Mid-Barataria Sediment Diversion River Sampling

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STATE OF THE COAST

TBS T. BAKER SMITH, LLC
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OUTLINE

1. Mid-Barataria Sediment Diversion Project Overview
2. River Sampling Overview
3. Sampling Tasks and Equipment
4. Scope of Work / Execution
5. Analysis and Results

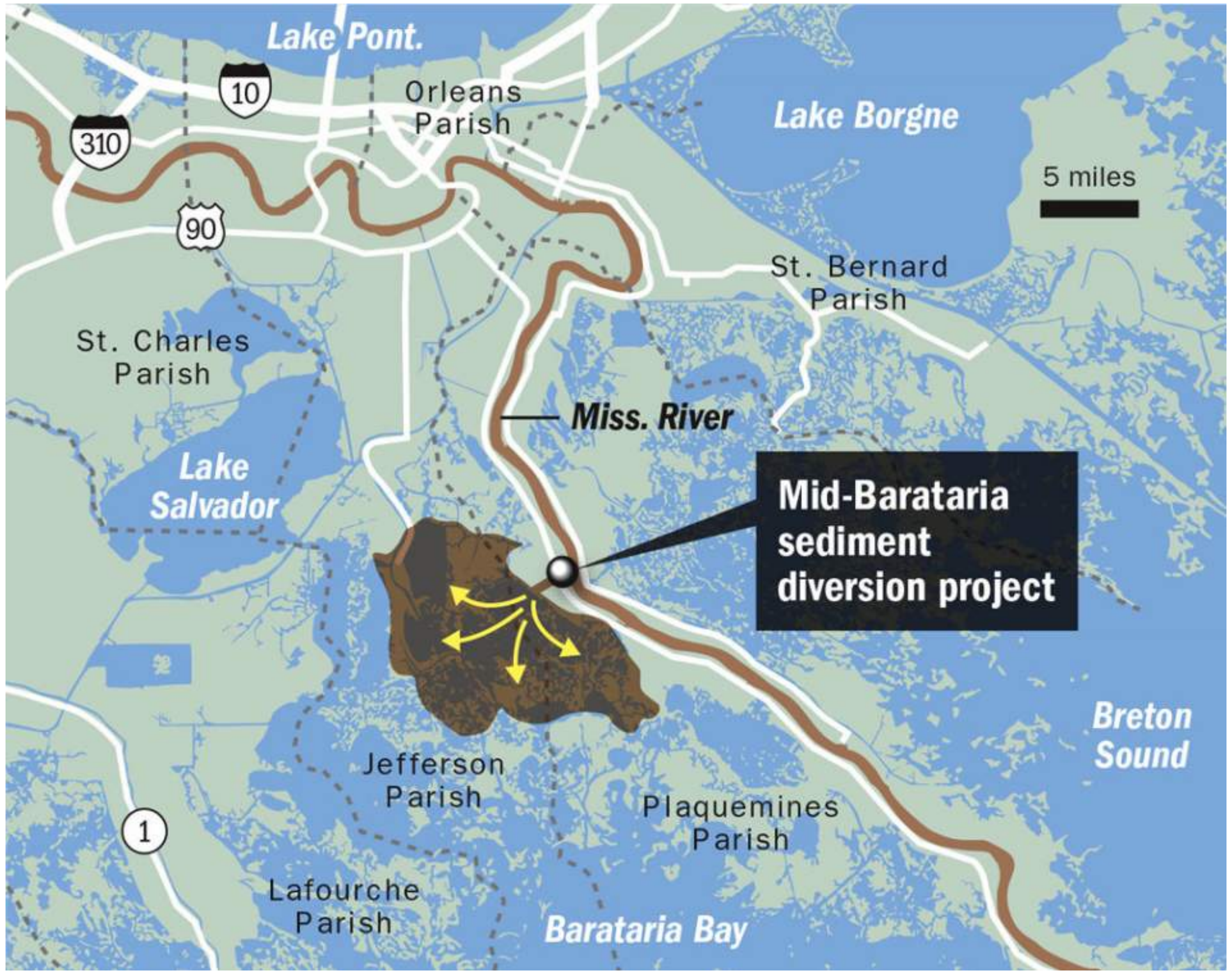
MID-BARATARIA SEDIMENT DIVERSION PROJECT OVERVIEW

Owner: State of Louisiana
Coastal Protection and Restoration Authority (CPRA)

Cost: 2.9 Billion (includes E&D, Construction, Mitigation)

Funding: National Fish and Wildlife Foundation (NFWF)
2010 Deepwater Horizon settlement

Goal: Divert sediment from the MS River to build land in the Barataria Basin



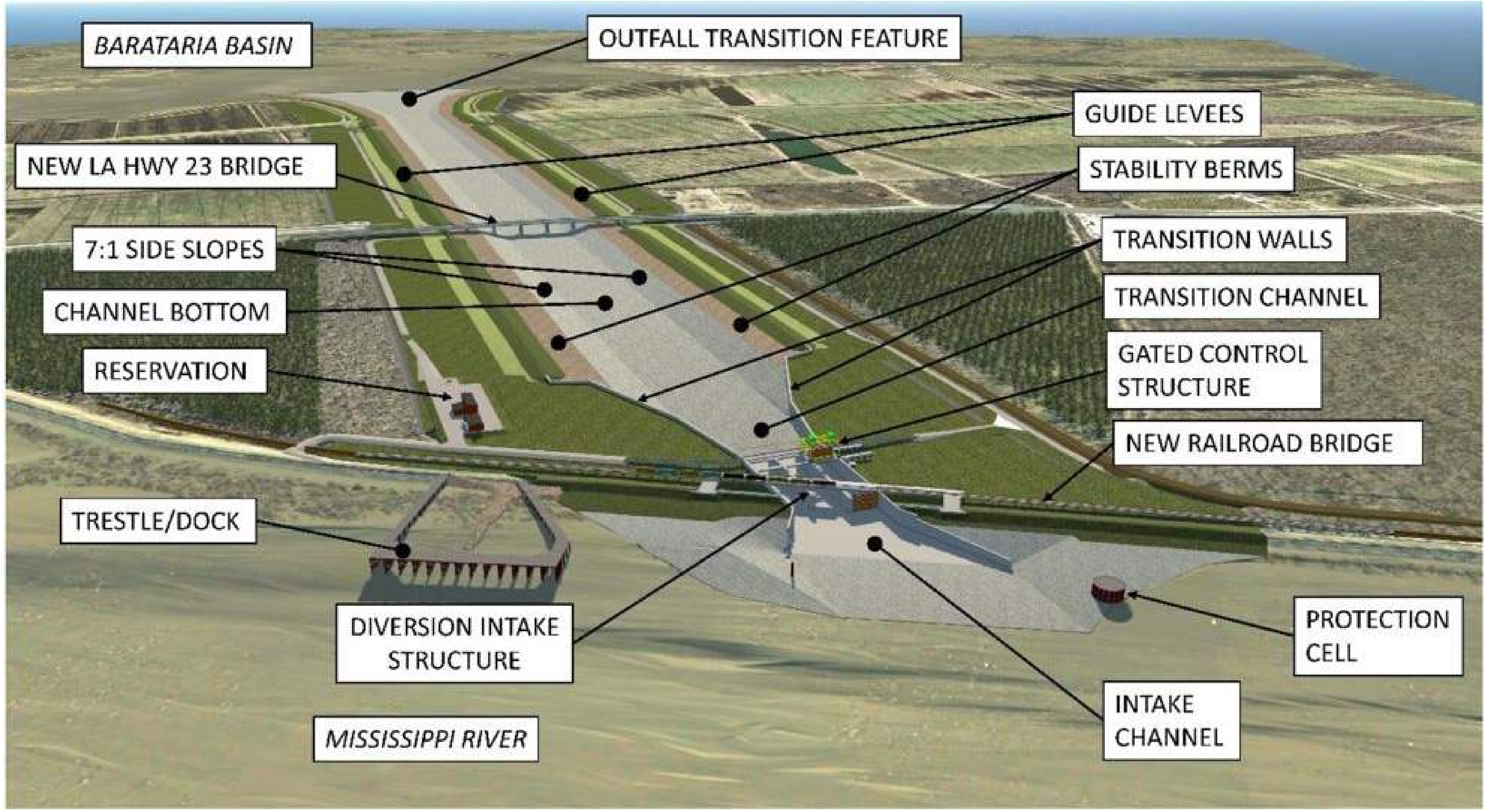
MID-BARATARIA SEDIMENT DIVERSION PROJECT OVERVIEW

Diversion Features:

- Intake
  - Intake structure
  - Gates
  - Transition channel
- Conveyance
  - 2 mile conveyance channel and guide levees
- Discharge
  - Outfall transition feature

Operation:

- Base flow: 5,000 cfs (MR at 450,000 cfs)
- Maximum flow: 75,000 cfs (MR at 1,000,000 cfs)



RIVER SAMPLING OVERVIEW

Goals

- Understand the sediment load in the Mississippi River (suspended sediment & bedload)
- Optimize design of the diversion and develop an operation plan.

Means

- Hydrodynamic modeling (FTN)
- Physical modeling (Alden Lab)

Data Collection (Model Validation)

- MS River discharge
- Suspended sediment concentration, character, and load
- Bed sediment grain size
- Bedload transport (multibeam survey)
- Batture sediment sampling

RIVER SAMPLING TEAM

AECOM	✓ Design team lead
TBS	✓ Management & coordination of field activities ✓ Multibeam surveys ✓ Field support for point sampling, bed grabs, and ADCP ✓ Batture bed grabs ✓ Data processing & deliverables
Delta Land Services	✓ ADCP transects, CTD test, and suspended sediment samples
integral consulting inc.	✓ Lab testing
ftn	✓ Coordination of field activities ✓ Provided direction on data needs to support modeling
Tulane University	✓ QC Support

SAMPLING EQUIPMENT

Operator	Vessel Name	Data Collection	Equipment	Field Days Required
TBS / DLS	S/V Pallid Sturgeon	Isokinetic point samples of water and suspended sediment	P-6-200	2
		Sediment bed grab	Wildco Shipek	
		ADCP transect for water discharge	Workhorse Rio Grande ADCP	
		Stationary ADCP for suspended sediment calibration		
		CTD profile casts	SBE 19plus Seacat	
TBS	N/A	Batture grab sample collection	Modified Push Core Sampler	1
TBS	M/V Echotrac M/V Surveyor 7	Multibeam bathymetry grids for bed load transport calculations	Sonic 2024 Sonic 2020	2 to 4

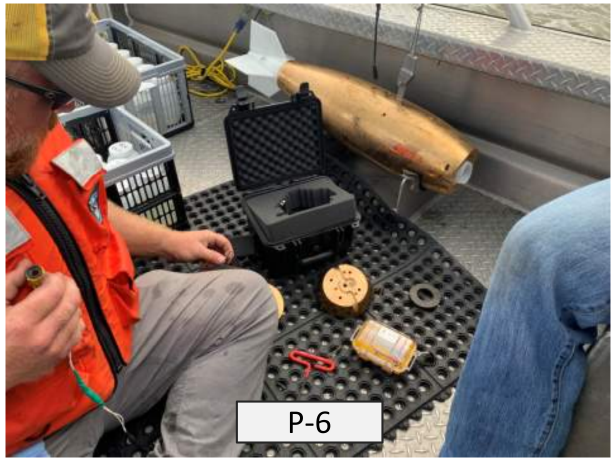
FIELD PICTURES

Shingle Point Boat Launch

S/V Pallid Sturgeon

FIELD PICTURES

Winch & Davit Setup



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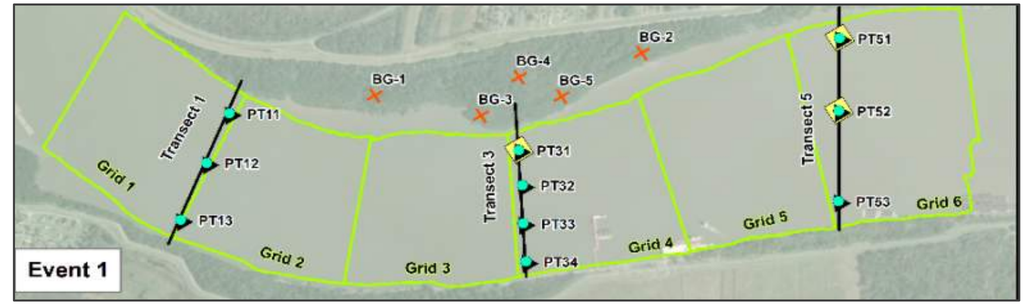
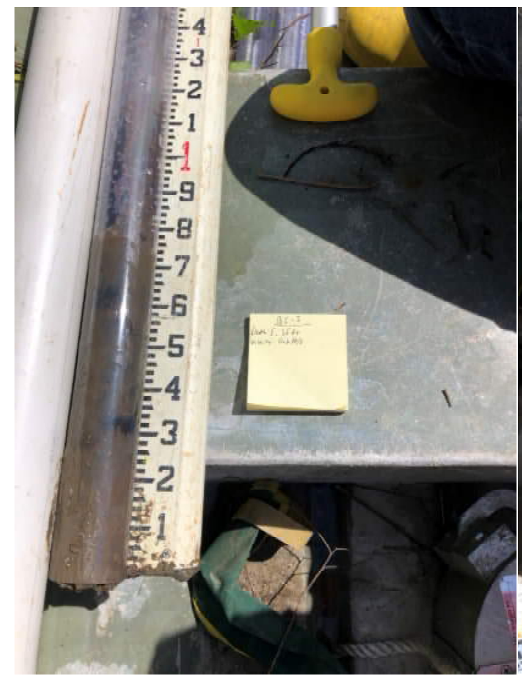
Ship Traffic

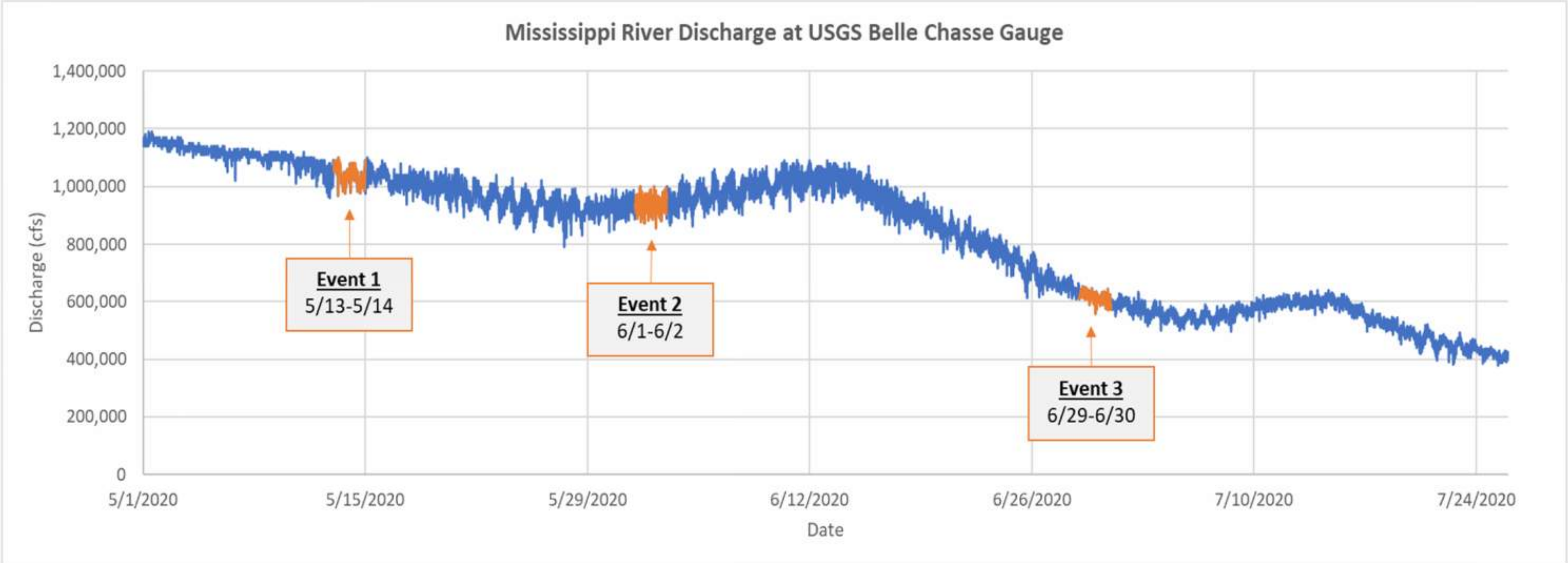
Event 1 – Waves at Alliance

BATTURE BED GRABS



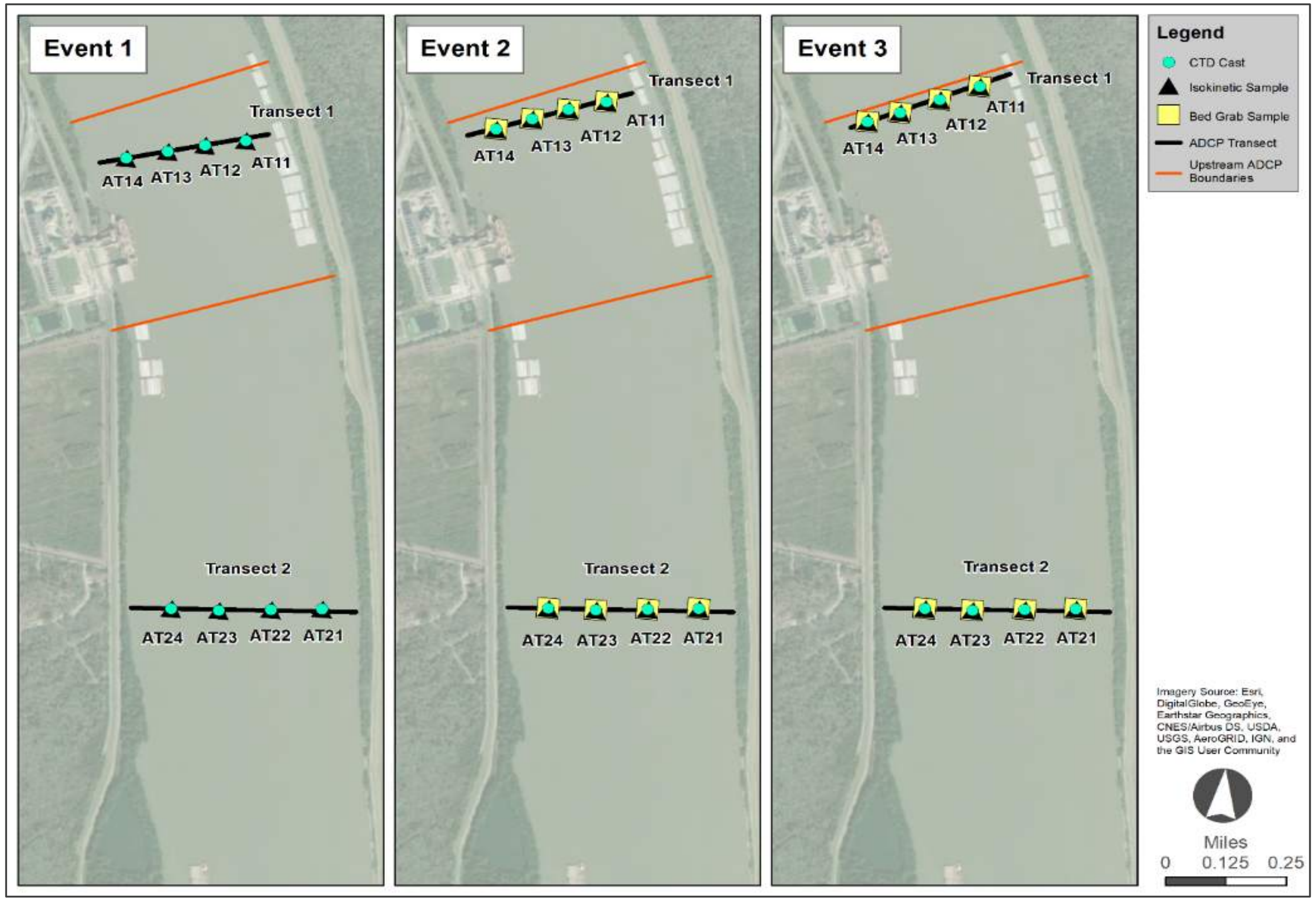


RIVER SAMPLING EVENTS



Event	Date	Target Belle Chase (cfs)	Actual Belle Chase (cfs)
#1	May 13-14, 2020	1,000,000	1,080,000
#2	June 1-2, 2020	900,000	914,000
#3	June 29-30, 2020	700,000	652,000

SAMPLING LOCATIONS – ALLIANCE POINT BAR



Sampling Objectives

- Acoustic Doppler Current Profiler (ADCP) Transects
  - 2 Transects
- Isokinetic Sampling
  - 56 Samples w/ stationary ADCP
- Grab Sampling – River
  - 8 Samples
- Conductivity, Temperature, Depth (CTD) Cast
  - 8 Casts

SAMPLING LOCATIONS – PHOENIX / MYRTLE GROVE POINT BAR

Sampling Objectives

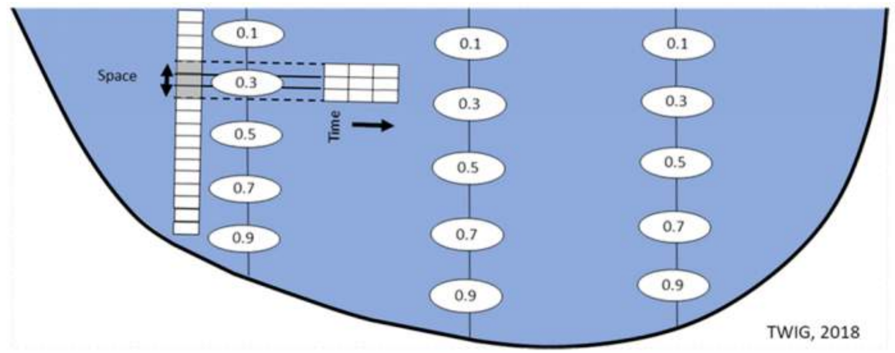
- Acoustic Doppler Current Profiler (ADCP) Transects
  - 5 Transects
- Isokinetic Sampling
  - 80 Samples w/ stationary ADCP
- Grab Sampling – River
  - 10 Samples
- Grab Sampling – Batture
  - 5 samples
- Conductivity, Temperature, Depth (CTD) Cast
  - 10 Casts
- Multibeam Grids
  - 6 grids surveyed 2 times, 24 hrs apart

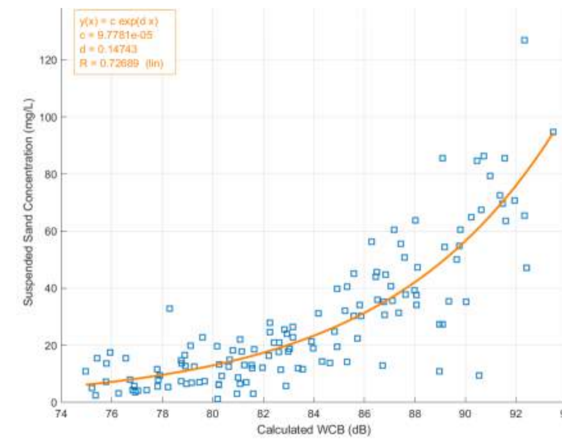
ANALYSIS: SUSPENDED SAND CONCENTRATION

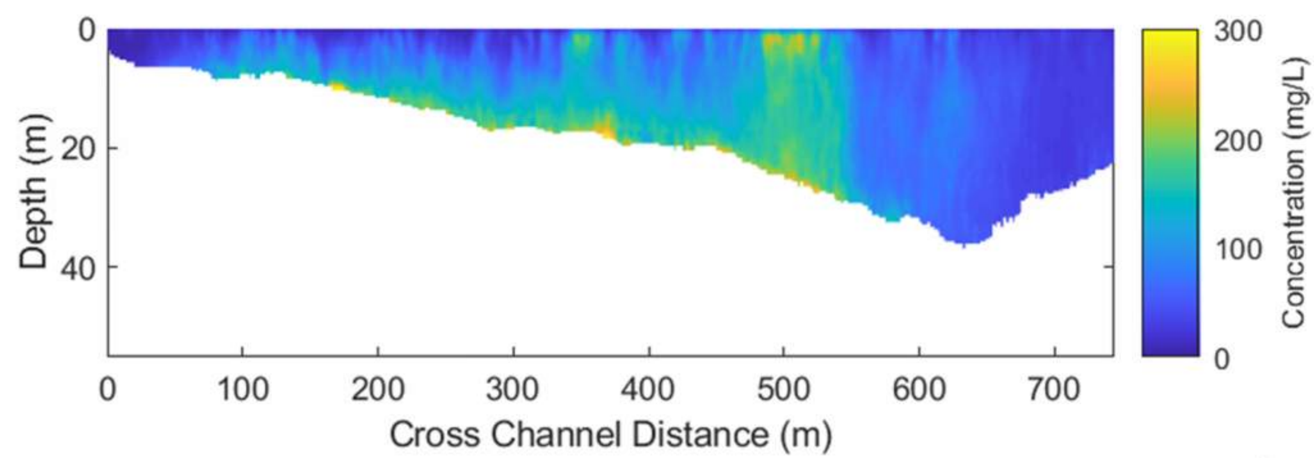
- Stationary ADCP
  - Water Corrected Backscatter
    - Converted from beam intensity and corrected for water effects
  - Averaging
    - Spatial-temporal averages calculated for each isokinetic sample
- Suspended Sediment
  - Regression analyses
    - Sand concentration paired with averaged ADCP backscatter
    - Develop exponential regression curves
- ADCP Transects
  - Suspended sand cross sections
    - Use regression curves to convert ADCP transects to suspended sand concentration

$$WCB = MB + 20\log_{10} R + 2\alpha_w R$$

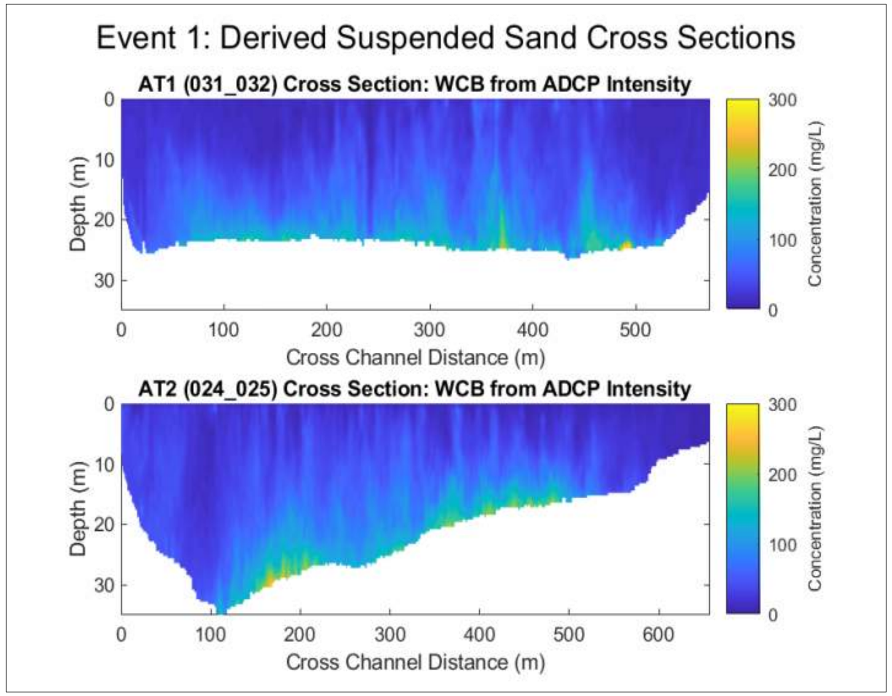
Ramirez and Allison, 2013

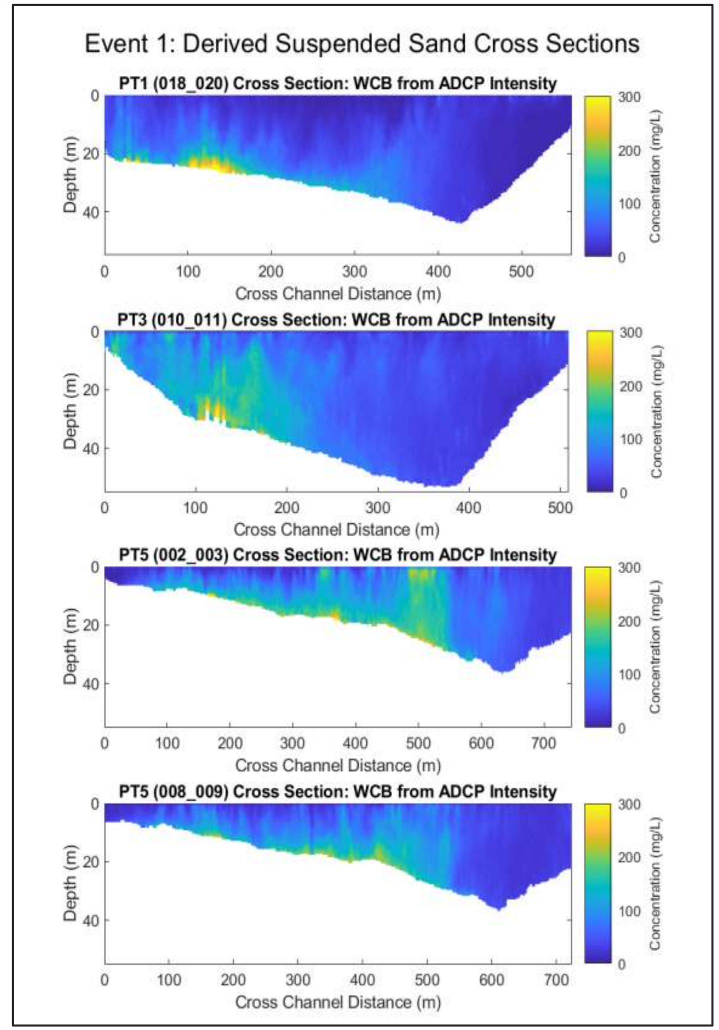






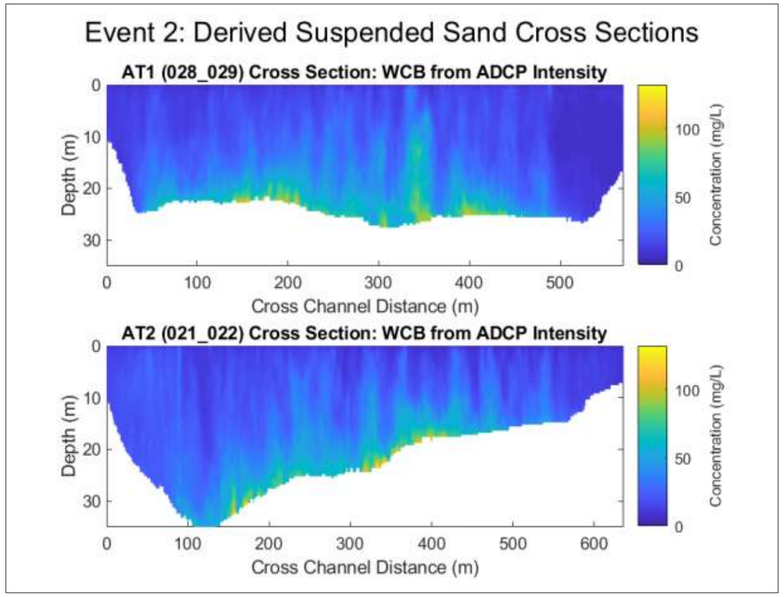
ANALYSIS: SUSPENDED SAND CONCENTRATION (EVENT 1)



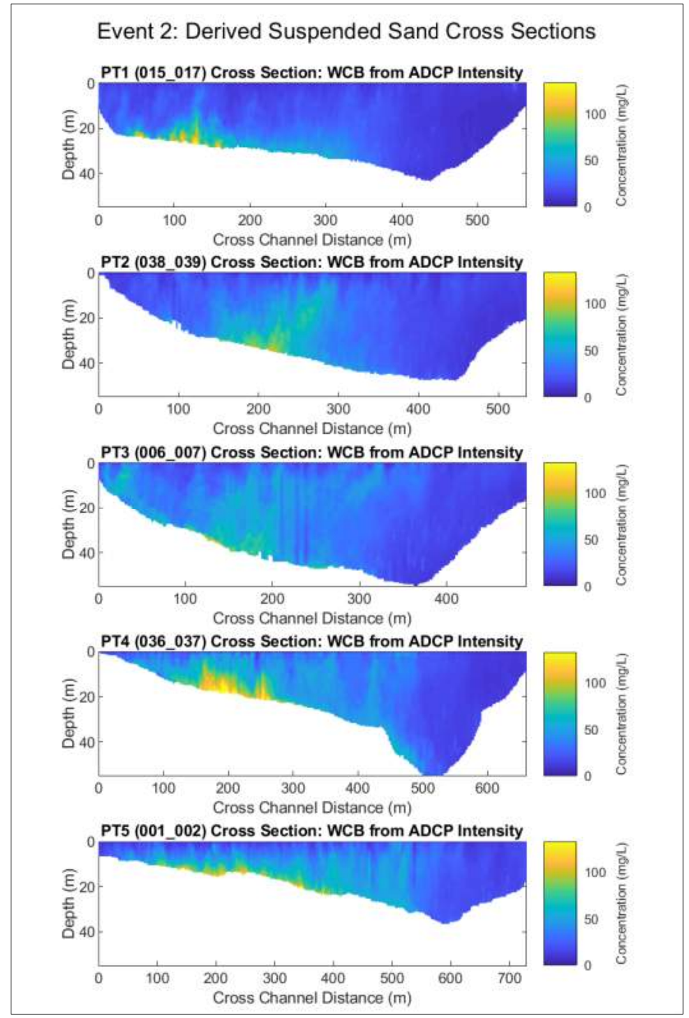


Cross Section ID	Minimum (mg/L)	Maximum (mg/L)	Average (mg/L)
AT1	3.47	291.65	50.01
AT2	3.13	271.49	53.06
PT1	3.54	387.65	46.04
PT3	11.58	313.37	67.79
PT5	3.36	338.11	87.05
PT5	5.18	284.65	66.64

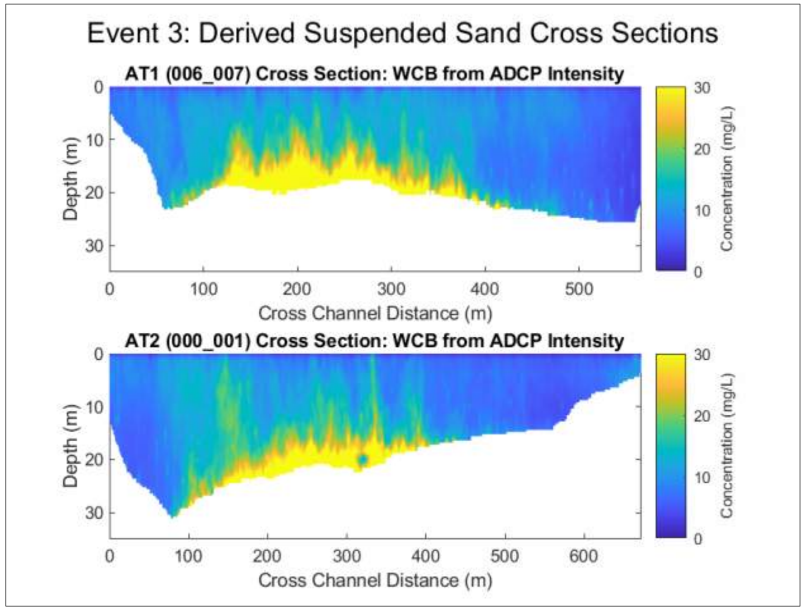
ANALYSIS: SUSPENDED SAND CONCENTRATION (EVENT 2)



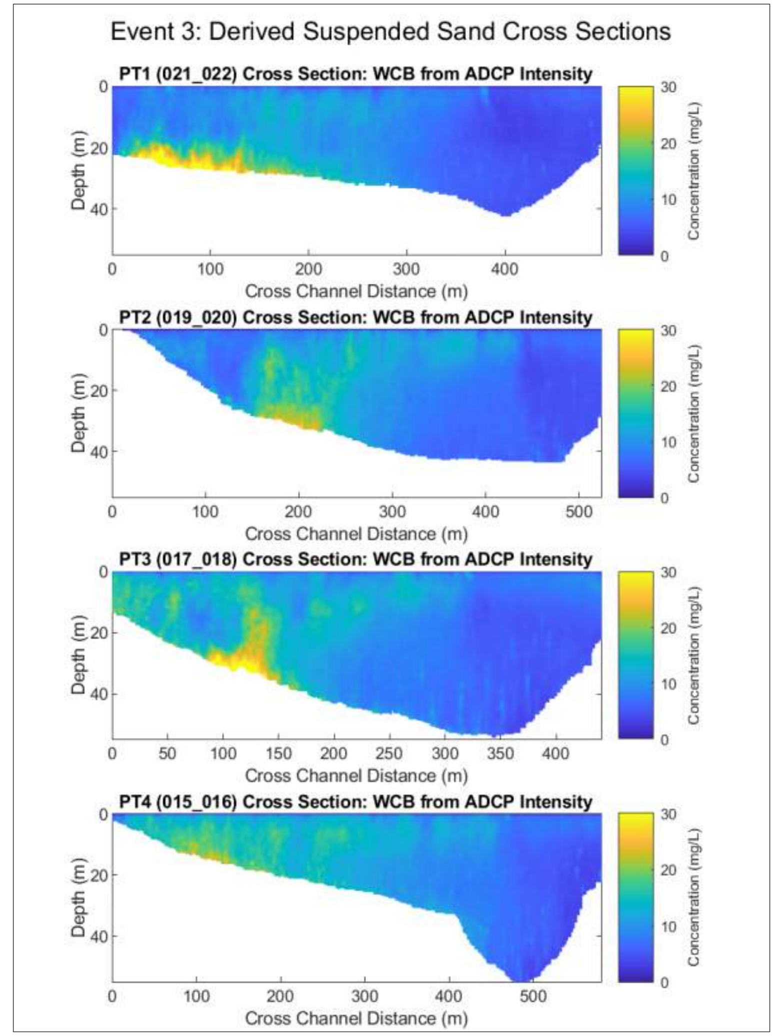
Cross Section ID	Minimum (mg/L)	Maximum (mg/L)	Average (mg/L)
AT1	4.50	115.45	28.17
AT2	4.26	126.78	29.09
PT1	5.36	140.53	22.67
PT2	4.17	108.38	28.24
PT3	6.12	114.06	31.85
PT4	4.99	164.28	34.92
PT5	4.96	134.50	35.82
PT5	4.74	156.52	35.05



ANALYSIS: SUSPENDED SAND CONCENTRATION (EVENT 3)

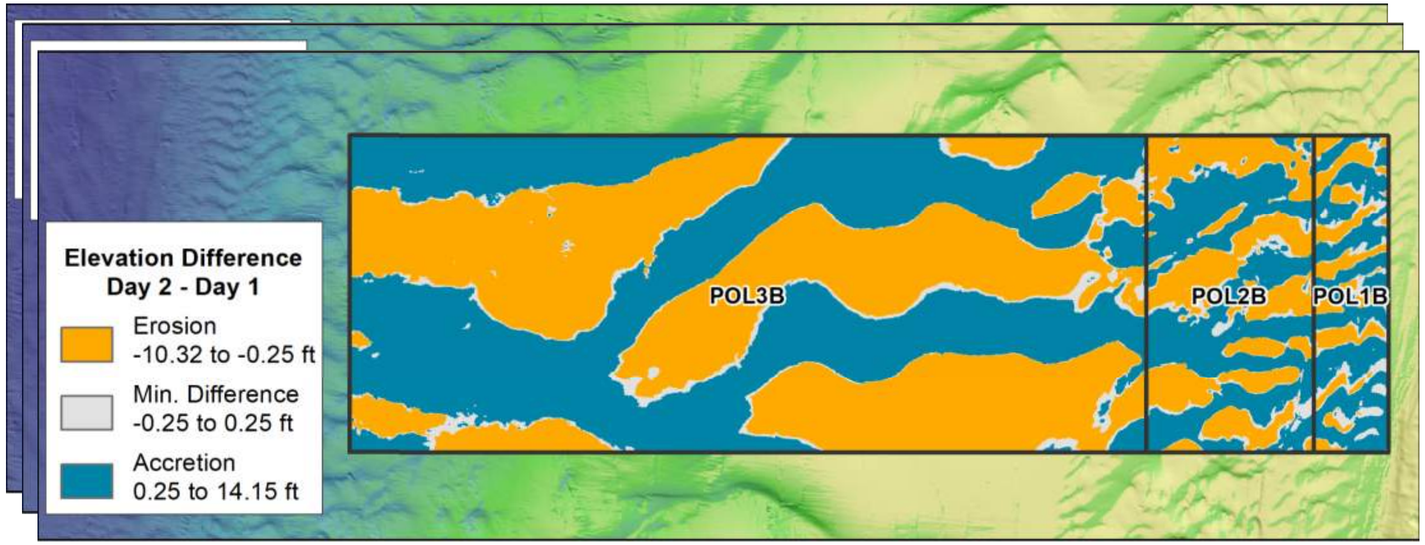


Cross Section ID	Minimum (mg/L)	Maximum (mg/L)	Average (mg/L)
AT1	1.97	82.82	12.97
AT2	1.85	88.15	12.30
PT1	2.21	58.23	9.01
PT2	2.17	28.01	9.25
PT3	3.05	44.95	10.05
PT4	3.04	27.44	9.96
PT5	2.08	26.37	10.37



ANALYSIS: BEDLOAD

- Multibeam
  - Polygon Analysis Areas
    - Draw analysis areas based on dune wavelength
    - Count sand dunes for each day
  - Elevation Change
    - Calculate difference maps for each grid
  - Sediment Flux
    - Assess volumetric change over time to develop cross sectional bed load flux



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CONCLUSION

- Suspended sediment cross sections and bedload sediment flux data were input into the numerical and physical models.
- Model outputs were used to optimize the design of the diversion and develop an operation plan.

Special Thanks:

- Brad Barth – CPRA
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THANK YOU
AECOM