

Atchafalaya Long Distance Sediment Pipeline Feasibility Study

Identification of Borrow Sites

BTNEP Management Conference
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moffatt & nichol

Land Loss Central Terrebonne Parish



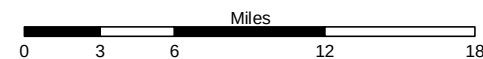
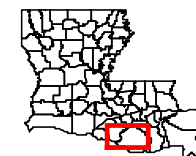
Part 1:
Where would one find
suitable sediments
for marsh restoration

Part 2:
How and to what locations would
one transport the sediments
for marsh restoration

Project Region and Study Area

-  Approximate Point of Intake
-  Atchafalaya LDSP Borrow Site Identification Study Area
-  Pipeline Corridor
-  Land Loss 1932-2010 (Source: USGS)

- USACE Dredge Reaches**
-  Bar Channel
 -  Bay Channel
 -  Horseshoe Bend
 -  Bayou Chene
 -  Bayou Boeuf
 -  Bayou Black



Feasibility Study Part 1 – Chapter 1

1. Beneficial Use Material

Sediment dredged from maintenance dredging in the Lower Atchafalaya

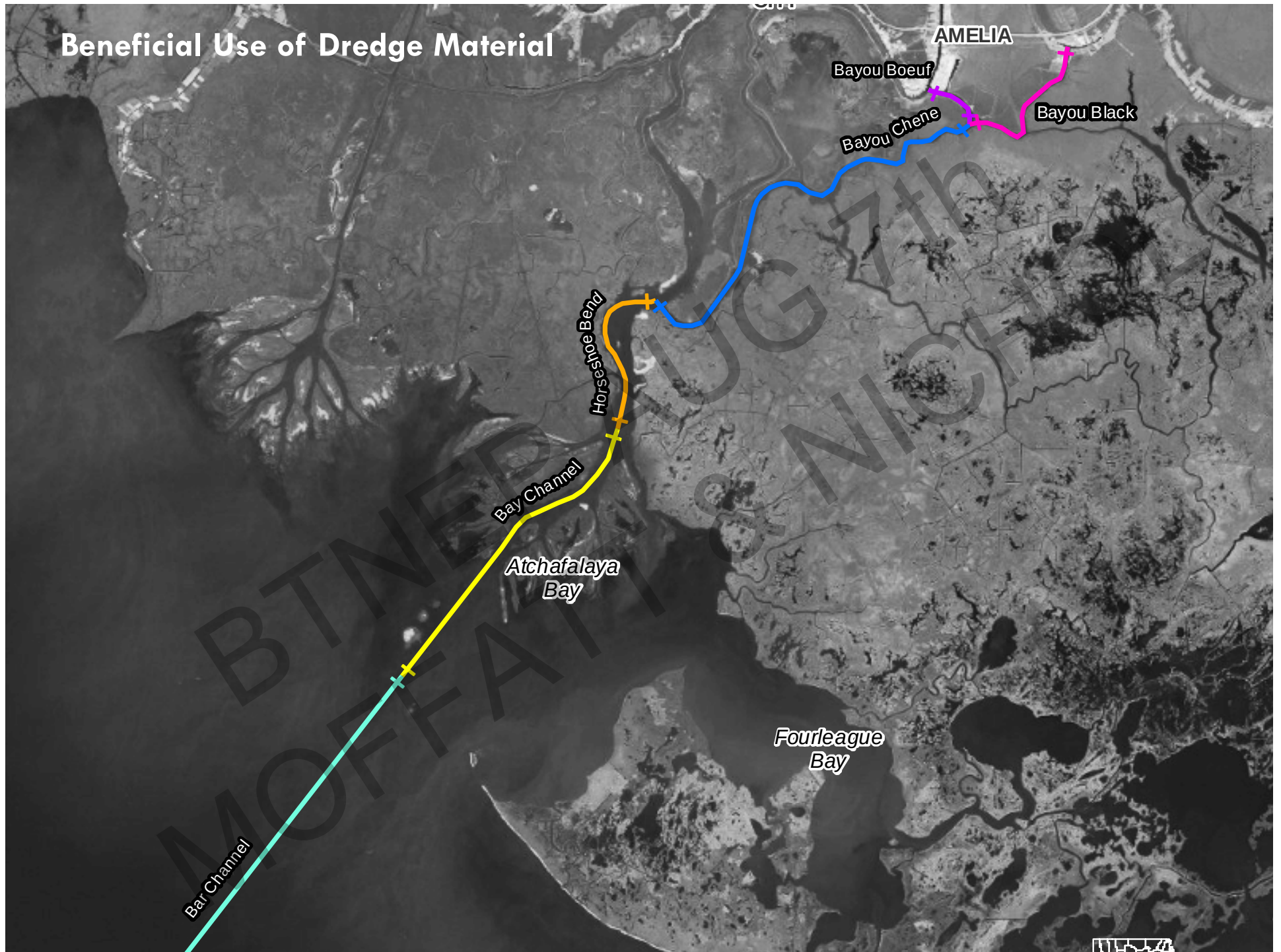
2. Dedicated dredging

Dedicated borrow sites to serve as sediment sources for the Atchafalaya River LDSP.



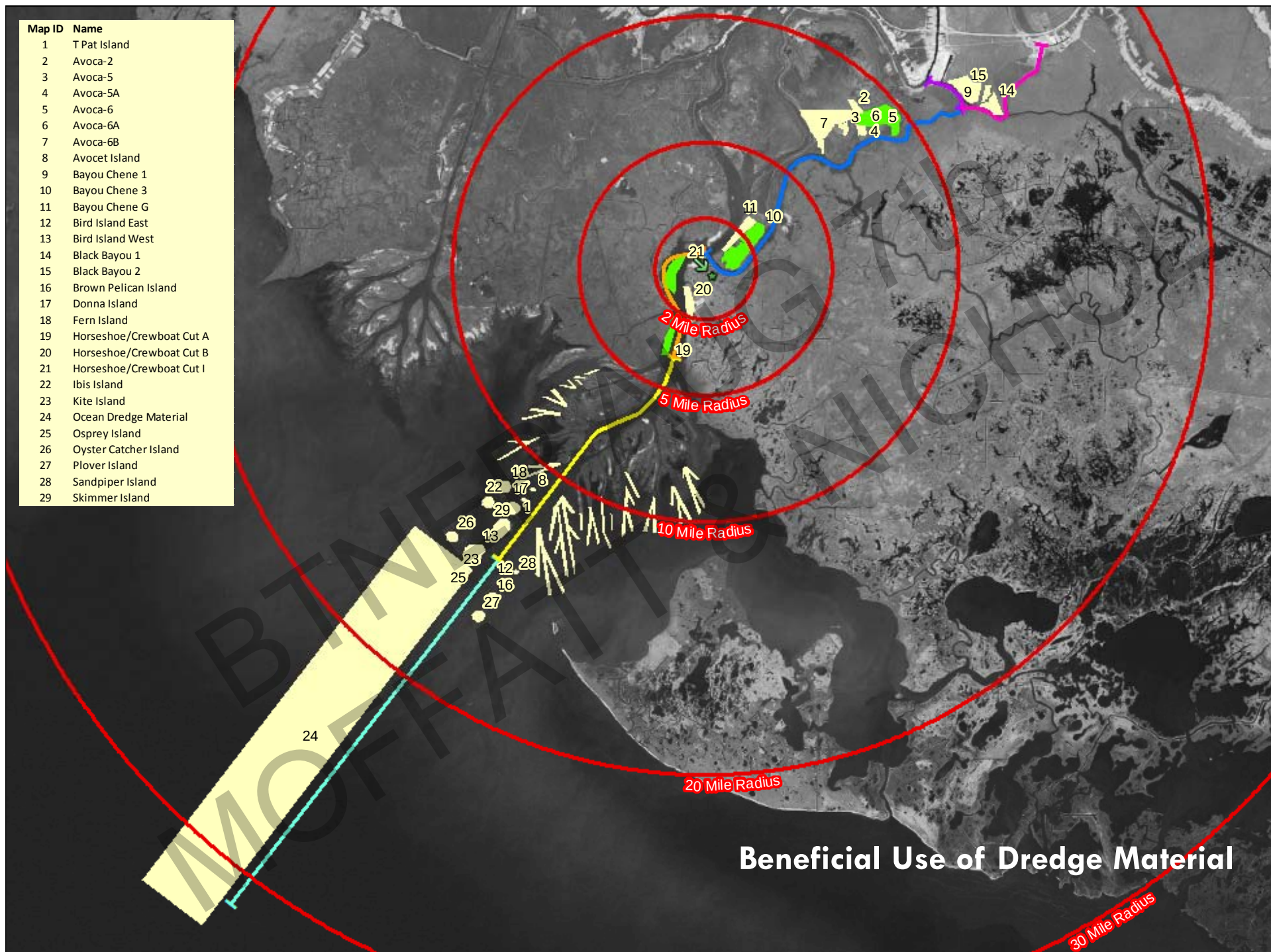
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Beneficial Use of Dredge Material



Map ID Name

- 1 T Pat Island
- 2 Avoca-2
- 3 Avoca-5
- 4 Avoca-5A
- 5 Avoca-6
- 6 Avoca-6A
- 7 Avoca-6B
- 8 Avocet Island
- 9 Bayou Chene 1
- 10 Bayou Chene 3
- 11 Bayou Chene G
- 12 Bird Island East
- 13 Bird Island West
- 14 Black Bayou 1
- 15 Black Bayou 2
- 16 Brown Pelican Island
- 17 Donna Island
- 18 Fern Island
- 19 Horseshoe/Crewboat Cut A
- 20 Horseshoe/Crewboat Cut B
- 21 Horseshoe/Crewboat Cut I
- 22 Ibis Island
- 23 Kite Island
- 24 Ocean Dredge Material
- 25 Osprey Island
- 26 Oyster Catcher Island
- 27 Plover Island
- 28 Sandpiper Island
- 29 Skimmer Island



Beneficial Use of Dredge Material

Feasibility of Dedicated Dredging

Goal:

To find suitable material for marsh restoration

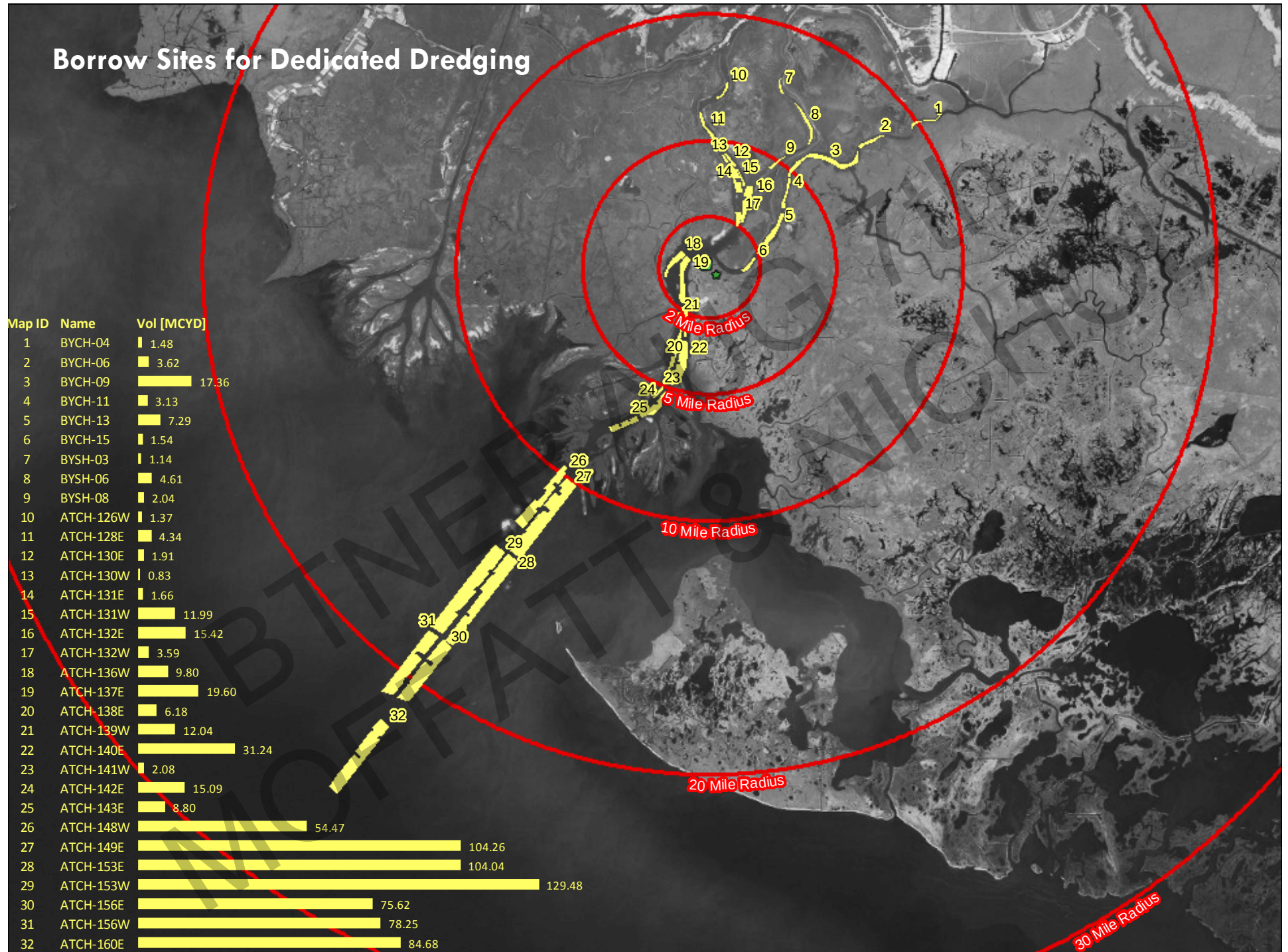
Conditions:

- Within the Lower Atchafalaya River Region
- Borrow material to transport it by pipeline
- Pump out location is located in the vicinity of Crew Boat Cut



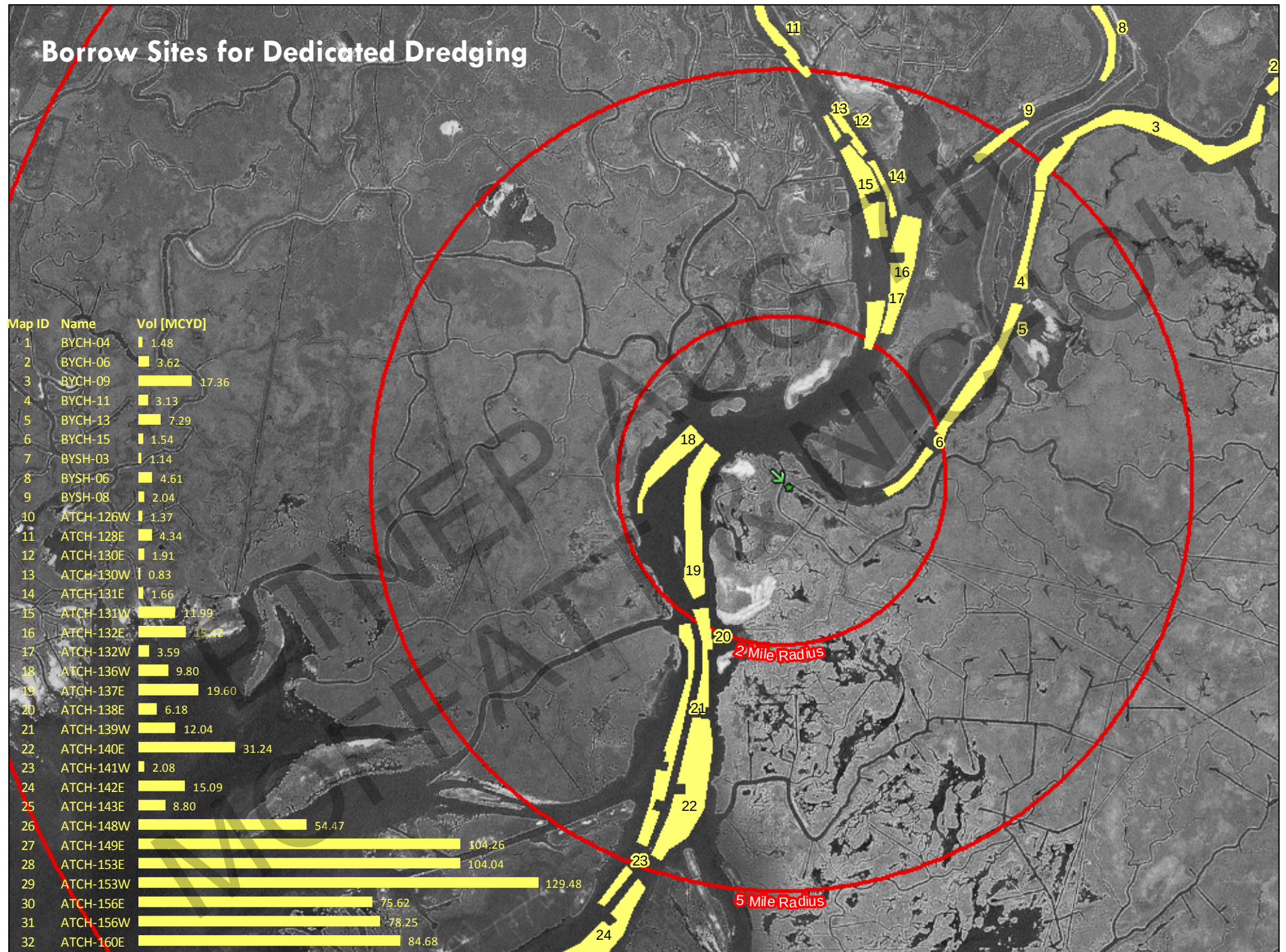
Borrow Sites for Dedicated Dredging

Map ID	Name	Vol [MCYD]
1	BYCH-04	1.48
2	BYCH-06	3.62
3	BYCH-09	17.36
4	BYCH-11	3.13
5	BYCH-13	7.29
6	BYCH-15	1.54
7	BYSH-03	1.14
8	BYSH-06	4.61
9	BYSH-08	2.04
10	ATCH-126W	1.37
11	ATCH-128E	4.34
12	ATCH-130E	1.91
13	ATCH-130W	0.83
14	ATCH-131E	1.66
15	ATCH-131W	11.99
16	ATCH-132E	15.42
17	ATCH-132W	3.59
18	ATCH-136W	9.80
19	ATCH-137E	19.60
20	ATCH-138E	6.18
21	ATCH-139W	12.04
22	ATCH-140E	31.24
23	ATCH-141W	2.08
24	ATCH-142E	15.09
25	ATCH-143E	8.80
26	ATCH-148W	54.47
27	ATCH-149E	104.26
28	ATCH-153E	104.04
29	ATCH-153W	129.48
30	ATCH-156E	75.62
31	ATCH-156W	78.25
32	ATCH-160E	84.68



Borrow Sites for Dedicated Dredging

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1	BYCH-04	1.48
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13	ATCH-130W	0.83
14	ATCH-131E	1.66
15	ATCH-131W	11.99
16	ATCH-132E	15.43
17	ATCH-132W	3.59
18	ATCH-136W	9.80
19	ATCH-137E	19.60
20	ATCH-138E	6.18
21	ATCH-139W	12.04
22	ATCH-140E	31.24
23	ATCH-141W	2.08
24	ATCH-142E	15.09
25	ATCH-143E	8.80
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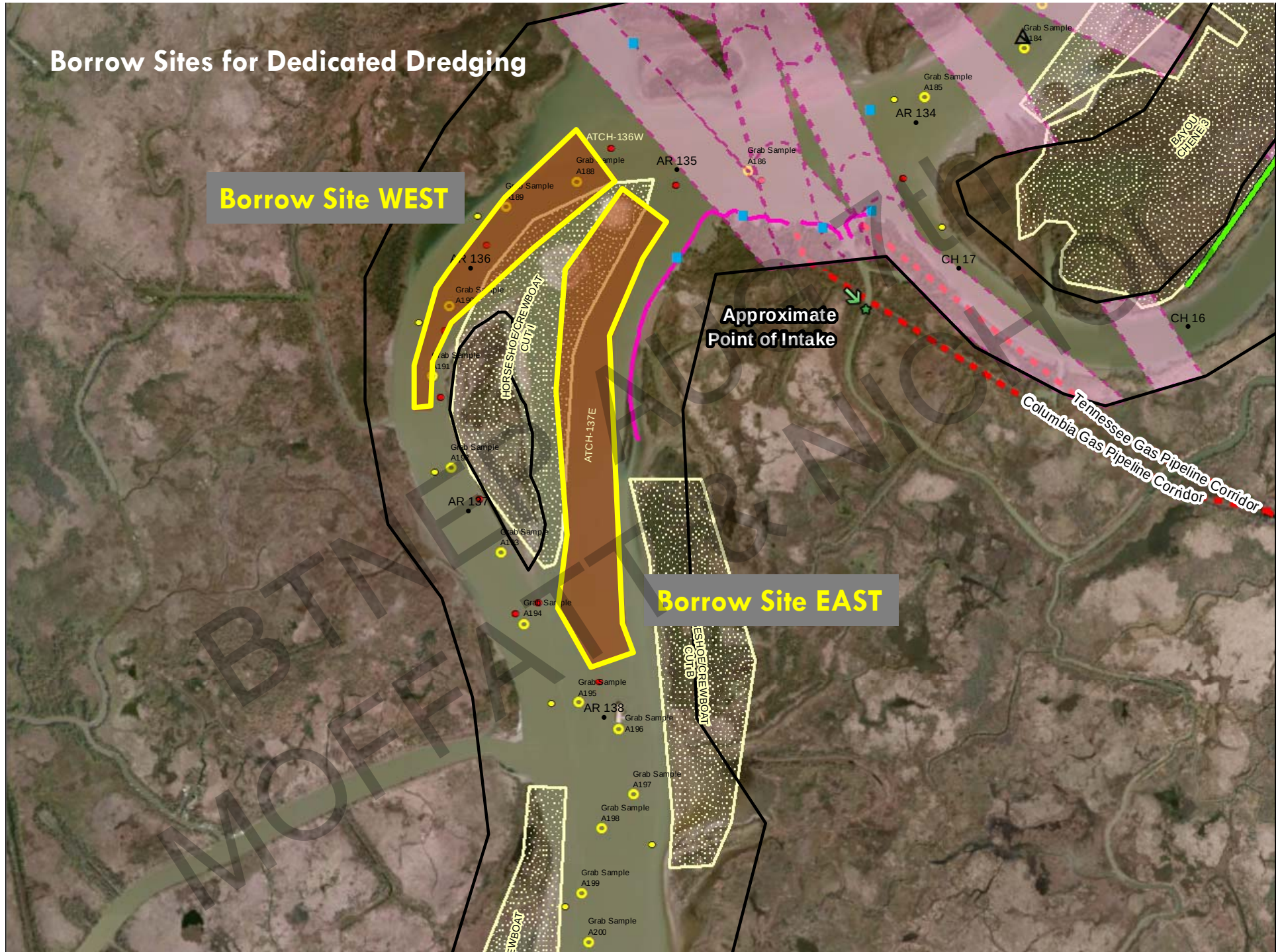
Borrow Sites for Dedicated Dredging

Borrow Site WEST

**Approximate
Point of Intake**

Borrow Site EAST

Tennessee Gas Pipeline Corridor
Columbia Gas Pipeline Corridor



Preliminary Identified Borrow Sites

Borrow Site Name	Quantitative characteristics	Qualitative characteristics		
		Reach	Proximity	Refill Rate
WEST	Volume [Million CY] 9.50	Horseshoe Bend	Good < 2miles	? CY / year
EAST	19.50	Crew Boat Cut	Good < 2miles	? CY / year



Feasibility Study – Part 1: Chapter 2

- The demand of sediment for restoration projects:
 - Volume of sediment (~50 Million CY)
 - Time scale and sequencing of needed sediment supply (~5 Million CY per year)
- “Chapter 2”
 - Perform hydrodynamic and morphological modeling for the river reach that contains the 2 borrow site locations and estimate refill rates



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Modeling Approach

- Model Setup and Development
- Sediment Transport Model Testing and Verification
- Production Runs for Water Years
- Result Analysis and refill rate assessment



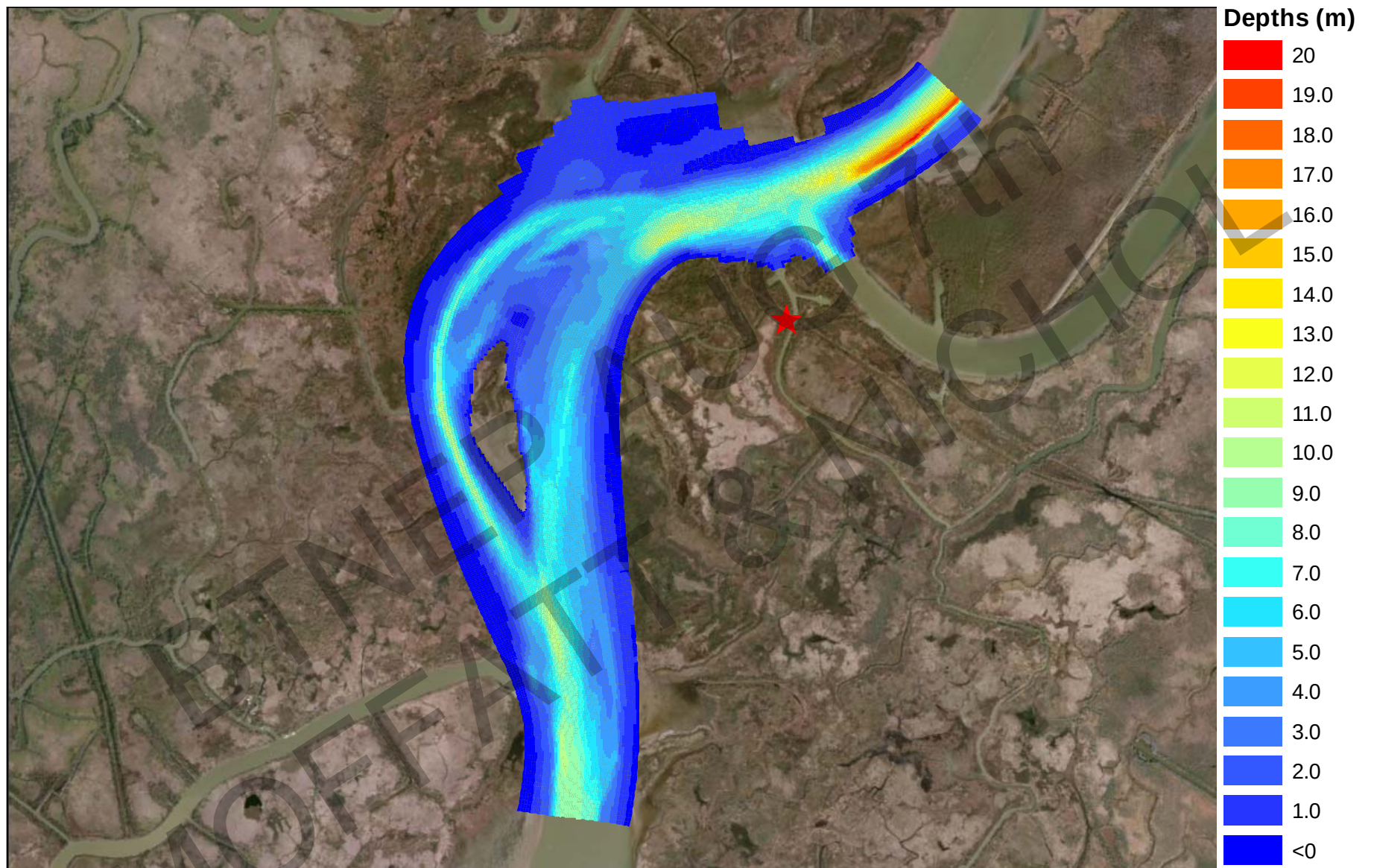
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Horseshoe Bend and Crewboat Cut Model Extents

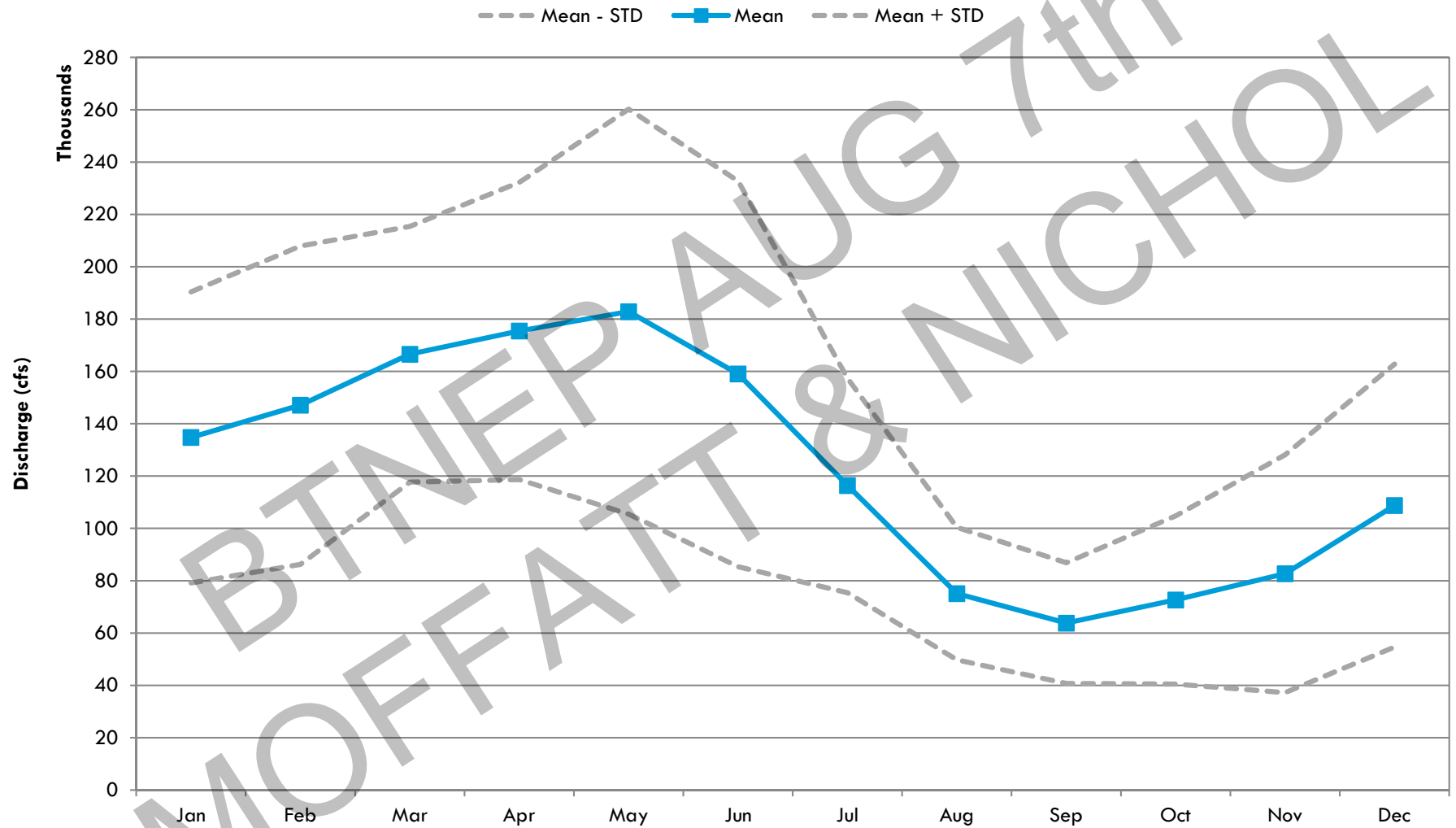
- ★ Approximate Point of Intake
- Model Grid



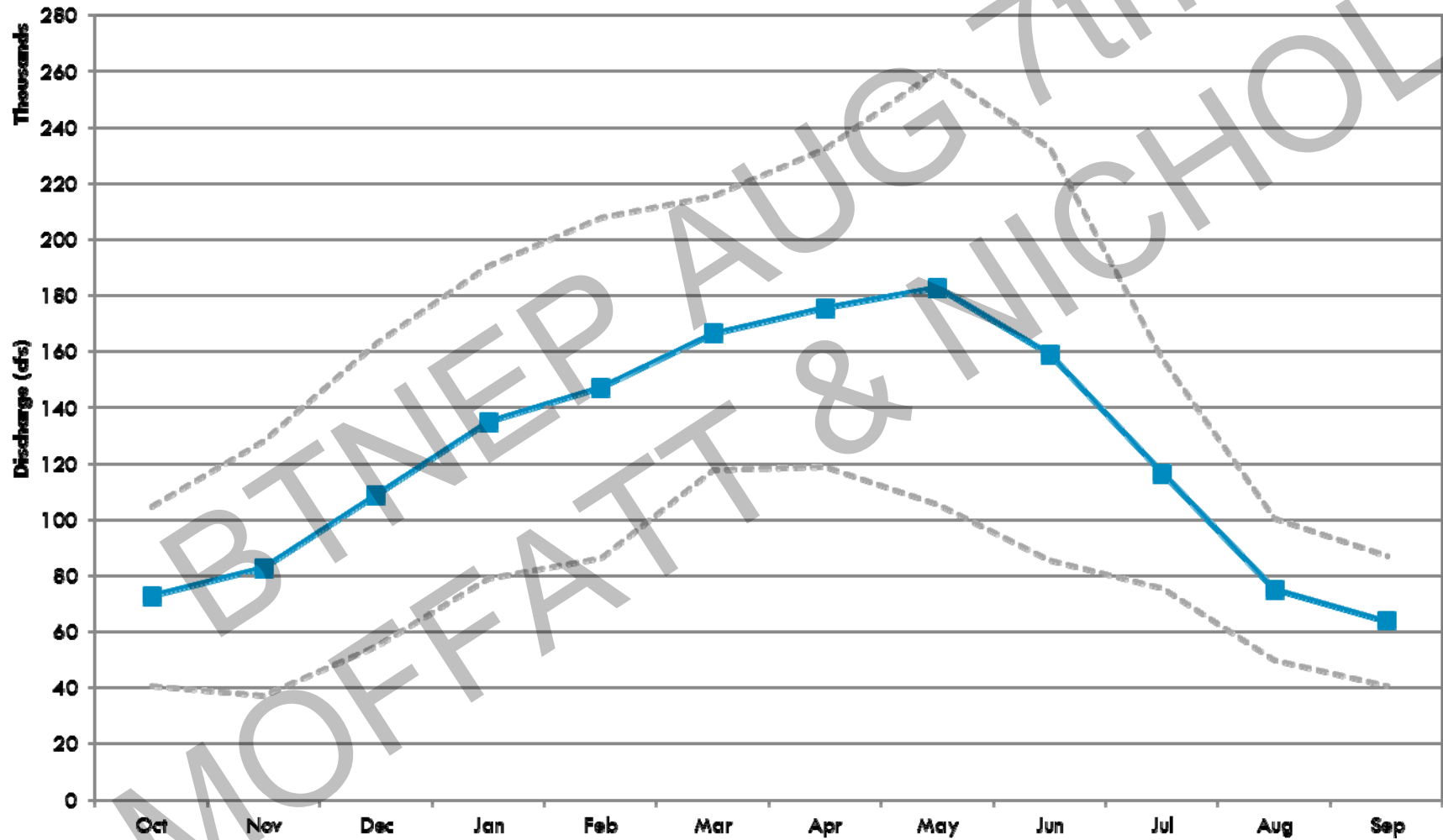


Numerical Model Bathymetry (Existing Conditions)

Yearly Average Flow - Lower Atchafalaya River at Morgan City



Yearly Average Flow - Lower Atchafalaya River at Morgan City



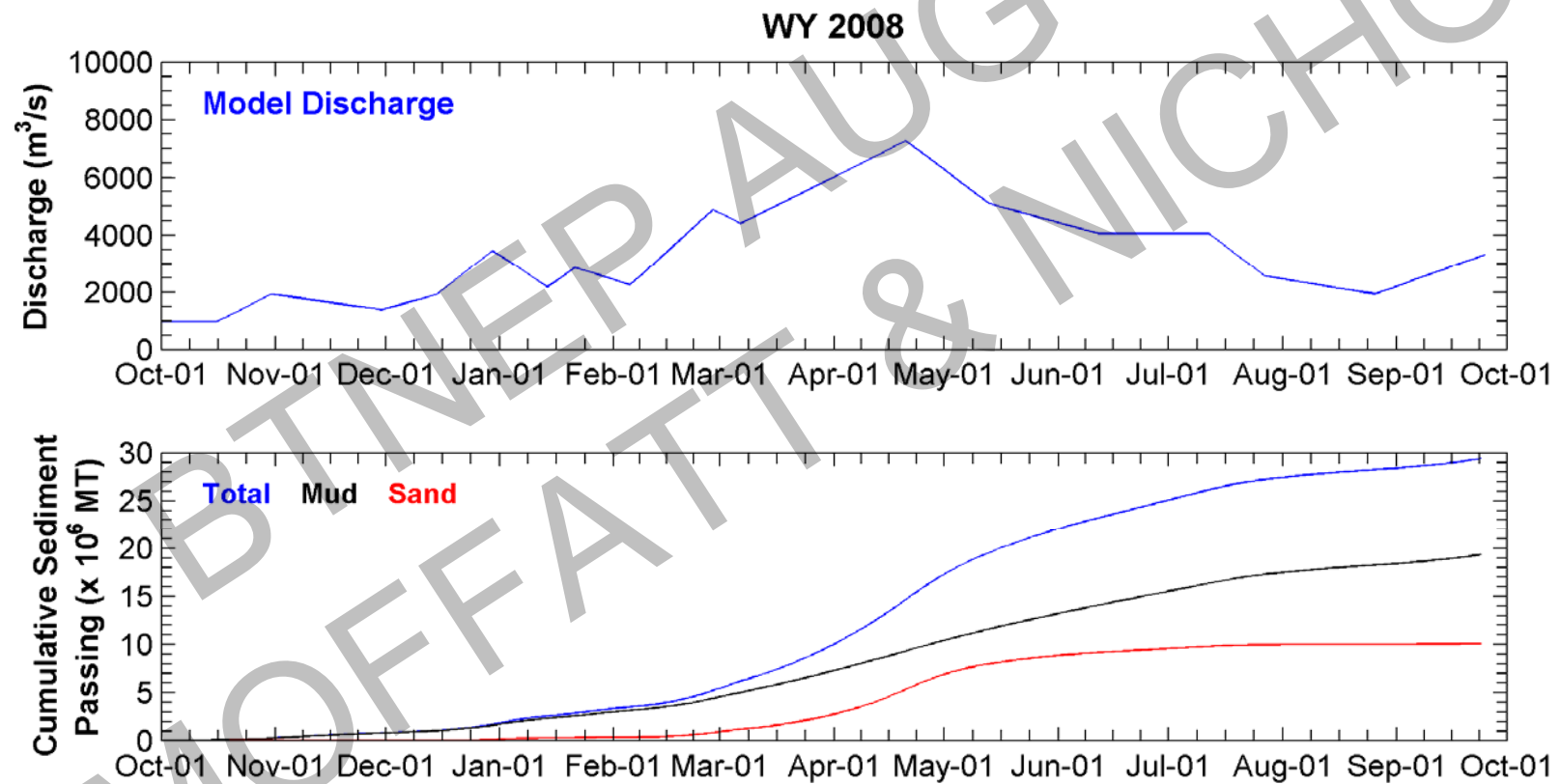
Model Validation

- Three water years were simulated
 - ▣ Water year 2008, 2009 and 2010
- Simulated vs. for Observed Sediment loads
 - ▣ Sediment load was compared to literature
 - ▣ Both mud, sand and total sediment load
- Comparison of Bathymetric Change for 2 timeframes



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Simulated vs. for obs. sediment loads (1)



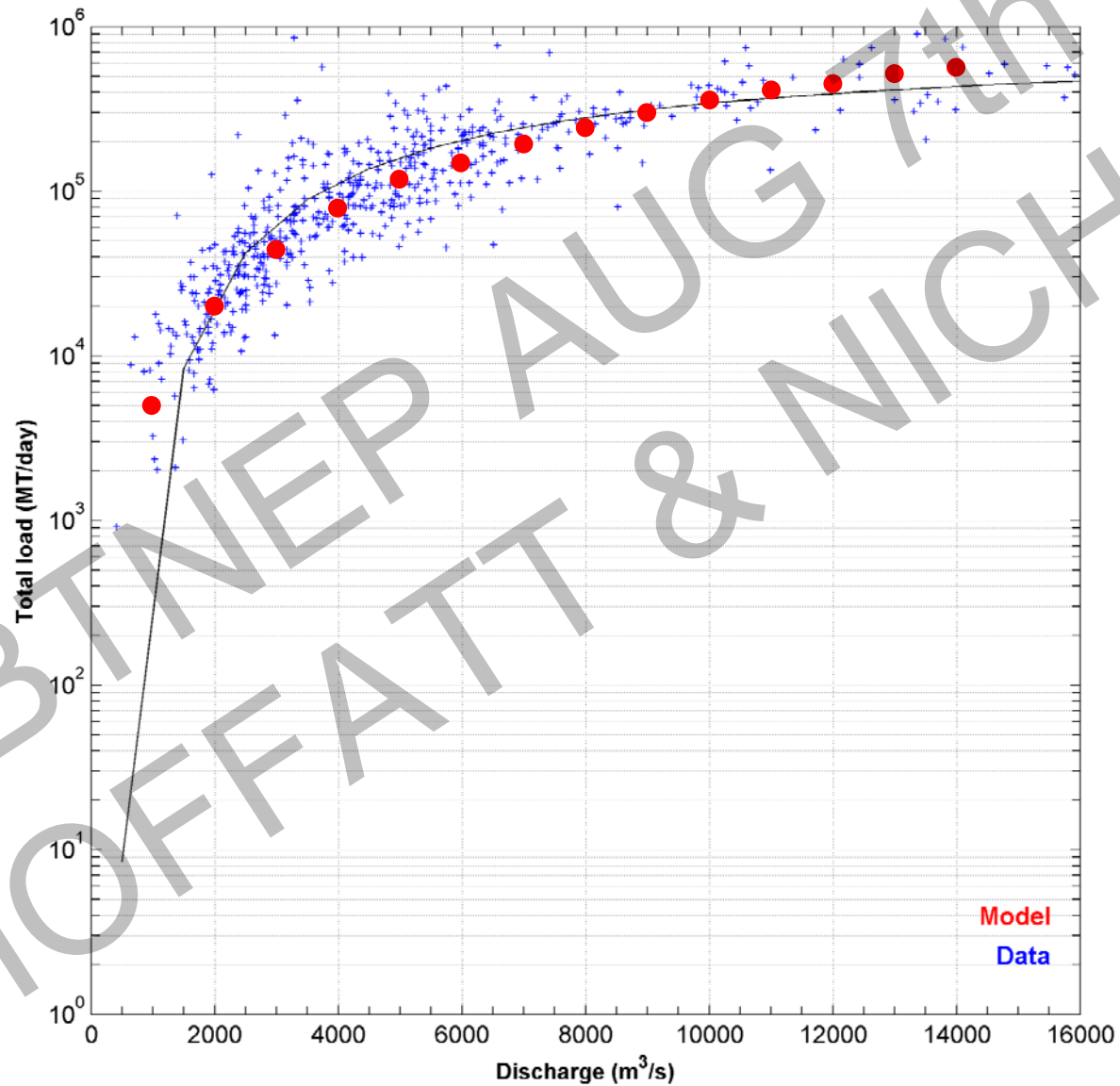
Simulated vs. for obs. sediment loads (2)

Water Year	Allison et al. (2012) Total load at Morgan City (10 ⁶ Tons)	Allison et al. (2012) Sand load at Morgan City (10 ⁶ Tons)	ST model Total Load into Horseshoe Bend (10 ⁶ Tons)	ST model Sand Load into Horseshoe Bend (10 ⁶ Tons)
WY 2008	30.9	7.3	29.4	10.1
WY 2009	22.7	3.8	23.8	6.7
WY 2010	30.1	5.0	30.0	7.7

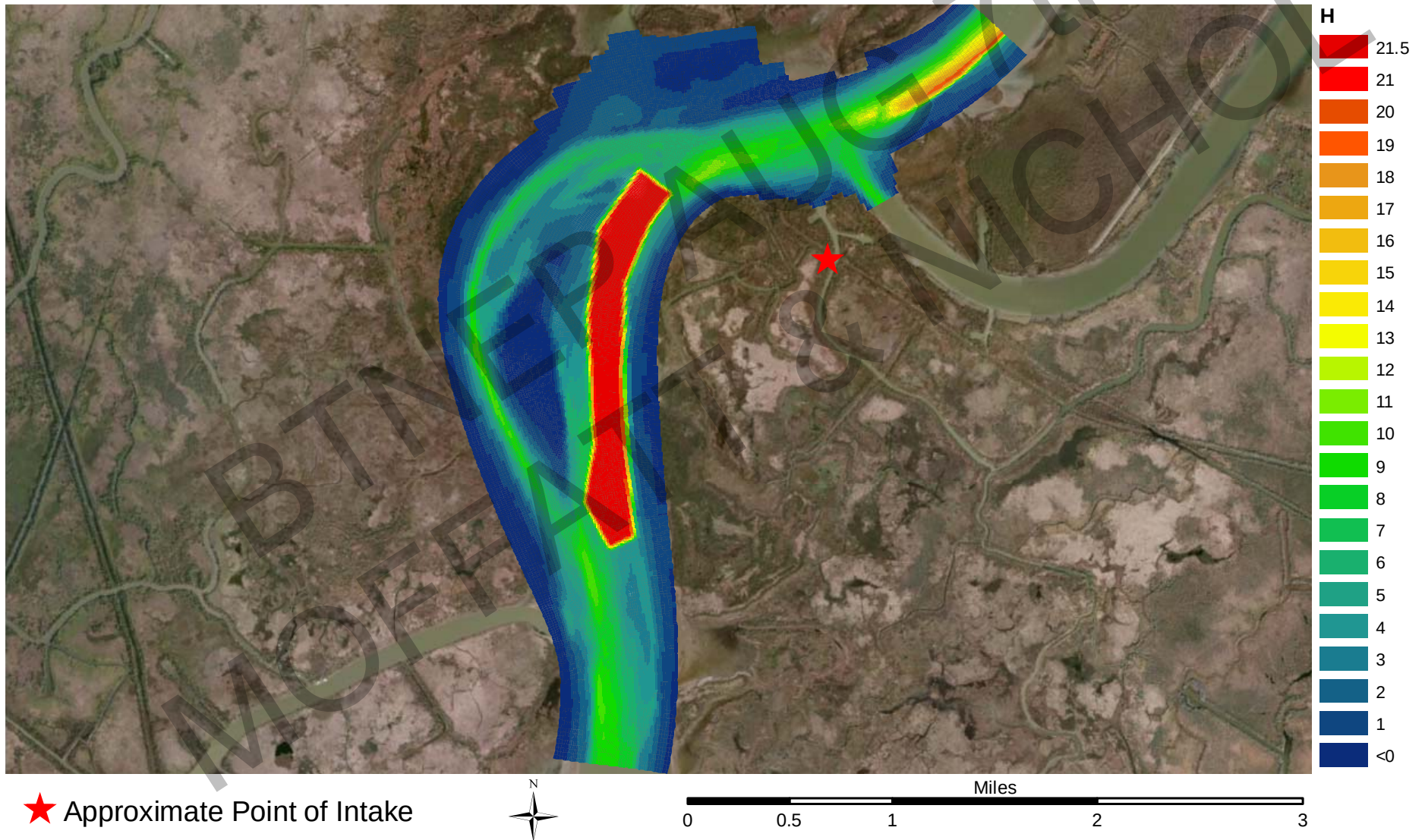


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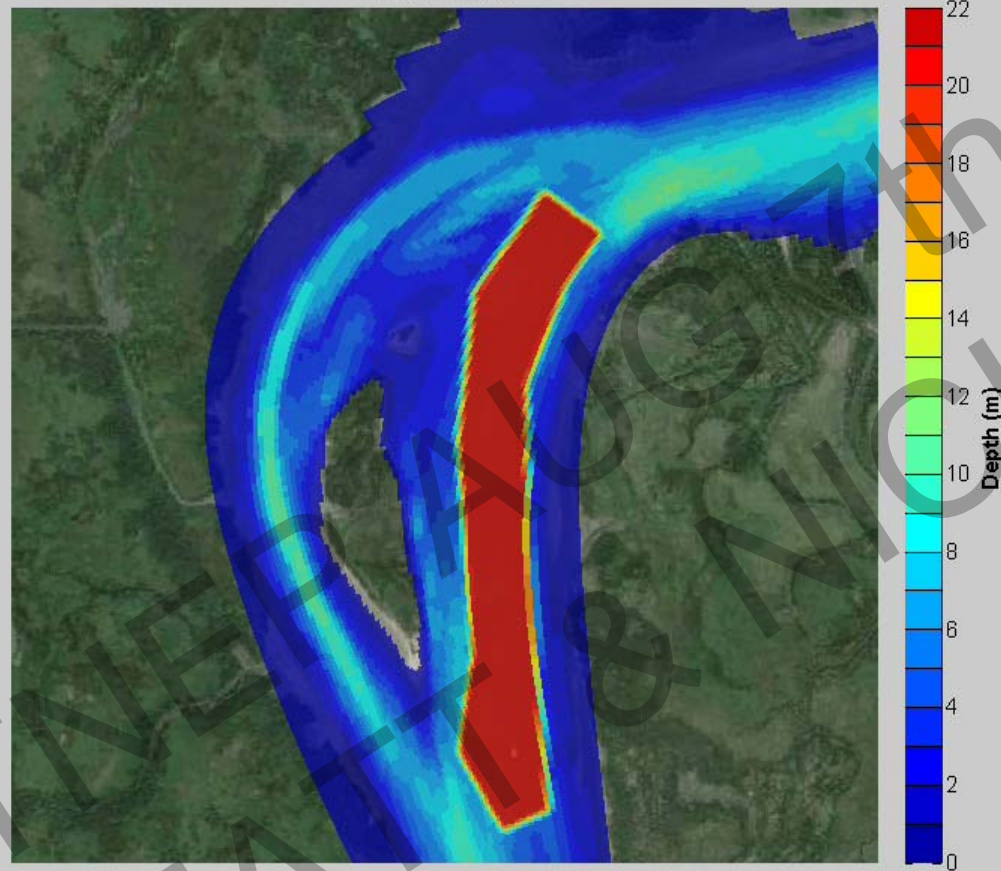
Simulated vs. for obs. sediment loads (3)



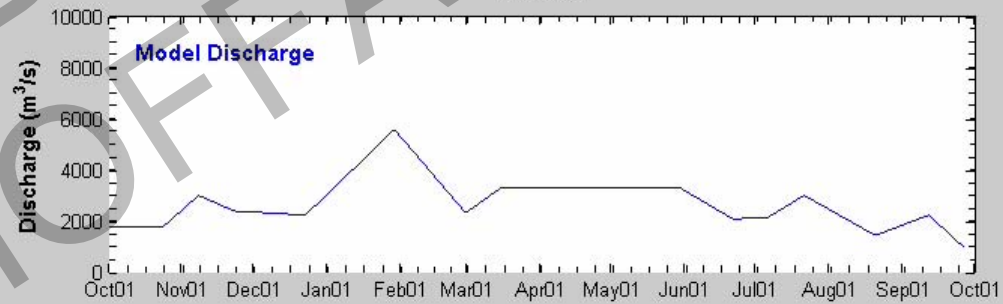
“EAST” | Model Bathymetry



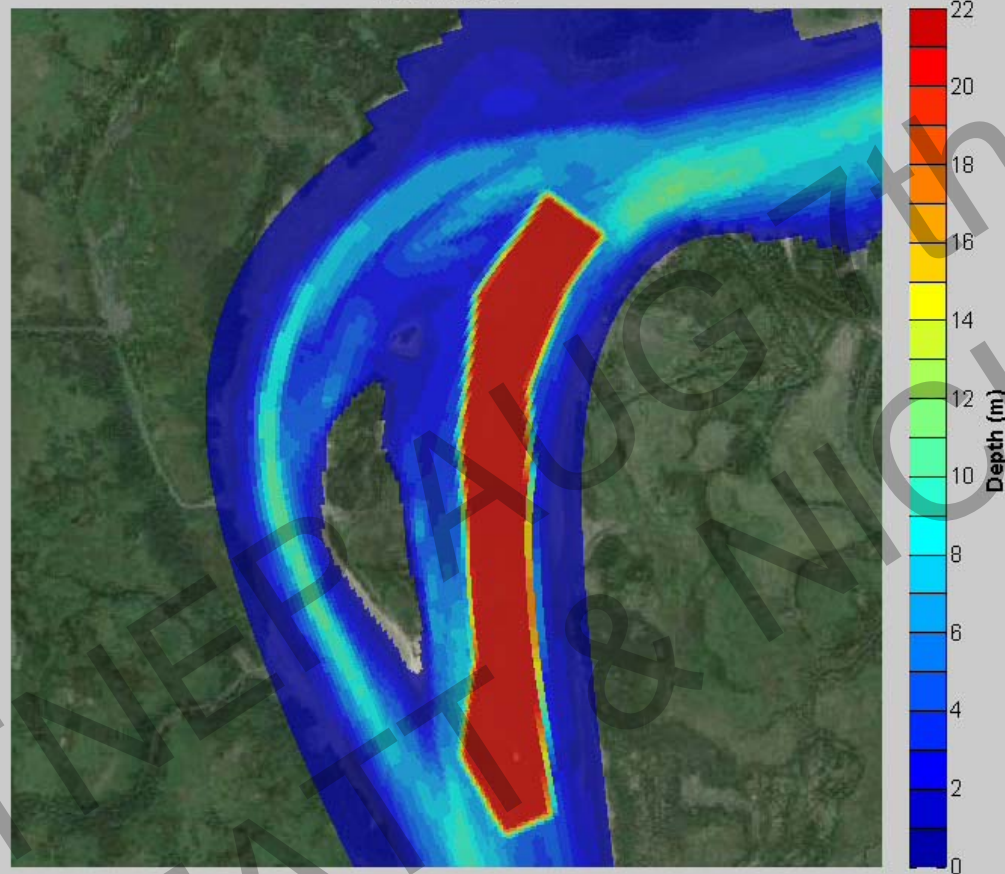
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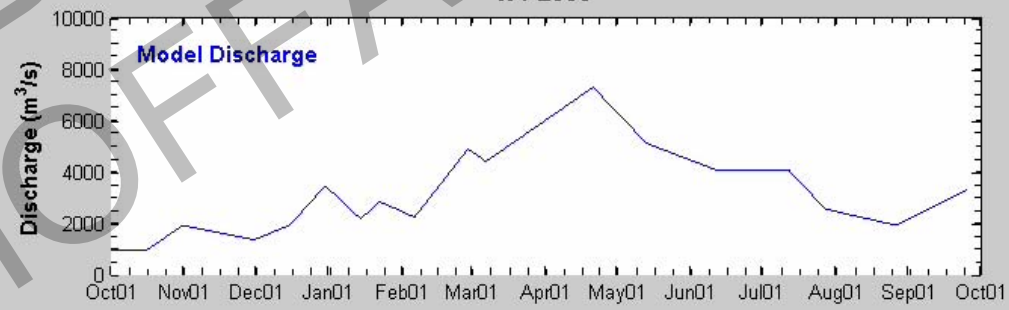
WY 2007



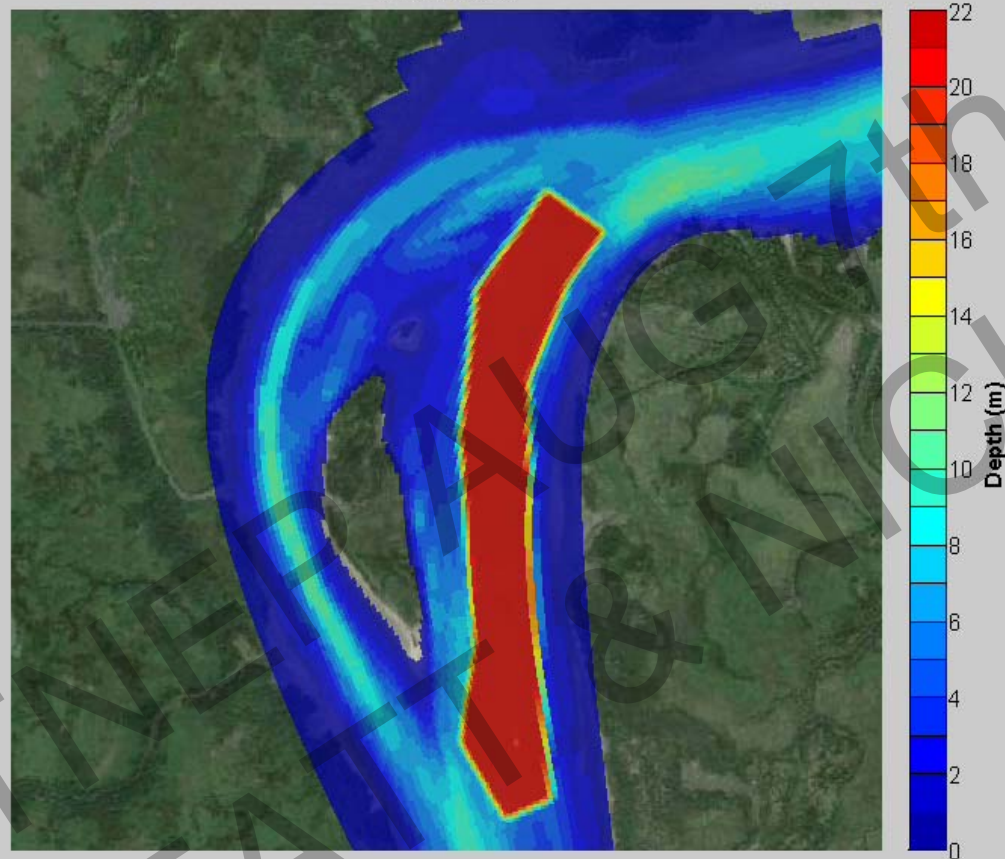
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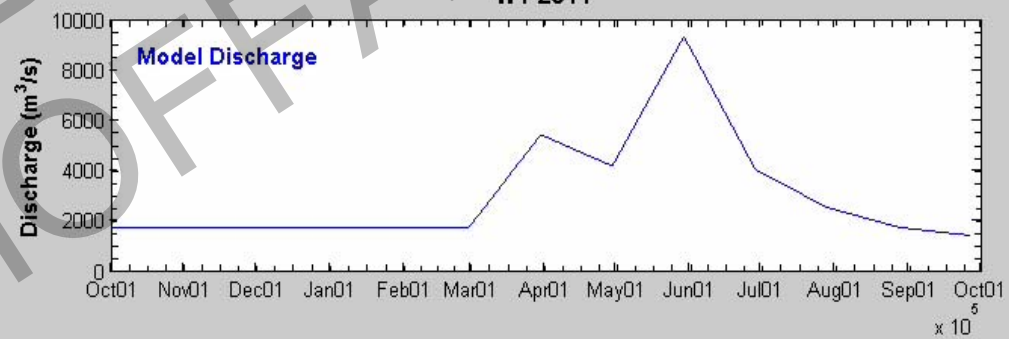
WY 2008



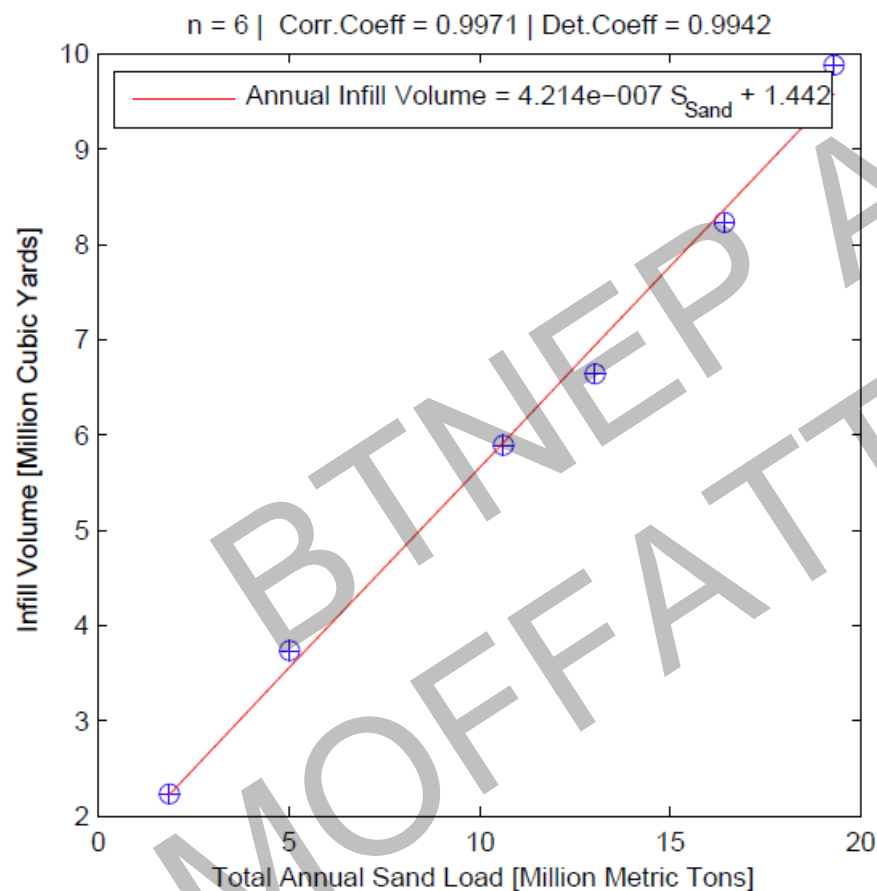
01-Oct-2010



WY 2011

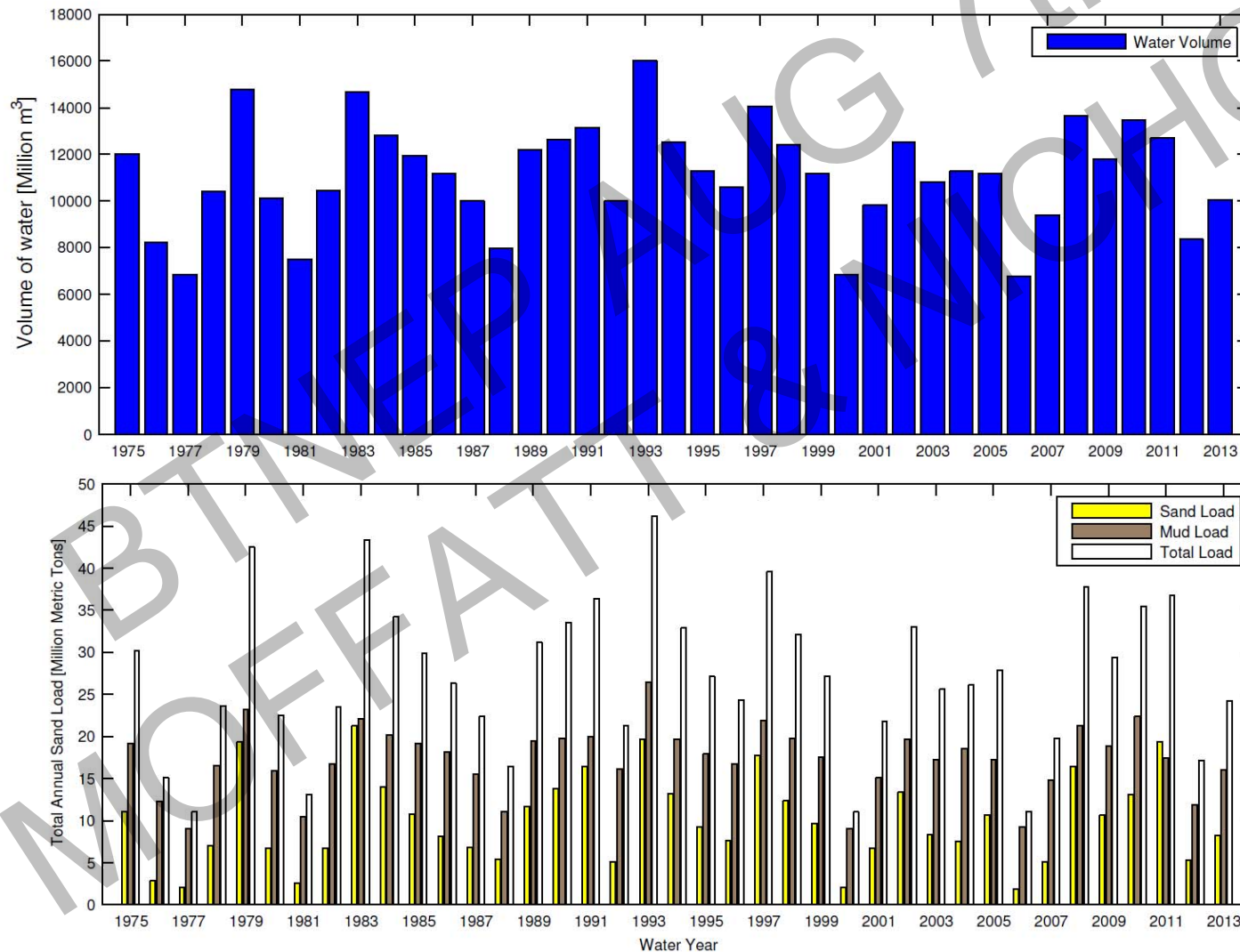


Model Results for “EAST”

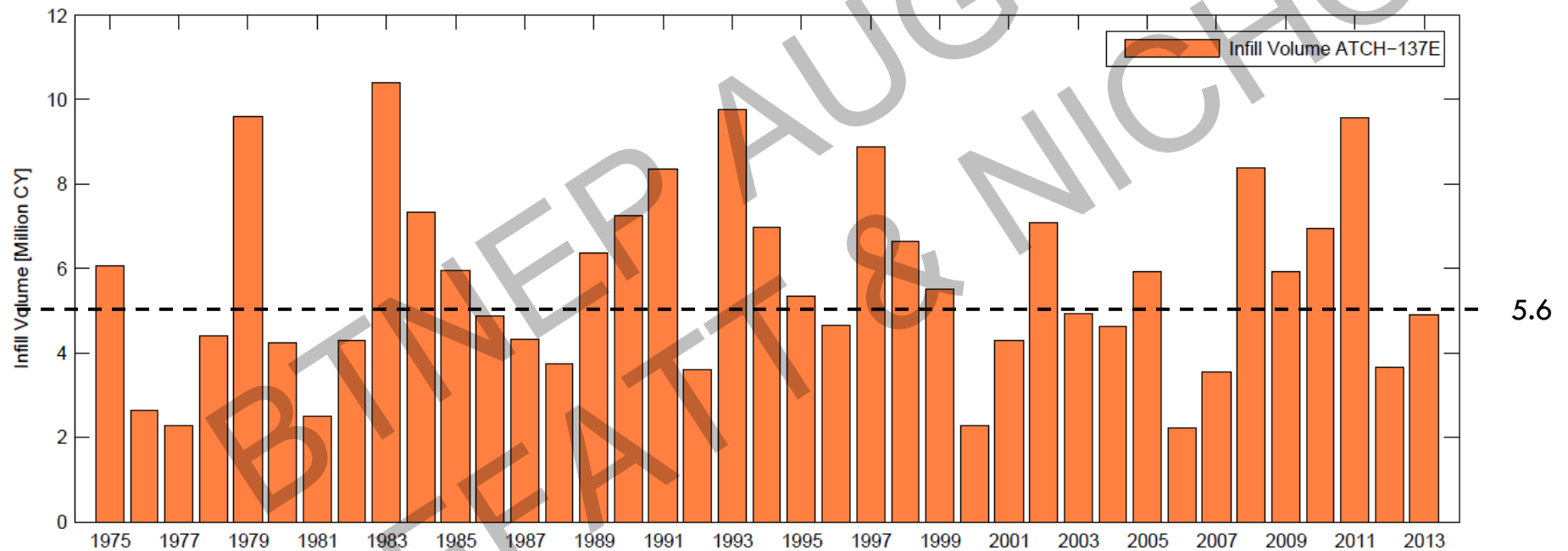


Sand Load	Volume of Infill [Million CY]
1.38	2.23
3.35	3.73
10.07	8.23
6.74	5.89
7.73	6.64
11.97	9.88

Synthesized Water Years



Calculated Infill Volumes – borrow site EAST



ALDSP - Sediment Availability

Borrow Site	Reach	Initial Volume [Million CY]	Mean Annual Infill Volume [Million CY]
WEST	Horseshoe Bend	9.8	3.2
EAST	Crew Boat Cut	19.5	5.6



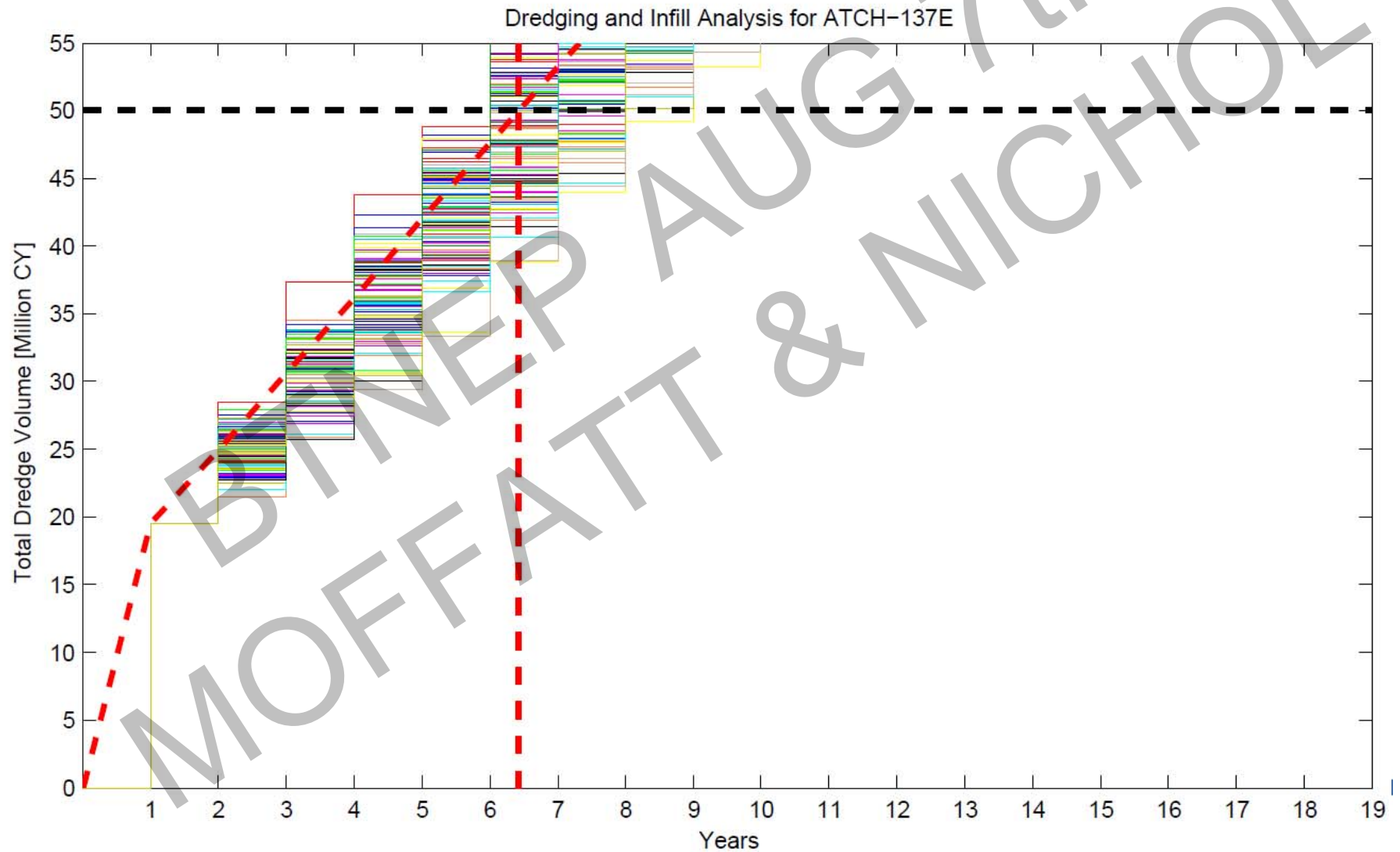
ALDSP – Borrow Site Utilization

- The demand of sediment:
 - Volume of sediment (~50 Million CY)
 - Time scale and sequencing of needed sediment supply (~5 Million CY per year)
- Utilization
 - Initial volume dredged in first year
 - Let site fill in over the course of one water year
 - Annual dredging to borrow material and keep site at the designed dimensions



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Utilization of Borrow Site EAST



ALDSP - Sediment Availability

Borrow Site	Reach	Initial Volume [Million CY]	Mean Annual Infill Volume [Million CY]
WEST	Horseshoe Bend	9.8	3.2
EAST	Crew Boat Cut	19.5	5.6



Conclusions - Feasibility Study Part 1

Borrow site “EAST” can meet the project demand and is recommended for selection.

- Initial volume of 19.5 Million CY;
- Annual average infill volume of 5.6 Million CY - this exceeds the need of 5 Million cubic yards per year;
- The project duration is estimated to be ~6.5 years for a total demand of 50 Million CY.



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Recommendations

- Optimization of borrow site geometry
 - ▣ Better capture high sediment loads
 - ▣ Gradual infilling
 - ▣ Less impacts on currents and flow field
 - ▣ Less impacts on currents and vessel traffic
 - ▣ Downstream geometry and gradients in velocity



Questions



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