

# Inspecting the Deepest Bridge in Kentucky

Kennedy Mill Bridge over Herrington Lake

**2024**  
**PARTNERING**  
**CONFERENCE**  
— accec-ky —  
kytc \* fhwa



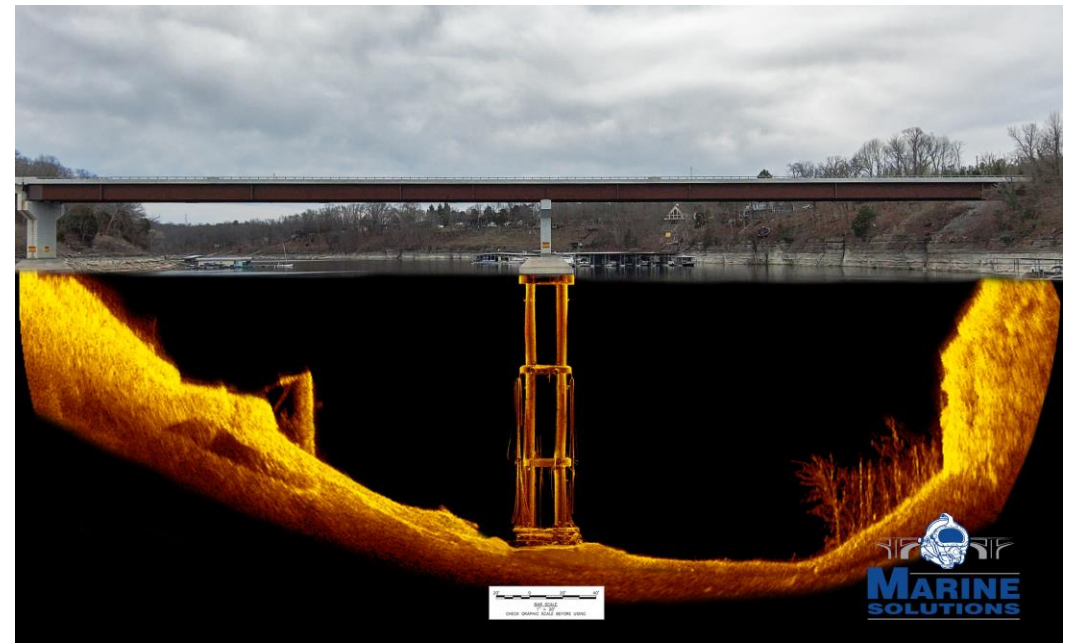
John J. Loftus P.E.  
September 3, 2024



# Agenda

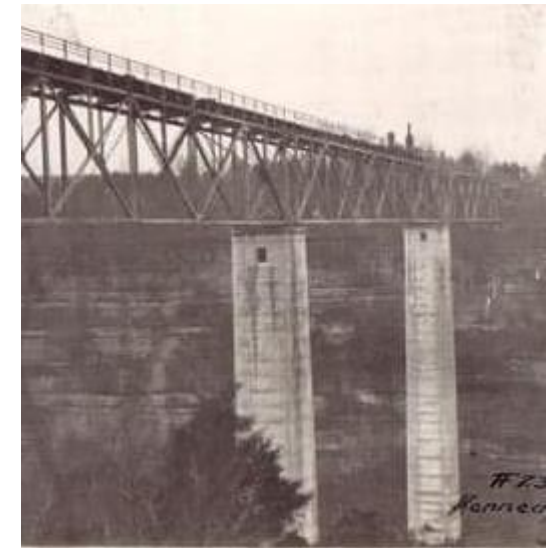
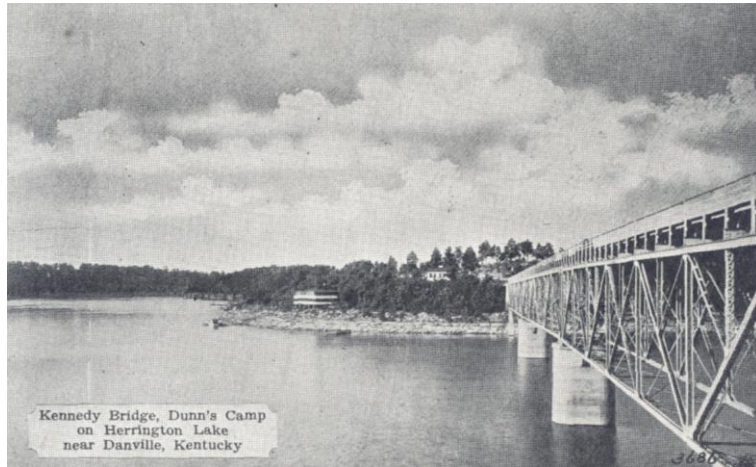
- History of the Kennedy Mills Bridge
- Sonar and Tech Utilized
- Hazard Identification
- Hands-on Diving Inspection Plan
- Findings and Conclusions

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# History of the Kennedy Mills Bridge

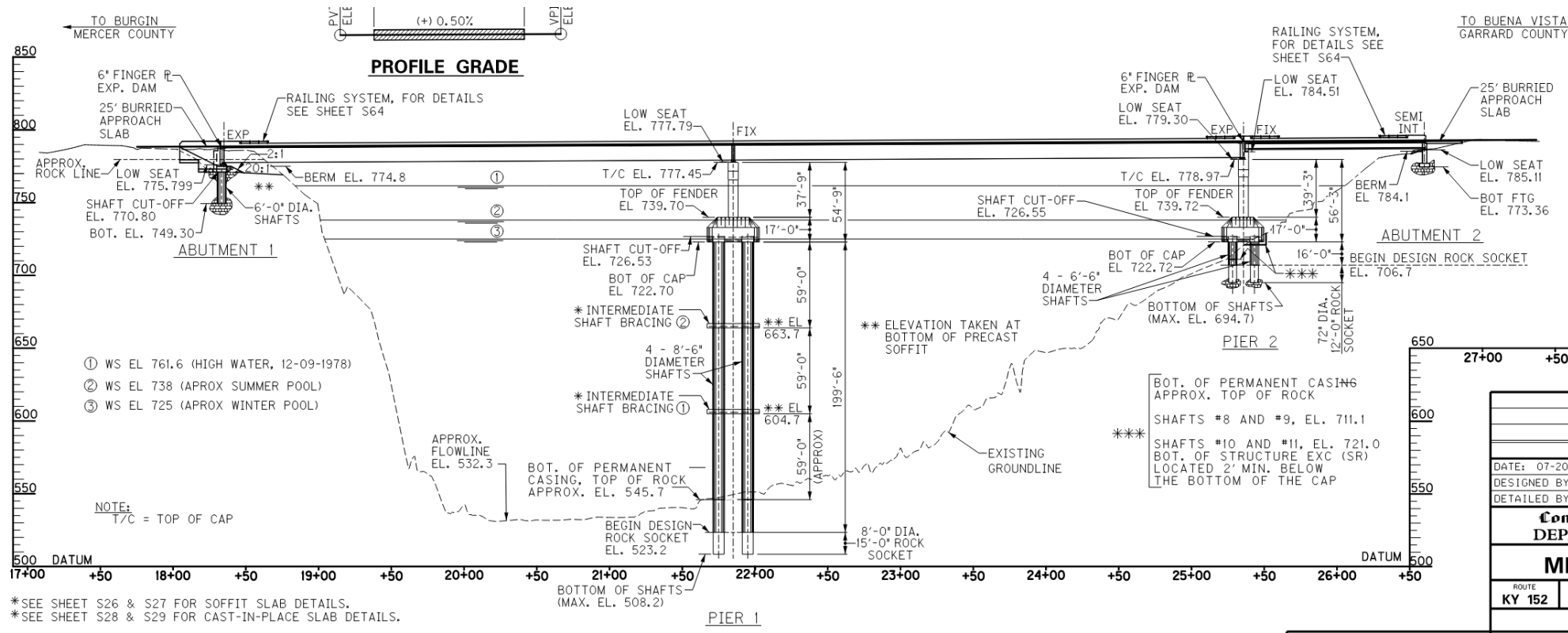
- Original construction completed in the late 1920's



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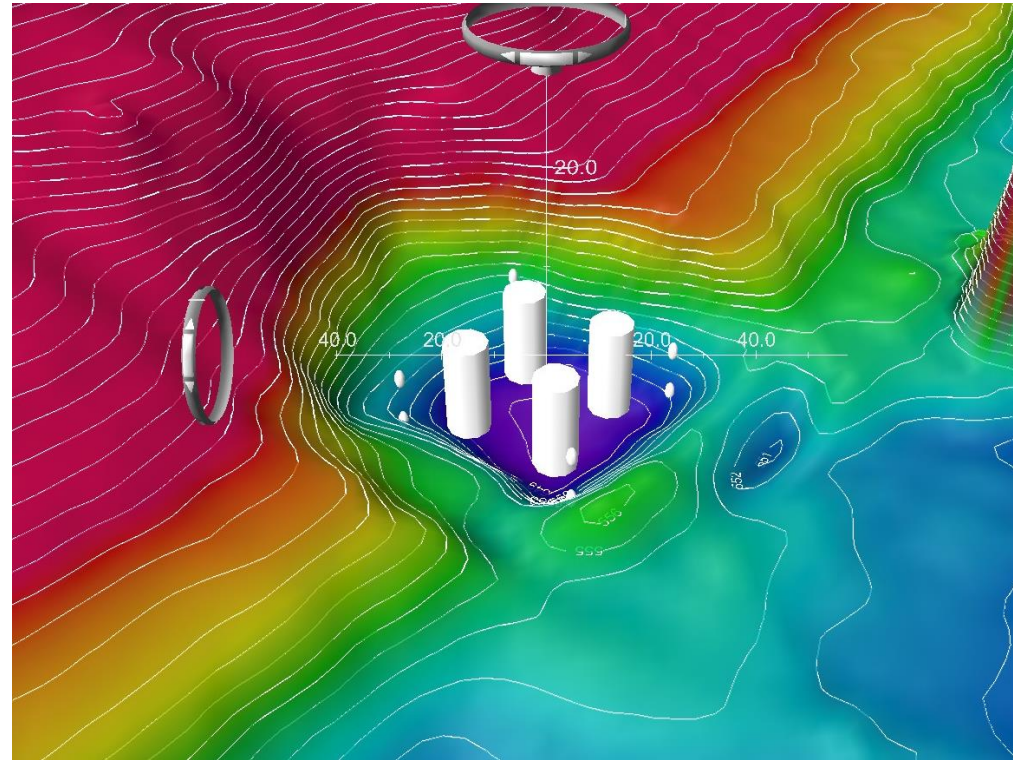
# History of the Kennedy Mills Bridge

- Bridge replacement completed in 2019
  - Deepest bridge constructed via “top-down” methodology at the time



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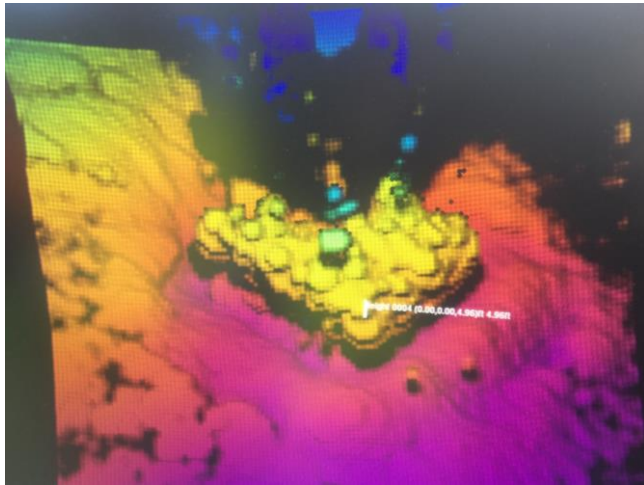
# History of the Kennedy Mills Bridge

- Marine Solutions provided commercial diving, sonar imaging, and hydrographic surveying services during construction.



# History of the Kennedy Mills Bridge

- Mesotech 2D and Coda Octopus 3D sonars



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# Sonar and Tech Utilized

- Mesotech 2D Sonar Scanning – Upstream Profile

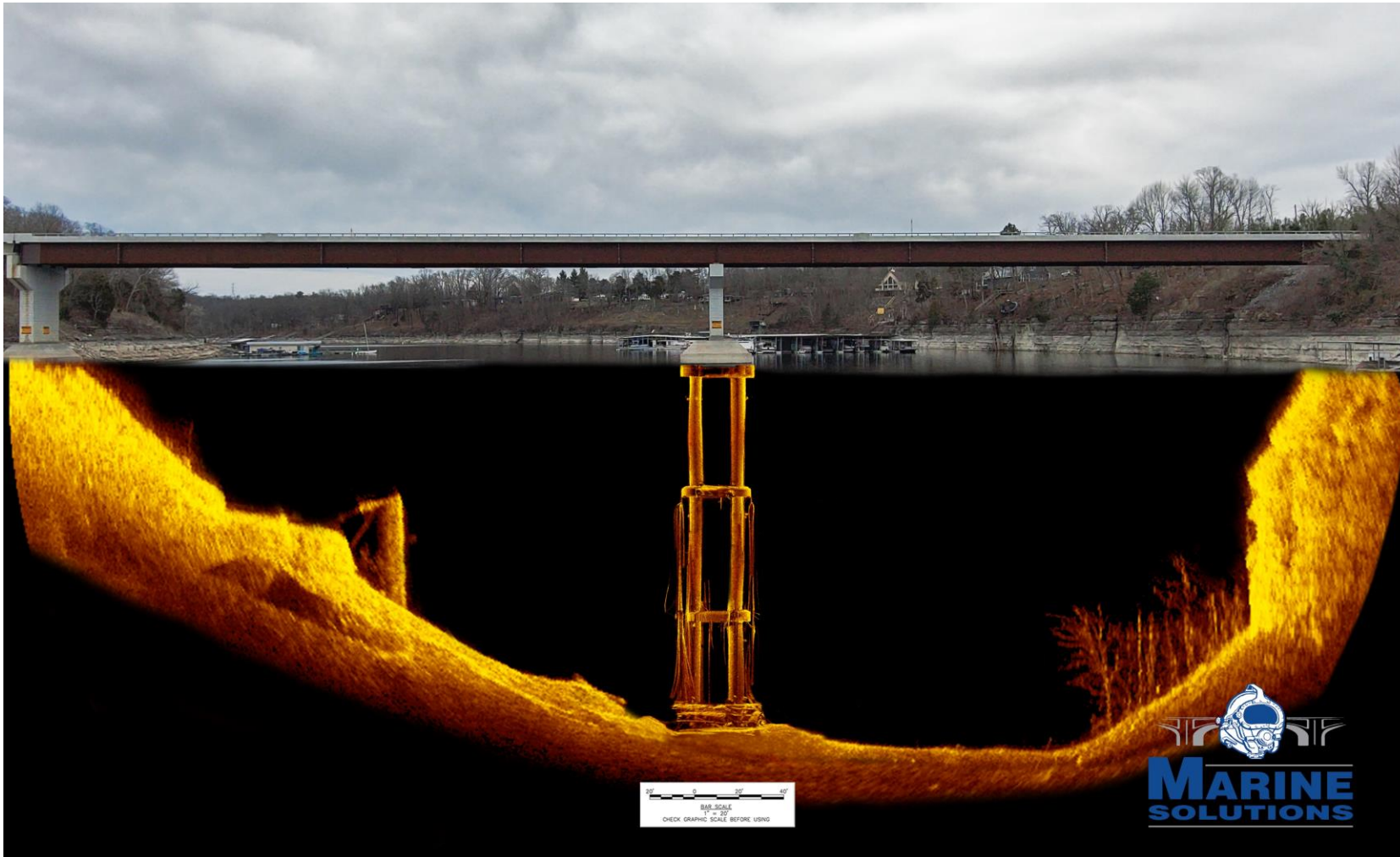


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MARINE  
SOLUTIONS

# Sonar and Tech Utilized

- Mesotech 2D Sonar Scanning – Downstream Profile



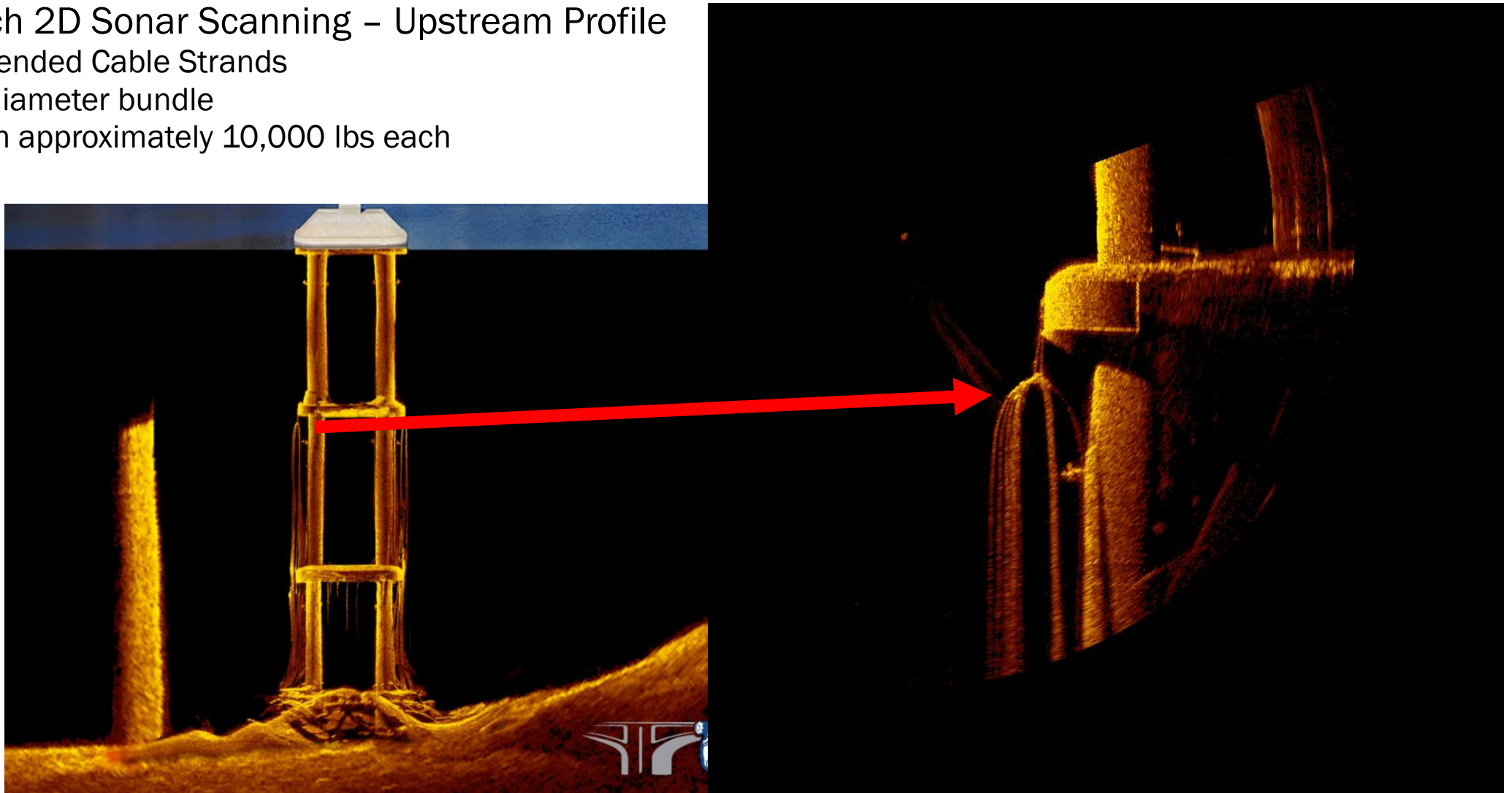
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0 20 40  
BAR SCALE  
1" = 20'  
CHECK GRAPHIC SCALE BEFORE USING

**MARINE**  
**SOLUTIONS**

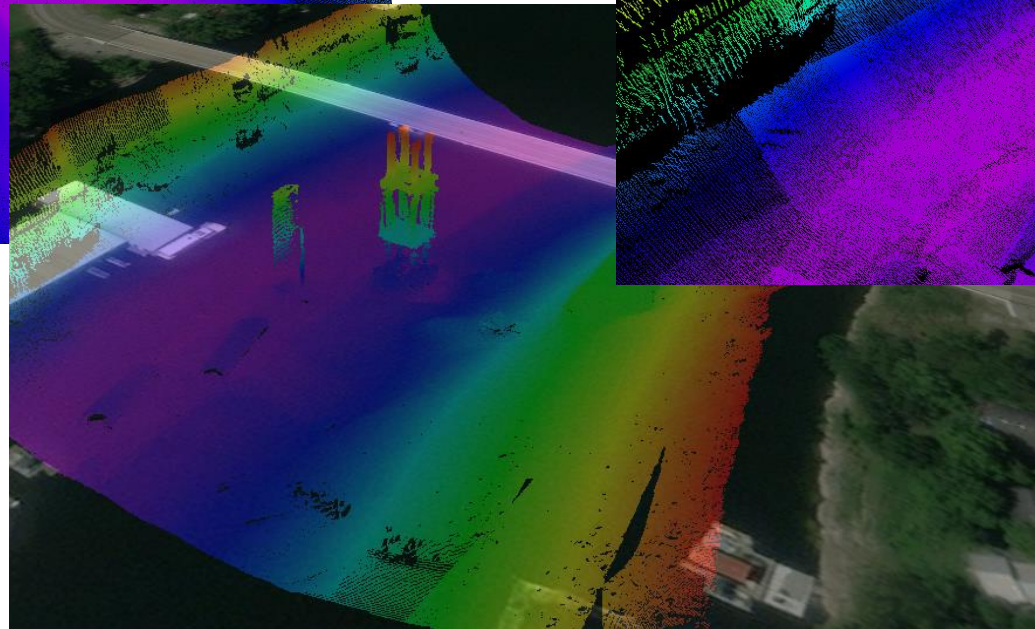
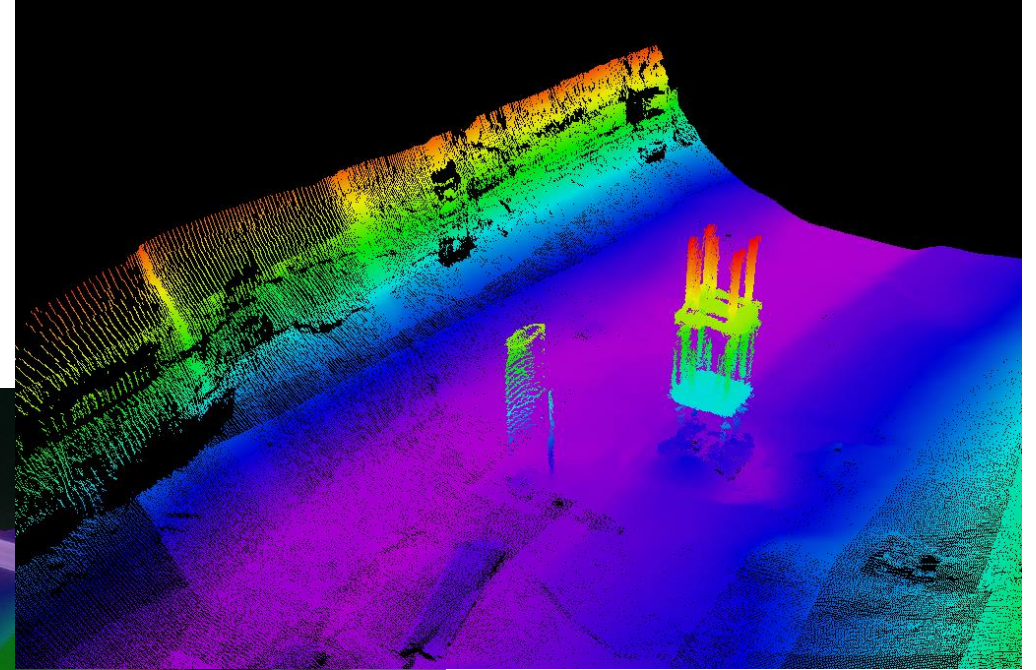
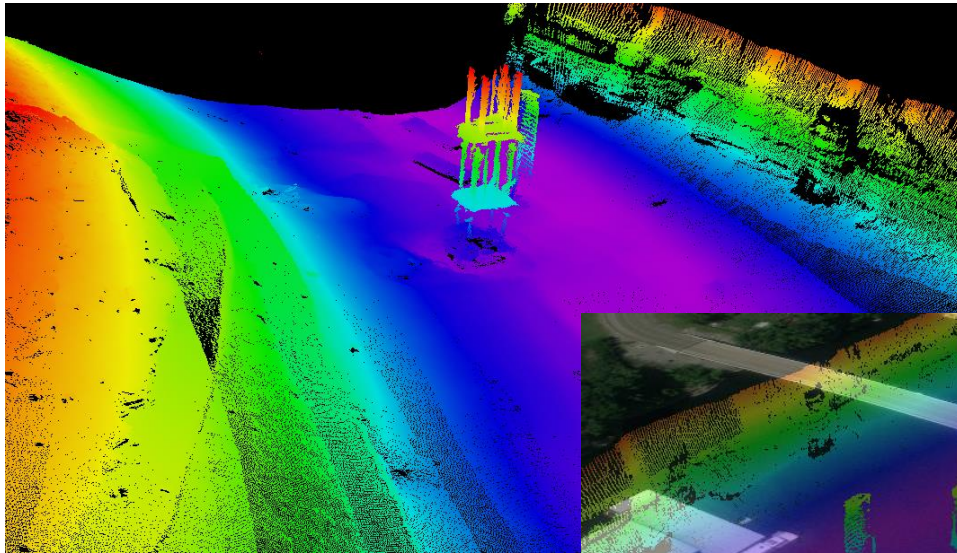
# Sonar and Tech Utilized

- Mesotech 2D Sonar Scanning – Upstream Profile
  - Suspended Cable Strands
  - 10” diameter bundle
  - Weigh approximately 10,000 lbs each



# Sonar and Tech Utilized

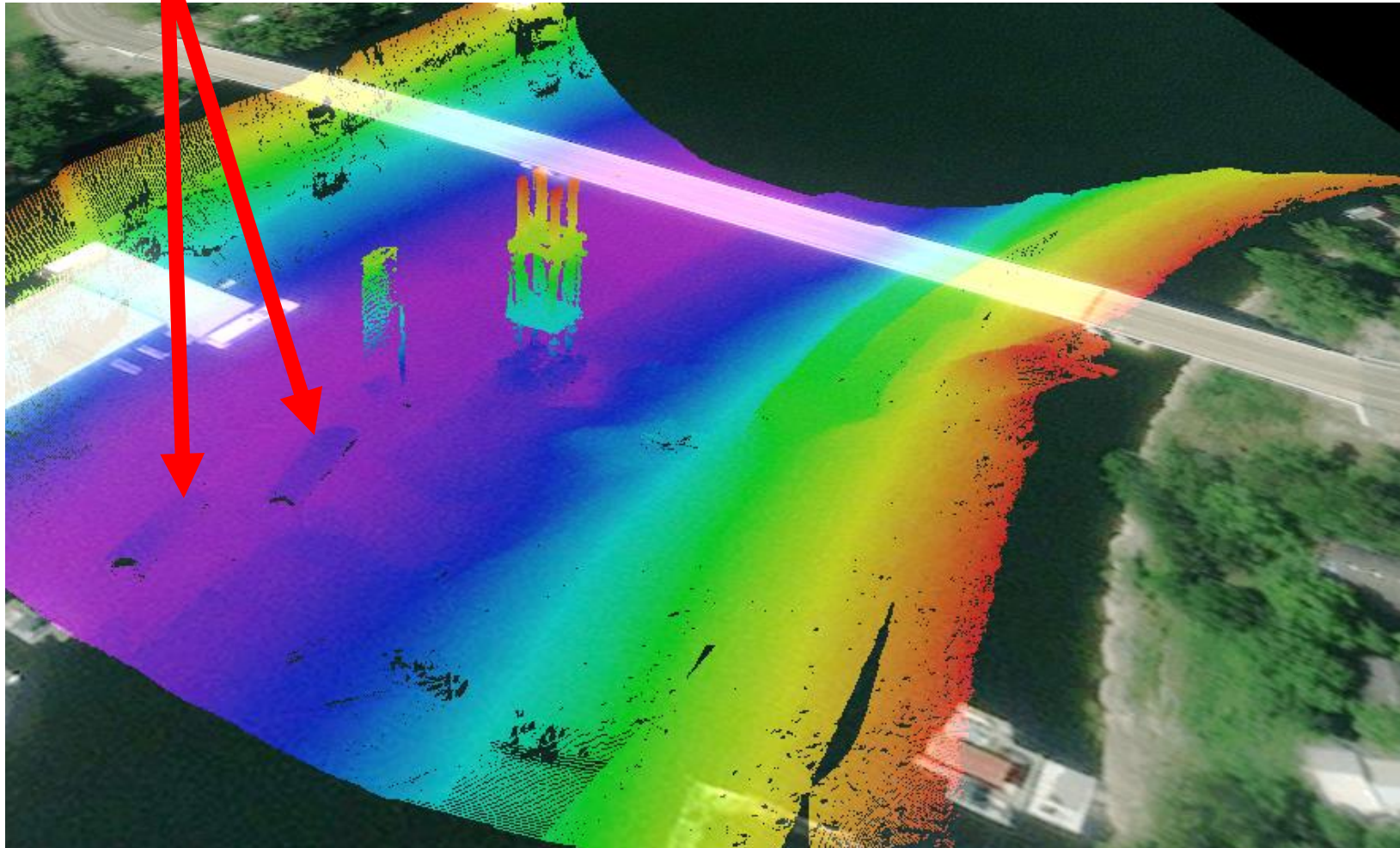
- Multibeam Hydrographic Survey



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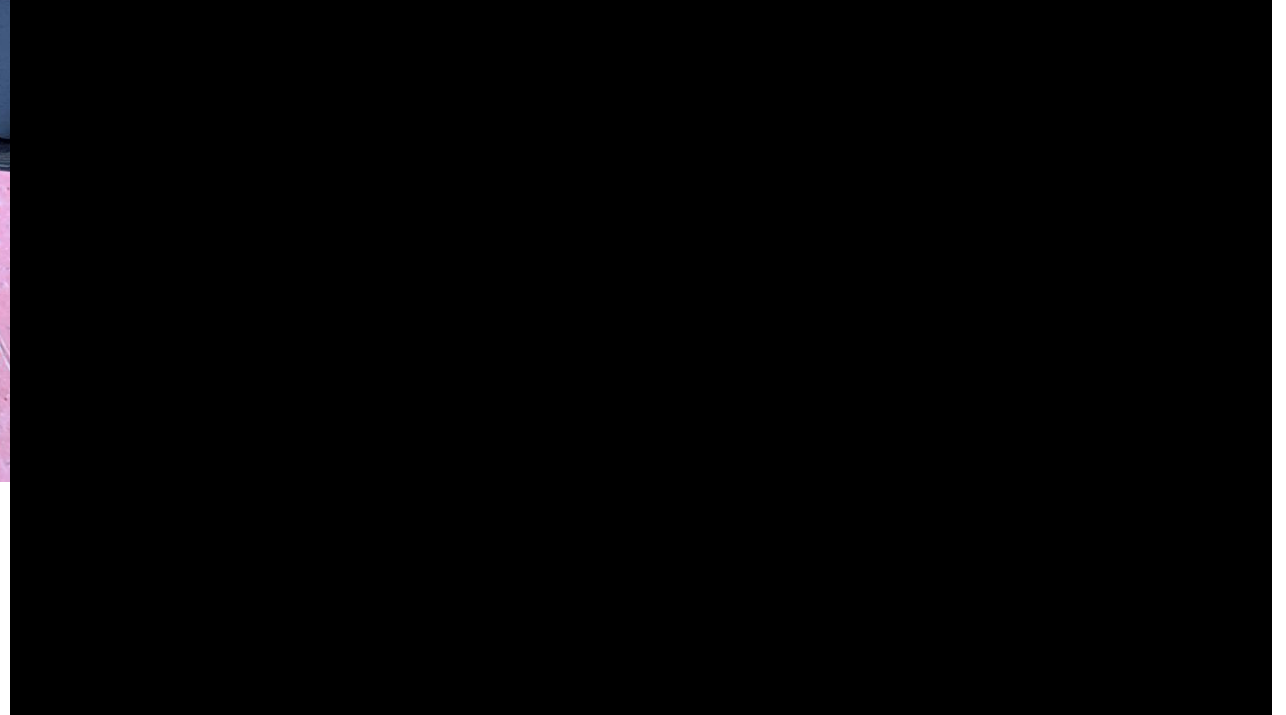
# Sonar and Tech Utilized

- Tops of cut off old bridge piers



# Sonar and Tech Utilized

- VideoRay Pro5 ROV with forward sonar



# Hazard Identification

- Deep Diving Depths
  - 170' to 180'+
  - Elevation near 1000'
  - Required SurD02
- Diver Entanglement
  - Lifting strands cut and hanging from all 4 corners of the main pier
- Cold Water
  - 42° F
- Nitrogen Narcosis
  - “Rapture of the Deep”
  - Impaired judgement
  - Confusion
  - Hallucinations







# Hazard Identification

- Deep Diving Depths
  - 170' to 180'+
  - Elevation near 1000'
  - Required SurD02



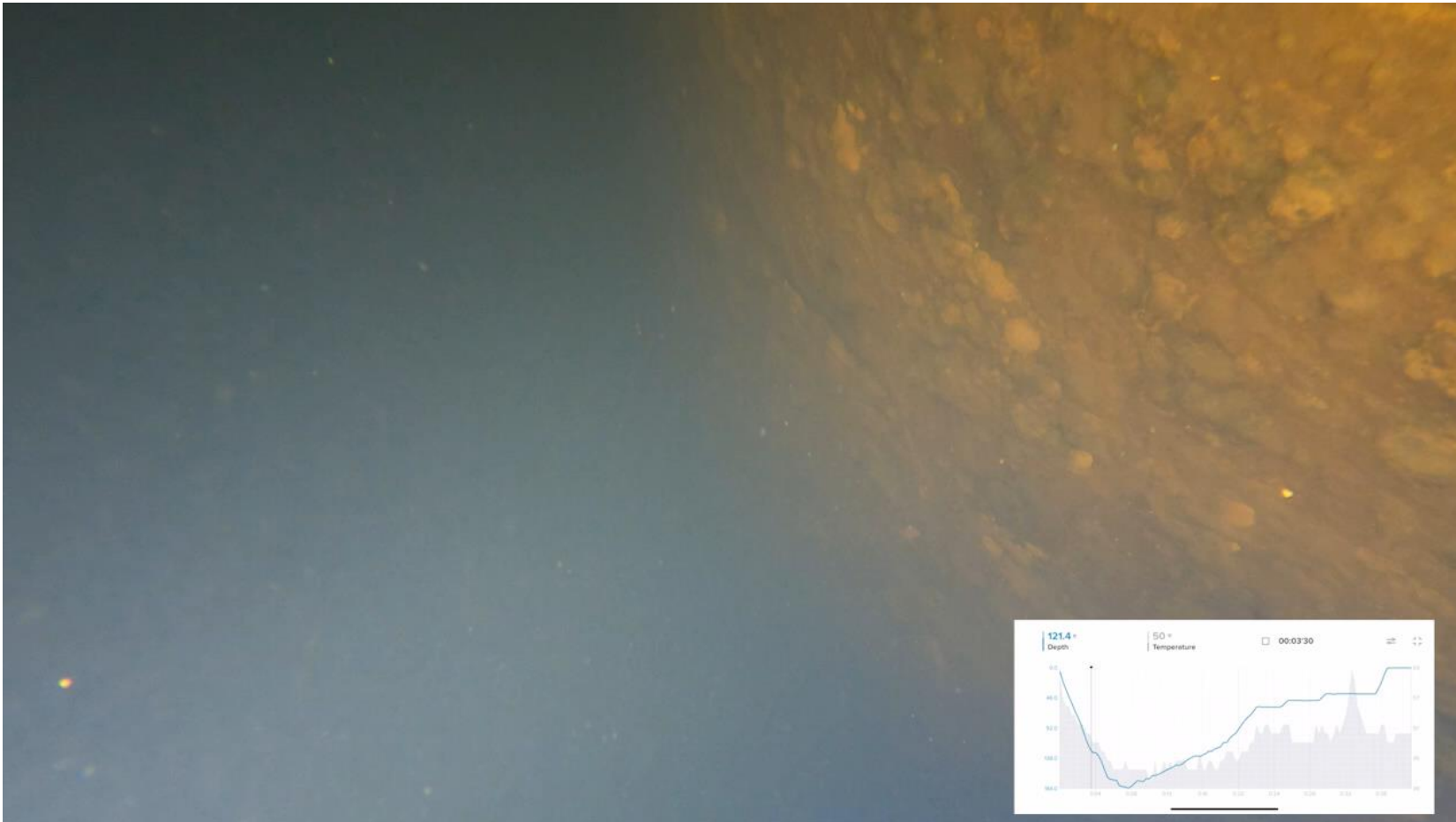
## Record of Dive

Dive No.: 4	Diver: JOHN LOFTUS	Job No.: 01-24-002-03-02							
Date: 2/14/24	Stand-By Diver: TYLER ESTES	Customer: KYTC							
Location: LAKE HERINGTOWN	Vessel/Platform: BARGE	Max Depth: 170+2							
	Dive No. 4	Dive No.							
Main Diver Hat: TE MK	Bailout: 3000	Stand-By Diver Hat: SB							
		Bailout: 2900							
Breathing Mix: <input checked="" type="checkbox"/> Air <input type="checkbox"/>	Thermal Protection: <input checked="" type="checkbox"/> Wet Suit <input type="checkbox"/> Dry Suit <input type="checkbox"/> Hot Water								
Sea State: CALM	Water Temp: 40	Air Temp: 40							
Bottom Type: <input type="checkbox"/> Mud <input type="checkbox"/> Sand <input checked="" type="checkbox"/> CONCRETE	Visibility: 0-10	Current: 0-1							
Work Load: <input type="checkbox"/> Heavy <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Light <input type="checkbox"/> NO-D <input type="checkbox"/> Standard Air <input checked="" type="checkbox"/> Sur D O2 <input type="checkbox"/> NITROX									
Dive No.: 4	Start GRP: —	LS: 1209	LB: 1231	BT: —	RNT: —	TBT: —	TABLE: 190	End GRP: N	Surface Interval: Hour ___ Min ___
Dive No.:	Start GRP:	LS:	LB:	BT:	RNT:	TBT:	TABLE:	End GRP:	Surface Interval: Hour ___ Min ___
<b>In Water Decompression</b>					<b>Chamber Decompression</b>				
Must have Seal within 3.5 minutes after reaching surface									
Depth	Time	Reach	Leave	Mix	Depth	Time	Reach	Leave	Mix
60	1	1227	1228		50	15	12:42	12:57	O <sub>2</sub> AIR
50	2	1228	1230		50-40	1:20	12:57	12:57:20	O <sub>2</sub>
40	6	1230	1236		40	15	12:57:20	1312	O <sub>2</sub>
					40-0	1:20	1312	1313:20	AIR
40-0		1237							
Reached Surface: 12:37	Surface Interval: :05	Reached Surface Chamber: 13:13:20	Oxygen						
RB Chamber: 12:02	Start O <sub>2</sub> : 1400	PSI consumed: 300	# of Bottles: 1						
Pre-Dive Surveyor:	Chamber Operator: Ryan KENDALL	Start PSI: 1400							
Diver:	Chamber Operator Signature:	End PSI: 1100							
Supervisor: Ryan KENDALL	Date: 2/14/24	Notes: 1231							



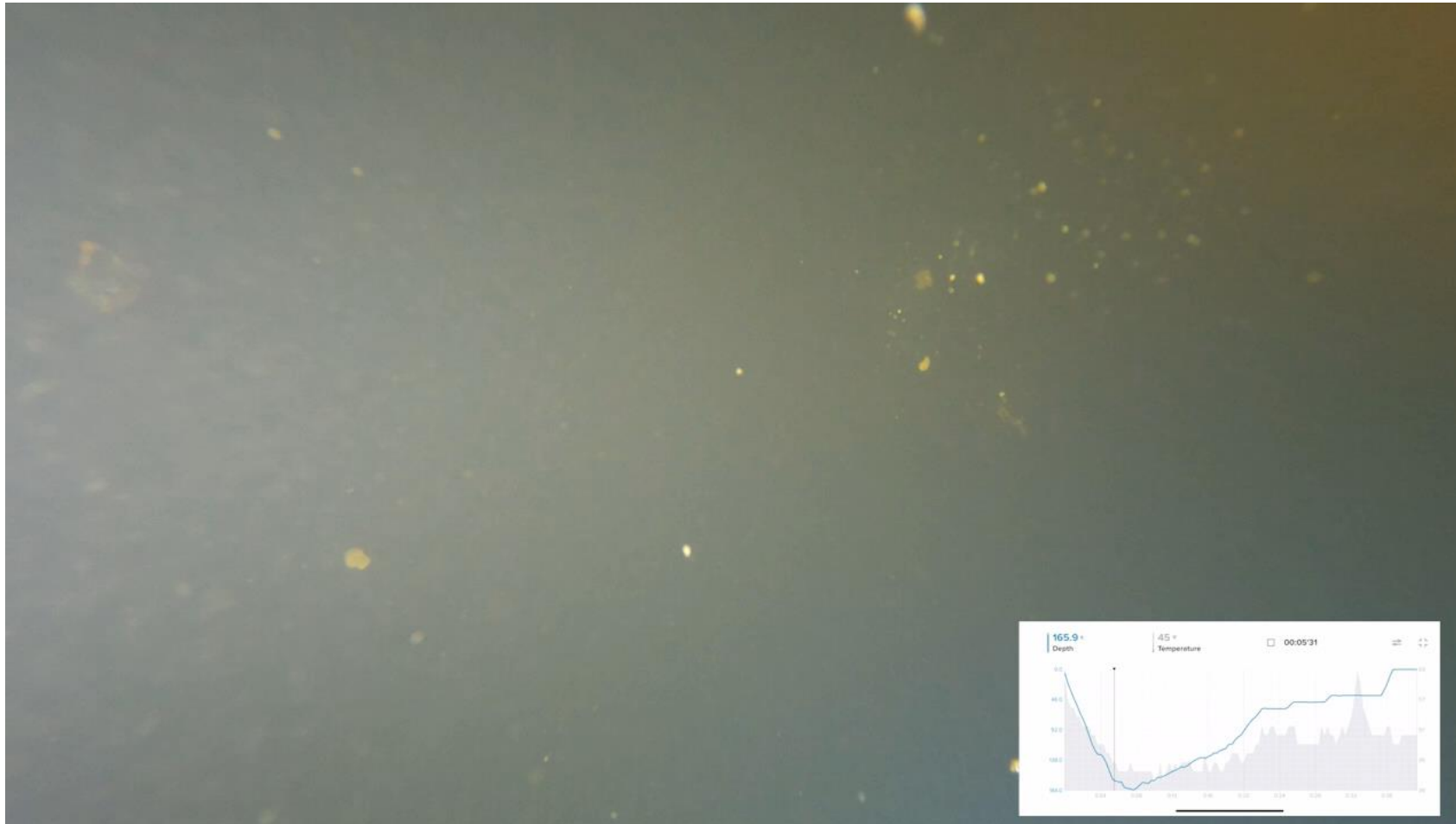
# Hazard Identification

- Diver Entanglement
  - Lifting strands cut and hanging from all 4 corners of the main pier



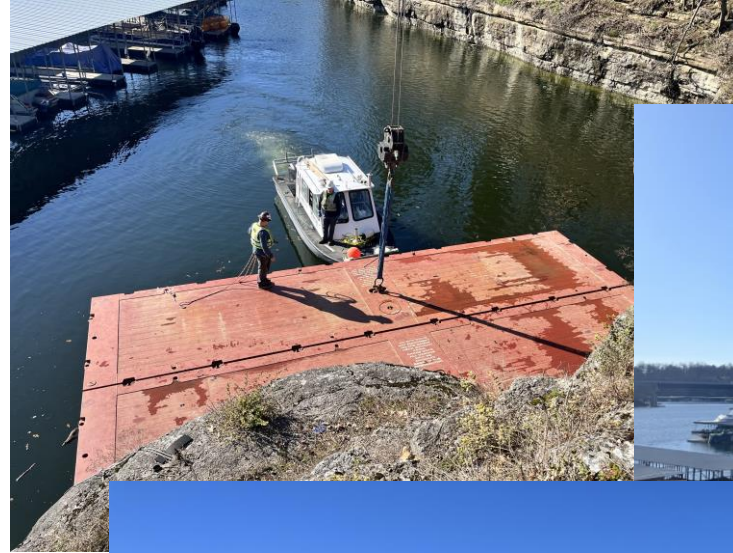
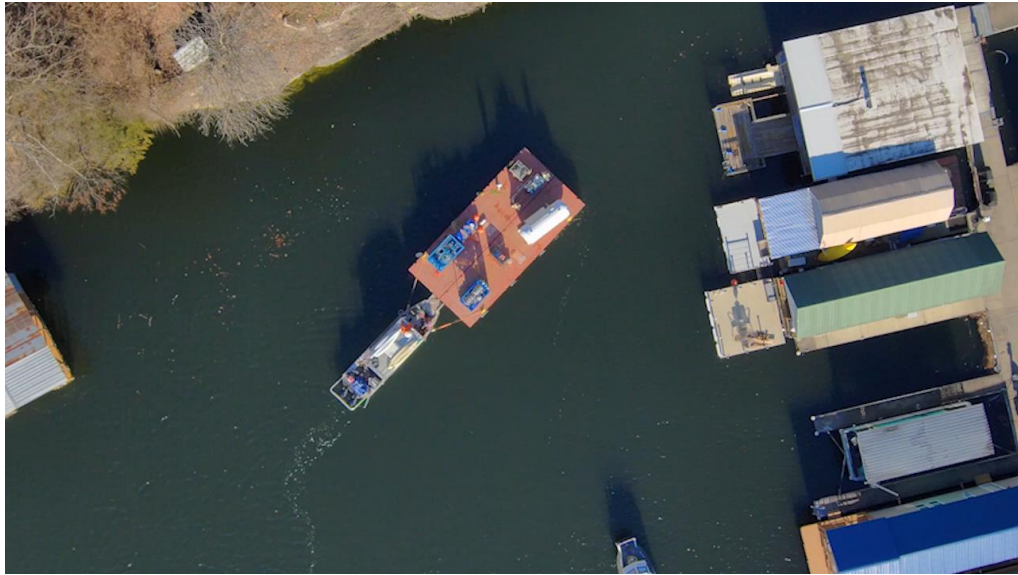
# Hazard Identification

- Diver Entanglement AND Nitrogen Narcosis
  - Many loose cables in 180 feet of water



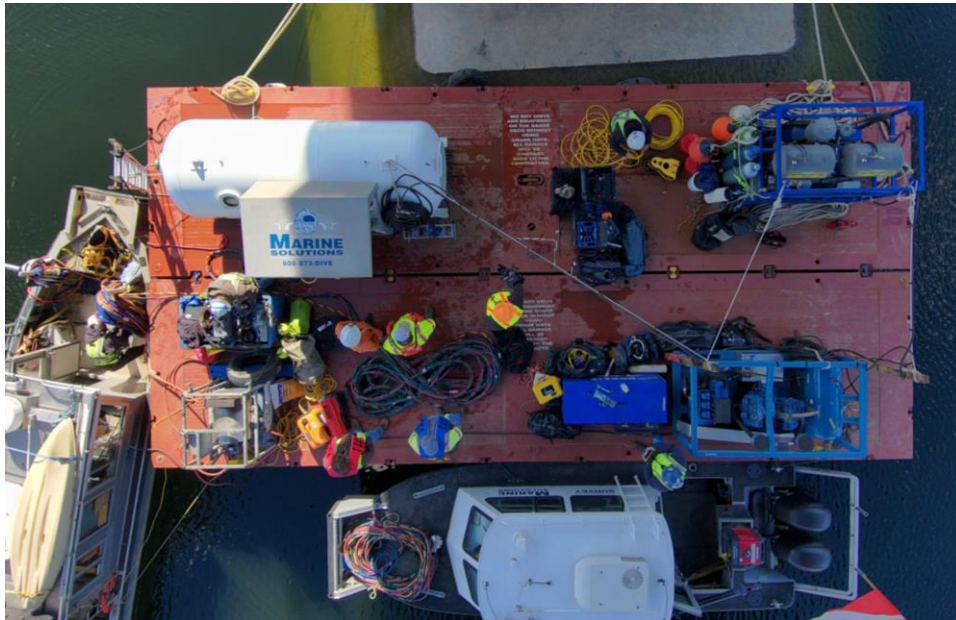
# Diving Inspection Plan

- Dive Spread Mobilization
  - Barge Setup



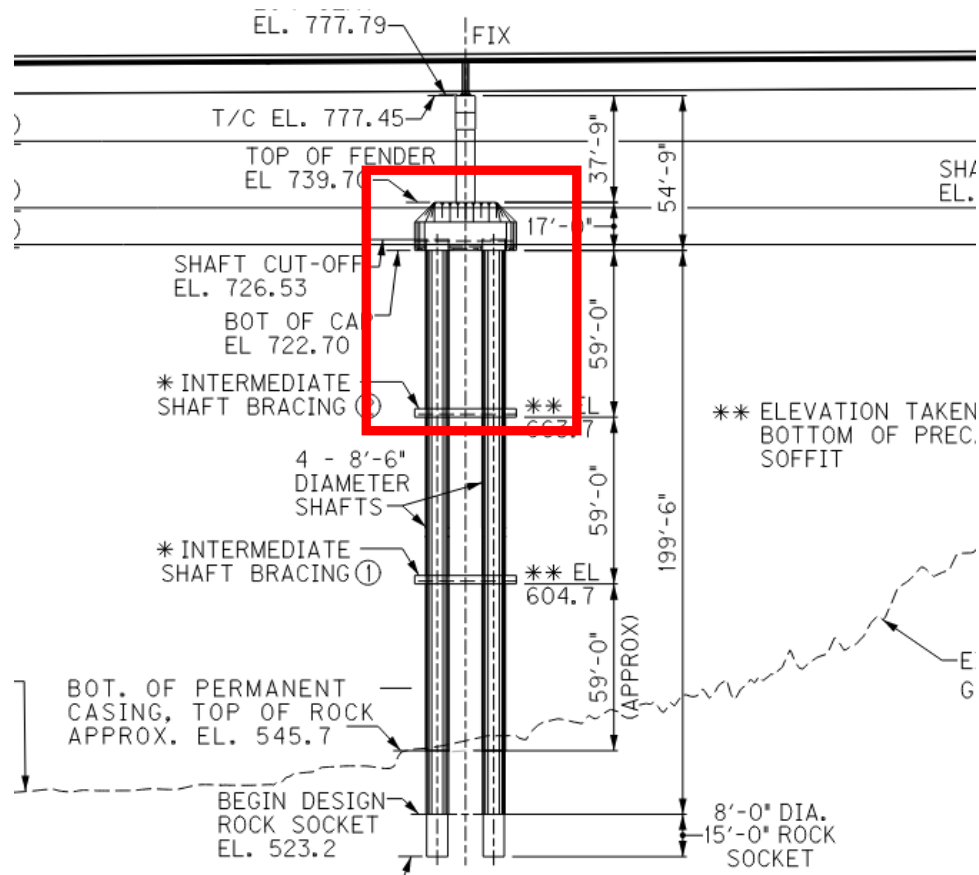
# Diving Inspection Plan

- 6 Total Dives
  - Dive 1: Retrieve entangled ROV at 120 feet...oops
  - Dive 2: Cap and Columns 0 to 60 feet at first brace
    - 60 minutes of bottom time
  - Dives 3-6: Columns 1 through 4 and bottom brace, 60 to 180 feet
    - 20 minutes of bottom time each



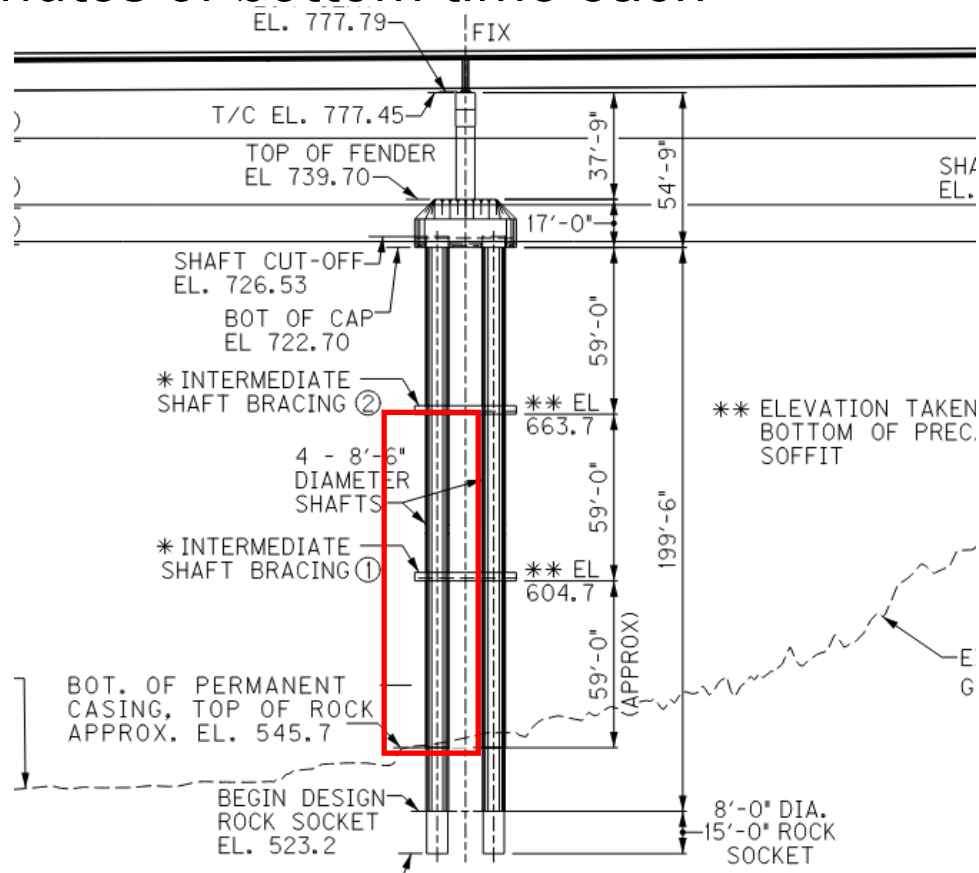
# Diving Inspection Plan

- Dive 2: Cap and Columns 0 to 60 feet at first brace
  - 60 minutes of bottom time



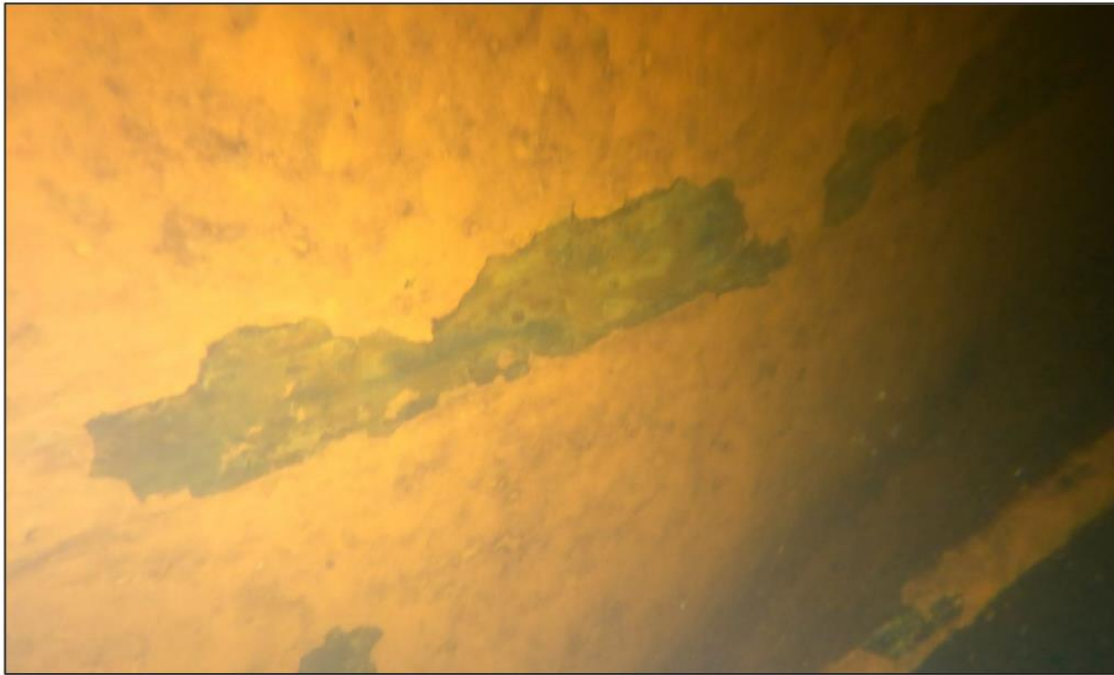
# Diving Inspection Plan

- Dives 3-6: Columns 1 through 4 and bottom brace, 60 to 180 feet
  - 20 minutes of bottom time each

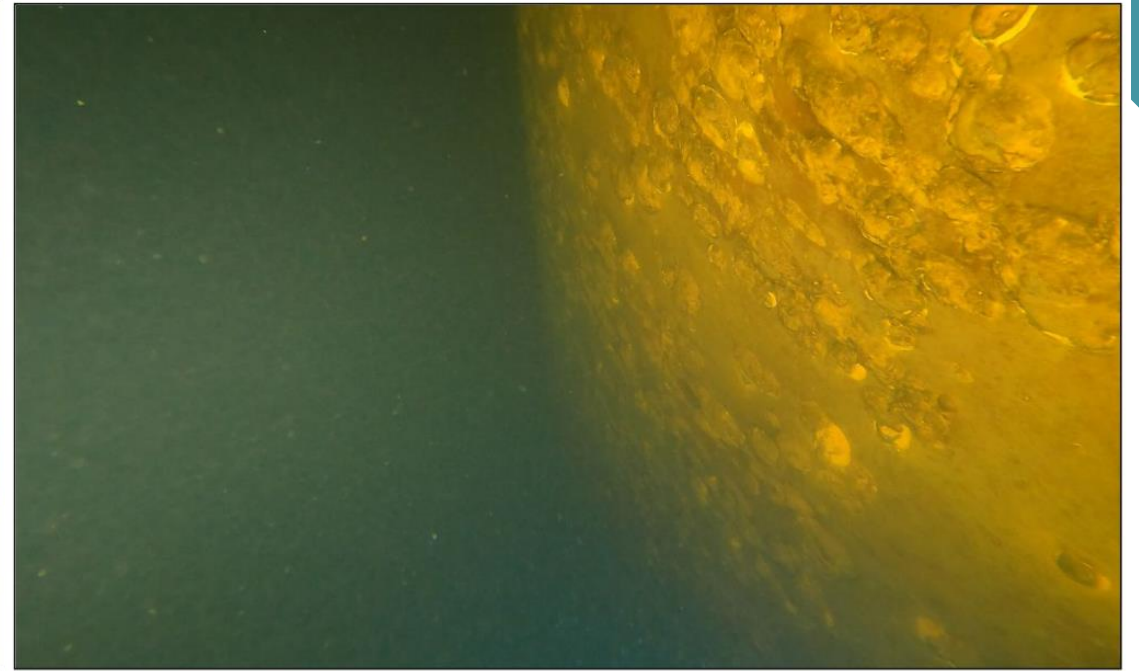


# Inspection Findings

- Bridge is in Good Condition
  - Minor scaling on steel column casings



Photograph 16 View of the typical condition of the welds beneath the rust scaling on the steel pile casings on Pier 2.

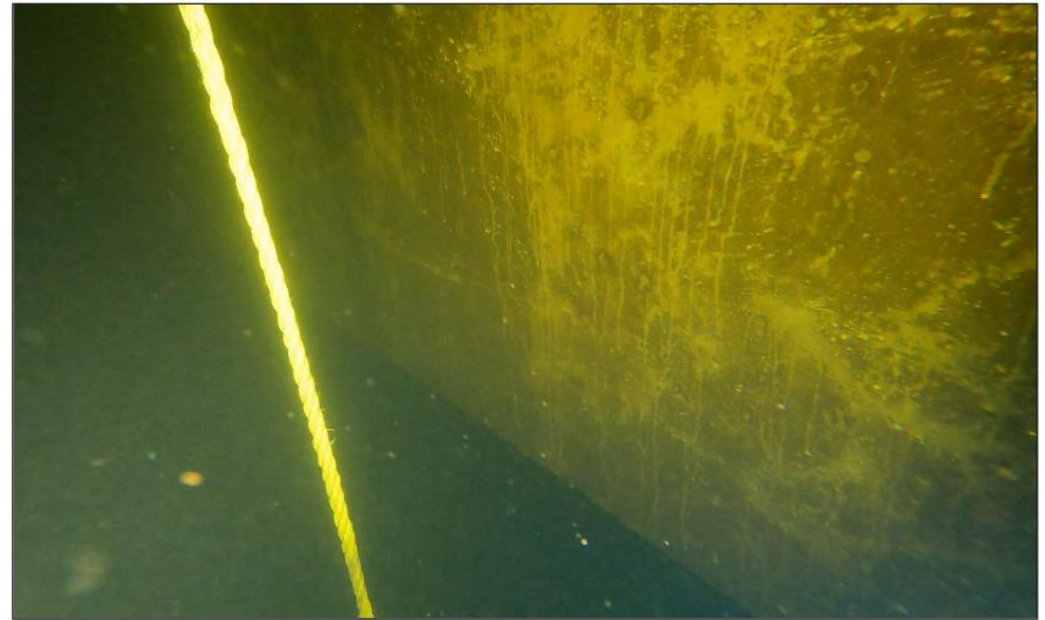


Photograph 15 View of typical rust nodules on the steel pile casings of Pier 2.



# Inspection Findings

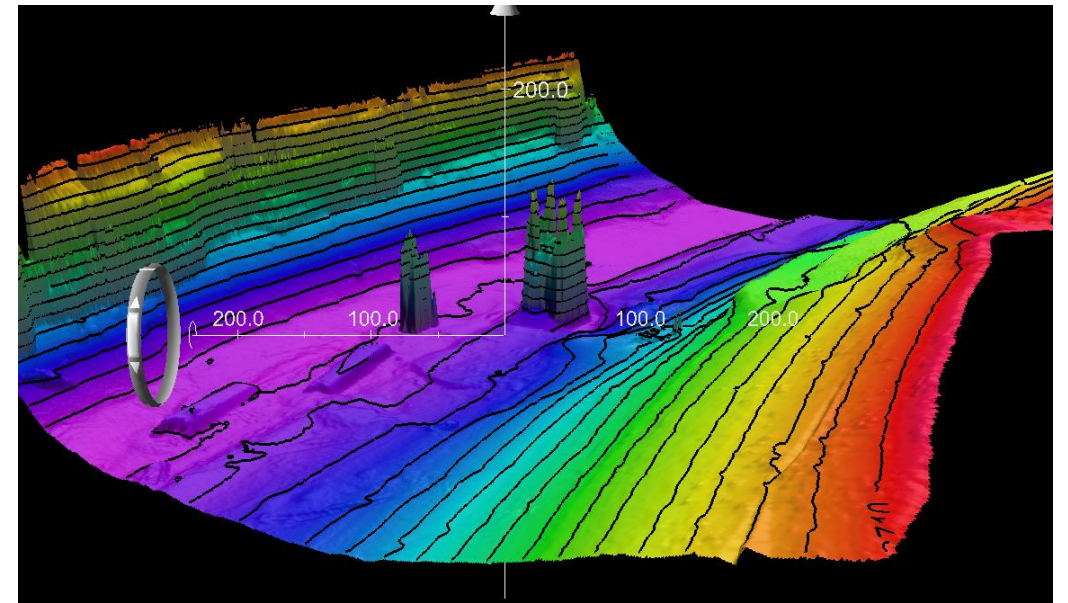
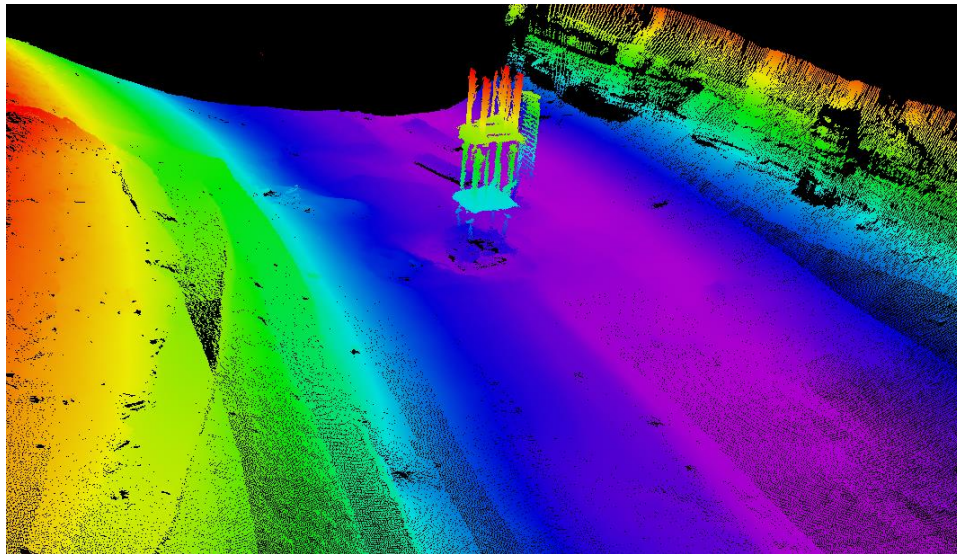
- Bridge is in Good Condition
  - Concrete sound, smooth, and free of defects.



*Photograph 17 View of the typical condition of the concrete on the lower brace of Pier 2.*

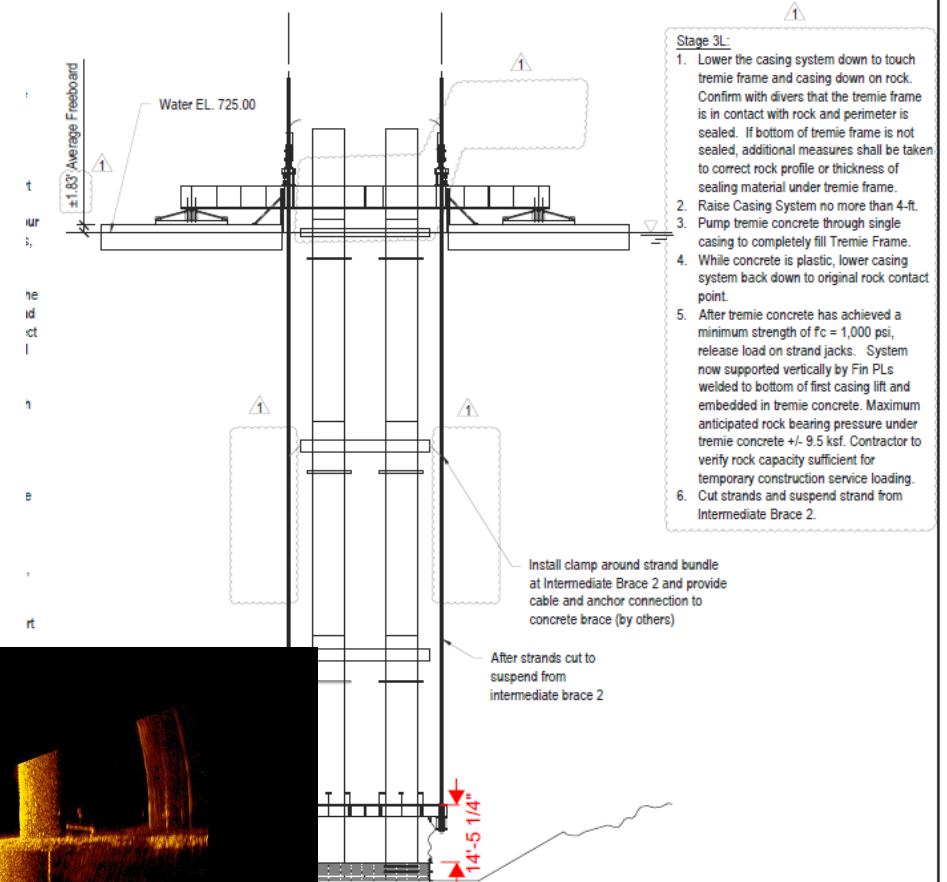
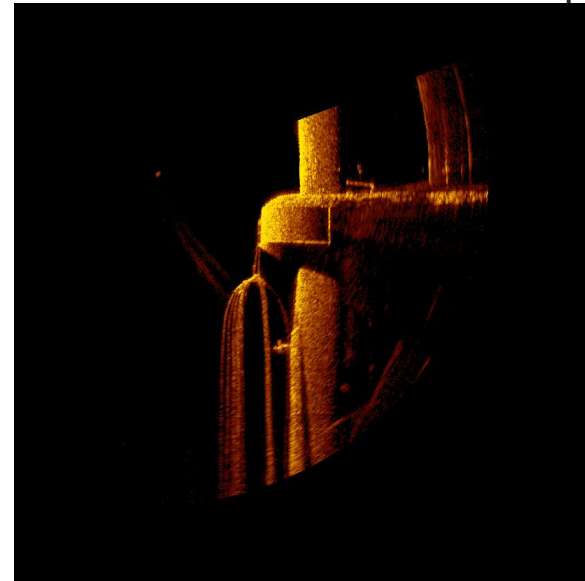
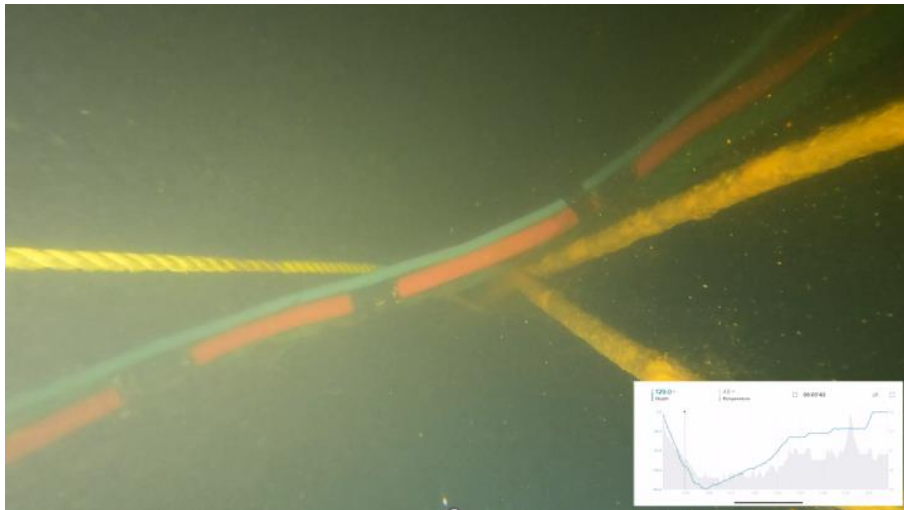
# Inspection Conclusions

- This bridge is a candidate to extend the underwater inspection interval.
  - Substructure is free of significant defects.
  - No scour issues.
  - Sonar can image significant defects/damage.



# Inspection Conclusions

- The cables left in place are a significant hazard to divers and equipment.
  - With the cables in place, an ROV inspection can not be done without a dive team.
  - Recommend the cables be removed.



# Questions?





- QR Code for PDH Credit 8:00 AM

