Acoustical Imaging for Underwater Inspection

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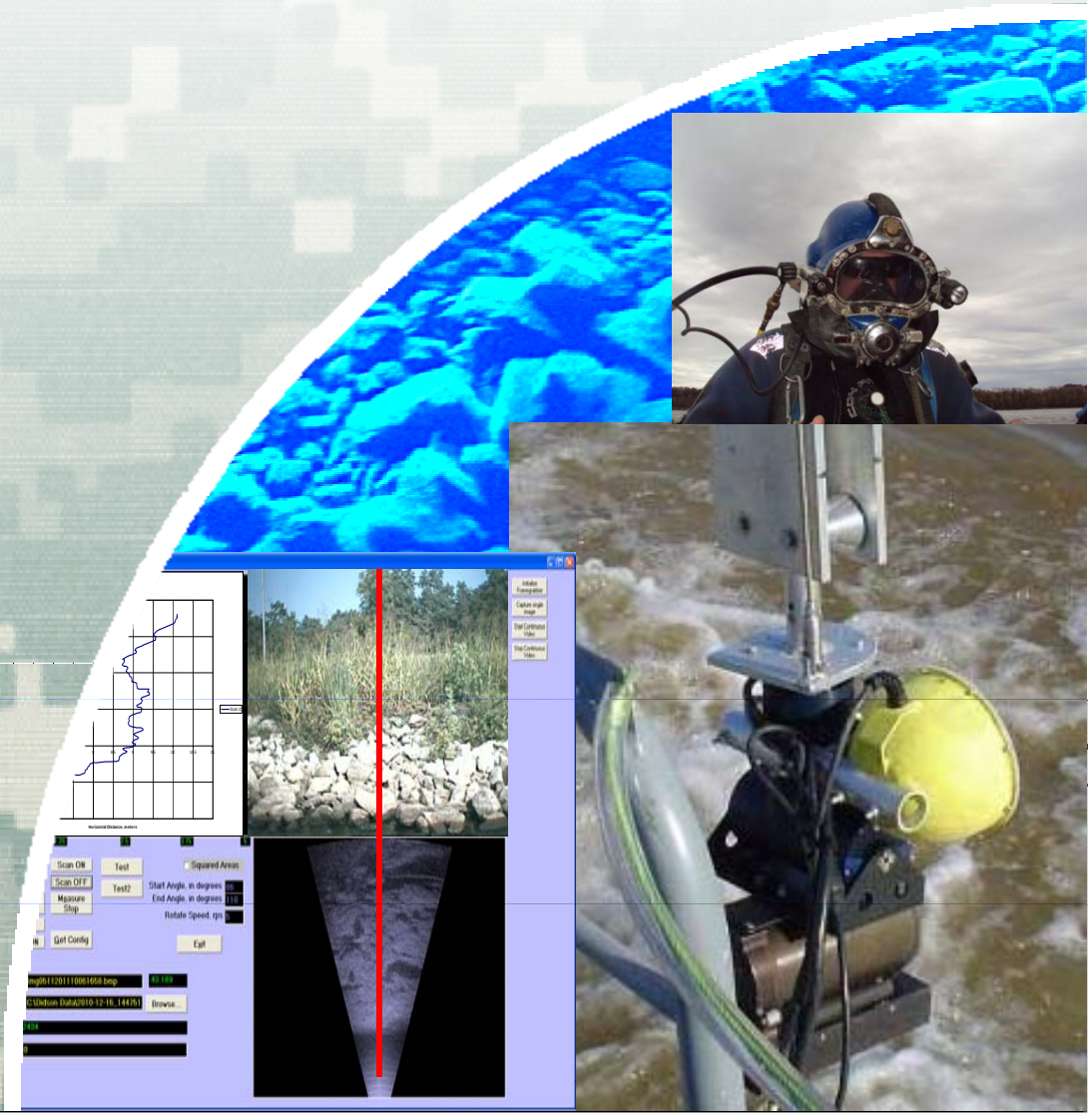


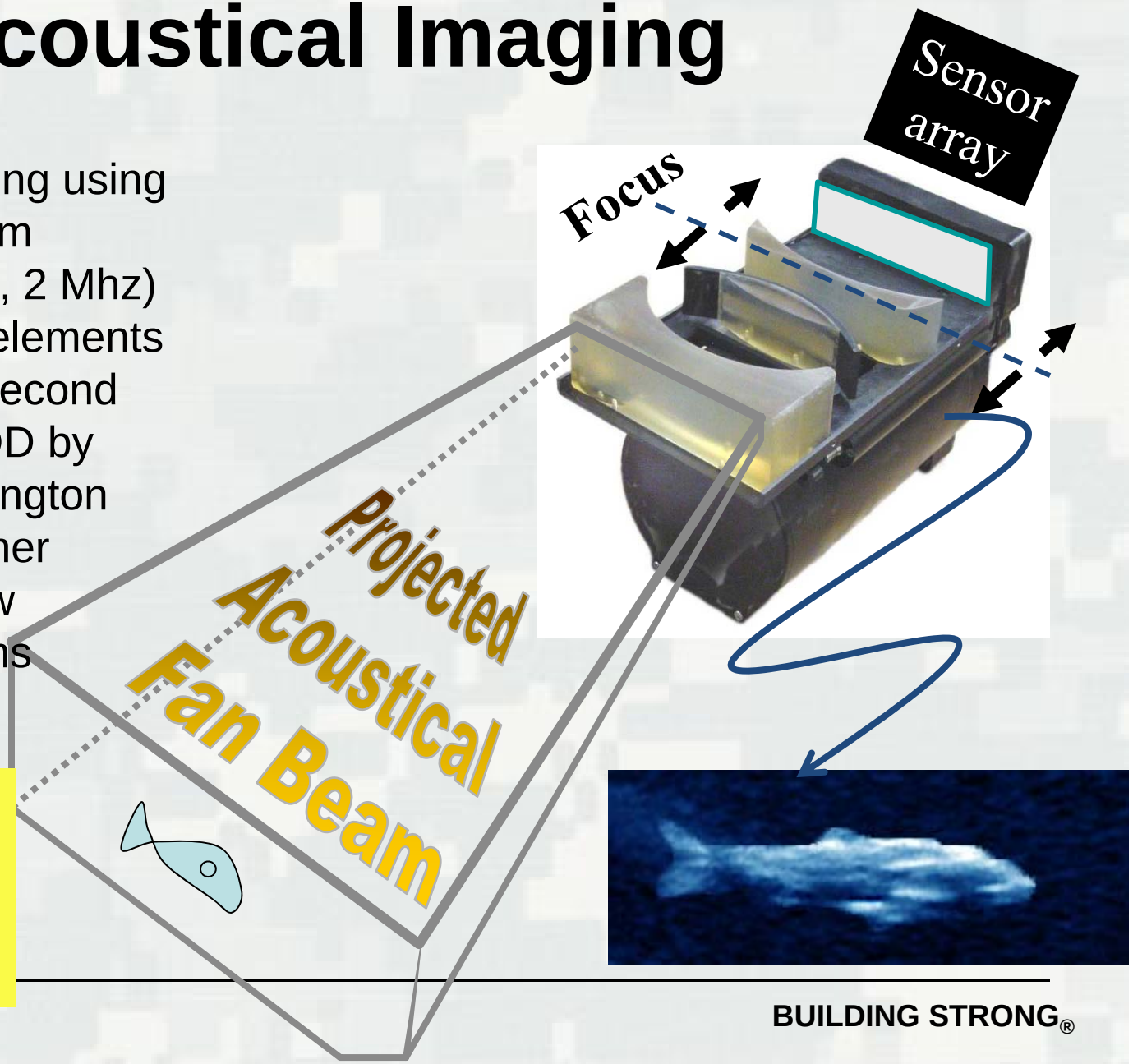
US Army Corps of Engineers

BUILDING STRONG®

High Resolution Acoustical Imaging

Specifications:

- Mechanical focusing using complex lens system
- Dual frequency (1, 2 Mhz)
- 1-30M range, 96 elements
- Up to 12 frames/second
- Developed for DOD by University of Washington
- Larger Arrays, higher frequency units now Available 128 beams @ 3Mhz



The acoustic camera improves capabilities by offering superior resolution portability and speed compared to sidescan and beam forming approaches

High Resolution Acoustical Imaging Vs. Conventional Dive Inspection

Diver only inspection

- Near zero visibility in turbid water
- Subjective verbal descriptions
- Potentially hazardous for diver
- Poor location referencing
- Limited to divers' perception

Acoustical Imaging

- Image unaffected by turbid water
- "Optical" digital record (2d -> 3d)
- Boat, ROV or diver deployed
- Data Tagging w/ Geo-referenced Position
- Real-time, noninvasive, and remote (3-90')

Acoustical Imaging System

Products developed to enhance Operation Of Acoustical Camera Imaging System

- Deployment System (Pole mounted for GPS location)
- High Speed Mosaicking of Images
- DDF Parser for file processing
- Integrated Sensor Platform Provide Geospatial
- Edge Detect Software (Used to build contour map)
- Technical Report ERDC/ITL-13-3
- Technical Note CHETN-IX-23

Pan and Tilt

High Resolution Acoustical Imaging Deployment (Continued)

Integration of Video Monitor for Diver Use

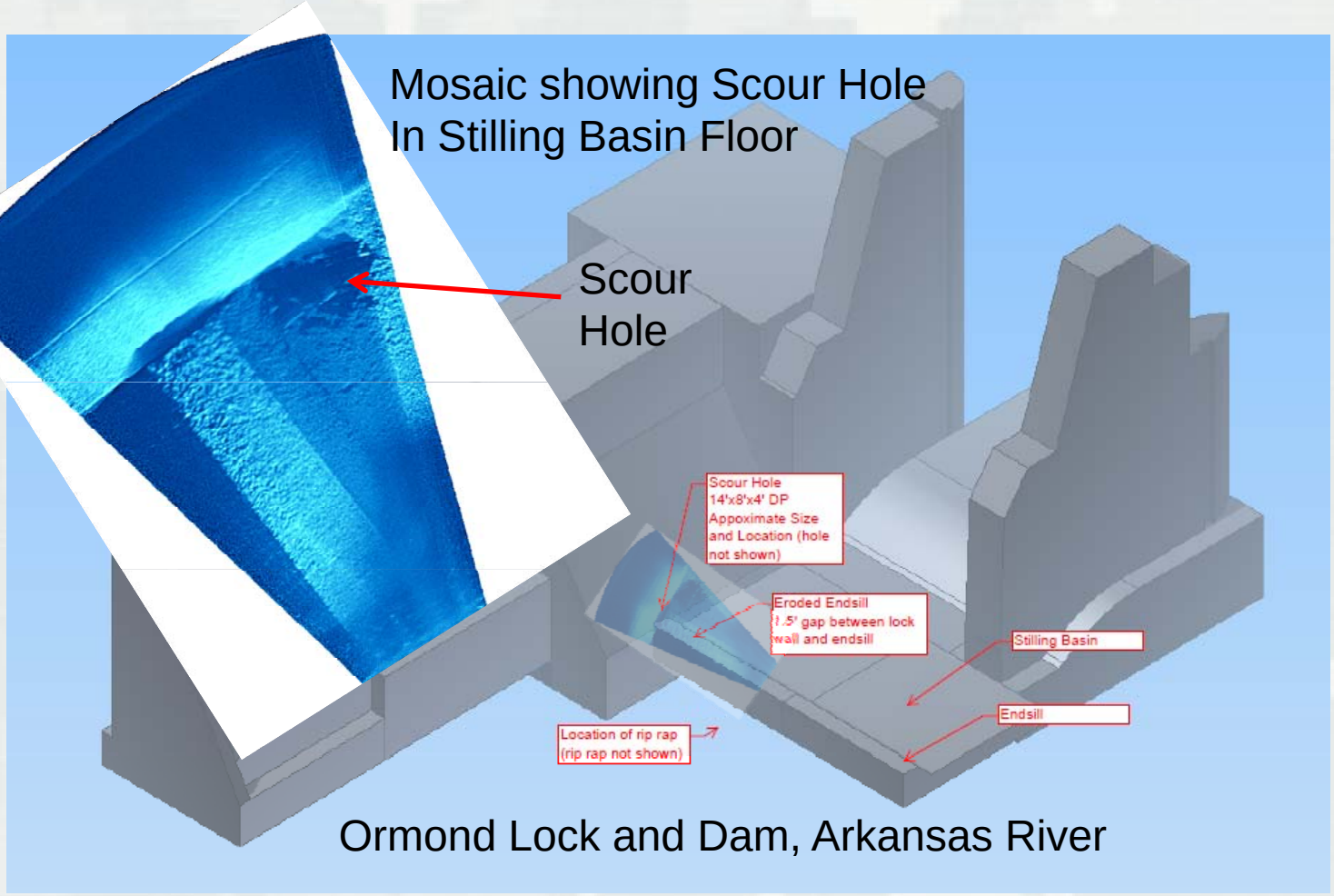
Latest Version of Diver Display

1) Increases Diver's Involvement of Inspection Process.

2) Improves Diver Safety

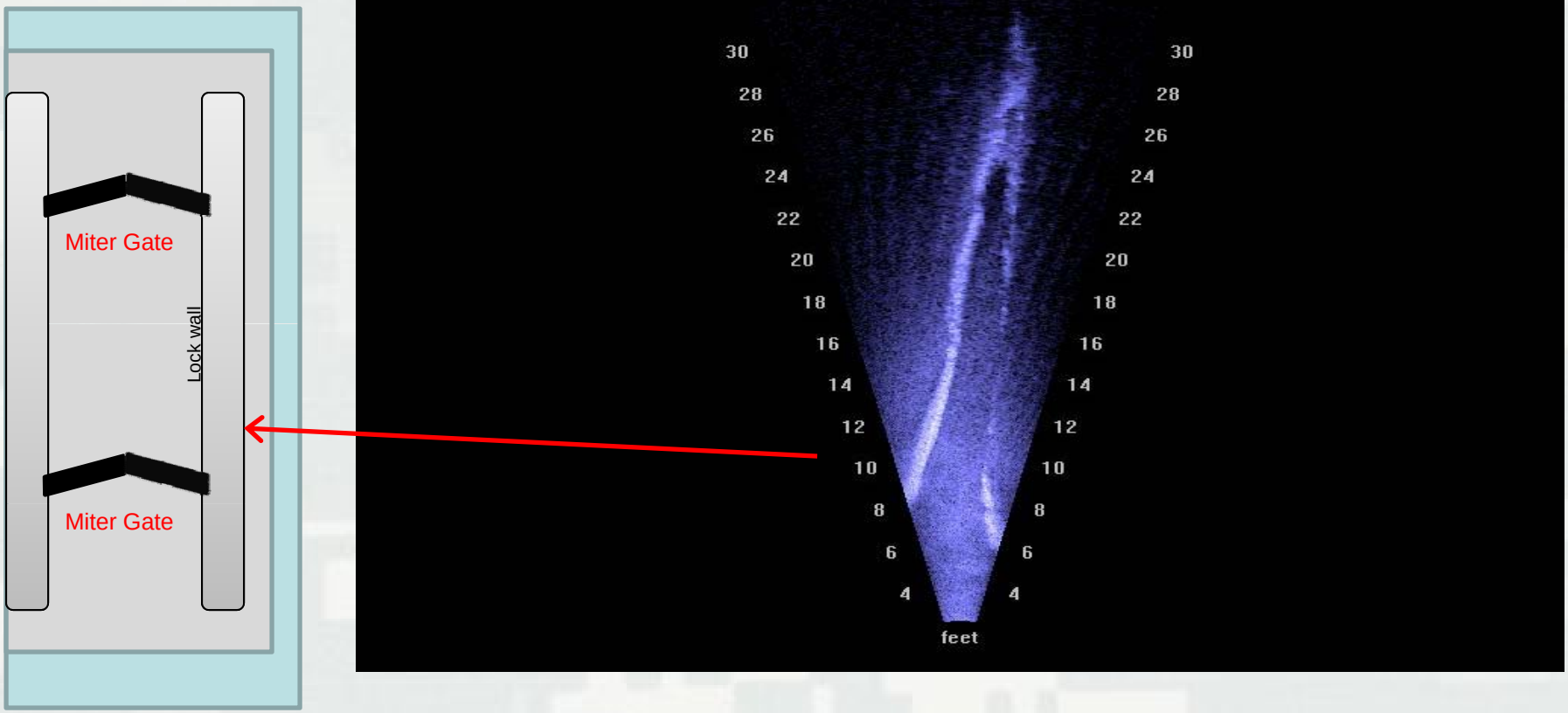
Early Versions of Diver Display

Acoustical Inspection of Scouring On Stilling Basin End Sill



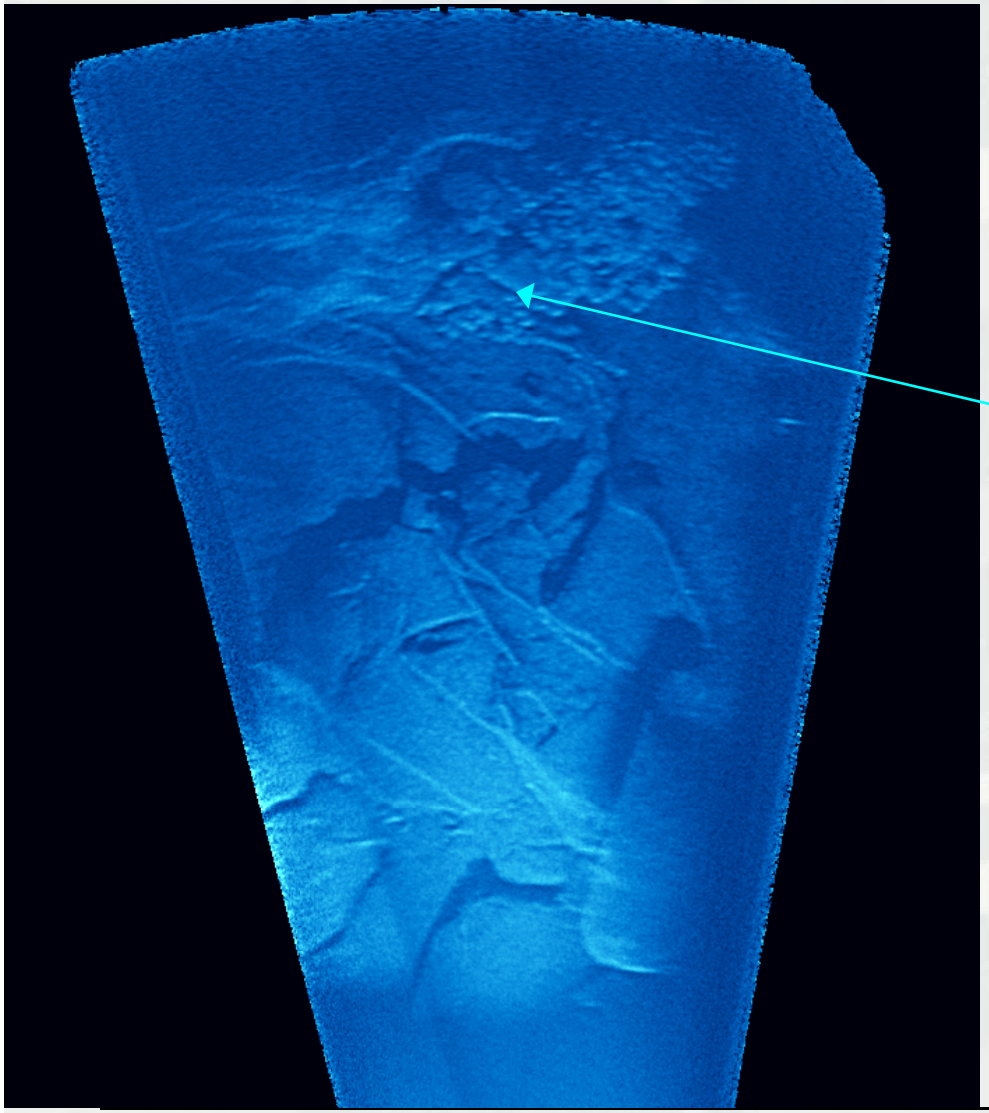
Acoustical Imaging of Lock and Dam #25

Nov 5 2012

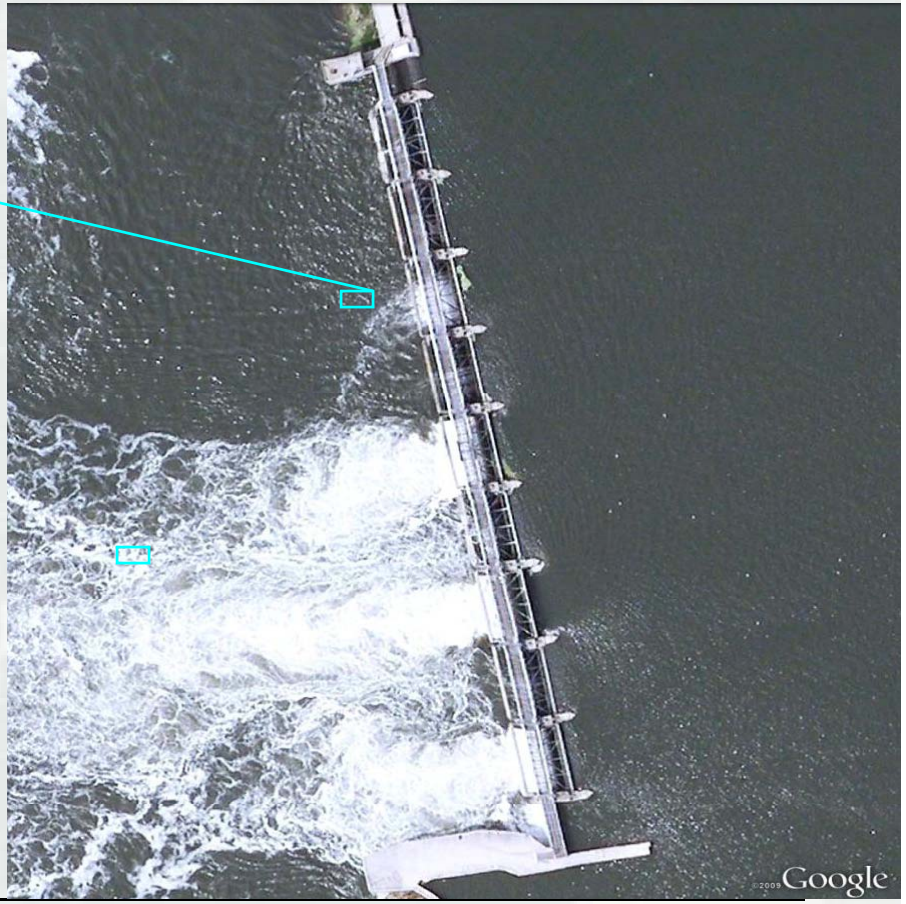


Scour Depth approximately 22 feet from edge of existing cracked concrete edge. Scour Depth estimated at 6 feet but could not be viewed directly as the diver was restricted in distance he could back from the target area. Arrow shows approximate location of this scoured area.

Acoustical Imaging of Dresden Dam
Chicago District



Scour inspection below the dam.

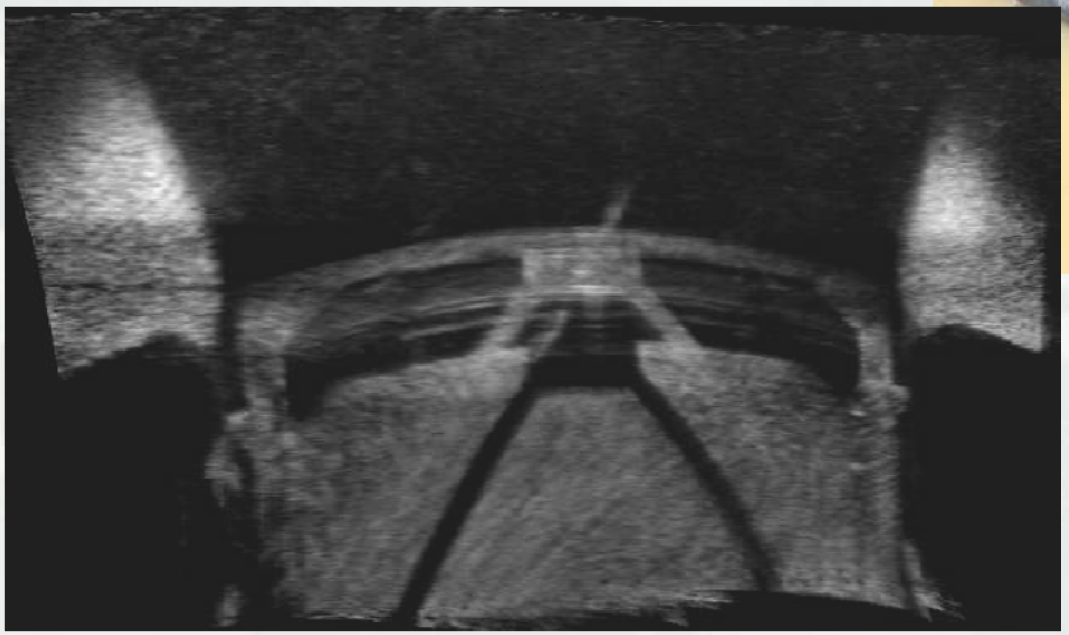


Imaging Structural Elements

Acoustic Camera was used at Delaware Dam, Huntington District to look for obstructions in the gate slots.

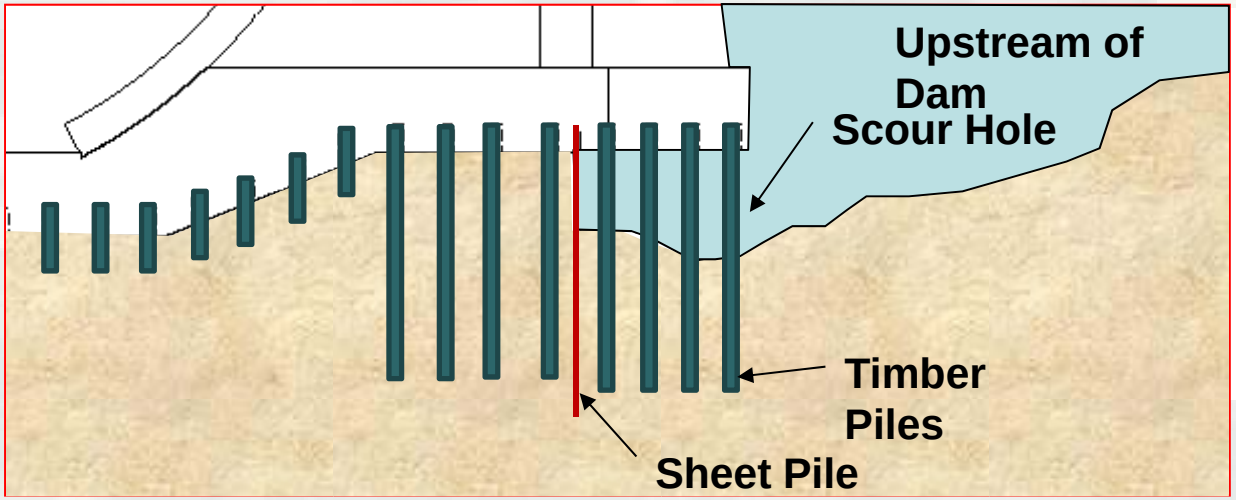
- No slot problems were found.

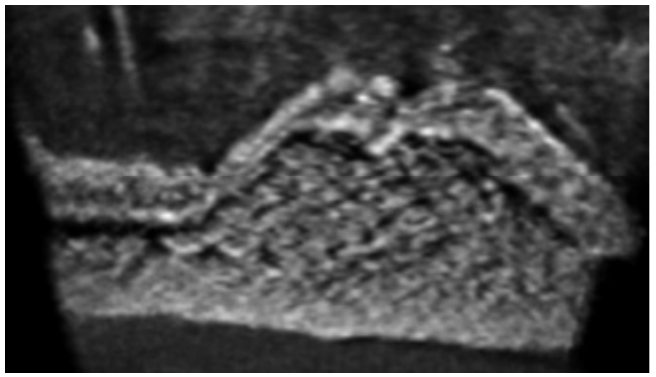
Maintenance gate being lowered

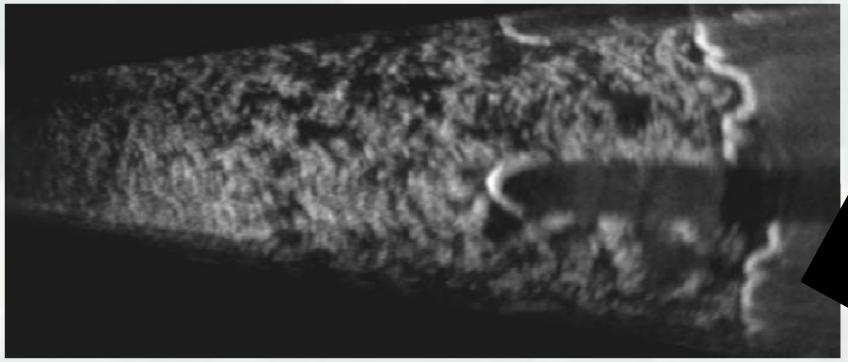


Note water opacity

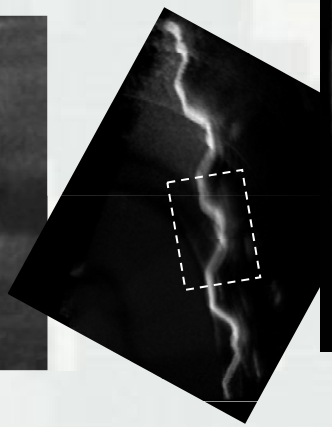
Inspection of Scour-exposed Components
Mel Price Lock and Dam

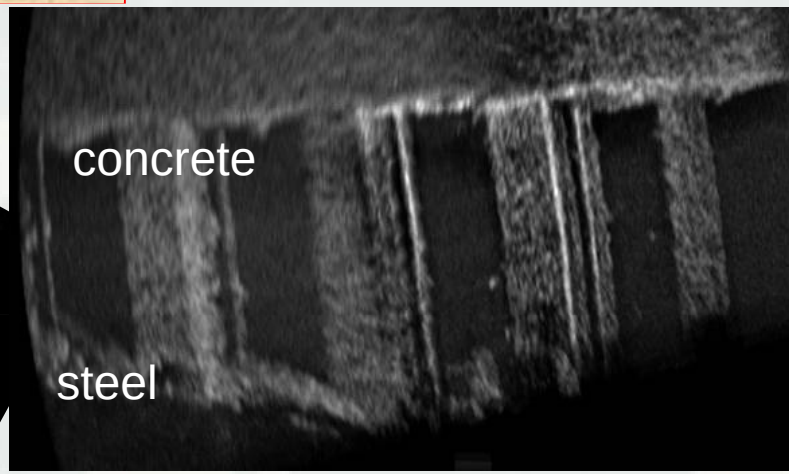






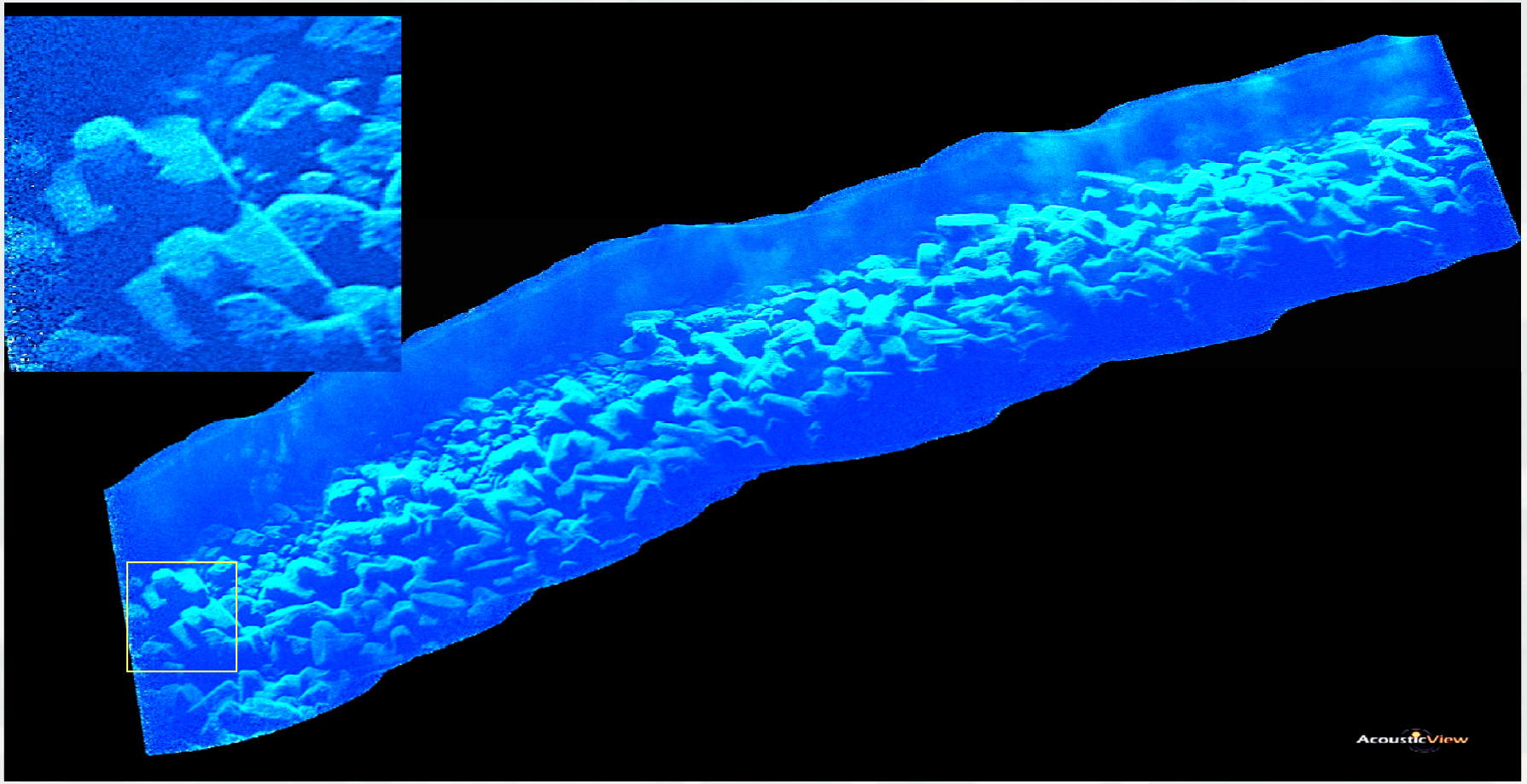
Scour-exposed Timbers





Scour-exposed Sheet Piles

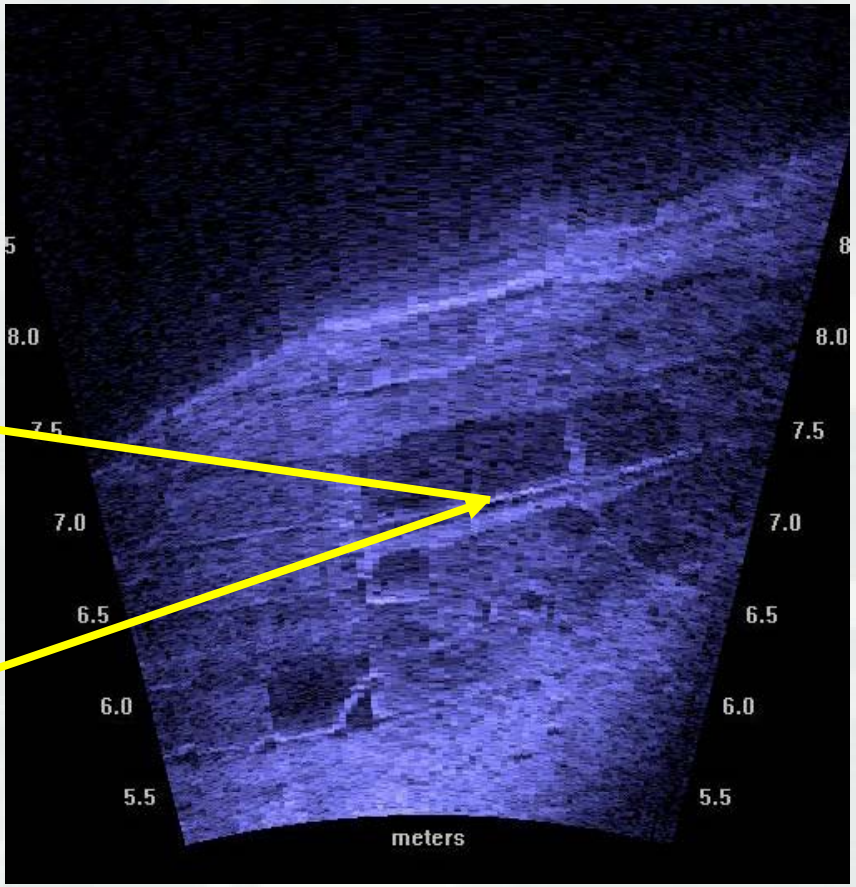
New Image Mosaicking Capability in Near Real-time



GIS Referencing of Each Data Pixel

Adding Acoustical Camera Images to CorpsMap 3D

GIS Positional Data



Matting Along Mississippi River Bank

Acoustical Imaging

Summary:

Underwater Acoustical Imaging using High Resolution acoustical cameras provides near photographic quality images, reduces the risk of diver injury and provides a permanent record of inspections. This system provides a tool for capturing high resolution 2d+ dimensional images of structures which can be exported via the DXF format to commercial software packages such as Right Hemisphere, AutoCAD, MicroStation, etc..