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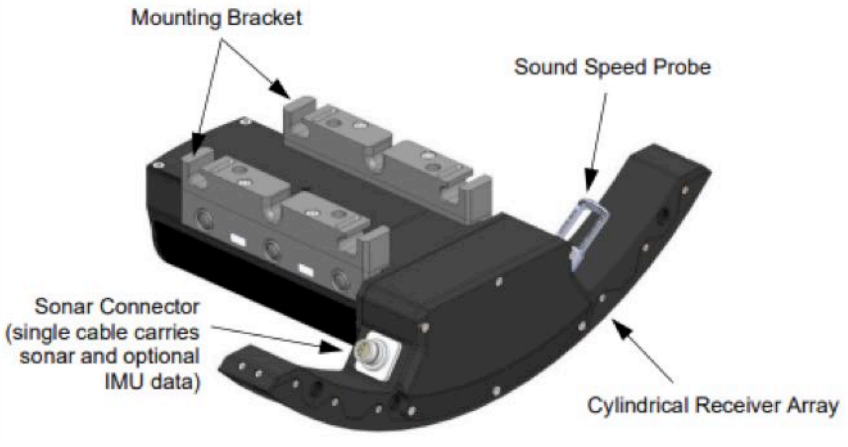
Combined Multibeam and LiDAR Survey Using NORBIT WINGHEAD®

River Nidelva, Trondheim, Norway

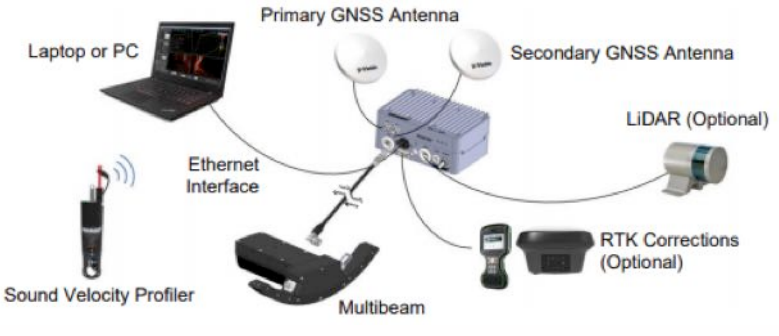
- Introduction
- Installation & Setup
- Bridge Inspection
- Data Examples

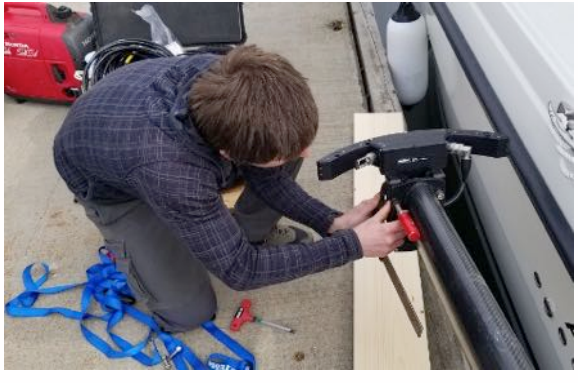
- In this case study we highlight the benefits of using the NORBIT WINGHEAD® for shallow water river surveys and bridge inspections, with combined LiDAR data collection
- WINGHEAD benefits:
  - First cylindrical ultra-high resolution bathymetry sonar on the market
  - 0.5 x 0.9° beam widths at 400kHz
  - HD beamformer providing 1024 beams per ping
  - High performance integrated GNSS/INS systems
  - Integrated sound velocity probe
  - Small form factor and low power consumption
  - Designed for rapid mobilization on *any* platform
  - Available with optional LiDAR



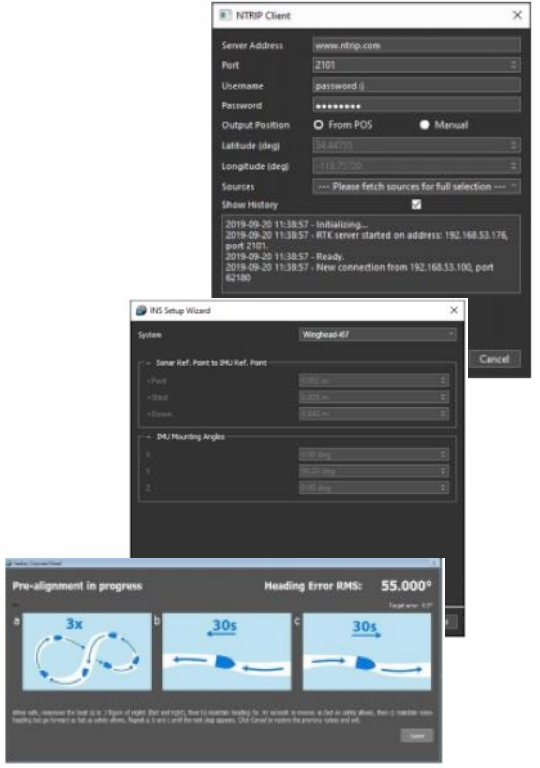
- The NORBIT WINGHEAD® is the most compact ultra-high resolution multibeam survey system currently available
- All components fit in a single pelicase that meets airline baggage requirements:
  - NORBIT WINGHEAD® sonar with integrated IMU
  - GNSS antennas
  - Topside unit
  - Sonar and antenna cables
  - Optional sound velocity profiler
  - Optional LiDAR

- For this case study we chose the NORBIT WINGHEAD® i77h model, featuring integrated Applanix OceanMaster GNSS/INS system
  - All sensors were mounted on a small boat using the NORBIT PORTUS pole, a lightweight, portable carbon fibre solution that was specifically designed for NORBIT systems
  - Trials were performed in the River Nidelva, in Trondheim, Norway



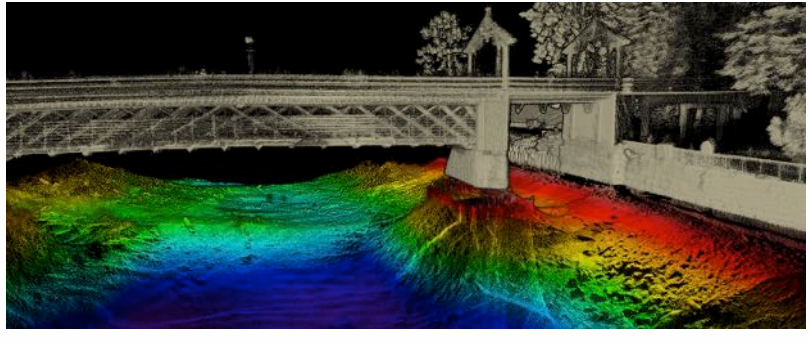


- Since the PORTUS pole is specifically designed for NORBIT sonars, all offsets and alignments are known and documented beforehand
  - Greatly simplifies the setup and calibration procedures
  - The surveyor does not need to measure offsets, reducing the risk of human error
- The INS was configured using the easy-to-follow setup wizard in the NORBIT GUI (no additional software needed)
- RTK positioning was provided, giving centimetre-level accuracy, using the in-built GUI NTRIP client
  - No additional cables or software are required for RTK positioning
  - Only an on-board Internet connection is needed (cell phone hotspot is sufficient)

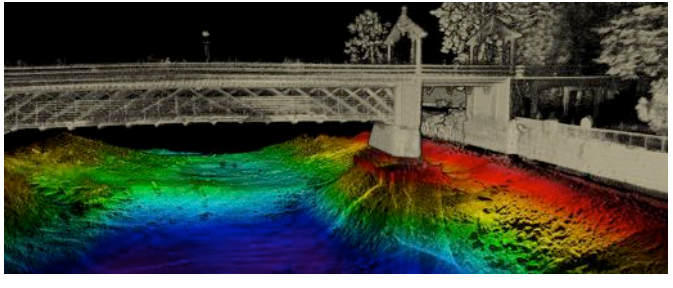


- The Old Town Bridge is a historic bridge, built in 1681, crossing the Nidelva River
- The combined multibeam and LiDAR solution provides a complete 3D, georeferenced image above and below water
  - All data is collected simultaneously and 3D images can be obtained in real time
  - Data can be used to rapidly inspect the structural integrity of the bridge piers and detect objects on the seafloor which may be hazardous to vessel traffic
  - Regular inspections are important to improve safety of navigation, especially in high traffic areas where the depth is shallow (6m depth on average in this case)



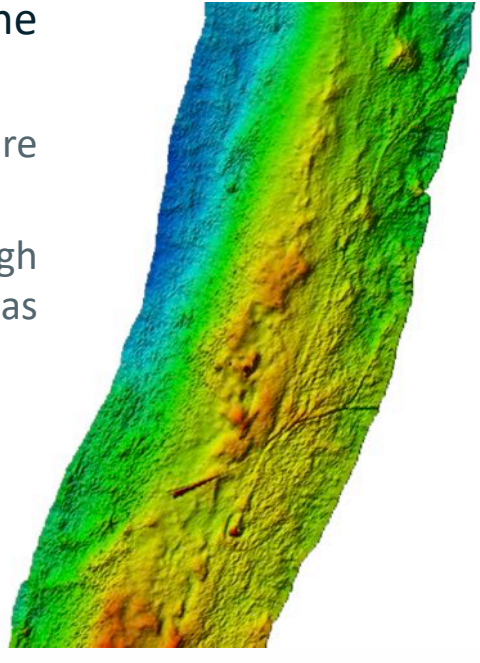


- NORBIT's curved array technology allows the beams to be steered electronically up to waterline without having to physically rotate the sonar, which is ideal for bridge inspection work
  - Curved arrays produce narrower beams (higher resolution) across the entire swath compared to an equivalent flat array system
  - The combination of 1024 beams and 0.5° beam widths provides ultra-high resolution point cloud data and facilitates the detection of small targets such as rocks, ropes, chains, anchors, etc. which may be hazardous to navigation



Full resolution point cloud data (multibeam + LiDAR)

Real time GUI display - electronic steering is employed to image vertical structures



0.25cm Digital Terrain Model Multibeam Data, River Nidelva

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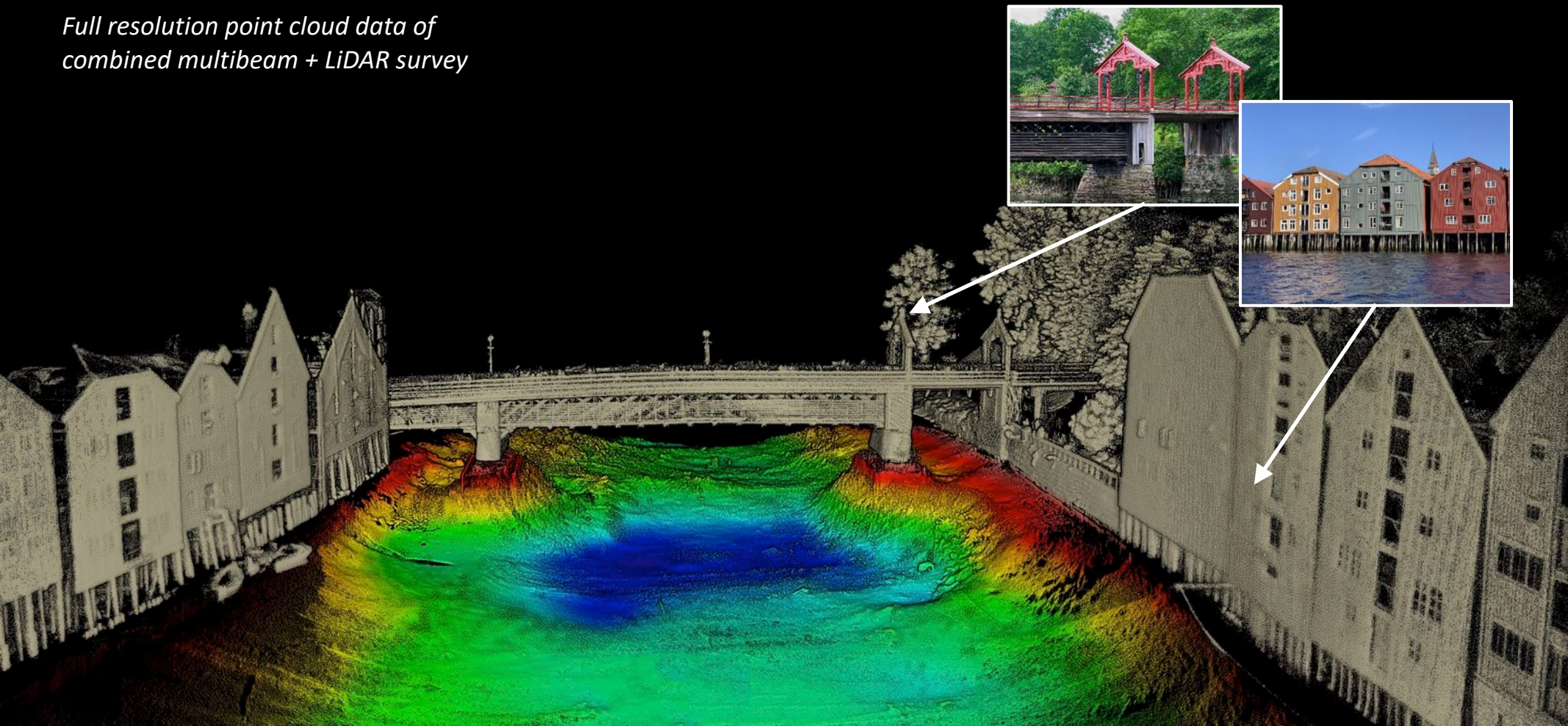
Full resolution point cloud data of combined multibeam + LiDAR survey



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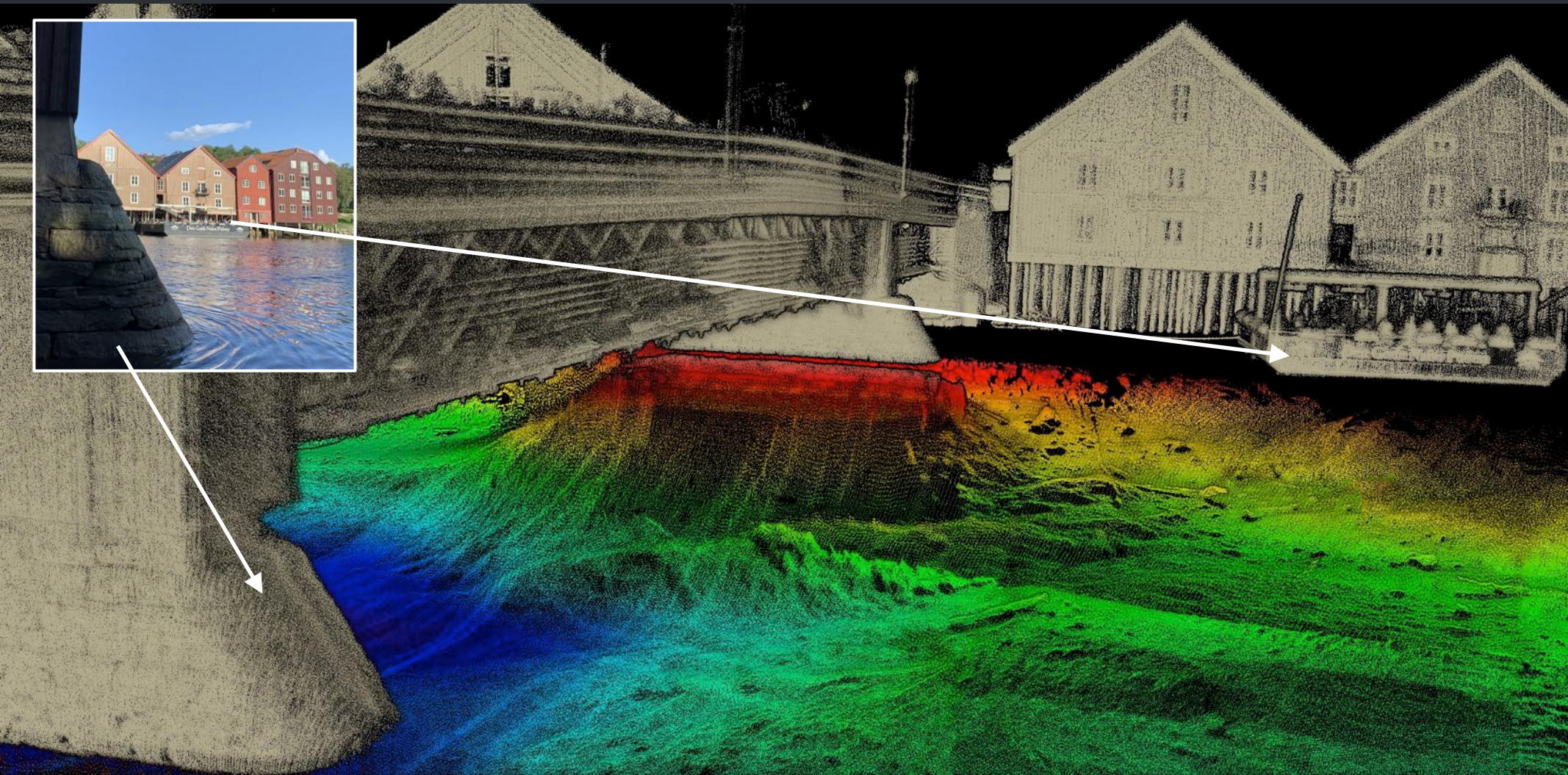
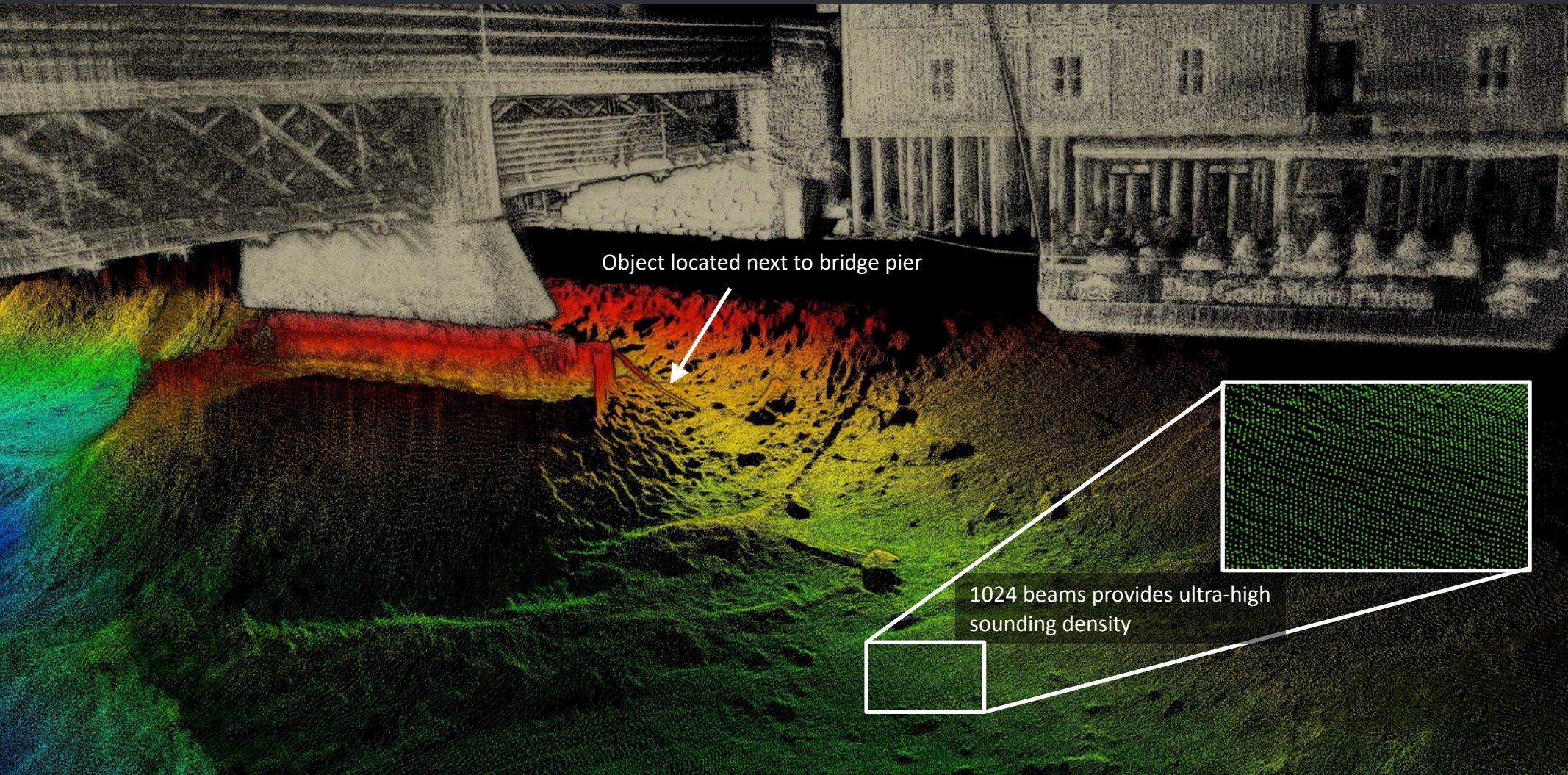


Old Town Bridge



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