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FIG Geospatial Council of Australia
Collaboration, Innovation and Resilience: Championing a Digital Generation
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Overcoming Vegetation Challenges in Digital Terrain Modelling for Hydrodynamic Applications

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Background: Blue Carbon and Coastal Wetland Restoration

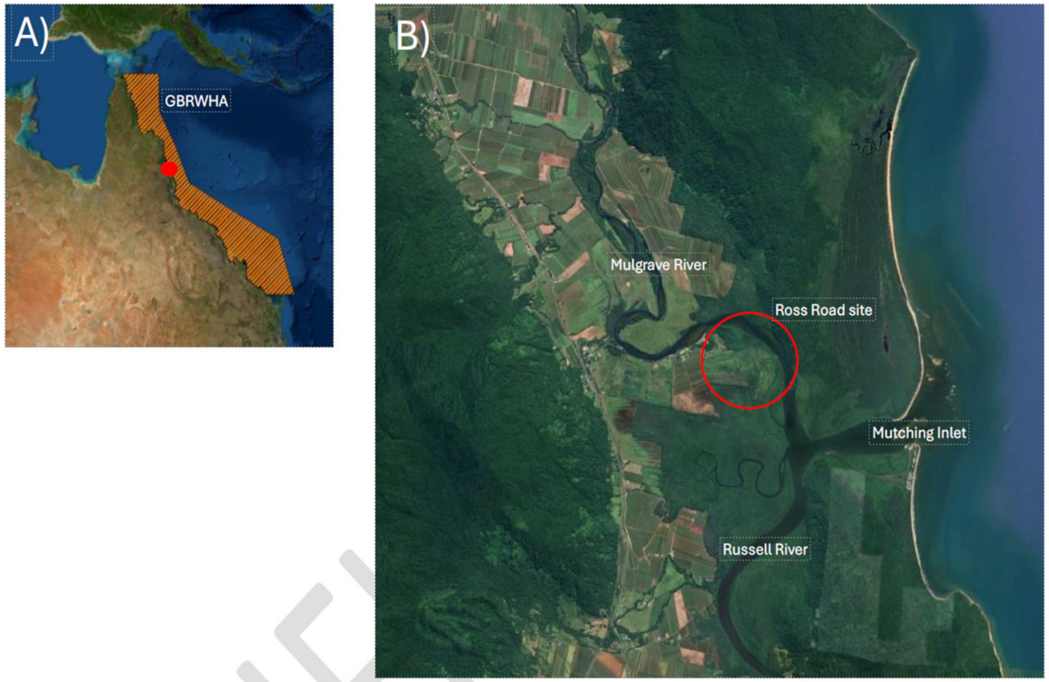
- **Blue Carbon ecosystems** (e.g., mangroves, saltmarshes) store ~50% of marine carbon despite covering only 0.2% of marine environments
- **Australia hosts a significant share** of global Blue Carbon habitats
- **Degradation releases carbon**, while restoration helps **sequester carbon**—similar to reforestation
- **Co-benefits** include improved biodiversity, fisheries productivity, and water quality
- Growing **carbon credit market** in Australia (e.g., Emissions Reduction Fund, ACCUs) supports voluntary offset schemes
- **Tidal flow reintroduction** is being piloted as a method to restore wetlands and generate carbon credits

Project Aim

- Investigated **tidal dynamics** of a low-lying coastal agricultural property near the Mulgrave River
- Site is currently **disconnected from tidal flow** by drainage channels and tidal control gates
- Aimed to simulate hydrodynamic conditions under two scenarios:
  - **Current state** – with tidal gates restricting seawater flow
  - **Proposed restoration** – with bund removed to **allow tidal reconnection**
- Used hydrodynamic modelling to assess **tidal water levels and overbank inundation**
- Findings support **Greening Australia** in evaluating **blue carbon restoration potential**

Project Site Description

- Located at the end of Ross Road on the Mulgrave River, ~5 km upstream of Mutching Inlet
- Lies near the confluence of the Russell and Mulgrave Rivers in North Queensland
- Previously used for sugar cane farming
- Over time, became largely unproductive due to:
    - Low-lying topography
    - Frequent flooding
    - Hydrological connectivity with the floodplain and river system

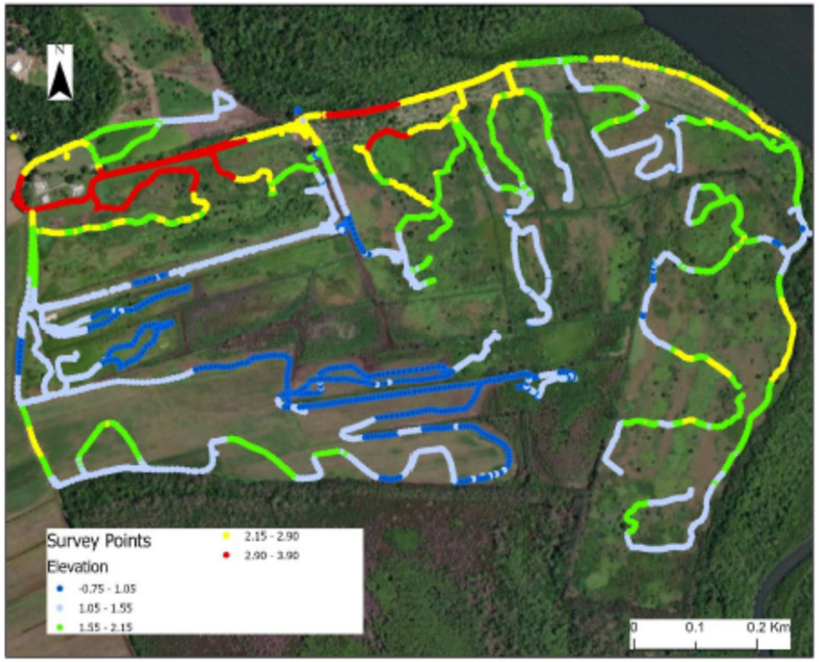


Methods

- **Drone-based mapping** of the site using:
  - **RGB (optical) imagery** for Structure-from-Motion (SfM) photogrammetry
  - **Drone-mounted LiDAR** for high-resolution elevation data and vegetation penetration
- **Ground-based RTK GPS survey** conducted for:
  - Collecting accurate elevation reference points
  - **Establishing permanent survey benchmarks** across the site
- Data integrated to generate:
  - **Digital Surface Model (DSM)**
  - **Digital Terrain Model (DTM)**
- Datasets used to calibrate and validate **hydrodynamic models**

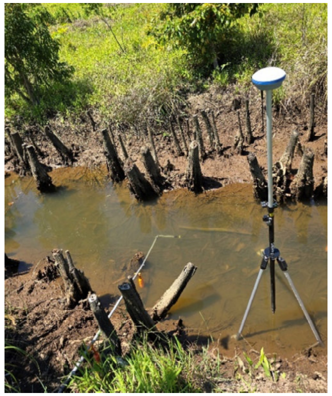
Methods: Ground-based RTK GPS survey

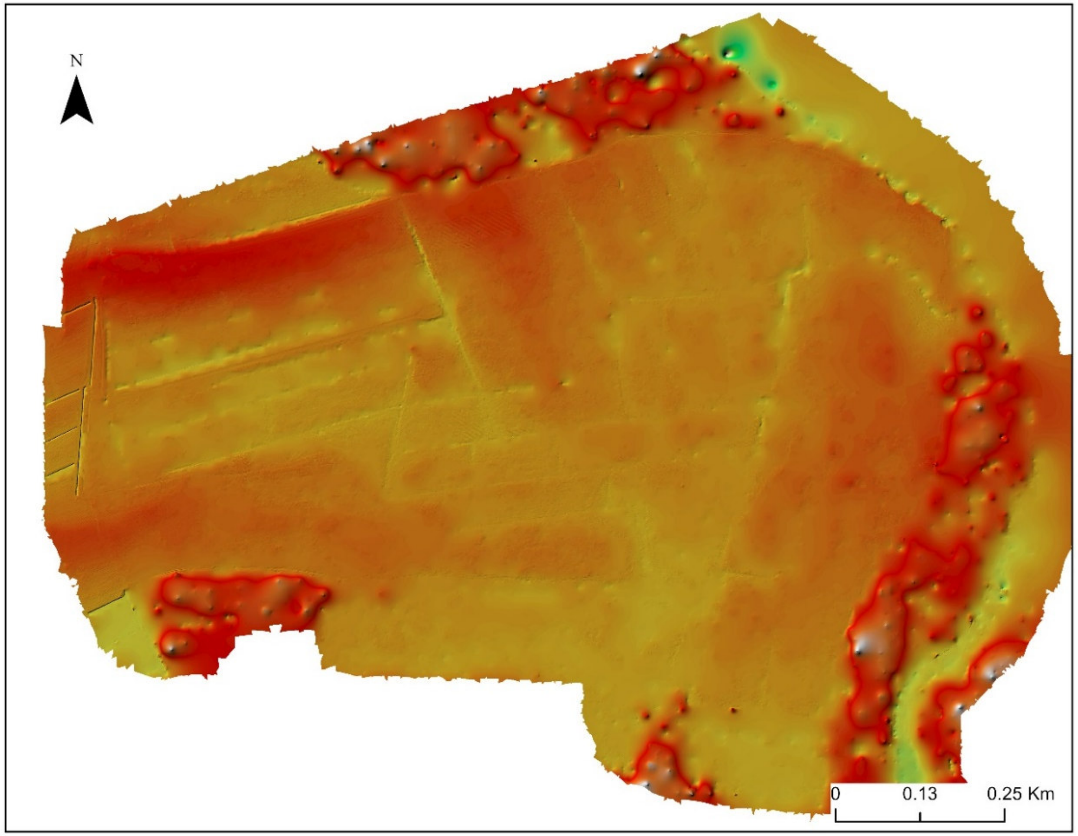
- Collecting accurate elevation reference points



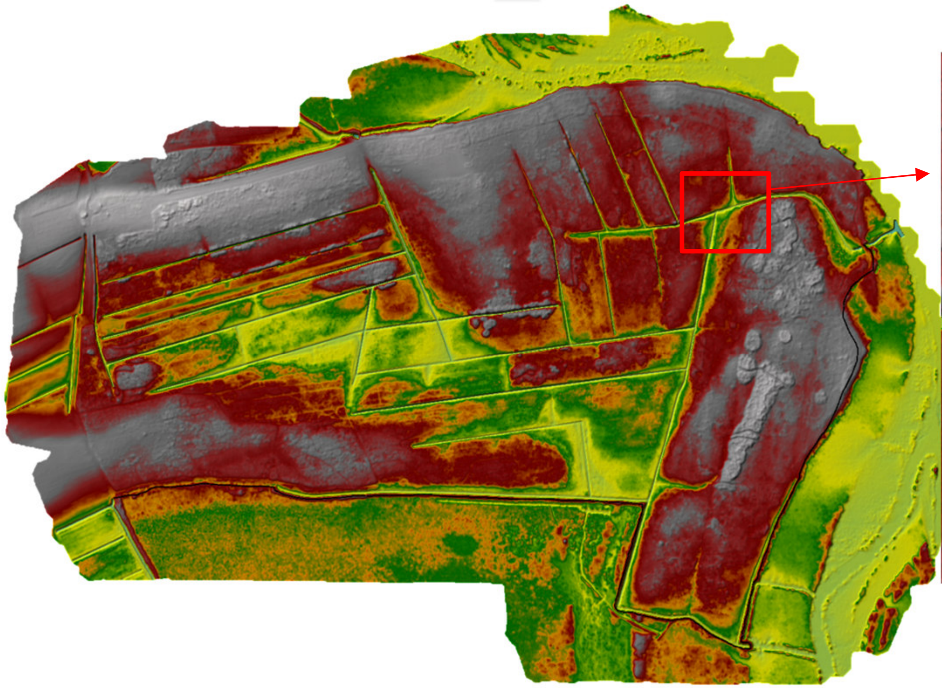
Results: Orthomosaic

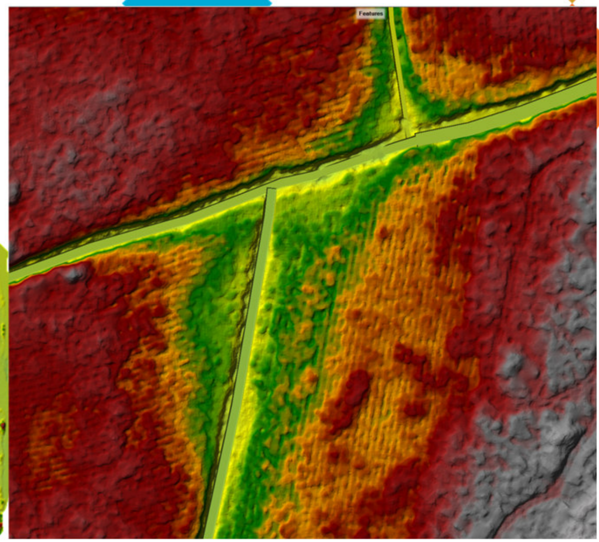
Results: DTM from Drone

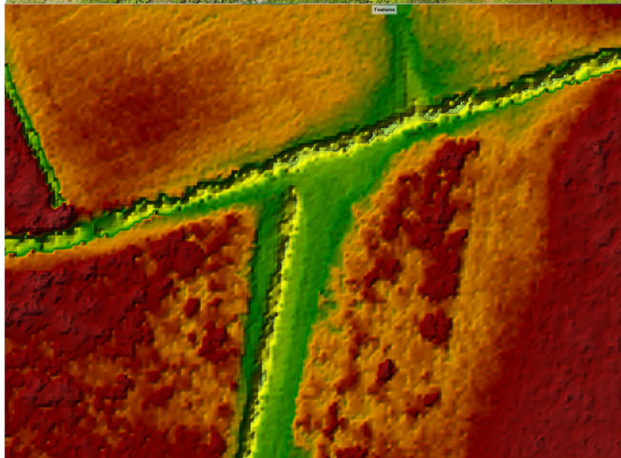




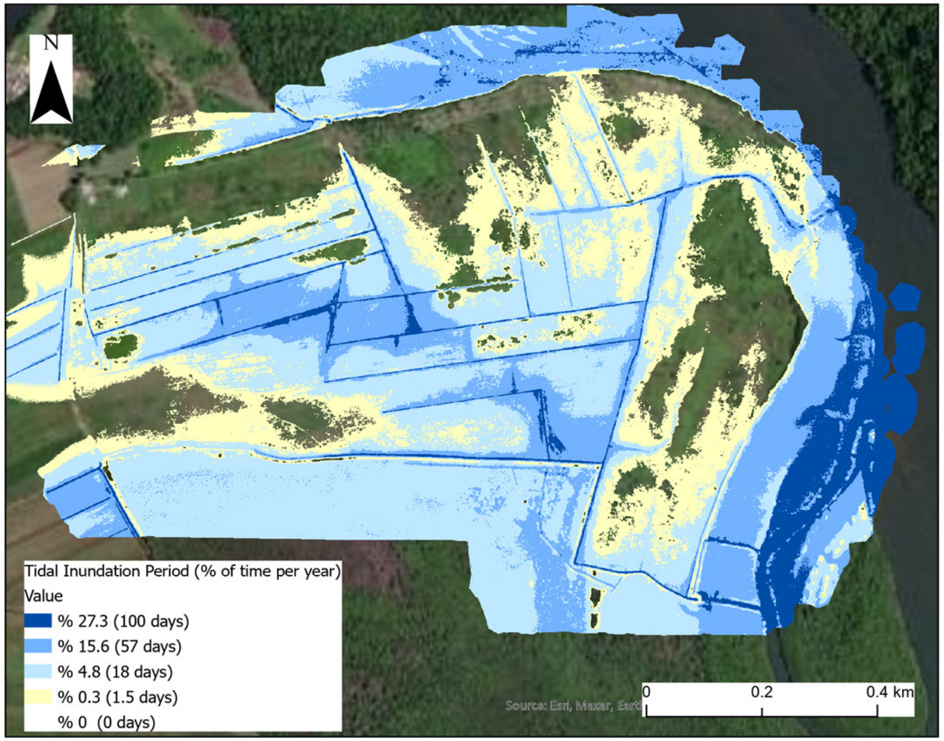
Results: Hydrologically corrected DEM

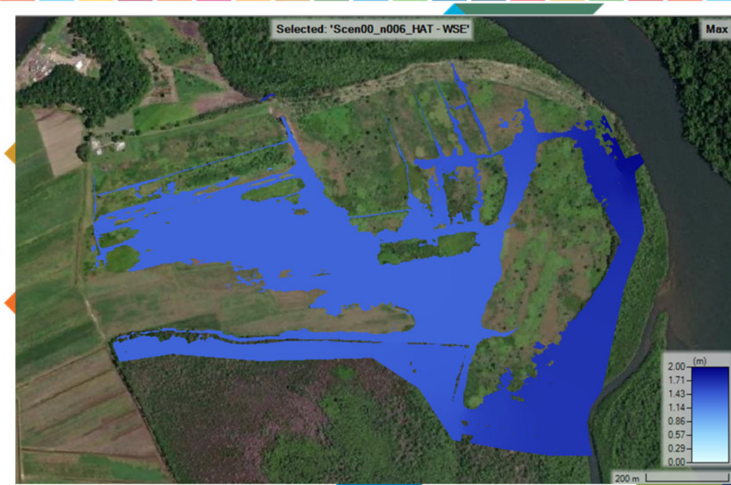


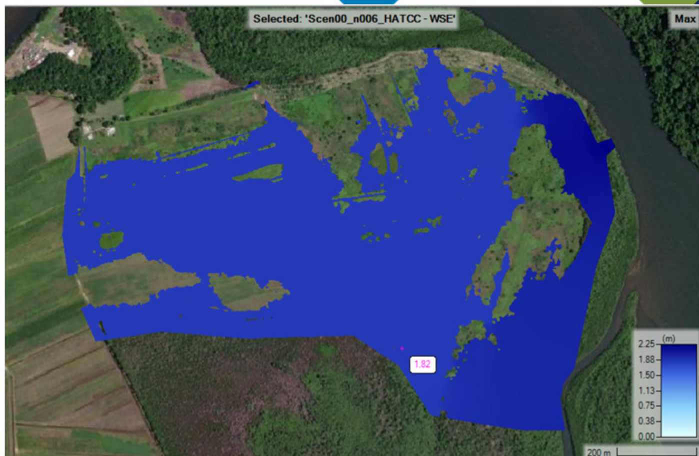




Results: Hydrodynamic of Tidal Inundation







Conclusion / Take-Home Message

- **High-accuracy DTMs** are critical for **hydrodynamic modelling**, especially in **flat, low-lying landscapes**
- **Vegetation poses significant challenges** in generating accurate Digital Terrain Models (DTMs)
- **Removing vegetation artefacts** is essential for representing true ground surface
- Even **drone-based LiDAR** struggles in areas with **dense or overhanging vegetation**
- A **combined approach** using **ground-based RTK surveys and drone data** enhances DTM accuracy
- Improved terrain data leads to **better tidal modelling**, supporting **Blue Carbon restoration assessments.**
- **Fieldwork in wetlands introduces safety challenges**—notably the presence of **crocodiles in tidal systems**

The most relevant SDGs related to the presentation and theme of this session

1st relevant SDG: 13 CLIMATE ACTION

2nd relevant SDG: 15 LIFE ON LAND

3rd relevant SDG: 14 LIFE BELOW WATER

SUSTAINABLE DEVELOPMENT GOALS | International Federation of Surveyors supports the Sustainable Development Goals

STEP 1: SELECT HERE THE THREE MOST RELEVANT SDGs
STEP 2: COPY THE SDG INTO PREVIOUS SLIDE

1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS