

AusSeabed Newsletter No. 36 August 2023

Dear AusSeabed Community,

Last month, we bid farewell to Kim Picard, an AusSeabed founding figure and the first Steering Committee Chair. Kim has departed Australia to take up a new role as the Executive Director at the Calgary Office of the Geological Survey of Canada.

It would be impossible to count the number of times Kim worked late into the night or across the weekend, pouring over presentations, proposals, project agreements, and strategies, driving the development of the AusSeabed program. A pilgrimage she made without complaint that often passed under the radar. Without Kim's energy, unyielding commitment, and vision, AusSeabed would never have had the reach, impact, or growth that it has: uniting the Australian seabed mapping and marine science community across sectors and establishing our collective efforts as the international gold standard for community led seabed data collaboration.

Kim, you are leaving behind a resilient program: an inspired steering committee, a committed executive board, and an empowered community—a legacy to be resoundingly proud of. Thank you, on behalf of everyone you have worked with, for all the emails, phone calls, casual chats, deadlines, data requests, newsletter articles, and program updates. Thank you for the friendships forged in the time you never had to spare but always managed to find. We wish you the best of luck!



Kim Presenting at ASMA 2019, Perth. Image credit: Rachel Przeslawski

Steering Committee Updates

July also heralded a few changes to the steering committee standing and general memberships. Richard Cullen previously representing Hydrographic and Cadastral Survey stepped down as an Industry representative after taking a new role with the Australian Hydrographic Office and will continue serving on the steering committee as the Australian Hydrographic Office Standing representative. This left one academic, one Australian Government, one Early Career Ocean Professional (ECOP), two industry and two state government positions open for the community election process as we had several general memberships also come to the end of their elected terms.

This year we received 17 nominations—the greatest show of interest yet. Thank you to all who nominated for positions and to all who voted on behalf of their agency. We had a few outgoing members successfully reapply, some with new representatives, and we are happy to welcome back:

Academic position

Curtain University; represented by Iain Parnum

Australian Government position

Department of Climate Change, Energy, the Environment and Water; represented by Merinda Nash

State Government positions

NSW Department of Planning and Environment; represented by Tom Doyle

South Australian Research and Development Institute; Represented by Mark Doubell

Three new organisations also joined the steering committee for the first time:

Industry positions

EOMAP; represented by Emily Twiggs

Kongsberg Discovery, represented by Henry Johnson

Early Career Ocean Professional position

University of Wollongong; represented by Alysha Johnson

We would like to acknowledge all the contributions our outgoing representatives and their organisations have made to the strategic direction of AusSeabed during their tenure: David Crossman (IIC Technologies, Vice Chair); Tim Ingleton (NSW DPIE, Outreach Education and Training Theme Lead); Cath Samson (Parks Australia; DCCEEW), and Mardi McNeil (Geoscience Australia; Early Career Ocean Professional). We couldn't achieve what we do without your collaboration and support and recognise that often this comes above and beyond the remit of your day-to-day roles.

To our new and returning steering committee representatives – thank you for your commitment and interest in the AusSeabed program—we are looking forward to working with you into the future.

Work plan updates

We have developed the 2023/24 work plan which has now been endorsed by the steering committee and executive board and we will be publishing this online in the coming weeks.

Details are being finalised for a September workshop to continue working through the outcomes of the Coordinating and Measuring our Seabed Mapping Progress session held in association with the World Hydro Day seminar in June.

We are also in the process of setting up working groups to continue progressing some of our most important work activities:

Work Theme	Tools Guidelines and Standards	AusSeabed Data Hub	Outreach, Education and Training
Working Groups	QAX	Data	First Nations Engagement
	Vertical Datum	Survey Coordination	Education Outreach
	Backscatter	Data Sources	Webinar and Workshop
	Guidelines		

I would like to encourage everyone to consider joining a working group that they are interested in, especially those who were interested in joining the steering committee. To do so please email - ausseabed@ga.gov.au.

CMDR Nigel Townsend, AusSeabed Steering Committee Chair

Newsletter in a nutshell...

- 1. Steering Committee Updates
- 2. Work Plan Updates
- 3. AusSeabed Quarterly Showcase
- 4. AusSeabed 2023 Workshop
- 5. Publications
- 6. Welcome to the 4th Dimension
- 7. A high-resolution Coastal Bathymetry Facility with Advanced technologies (CoastBAT)
- 8. Guardian Geomatics Total Propagated Error Engine
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- 12. Deakin University jobs
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AusSeabed Quarterly Showcase

On the 20th of July AusSeabed ran the final Quarterly showcase for the year. The session featured presentations from the Western Australian Department of Transport and the NSW Department of Planning and Environment on their state seabed mapping and data delivery projects as well as an overview of the highlights from AusSeabed's previous year and the exciting things to look forward to with the 2023/24 work plan. This showcase was also the last time that departing Director Kim Picard addressed the Australian seabed mapping community.

Needless to say, the community which Kim was pivotal in establishing, gave her a wonderful farewell clearly showing the appreciation they have for all that she has done during the last five years. The showcase recording and slides have now been uploaded to the AusSeabed Publications and Presentations page.

AusSeabed 2023 Workshop: Coordinating and Measuring our Seabed Mapping Progress



On 22 June AusSeabed held a workshop looking at Coordinating and Measuring our Seabed Mapping Progress. The workshop was held across two sessions with the following overarching objectives:

Session 1 - How much of our Seabed is 'mapped'?: Seabed mapping data is being reported and interpreted inconsistently. Without a consistent quality assessment framework and data coverage approach agreed upon and applied, we will continue to see contradictory estimates used to establish national context over the years to come. Agree on a quality assessment and reporting framework that would provide the AusSeabed community a means to communicate official metrics on a regular basis through our data management practices.

Session 2 - Developing a National Seabed Mapping Program: The purpose of this session was to explore possibilities for better coordinated efforts (data collation and acquisition) nationally to improve engagement at executive and departmental level, the tracking of our progress and coordination of data acquisition.

38 attendees from government, industry and academia participated throughout the day looking at how we report, area's of interest, alignment of priorities and much more. A report from this workshop discussing outcomes will be distributed shortly and AusSeabed is organising a follow on workshop to look at developing a National Seabed Mapping Plan in September.

Portal Publications

Date Published: 31-July-2023 & 01-Aug-2023

Banks Strait to Cape Barren TAS (HIPP SI 1024) Bathymetry 2021 30m http://pid.geoscience.gov.au/dataset/ga/147986 PROD Portal https://portal.ga.gov.au/restore/7be4e529-eb0a-4678-b3de-5a83a8949731

Cape Barren to Babel Island TAS (HIPP SI 1035) Bathymetry 2021 30m http://pid.geoscience.gov.au/dataset/ga/147826 PROD Portal https://portal.ga.gov.au/restore/dd24f07c-e413-445d-aa07-99ec96d1a48e

Gulf St Vincent North SA (HIPP SI 1008) Bathymetry 2020 30m http://pid.geoscience.gov.au/dataset/ga/148605 PROD Portal https://portal.ga.gov.au/restore/b034443d-6556-4af5-b7d0-37139d5f7d69

Western approaches to Torres Strait QLD (HIPP SI 1004) Bathymetry 2020 30m http://pid.geoscience.gov.au/dataset/ga/147825 PROD Portal https://portal.ga.gov.au/restore/6ebff688-0bdb-40d3-a8eb-277f52f82bca

Norfolk Island Nearshore and Coastal Habitat Mapping AU420 Bathymetry 2021 1m http://pid.geoscience.gov.au/dataset/ga/148607 PROD Portal https://portal.ga.gov.au/restore/a20b4cbb-cae1-41e5-a03e-922f45c2124f

Date Published: 10-Aug-2023

Southwest Margins 3D seismic derived bathymetry compilation (20230001C) http://pid.geoscience.gov.au/dataset/ga/148610 PROD Portal https://portal.ga.gov.au/restore/d53e6096-b9c8-438d-95d7-55a56c1231c1

Welcome to the fourth dimension: Unveiling the dynamic nature of bathymetry - from space!

As much of the world's seafloor remains unmapped, efforts have understandably focused on uncovering the unknown rather than monitoring bathymetric change. The evolution of seafloor morphology can be a gradual process, but this is far from the case in dynamic coastlines where change can have significant implications for infrastructure, benthic habitats, cultural heritage sites and maritime safety.

During the Pacific Regional Navigation Initiative (PRNI), Land Information New Zealand (LINZ) used a pioneering, multi-pronged approach with Satellite-Derived Bathymetry (SDB, Stage 1), Airborne Lidar Bathymetry (ALB, Stage 2) and Multibeam Echosounders (MBES, Stage 3).

Preliminary findings presented at Hydro 2018 in Sydney, suggested that the SDB (captured Dec 2017) had not detected a wreck in the shallow lagoon of Beverage Reef, clearly mapped with the ALB (May 2018). Subsequent investigations revealed the SDB had indeed mapped the *MV Liberty* (a small Niuean trawler), with the wreck shifting hundreds of metres during Tropical Cyclone Gita (Feb 2018), one of the most severe cyclones recorded in Tonga's history! Although this was a relatively unique sequence of conditions, it illustrates the presumption that higher resolution ALB data represented 'the truth' against which the SDB was evaluated, overlooking the potential for dynamic seafloor changes.



Image credit: iXBlue SDB-Day 2019 presentation: The case of the missing shipwreck

SDB has emerged as an invaluable, complementary hydrospatial tool for hydrographic surveys (AHO, LINZ, UKHO, Pushidrosal), along with applications in georegulation (GA), marine park management (Parks Australia), climate change modelling (CSIRO), and the Seabed 2030 program. SDB even played a pivotal role in the development of a highly precise tidal model for Auckland's Waitemata Harbour, contributing to New Zealand's triumph in the 2021 Americas Cup sailing race! While SDB offers less vertical accuracy compared to ALB or MBES, it presents distinct advantages for regular tracking of seafloor change, with no mobilisation, rapid data deliveries, affordability and global coverage, crucial considerations for repeat acquisitions.

In recent years, we have seen a notable shift from baseline surveys to monitoring, with State and Local Governments recognising the need to understand the morphodynamic evolution of vulnerable coastlines. Recent examples include quarterly assessments of sand bars at Rous Head and Wide Bay Bar (MSQ); annual observations in the Gold Coast Waterways (GCWA) and Byron Bay (Bluecoast and NSWDPE); as well as evaluating coastal change pre and post dredging (Swash and TfNSW).

The Queensland Earth Observation Hub—an initiative by the QLD Department of State Development, Infrastructure, Local Government and Planning, and the SmartSat Cooperative Research Centre—recently funded the development of a commercial coastal change monitoring solution, aptly named COASTS, leveraging satellite imagery for bathymetry, habitat and water quality data, alongside UAVs, beach cameras, wind and current tracking, modelling, AI analytics and portal technology, leading to monitoring tools for coastal processes, hazards and beach safety.

From our vantage point within the hydro-centric corner of Earth Observation (EO) (a relatively small component of the hydrospatial sector), we are seeing that progress in satellite sensors, software (e.g. SDB-Online), and rapidly advancing AI capabilities, are unlocking the fourth dimension in seafloor surveys. As we expect this trend to continue, the AusSeabed platform could perhaps offer a comprehensive view of both spatial and temporal coverage of the Australian seabed.



Dynamic seabed at Rous Head, QLD, 2m SDB

Emily Twiggs (Senior Project Scientist - EOMAP Australia)

A High-Resolution Coastal Bathymetry Facility with Advanced Technologies (CoastBAT)

High-resolution bathymetric data in nearshore areas, particularly in Southern and Southeastern Australia, is very sparse or even absent in some locations. Yet, this information is critical for the management of coastal systems. The Coastal Bathymetry with Advanced Technologies (CoastBAT) facility will provide high resolution bathymetry in nearshore and inland waters, where information is currently limited due to high cost and/or difficult access by traditional surveying operations.

CoastBAT consists of an airborne (DJI Matrice 300 RTK drone) solution (Figure 1) with a bathymetric/terrestrial LiDAR sensor of very high resolution (TDOT) that can measure topography and bathymetry to a depth of -~10 meters in one single dataset. This is combined with an autonomous sea vessel (ASV), which will measure bathymetry, using multi-beam sonar, down to -50 metre depth. The TDOT sensor is a state-of-the-art topo-bathy LiDAR system, manufactured by Amuse Oneself Inc. in Japan. It provides high resolution bathymetry and 3-D underwater imagery with depth penetration of >1.4 SD (Secchi Disk) at flying altitudes of 50 m. During an internal test in a coastal area in Japan, the TDOT measured continuous topography and complex morphology of coral reefs to a depth of about 17 m, in conditions that included breaking waves. The system was able to acquire a high-density point cloud and to successfully map complex nearshore bathymetry as well as dune, river and lagoon profiles at centimetre-level resolution. The ASV + multibeam system will be used in inland waters, rivers, low energy nearshore and deeper waters outside the airborne LiDAR's depth/water clarity range. The small size of the ASV will allow access to very shallow waters that are currently out of reach by large vessels.

The CoastBAT facility will be operational from early 2024. Data obtained will be shared with the community via AusSeabed. This project is funded by the Australian Research Council (LE230100038), led by Flinders University in partnership with the SA Department for Environment and Water (DEW), SA Water, Deakin University, District Council of Robe and Monash University.

For more information please contact Assoc Prof Graziela Miot da Silva, Beach and Dune Systems (BEADS) Lab, Flinders University, miot0004@flinders.edu.au



Figure 1: The DJI Matrice 300 RTK drone coupled with a terrestrial LiDAR sensor, the TDOT topo/bathy sensor will utilize a similar setup.

Guardian Geomatics Total Propagated Error Engine

The Total Propagated Uncertainty (TPU) of a sounding is a measure of the accuracy to be expected for such a sounding when all relevant error / uncertainty sources are taken into account. Instead of "TPU", the term "error budget" is also used. TPU is the parent term for Total Horizontal Uncertainty (THU) and Total Vertical Uncertainty (TVU). Uncertainty sources do not only come from the echo sounder. They come from all the various sensors, vessel, and environment which together we often call a Hydrographic Survey System.

This tool is an open-source native python tool developed to compute the Total Horizontal Uncertainty (THU) and Total Vertical Uncertainty (TVU) of a multibeam survey of the seabed. Together, THU and TVU produce a model of Total Propagated Uncertainty (TPU).

The traditional mechanism for computation of apriori THU and TVU has been an excel spreadsheet, often based on the TPU sheet from Hare et al. circa 1990. Excel is excellent at blending data and graphical results so has been the go-to tool. Unfortunately, Excel is also cursed with formulas, or rather the errors, bugs, typos of formulas within a cell. They can be very hard to debug, and easy to mistakenly fail to make a reference to the wrong cell in another sheet.

This tool takes a new path for uncertainty computations. We have coded the entire calculation process and the user interface in native python. This makes it much easier to debug, share and manage. As new requirements arise, such as USBL, AUV, ROV, SROV they can be added with ease. The code is managed, and version controlled on GitHub.

The user interface is also modernised. Instead of an excel sheet with Excel graphics, we now have a web-based user interface which anyone can easily access. The underlying code is hidden away from the casual user to prevent errors being accidentally introduced.

See link - totalpropagatederror.com

The "Belinda" shipwreck 3D model - lost 199 years ago today.

Curtin University and the Western Australian Museum have released a digital 3D model of the wreck of sealing vessel *Belinda* on the 199th anniversary of the brig sinking off Esperance.

The digital model can be viewed on the Sketchfab website: https://lnkd.in/ggJsUcAW

The *Belinda* was built in 1819 and wrecked at Middle Island in the Archipelago of the Recherche near Esperance on 19 July 1824. The ship's crew all survived and were rescued by another sealing ship *Nereus*, but only after a gruelling five-month wait on the uninhabited island.

The WA Museum discovered the wreck site in 1989 and excavated it between 1989 and 1991, during which overlapping black and white photographs were taken and a 2D photomosaic was created. In the summer of 2022-23, Curtin University HIVE (Hub for Immersive Visualisation and eResearch) Internship student Jarod Harris used the photography from 1991 to create the digital 3D model of the wreck released today.

The *Belinda* 3D model project was funded through the Commonwealth Government's Underwater Cultural Heritage Program.

A video animation is here: https://youtu.be/mlzHSzY9nnE

And you can read more about the Belinda and its crew on the WA Museum website:

https://museum.wa.gov.au/maritime-archaeology-db/wrecks/belinda

ECO (Environment Coastal & Offshore) Magazine Article – Research Exploration: Mapping Australia's Seafloor

http://digital.ecomagazine.com/publication/?i=796853&p=12&view=issueViewer

"With no scientists on board for the first time in its history of operations, *RV Falkor* mapped and visited the steep flanks of coral reefs on the Queensland Plateau within the Coral Sea Marine Park". *By Allison Miller, Schmidt Ocean Institute & Robin Beaman, James Cook University.*



A bathymetric map of Osprey Reef. (Image credit: Robin Beaman; Reef LiDAR data courtesy of the Australian Hydrographic Office)

International Hydrographic Organisation (IHO) – MSDIWG

SWPHC MSDIWG (The Marine Spatial Data Infrastructures in the South West Pacific Region) effort is focused on the SWPHC Workplan 2022-2023 and the nine Strategic Pathways from the United Nations Global Geospatial Information Management, Integrated Geospatial Information Framework. (UN-GGIM IGIF)

Why Should we share data?

- *Public understanding* Releasing marine spatial data raises public understanding of the importance of hydrography.
- **Quality assurance** Data held by hydrographic offices have particular value because it is often unique; it captures characteristics and features of the ocean and the seafloor that are usually difficult to observe and expensive to acquire.
- International obligations Sharing data is a crucial part of international conventions that guide the work of hydrographic offices, including the United Nations Convention on the Law of the Sea (UNCLOS), the International Convention for the Prevention of Pollution from Ships (MARPOL), and the International Convention for the Safety of Life at Sea (SOLAS).
- Public good Public access to trusted marine spatial data creates many opportunities to understand the marine environment; it is crucial data for almost every maritime activity, supporting more intelligent and sustainable decision-making.

The SWPHC MSDI Working Group identified seven crucial social benefits aligned with the 17 UN SDGs that may stem from the public release of hydrographic offices' data:

› Food security › Education and capacity development › Safety › Sustainable resources ›
 Environmental sustainability › Public release sovereignty › Heritage

Data Value Proposition Document

Unlocking the value in hydrographic offices' data. A proposition plan developed by members of the SWPHC Marine Spatial Data Infrastructure (MSDI) Working Group.

Deakin University Jobs

Advertised: 11 Aug 2023 AUS Eastern Standard Time Applications close: 13 Sep 2023 AUS Eastern Standard Time

Associate Research Fellow, Marine Habitat Mapping

Deakin External: https://careers.pageuppeople.com/949/cw/en/job/543890/associateresearch-fellow-marine-habitat-mapping Deakin Internal: https://careers.pageuppeople.com/949/ci/en/job/543890/associate-researchfellow-marine-habitat-mapping Seek: https://www.seek.com.au/job/69244937?type=standout#sol=9784a6e1b3ab1d2b40c3809fa5 4698ecdae66579 LinkedIn: https://www.linkedin.com/jobs/view/3685865953

Senior Technical Officer, Marine

Deakin External: https://careers.pageuppeople.com/949/cw/en/job/544538/senior-technicalofficer-marine Deakin Internal: https://careers.pageuppeople.com/949/ci/en/job/544538/senior-technicalofficer-marine Seek: https://www.seek.com.au/job/69240985?type=standout#sol=99a8181651105ec8e691ff716a1 a408d42ba79ea LinkedIn: https://www.linkedin.com/jobs/view/3685861415

Upcoming Events

Stay up-to date on upcoming events via the AusSeabed website. Please contact us if we have missed any, or you are running events or workshops that you would like to make the community aware of.

2023 Australian Institute for Maritime Archaeology (AIMA) – International Committee for Underwater Cultural Heritage (ICUCH) Conference

14 -15 September 2023

The 2023 joint AIMA-ICUCH Conference is being held in Canberra, Australian Capital Territory. The conference is being held in person but is also open to online attendance.

The 2023 conference theme is Connected by water with sub themes of ratification of the UNESCO 2001 Convention on the Protection of the Underwater Cultural Heritage and

the archaeology and management of underwater cultural heritage. This theme and the sub themes were selected because they link to Australia progressing its consideration of ratification of the UNESCO 2001 Convention and pick up a key principle of the Convention regarding promotion of information exchange and shared heritage management.

This year's conference is an opportunity to celebrate 40 years of Australia's national Underwater Cultural Heritage Program and to reflect on the outcomes and achievements over that period. The conference is also an opportunity to promote and encourage broader regional uptake of the UNESCO 2001 Convention in the Pacific, Indian Ocean, and Southeast Asian Region.

https://www.aima-underwater.org.au/app/events/events/view?event=5988

Autonomous Marine Technology (AMT) Conference 2023

Perth - 18 October, 2023 - 19 October, 2023

Returning in 2023, the Autonomous Marine Technology Conference (formerly Autonomous Underwater Technology Conference AMT) will be held in Perth, Western Australia in October. The conference aims to showcase the rapid advances in the autonomous marine technology field along with demonstrating real world and future potential applications of the different technologies within our marine environment.

This long running and well reputed conference continues to be one of the most globally essential knowledge centres and networking opportunities in this field, allowing delegates to meet with industry leaders, academics and researchers in this innovative section of subsea development. Sponsorship and exhibition opportunities are still available.

https://sut.org/event/perth-autonomous-marine-technology-amt-2023-conference/

Reading Corner

Grab a cuppa and have a read of some new relevant material published in the community:

- CSIRO voyage helps fill gaps in seafloor maps
 https://www.spatialsource.com.au/csiro-voyage-helps-fill-gaps-in-seafloor-maps/
- Rare handfish spotted for first time in 25 years https://www.csiro.au/en/news/all/articles/2023/august/rare-narrowbody-handfishspotted

Share your work with the AusSeabed community

Finally, a reminder as always that anyone with an interest in AusSeabed can sign up to the newsletter mailing list on our website, where you can also check out past issues. And please send any items for the next newsletter to AusSeabed@ga.gov.au