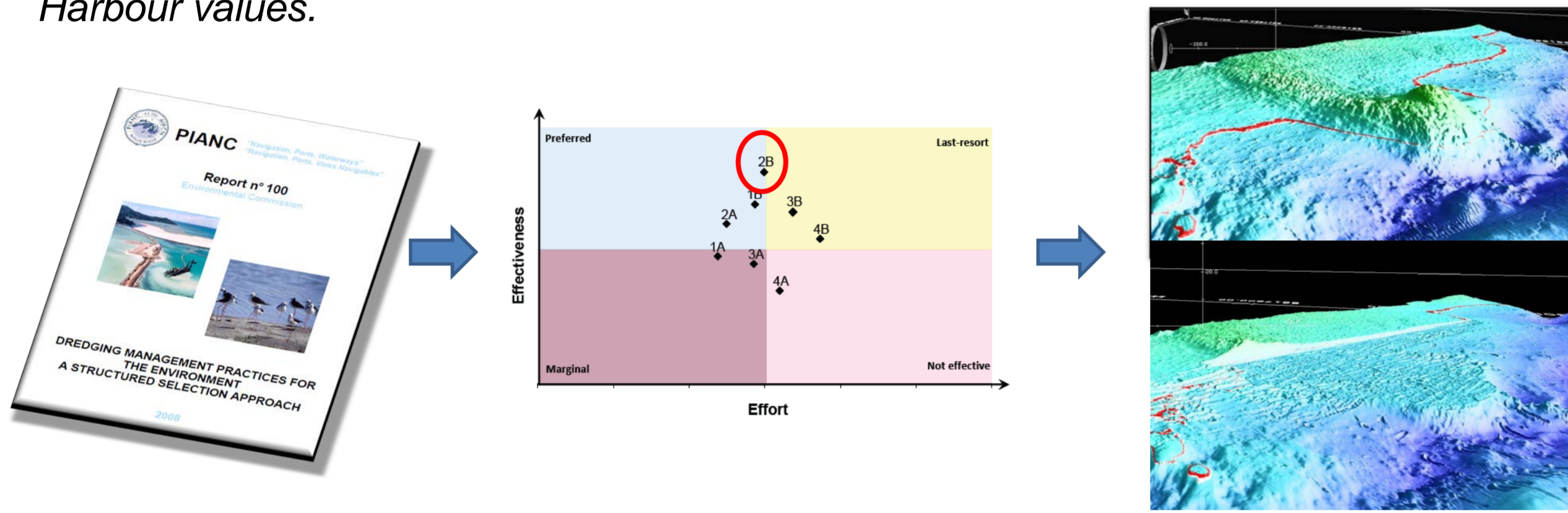


# ICHTHYS LNG DREDGING SUMMARY

Ichthys LNG is a joint venture between INPEX group companies (the Operator), major partner TotalEnergies, and the Australian subsidiaries of CPC Corporation Taiwan, Tokyo Gas, Daigas, Kansai Electric Power, JERA and Toho Gas.

## BEST-PRACTICE DREDGING METHODOLOGY SELECTION

- Implementation of **PIANC 100 international best practice dredging guidelines** for selection of state of the art dredging equipment and methodology in Darwin Harbour
- Consultative approach with international dredging, marine engineering and offshore projects contractor (Van Oord), plume modelling consultant and a PIANC contributing author.
- First case-study in Australia (and world-wide according to PIANC contributing author) where PIANC 100 guidelines have been quantitatively used during tender selection and in the submission of a dredging and spoil disposal management plan (DSDMP) to government for approval.
- Best practice commitments were supported by INPEX senior management; demonstrating INPEX's strong leadership and willingness to minimise risks to Darwin Harbour values.



*'The very hard rock of Walker Shoal was removed by high powered Cutter Suction Dredger, Athena eliminating the need to Drill and Blast!'*

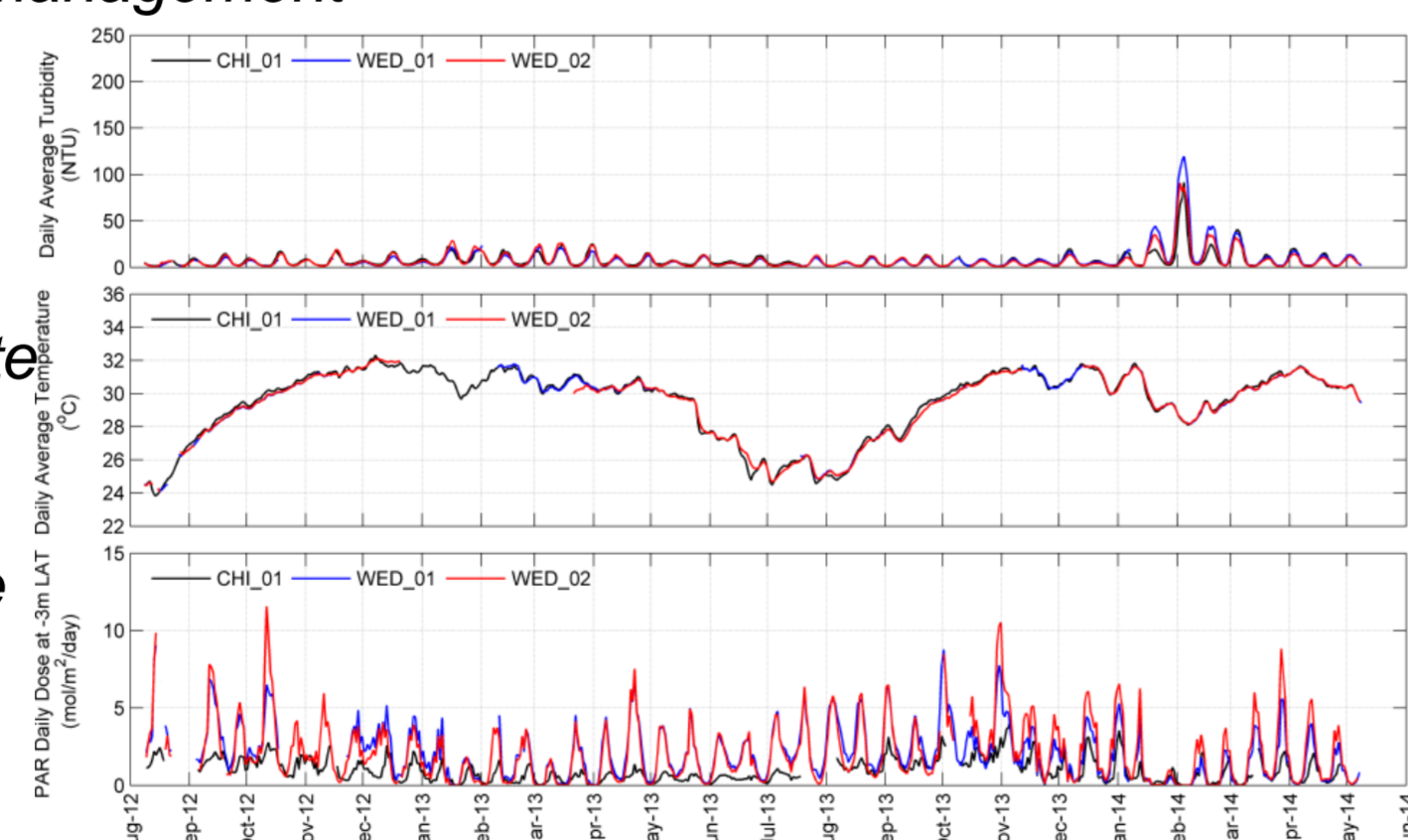
In keeping with the sensitive environmental and social values of Darwin Harbour, the dredging methodology was selected to minimise potential impacts to sensitive receptors (i.e. corals, seagrasses, mangroves). Key outcomes were:

- selection of high power cutter suction dredger (CSD) to remove Walker Shoal located to avoid drilling and blasting
- selection of jumbo sized trailing suction hopper dredges (TSHDs) in excess of 200m to reduce trips to the spoil disposal ground and risks to other Port users
- restrictions to overflow on TSHDs to minimise the release of fine sediments
- commitment to demobilise dredgers during the dry season (6 month period) when receptors were at greatest risk of potential impacts caused by dredging



## NEARSHORE ENVIRONMENTAL MONITORING PROGRAM

- A monitoring program guided the management and adaptation of dredging activities
- The monitoring program comprised of 13 diverse programs designed in consultation with an independent dredging expert panel
- The monitoring program was informed by hydrodynamic and sediment transport models. It covered all facets of the marine environment from water quality to fish parasitology, allowing an integrated and "multiple lines of evidence" approach to guide the rapid assimilation of data to inform dredge management decisions and minimise environmental risk
- The programs fall into two categories, **informative** and **reactive**; the latter included triggers that if exceeded, and were attributable to dredging, initiated targeted monitoring and dredging adaptive management
- Triggers were put in place for water quality, corals, mangroves and seagrass and where exceeded and attributed to dredging it would initiate a targeted monitoring and management response designed to mitigate potential impacts within the limits of acceptable loss as defined in the Draft EIS and DSDMP



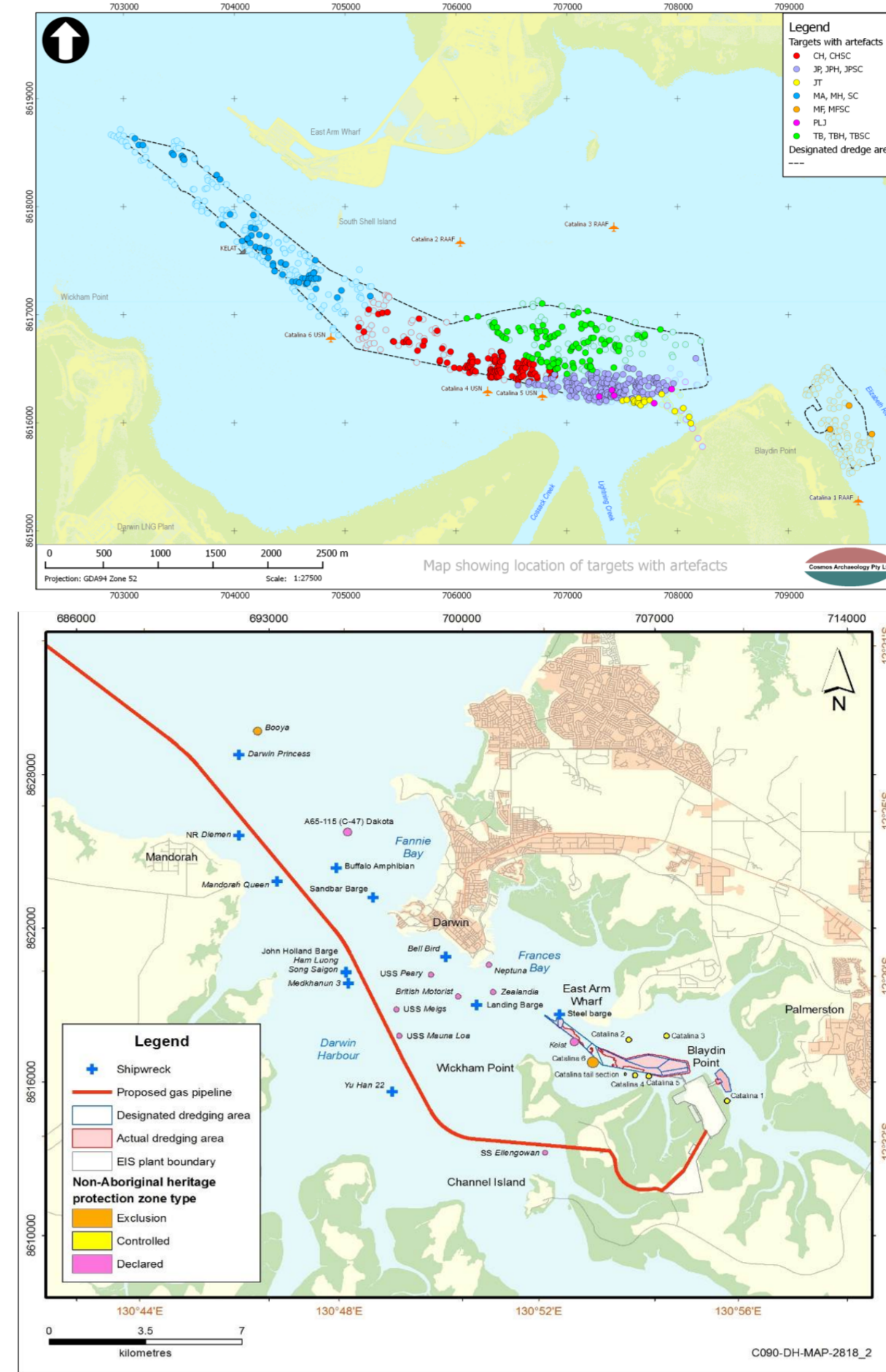
*'Monitoring results indicated there were no discernible dredging related impacts to the mangroves, seagrasses or corals (at reactive sites), including all post dredge monitoring.'*

- Significant advances in the understanding of Darwin Harbour led to the development of innovative tools such as an **empirical model** to predict background turbidity and discriminate dredging from natural turbidity.
- The development of such tools for near real-time assessment of natural turbidity variability and biotic indices provides a new benchmark for environmental monitoring
- Near real-time monitoring results were made available online (via website) to government bodies and the independent dredge expert panel members
- It allowed INPEX to obtain approvals for adaptations to the program that allowed for optimisation of dredging productivity, in an environmentally responsible manner



## HERITAGE SURVEYS AND RELOCATION

**Footprint Design:** Careful design of dredge footprint to ensure protection of Aboriginal sacred sites and WWII historical wrecks

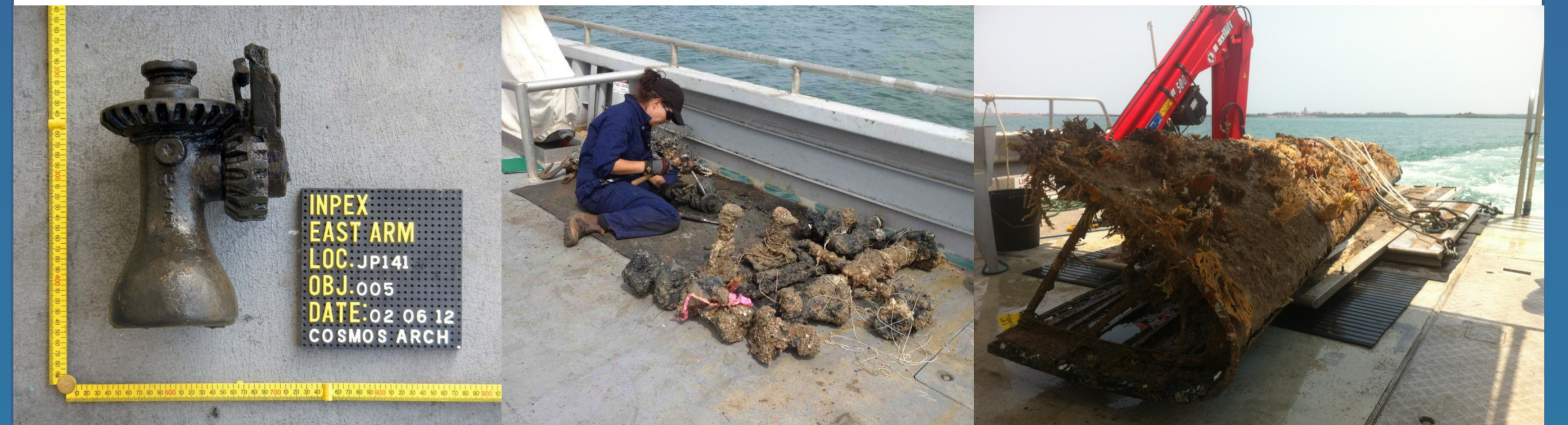


### Pre-dredge Heritage Surveys:

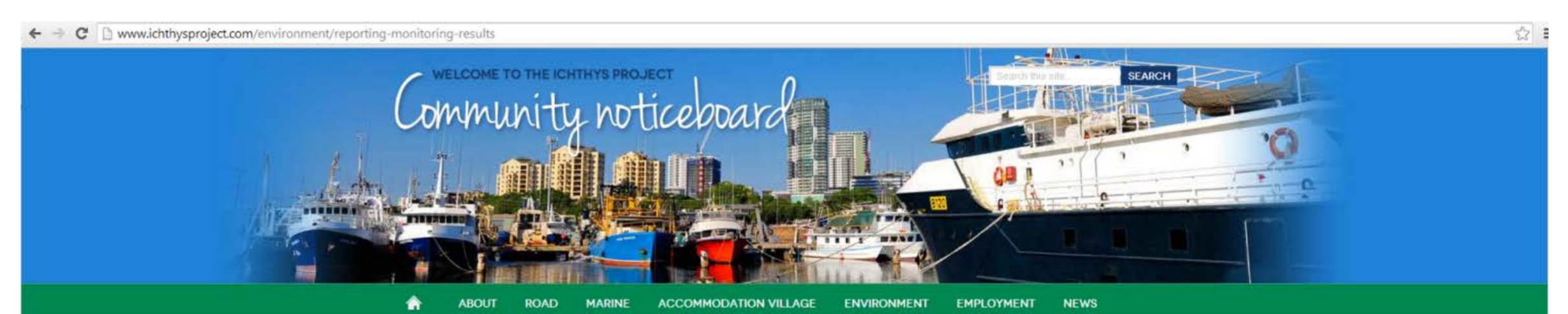
- Largest private sector maritime archaeology project conducted in Australia at the time
- Gradiometer and side-scan sonar surveys to identify unexploded ordnance and heritage items prior to commencement of dredging
- Appointment of maritime archaeologists (Cosmos Archaeology) to review, inspect, and catalogue potential heritage targets and evaluate their cultural heritage significance
- Diving inspections, in and adjacent to dredge footprint, revealed dense concentrations of cultural material (WWII and pearling industry from the late 20<sup>th</sup> century)
- Approximately 1,077 seabed anomalies were inspected by divers. Of these, 6,897 artefacts were assessed, yielding 490 culturally significant objects, with 69 cultural objects assessed as being of high cultural value
- All objects were assessed and extensively catalogued for their heritage value against the Northern Territory Heritage Act 2011 by a qualified maritime archaeologist

### Heritage Management:

- Demarcated heritage exclusion zones embedded into vessel survey navigation screens
- Early warning alarm systems established around exclusion zones linked to real-time vessel positioning systems
- Daily, weekly, monthly checks of vessel track plots to monitor compliance
- Implementation of chance finds reporting and (prompt) response procedures while dredging - 42 isolated heritage objects were discovered and assessed without delays
- Scour and accretion modelling assessments and routine Catalina monitoring campaigns have been conducted to assess potential impacts to WWII Catalina wreck sites



## COMMUNITY AND STAKEHOLDER ENGAGEMENT



- Heritage management, surveys and relocation required ongoing engagement and consultation with the NTG Heritage Branch and in some cases engagement and approval from the United States Navy under the Sunken Military Crafts Act
- To address local government and community concerns related to the dredging program in Darwin Harbour, INPEX established an independent dredge expert panel to act as an advisory committee to State and Commonwealth governments
- A **multi-layered community engagement and communications program** was also developed and delivered focused on providing timely information about dredging activities in the Harbour and safety messaging to the community

*'Speaking to ABC Local Radio on 27 May 2014, the Chief Minister Adam Giles recalled a recent conversation in which he told a third party to take a leaf out of INPEX's book, and see how INPEX have tried to work very positively with the community'*

- The engagement activities included briefings to key stakeholders and community representatives; fact sheets; print, radio and television advertising; information signs at boat ramps; a Project website; and a community feedback phone number
- Public issues raised were logged in a register to ensure they were managed appropriately. There were no public incidents, protests or grievances during the two year campaign and only two public queries relating to visible plumes
- Removal of **Walker Shoal**, a rocky outcrop which contained extremely high strength quartz conglomerate, was the most **technically challenging** component and a **significant environmental achievement** of the dredging program
- The removal of Walker Shoal provides safe navigable access to commercial shipping within the Harbour, not just for the benefit of INPEX operations but for any future expansions to the Darwin Port facilities in East Arm

