Mandorah Marine Facilities: Supplementary Environmental Report, Executive Summary

Prepared for DEPARTMENT OF INFRASTRUCTURE, PLANNING AND LOGISTICS

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1 Purpose

This document, *the Supplementary Environmental Report (SER) - Executive Summary*, briefly describes the results of the Environmental Impact Assessment (EIA) undertaken in relation to the Northern Territory Government's proposal to develop marine facilities at Mandorah, located approximately 6 km west of Darwin.

The intent of the SER is to evaluate the potential for the Proposal to compromise the EPA's factors and environmental objectives (**Table 1-1**), following the issuing of the 'statement of reasons' and provide confidence to the Minister that the Proposal is manageable under the NT EPA's environmental quality management framework. The results presented herein are based on a combination of the studies undertaken prior to submission of the referral on the 23/03/2022 and additional studies requested under section 55 of the *Environmental Protection Act 2019* (EP Act).

Table 1-1: Statement of Reasons (NT EPA, 2022a).

Theme	Factors (with Statements of Reasons)
Land	• **Landforms** – Two large rock armoured breakwaters will be constructed to form a safe harbour protecting ferry berthing and new passenger boarding infrastructure. The construction of these structures is a physical change to the terrestrial landform and may alter nearby coastal landforms due to their effect on coastal processes. The long-term evolution of the shoreline and foreshore could be impacted by altered rates and patterns of erosion and accretion
	• **Terrestrial ecosystems** – A temporary 30,000 m^2 area for stockpiling up to 70,000 m3 of dredge spoil will be utilised. Saline run-off from dredge spoil has the potential to contaminate soil in the storage area and surrounding environment.
Sea	• **Coastal processes** – The installation of two large rock armoured breakwaters will interrupt nearshore hydrodynamics, waves, and sediment transport, altering erosion and accretion patterns leading to ongoing physical impacts along the coastline.
	• **Marine environmental quality** – The marine environment including water quality and biota will be impacted by construction of breakwaters, dredging and dredge spoil disposal. There is currently insufficient information to assess cumulative impacts of the proposal's construction and dredging activities, with other activities in Darwin Harbour.
	• **Marine ecosystems** – Changes to longshore drift and sediment transport has the potential to have a significant impact on sensitive receptors and benthic habitats. Additionally, impacts from changes in turbidity/total suspended solids can adversely impact sensitive receptors such as benthic primary producer habitats, corals and seagrass habitats, and can result in potential loss of ecosystem function and marine fauna.
People	• **Culture and heritage** – There is potential for significant impacts to known and unknown Aboriginal sacred sites, heritage sites and objects directly during construction, dredging and maintenance activities, as well as indirectly through altered coastal processes.

2 Proposal Overview

The Northern Territory Government (NTG), Department of Infrastructure, Planning and Logistics (DIPL), proposes to develop marine facilities at Mandorah, located near the eastern tip of the Cox Peninsula, approximately 6 km west of Darwin (the Proposal). NTG has identified the need to develop a safer, Disability Discrimination Act 1992 compliant and more weather-resistant ferry berthing facility, to improve transport connectivity between Cox Peninsula and Darwin. The proposal is located adjacent the existing Mandorah Jetty, which currently services the transfer of ferry passengers, but does not comply with access requirements for persons with a disability. DIPL, as the proponent for the Mandorah New Marine Facilities, is seeking the endorsement of the Northern Territory Environment Protection Agency (NT EPA) for the Proposal, which is anticipated to improve transport connectivity and disability access between Cox Peninsula and Darwin city.

The key components and estimated footprint of the Proposal are summarised in **Table 2-1** and **Figure 2-1** respectively.

Table 2-1: Summary of Key Proposal Characteristics.

Proposal Element	Component	Approximate area / volume/ quantity
Landside (generally above high tide)		
Pavement (additional to existing)	Paths	~600 m^2
	Carparking and Roads	~1945 m^2
Terminal Building	Structure (Existing building repurposed or reconstructed)	~150 m^2
	Rainwater tanks	< 30,000 L
	Toilet block	< 40 m^2
Earthworks	Boat ramp connection	≈ 100 m^3
	Causeway connection	≈ 100 m^3
Stormwater Drainage	Pits	~4
	Pipe network	~115 m
Landscaped areas	Minor native	~150 m^2
Construction disturbance areas	Laydown and transit	~30,000 m^2
Total new terrestrial infrastructure footprint		3,000 m^2
Marine (generally below high tide)		
Main breakwater	Imported rock material	45,000 m^3
	Reused dredge material	19,700 m^3
	Footprint	10,800 m^2
Lee breakwater	Imported rock material	8,500 m^3
	Reused dredge material	8,200 m^3
	Footprint	4,400 m^2

Proposal Element	Component	Approximate area / volume/ quantity
Boat ramp	Concrete pavement	16 m^3
	Imported rock material	170 m^3
	Reused dredge material	760 m^3
	Footprint	650 m^2
Maritime facilities	Pontoon	500 m^2
	Gangway	125 m^2
	Causeway	400 m2
	Mechanical lift	1
	Piles	Up to 10
Dredging	Unconsolidated sediment	15,000 to 30,000 m^3
	Rock	70,000 m^3 (note volumes to be reused above)
	Dredge footprint (excluding breakwater footprint)	20,200 m^2
Total new marine facilities footprint		37,000 m^2

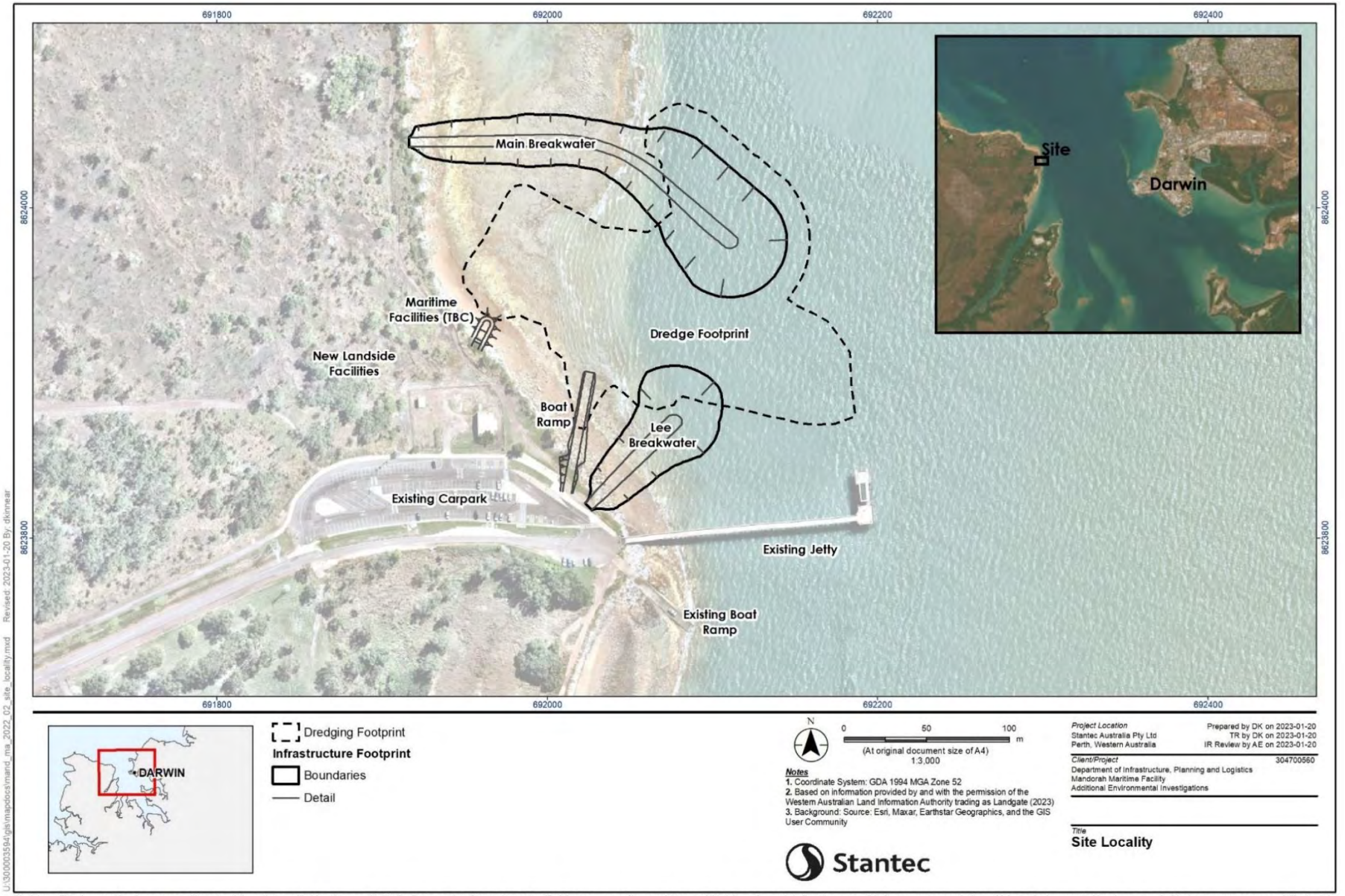

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Figure 2-1: Existing and proposed marine facilities at Mandorah.

3 Summary of Work Undertaken

Table 3-1 details the extent of the studies completed since the submission of the original Referral. Several additional investigations have been conducted with the intent to better define the receiving environment, re-evaluate the potential for impacts and develop robust management strategies. Additional consultation was undertaken with the following stakeholders subsequent to the submission of the referral:

- Aboriginal Areas Protection Authority
- NT EPA
- Department of Environment Parks and Water Security - Flora and Fauna Division
- Department of Environment Parks and Water Security - Rangelands Division
- NT Worksafe
- NT Police Fire and Emergency Services
- Department of Chief Minister and Cabinet
- Belyuen Community Government Council
- Sealink; and
- Wagait Shire Council and Wagait Progress Association

Table 3-1 Additional studies undertaken following the submission of the referral.

Factor	Description of additional work
Terrestrial Environmental Quality	The Construction Environmental Management Plan (**Appendix C**) has been revised to include more information on the approaches to rehabilitation and the criteria for measuring the extent of rehabilitation.
Terrestrial Ecosystems	The Construction Environmental Management Plan (**Appendix C**) has been revised to include more information on the clearing of the temporary works area, the flora and fauna monitoring to be completed during construction and throughout the rehabilitation of the site, and further information on the proposed lighting for the facility.
Coastal Processes	Additional sediment transport modelling has been undertaken to assess the cumulative effects of the dredging program and provide clarity on the potential for direct and indirect impacts to coastal processes post-construction. This is detailed in the Sediment Transport Report (**Appendix M**) with the underlying physical processes (Metocean) modelling detailed in the Metocean Report (**Appendix L**). The Dredge and Spoil Disposal Management Plan (DSDMP) has been reviewed and updated (**Appendix B**). A new coastline Monitoring and Management Plan has also been developed (**Appendix D)**.
Marine Environmental Quality	Field studies were completed to establish the local relationship between turbidity/TSS and light intensity. The data were used to develop a new set of site-specific triggers for mapping the extent of impacts, and for monitoring and managing the potential impacts of dredging. The DSDMP was updated with the revised triggers comprising early warning, primary and secondary level triggers.
Marine Ecosystems	The proposed spoil ground was reconsidered against a number of environmental and logistical criteria. The potential for impacts to benthic communities and habitats was assessed based on the approaches recommended by the Western Australian EPA (WA EPA 2021), together with the outcomes of the WAMSI Dredging Science Node. Impacts were determined in the context of the revised benthic habitat map, which was completed using multi-beam and side scan sonar technology, together with towed video. The environmental significance of benthic communities at the spoil ground was evaluated, and the risks interrogated against the

Factor	Description of additional work
	revised impact thresholds, using a calibrated hydrodynamic and sediment transport model (**Appendix K, L**). The DSDMP was updated to include seagrass and marine mammal interaction monitoring programs. The revised DSMP details the need to develop additional management strategies prior to the commencement of the dredging program.

4 Environmental Implications & Management Objectives

4.1 Overview

The potential for the Proposal to compromise the EPA's key environmental factors was assessed based on the results of studies undertaken prior to referral, and the findings of additional studies undertaken to support this SER. The results of the studies with respect to the NT EPA values, landforms, terrestrial ecosystems; coastal processes; marine environmental quality; marine ecosystems and culture and heritage, are summarised below.

The potential for impacts to the marine environment were considered in the context of dredging and dredge spoil disposal at a site located approximately 1.2 km north of the construction area (Disposal Site 3). The site was selected following a multicriteria analysis (MCA), based on safety, logistical and environmental criteria. Based on the updated habitat map, the preferred site comprises predominantly bare reef and sponge communities, with occasions coral colonies (<5%). Disposal Site 3 maintains the lowest diversity of the sites considered during the MCA.

In total, the project will involve the dredging and disposal of between 85,000 to 100,000 m^3 of unconsolidated sand and rock, under best and worst-case scenarios, respectively. Based on the outcomes of the studies described herein, DIPL is confident that the potential impacts of the proposal are acceptable under the NT EPA's EIA framework, and satisfied that any residual impacts (if any) can be managed under the revised Dredging and Dredge Spoil Management Plan, the Construction and Environmental Management Plan and the Coastal Processes Monitoring and Management Plan (**Appendices B**, **C** and **D**, respectively).

4.2 Marine Environmental Quality / Marine Ecosystems

Risks to marine environmental quality and marine ecosystems were considered in the context of turbidity and light reduction, and the potential for reversible and irreversible impacts to benthic communities and habitats. The extent and concentration of TSS entrained within the plume varied depending on the tidal cycle, with significantly greater dispersion and lower concentrations during spring tide events. Modelling suggested there is potential for 50^{th} and 95^{th} percentile TSS concentrations to reach 15-20 mg/L and >100 mg/L, respectively, at the dredging and dredge spoil disposal sites over the course of the dredging program, which is anticipated to require 14-30 days to complete (**Figure 4-1**, **Figure 4-2**). The 50^{th} percentile values are within the range experienced under typical dry season conditions, and the 95^{th} percentile values are within the upper ranges experienced under wet season conditions, when TSS concentrations are documented to exceed 100 mg/L for extended periods (i.e. up to 30 days during storm events).

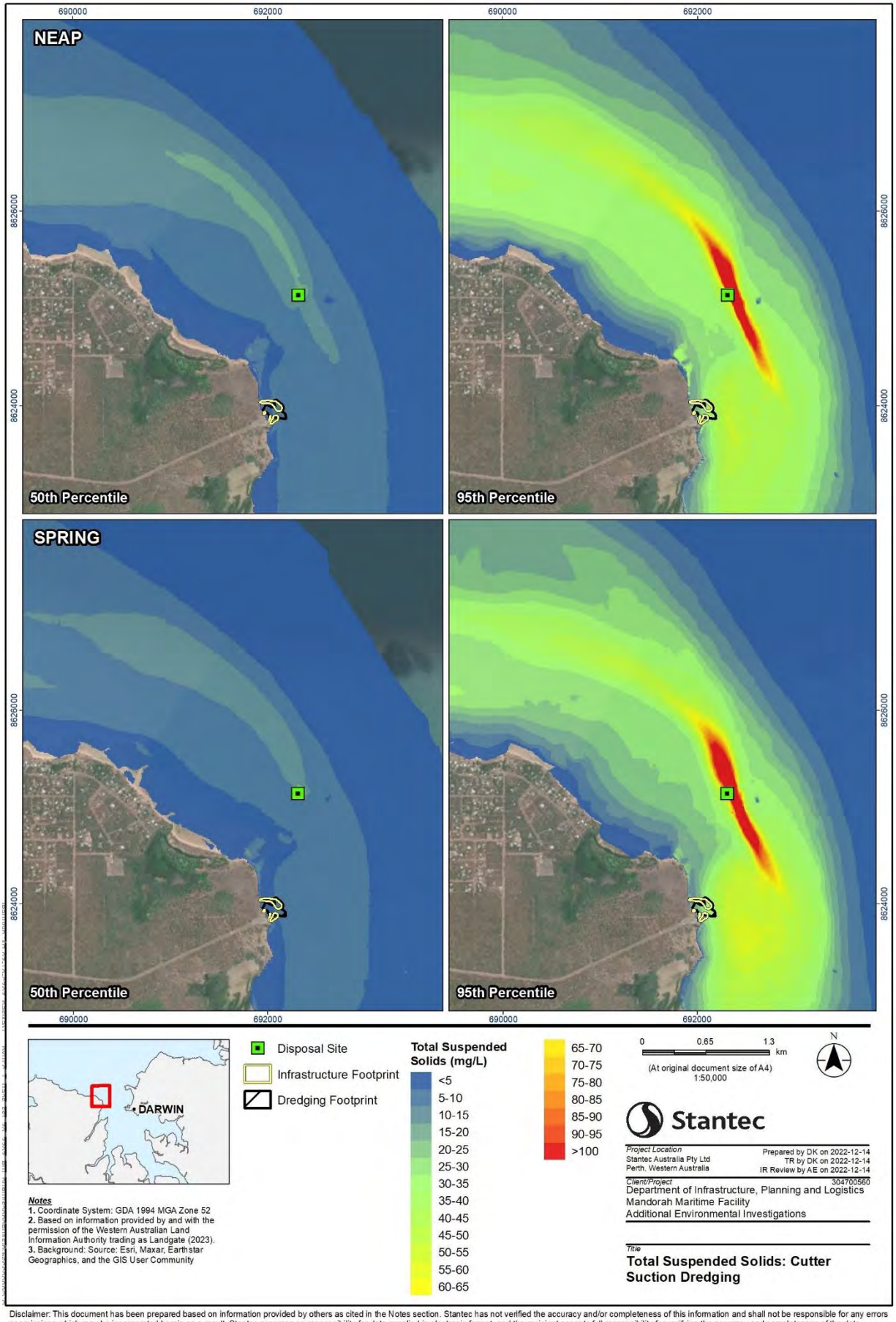

Figure 4-1: Predicted depth averaged TSS concentrations during the cutter suction dredging phase.

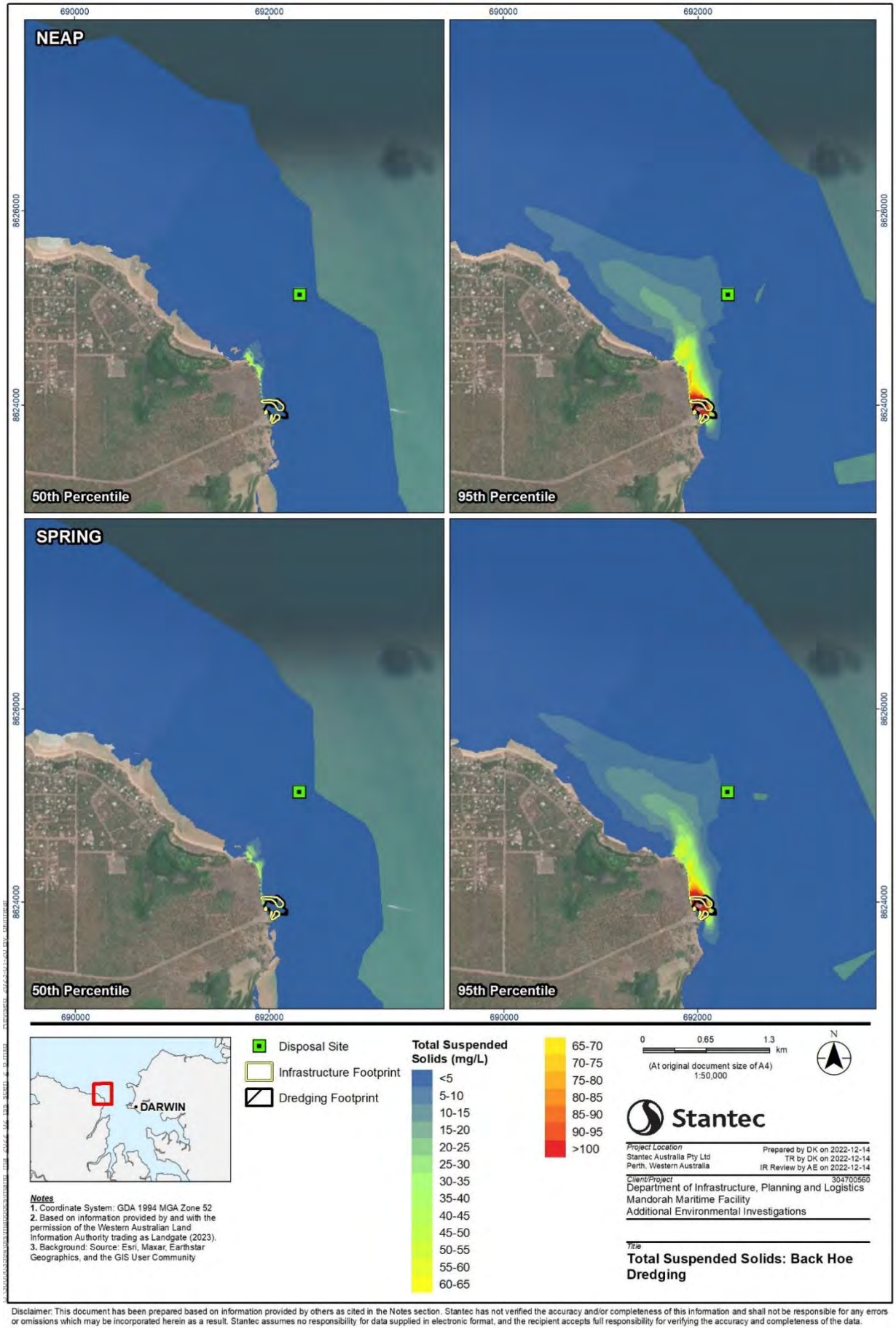

Figure 4-2: Predicted depth averaged TSS concentrations during the back hoe dredging phase.

TSS and PAR will be monitored continuously during the dredging program with the results compared to a series of trigger values with exceedance of stage 1 triggers representing early warning, and exceedance of stage 3 triggers, leading to contingency management (see DSDMP, Appendix B). Although protective of marine environmental quality generally, the triggers were developed specifically for the protection of BCH. Based on the results of the highly conservative modeling process, the Proposal is not expected to compromise the EPA's objective for marine environmental quality, with any effects considered short term and fully reversible.

The potential for impacts to the marine ecosystem within and adjacent to the project area was considered in the context of benthic communities and habitats (BCH). Impacts were assessed using an updated hydrodynamic and sediment transport, together with new impact thresholds developed for local coral communities. Modelling proceeded based on best practice approaches, the best available geotechnical information and the anticipated dredge spoil disposal practices.

The potential for impacts to corals during the cutter suction phase was restricted to a <0.087 ha area of high impact (ZoHI) and a 2.2 km long ZoMI in the dry season, under neap tide conditions (**Figure 4-3**). Impacts under spring tide conditions diminished significantly. In this case, the effects of dredging were restricted to a zone of influence (ZoI), extending some 12 km north and 4 km south of the dredging area.

Results for the backhoe dredging followed a similar pattern, with modeling suggesting the highest potential for impact was in the dry season under neap tide conditions (**Figure 4-5**). Despite this, the resulting ZoHI was restricted to very small area along the beach front (1.26 ha) and a moderately sized area north east of the bluff, immediately north of the dredging footprint. Under wet season conditions, the ZoHI disappeared and the ZoMI retracted significantly, to occupy just a fraction of the footprint predicted under dry season conditions (**Figure 4-6**).

Zones of influence and impact were also predicted based on the sedimentation thresholds for coral (based on EPA WA 2021). The ZoHI (equating to permanent loss) was contained within to the construction footprint and small areas immediately south (**Figure 4-7**). The majority of the ZoMI hugs the exterior of the ZoHI, with the exception of a relatively small area approximately south of the construction zone.

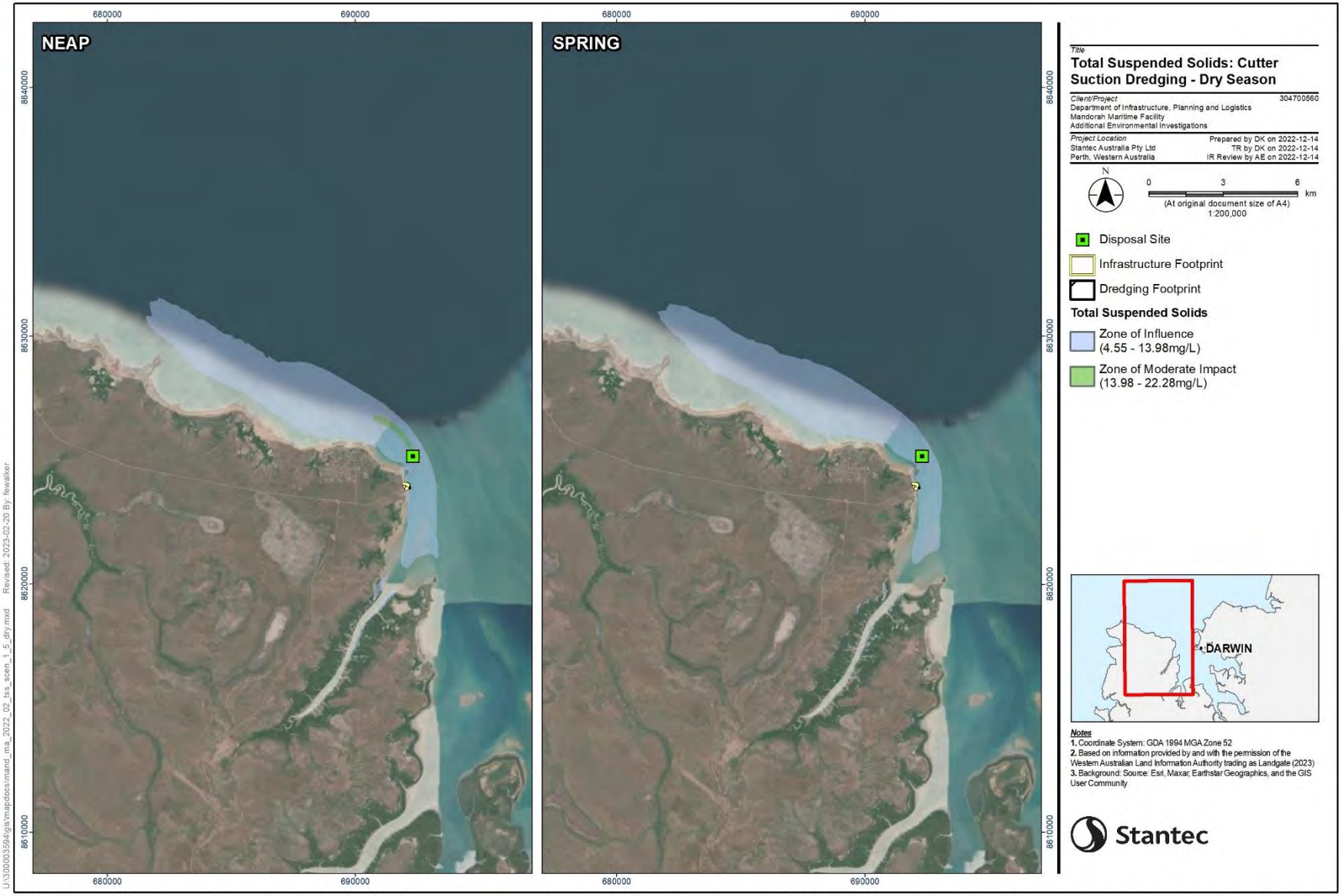

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Figure 4-3: Predicted zones of impact during the cutter suction phase, based on dry season conditions.

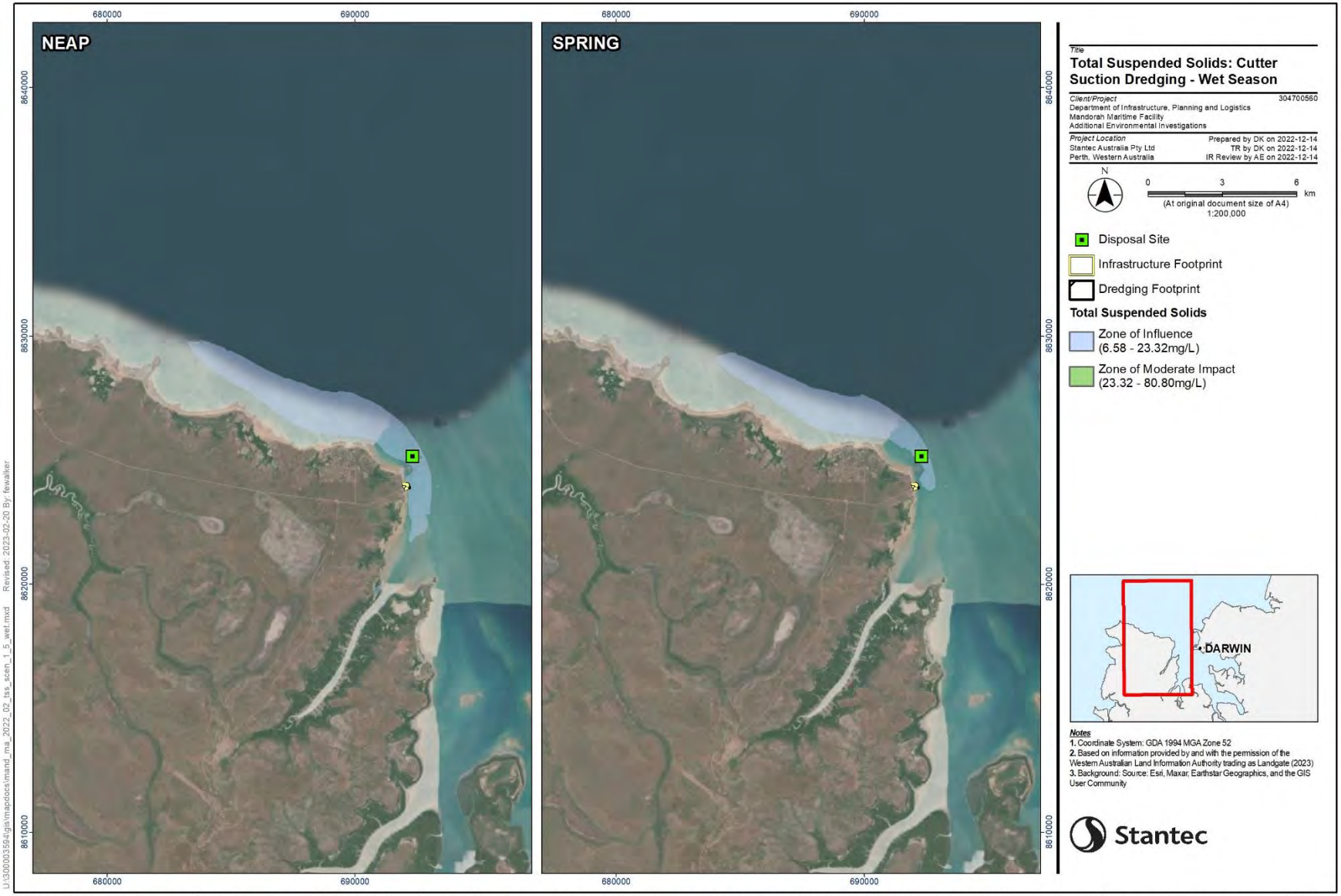

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Figure 4-4: Predicted zones of impact during the cutter suction phase, based on wet season conditions.

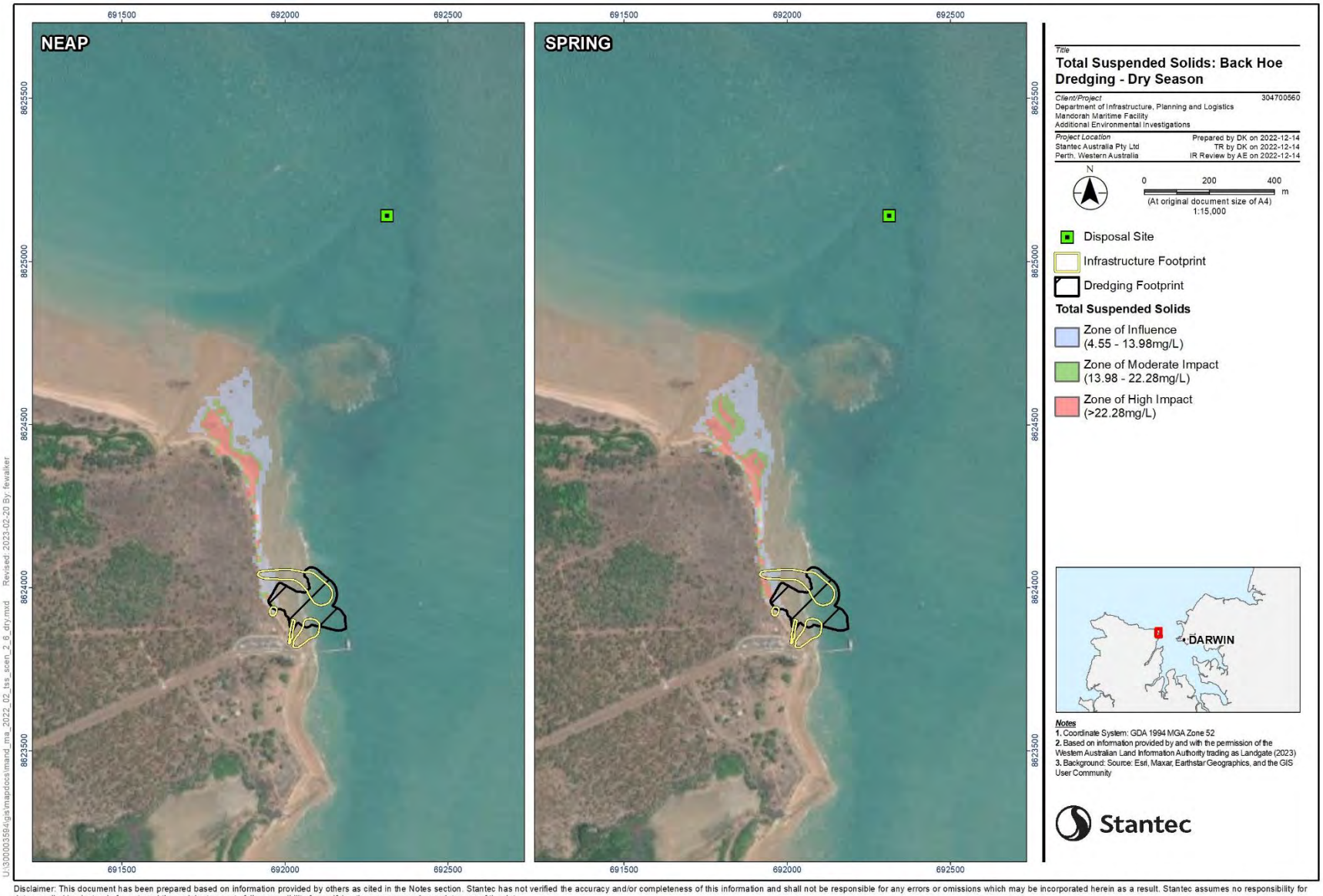

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Figure 4-5: Predicted zones of impact during the back hoe phase, based on dry season conditions.

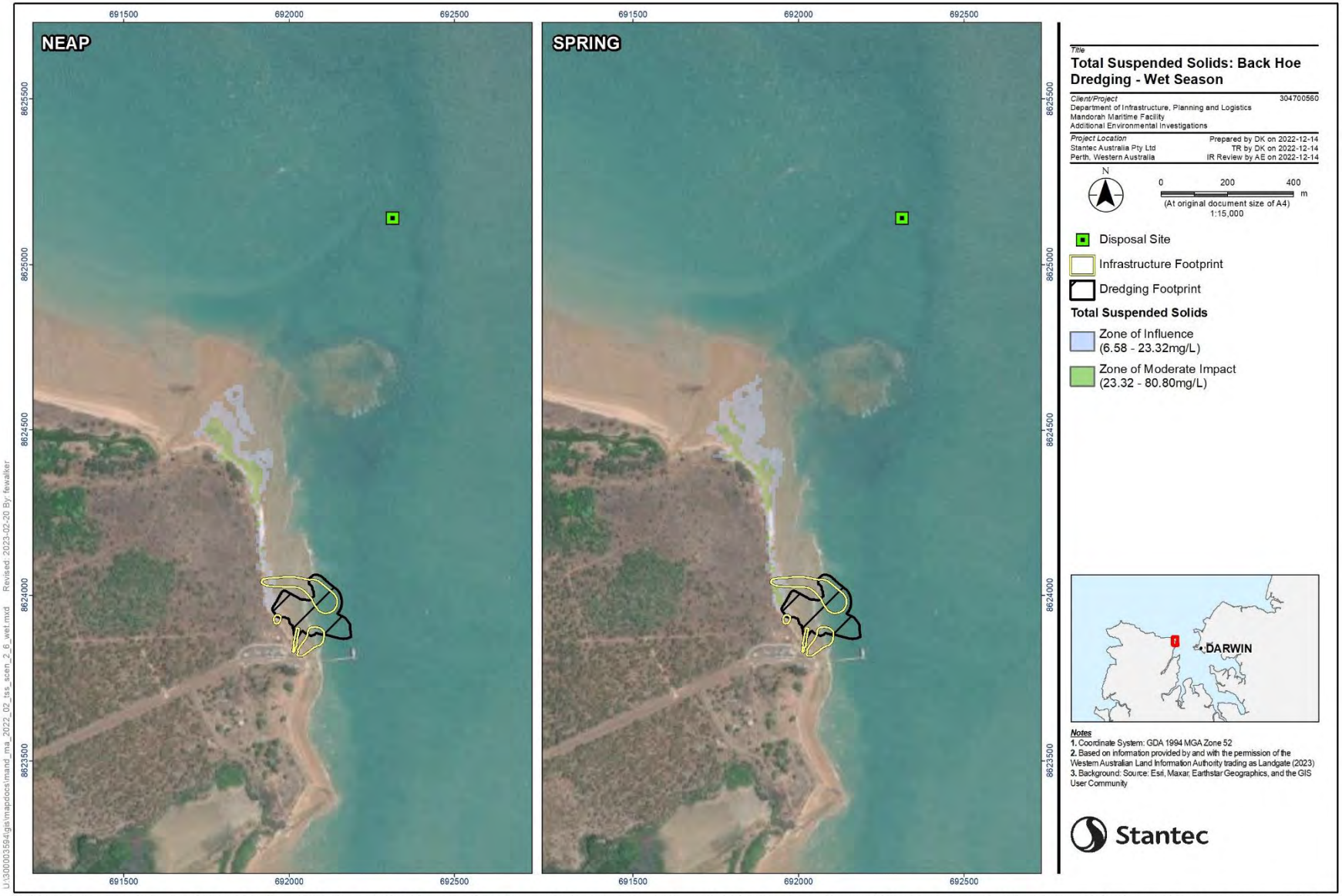

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Figure 4-6: Predicted zones of impact during the back hoe phase, based on wet season conditions.

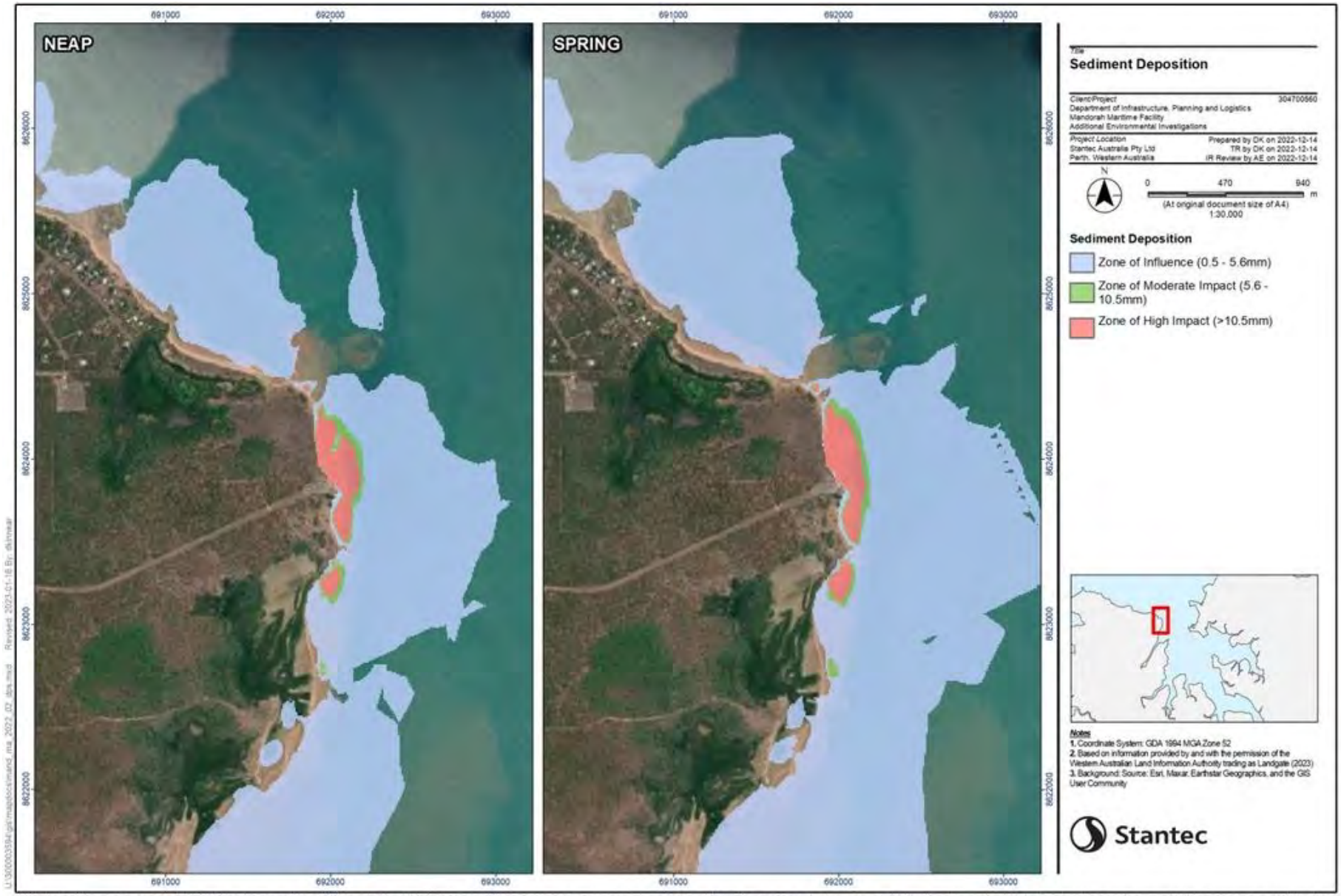

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Figure 4-7: Predicted zone of impact due to sedimentation from the combined cutter suction and back hoe dredging phases.

Cumulative impacts to BCH resulting from the combined effects of changes in water quality during the dredging phases together with the direct removal of BCH from the dredging footprint, were considered. Taking into account the total area occupied by the ZoHI and the dredging footprint, predicted losses of BCH due to the Proposal are conservatively estimated at 1.08% and 1.13% of the total BCH present across the project area, under neap and spring tides conditions respectively[1]. These numbers are likely over representations given the overlap of the dredge footprint and the ZoHI due to sedimentation. The integrity of marine environmental quality and marine ecosystems will be managed according to the actions and mitigation strategies summarised in the Draft Dredge and Spoil Disposal Management Plan (DSDMP). The Draft DSDMP will be provided to the Head contractor who will be responsible for finalising and implementing DSDMP, based on their intended approach and management of dredge spoil characteristics. The DSDMP contains the management and monitoring approaches required (a) to monitor the spatial extent and concentration of TSS in the plume (b) validate the predictions of the model and (c) detail the contractor's actions in the event any of the early warning, primary of secondary triggers are exceeded. To that end, the water quality monitoring triggers and the approach to monitoring has been updated in the DSDMP according to the approaches recommended by the WA EPA (2021). The DSDMP also outlines the contractor's obligations with regard to monitoring the health of local BCH and the expectations with regard to marine mammals (especially dugongs), which transit the area.

4.3 Coastal Processes

Potential changes to the nearshore sediment transport regime, induced by installation of the Proposal, were assessed using sediment transport modelling for typical seasonal and shoulder season conditions, as well as storm-based conditions. Interruption of longshore sediment transport (littoral drift) and subsequent changes to coastline morphology were also investigated by modelling the coastline for a 10-year period, with and without the structures present. The facility will interrupt long-shore drift, which may result in accretion of sediments directly to the north of the northern breakwater, as well as some changes to the beach to the south of the southern breakwater. The interruption of southward moving sediment may create a supply deficit to the beach south of the facility, leading to gradual erosion and shoreline recession. This may be counteracted, however, by additional protection from wave energy from the facility that reduces the existing drivers of longshore drift. This erosion may also be restricted by coastal geology, which is not fully understood along this beach.

In general, conservative modeling predicted that potential risks to the environmental factors are low. However, given the uncertainty in sediment transport modelling and the lack of existing, targeted, long-term validation datasets (e.g., repeated intra-annual and interannual surveying, broad scale characterisation of available sediment volumes and characteristics), it is recommended the Proposal is managed under a Coastal Processes Monitoring and Management Plan (CPMMP), as recommended by the NT EPA. Subject to effective implementation of the CPMMP, the NT EPA's objective for Coastal Processes will be met.

4.4 Landforms / Terrestrial Ecosystems

The assessment focused on the potential for temporary stockpiling of saline-soaked dredged rocks to compromise environmental quality within the temporary storage area and the surrounding environment. Impacts associated with saline soil contamination from storage and handling of dredge spoil were considered negligible, with any residual risks manageable under the revised Construction Environmental Management Plan (CEMP) – which includes closure and performance criteria, relating to landforms, dust suppression and soil / vegetation health, and the flexibility for changes to the program should the stockpiling process change.

The proposal is conservatively expected to result in the clearing of 3 ha of mid-open woodland, comprising predominantly Terminalia spp. Irreversible losses of habitat within the broader 3 ha area are expected to be limited to a 0.3 ha terrestrial construction footprint, consisting of the newly constructed facilities. It is anticipated that the remainder of the temporary work site will recover fully.

The recovery of the area to its original baseline condition will be monitored post construction as per the Revised Construction Environmental Management Plan provided in Section 7.1 of the SER. The plan details the monitoring that will be undertaken to ensure early detection of impacts to local vegetation health, including the ingress of weeds especially post clearing and throughout rehabilitation. Success criteria and closure objectives have been developed to ensure the outcomes of the rehabilitation process are clear and effective. Subject to effective implementation of these commitments, it is likely that the NT EPA's objective for Terrestrial Ecosystems will be met.

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[1] The differences between tides are unlikely significant given the inherent uncertainty in the method used to calculate the relative proportions of habitat classes. Numbers are also based on dry season conditions when the TSS concentrations in the water column are higher relative to background; as such these numbers reduce marginally under wet season conditions.

4.5 People

The potential for impacts to Culture and Heritage were assessed with respect to impacts to known or unknown Aboriginal sacred sites and unknown heritage objects or sites (e.g. WWII) during construction. As part of the SER, two additional studies and an additional management plan were completed to supplement the original information provided with the referral. Subject to effective implementation of these commitments, risks to local aboriginal sacred sites are considered low, and the NT EPA's objective for Culture and Heritage is expected to be met by the proposal.

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