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Tenax Energy Tropical Tidal Testing Centre
Notice of Intent

ENTURA-77859
12 December 2013

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Document information

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	Notice of Intent
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Revision history

Revision 1

Revision description	Final for submission		
Prepared by	David Procter		12.12.13
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Approved by	Peter Greilach		12.12.13
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Distributed to	Alan Major (name)	Tenax Energy (organisation)	12.12.13 (date)

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1. Introduction

1.1 Overview

Tenax Energy Pty Ltd (Tenax Energy) proposes to develop the Tropical Tidal Testing Centre (T^3C) in the vicinity of Clarence Strait approximately 50 km north east of Darwin in the Northern Territory (Figure 1.1).

Tidal energy is a clean renewable energy source that has the advantage over other forms of renewable energy such as wind, solar and wave energy generation of being highly predictable and reliable. The times at which the generators can operate can be forecast with exceptional accuracy, years in advance. Investing in this type of power generating technology has the security of a pre-defined electricity output during the life of the asset. Tidal energy projects are currently planned in the United Kingdom, China, Korea, Canada, USA, India and New Zealand. There are currently more than 80 tidal generator developers worldwide.

The T^3C aims to provide a location where national and international tidal energy developers are able to test tidal generator infrastructure in a tropical environment. Testing is a critical component of tidal energy development as it provides developers with accurate 'real world' information on the performance of tidal energy generator designs. There are currently no other such centres located in tropical waters; however, a comparable facility, the European Marine Energy Centre (www.emec.org.uk) has been operating in Scotland since 2003. Tenax anticipates that the T^3C will provide a centre for developers seeking to undertake testing in tropical environments. Preliminary enquiries by Tenax Energy to a number of developers regarding the potential use of the T^3C have been positively received.

The T^3C will be located in the South Channel and have capacity for up to 15 tidal generators (Figure 1.2). The T^3C will be connected to the Darwin / Katherine electricity grid via an extension to the existing 22 kV power line to Gunn Point. The capacity on this power line is limited to 10 MW and as a consequence the maximum generating capacity of the T^3C will also be 10 MW. Due to the generation constraint it is unlikely that all that 15 tidal generators will be operational and exporting power simultaneously. The tidal generators will be arranged in three bays of five generators. Each bay will be connected via submarine cable to an onshore control room located on Gunn Point.

Little information is currently known about the environment of Clarence Strait or of the potential impacts of tidal generators more generally in tropical locations. A vital component of the T^3C will be the ability to monitor and assess potential impacts of tidal energy generator designs at a scale where significant impacts are highly unlikely. The development of the T^3C will involve extensive survey and monitoring to collect baseline environmental data describing the habitats in proximity to the project location and the species that may interact with the tidal generators. Baseline data and consultation with experts will be used to design effective monitoring programs to avoid and mitigate potential impacts. During operation of the T^3C monitoring and survey will continue to build on the baseline data and to allow the ongoing assessment of potential impacts of tidal generators and to identify how closely generators can be located so as to minimise the footprint of larger developments.

Tenax Energy has previously proposed a larger scale tidal energy development in Clarence Strait, the Clarence Strait Tidal Energy Project. A Notice of Intent (NOI) was submitted and guidelines for the preparation of an Environmental Impact Statement (EIS) were prepared by the Northern Territory

EPA (NT EPA 2009). This project is currently on hold as the guidelines for that project identified several areas where research into the effects of tidal generators in tropical environments was required before an EIS for that project could proceed. This NOI is submitted in isolation of the Clarence Strait Tidal Energy Project NOI (URS 2008), although the outputs from the T^3C will help inform a separate assessment of that project. Notwithstanding, information contained in this NOI has been drawn from the Clarence Strait Tidal Energy Project NOI.

At the time of preparing this NOI only preliminary modelling of the tidal resource has been completed and, as such, information on many elements of the project is limited. It is expected that additional information will be forthcoming as the project is developed and will be included in the Environmental Impact Statement (EIS) which is assumed need to be prepared for this project.

The proposed surveys and monitoring referred to in Section 8 have been designed to respond to the issues raised in the EIS guidelines for the Clarence Strait Tidal Energy Project that would require research of tidal generator impacts in tropical waters.

This Notice of Intent (NOI) has been prepared with reference to the Guide to the Environmental Impact Assessment Process in the Northern Territory (NT EPA 2013), noting that Appendix 1 to this Guide – Information Guidelines for a Notice of Intent (NOI) is currently under review.

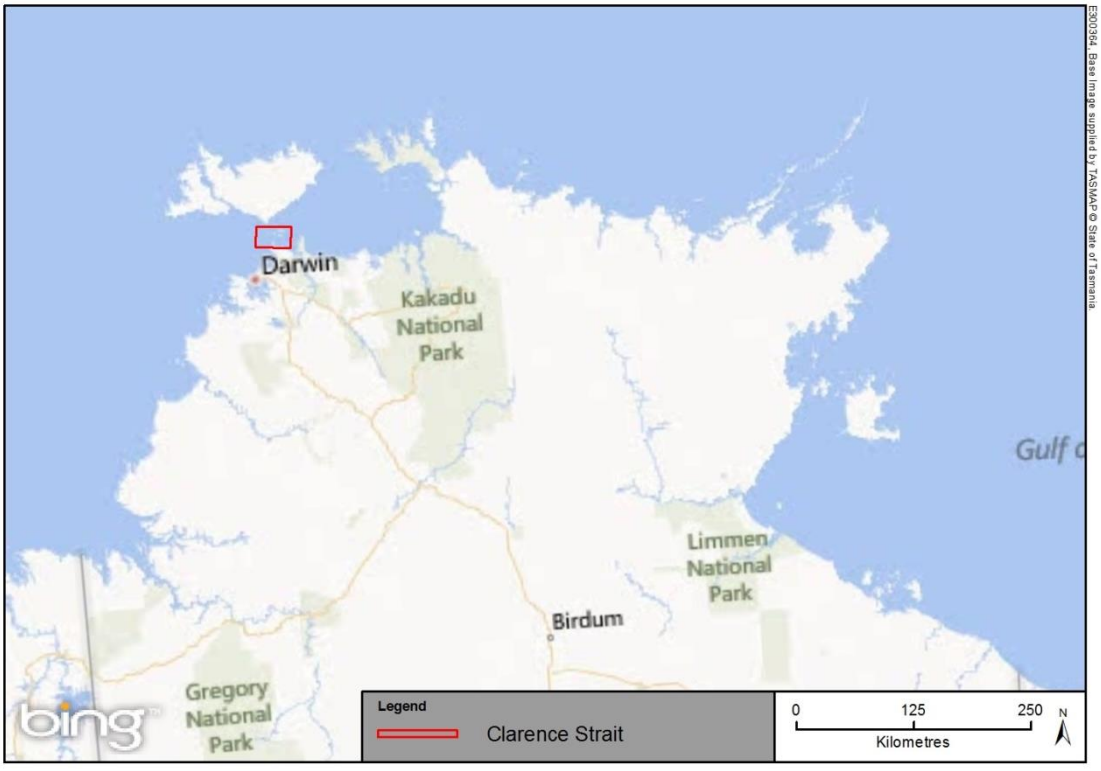

Figure 1.1: Clarence Strait

Figure 1.2: South Channel showing proposed T^3C location

1.2 Proponent details and contacts

Tenax Energy is a company that is committed to exploring, developing and bringing to market the most reliable and efficient renewable energy technologies available. Tenax Energy is focussed on meeting rising energy demands in a cost-effective manner while maintaining a focus of reducing greenhouse gas emissions. Further information regarding Tenax Energy can be found at www.tenaxenergy.com.au.

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Tenax Energy Pty Ltd (Tenax Energy) is a proprietary limited company registered on 16/08/2007.

This application is being lodged on behalf of Tenax Energy by:

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2. Policy support

Australia remains committed to reducing greenhouse gas emissions to 5% below 2000 levels by 2020. Electricity generation accounts for a significant proportion of Australia's greenhouse gas emissions and demand of electricity in Australia is expected to increase. As part of Commonwealth Government's effort to reduce greenhouse gas emissions from the electricity industry the Renewable Energy Target (RET) was introduced. The RET requires that 20% of Australia's electricity be produced from renewable energy sources by 2020.

Further incentives for renewable energy generation have been introduced by the Commonwealth Government, including the Clean Energy Finance Corporation and Australian Renewable Energy Agency (ARENA) set up to co-ordinate the investments and administration of new and existing support for renewable research and development, demonstration and commercialisation of renewable energy technologies. The current Commonwealth Government intends to disband the Clean Energy Finance Corporation.

3. Site description and selection

Tenax Energy proposes to develop the T^3C in Clarence Strait. Clarence Strait is a narrow body of water in the vicinity of the Vernon Islands, approximately 50 km north of Darwin, Northern Territory and south of Melville Island, Tiwi Islands (Figure 1.1). It links the Beagle Gulf in the west with the Van Diemen Gulf in the east. The Strait is situated within the Timor Sea with the Vernon Islands located within the Strait. The Vernon Islands consist of North West Vernon, South West Vernon and East Vernon Island and Knight Reef. Three main channels pass through the islands — the North Channel, Howard Channel and South Channel. It is proposed to locate the T^3C in the South Channel (Figure 1.2).

Tenax Energy has investigated the development potential of numerous sites around Australia based on three major criteria:

- Reliable and consistent tidal currents, with velocities of above 2.0 m/sec for extended periods and flows that reverse in direction at 180 degrees with the change in tides.
- Proximity to existing electricity transmission infrastructure so as to reduce connection costs.
- Sufficient water depth close to shore to allow installation of tidal energy generator.

Clarence Strait, and the South Channel in particulars was selected as the proposed location for the T^3C as it provides a location with excellent tidal currents, sufficient water depth and is located in the greater Darwin area with opportunity for grid connection via existing electricity infrastructure. Tenax Energy originally engaged Kellogg, Brown and Root to re-instate the hydrodynamic modelling of Clarence Strait undertaken as part of the currently deferred development of Glyde Point. Modelling found tidal currents with velocities ranging between 2.00 and 2.75 m/s were present in Clarence Strait (URS 2008). This modelling has now been continued by Water Technologies.

The offshore component of the T3C will comprise the tidal generators and submarine cables connecting the generators to shore. The onshore component of the project will comprise beach joints connecting sea and land cables, underground cables from the joints to a small control room located on Gunn Point, and a section of overhead line exporting power from the control room and connecting to the existing 22kV Gunn Point powerline. The location of the enclosure will be determined by the location selected for the shore crossing. It will be located as far as is practicable on previously disturbed land and close to existing tracks to minimise disturbance.

4. Project description

4.1 Tidal generator bays

The T^3C will consist of three tidal generator bays. The generator bays refer only to a defined area of sea floor within which turbines will be placed and are not physical structures. Each turbine bay will be capable of housing up to five tidal generators. Each bay will have a pre-installed submarine cable connection point whereby up to five generators located at varying and moveable sites within the bay can be connecting by individual cables. It is Tenax's intention that the generators installed in the bays will utilise gravity base anchors to connect the generators directly to the seabed; however, other common methods such as rock bolt anchoring, gravity anchors with skirts or gravity anchors connected to mooring chains may also be employed solely or in addition to a gravity base depending on the local site conditions.

A gravity base does not require any excavation of the seabed for mooring or foundations because it remains in place by virtue of its own weight. The preferred gravity base design will be positioned on three or four vertical pylons that can be lengthened where required, to provide a level base where the seabed topography is uneven. The pylons may extend above the base to provide attachment points for generators. It is likely that a gravity base will be constructed of steel, with concrete and/or a combination of materials within the pylons to provide strength and weight. Such anchors, or their variants listed above, have the advantage that they can be readily removed thereby allowing the generators to be re-located to investigate the effects of downstream wakes (and therefore packing density) as part of the testing works and to be removed from site at the end of the project.

The dimensions of the generator bays are yet to be determined but are likely to be approximately 350 m long by 350 m wide. The actual footprint area of each generator on the seabed within the bay will be limited to the extent of the gravity anchor and is likely to be approximately 16 m × 16 m.

4.2 Tidal energy generator designs

The T^3C is proposed to be a centre to test various tidal energy generator designs. As such, it is not possible to provide a description of a specific tidal energy generator for the purposes of assessing this NOI. Tidal energy is a relatively new technology and there are currently a broad range of tidal energy generators being designed and tested by developers. The more common types of generators

are described below and represent the likely range of designs that may be considered for deployment at the T^3C.

It should be noted that any specific generators identified below are provided as illustrations of the types of generators that may be deployed and that this should not be considered to indicate that Tenax Energy has been in discussion with these specific developers or that there has been a commitment of interest by these generators developers to seek a berth in the T^3C.

The most common type of tidal generator currently under development can generally be classed as horizontal axis turbines. The most common of these use rotor blades to generate energy as tidal currents cause rotation (Fig 4.1). Variations to horizontal axis turbines include open duct turbines which don't have traditional rotors but still generate energy by causing rotation around a horizontal axis (Figure 4.2.). Several horizontal axis turbines include venturi structures to help concentrate the flow of the tidal current (Figure 4.3). Whilst less common there are also several turbines that may be classed as vertical axis turbines (Figure 4.4). Other tidal energy generators being developed include those based on an Archimedes screw configuration and those that can generally be described as oscillating (Figure 4.5).

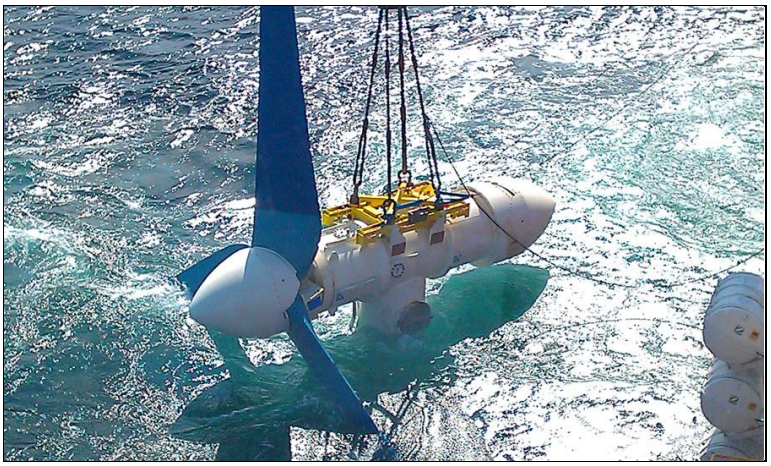

Figure 4.1: Typical horizontal axis turbine being lowered onto the seafloor (Source: Atlantis Resources Limited)

Figure 4.2: Open duct turbines (Source: Open Hydro)

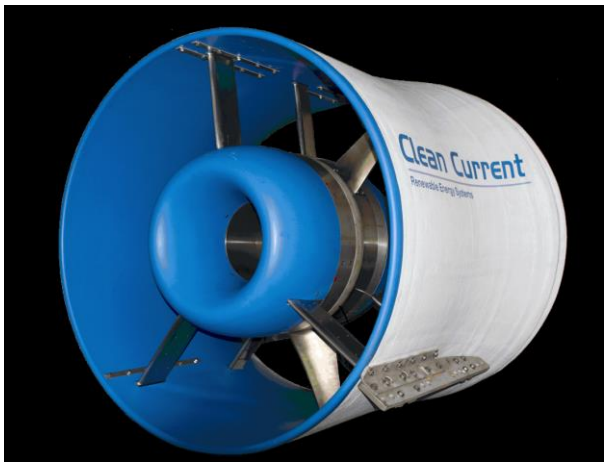

Figure 4.3: Venturi style turbine (Source: Clean Current Power Systems Inc)

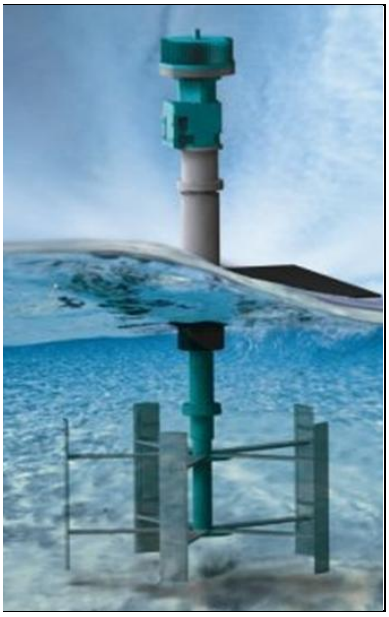

Figure 4.4: Vertical axis turbine (Source: New Energy Corp)

Figure 4.5: Archimedes screw and oscillating tidal energy generators (Sources: Flumill and Biopower Systems)

4.3 Electrical connection

4.3.1 Submarine cable

Each of the three bays will be connected to the control room by a separate cable to allow individual monitoring and collection of data from each generator. Each cable will be nominally 11 kV and 100 mm in diameter. The submarine cables will be bought ashore at a single location using a single conduit installed using horizontal directional drilling to minimise potential impacts on the coastal and mangrove areas.

The submarine cable will be connected at a beach joint to an underground onshore cable located above the highest tidal inundation level. The beach joint pit will be approximately 5 m long × 2-5 m wide. If this is close to the control room, the submarine cable may be brought directly to the control room and need for a beach joint negated.

A submarine connector will be installed at the offshore end of the cables to each bay. Each generator within the bay will have an individual cable connecting the generator to the submarine connector. This will allow individual generators to be relocated or removed as necessitated by the monitoring regime for each generator type without affecting the connection back to shore.

4.3.2 Onshore infrastructure

The generator cables will be connected to an onshore control room housing the necessary transformers, switchgear, meters, data and feedback controls. The control room will also house monitoring equipment to allow the independent monitoring of each generator and a range of ambient conditions. The monitoring equipment will be configured to allow remote access and it is not envisaged that the onshore enclosure will be permanently manned. It is expected that the onshore enclosure will be contained to an area approximately 20 m × 20 m.

4.3.3 Grid connection

Connection to the Darwin / Katherine grid will be achieved by connection of the control room to the existing 22 kV powerline located approximately 7 km to the south of Gunn Point. A new overhead line will be built from the control room to the existing powerline.

4.4 Construction, operation and maintenance

4.4.1 Construction

The cabling and onshore facilities will be installed prior to the installation of any tidal generators. The generators (including gravity anchors) will be shipped to Clarence Strait from Darwin. The gravity base will be lowered into position using an appropriately sized lift vessel and will be installed during periods of slack tide. Dependent on the design of the generators and choice of installation location, it is possible that the use of a gravity base may be sufficient to anchor the generator bay to the sea floor. If this is not the case rock anchors or alternative methods may be used.

The submarine cables will be installed from each bay back to a single shore crossing location. The cables will be buried where possible (i.e. in areas of soft sediment) or positioned using gravity

weights or rock anchors. If technically feasible, cables will be buried together to reduce potential impacts to the benthic habitat.

The submarine cables will be bought ashore at a single shore crossing location. The shore crossing location will be horizontally directionally drilled to reduce potential impacts to the mangrove, mudflat, reef and dune systems.

These project components will form the permanent structures comprising the T^3C with generators regularly interchanged or relocated during the operation of the centre.

4.4.2 Operation and maintenance

It is expected that the T^3C will host generators from numerous developers during its operation. Generators will be shipped to the T^3C from a suitable onshore facility (likely Darwin) and lowered into place using a lifting vessel. Cables will then be connected from the individual generators to the submarine connector using divers or a ROV. Generators may be relocated, removed and re-installed within the generator bay during their deployment at the centre to investigate the effect of generator wake on packing density or for maintenance or modification. If required, generators will be taken to an appropriate onshore facility for maintenance or modification.

The length of time each generator is deployed for will be subject to agreement between the T^3C and the developer; however, it is expected that most generators will be left in place for a minimum of several months and likely for significantly longer.

A range of surveys and assessments will be undertaken prior to construction of the T^3C to collect baseline data (refer to Section 8). During operation of the T3C monitoring and survey will continue to build on the baseline data and to allow the ongoing assessment of potential impacts of tidal generators

A risk assessment will be completed for each generator prior to installation to determine the potential impacts of the generator and allow the development of suitable mitigation strategies and the deployment of monitoring equipment. This assessment will determine the generator's suitability for deployment and will consider aspects such as survivability during extreme storms, systems redundancy to prevent leakages, material selection and anti-foulant coatings, etc.

4.4.3 Decommissioning

It is expected that the T^3C will remain in operation for at least 25 years. Decommissioning of the tidal generators, submarine cable and control room will be a reversal of the construction procedure described above. The generator gravity base's will be de-ballasted (if required) and lifted from the sea floor.

4.5 Timeframe

A detailed development schedule has yet to be developed; however, it is nominally expected that construction of the T^3C may begin in late 2014.

5. Regulatory framework

This Notice of Intent (NOI) is being prepared as the initial notification of a proposed action to the Northern Territory Environment Minister and provides the essential information of the proposal and a preliminary identification of potential environmental impacts to enable assessment under the *Environmental Assessment Act* (EA Act). Tenax Energy submitted a Notice of Intent under the EA Act for the Clarence Strait Tidal Energy Project in 2008 and the NT EPA issued guidelines for the preparation of an EIS. This NOI remains current. The Clarence Strait Tidal Energy Project encompassed the utility scale deployment of over 450 tidal generators in the vicinity of Clarence Strait. Section 14A of the Environmental Assessment Act allows for the amendment of a proposed action; however, given the vastly differing scope of the T^3C and the Clarence Strait Tidal Energy Project Tenax Energy have opted to submit a separate NOI for the T^3C.

In addition to assessment under the provisions of EA Act, the project is likely to require assessment of the environmental impacts under the following primary environmental and development approval legislation (Commonwealth and Territory):

- The Commonwealth's *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) administered by the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPC).
- The Territory's *Planning Act 1999* administered through local development consent authorities and applies to all land zoned under the Northern Territory Planning Scheme (NTPS).

It is likely that a number of additional development and environmental approvals will be required to facilitate the project, and will be identified in detailed during the assessment processes under the EA Act, EPBC Act and *Planning Act 1999*.

5.1 Environmental Assessment Act

The primary purpose of the assessment process under the EA Act is to provide for appropriate examination of proposed projects that may cause significant environmental impact. While it does not provide explicit consent in its own right, it provides a determination of the environmental impact of a development that assists other decision-making bodies in their own regulatory responsibilities. To this end a Notice of Intent is required to be submitted to the Minister who will then verify the level of assessment and issue the assessment guidelines for the proposal. The guidelines may require additional investigations to be undertaken.

Once a NOI is received by the Minister, a decision is required whether the proposal could have a significant effect on the environment. The NOI is examined in relation to:

- Potentially significant environmental impacts, particularly magnitude, duration, frequency and extent of impacts.
- The significance of the surrounding biophysical environment.
- The processes inherent in the proposed action such as inputs and outputs, and subsequent on-site or off-site effects on the environment.
- Issues such as, statutory planning, heritage, public health, water resources, water quality and resource management.

5.2 Environment Protection and Biodiversity Conservation Act 1999

The *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) is administered by the DSEWPC. Approval under the Act is required for actions that are likely to have a significant impact on a matter of 'national environmental significance'.

The EPBC Act currently identifies seven matters of national environmental significance:

- World Heritage properties.
- National Heritage Places.
- Ramsar wetlands of international importance.
- Listed threatened species and ecological communities.
- Listed migratory species.
- Commonwealth marine areas.
- Nuclear actions (including uranium mining).

It is noted that the current assessment process for the Clarence Strait Tidal project is being undertaken under the bilateral agreement between the NT and the Commonwealth allowing a joint assessment to occur in the case that formal assessment is required at both a Territory and Commonwealth level. As such the modification of the assessment process will require agreement of the Commonwealth Department of Sustainability, Environment, Water, Population and Communities.

5.3 Planning Act 1999

In the Northern Territory the *Planning Act 1999* is the legislative instrument regulating the use and development of land. The Planning Act establishes a framework for the creation, amendment and modification of planning schemes as the primary instrument guiding the use and development of land through zoning and development standards for a variety of land uses.

As the EIS is the primary development approval process that will be required to facilitate the project. Following successful completion of the phase 1 EIS, assessment of the project against the provision of the *Planning Act 1999* and the NTPS will be required.

Approval under the *Planning Act 1999* may be required for all components of the project that are located with zoned areas identified in the NTPS. This is likely to include onshore components such as buildings, transmission lines and any vegetation clearing necessary to facilitate construction of the project.

5.4 Additional permitting processes

As identified above, addition development approvals and consents are likely to be required under a number of other legislative instruments. Additional decision-making bodies that may rely upon the projects considered under the EA Act include:

- *Commonwealth*
    - Historic Shipwrecks Act 1976 (Cth)
    - Native Title Act 1993

- *Northern Territory Legislation*
    - Crown Lands Act 1992
    - Marine Act
    - Heritage Conservation Act
    - Aboriginal Sacred Sites Act 1999
    - Northern Territory Aboriginal Sacred Sites Act
    - Parks and Wildlife Commission Act
    - Soil Conservation and Land Utilisation Act
    - Waste Management and Pollution Control Act
    - Building Act 1993

To this end a Notice of Intent is required to be submitted to the Minister who will then verify the level of assessment and issue the assessment guidelines for the proposal. The guidelines may require additional investigations to be undertaken.

5.4.1 Historic Shipwrecks Act 1976 (Cth)

The *Historic Shipwrecks Act 1976* protects historic wrecks and associated relics that are more than 75 years old and in Commonwealth waters, extending from below the low water mark to the edge of the continental shelf. Each of the States and the Northern Territory has complementary legislation, which protects historic shipwrecks in State waters, such as bays, harbours and rivers. The Minister for the Environment, Heritage and the Arts can also make a declaration to protect any historically significant wrecks or articles and relics which are less than 75 years old.

The identification of any shipwrecks and potential impacts will be undertaken as part of the EIS, and any consent requirements identified under this process.

5.4.2 Native Title Act 1993 (Cth)

The *Native Title Act 1993* establishes the recognition by Australian law that some Indigenous people have rights and interests to their land that come from their traditional laws and customs.

The native title rights and interests held by particular Indigenous people will depend on both their traditional laws and customs and what interests are held by others in the area concerned. Generally speaking, native title must give way to the rights held by others. The capacity of Australian law to recognise the rights and interests held under traditional law and custom will also be a factor.

As the project includes substantial areas of Crown land, native title claims over this area will need to be investigated and reviewed from time to time during the development of the project to ensure compliance with the notification and negotiation provisions of the Act.

5.4.3 Crown Lands Act 1992

The *Crown Lands Act 1992* regulates the management of all undedicated land within the Northern Territory, including the sea bed within territorial limits. As the proposed T^3C will require the use and development of both onshore and offshore portions of Crown land, the lease of land will be required

to facilitate the project development. Specific details of the lease arrangement will need to be determined following the approval of the EIS and other permitting processes.

5.4.4 Marine Act

The *Marine Act* and Regulations cover the construction, survey and safety equipment on commercial vessels, tourist vessels, hire and drive vessels and regulate safe boating practices for pleasure craft. With particular regard to the T^3C, section 188A of the Act prescribes that the approval of the Director is required to erect any structure within Northern Territory Waters.

An application under section 188A will need to be supported by an EIS approved under the EA Act and any relevant information pertaining to the safe navigation and potential hazards relating to the structures.

5.4.5 Heritage Conservation Act

The *Heritage Conservation Act* provides statuary protection for all forms of heritage, Aboriginal and non-Aboriginal, built and natural, on land and underwater.

The purpose of this Act is to provide a legal frame work for the identification and recording, assessment, conservation and protection of places and objects of prehistoric, proto-historic, historic, social, aesthetic or scientific value, including geological structures, fossils, archaeological sites, ruins, buildings, gardens, landscapes, coastlines and plant and animal communities or ecosystems of the Northern Territory.

Submerged material culture in its many forms, whether it is a shipwreck, an aircraft wreck or an historic jetty, can be protected under the *Heritage Conservation Act* provided it is considered to have heritage significance.

Where it is proposed to undertaken works on a heritage place or object, the approval of the Minister or delegate is required. The identification of potential impacts on a heritage place or object will be undertaken as part of the EIS, and any consent requirements identified under this process.

5.4.6 Aboriginal Sacred Sites Act

The *Aboriginal Sacred Sites Act* established a framework for the protection of Aboriginal sacred sites on land and sea. The act established the Aboriginal Areas Protection Authority (AAPA), an independent statutory organisation responsible for overseeing the protection of Aboriginal sacred sites and administering the functions of the Act.

Sacred sites include places within the landscape that have a special significance under Aboriginal tradition, and may include hills, rocks, waterholes, trees, plains and other natural features. Consent of the AAPA is required where works or damage to a sacred site may occur.

The identification of sacred sites and potential impacts will be undertaken as part of the EIS, and any consent requirements identified under this process.

5.4.7 Territory Parks and Wildlife Conservation Act

The *Territory Parks and Wildlife Conservation Act* and subordinate Regulations establish a framework for the establishment and ongoing operations of national parks and conservation areas throughout the Northern Territory. In addition, the regulations also provide for the management of protected and threatened wildlife, and areas of essential habitat.

In so doing, works within a national park or conservation area may only be undertaken with the consent of the Parks and Wildlife Service in accordance with the plan of management for that park or reserve.

Similarly, the interference or taking of essential habitat, protected or threatened wildlife may only be undertaken with the consent of the Director of the Parks and Wildlife Service.

The identification of potential impacts on parks, reserves, protected and threatened wildlife, and areas of essential habitat will be undertaken as part of the EIS, and any consent requirements identified under this process.

5.4.8 Soil Conservation and Land Utilisation Act

Under the *Soil Conservation and Land Utilisation Act* areas of land that are subject to soil erosion or that are likely to become subject to soil erosion may be declared as Areas of Erosion Hazard. These areas are defined by a map and prescribe measures to be taken in the area to reduce the hazard. The declaration may also require treatment to be carried out on the land and can also determine the number of livestock permitted to be carried and may otherwise restrict the lawful use of the land to which it relates.

More generally, it maintains a requirement on all development that appropriate Erosion & Sediment Control Plans are prepared and implemented in accordance with the *Erosion and Sediment Control Guidelines - Built Environment*, NRETAS.

Of particular reference to this project is the potential for the disturbance of acid sulphate soils during the cable installation in coastal areas.

5.4.9 Waste Management and Pollution Control Act

The *Waste Management and Pollution Control Act* regulates the operation of waste management facilities, site contamination and pollution management throughout the Northern Territory. The specific activities that require approval or licencing are prescribed under Schedule 2 of the Act. It is considered that the T^3C will not involve any specified waste management or polluting activity that requires approval or a licence under this legislation.

5.4.10 Building Act 1993

The *Building Act 1993* regulates the standards by which building and construction is executed in the Northern Territory. The Act establishes reference to standards, including the Building Code of Australia, and procedures for the certification and approval of building works.

It is likely that certification of the proposed buildings and structures associated with the project will be required prior to construction commencing.

6. Existing environment, potential impacts and management

6.1 Existing environment

6.1.1 Previous environmental assessments

URS conducted searches for previous environmental assessments in the vicinity of Clarence Strait and were unable to find any relevant studies (URS 2008). No further publically available assessments were located during preparation of this NOI. It is therefore difficult to describe the current environment in Clarence Strait and to assess the potential impacts of the proposed development. A vital component of the development of the T^3C will be the collection of baseline environmental data.

6.1.2 Bathymetry and topography

The bathymetry of South Channel is relatively complex with widths ranging from 900-1650 m and with depths down to 62 m but more generally within 35-40 m along the middle of the Channel. Further assessment of the bathymetry of South Channel will be undertaken to determine the most suitable location for the generator bays and cable routes.

6.1.3 Geology and geomorphology

Both the geology and the geomorphology of the Clarence Strait area will be further assessed to determine the most suitable location for the generator bays and cable routes.

The Glyde Point area (including Gunn Point) is underlain by tertiary soils and laterite overlying Wangarlu Mudstone of the Bathurst Island Formation, which in turn overlies Koolpinyah Dolomite. These tertiary soils comprise of unconsolidated sand, ferruginous clayey sand and soil, clay soils, and commonly contain limonite pisolites. Tertiary laterite typically comprises nodular, concretionary, pisolitic and vermicular mottled laterite and ferricrete (Kellogg Brown & Root 2003).

6.1.4 Fauna and flora

A search of NT NRM InfoNet database and the Commonwealth Protected Matters Search Tool (PMST) identified 72 threatened species that may potentially occur within 10 km of the onshore, crossing and marine components of the T^3C (Appendix A). A further 52 listed migratory species and 101 listed marine species were recorded by the PMST.

Many of the threatened, listed and migratory species are terrestrial or aquatic species and are highly unlikely to be impacted by the T^3C.

There is little published information on the distribution of the recorded threatened species in the Clarence Strait Region. Comprehensive surveys will be completed to identify marine and terrestrial species which may be impacted by the T^3C.

6.1.5 Indigenous and non-indigenous heritage

There is a known submarine wreck at the western entrance of the Clarence Strait and there may be further significant marine archaeology in the vicinity of the South Channel.

A native title claim is active over all Vernon Islands from the Larrakia and Jampalampi Tiwi Groups; however, this claim is to the low water mark and, as such, the T^3C project area and corresponding submarine cables area are not within this claim. The claim may affect the onshore components of the project.

6.1.6 Socio-economic

The area around the proposed T^3C location is sparsely populated. The nearest town is Howard Springs approximately 35 km away. The closest road is Gunn Point Road, while the closest city is Greater Darwin. On the northern side of the Strait is Melville Island, Tiwi Islands.

Economic uses related to the area include the revenue from commercial fishing, scuba diving, boating and sailing, and recreational fishing tours and charters.

6.2 Potential environmental impacts

6.2.1 Bathymetry and topography

There is unlikely to be any impacts to the seabed bathymetry as the tidal generators are likely to be on gravity base or similar structures.

Further detailed bathymetric surveys will be undertaken prior to construction of the T^3C.

6.2.2 Geology and geomorphology

The installation of the generators will not require excavation of the seabed and it is therefore unlikely that there will be any impact to the geology underlying the seabed.

The active geomorphic processes surrounding the generator bay locations will be further assessed. The amount and size of sediments within the water flow and natural seabed erosion will be modelled and the result used to help select the location of generator bays.

The submarine cable will be trenched into the sandy seabed along the submarine cable alignment to a depth of up to 1 m. Once buried, the cable is unlikely to affect any active natural processes on the seabed.

The shore crossing will be drilled using HDD and the route will be selected to avoid any reefs or coral outcrops. Further onshore geotechnical assessment will be undertaken prior to construction.

6.2.3 Fauna and flora

There is potential for injury to marine animals resulting from striking tidal generators or from striking shipping during the construction and operation of the T^3C. There is little published information available on the occurrence and distribution of marine animals within the vicinity of Clarence Strait or on the likely behaviour of these animals in relation to tidal generators. Results of database

searches suggest the possible presence in the project area of marine mammals, all of which have the potential to be impacted by direct collision. A detailed desktop and field survey is planned to identify marine species that may utilise the project area. Data from these surveys will be used to develop a collision risk model that is intended to be continually refined as data is obtained during the operation of the T^3C.

It is likely that noise generated by generators installed at the T^3C will be above ambient and will therefore be audible to marine animals. Based on assessments of noise generated by tidal generators (e.g. Duncan and Kent 2009) the noise level generated by the T^3C is likely to be low and will not cause physical injury. Some marine animals (e.g. cetaceans) may exhibit behavioural reactions to the presence of tidal generators, which could take the form of either avoidance or attraction. A comprehensive noise assessment will be undertaken to assess the potential acoustic impact of the T^3C on species sensitive to marine noise.

There is potential for disturbance to benthic and terrestrial communities and habitat through the placement of the gravity base, submarine cable, control room and overhead connection. Additionally benthic communities may be disturbed by changes to sediment movement. A detailed survey to map benthic and terrestrial communities will be completed during the design of the T^3C and infrastructure will be located to avoid significant species or habitats wherever possible.

There is also potential for electromagnetic fields to be generated by the submarine cable. Electrical fields will be eliminated by surrounding the cable with conducting materials that are grounded at each end of the cable. This ensures that no electrical fields are produced in the marine environment surrounding the cable.

Indirect impacts such as the introduction of pest species or pollution from oil spills or anti fouling treatments will be mitigated by preparing a management plan for the construction and operation of the T^3C and by conducting a risk assessment for each generator prior to its installation.

The small scale of the T^3C (small physical footprint and limited number of tidal generators) reduces the likelihood of any significant impact of the tidal generator on any population of marine animal. A detailed marine survey will completed prior to the construction of the T^3C (refer Section 8) that will gather baseline data to allow further assessment of the potential impacts of the T^3C. Further, a critical component of the T^3C is the continued monitoring of the potential impacts of the tidal generators on marine species and, where necessary, adaptively respond to any potential impacts.

A range of surveys and assessments will be undertaken prior to construction of the T3C to collect baseline environmental data describing the habitats in proximity to the project location and the species that may interact with the generators (refer Section 8). Baseline data and consultation with experts will be used to design effective monitoring programs to avoid and mitigate potential impacts.

A risk assessment will be completed for each generator prior to installation to determine the potential impacts of the generator and allow the development of suitable mitigation strategies and the deployment of monitoring equipment.

6.2.4 Indigenous and non-indigenous heritage

Significant indigenous and non-indigenous sites and landscapes have the potential to be disturbed by the construction and operation of the T^3C. A detailed indigenous and non-indigenous heritage survey will be completed during the design of the project and the results used to locate infrastructure and

minimise potential impacts. The Larrakeyah traditional owners will be given the opportunity to take part in the indigenous heritage survey.

6.2.5 Socio-economic

The T^3C may disrupt commercial and recreational use of South Channel. There will most likely be the need for some restriction on fishing in the project area, limiting the use of trawl and dredge fishing methods within the generator bays. Commercial sport fishing ventures and recreational activities may also be disrupted. The location of the generator bays will be identified in consultation with the commercial and recreational fishing associations and chosen to avoid areas of high fishing activity and to ensure that potential concerns are avoided wherever possible. The impact of the proposed development on boat movements is dependent on the maritime safety restrictions imposed on the T^3C. It is expected that the location of the generator bays will allow a navigable path through South Channel and the channel is one of many channels in the immediate vicinity.

Although the scale of the T^3C is relatively small, its operation as a test centre is likely to provide employment for local maritime contractors, provide opportunities to attract researchers and students to the Charles Darwin University (with whom a Memorandum of Understanding already exists with Tenax Energy) and result in more people visiting the location and surrounding centres. These factors can be expected to contribute an economic benefit for the area.

7. Stakeholder consultation

Tenax Energy has to date consulted with officers from the following Northern Territory Government departments:

- Department of Natural Resources, Environment and the Arts (NRETA)
- Environment Protection Authority
- Department of Business and Employment
- Department of Chief Minister
- Aboriginal Areas Protection Authority
- Commonwealth Department of Environment

7.1 Further consultation

Tenax intend continue to consult widely with Northern Territory Government departments during the development of the T^3C. Tenax also intend to engage with local businesses, recreational users of Clarence Strait and the local community early in the development of the T^3C such that wherever possible issues identified can be avoided or mitigated.

A Community and Stakeholder Management Plan will be developed in accordance with the principles of the International Association for Public Participation (IAP2) — focus (clear goals, techniques, responsibilities, coordination), inclusive (initiate dialogue, encourage participation), responsive (consider views and new ideas, resolve conflicts), open and transparent (information readily available, presented in appropriate format) and time feedback (advise and explain outcomes).

The aim of the Community and Stakeholder Management Plan is to ensure relationships with the local community and business owners are established and maintained and that the local community and businesses owners are kept informed, engaged and supportive of the T^3C.

8. Proposed surveys and assessment

As outlined throughout this NOI the collection and assessment of environmental data will form a vital component of the development and future operation of the T^3C. The information gathered during the surveys and assessments will be included in the Environmental Impact Statement (EIS) which is assumed will apply for this project

The scope of the surveys and assessments presented in this section has been designed with reference to the guidelines for the preparation of an Environmental Impact Statement prepared by the Northern Territory EPA for the Clarence Strait Tidal Energy Project.

Initial desktop ecological and oceanographic assessments will be completed to assist in further definition of the project and to inform the scope of detailed field surveys.

The desktop ecological survey will review available ecological information, bathymetric data and aerial photography (seagrass distribution and shallow reef habitats). The assessment will aim to collate existing information to provide a description of the biological communities and species of significance, important habitats and use, reef and macro benthic communities in the vicinity of the generator and cable areas, distribution and behaviour of vertebrates and distribution of seagrasses.

The desktop oceanographic assessment will review available oceanographic data (tides, currents, waves, meteorology, wave quality, geomorphology and ENSO variability) and existing hydrodynamic models of the region. The assessment will aim to collate existing information that could inform future development of hydrodynamic and sediment transport models.

The following detailed assessments are planned; however, the requirement for or scope of the assessments may be revised as information becomes available either through desktop assessments or preceding assessments.

8.1 Marine survey

A marine survey of the South Channel (and possibly surrounding channels) and cable route will be undertaken to provide baseline information to assess the potential environmental impacts of the project, to allow siting of the generator bays and to provide inputs to the engineering studies. The survey will include:

- Single beam echosoundings of selected habitat areas and along cable route. Depth measurements will be corrected to provide a Digital Elevation Model of the seabed for input to future hydrodynamic modelling.
- Sediment grab sampling with samples analysed for grain size. This will assist in habitat classification as well as providing input data for future sediment transport modelling.
- Sidescan sonar of selected areas to describe seabed structures, including potential generator bay placement areas and cable route. This will provide valuable information on seabed structures (for placement of generators) and bottom hardness (generators foundations and hydrodynamic modelling).

- Towed video surveys of selected transects to describe seabed structures, habitat types and community types.
- ROV surveys of selected sites to describe community composition and key biological features.
- Sled collection of selected sites to identify species and describe composition for ground-truthing larger spatial-scale ROV and towed video information. Sled samples will provide material for biomass measurements and samples for taxonomic analysis and assessment of epibenthic communities at generator bay sites.
- If required and practicable towed video and sidescan sonar surveys will be undertaken of seagrass beds.
- Marine mammal focal follow surveys and observations concurrent with other fieldwork. Given the need to monitor fine-scale behaviours, this work will be undertaken by experienced and qualified marine mammal observers.
- Fish and shark surveys may be undertaken using baited remote underwater video (BRUVS) placed on the seabed and in the water column.

8.2 Collision risk model

A collision risk model will be developed to assess the impact of the T^3C on fauna identified during marine surveys. It is intended that the model will be refined as further data is obtained during the operation of the T^3C.

The objectives of the collision risk model will be to:

- Build a foundational platform that could utilise additional information and learnings generated during operation of the T^3C.
- Assess the potential risk from the placement of generator bays in a stream flow.

All collision models operate from the basic aspect of determining the likelihood of interacting with the generator's swept space, and then determining the likely strike rate given this interaction. The latter component is a well-established, deterministic approach. It is the former aspect that raises difficulty for a tidal, or submarine, rotor. It is proposed to develop an agent-based collision risk model, rather than the more traditional average "flux" based approach used in most avian models because:

- Marine observations tend to be of "individuals." Even schools of fish are considered numerically as an individual school due to the highly correlated behaviours of the constituents.
- The marine environment has currents and channels more likely to dictate movement patterns than wind patterns dictate avian patterns.
- Scenarios can more easily be conceptualised by stakeholders than for averaged movements.
- Any existing telemetric tracking can be used to support the models.
- Complex corrections for detectability can be avoided, including assumptions such as homogeneity. (Homogenous utilisation is much less likely to be a valid explanation of activity on the scale of generators).

8.3 Marine noise

A marine noise assessment will be undertaken to assess the potential acoustic impact of the T^3C on species sensitive to marine noise (e.g. cetaceans). As the type of tidal generator (s) will not be known

prior to the assessment a 'worst case' approach will be taken in selecting the generator design to model for the assessment. The assessment will include:

- Estimation of the likely underwater ambient noise levels in the vicinity of the trial deployment based on existing data or levels from other locations with similar characteristics.
- Underwater acoustic propagation modelling to establish how sound levels are likely to vary with range from the source based on the sound spectra of the trial generator, bathymetry, seabed geology, water column properties, source spectrum.
- An assessment of the likely impacts of the resulting underwater sound levels on marine mammals.

Note: if no sound data for the selected generator is available an estimate of the likely underwater noise spectrum produced by the generator may be able to be calculated based on analogous device for which data can be obtained.

8.4 Marine heritage

A marine heritage assessment will be completed to assess the potential impact of the T^3C on known marine heritage in the region and identify the location of any items of marine heritage in the vicinity of the trial deployment. Sidescan sonar data collected during the marine surveys will be analysed by a specialist marine archaeologist to identify any potential heritage items in the vicinity of the generator bays. Data resolution will be a minimum of 10cm squares.

8.5 Current velocity measurements and generator impacts on flows

An Acoustic Doppler Current Profiler (ADCP) will be deployed in the South Channel for a period of approximately one month to establish the existing three dimensional tidal current fields and enable hydrodynamic modelling calibration. The deployment period is expected to be sufficient to capture the range of tidal flows in the area.

The wake effects of generators will be derived from empirically-derived drag law relationships and the ADCP current data to provide input into the preliminary downstream habitat impact assessments. Monitoring data from operation of different generator types will then be used to fine-tune these relationships and allow the develop of predictive algorithms that can be used to assess larger generator developments.

8.6 Terrestrial (onshore) flora and fauna assessment

A terrestrial flora and fauna assessment will be undertaken in the area proposed to locate the onshore infrastructure. The results of the surveys will be used to determine the location of the infrastructure which will be sited to minimise impacts. The survey area will include the cabling corridor from a shore crossing point and the overhead transmission line corridor and is expected to be sufficient to allow micro-siting of infrastructure.

The flora and fauna survey will use a meandering search technique to identify flora species, vegetation communities, fauna and fauna habitat present on the site. Threatened communities and species listed under the Northern Territories *Territory Parks and Wildlife Conservation Act* and the Commonwealth *Environmental Biodiversity and Conservation Act* will be identified. The requirement for any further surveys that may be required (and their timing) to identify listed threatened species

or species which are annuals or are difficult to identify at other times of the year will also be determined.

8.7 Terrestrial (onshore) heritage assessment

An indigenous and non-indigenous heritage assessment will be completed in the area proposed to locate the onshore infrastructure. The results of the surveys will be used to determine the location of the infrastructure which will be sited to minimise impacts. The survey area will include the cabling corridor from a shore crossing point and the overhead powerline corridor and is expected to be sufficient to allow micro-siting of infrastructure.

The survey assessment will include a desktop assessment to identify known heritage sites as well as a field survey. The field survey will consist of parallel pedestrian transects (20-30m apart) across the required area. Areas with a higher visibility and which have a higher potential for the presence of archaeological material will be targeted. Larrakeyah traditional owners will be given the opportunity to take part in the survey.

8.8 Preliminary geotechnical investigation (onshore)

A preliminary geotechnical survey of onshore locations where ground disturbing activities (e.g. cable trenching) will occur will be completed. The geotechnical investigation will include both a desktop and field assessment and will also include an assessment of Acid Sulphate Soils. Estimates will be derived of the quantity of acid sulphate soils requiring treatment or removal, and management plans will be developed.

9. References

Duncan, A., and Salgado-Kent C., 2009. Likely environmental impacts of underwater noise from a proposed tidal power generation turbine near Koolan Island, Western Australia. Curtin University, Centre for Marine Science and Technology: Unpublished Report C2009-03 for Atlantis Resources Corporation, January 2009

NT EPA, 2009. Guidelines for the Preparation of an Environmental Impact Statement – Clarence Strait Tidal Energy Project (http://www.ntepa.nt.gov.au/environmental-assessments/assessment/register/tenaxtidal)

NT EPA, 2013. Guide to the Environmental Impact Assessment Process in the Northern Territory (http://www.ntepa.nt.gov.au/__data/assets/pdf_file/0007/125944/Guide-to-EIA-Process-in-NT.pdf)

URS, 2008. Clarence Strait Tidal Energy Project NOI (http://www.ntepa.nt.gov.au/environmental-assessments/assessment/register/tenaxtidal)

Appendices

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A Flora and fauna species listed on the NTPWC Act and the EPBC Act potentially occurring within the T^3C site

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Species	Common Name	NTPWC Act	EPBC Act	Comments
Mammals				
Antechinus bellus	Fawn Antechinus	Endangered	Not Listed	Terrestrial species unlikely to be impacted
Balaenoptera musculus	Blue Whale	Data Deficient	Endangered	Further survey required
Conilurus penicillatus	Brush-tailed Rabbit-rat	Endangered	Vulnerable	Terrestrial species unlikely to be impacted
Dasyurus hallucatus	Northern Quoll	Critically Endangered	Endangered	Terrestrial species unlikely to be impacted
Megaptera novaeangliae	Humpback Whale	Not Listed	Vulnerable	Further survey required
Mesembriomys gouldii	Black-footed Tree-rat	Vulnerable	Not Listed	Terrestrial species unlikely to be impacted
Phascogale pirata	Northern Brush-tailed Phascogale	Endangered	Vulnerable	Terrestrial species unlikely to be impacted
Rattus tunneyi	Pale Field-rat	Vulnerable	Not Listed	Terrestrial species unlikely to be impacted
Saccolaimus saccolaimus nudicluniatus	Bare-rumped Sheathtail Bat	Not Listed	Critically Endangered	Terrestrial species unlikely to be impacted
Sminthopsis butleri	Butler`s Dunnart	Vulnerable	Vulnerable	Terrestrial species unlikely to be impacted
Trichosurus vulpecula	Common Brushtail Possum	Endangered	Not Listed	Terrestrial species unlikely to be impacted
Xeromys myoides	Water Mouse	Not Listed	Vulnerable	Terrestrial species unlikely to be impacted
Reptiles				
Acanthophis hawkei	Plains Death Adder	Vulnerable	Vulnerable	Terrestrial species unlikely to be impacted
Caretta caretta	Loggerhead Turtle	Vulnerable	Endangered	Further survey required
Chelonia mydas	Green Turtle	Not Listed	Vulnerable	Further survey required
Dermochelys coriacea	Leatherback Turtle	Critically Endangered	Endangered	Further survey required
Eretmochelys imbricata	Hawksbill Turtle	Vulnerable	Vulnerable	Further survey required

Lepidochelys olivacea	Olive Ridley Turtle	Vulnerable	Endangered	Further survey required
Natator depressus	Flatback Turtle	Not Listed	Vulnerable	Further survey required
Varanus mertensi	Mertens` Water Monitor	Vulnerable	Not Listed	Terrestrial species unlikely to be impacted
Varanus mitchelli	Mitchell`s Water Monitor	Vulnerable	Not Listed	Terrestrial species unlikely to be impacted
Varanus panoptes	Yellow-spotted Monitor	Vulnerable	Not Listed	Terrestrial species unlikely to be impacted
Fish				
Glyphis garricki	Northern River Shark,	Endangered	Endangered	Further survey required
Glyphis glyphis	Speartooth Shark	Vulnerable	Critically Endangered	Further survey required
Pristis clavata	Dwarf Sawfish	Vulnerable	Vulnerable	Further survey required
Pristis pristis	Largetooth Sawfish	Not Listed	Vulnerable	Further survey required
Pristis zijsron	Green Sawfish	Vulnerable	Vulnerable	Further survey required
Rhincodon typus	Whale Shark	Not Listed	Vulnerable	Further survey required
Birds				
Calidris canutus	Red Knot	Vulnerable	Not Listed	Unlikely to be impacted
Calidris ferruginea	Curlew Sandpiper	Vulnerable	Not Listed	Unlikely to be impacted
Calidris tenuirostris	Great Knot	Vulnerable	Not Listed	Unlikely to be impacted
Charadrius leschenaultii	Greater Sand Plover	Vulnerable	Not Listed	Unlikely to be impacted
Charadrius mongolus	Lesser Sand Plover	Vulnerable	Not Listed	Unlikely to be impacted
Epthianura crocea tunneyi	Yellow Chat (Alligator River)	Endangered	Endangered	Unlikely to be impacted
Erythrotriorchis radiatus	Red Goshawk	Vulnerable	Vulnerable	Unlikely to be impacted
Erythrura gouldiae	Gouldian Finch	Vulnerable	Endangered	Unlikely to be impacted

Falco hypoleucos	Grey Falcon	Vulnerable	Not Listed	Unlikely to be impacted
Fregata andrewsi	Christmas Island Frigatebird	Not Listed	Vulnerable	Unlikely to be impacted
Geophaps smithii smithii	Partridge Pigeon	Vulnerable	Vulnerable	Unlikely to be impacted
Limnodromus semipalmatus	Asian Dowitcher	Vulnerable	Not Listed	Unlikely to be impacted
Limosa lapponica	Bar-tailed Godwit	Vulnerable	Not Listed	Unlikely to be impacted
Melanodryas cucullata	Hooded Robin	Critically Endangered	Endangered	Unlikely to be impacted
Melanodryas cucullata melvillensis	Hooded Robin (Tiwi)	Critically Endangered	Endangered	Unlikely to be impacted
Mirafra javanica	Horsfield's Bushlark	Vulnerable	Not Listed	Unlikely to be impacted
Numenius madagascariensis	Eastern Curlew	Vulnerable	Not Listed	Unlikely to be impacted
Rostratula australis	Australian Painted Snipe	Vulnerable	Endangered	Unlikely to be impacted
Tyto novaehollandiae	Masked Owl	Endangered / Vulnerable	-	Unlikely to be impacted
Tyto novaehollandiae kimberli	Masked Owl (northern)	Vulnerable	Vulnerable	Unlikely to be impacted
Tyto novaehollandiae melvillensis	Masked Owl (Tiwi Islands)	Endangered	Endangered	Unlikely to be impacted
Insects				
Attacus wardi	Atlas Moth	Vulnerable	Not Listed	Unlikely to be impacted
Ogyris iphis doddi	Dodd's Azure Butterfly	Endangered	Not Listed	Unlikely to be impacted
Frogs				
Uperoleia daviesae	Howard Springs Toadlet	Vulnerable	Not Listed	Terrestrial / aquatic species unlikely to be

				impacted
Ferns				
Cephalomanes obscurum	Filmy Fern	Endangered	Not Listed	Further survey required
Cycads				
Cycas armstrongii	Armstrong`s Cycad	Vulnerable	Not Listed	Further survey required
Flowering Plants				
Calochilus caeruleus	Beard Orchid	Vulnerable	Not Listed	Further survey required
Crepidium marsupichila	Ground Orchid	Vulnerable	Not Listed	Further survey required
Dendromyza reinwardtiana	Dendromyza	Vulnerable	Not Listed	Further survey required
Elaeocarpus miegei	Blue Quandong	Critically Endangered	Not Listed	Further survey required
Endiandra limnophila	Native Walnut	Vulnerable	Not Listed	Further survey required
Freycinetia excelsa	Narrow Leaf Climbing Pandan	Vulnerable	Not Listed	Further survey required
Hoya australis subsp. oramicola	Tiwi Islands Waxflower	Vulnerable	Vulnerable	Further survey required
Luisia corrugate	Luisia Orchid	Vulnerable	Not Listed	Further survey required
Mitrella tiwiensis	Mitrella	Vulnerable	Vulnerable	Further survey required
Ptychosperma macarthurii	Darwin Palm	Endangered	Endangered	Further survey required
Stylidium ensatum	Trigger Plant	Endangered	Not Listed	Further survey required
Tarennoidea wallichii	Tarennoidea wallichii	Endangered	Not Listed	Further survey required
Thrixspermum congestum	Epiphytic Orchid	Vulnerable	Not Listed	Further survey required
Typhonium jonesii	Typhonium	Endangered	Endangered	Further survey required

Typhonium mirabile	Typhonium	Endangered	Endangered	Further survey required
Typhonium praetermissum	Typhonium.	Vulnerable	Not Listed	Further survey required
Typhonium taylori	Typhonium	Endangered	Endangered	Further survey required
Utricularia dunstaniae	Bladderwort	Vulnerable	Not Listed	Further survey required
Xylopia monosperma	Xylopia	Endangered	Endangered	Further survey required