Sassafras - Wesley Vale Irrigation Scheme Augmentation

Application Number: **01830** Commencement Date: **09/05/2023** Status: **Declared**

1. About the project

1.1 Project details

1.1.1 Project title *

Sassafras - Wesley Vale Irrigation Scheme Augmentation

1.1.2 Project industry type *

Water Management and Use

1.1.3 Project industry sub-type

Irrigation

1.1.4 Estimated start date *

01/07/2024

1.1.4 Estimated end date *

31/10/2127

1.2 Proposed Action details

1.2.1 Provide an overview of the proposed action, including all proposed activities. *

Project area and footprints

The Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA) proposed action is a linear project involving the installation of 102km of pipe, a pump station and access road, and a balance tank (Att_1_TI_SWISA Saggers Hill Loop Option Engineering Report). The proposed action area being referred is the design corridor. The design corridor is the land area around the pipeline alignment that has the potential to be impacted by the proposed action and it will contain the entire pipeline alignment and infrastructure. The final construction corridor alignment may be subject to realignment in latter planning phases up until construction, it will however be within the design corridor (and not meaningfully change in scale if the alignment changes). The design corridor is defined as a 50m buffer of the proposed pipeline (100m corridor area). The disturbance footprint is the construction corridor which is a nominal 15m buffer of the pipeline alignment (30m corridor). The construction corridor represents the maximum impact area likely to occur based on the requisite works area. The balance of the design corridor outside the construction corridor will not be impacted, i.e. this area will be avoided. Definitions can be found in the natural values assessment (Att_2_NBES_NVA-SWISA_report, sct1.3, pg2) and visualised on maps (Att_10_NBES_NVA-SWISA_Appendix_A_MapOfNaturalValues). Below is a summary of the land area within the disturbance and avoidance areas.

Design corridor

- 50m buffer of pipeline alignment – noting that the approval will cover potential alignment anywhere within the design corridor (notwithstanding exclusion areas, etc.), but the construction footprint will not change in scale/extent if it is required to change in alignment.
- 1036ha

Disturbance footprint (construction corridor)

- 15m buffer of pipeline alignment – taken for current purposes as buffer of notional centreline, but subject to realignment (within design corridor) if required for construction purposes, avoidance of values, landowner permissions, etc.
- 310ha (temporary impact – subject to rehabilitation once pipeline is installed)
  1.5ha (permanent impact from infrastructure: pump station, tank, and access road)

Avoidance area

- Balance of design corridor outside of disturbance footprint.
- 725ha

Background and Overview

The SWISA is a proposed redevelopment of the Sassafras Wesley Vale Irrigation Scheme (SWIS) (EPBC2010/5327). SWIS was developed by Tasmanian Irrigation (TI) and commenced operations in the 2011-12 irrigation season. Water is sourced from the Great Bend pump station and services an irrigation district between Devonport, Port Sorell, and Sassafras in northern Tasmania. For SWISA, TI proposes several upgrades to the SWIS infrastructure and a new trunkline to service new customers. The alignment will largely pass through private land with only 1km of the alignment passing through Warrawee Conservation Area (Att_2_NBES_NVA-SWISA_report, sct5.6 pg61). The remainder of the alignment is within private land except where is crosses public roads.

The proposed development comes with a significant understanding by TI of implementing and managing large-scale water delivery projects in environments with conservation significant values. With the existing SWIS scheme being developed within the framework of the Environment Protection and Biodiversity Conservation Act 1999 (EPBCA), TI have been able to successfully demonstrate that by implementing considered environmental management, planning and controls, natural values can co-exist and thrive within a working scheme like the one proposed.

The goal is to design the final alignment using historical knowledge, including learnings from previous SWIS project, detailed site investigations, and inputs from landowners, planning consultants and ecologists. At the time of referral submission, the project design has been through several iterations from the original concept design. The design changes have incorporated avoidance of natural values, planning advice, landowner feedback, and heritage advice. The construction methodology has also been designed to minimise impact. Att_30_TI_Overview map of SWISA redesign areas provides an overview of the original concept design versus current pipeline alignment with reasons for realignments detailed on the map.

The proposed pipeline network consists of approximately 102km of large diameter high-density polyethylene pipeline, with a design peak flow over a 150 day summer period to landholders in the irrigation area (Fig1, Att_2_NBES_NVA-SWISA_report, sct1.1, pg1), allowing TI to service the majority of properties that submitted an expression of interest. The scheme will thus allow for irrigation water to be provided to an estimated area of 20,000 ha with the infrastructure having a design lifespan of 100 years. Most of the augmentation falls within the existing Irrigation District and requires an amendment of the district by less than 10%. Water will be extracted from the Mersey River under license with surety of supply underpinned by a water purchasing agreement between Tasmania Irrigation and Hydro Tasmania. That agreement will ensure the delivery of up to 106ML per day, which accounts for transmission losses on the river.

Water will be extracted from the Mersey River at Great Bend Pump Station, moving through 3km of rising main to a 2.1ML, 23m diameter, 6m high tank located at Saggers Hill, which is directly west of Native Plains Road. Water is discharged from the tank and distributed through 102km of HDPE pipe; most of the scheme is gravity feed with a small 70kw pump station located directly below the tank on Native Plains Road; this pump station services the Sassafras line. Water distribution to properties is through 172 outlets proportioned across the irrigation district. These outlets range in size between 80mm and 300mm. Approximately 70 outlets are to be fitted with telemetry to manage daily flow and trade-ability.

Summary of Nature of Activities for Proposed Action

The works proposed will require excavation along the pipeline route, including some aquatic crossing points. Excavation in the form of trenching will occur only within the proposed construction corridor. Trenching width varies depending on the diameter of pipe required, ranging from 1m to 5m depending on whether it is a single trench or dual trench. The depth of the trench varies in depth, ranging from 1 m to 3.5 m, with an average depth of 1.5m. The indicative works area is provided in Att_2_NBES_NVA -SWISA_report, sct4, pg49- Fig6. This construction impact will be temporary and subject to rehabilitation once pipeline is installed.

Construction of the proposed action will include clearing of vegetation, trenching and pipeline installation and rehabilitation of the of the pipeline alignment. The time for the trenching, pipe laying and refill process usually takes 1-3 days along a ~400m section, and ground cover typically re-establishes within a month of the activity. Permanent structures to be installed include the Saggers Hill reservoir (including an access road) and Sassafras pump station (Att_2_NBES_NVA-SWISA_report, sct1.1, pg1). Access to the construction area will be via existing road network, no construction of access roads is required other than for the Saggers Hill reservoir. A map of the action area with the proposed alignment is provided in Att_2_NBES_NVA-SWISA_report, sct1.3, pg3- Fig1.

Activities associated with the proposed action have the potential to impact on MNES including Tasmanian wedge-tailed eagle (EN), swift parrot (CR), Tasmanian masked owl (VU), spotted-tail (VU) and eastern quoll (EN), Tasmanian devil (EN), green and gold frog (VU), central north burrowing crayfish (EN), and Tasmanian Forests and Woodlands dominated by black gum or Brookers gum (CR). Impact assessments of MNES are detailed in Att_17_NBES_NVA-SWISA_Appendix_H_MNES_SIA_Table and a summary of activity impacts are outlined below.

Vegetation clearing and excavation will potentially have an impact on MNES by reducing the area of occupancy, adversely affecting habitat critical to survival of the species, disrupting the breeding cycle, or interfere with the recovery of the species (Att_2_NBES_NVA-SWISA_report, Sctn4.3, pg51-57). The vast majority of the design corridor (96%) is within modified land units. The remaining 4% (36ha) is

native vegetation (Att_2_NBES_NVA-SWISA_report, sct3.1, pg12). 8.6ha of native vegetation is within the construction corridor (i.e. 1% of the construction corridor) and will be revegetated post construction (Att_2_NBES_NVA-SWISA_report, sct4.1, pg49-50). 1.5ha of modified vegetation will be permanently impacted by the proposed action.

The facilitated impacts such as noise and roadkill vary. It is not considered that noise will have a significant impact, however roadkill due to increased traffic on existing roads may have an impact on dasyurid MNES (Att_2_NBES_NVA-SWISA_report, sct4.3.4, pg54) by leading to a long-term decrease in the size of a population.

Facilitation of weed establishment and introduction of chytridiomycosis disease (via chytrid fungus) (Att_2_NBES_NVA-SWISA_report, Sctn3.5.1, pg41 and Sctn3.5.3, pg47) may impact central north burrowing crayfish and green and gold frog by causing species decline, and for the former, adversely affecting habitat critical to the survival of the species.

Farm Water Access Plans

Prior to water distribution, individual irrigators must meet with TI staff to confirm a Farm Water Access Plan (Farm WAP) area, to collect data such as water licenses and NVA records, and any existing farm plans. The Farm WAP process is completed by having prequalified consultants conduct soil and biodiversity assessments. The consultant then provides TI with the completed Farm WAP for quality assurance processes and is then verified by the irrigator (Att_3_TI_Farm_WAP_Fact_Sheet).

1.2.2 Is the project action part of a staged development or related to other actions or proposals in the region?

Yes

1.2.3 Is the proposed action the first stage of a staged development (or a larger project)?

No

1.2.4 Related referral(s)

EPBC Number	Project Title
2010/5327	Water Pipeline

1.2.5 Provide information about the staged development (or relevant larger project).

A response to this question is required. Your response must succinctly address any applicable sub points of the question and the requirements found in the 'More Guidance' section for this question. If necessary, additional information can be attached and referenced appropriately (e.g. Attachment file name, section, page number/s).

1.2.6 What Commonwealth or state legislation, planning frameworks or policy documents are relevant to the proposed action, and how are they relevant? *

According to the Significant Impact Guidelines1.1, the EPBC Act refers to the living things (including plants and animals), habitats and places that need protecting as 'matters of national environmental significance' (MNES). The proposed SWISA project interacts with two of the nine matters; listed threatened species and listed ecological communities, and listed migratory species (protected under international agreements). The impact the proposed action will have on relevant MNES have been assessed against the significant impact criteria as set out by the Significant Impact Guidelines 1.1.

The legislative and planning framework that governs the protection and management of Tasmania's environment and heritage has been considered in the planning and design of the SWISA. The relevant instruments are listed below and their relationship to the protection of matters listed on the EPBC Act are outlined in Att_4_NBES_Legislation_Summary.

The project will not require assessment as a project of State significance or via the major projects planning pathway. However, the project will need to meet the requirements of various State Acts, including the *Tasmanian Water Management Act 1999, Threatened Species Protection Act 1995* and the *Nature Conservation Act 2002*. The purpose of the latter two acts is to provide for the protection and management of threatened native flora and fauna and to enable and promote the conservation of native flora and fauna. Under these acts, the crown can issue a 'permit to take' a threatened species or the product of a threatened species (e.g. a possible burrow) for the planned activity, with mitigation and offset requirements determined by the nature of the proposed impact.

Tasmanian *Water Management Act 1999*

Water License (Part 6, Section 54)

Dam Permit (Part 8, Section 146)

Water Entity Status (Part 9, Section 166)

Irrigation District (Part 9, Section 176)

Tasmanian *Irrigation Clauses Act 1973*

Power to Grant Irrigation Rights (Section 23)

Tasmanian *Land Use and Planning Approvals Act 1993*

Development Application

Tasmanian *Threatened Species Protection Act 1995**

Permit to Take (Flora and Fauna)

Tasmanian *Nature Conservation Act 2002**

Permit to Take (Products of Wildlife)

Tasmanian *Forest Practices Act 1985*

Application for Certification of Forest Practices Plan (Part 3, Section 18)

Tasmanian *Aboriginal Lands Act 1995*

Land Vested in Council (Part 3, Section 27), Local Management of Certain Areas (Part 3, Section 31)

Tasmanian *Aboriginal Relics Act 1975*

Permit to Take, Destroy, Conceal, or Remove.

Tasmanian *Biosecurity Act 2019*

Weed Management Plan

Tasmanian *Crown Land Act 1976*

Works Permit

Tasmanian Planning Scheme

Planning Permit

1.2.7 Describe any public consultation that has been, is being or will be undertaken regarding the project area, including with Indigenous stakeholders. Attach any completed consultation documentations, if relevant. *

Tasmanian Irrigation has completed extensive consultation regarding the SWISA. The consultation process is detailed in Att_5_TI_Community_consultation_Summary. Public consultation has been on-going for the past 3 years. The project consultation commenced in 2019 and a Business Case was submitted to the Tasmanian Irrigation board in November 2022.

Community consultation

As SWIS is an existing scheme, an irrigator representative committee (IRC) was already in operation to represent the interests of the participating and new irrigators of the SWISA scheme. Meetings with individual landowners, the IRC as a whole and other interested parties are held as required. During the development of the scheme design, the IRC met formally several times. In addition, numerous site meetings with individuals have occurred to ensure that any issues of concern were considered in the scheme design.

Since 2020, TI has produced community newsletters providing information relating to the scheme design progress. These newsletters were either mailed or emailed to landowners in possession of approx. 287 parcels of land and 140 interested parties. Newsletters are available on Tasmanian Irrigation's website (http://www.tasmanianirrigation.com.au). In addition, the local community newspaper has run a number of articles on the scheme. The SWISA scheme has been the subject of a number of Local ABC radio and television interviews and has also been discussed in a general context for the past 3 years.

Directly after the official 'Preferred Option launch' on the 17th of November 2021, a six-week period of public consultation was provided ending on the 4th of January 2022. This was used to capture landowner feedback and concerns about the project and to seek out ways to better understand what is required from the scheme. To support this period, TI advertised the schemes preferred option in the Tas Country

and Advocate Newspapers, it was posted on the TI Website and physical information and feedback forms were placed at high traffic locations in the community district. In general, the scheme was positively received, with 39 direct enquiries captured (Att_6_TI_SWISA Public consultation and design Summary).

The preferred option public consultation was relatively straightforward, with most people accepting of the scheme and see the value in its implementation. During this period no major complaints were made which could inhibit the progression of the project from a social, environmental or economic perspective.

Overall, it was identified that the scheme would benefit from a long-term approach for the entire irrigation district, with a focus not only how to provide the stated volume of water proposed now but more broadly to develop a plan to ensure increasing capacity in twenty years avoids repeating the entire scheme again. Public consultation is a fundamental aspect of the SWISA Project and consultation is planned to be undertaken throughout the life of the schemes development to increase the likelihood of the schemes success.

Local government consultation

No direct presentations to council have been made, however both Latrobe/Kentish and Devonport Councils' planning offices have been made aware of the project and understand that Development Application documentation will follow.

State government consultation

Tasmanian Irrigation has engaged closely with the Tasmanian Department of Natural Resources and Environment Tasmanian (NRE) to ensure appropriate surveys are undertaken relating to the environment, heritage, and water. The Business Case for the scheme has been assessed by NRE and the Treasury Department of the Tasmanian government. The natural values assessment reports for this project have been comprehensively reviewed and proposed avoidance and mitigation strategies supported by the Conservation Assessments branch of NRE (Att_31_TI_Correspondence_from_NRE_Natural_Values_Feedback_SWISA).

Tasmanian Irrigation has consulted and been supported by both State and Federal Members of Parliament as the scheme proposal has been progressed.

Traditional landowner consultation

Following an examination of alignment options, and the development of an initial preferred option, Aboriginal heritage surveys and consultation with the Aboriginal community were progressed.

Indigenous stakeholder engagement to date is outlined in the SWISA Aboriginal Heritage Assessment Report (04/07/2023). The report is provided in Att_7_SWISA_Aboriginal_Heritage_Assessment_Report. This document contains sensitive information and must be withheld from publication for cultural sensitivity reasons.

Indigenous stakeholder bodies that are being consulted include the regulator; Aboriginal Heritage Tasmania (AHT), and various Aboriginal community representative groups including the Aboriginal Heritage Council. Consultation with the Aboriginal community includes the involvement of an Aboriginal Heritage Officer in both the identification of artefacts and the completion of any on-ground survey work.

1.3.1 Identity: Referring party

Privacy Notice:

Personal information means information or an opinion about an identified individual, or an individual who is reasonably identifiable.

By completing and submitting this form, you consent to the collection of all personal information contained in this form. If you are providing the personal information of other individuals in this form, please ensure you have their consent before doing so.

The Department of Climate Change, Energy, the Environment and Water (the department) collects your personal information (as defined by the Privacy Act 1988) through this platform for the purposes of enabling the department to consider your submission and contact you in relation to your submission. If you fail to provide some or all of the personal information requested on this platform (name and email address), the department will be unable to contact you to seek further information (if required) and subsequently may impact the consideration given to your submission.

Personal information may be disclosed to other Australian government agencies, persons or organisations where necessary for the above purposes, provided the disclosure is consistent with relevant laws, in particular the Privacy Act 1988 (Privacy Act). Your personal information will be used and stored in accordance with the Australian Privacy Principles.

See our Privacy Policy to learn more about accessing or correcting personal information or making a complaint. Alternatively, email us at privacy@awe.gov.au.

☑ **Confirm that you have read and understand this Privacy Notice ***

1.3.1.1 Is Referring party an organisation or business? *

Yes

Referring party organisation details	
ABN/ACN	32641893352
Organisation name	NORTH BARKER ECOSYSTEM SERVICES PTY LTD
Organisation address	313 Macquarie St, Hobart, 7000, TAS

Referring party details	
Name	Grant Daniels
Job title	Managing Director
Phone	0262319788
Email	admin@northbarker.com.au
Address	313 Macquarie Street, Hobart, TAS 7000

1.3.2 Identity: Person proposing to take the action

1.3.2.1 Are the Person proposing to take the action details the same as the Referring party details? *

No

1.3.2.2 Is Person proposing to take the action an organisation or business? *

Yes

Person proposing to take the action organisation details	
ABN/ACN	95722799075
Organisation name	Tasmanian Irrigation Pty Ltd
Organisation address	201 Evandale Road, Western Junction, Tasmania, 7212

Person proposing to take the action details	
Name	Sophie Grace
Job title	General Manager – Environmental, Health and Safety
Phone	(03) 6398 8433
Email	sophie.grace@tasirrigation.com.au
Address	Level 2, Launceston Airport, 201 Evandale Road, Western Junction, Tasmania, 7212

1.3.2.14 Are you proposing the action as part of a Joint Venture? *

No

1.3.2.15 Are you proposing the action as part of a Trust? *

No

1.3.2.17 Describe the Person proposing the action's history of responsible environmental management including details of any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against the Person proposing to take the action. *

TI has a satisfactory record of responsible environmental management. TI has gained approval to construct seventeen irrigation schemes under the EPBC Act and are operating in accordance with the approvals and the manner specified in referral in the case of not controlled actions. TI has not had any fines or notices issued to it under any Commonwealth or Tasmanian environmental legislation during this time.

There has been no past or present proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources against the person proposing to take the action.

TI schemes are designed and operated in accordance with its environmental policy. The environmental policy is underpinned by internally developed Environmental Protection Requirements (EPRs), construction audit protocols, the Farm Water Access Planning Framework, and a Landscape Monitoring Program.

Previous submissions made by TI (Name of Proposal and EPBC Act No):

- Sassafras-Wesley Vale Irrigation Scheme (EPBC 2010/5327) - Controlling provision with conditions ***(Controlled action)***
- Whitemore Irrigation Scheme (EPBC 2010/5335) - Not a controlled action provided undertaken in a particular manner
- Headquarters Road Irrigation Scheme (EPBC 2010/5305) - Not a controlled action
- Winnaleah Irrigation Scheme (EPBC 2011/5798) - Not a controlled action provided undertaken in a particular manner
- Kindred North Motton Irrigation Scheme (EPBC 2012/6401) - Not a controlled action provided undertaken in a particular manner
- Upper Ringarooma Irrigation Scheme (EPBC 2013/6787) - Not a controlled action provided undertaken in a particular manner
- South East Irrigation Scheme (EPBC 2013/6843) - Not a controlled action provided undertaken in a particular manner
- Dial Blythe Irrigation Scheme (EPBC 2013/7058) - Not a controlled action
- Southern Highlands Irrigation Scheme (EPBC 2015/7491) - Not a controlled action
- Swan Valley Irrigation Scheme (EPBC 2015/7560) - Not a controlled action
- Lower South Esk Irrigation Scheme (Strategic Assessment Midlands Water Scheme) - Strategic Assessment
- Arthurs Pipeline Irrigation Scheme (Strategic Assessment Midlands Water Scheme) - Strategic Assessment
- Duck Irrigation Scheme (EPBC 2016/7778) - Not a controlled action
- North Esk Irrigation Scheme (EPBC 2017/7936) - Not a controlled action
- Scottsdale Irrigation Scheme (EPBC 2017/7981) - Not a controlled action provided undertaken in a particular manner
- Northern Midlands Irrigation Scheme (EPBC 2022/09295) – Currently under assessment

1.3.2.18 If the person proposing to take the action is a corporation, provide details of the corporation's environmental policy and planning framework

TI's Environment Team is responsible for ensuring the Company develops and operates irrigation schemes that are environmentally sustainable, monitors environmental compliance obligations, supports regulatory approval processes, and promotes sustainability and environmental awareness within the organisation.

TI implements a range of procedures to ensure all activities undertaken meet environmental statutory requirements and are conducted in an environmentally responsible manner (See Att_8_TI_Environmental Management Processes).

The Company reports that in 2020/21, all monitoring programs found no discernible impacts from Tasmanian Irrigation operations, no incidents of environmental harm were recorded and no listed aquatic weeds were detected in TI's storages.

An algal bloom occurred in the TI managed Craigbourne Dam which resulted in its closure for recreational use. The bloom was closely monitored by TI staff throughout its duration. There was no discernible impact on the Coal River or South East irrigators. The Dam was reopened for recreational use in May 2021.

In accordance with State and Federal approvals, surveys continued across schemes for the presence of native and pest fish, aquatic habitat quality for burrowing crayfish and giant freshwater crayfish, progress of rehabilitation, and to detect any erosion impacts from water releases into receiving waterways. All surveys show minimal impact from TI activities.

TI understands that its environmental obligations extend beyond development of schemes to include their enduring impacts once operating. It is a requirement that water from schemes developed by TI may be applied on farm only in accordance with a completed Farm Water Access Plan (Farm WAP). Farm WAPs contain water, soil and biodiversity modules to ensure that the application of water accords with

modern sustainability principles (Att_3_TI_Farm_WAP_Fact_Sheet).

TI is committed to providing best-practice environmental policy and planning framework. TI's Environment Team has developed Operational Environmental Management Plans (OEMP) for all operational schemes (Att_33_TI_Operational Environmental Management Plan). Phase one of the project involved auditing all schemes and gauging each Scheme Operators understanding of environmental requirements. The next phase involved the preparation of an overarching OEMP handbook with sections on weed and pest management, chemical handling and storage, water quality monitoring, biosecurity and maintaining water license data records, and scheme specific coversheets with detailed requirements particular to each scheme. The third phase involved the formal training of all operators on the requirements of the plans, which is scheduled to be completed prior to the next irrigation season. An annual review of the handbook and scheme-specific coversheets will be undertaken.

1.3.3 Identity: Proposed designated proponent

1.3.3.1 Are the Proposed designated proponent details the same as the Person proposing to take the action? *

Yes

Proposed designated proponent organisation details

ABN/ACN	95722799075
Organisation name	Tasmanian Irrigation Pty Ltd
Organisation address	201 Evandale Road, Western Junction, Tasmania, 7212

Proposed designated proponent details

Name	Sophie Grace
Job title	General Manager – Environmental, Health and Safety
Phone	(03) 6398 8433
Email	sophie.grace@tasirrigation.com.au
Address	Level 2, Launceston Airport, 201 Evandale Road, Western Junction, Tasmania, 7212

1.3.4 Identity: Summary of allocation

Confirmed Referring party's identity

The Referring party is the person preparing the information in this referral.

ABN/ACN	32641893352
Organisation name	NORTH BARKER ECOSYSTEM SERVICES PTY LTD
Organisation address	313 Macquarie St, Hobart, 7000, TAS
Representative's name	Grant Daniels
Representative's job title	Managing Director
Phone	0262319788

Email	admin@northbarker.com.au
Address	313 Macquarie Street, Hobart, TAS 7000

Confirmed Person proposing to take the action's identity

The Person proposing to take the action is the individual, business, government agency or trustee that will be responsible for the proposed action.

ABN/ACN	95722799075
Organisation name	Tasmanian Irrigation Pty Ltd
Organisation address	201 Evandale Road, Western Junction, Tasmania, 7212
Representative's name	Sophie Grace
Representative's job title	General Manager – Environmental, Health and Safety
Phone	(03) 6398 8433
Email	sophie.grace@tasirrigation.com.au
Address	Level 2, Launceston Airport, 201 Evandale Road, Western Junction, Tasmania, 7212

Confirmed Proposed designated proponent's identity

The Person proposing to take the action is the individual or organisation proposed to be responsible for meeting the requirements of the EPBC Act during the assessment process, if the Minister decides that this project is a controlled action.

Same as Person proposing to take the action information.

1.4 Payment details: Payment exemption and fee waiver

1.4.1 Do you qualify for an exemption from fees under EPBC Regulation 5.23 (1) (a)? *

No

1.4.3 Have you applied for or been granted a waiver for full or partial fees under Regulation 5.21A? *

No

1.4.5 Are you going to apply for a waiver of full or partial fees under EPBC Regulation 5.21A?

No

1.4.7 Has the department issued you with a credit note? *

No

1.4.9 Would you like to add a purchase order number to your invoice? *

No

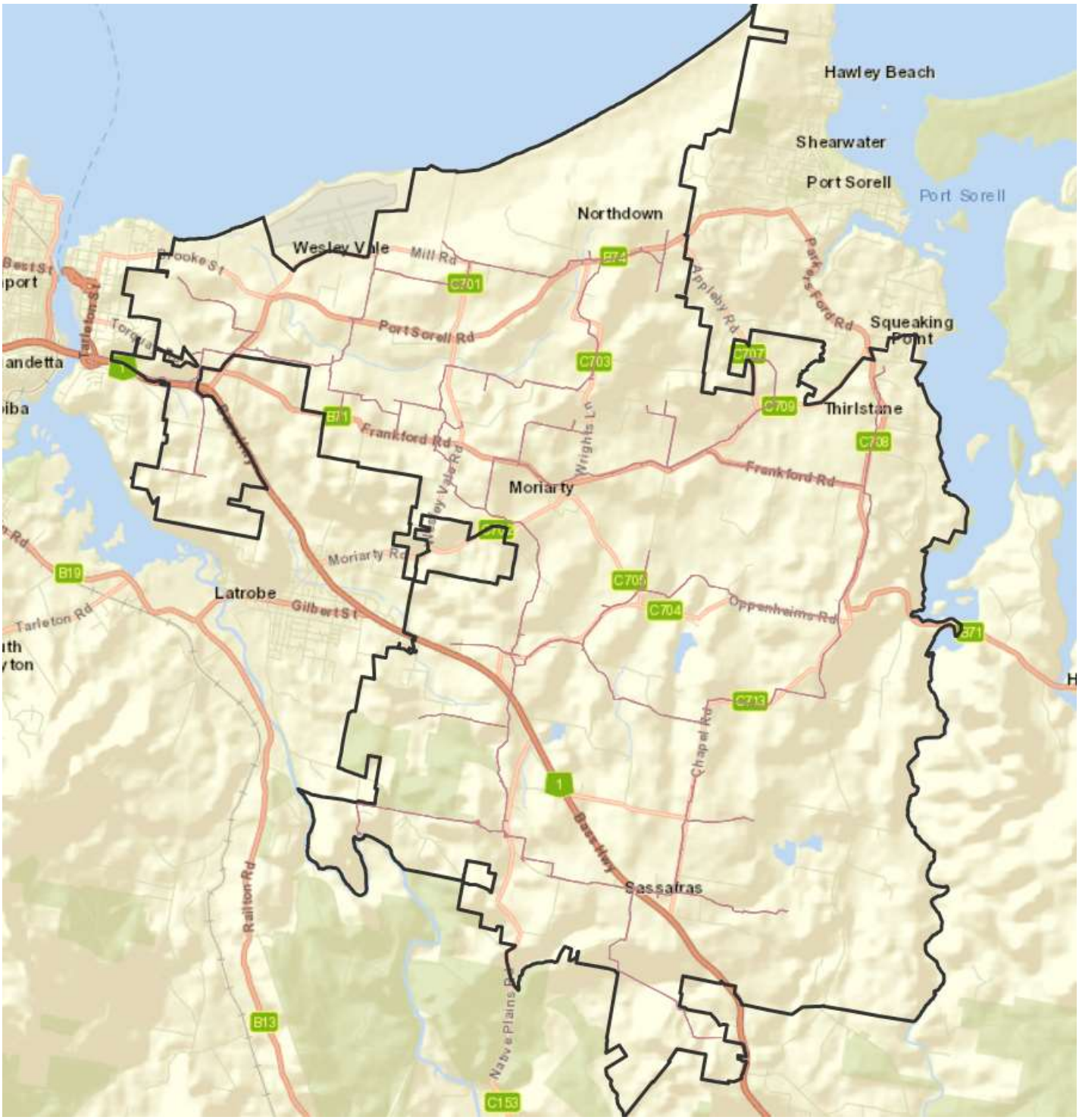
1.4 Payment details: Payment allocation

1.4.11 Who would you like to allocate as the entity responsible for payment? *

Person proposing to take the action

2. Location

2.1 Project footprint


Hawley Beach
Shearwater
Port Sorell
Port Sorell
Northdown
Wesley Vale
Mill Rd
C701
C704
Brooke St
Port Sorell Rd
C703
Appleby Rd
Parkes Ford Rd
Squeaking Point
C707
C709
Thirlstane
C738
Frankford Rd
Wrights Ln
Moriarty
Moriarty Rd
B71
B19
Latrobe
Gilbert St
Tarleton Rd
C706
C704
Oppenheims Rd
371
C713
Chapel Rd
1
Bass Hwy
Sassafras
Railton Rd
B13
Nabs Plains Rd
C153

2.2 Footprint details

2.2.1 What is the address of the proposed action? *

Latrobe Council region - between Devonport and Port Sorell, and as far south as Sassafras

2.2.2 Where is the primary jurisdiction of the proposed action? *

Tasmania

2.2.3 Is there a secondary jurisdiction for this proposed action? *

No

2.2.5 What is the tenure of the action area relevant to the project area? *

The majority of the proposal area is classified as 'private freehold' with large agricultural production areas occurring alongside small patches of remnant native vegetation. The proposal area passes through land zoned 'Permanent Timber Production' in the southern area from the Great Bend Pump Station on the Mersey River. This land is owned by Forico Pty Ltd and is used for private timber production. The proposal also passes through the Warrawee Conservation Area reserved under the Tasmanian *Nature Conservation Act 2002* and managed by Tasmanian Parks and Wildlife Service.

3. Existing environment

3.1 Physical description

3.1.1 Describe the current condition of the project area's environment.

The scheme covers the Sassafras, Harford, Thirlstane, Moriarty, Wesley Vale, Northdown, Pardoe and East Devonport areas in northern Tasmania. The pipeline alignment largely occurs within private land and broadly follows Pardoe Creek and Panatana Rivulet south-east of Devonport to Knights Creek south of Sassafras.

The surrounding land cover along the route is predominantly non-forest agricultural land with small patches of remnant native vegetation. The only significant area of plantation and native forest through which the pipeline route passes is from the Great Bend pump station on the Mersey River.

Vegetation

The majority of the pipeline (94 %) traverses extensive areas of agricultural land predominantly used for vegetable crops, dairy and cattle farming, with a further 2 % is covered by other modified land classes (i.e. non-native vegetation units such as urban miscellaneous development). Small remnants of native vegetation exist within this agricultural matrix, with the edges abutting some larger native forest areas in some areas.

Ground field surveys conducted on February 14th -17th 2023 revealed eight native TASVEG 4.0 communities occur within the project area, with most of these native patches in poor condition and representing poor habitat quality due to their small area surrounded by a matrix of agricultural paddocks. Stock grazing is frequent within many native vegetation patches on account of the land tenure and agricultural land use.

The project area supports the following TASVEG native vegetation mapping units (Att_2_NBES_NVA-SWISA_report, sct3.1, pg14)

- *Eucalyptus amygdalina* coastal forest and woodland (DAC)
- *Eucalyptus amygdalina* forest on mudstone (DAM)
- *Eucalyptus obliqua* dry forest (DOB)
- *Eucalyptus ovata* forest and woodland (DOV)
- *Eucalyptus amygdalina- Eucalyptus obliqua* damp sclerophyll forest (DSC)
- *Melaleuca ericifolia* swamp forest (NME)
- *Eucalyptus obliqua* forest with broad-leaf shrubs (WOB)
- *Eucalyptus obliqua* forest over *Leptospermum* (WOL)

In addition to the dominant human land uses and the sparse remnant native vegetation, one of the major limitations on the condition and habitat quality of the surrounding terrestrial environment is the presence of weeds. Although many of the taxa of introduced plants recorded during the ecological assessments for this proposal are widespread species with limited capacity to displace natives, twelve taxa classified as declared weeds under the Tasmanian *Biosecurity Act 2019* were observed within the study area:

Declared weeds

- Fennel (*Foeniculum vulgare*)
- Holly (*Ilex aquifolium*)
- Perforated St Johns wort (*Hypericum perforatum* subsp. *veronense*)
- Ragwort (*Senecio jacobaea*)
- Spanish heath (*Erica lusitanica*)
- Winged thistle (*Carduus tenuiflorus*)

Weeds of National Signifcance

- African boxthorn (*Lycium ferocissimum*)
- Blackberry (*Rubus fruticosus* aggregate)
- Crack willow (*Salix X fragilis* var. *fragilis*)
- English broom (*Cytisus scoparius*)
- Gorse (*Ulex europaeus*)
- Montpellier broom (*Genista monspessulana*)

An additional declared weed species is known from the area though not recorded during surveys (suggesting it has been removed with targeted control or is at very low density). Declared weeds are summarised in Att_2_NBES_NVA-SWISA_report, sct3.5.1, pg41-46.

Several more species of declared and environmental weeds are found at the municipal level, although there are high level weed strategies in place contributing to targeted control in many areas.

Other introduced species

According to the Tasmanian Natural Values Atlas, in addition to weeds, other introduced species known to occur within the irrigation district include feral cat *Felis catus*, European rabbit *Oryctolagus cuniculus,* brown hare *Lepus capensis*, various birds and ubiquitous rodents.

Pathogens

According to the Tasmanian Natural Values Atlas, root rot (*Phytophthora cinnamomi* [PC]) is within the altitudinal and rainfall range and there are five previous records of PC within 5 km of the action area, last recorded in 2017. None of those records are within the irrigation district and no symptomatic evidence of this pathogen was noted during ecological assessments. There is very limited PC susceptive vegetation within the project area.

Chytrid fungus (*Batrachochytrium dendrobatidis*) causes the infectious disease chytridiomycosis, which is affecting amphibians worldwide, including Tasmania. The spread of the pathogen is likely to be promoted by human activity and in Tasmania has been associated with gravel roads near water bodies. One record (2004) of Chytrid fungus from near Hawley Beach is known from within five kilometres of the project area. It can be expected to be present within the irrigation district. With hygiene measures in place, the proposal is unlikely to further contribute to the proliferation of this fungus.

The Devil Facial Tumour Disease (DTFD) - The occurrence of DTFD is documented throughout northern Tasmania according to the most recent distribution maps (see Att_9_DFTD_distribution). The scope of the proposal will not conceivably cause further spread or virility of this disease within the Tasmanian devil population.

Toxoplasmosis – *Toxoplasmosis gondii* is a parasite that has been reported to be a cause of morbidity and mortality in marsupials. Impacts of toxoplasmosis on marsupials can include blindness, ataxia, incoordination, head tilt, and limb paralysis. Cats are a common host of this parasite, although it is thought that all endothermic vertebrates are capable of acting as hosts. It is likely that it is present throughout the irrigation district as feral cats are effectively ubiquitous in such environments, however the proposed actions are unlikely to cause the further spread of the parasite nor vectors.

Zoning

Most of the project area design corridor is zoned agricultural (91 % design corridor area), with minor areas including rural (3 %), utilities (3 %), general industrial (1 %), environmental management (Att_32_TI_SWISA_Planning Zones). No changes to zoning are currently proposed nor are likely to be. The project is subject to a development application with the relevant State planning authorities.

The project will utilise the existing road infrastructure in the Sassafras-Wesley Vale area for transportation during all phases of the project. Depending on the location within the project area, these roads will vary from national highways to significant state roads, sealed and unsealed local government roads, and private roads, driveways, and access tracks of varying construction.

During the development stage, plant and materials will be moved via road to the construction area using heavy vehicles of varying types and GMVs. The exact natures and quantities of construction vehicles will be determined by the construction contractor, when selected, however experience from similar projects indicates that lengths of large diameter HPDE pipe and plant will likely need to be moved using a combination of heavy combination and heavy rigid vehicles. Personnel and smaller materials will also likely be moving through the construction area in standard light utility vehicles, e.g. SUVs and Utes, during this phase.

In the completion phase, most heavy vehicle movements should cease, as there should be limited-to-no requirement for any further large scale construction materials or plant. Vehicle movements throughout the project area should be limited to light utility vehicles transporting personnel across the project area to conduct commissioning testing.

Once the scheme is commissioned and reaches the full operational phase, vehicle movements should be limited to a single light utility vehicle operating in the scheme area on an as-needs basis, carrying a single, locally based operator to conduct routine and emergency maintenance on scheme assets. Increased frequency or larger weight vehicle movements would only occur during large-scale emergency or routine maintenance – something that should occur only a few times in the 100-year life of the project.

At all phases, vehicle movements will be predominantly during daylight hours and in accordance with relevant state road laws. The project will only cause an appreciable increase in traffic volume during the development phase, and this increase will likely only be noticeable on minor roads that are otherwise used predominantly by residents.

3.1.2 Describe any existing or proposed uses for the project area.

The proposed action area is predominantly used for agricultural activities including meat production, vegetable and cereal cropping, stone fruits and fodder, as well as dry-land grazing. Private production timber plantations occur south of the action area. The Mersey River, west of the action area, is a popular trout fishing stream holding brown and rainbow trout and other recreational activities. The Warrawee Conservation Area is a popular mountain biking, bushwalking, and fauna spotting destination.

The pipeline crosses under the Bass Highway, a major highway that connects Burnie, Devonport and Launceston and beyond.

There are several townships of various populations located within the irrigation district, including East Devonport, Bellfield, Wesley Vale, Latrobe, Moriarty, Thirlstane, Harford and Sassafras. These towns are mostly small rural communities built around the large agricultural production within the area.

3.1.3 Describe any outstanding natural features and/or any other important or unique values that applies to the project area.

Eight hectares of the proposed action area is located within the Warrawee Conservation Area Reserve. This reserve has been declared under the Tasmanian *Nature Conservation Act 2002* and is managed by the Tasmanian Parks and Wildlife Service under the Tasmanian *National Parks and Reserves Management Act 2002*. This area is used for nature recreation including mountain biking, bushwalking, and fauna viewing.

No other outstanding natural features or unique values are relevant to the project area outside the relevant flora and fauna listed in Section 3.2 of this referral.

3.1.4 Describe the gradient (or depth range if action is to be taken in a marine area) relevant to the project area.

Elevation in the proposed action area ranges from 10 m to 170 m above sea level. The proposal does not take place within any marine environments.

3.2 Flora and fauna

3.2.1 Describe the flora and fauna within the affected area and attach any investigations of surveys if applicable.

A baseline natural values assessment of the proposed alignment was undertaken between February and May 2023 and is attached for reference:

- Att_2_NBES_NVA-SWISA_report
- Att_10_NBES_NVA-SWISA_Appendix_A_MapOf Natural Values
- Att_11_NBES_NVA-SWISA_Appendix_B_PlantSpeciesList
- Att_12_NBES_NVA-SWISA_Appendix_C_ThreatenedFlora500m
- Att_13_NBES_NVA-SWISA_Appendix_D_PreliminaryNVAReport&ClarificationOfC. tonelliiDistribution
- Att_15_NBES_NVA-SWISA_Appendix_F_EagleNestVisibility
- Att_16_NBES_NVA-SWISA_Appendix_G_MNES_Table
- Att_17_NBES_NVA-SWISA_Appendix_H_MNES_SIA_Table
- Att_18_NBES_NVA-SWISA_Appendix_I_MNES_Maps_Vegetation
- Att_19_NBES_NVA-SWISA_Appendix_J_MNES_Maps_Fauna
- Att_20_NBES_NVA-SWISA_Appendix_K_MNES_Maps_Flora
- Att_21_NBES_NVA-SWISA_Appendix_L_MNES_Maps_Migratory & Marine

A total of 148 vascular plant species were recorded during field surveys (Att_11_NBES_NVA-SWISA_Appendix_B_PlantSpeciesList, Appendix. B to NVA report).

The following TASVEG native vegetation mapping units have been identified within the alignment areas (Att_2_NBES_NVA-SWISA_report, sct3.1, pg14, Att_10_NBES_NVA-SWISA_Appendix_A_MapOf Natural Values)

Dry eucalypt forest and woodland

- DAC: *Eucalyptus amygdalina* coastal forest and woodland
- DAM: *Eucalyptus amygdalina* forest on mudstone
- DOB: *Eucalyptus obliqua* dry forest
- DOV: *Eucalyptus ovata* forest and woodland
- DSC: *Eucalyptus amygdalina – Eucalyptus obliqua* damp sclerophyll forest

Non-eucalypt forest and woodland

- NME: *Melaleuca ericifolia* swamp forest

Wet eucalypt forest and woodland

- WOB: *Eucalyptus obliqua* forest with broad-leaf shrubs
- WOL: *Eucalyptus obliqua* forest over *Leptospermum*

Of these TASVEG communities, DOV and NME constitute threatened communities under the Tasmanian *Nature Conservation Act 2002*. None are wholly listed threatened communities under the EPBCA, however if certain condition thresholds are met, DOV can qualify for listing as the critically endangered Tasmanian forests and woodlands dominated by black gum or Brookers gum (*Eucalyptus ovata* / *E. brookeriana*). DOV will be further assessed against EPBCA listing criteria if at risk of impacts but preliminary indications from the baseline assessment is that the patches will not qualify under the EPBCA.

Threatened flora

- *Persicaria decipiens* (TSPA vulnerable) was recorded at 30 locations along the northern half of the project area through agricultural land (Att_2_NBES_NVA-SWISA_report, sct3.2, pg26). This species occurs in wet to damp sites including dam margins, creek margins, drainage ditches, damp paddock areas and ephemeral soaks. The number of plants recorded at each location ranged from single plants to locally abundant in large numbers. The total area of plants recorded is approximately 1490 sqm in 30 locations.
- *Caladenia tonellii* (TSPA endangered / EPBCA critically endangered) was recorded within the in the vicinity of the pipeline alignment during field surveys in November 2022 (Att_13_NBES_NVA-SWISA_Appendix_D_PreliminaryNVAReport&ClarificationOfC.tonelliiDistribution, pg11). As a result of the findings, the proposed pipeline was realigned to avoid the *C. tonelli* population (and thus the existing pipeline at the general location) to be adjacent to Devil Road. The closest past record of *C. tonelii* (recorded in 2006) is attributed to 20 m from the edge of the proposed design corridor, albeit with spatial accuracy of 100 m, which could mean the earlier occurrence was in the design corridor- nonetheless, this area (and spatial radius) was included in the targeted search and not found to support any plants.

Weeds

Several declared weed species are present in the action area (as observed during field surveys): African boxthorn (*Lycium ferocissimum),* blackberry (*Rubus fruticosus*), crack willow (*Salix X fragilis* var. *fragilis*), gorse (*Ulex europaeus*), English broom (*Cytisus scoparius*), fennel (*Foeniculum vulgare*), holly (*Ilex aquifolium*), Montpellier broom (*Genista monspessulana*), perfolated St Johns wort (*Hypericum perforatum* subsp. *veronense*), ragwort (*Senecio jacobaea*) and winged thistle (*Carduus tenuiflorus*) (Att_2_NBES_NVA-SWISA_report, sct3.5.1, pg41-47).

Fauna (Att_2_NBES_NVA-SWISA_report, sct3.3, pg27-40)

Evidence of 6 threatened fauna species was detected as a consequence of the field surveys from within the project area:

- *Litoria raniformis* (Green and gold frog): Four sightings of green and gold frogs were recorded at three locations within the action area. More than 80 sites (a total of 8.6 ha) of potentially suitable breeding habitat were recorded within the action area mostly in farm dams and drainage ditches (Att_2_NBES_NVA-SWISA_report, sct3.3.1, page 27). Dispersal habitat for green and gold frogs includes aquatic corridors, open ground, and native vegetation; given the high number of water bodies within the irrigation district, the whole action area can be considered to be dispersal habitat. This will require management procedures and targeted avoidance of breeding habitat.
- *Aquila audax fleayi* (Tasmanian wedge-tailed eagle), *Haliaeetus leucogaster* (white-bellied sea eagle): Eleven eagle nests are known from within 1.5 km of the action area (Att_2_NBES_NVA-SWISA_report, sct3.3.3, pg2). Three nests are within 500 m of the construction corridor and are within the same vicinity of each other. An additional four nests are within 1 km from the construction corridor of which one nest (nest 1261) is within line of site of the construction corridor (Att_15_NBES_NVA-SWISA_Appendix_F_EagleNestVisibility.pdf, Appendix. F of NVA report). All surveyed nests, with the exception of one (nest 1281), were deemed to be in prime or viable condition.
- *Engaeus granulatus* (central north burrowing crayfish [CNBCF]): The proposed action area is within the core range for central north burrowing crayfish and direct evidence of burrowing crayfish in the project area (chimneys) are potentially attributable to this species. Crayfish chimneys were recorded at 13 separate locations within the action area. A total of 2.1 ha of optimal CNBCF habitat was mapped within the current action area after realignments were made to avoid optimal habitat. A additional total of 6.6 ha of suboptimal CNBCF habitat was mapped within the action area (Att_2_NBES_NVA-SWISA_report, sct3.3.2, pg29, Att_10_NBES_NVA-SWISA_Appendix_A_MapOf Natural Values).
- *Sarcophilus harrisii* (Tasmanian devil): potential foraging habitat widespread. Four individual Tasmanian devils were recorded by camera traps in two locations over 28 nights. Two Tasmanian devil scats were recorded in two locations in the vicinity of the camera traps (Att_2_NBES_NVA-SWISA_report, 3.3.3, pg 32).
- *Dasyurus maculatus maculatus* (spotted-tail quoll): potential foraging habitat widespread. Two spotted-tail quolls were recorded by camera traps in two locations over 28 nights (Att_2_NBES_NVA-SWISA_report, sct3.3.4, pg32).

Potential habitat is present for the above species and additional species:

- *Dasyurus viverrinus* (eastern quoll): potential foraging habitat widespread but natural values records indicate the broader region is sparsely occupied. Additional camera surveys may provide more definitive evidence of presence/absence (Att_2_NBES_NVA-SWISA_report, sct3.3.4, pg32).
- *Lathamus discolor* (swift parrot): includes a number of areas of blue gum (*Eucalyptus globulus*) plantation that may support this species. Additionally, a number of large (dbh > 70 cm) potential hollow bearing trees were recorded during field surveys. These trees may provide potential nesting habitat for swift parrots (Att_2_NBES_NVA-SWISA_report, sct3.3.5, pg38).
- *Tyto novaehollandiae castanops* (Tasmanian masked owl): The project area is within this species core range and although there is no old growth forest within the survey area, several large eucalypt trees are present in remnant vegetation in agricultural land and previously logged areas. Although isolated, these trees are potentially viable breeding and/or roosting habitat for masked owl (Att_2_NBES_NVA-SWISA_report, 3.3.6, pg39).

3.2.2 Describe the vegetation (including the status of native vegetation and soil) within the project area.

The geology of the proposal area (derived from Mineral Resources Tasmania geological polygons 250K data - See link to Geology of Northwest Tasmania) is highly varied and is comprised of a mixture of basalt pyroclastic rocks, dolerite, non-marine sequences of gravel, sand, silt, clay and regolith, freshwater and paralic sandstone and mudstone, lower glaciomarine sequences of mudstone, sand gravel and mud of alluvial origin, undifferentiated pelitic rocks of quartzite sequences and upper glaciomarine sequences of pebbly mudstone.

The majority of the proposal area is private freehold, with small areas of forestry plantation and timber production in the southern of the design corridor, notably around the Warrawee Conservation Area and Creeleys Road.

Within the existing SWIS district, 19,624 ha of land (92 % of the total land area) is classed as suitable for long-term irrigation (largely class 4 and 5), 32% of which is classed as prime agricultural land (Class 1-3).

Sixteen TASVEG mapping units occur within the design corridor area, eight of which are native communities, while seven are modified land communities no longer constituting native vegetation; in addition, one unit is a miscellaneous mapping unit (water). A total of 8.6 ha of native vegetation will be impacted within the construction corridor (as well as 306 ha of modified land) with the corridor modified significantly from its initial design to reduce the impact on native vegetation as much as possible. The remaining avoidance area within the design corridor is 720 ha (including 28 ha of native vegetation). The status of the eight native vegetation communities in both a State and a local context is provided in (Att_2_NBES_NVA-SWISA_report, sct3.1, pg24-25,Table 3).

- DAC - *Eucalyptus amygdalina* coastal forest and woodland - Occurs as remnant patches adjacent to Port Sorell along Woodbury Lane. The patches are generally in poor condition due to their small area surrounded by paddocks. The canopy is dominated by

Eucalyptus amygdalina with occasional localised *E.ovata* in low-lying areas with woody weeds common in the ground layer. This community is not listed as threatened under the NCA nor EPBCA.

- DAM - *Eucalyptus amygdalina* forest on mudstone - Mapped in two locations, near Abeys Road and along the Creeleys Road alignment. Both patches are contiguous with larger forest blocks. Near Abeys Road the alignment is within an existing cleared break within this forest block. This forest occurs on a dry hill side and is fairly open and species poor throughout its floristic structure. This community is not listed as threatened under the NCA nor EPBCA.
- DOB - *Eucalyptus obliqua* dry forest - This community is the most extensive native forest community throughout the pipeline alignment. The largest area of DOB is land between the Great Bend pump station and the Saggers Hill reservoir, where the forest continues outside the design corridor, and is also within the Warrawee Conservation Area. The TSPA and EPBCA listed orchid species, *Caladenia tonellii* was recorded within the DOB forest on the slopes between the proposed alignment and the existing reservoir near Great Bend. This community is not listed as threatened under the NCA nor EPBCA.
- DOV - *Eucalyptus ovata* forest and woodland - This community occurs as remnant patches at four locations within the survey area. Patches are small and isolated and generally do not form contiguous vegetated areas of this community, or with other native vegetation far outside of the design corridor. This community is listed as threatened under the NCA. DOV can also qualify as the EPBCA listed Tasmanian forests and woodlands dominated by black gum or Brookers gum (*Eucalyptus ovata / E. brookeriana*) community where key diagnostics and condition criteria are met. Preliminary natural values investigations indicate the patches within the design corridor are not likely to quality for EPBCA listing, however this will be further assessed where avoidance isn't achievable (or there may be potential for indirect impacts).
- DSC - *Eucalyptus amygdalina - Eucalyptus obliqua* damp sclerophyll forest - This community occurs throughout the survey area generally in damper areas intergrading with drier forest communities. Damp sclerophyll forest is characterised by the lack of a clear dominant eucalypt species. Many of the DSC patches occur as remnant vegetation patches within the modified agricultural landscape and are infested with various grassy weeds. This community is not listed as threatened under the NCA nor EPBCA.
- NME - *Melaleuca ericifolia* swamp forest - This vegetation is listed as threatened under the NCA but not the EPBCA. It occurs in damp areas and drainage lines within the design corridor and provides habitat for the EPBCA endangered central north burrowing crayfish *(Engaeus granulatus)*.
- WOB - *Eucalyptus obliqua* forest with broad-leaf shrubs - This community occurs in the damp gullies and lower slopes within the forested area between the Great Bend pump station and Saggers Hill reservoir. This community is not listed as threatened under the NCA nor EPBCA.
- WOL - *Eucalyptus obliqua* forest over *Leptospermum* - This community occurs in a wet area between Great Bend and Saggers Hill reservoir. It is likely to be a product of past disturbance as there is significant earth works in the surrounding areas. This community is not listed as threatened under the NCA nor EPBCA.

3.3 Heritage

3.3.1 Describe any Commonwealth heritage places overseas or other places recognised as having heritage values that apply to the project area.

The closest site listed under the National Heritage List is the Home Hill site located at 77 Middle Road, Devonport. Home Hill is a single-story timber house built in 1916 set in extensive landscaped grounds overlooking Devonport in the north of Tasmania. This site is approximately 3.2 km west of the westernmost extent of the action area. This site is located far out from the proposed construction footprint and there is no potential for this site to be impacted.

An independent cultural heritage assessment was conducted by Cultural Heritage Management Australia (CHMA) (Att_22_SWISA_Historic_Heritage_Report). A desktop a search of the Tasmanian Heritage Register (THR) was carried out in order to determine the extent of listed historic sites and places in the vicinity of the SWISA pipeline easement. The search results showed that there are no heritage places located within or in the immediate surrounds of the study area that are no sites or places listed on the THR that are situated in the immediate vicinity of the study area. The investigations undertaken by CHMA (2009 and 2010) for the SWIS pipeline easement also did not identify any THR listed historic sites or features.

The heritage register search results does show that a section of the pipeline easement traverses the boundaries of a property that is listed as a Local Heritage Place under the Tasmanian Planning Scheme. The property (CT144681/1) is located at Northdown, immediately south of Port Sorell Road and immediately west with the junction of Appleby Road. A 150 m section of the pipeline corridor traverses along the western boundary of the property. The proposed scope of works in this area will involve the installation of a new water pipeline along the western edge of the property boundary. The pipeline will be installed via trenching and conducted in accordance with Australian Pipelines and Gas Association Code of Environmental Practice 2017. The pipeline easement is confirmed as avoiding all built structures on the property, including buildings, stone walls and heritage landscape plantings associated with the property.

3.3.2 Describe any Indigenous heritage values that apply to the project area.

An independent Aboriginal heritage assessment was conducted by Cultural Heritage Management Australia (CHMA) (Att_7_SWISA_Aboriginal_Heritage_Assessment_Report). Note that this report is not to be published due to cultural sensitivity reasons. A desktop search of the Aboriginal Heritage Register (AHR) shows that there are a total of 59 registered Aboriginal sites that are situated

within an approximate 3 km radius of the SWISA corridor. Of these 59 registered Aboriginal sites, there are 5 registered sites that are situated within the SWISA pipeline easement. Four of these sites were recorded by CHMA (2009 and 2010) within the original SWIS pipeline easement. Aboriginal Heritage Tasmania has advised that a permit had been previously issued for these sites (Permit 1011/4), and it appears that all four sites have most probably been destroyed (under permit) during the installation of the SWIS pipelines. The fifth registered Aboriginal site was potentially recorded by Dunnett (1994) and no permit has been issued for this site. An additional 4 registered Aboriginal sites that are situated within a 150m radius of the SWISA pipeline easement.

No Aboriginal heritage sites, suspected features, or specific areas of elevated archaeological potential were identified during the field survey assessment of the SWISA project footprint. The field survey assessment confirmed that there are no rock shelter features that occur within or in the immediate vicinity of the project footprint. The field survey was also able to confirm that there were no stone resources detected within the project footprint that would be suitable for stone artefact manufacturing. It is assessed that there is very little potential for quarry/procurement sites to be present, given the nature of the underlying geology. Despite an extensive search, no evidence for the five registered sites within the SWISA action area could be identified

In the event of any discoveries, the Aboriginal Heritage Tasmania document “Unanticipated Discovery Plan: Procedure for the management of unanticipated discoveries of Aboriginal relics in Tasmania” will be referred to and followed.

3.4 Hydrology

3.4.1 Describe the hydrology characteristics that apply to the project area and attach any hydrological investigations or surveys if applicable. *

Mean annual rainfall for the area is around 905 mm per annum, with precipitation across all seasons though greatest in the winter months of July and August.

The project area is located within the broad valley of the Mersey River, a major river with its source at Lake Meston and flowing through to Devonport and into the Bass Strait. Major tributaries of the Mersey River are the Fisher River, Mole Creek and Lobster Rivulet in the upper catchment, and the Dasher, Minnow and Don rivers in the lower catchment.

The pipeline intersects with various creeks that flow into the Mersey River and Bass Strait, including Bishton Creek, Pardoe Creek, Panatana Rivulet, Tullamona Creek, Westford Creek, Eastford Creek, Bonneys Creek, Smiths Creek, Knights Creek, and Kings Creek.

In the upper catchment, impoundments have been created for hydro-electricity generation including at Lake Rowallan and Lake Parangana. In addition to power generation, there is also forest harvesting in the upper and middle catchment. The area downstream of Parangana Dam supports extensive agriculture- grazing, dairy and pig farming, and commercial cropping. Although no major drinking water is taken from the Mersey River, a major extraction is made to supply the Wesley Vale pulp mill.

The project area is heavily cropped and grazed and is subject to pivot irrigation in places. The SWISA falls mostly within the existing SWIS Irrigation District and requires an amendment of the district by less than 10 %, though the augmentation will increase summer water capacity three fold (5 460-14 860 ML/season).

The potential impact of the action on hydrology has been assessed in Att_34_TI_SWISA Hydrology Considerations Report V2, which determined that the proposed SWISA will not have a significant impact on the hydrology of the area. Factors considered to reach this determination include:

Project Context: SWISA is an upgrade of the existing SWIS, the area already has irrigated agriculture with a history of intensive production. The cost of TI water encourages water use efficiency. The volume being added to the irrigation district in a drying climate will not be a significant increase.

Water Source and Storage: There is no increase in the existing 12,410 ML NRE Tas Water Licence. The additional 9,200ML of water will be sourced from Hydro Tasmania and stored in their existing infrastructure, there will be no localised effect from dam operation. An application has been submitted for a 7800 ML winter NRE water allocation, which will also have a watercourse authority ensuring no impact on water uses including environmental flows.

Water Movement: Controlled releases will be metered and regulated by a signed Water Transfer Agreement and an approved NRE Tas Water Course Authority. Water will not be released into the Mersey River during periods of flood, and its transfer and extraction will not affect current water users or the environment.

Environmental Monitoring and Management: Water quality is monitored across the district, and no impact has been identified from SWIS. The Farm WAP system and ongoing compliance framework manages irrigation application and risks to natural values, including the risk of runoff and infiltration to waterways and groundwater. There is no material land clearing for construction or operations that could impact local and regional hydrology. There are no Ramsar wetlands within the proposed SWISA irrigation district. The 65 water crossings during construction will be undertaken in a manner to minimise local environmental/hydrological disruption.

TI have developed a Turbidity Management Framework to monitor water quality impacts due to the proposed construction works (Att_23_TI_SWISA_Turbidity_Management_Framework).

4. Impacts and mitigation

4.1 Impact details

Potential Matters of National Environmental Significance (MNES) relevant to your proposed action area.

EPBC Act section	Controlling provision	Impacted	Reviewed
S12	World Heritage	No	Yes
S15B	National Heritage	No	Yes
S16	Ramsar Wetland	No	Yes
S18	Threatened Species and Ecological Communities	Yes	Yes
S20	Migratory Species	No	Yes
S21	Nuclear	No	Yes
S23	Commonwealth Marine Area	No	Yes
S24B	Great Barrier Reef	No	Yes
S24D	Water resource in relation to large coal mining development or coal seam gas	No	Yes
S26	Commonwealth Land	No	Yes
S27B	Commonwealth Heritage Places Overseas	No	Yes
S28	Commonwealth or Commonwealth Agency	No	Yes

4.1.1 World Heritage

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

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4.1.1.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.1.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The proposed development will not have a direct and /or indirect impact on a World Heritage Area (WHA). The nearest WHA is the Tasmanian Wilderness World Heritage Area, located approximately 33 km south-west of the proposed action. The proposed action will not impact this WHA

4.1.2 National Heritage

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

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4.1.2.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.2.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The proposed development will not have not have a direct and/or indirect impact on any National Heritage sites. The nearest national heritage site is located at 77 Middle Road, Devonport approximately 3.2 km west of the action area. The proposed action will not impact this national heritage site.

4.1.3 Ramsar Wetland

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

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4.1.3.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.3.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The proposed development will not have direct and/or indirect impacts on Ramsar Wetlands. The nearest know Ramsar Wetlands site is Little Waterhouse Lake approximately 95 km north-east of the project area. There is no potential to impact this site due to the proposed action.

4.1.4 Threatened Species and Ecological Communities

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

Threatened species

Direct impact	Indirect impact	Species
No	Yes	Aquila audax fleayi
No	No	Astacopsis gouldi
No	No	Balaenoptera musculus
No	No	Barbarea australis
No	No	Botaurus poiciloptilus
No	No	Caladenia caudata
No	No	Caladenia pallida
No	No	Caladenia tonellii
No	No	Calidris canutus
No	No	Calidris ferruginea
No	No	Carcharodon carcharias
No	No	Cassinia rugata
No	No	Ceyx azureus diemenensis
No	No	Chelonia mydas
No	Yes	Dasyurus maculatus maculatus (Tasmanian population)
No	Yes	Dasyurus viverrinus
No	No	Diomedea antipodensis
No	No	Diomedea antipodensis gibsoni
No	No	Diomedea epomophora
No	No	Diomedea exulans
No	No	Diomedea sanfordi
Yes	Yes	Engaeus granulatus
No	No	Eubalaena australis
No	No	Fregetta grallaria grallaria
No	No	Galaxiella pusilla
No	No	Galeorhinus galeus
No	No	Glycine latrobeana
No	No	Hirundapus caudacutus
No	Yes	Lathamus discolor
No	No	Leucochrysum albicans subsp. tricolor
No	No	Limosa lapponica baueri

Direct impact	Indirect impact	Species
Yes	Yes	Litoria raniformis
No	No	Macronectes giganteus
No	No	Macronectes halli
No	No	Neophema chrysostoma
No	No	Numenius madagascariensis
No	No	Pachyptila turtur subantarctica
No	No	Perameles gunnii gunnii
No	No	Phoebetria fusca
No	No	Prasophyllum apoxychilum
No	No	Prasophyllum limnetes
No	No	Prasophyllum pulchellum
No	No	Prasophyllum robustum
No	No	Prototroctes maraena
No	No	Pterodroma leucoptera leucoptera
No	No	Pterostylis ziegeleri
No	Yes	Sarcophilus harrisii
No	No	Senecio psilocarpus
No	No	Seriolella brama
No	No	Spyridium obcordatum
No	No	Sternula nereis nereis
No	No	Thalassarche bulleri
No	No	Thalassarche bulleri platei
No	No	Thalassarche carteri
No	No	Thalassarche cauta
No	No	Thalassarche chrysostoma
No	No	Thalassarche impavida
No	No	Thalassarche melanophris
No	No	Thalassarche salvini
No	No	Thalassarche steadi
No	No	Thelymitra jonesii
No	No	Thinornis cucullatus cucullatus
No	No	Thunnus maccoyii
No	Yes	Tyto novaehollandiae castanops (Tasmanian population)
No	No	Xanthorrhoea arenaria
No	No	Xanthorrhoea bracteata

Direct impact	Indirect impact	Species
No	No	Xerochrysum palustre

Ecological communities

Direct impact	Indirect impact	Ecological community
No	No	Giant Kelp Marine Forests of South East Australia
Yes	Yes	Tasmanian Forests and Woodlands dominated by black gum or Brookers gum (Eucalyptus ovata / E. brookeriana)
No	No	Tasmanian white gum (Eucalyptus viminalis) wet forest

4.1.4.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

Yes

4.1.4.2 Briefly describe why your action has a direct and/or indirect impact on these protected matters. *

The direct and indirect impacts have been considered for all MNES species and communities (Att_17_NBES_NVA-SWISA_Appendix_H_MNES_SIA_Table - App, Table A1).

***Aquila audax fleayi* - Tasmanian wedge-tailed eagle**

24 eagle nests are known from within 5 km of the proposed design corridor and 7 within 1 km (Att_2_NBES_NVA-SWISA_report, sct3.3.3, pg32). Three (3) nests are within 500 m of the design corridor and 1 nest within 1 km is also within line of sight of the design corridor (Att_15_NBES_NVA_SWISA_Appendix_F_EagleNestVisibility). The Forest Practices Authority recommends activity constraint areas of 500 m direct distance and 1 km line-of-sight around active eagle nests (to be determined through nest activity assessments) during the eagle breeding season (as defined in Att_2_NBES_NVA-SWISA_report, sct4.3.3, pg53-54).

The proposed action will not directly impact on any nest sites; however construction activities proposed for within these management constraint areas have the potential for nest disturbance, which will require targeted avoidance and management procedures (Att_2_NBES_NVA-SWISA_report, sct4.3.3, pg53-54).

***Engaeus granulatus* – central north burrowing crayfish**

The entirety of the project area is within the core range of this species. Thirteen colonies and an additional 2.1 ha of optimal habitat and 6.6 ha of suboptimal habitat were recorded within the design corridor (Att_2_NBES_NVA-SWISA_report, sct3.3.2, pg29). While construction impacts are likely to avoid most recorded colonies, it is likely that without further mitigation direct impact to this species is unavoidable.

The proposed action also has the potential for facilitated (indirect) impacts to this species due to altered hydrology during the operational phase of the irrigation scheme (Att_2_NBES_NVA-SWISA_report, sct4.3.2, pg52-53).

***Lathamus discolor* – swift parrot**

The design corridor is located within the northwest breeding range for swift parrots where the pipeline passes through the Warrawee Conservation Area, as well as the westernmost extent of the pipeline (west of Wesley Vale) (Att_2_NBES_NVA-SWISA_report, sct3.4, pg40, Figure 4).

Foraging trees (*E. ovata* and *E. globulus*) and potential nesting habitat trees (*Eucalypt* species >70 cm diameter at breast height) are present within the action area. There is potential to impact foraging and potential nesting habitat trees within the construction footprint (Att_2_NBES_NVA-SWISA_report, sct4.3.5, pg55-56). Habitat loss is a major threat to the persistence of this species and halting habitat loss is critical to maintaining and maximising breeding habitat. Additional surveying and assessment, and/or management procedures will be required to address this risk.

***Tyto novaehollandiae castanops* – Tasmanian masked owl**

The action area is located within the core range for this species. It is likely that the species uses the greater area for foraging and roosting, with extensive potential habitat occurring in the region. Within the design corridor, potential nesting habitat is present with 62 large potential hollow-bearing trees recorded. Twenty potential nesting habitat trees are within the indicative construction corridor at the time of referral Att_2_NBES_NVA-SWISA_report, sct4.3.6, pg57). It is anticipated that complete avoidance of these habitat trees will be unavoidable and at least some will be cleared and/ or impacted structurally to the degree that failure is likely. Any removal of this habitat has the potential to impact this species. Additional surveying and assessment, and/or management procedures will thus be required to address this risk.

***Litoria raniformis* – green and gold frog**

624 ha of the design corridor is located within the core range for this species, and the entire action area is located within the potential range. The species was confirmed as present at three locations in the design corridor with additional past records known from natural values records. The species was a reason for the referral of the original SWIS project and it is noted the species has remained extant within

the irrigation district during operations.

Potential breeding habitat is present throughout the proposed action area, with 82 patches, totalling 8.62 ha optimal breeding habitat occurring within the design corridor. In addition, the whole action area can be considered to be dispersal habitat (Att_2_NBES_NVA-SWISA_report, Page 25). Any impacts to breeding/dispersal habitat by the proposed action, as well as impacts to individuals may have a significant impact on this species. Additional surveying and assessment, and/or management procedures will thus be required to address this risk (Att_2_NBES_NVA-SWISA_report, sct3.3.1, pg27).

***Sarcophilus harrisii* – Tasmanian devil**

Tasmanian devils were confirmed as present within the action area, with camera trapping detecting devils within the project area in close proximity to the action area (Att_2_NBES_NVA-SWISA_report, sct3.3.4, pg32).

The proposed action has a risk of increased demographic pressures on local populations, such as an increased risk of roadkill due to the construction of the pipeline and the risk of disrupting the breeding cycle of individuals if a den were to occur in the development area, as well as temporary impacts to foraging habitat (Att_2_NBES_NVA-SWISA_report, sct4.3.4, pg54-55). The latter are particularly unlikely to occur and/or unlikely to be of a magnitude to constitute significant residual impacts, however additional assessment and consideration of impacts is warranted through the final design phases.

***Dasyurus viverrinus* – eastern quoll**

No evidence of eastern quolls was observed during field investigations, however the project area provides potential habitat for this species (Att_2_NBES_NVA-SWISA_report, sct3.3.4, pg32).

The proposed action has a risk of increased demographic pressures on local populations, such as an increased risk of roadkill due to the construction of the pipeline and the risk of disrupting the breeding cycle of individuals if a den were to occur in the development area, as well as temporary impacts to foraging habitat (Att_2_NBES_NVA-SWISA_report, sct4.3.4, pg54-55). The latter are particularly unlikely to occur and/or unlikely to be of a magnitude to constitute significant residual impacts, however additional assessment and consideration of impacts is warranted through the final design phases.

***Dasyurus maculatus maculatus* – spotted-tail quoll**

A single spotted-tail quoll was observed during field investigations, and the project area provides habitat for this species (Att_2_NBES_NVA-SWISA_report, sct3.3.4, pg32)..

The proposed action has a risk of increased demographic pressures on local populations, such as an increased risk of roadkill due to the construction of the pipeline and the risk of disrupting the breeding cycle of individuals if a den were to occur in the development area, as well as temporary impacts to foraging habitat (Att_2_NBES_NVA-SWISA_report, sct4.3.4, pg54-55). The latter are particularly unlikely to occur and/or unlikely to be of a magnitude to constitute significant residual impacts, however additional assessment and consideration of impacts is warranted through the final design phases.

Tasmanian forests and woodlands dominated by black gum or Brookers gum (*Eucalyptus ovata* / *E. brookeriana*)

A *Eucalyptus ovata* dominated community is present within the action area; preliminary results suggest the patches are unlikely to meet EPBCA listing requirements and are likely to be avoidable (Att_2_NBES_NVA-SWISA_report, sct3.1, pg16-17). Based on the initial surveys, patch size, and isolation from neighboring native vegetation, it is unlikely that any of the patches would qualify as 'Class A high quality'. Although patches are unlikely to qualify, they may meet the criteria for, and qualify as, Class B good quality depending on patch size and proportion cover and number of native species. Without avoidance and/or mitigation measures, these vegetation patches may be directly and indirectly impacted by the proposed action (Att_2_NBES_NVA-SWISA_report, sct4.1, pg50). It is anticipated that any potential impacts can be avoided with the alignment. If there is a risk this is not achievable additional survey effort will be required to address if patches qualify under the EPBCA.

Other MNES

Other MNES identified as having potential to occur in the action area (Att_24_Protected Matters-MNES layers- March 15th 2023) have been considered. Context and justification are provided in Att_16_NBES_NVA-SWISA_Appendix_G_MNES_Table and distribution maps are provided for threatened vegetation communities (Att_18_NBES_NVA-SWISA_Appendix_I_MNES_Maps_Vegetation), threated fauna (Att_19_NBES_NVA-SWISA_Appendix_J_MNES_Maps_Fauna), threatened flora (Att_20_NBES_NVA-SWISA_Appendix_K_MNES_Maps_Flora), threatened marine and migratory fauna (Att_21_NBES_NVA-SWISA_Appendix_L_MNES_Maps_Migratory & Marine).

4.1.4.4 Do you consider this likely direct and/or indirect impact to be a Significant Impact? *

Yes

4.1.4.5 Describe why you consider this to be a Significant Impact. *

Significant impact assessments of all MNES species and communities against the *Significant Impact Guidelines 1.1* can be found in Att_16_NBES_NVA-SWISA_Appendix_G_MNES_Table, and Att_17_NBES_NVA-SWISA_Appendix_H_MNES_SIA_Table, Table A1. Matters considered to be at risk of significant impact are detailed in tables A2-A10 of Att_17_NBES_NVA-SWISA_Appendix_H_MNES_SIA_Table.

***Aquila audax fleayi*- Tasmanian wedge-tailed eagle (Att_17_NBES_NVA-SWISA_Appendix_H_MNES_SIA_Table - Table A2)**

No nests will be directly impacted as a result of the proposed action.

Indirect impacts to eagle nests have the potential to trigger criterion '*Disrupt the breeding cycle of a population'*. Loss of nesting habitat and disturbance of nesting birds are listed as key threats to the Tasmanian wedge-tailed eagle. Four eagle nests are located within 500 m direct distance and/or 1 km line of sight from the proposed construction corridor alignment. Without mitigation measures in place, the project may indirectly impact the breeding of nesting pairs. The proposal will not impact at the population scale. Management of disturbances to nests will be managed at a site level. Implementing these measures can ensure residual impacts from the proposal are not significant.

***Lathamus discolor* – swift parrot (Att_17_NBES_NVA-SWISA_Appendix_H_MNES_SIA_Table - Table A3)**

Indirect impacts to swift parrot habitat have the potential to trigger '*Lead to a long-term decrease in the size of a population'*, '*Reduce the area of occupancy of the species*', '*Adversely affect habitat critical to the survival of a species*', '*Disrupt the breeding cycle of a population*', and '*Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline'*.

The action area partially falls within the north-west breeding range and is entirely within the potential breeding range for this species. The action area contains both potential nesting and foraging habitat (mature *E. ovata* trees). Any removal of mature *E. ovata* as a result of the proposal may trigger the above criteria. However, mitigation to strategies to avoid tree impacts can ensure residual impacts from the proposal are not significant, which can be prioritised through the final design phases and if required supplemented with additional survey effort.

***Tyto novaehollandiae castanops* – Tasmanian masked owl (Att_17_NBES_NVA-SWISA_Appendix_H_MNES_SIA_Table - Table A4)**

Of the significant impact criteria, this species is at risk of '*Adversely affect habitat critical to the survival of a species*' and '*Disrupt the breeding cycle of an important population'*. Potential nesting habitat (mature eucalypts containing well-formed hollows) is present within the action area and may be impacted by the proposal. However, mitigation to strategies to avoid tree impacts can ensure residual impacts from the proposal are not significant, which can be prioritised through the final design phases and if required supplemented with additional survey effort.

***Sarcophilus harrisii* – Tasmanian devil, *Dasyurus viverrinus* – eastern quoll & *Dasyurus maculatus maculatus* – spotted-tail quoll (Att_17_NBES_NVA-SWISA_Appendix_H_MNES_SIA_Table - Table A5, A6, A7)**

Due to the size of the footprint, and widespread nature and limited habitat preferences of these species, impacts on the potential foraging are likely to be unavoidable, with additional potential impacts to denning habitat. In addition, a potential increase in roadkill of these species during the construction of this project may also have a significant impact on these species.

The presence of eastern quolls within the project area may be further considered with additional survey effort. Avoidance of denning habitat, rehabilitation of the construction area, and implantation of roadkill mitigation protocols will reduce the residual significant impact should the species be present.

***Litoria raniformis* – green and gold frog (Att_17_NBES_NVA-SWISA_Appendix_H_MNES_SIA_Table - Table A8)**

The proposed action has the potential to have direct and indirect impacts on this species. Without mitigation and targeted avoidance, the proposed action has the potential to trigger '*Reduce the area of occupancy of an important population of the species*', '*Adversely affect habitat critical to the survival of a species'*, '*Disrupt the breeding cycle of an important population'*, and *'Introduce disease that may cause the species to decline'* significant impacts for green and gold frog.

The potential impacts will be managed through targeted habitat avoidance, pre-clearance searches, and a frog habitat management protocol, including hygiene measures. However, even with this measure in place, it is unlikely that impact to this species can be avoided. The scale of impacts has not yet been quantified and may require further investigation, thus it is yet to be determined if residual impacts will be significant.

***Engaeus granulatus* – central north burrowing crayfish (Att_17_NBES_NVA-SWISA_Appendix_H_MNES_SIA_Table - Table A9)**

The proposed action is likely to have significant impacts based upon several of the significant impact criteria, most notably by *'Lead to a long-term decrease in the size of a population'*, '*Reduce the area of occupancy of the species'*, '*Fragment an existing population into two or more populations'*, '*Adversely affecting habitat critical to the survival of the species'*, and '*Disrupt the breeding cycle of a population', 'Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline'* and *'Interfere with the recovery of the species'*.

Complete avoidance of habitat is unlikely to be achievable. Following avoidance, the potential impacts to this species will be managed through the application of a burrowing crayfish impact mitigation and habitat management protocol. This protocol aims to limit the likelihood of direct impacts to individuals and manage long-term impact to habitat, as well as including protocols to address translocation of individuals, sediment and chemical contamination, and monitoring of the water table. Additional measures to reduce impacts may include restrictions on the timing of works and further investigations to determine species presence.

Even with these measures in place, it is expected that impacts to individuals cannot be entirely avoided, thus there is the potential for significant impacts.

Tasmanian forests and woodlands dominated by black gum or Brookers gum (*Eucalyptus ovata* / *E. brookeriana*) (Att_17_NBES_NVA-SWISA_Appendix_H_MNES_SIA_Table - Table A10)

It is highly likely that direct impact to areas potentially supporting this community, and indirect impacts, can be avoided by the proposed action. If complete avoidance isn't feasible, additional surveys will determine if the potential patches qualify under the EPBCA. If present, the proposed action has the potential to *'Reduce the extent of the ecological community'* and *'Adversely Modify or destroy abiotic (non-living) factors (such as water, nutrients, soil) necessary for an ecological community's survival'.*

4.1.4.7 Do you think your proposed action is a controlled action? *

Yes

4.1.4.8 Please elaborate why you think your proposed action is a controlled action. *

Direct and indirect impacts on *Litoria raniformis* (green and gold frog) and *Engaeus granulatus* (central north burrowing crayfish) are unlikely to be completely avoidable and are expected to have the potential for significant impacts.

Suitable foraging and/or breeding habitat has the potential to be significantly impacted by this development either directly or indirectly for the following species:

- *Aquila audax fleayi* (Tasmanian wedge-tailed eagle)
- *Lathamus discolor* (swift parrot)
- *Tyto novaehollandiae castanops* (Tasmanian masked owl)
- *Dasyurus maculatus* (spotted-tailed quoll)
- *Sarcophilus harrisii* (Tasmanian devil)

Significance of residual impacts can be determined after further assessment (supported in some cases potentially by additional survey effort) and the finalisation of management and mitigation measures. It is expected following this, that residual impacts are unlikely to be significant.

4.1.4.10 Please describe any avoidance or mitigation measures proposed for this action and attach any supporting documentation for these avoidance and mitigation measures. *

***Aquila audax fleayi*- Tasmanian wedge-tailed eagle**

For any works within 500 m direct distance and/or 1 km line-of-sight of an eagle nest, Tasmanian Irrigation commit to conducting works outside of the eagle breeding season (as defined in Att_2_NBES_NVA-SWISA_report, sct4.3.3, pg53-54). Where this is not achievable, nests will be assumed to be active until an aerial nest activity assessment can be conducted, the results of which will inform any potential constraints surrounding construction activities. If a nest is deemed to be inactive, construction activities can proceed without constraints; however, if a nest is deemed to be active for a particular season, eagle nest constraints will apply.

***Lathamus discolor* – swift parrot**

Tasmanian Irrigation commit to avoiding potential habitat trees to the extent that is possible through design. Where avoidance is not possible trees will not be impacted during the breeding season for this species. If this measure is not achievable, a tree-clearance protocol will be developed and applied to manage the potential risk to individuals (which may include breeding parrots).

***Tyto novaehollandiae castanops* – Tasmanian masked owl**

Tasmanian Irrigation commit to avoiding potential habitat trees to the extent that is possible through design. Where avoidance is not possible, a tree-clearance protocol will be developed and applied to manage the potential risk to individuals.

***Litoria raniformis* – green and gold frog**

The potential for impacts to green and gold frogs and frog habitat will be managed through a green and gold frog impact and habitat management protocol (Att_25_TI_Green_Gold_Frog_Protocol). This will include measures such as exclusion zones, construction protocols, contamination controls, hygiene controls, and pre-clearance surveys and relocation.

***Engaeus granulatus* – central north burrowing crayfish**

The potential risks to this species will be addresses through the application of impact mitigation and habitat management protocol (Att_26_TI_Threatened_Burrowing_Crayfish_Protocol), with measures to include exclusion areas, translocation, sediment and contamination controls, and ongoing monitoring.

***Sarcophilus harrisii* – Tasmanian devil, *Dasyurus viverrinus* – eastern quoll & *Dasyurus maculatus maculatus* – spotted-tail quoll**

Prior to any construction activities, TI will adopt a pre-clearance survey and den management protocol (Att_27_NBES_Unanticipated_Den_Discovery_Protocol) that is consistent with the Tasmanian Natural and Cultural Heritage Division (2015) *Survey Guidelines and Management Advice for Development Proposals that may impact on the Tasmanian Devil (Sarcophilus harrisii*). In the absence of quoll-specific den management advice, these guidelines are accepted as suitable to apply to both quoll species.

Areas of native vegetation that are subject to temporary disturbance will be subject to a revegetation plan to ensure the viability of foraging and denning habitat is retained.

Other Mitigation Measures

Further to the measures detailed above, TI have a set of Environmental Protection Requirements (Att_28_TI_SWISA_Environmental_Protection_Requirements) that are applied to all irrigation projects, with guidelines in place to manage potential impacts to natural values

4.1.4.11 Please describe any proposed offsets and attach any supporting documentation relevant to these measures. *

No offsets have been proposed at this stage. Offset requirements will be explored consistent with EPBCA guidelines if and where residual impacts from the final design (and taking into account all mitigation measures) are considered to be significant.

4.1.5 Migratory Species

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

Direct impact	Indirect impact	Species
No	No	Actitis hypoleucos
No	No	Apus pacificus
No	No	Ardenna carneipes
No	No	Ardenna grisea
No	No	Arenaria interpres
No	No	Balaenoptera musculus
No	No	Calidris acuminata
No	No	Calidris canutus
No	No	Calidris ferruginea
No	No	Calidris melanotos
No	No	Calidris ruficollis
No	No	Caperea marginata
No	No	Carcharodon carcharias
No	No	Charadrius bicinctus
No	No	Chelonia mydas
No	No	Diomedea antipodensis
No	No	Diomedea epomophora
No	No	Diomedea exulans
No	No	Diomedea sanfordi

Direct impact	Indirect impact	Species
No	No	Eubalaena australis
No	No	Gallinago hardwickii
No	No	Gallinago megala
No	No	Gallinago stenura
No	No	Hirundapus caudacutus
No	No	Lagenorhynchus obscurus
No	No	Lamna nasus
No	No	Limosa lapponica
No	No	Macronectes giganteus
No	No	Macronectes halli
No	No	Megaptera novaeangliae
No	No	Myiagra cyanoleuca
No	No	Numenius madagascariensis
No	No	Numenius minutus
No	No	Phoebetria fusca
No	No	Pluvialis fulva
No	No	Sternula albifrons
No	No	Thalassarche bulleri
No	No	Thalassarche carteri
No	No	Thalassarche cauta
No	No	Thalassarche chrysostoma
No	No	Thalassarche impavida
No	No	Thalassarche melanophris
No	No	Thalassarche salvini
No	No	Thalassarche steadi
No	No	Tringa brevipes
No	No	Tringa nebularia

4.1.5.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.5.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The proposed action area contains no habitat suitable for breeding of the migratory species that are identified in Att_24_Protected Matters-MNES layers - March 15th 2023. Any occurrences of these species is likely to be transient in nature, and the nature of the proposed action will not be detrimental to their persistence in the region during migration (See Pg. 13 of Att_16_NBES_NVA-SWISA_Appendix_G_MNES_Table MNES and Att_21_NVA-SWISA_Appendix_L_MNES_Maps_Migratory & Marine distribution maps).

4.1.6 Nuclear

4.1.6.1 Is the proposed action likely to have any direct and/or indirect impact on this protected matter? *

No

4.1.6.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The proposed action does not involve any nuclear-related activities and will not have any direct and/or indirect impacts on nuclear activities

4.1.7 Commonwealth Marine Area

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

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4.1.7.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.7.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The proposed action will not have a direct and/or indirect impact on any Commonwealth Marine Areas (CMA). The nearest CMA is the Flinders Marine National Park approximately 180 km east of the proposed action area.

4.1.8 Great Barrier Reef

4.1.8.1 Is the proposed action likely to have any direct and/or indirect impact on this protected matter? *

No

4.1.8.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The proposed action will not have a direct and/or indirect impact on the Great Barrier Reef. The proposed action occurs in north-west Tasmania and has no potential to impact the Great Barrier Reef

4.1.9 Water resource in relation to large coal mining development or coal seam gas

4.1.9.1 Is the proposed action likely to have any direct and/or indirect impact on this protected matter? *

No

4.1.9.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The proposed action does not involve coal seam gas or large coal mining development and will not have a direct and/or indirect impact on large coal mining development or coal seam gas activities.

4.1.10 Commonwealth Land

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

Direct impact	Indirect impact	Commonwealth land area
No	No	Commonwealth Land -

4.1.10.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.10.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The proposed action will not have a direct and/or indirect impact on Commonwealth Land. Three Commonwealth land titles are present within the proposed irrigation district - ID 60192, 60189, and 60194. These titles are Telstra exchanges and will not be directly or indirectly impacted by the proposed action.

4.1.11 Commonwealth Heritage Places Overseas

You have identified your proposed action will likely directly and/or indirectly impact the following protected matters.

A direct impact is a direct consequence of an action taken – for example, clearing of habitat for a threatened species or permanent shading on an ecological community as the result of installing solar panels.

An indirect impact is an 'indirect consequence' such as a downstream impact or a facilitated third-party action.

—

4.1.11.1 Is the proposed action likely to have any direct and/or indirect impact on any of these protected matters? *

No

4.1.11.3 Briefly describe why your action is unlikely to have a direct and/or indirect impact. *

The proposed action occurs within north-west Tasmania and has no potential to impact Commonwealth heritage places overseas.

4.1.12 Commonwealth or Commonwealth Agency

4.1.12.1 Is the proposed action to be taken by the Commonwealth or a Commonwealth Agency? *

No

4.2 Impact summary

Conclusion on the likelihood of significant impacts

You have indicated that the proposed action will likely have a significant impact on the following Matters of National Environmental Significance:

- Threatened Species and Ecological Communities (S18)

Conclusion on the likelihood of unlikely significant impacts

You have indicated that the proposed action will unlikely have a significant impact on the following Matters of National Environmental Significance:

- World Heritage (S12)
- National Heritage (S15B)

- Ramsar Wetland (S16)
- Migratory Species (S20)
- Nuclear (S21)
- Commonwealth Marine Area (S23)
- Great Barrier Reef (S24B)
- Water resource in relation to large coal mining development or coal seam gas (S24D)
- Commonwealth Land (S26)
- Commonwealth Heritage Places Overseas (S27B)
- Commonwealth or Commonwealth Agency (S28)

4.3 Alternatives

4.3.1 Do you have any possible alternatives for your proposed action to be considered as part of your referral? *

No

4.3.8 Describe why alternatives for your proposed action were not possible. *

The alternative action would be a no-action alternative, that is the SWISA would not be constructed. The business case is provided in Att_29_TI_Business_Case_SWISA, and the 'no-project' case is addressed (Att_29_TI_Business_Case_SWISA, sct7.10, pg126).

Under the no-action alternative it can be expected that there will be an increasing demand for water from already heavily allocated natural waterways, and that agriculture within the region will continue to be constrained. The distribution area has moderate annual rainfall with a limited potential for additional water to be sourced from within the district's catchments; landowners who do not have immediate access to water already will have limited opportunity to access alternate water in a future without SWISA.

Under the no-action alternative, the following could reasonably be expected: limited growth of agricultural opportunities in the SWISA region; continued exposure of farmers in the region to climate risks – both climate change and rainfall variability which impact on the viability of irrigated enterprises; limited scope for expansion of higher value enterprises reliant on irrigation, due to the lack of viable additional water sources; financial vulnerability of some operators, due to the impacts of periods of low rainfall; and the potential need for publicly funded drought relief.

5. Lodgement

5.1 Attachments

1.2.1 Overview of the proposed action

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att_1_TI_SWISA Saggers Hill Loop Option Engineering Report.pdf Engineering and design report for SWISA project	01/11/2022	No	High
#2.	Document	Att_10_NBES_NVA-SWISA_Appendix_A_MapOf Natural Values.pdf Appendix A of Natural values report - Map Of Natural Values	25/07/2023	No	High
#3.	Document	Att_2_NBES_NVA-SWISA_report.pdf Natural values assessment of the Sassafras-Wesley Vale Irrigation Scheme Augmentation	28/08/2023		High
#4.	Document	Att_3_TI_Farm_WAP_Fact_Sheet.pdf Outline of the Farm Water Access Plan process	09/05/2023	No	High
#5.	Document	Att_30_TI_Overview map of SWISA redesign areas.pdf Map detailing the original concept versus current pipeline alignment with reasons for realignments.	12/09/2023	No	High

1.2.6 Commonwealth or state legislation, planning frameworks or policy documents that are relevant to the proposed action

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att_4_NBES_Legislation_Summary.pdf Detail and relevance of legislation to SWISA	31/07/2023	No	High

1.2.7 Public consultation regarding the project area

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att_31_TI_Correspondence_from_NRE_Natural_Values_Feedback_SWISA.pdf A summary of consultation between Tasmanian Irrigation and NRE Tas regarding the SWISA natural values assessment reports	20/09/2023	No	High
#2.	Document	Att_5_TI_Community _consultation_Summary.pdf Summary of all consultation undertaken by TI for the SWISA project	29/08/2023	No	High
#3.	Document	Att_6_TI_SWISA Public consutation and design Summary.pdf Summary of public consultation and design outcomes. This document contains property owners and private addresses and should not be published.	10/01/2022	Yes	High
#4.	Document	Att_7_SWISA_Aboriginal_Heritage_Assessment_Report.pdf Aboriginal heritage assessment conducted by Cultural Heritage Management Australia for the SWISA project. This document contains information regarding culturally sensitive sites and must not be published.	04/07/2023	Yes	High

1.3.2.18 (Person proposing to take the action) If the person proposing to take the action is a corporation, provide details of the corporation's environmental policy and planning framework

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att_3_TI_Farm_WAP_Fact_Sheet.pdf Outline of the Farm Water Access Plan process	09/05/2023	No	High
#2.	Document	Att_33_TI_Operational Environmental Management Plan.pdf The Operational Environmental Management Handbook (OEMP) provides details of the environmental compliance obligations for Tasmanian Irrigation's (TI) operational schemes and how these are to be applied.	13/11/2023	Yes	High
#3.	Document	Att_8_TI_Environmental Management Processes.pdf Outline and framework of TI's environmental management processes	13/07/2023	No	High

3.1.1 Current condition of the project area's environment

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att_2_NBES_NVA-SWISA_report.pdf Natural values assessment of the Sassafras-Wesley Vale Irrigation Scheme Augmentation	27/08/2023	No	High
#2.	Document	Att_32_TI_SWISA_Planning Zones.pdf Map of the SWISA and Tasmanian Planning Scheme Zones	13/11/2023	No	High
#3.	Document	Att_9_DFTD_distribution.pdf Map of Devil Facial Tumour Disease distribution in Tasmania	24/02/2022	No	High

3.2.1 Flora and fauna within the affected area

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att_10_NBES_NVA-SWISA_Appendix_A_MapOf Natural Values.pdf Appendix A of Natural values report - Map Of Natural Values	26/07/2023	No	High
#2.	Document	Att_11_NBES_NVA-SWISA_Appendix_B_PlantSpeciesList.pdf Appendix B of natural values assessment report - Plant Species List	31/07/2023	No	High
#3.	Document	Att_12_NBES_NVA-SWISA_Appendix_C_ThreatenedFlora500m.pdf Appendix C of natural values assessment report - Threatened Flora within 500m	27/07/2023	No	High
#4.	Document	Att_13_NBES_NVA-SWISA_Appendix_D_PreliminaryNVAReport&ClarificationOfC.	31/05/2023	No	High

		tonelliiDistribution.pdf Appendix D of natural values assessment report - C. tonellii distribution			
#5.	Document	Att_15_NBES_NVA-SWISA_Appendix_F_EagleNestVisibility.pdf Appendix F of Natural values assessment report - Eagle Nest Visibility Maps	27/07/2023	No	High
#6.	Document	Att_16_NBES_NVA-SWISA_Appendix_G_MNES_Table.pdf Appendix G of Natural values assessment report - PMST MNES assessment table	31/07/2023	No	High
#7.	Document	Att_17_NBES_NVA-SWISA_Appendix_H_MNES_SIA_Table.pdf Appendix to the Natural Values Report. Provides tables of MNES likely to trigger significant impact criteria, with an assessment of potential to trigger each criterion.	28/08/2023	No	High
#8.	Document	Att_18_NBES_NVA-SWISA_Appendix_I_MNES_Maps_Vegetation.pdf Appendix I of natural values assessment report - MNES distribution Maps: Vegetation	31/07/2023	No	High
#9.	Document	Att_19_NBES_NVA-SWISA_Appendix_J_MNES_Maps_Fauna.pdf Appendix J of Natural values assessment report - MNES distribution Maps: Threatened fauna	07/08/2023	No	High
#10.	Document	Att_2_NBES_NVA-SWISA_report.pdf Natural values assessment of the Sassafras-Wesley Vale Irrigation Scheme Augmentation	27/08/2023	No	High
#11.	Document	Att_20_NBES_NVA-SWISA_Appendix_K_MNES_Maps_Flora.pdf Appendix K of Natural values assessment report - MNES distribution Maps: Threatened flora	26/07/2023	No	High
#12.	Document	Att_21_NBES_NVA-SWISA_Appendix_L_MNES_Maps_Migratory & Marine.pdf Appendix L of Natural values assessment report - MNES distribution Maps: Migratory and Marine fauna	07/08/2023	No	High

3.2.2 Vegetation within the project area

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att_2_NBES_NVA-SWISA_report.pdf Natural values assessment of the Sassafras-Wesley Vale Irrigation Scheme Augmentation	27/08/2023	No	High
#2.	Link	Geology of Northwest Tasmania https://www.mrt.tas.gov.au/webdoc2/app/default/m..			High

3.3.1 Commonwealth heritage places overseas or other places that apply to the project area

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att_22_SWISA_Historic_Heritage_Report.pdf Historic Heritage Report prepared for SWISA	09/07/2023	No	High

3.3.2 Indigenous heritage values that apply to the project area

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att_7_SWISA_Aboriginal_Heritage_Assessment_Report.pdf Aboriginal heritage assessment conducted by Cultural Heritage Management Australia for the SWISA project.	03/07/2023	Yes	High

3.4.1 Hydrology characteristics that apply to the project area

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att_23_TI_SWISA_Turbidity_Management_Framework.pdf SWISA Turbidity Management Framework provides guidance for the development of environment management plans and guidelines	17/08/2023	No	High
#2.	Document				

Att_34_TI_SWISA Hydrology Considerations Report V2.pdf Summary of hydrological considerations and outcomes of the SWISA project		22/11/2023	No	High

4.1.4.2 (Threatened Species and Ecological Communities) Why your action has a direct and/or indirect impact on the identified protected matters

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att_15_NBES_NVA-SWISA_Appendix_F_EagleNestVisibility.pdf Appendix F of Natural values assessment report - Eagle Nest Visibility Maps	26/07/2023	No	High
#2.	Document	Att_16_NBES_NVA-SWISA_Appendix_G_MNES_Table.pdf Appendix G of Natural values assessment report - PMST MNES assessment table	30/07/2023	No	High
#3.	Document	Att_17_NBES_NVA-SWISA_Appendix_H_MNES_SIA_Table.pdf Appendix to the Natural Values Report. Provides tables of MNES likely to trigger significant impact criteria, with an assessment of potential to trigger each criterion.	27/08/2023	No	High
#4.	Document	Att_18_NBES_NVA-SWISA_Appendix_I_MNES_Maps_Vegetation.pdf Appendix I of natural values assessment report - MNES distribution Maps: Vegetation	30/07/2023	No	High
#5.	Document	Att_19_NBES_NVA-SWISA_Appendix_J_MNES_Maps_Fauna.pdf Appendix J of Natural values assessment report - MNES distribution Maps: Threatened fauna	06/08/2023	No	High
#6.	Document	Att_2_NBES_NVA-SWISA_report.pdf Natural values assessment of the Sassafras-Wesley Vale Irrigation Scheme Augmentation	27/08/2023	No	High
#7.	Document	Att_20_NBES_NVA-SWISA_Appendix_K_MNES_Maps_Flora.pdf Appendix K of Natural values assessment report - MNES distribution Maps: Threatened flora	25/07/2023	No	High
#8.	Document	Att_21_NBES_NVA-SWISA_Appendix_L_MNES_Maps_Migratory & Marine.pdf Appendix L of Natural values assessment report - MNES distribution Maps: Migratory and Marine fauna	06/08/2023	No	High
#9.	Document	Att_24_Protected Matters-MNES layers - March 15th 2023.pdf EPBC Act Protected Matters Report	15/03/2023	No	High

4.1.4.5 (Threatened Species and Ecological Communities) Why you consider the direct and/or indirect impact to be a Significant Impact

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att_16_NBES_NVA-SWISA_Appendix_G_MNES_Table.pdf Appendix G of Natural values assessment report - PMST MNES assessment table	30/07/2023	No	High
#2.	Document	Att_17_NBES_NVA-SWISA_Appendix_H_MNES_SIA_Table.pdf Appendix to the Natural Values Report. Provides tables of MNES likely to trigger significant impact criteria, with an assessment of potential to trigger each criterion.	27/08/2023	No	High

4.1.4.10 (Threatened Species and Ecological Communities) Avoidance or mitigation measures proposed for this action

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att_2_NBES_NVA-SWISA_report.pdf Natural values assessment of the Sassafras-Wesley Vale Irrigation Scheme Augmentation	27/08/2023	No	High
#2.	Document	Att_25_TI_Green_Gold_Frog_Protocol.pdf SWISA Green Gold Frog Protocol	01/03/2023	No	High
#3.	Document	Att_26_TI_Threatened_Burrowing_Crayfish_Protocol.pdf SWISA Burrowing Crayfish Protocol	01/04/2023	No	High
#4.	Document	Att_27_NBES_Unanticipated_Den_Discovery_Protocol.pdf SWISA Unanticipated Den Discovery Protocol	25/07/2023	No	High

#5.	Document	Att_28_TI_SWISA_Environmental_Protection_Requirements.pdf SWISA construction works Environmental Protection Requirements	11/08/2023	No	High

4.1.5.3 (Migratory Species) Why your action is unlikely to have a direct and/or indirect impact

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att_16_NBES_NVA-SWISA_Appendix_G_MNES_Table.pdf Appendix G of Natural values assessment report - PMST MNES assessment table	30/07/2023	No	High
#2.	Document	Att_21_NBES_NVA-SWISA_Appendix_L_MNES_Maps_Migratory & Marine.pdf Appendix L of Natural values assessment report - MNES distribution Maps: Migratory and Marine fauna	06/08/2023	No	High
#3.	Document	Att_24_Protected Matters-MNES layers - March 15th 2023.pdf EPBC Act Protected Matters Report	14/03/2023	No	High

4.3.8 Why alternatives for your proposed action were not possible

	Type	Name	Date	Sensitivity	Confidence
#1.	Document	Att_29_TI_Business_Case_SWISA.pdf SWISA Business Case	01/12/2022	No	High

5.2 Declarations

✔ Completed Referring party's declaration

The Referring party is the person preparing the information in this referral.

ABN/ACN	32641893352
Organisation name	NORTH BARKER ECOSYSTEM SERVICES PTY LTD
Organisation address	313 Macquarie St, Hobart, 7000, TAS
Representative's name	Grant Daniels
Representative's job title	Managing Director
Phone	0262319788
Email	admin@northbarker.com.au
Address	313 Macquarie Street, Hobart, TAS 7000

☑ Check this box to indicate you have read the referral form. *

☑ I would like to receive notifications and track the referral progress through the EPBC portal. *

☑ By checking this box, I, **Grant Daniels of NORTH BARKER ECOSYSTEM SERVICES PTY LTD**, declare that to the best of my knowledge the information I have given on, or attached to this EPBC Act Referral is complete, current and correct. I understand that giving false or misleading information is a serious offence. *

☑ I would like to receive notifications and track the referral progress through the EPBC portal. *

● Awaiting Person proposing to take the action's declaration

The Person proposing to take the action is the individual, business, government agency or trustee that will be responsible for the proposed action.

ABN/ACN	95722799075
Organisation name	Tasmanian Irrigation Pty Ltd
Organisation address	201 Evandale Road, Western Junction, Tasmania, 7212
Representative's name	Sophie Grace
Representative's job title	General Manager – Environmental, Health and Safety
Phone	(03) 6398 8433
Email	sophie.grace@tasirrigation.com.au
Address	Level 2, Launceston Airport, 201 Evandale Road, Western Junction, Tasmania, 7212

☐ Check this box to indicate you have read the referral form. *

☐ I would like to receive notifications and track the referral progress through the EPBC portal. *

☐ I, **Sophie Grace of Tasmanian Irrigation Pty Ltd**, declare that to the best of my knowledge the information I have given on, or attached to the EPBC Act Referral is complete, current and correct. I understand that giving false or misleading information is a serious offence. I declare that I am not taking the action on behalf or for the benefit of any other person or entity. *

☐ I would like to receive notifications and track the referral progress through the EPBC portal. *

● Awaiting Proposed designated proponent's declaration

The Proposed designated proponent is the individual or organisation proposed to be responsible for meeting the requirements of the EPBC Act during the assessment process, if the Minister decides that this project is a controlled action.

Same as Person proposing to take the action information.

☐ Check this box to indicate you have read the referral form. *

☐ I would like to receive notifications and track the referral progress through the EPBC portal. *

☐ I, **Sophie Grace of Tasmanian Irrigation Pty Ltd**, the Proposed designated proponent, consent to the designation of myself as the Proposed designated proponent for the purposes of the action described in this EPBC Act Referral. *

☐ I would like to receive notifications and track the referral progress through the EPBC portal. *

Tasmanian Irrigation

SASSAFRAS WESLEY VALE SCHEME AUGMENTATION

SWISA Saggers Hill Loop – Engineering Report

Document Control

Project:	Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA)
Report Title:	SWISA Saggers Hill Loop Engineering Design Report

Revision	Date	Author	Reviewer(s)		Summary of Revision Changes
			Name	Signature	
0	November 2022	C Reid	M Holmes		Initial Draft Issue
1	November 2022	C Reid	M Holmes		Finalised

Executive Summary

This report outlines the engineering design, rationale, and background information in developing the Sassafras and Wesley Vale Scheme Augmentation (SWISA) Saggers Hill Option to the Business Case Design stage post water sales.

SWISA is a brownfield site as there is there is the existing scheme, SWIS, which will remain in service during construction.

The SWISA is a 14,860 ML/150 day season or 99.1 ML/d irrigation scheme designed for summer delivery. Water will be extracted from the Mersey River before being pumped to the irrigators via 107.2 km of pipeline network including 2 pump stations and a reservoir.

The concept has been designed maximise tradability opportunities in the scheme based on the feedback from the preferred option public launch[1].

[1] 2022 TI, 20220126 Memo SWISA Alternative Option 20220126 Memo SWISA Alternative Options.docx

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1 Background

The Sassafras and Wesley Vale Scheme (SWIS) was built in 2012 off the Wesley Vale Paper Mill (WVPM) infrastructure of a pump station and 23 ML reservoir at Great Bend on the Mersey River and 11 km of DN900 trunk main to Wesley Vale. This was constructed in 1969/70.

There are 6 branches tied into the trunk main, three are gravity supplied from Great Bend Reservoir and three branches have with BPS.

Figure 1 SWIS Overview

2 Engineering Design Process

2.1 Assumptions

SWISA has been developed to the Business Case stage based on the following assumptions.

- Design assumptions include, but are not limited to:
  - Delivery of irrigation rights continually over the duration of the irrigation season(s);
  - Hydraulic design adopting a 0.2 mm Colebrook-White friction coefficient (factor of safety based on field testing of Pardoe Brach 2020);
  - Pump station to be controlled by balance tank water level;
  - Pumps to pump up to balance tank full supply level (FSL);
  - Hydraulic grade line (HGL) to be set by balance tank minimum operating level (MOL);
  - Pipe pressure class set to 5 m greater than FSL
    - 180 m AHD gravity supplied from Saggers Hill Reservoir
    - 210 m AHD supplied from Sassafras BPS.

- Preliminary OPEX and CAPEX optimisations have been based on the cost assumptions outlined in this report;

- Water will be delivered and traded as per Tasmanian Irrigations standard delivery rights and as per Tasmanian Irrigations standard water trading policy.
- The design will be refined during the Detailed Design phase through the completion of site walkovers, meetings with impacted landowners and improved understanding of elevation and geotechnical conditions.

2.2 Design Principles

The following design principles have been adopted.

- 100-year infrastructure design life:
  1. High-density polyethylene (HDPE) has been selected as the primary pipe material due to, but not limited to, the following reasons:
     i. HDPE Welds will generally have the strength of the parent material through the fusion of pipe lengths with butt welds.
     ii. Continuous pipe preventing ingress of foreign material in joints and allowing load transfer along the length of the pipe, thus reducing the frequency of thrust blocks.
     iii. Higher durability and hence more tolerant to rock in trench and penetration from surface practices.
  2. Minimise pipeline velocities to reduce likelihood of pipeline cavitation:
     i. Pipelines have been sized such that pipe velocities are less than 2.4 m/s.
- Design life for specific design elements as per relevant TI Basis of Design (BoD) standards and Technical Specifications. Note, a schedule of serviceability timeframes for specific scheme elements is provided in the Design Partner SoW.

- 95% average reliability of water entitlements.
- Compliance with relevant legislation and regulations.
- Identification and utilisation of opportunities to minimise the whole of life operating costs.
- Maintain highest standards with regard to safety and Safety in Design (SiD).

2.3 Report Context

This report outlines the engineering design, rationale, and background information in developing the Sassafras and Wesley Vale Scheme Augmentation (SWISA) to Business Case Design stage.

The SWISA Business Case should be read in conjunction with this document for a full understanding. The Business Case engineering report is supporting document to the SWISA Business case.

3 Demand

SWIS operates over 150 days with a total demand of 5460 ML/season or 36.4 ML/d. RH Loane Pty Ltd, who has a property at the start of the Northdown Branch, has an additional 200 ML from the Mersey River, the licence for which has now been transferred to TI. This water is on top of any allocations purchased as part of SWIS. There is an agreement with RH Loane and TI to deliver this water allocation through SWIS

The RH Loane water license brings the total supplied through SWIS to 37.7 ML/d.

9200 ML of water has been made available for purchase for SWISA. To date, 6340 ML has been sold over 82 contracts. Most sales are within the existing irrigation district and next to the existing irrigation pipeline. Sales outside of the existing district have occurred in two main areas; North of Latrobe and south of SWIS towards Paramatta Creek Two contracts have been received for properties bordering the Mersey River (their demand has been allocated to zone Trunk 1).

The SWISA demand more than doubles the existing scheme of 37.7 ML/d to 99.1 ML/d or 11860 ML per season (including RH Loane Pty Ltd).

Table 1 SWISA Demand

Demand	ML/season	ML/d
SWIS	5460	36.4
RH Loane	200	1.3
SWIS Sub-Total	5660	37.7
SWISA Sold	6340	42.3
SWISA Unsold	2859	19.1
Total	**14860**	99.1

4 Water Supply

SWIS is serviced from existing Department of Natural Resources and Environment Tasmania (NRE) Water Licence on the Mersey River which is sufficient to meet existing scheme demand. Additional water is required to service SWISA. Water source options have been considered with the preferred supply being to purchase water out of Lake Parangana from Hydro Tasmania.

A maximum outflow of 116 ML/d out of Parangana Dam is required. This is to includes additional 5 ML for cease-to-take limit and 10% transmission loss on Mersey River above the SWISA capacity of 99.1 ML/d.

Hydro has provided two options[2] for upgrading Parangana Dam outlet to supply water for SWISA. Both options have the capacity to supply the full flow rate of up to 116 ML/d. TI would have and control an outlet valve to manage the discharge for SWISA with Hydro having an override.

The first option is to connect to the existing DN600 outlet. A discharge pipeline is required to be extended 70 m to the end of the Parangana Dam Outlet Tunnel and a control valve added to release into the Mersey River for SWISA. This is a temporary option will be replaced when Hydro upgrade the dewatering capacity of the dam outlet.

The second option is the long-term solution. The Parangana main DN1900 outlet has been restricted and connected directly to the mini hydro station. Hydro plan to remove the restriction and construct a large diameter pipe to the end of the outlet tunnel. TI will have an offtake and control valve from this outlet extension. This is the preferred option for TI however is dependent on the timing of Hydro's upgrade to the dewatering valve.

[2] Hydro 2021, Parangana Outlet Options FW External RE Lake Parangana outlet inspection.msg

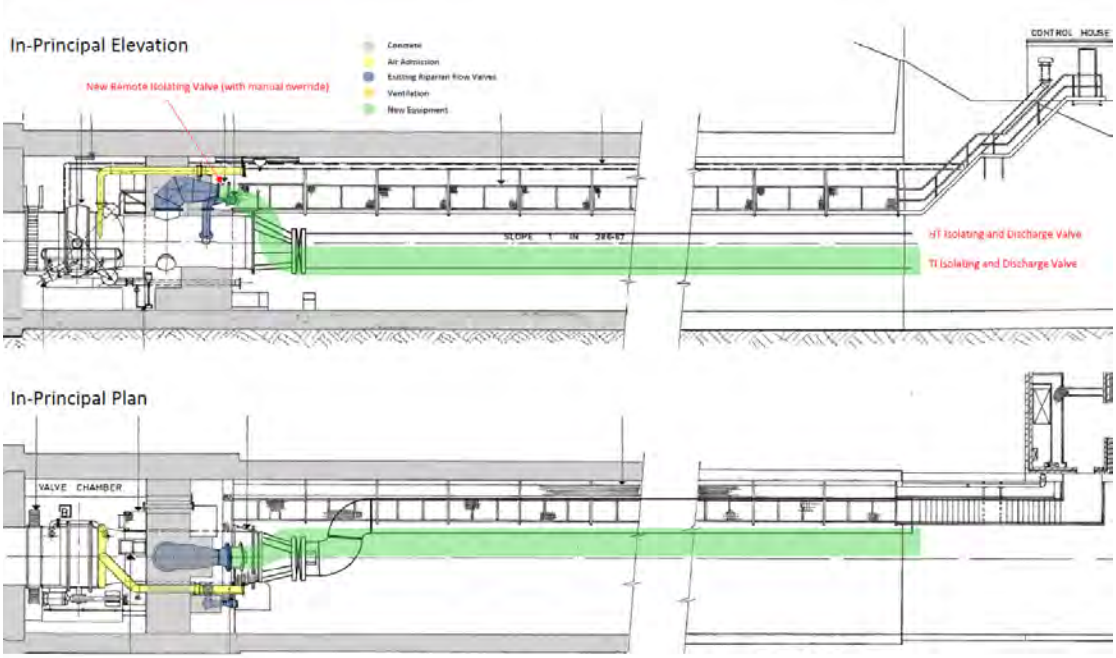


Figure 2 Parangana Outlet Short-term Option

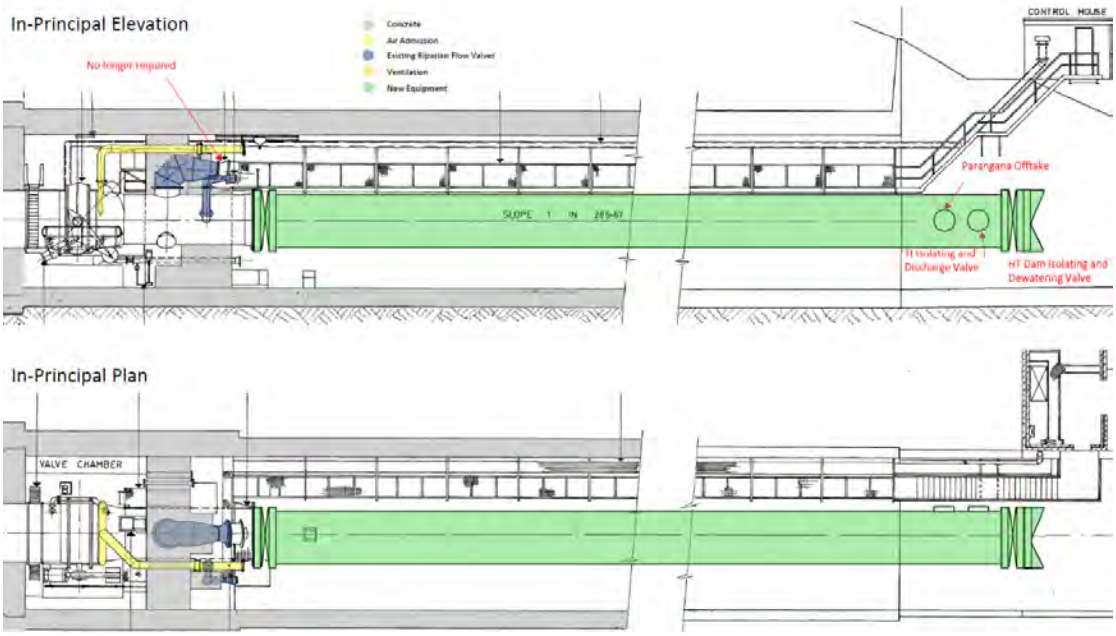


Figure 3 Parangana Outlet Long-term Option

5 SWISA Overview

Water is pumped out of the Mersey River at Great Bend up to the Saggers Hill Reservoir on top of a nearby hill. The Pump Station is controlled by the level in the reservoir.

There is a trunk main out of the reservoir which runs North to supply the scheme. The pressure in the first branch, Sassafras, is boosted by a pump station while the remain remainder of the scheme is gravity supplied out of Saggers Hill Reservoir.

The scheme includes two looped zones, Moriarty and Wesley Vale, to maximise trading opportunities. The SWIS Harford and Thirlstane branches have been connected on the eastern side of the scheme to create the Moriarty Zone. The Northdown and Pardoe branches have been looped together with a pipeline to the north of the scheme on Mill Road to create Wesley Valve Zone. There are 31 trading zones in SWISA.

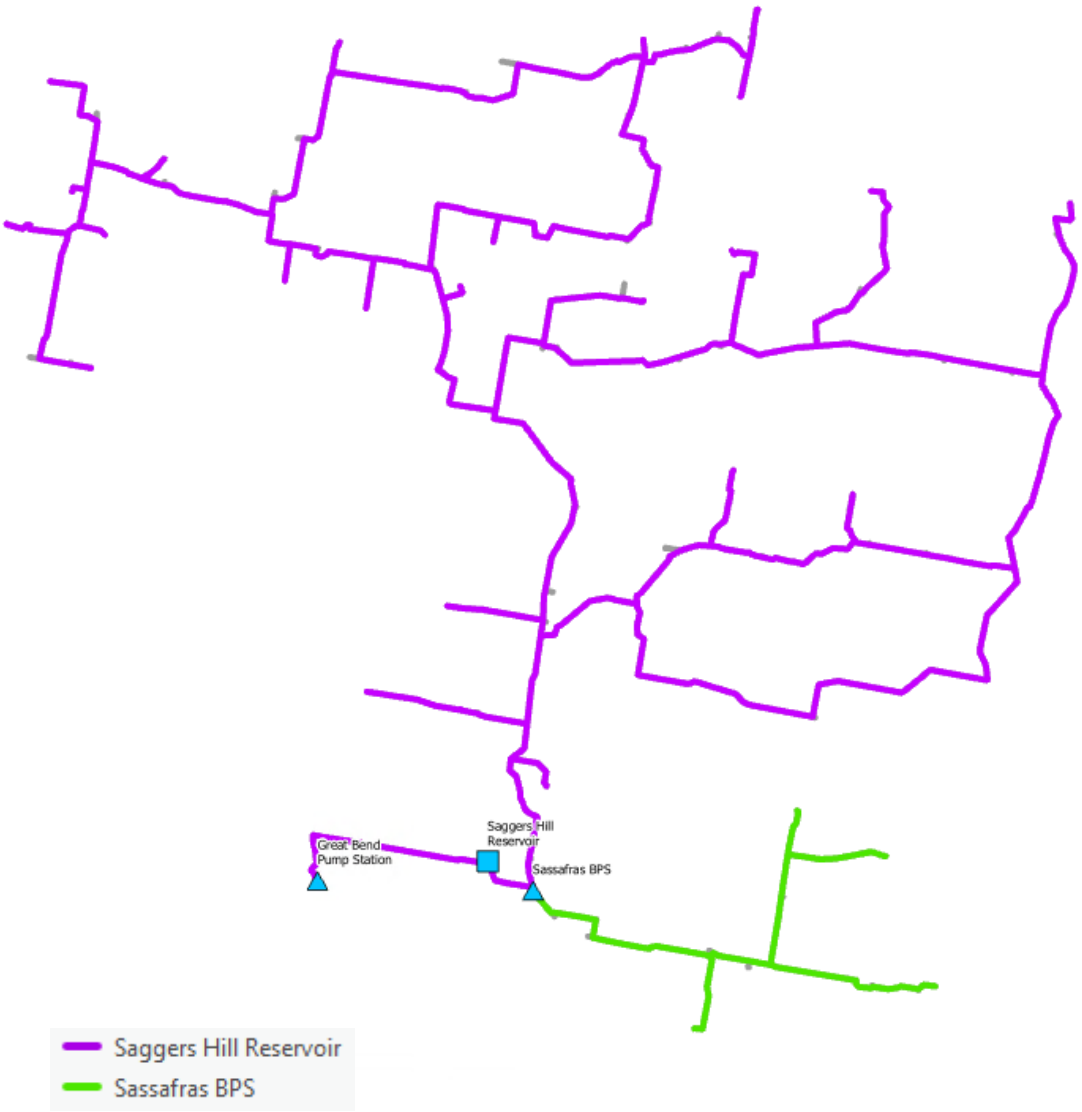


Figure 4 SWISA Overview

Figure 5 SIWSA Overview Map

5.1 Non-Viable Applications

A number of options for the SWISA scheme has been assessed including the viability of supplying all water sale application. There are four applications up to 7.2 km south of the scheme totalling 390 ML which have been deemed non-viable to supply due to cost of supply. The volume has been included as in main zones of the network.

6 Great Bend Pump Station

The Great Bend Pump Station is to be renewed for use in SWISA. The pump station was constructed 50 years ago in 1969/70. It was originally designed for 76 ML/d.

Works will need to be completed in a manner to minimise downtime and disruption to irrigators. Temporary pumping arrangement has been included in the CAPEX to achieve this.

6.1.1 Pumps

There are two existing 500 kW vertical turbine pumps that operate at 28 ML/d each or approximately 55 ML/d together to a pressure of approximately 100 m. SWISA requires pumps with higher pressure and the existing pumps are not suitable. All new pumps are required, and the existing pumps are to be decommissioned.

There are four well spaces in the pump station each for an 800 kW pump capable of 24.7 ML/d at 165 m. These pumps will operate on Variable Speed Drives to balance out the level in the reservoir.

6.1.2 Electrical

Great Bend Pump Station (GBPS) currently has a high voltage power connection with the pumps being DOL starting. The transformers and low voltage switchboard are original at over 50 years old and are past serviceable life.

High voltage connection has been costed for this option based on the cost benefit analysis assessment between low and high voltage options[3]. VSDs will be installed on the four new pumps, they will operate based on the level in the Saggers Hill Reservoir. A fibre optic cable will allow for communication between GBPS, the reservoir and Sassafras Booster Pump Station (BPS).

[3] TI 2022, SWISA Great Bend Pump Station Power Cost Benefit Analysis 20220915 SWISA Great Bend Pump Station Power Cost Benefit Analysis.docx, 20220915 SWISA Great Bend Pump Station Power Cost Benefit Analysis.xlsx

6.1.3 Screens

There are two screen wells intakes to the pump station; one is in use and the second is blocked off. The on-line well has a fixed screen on the outside of the station and a travelling screen within the well. The travelling screen is original, in working order but requires significant maintenance.

The second well is required to be opened for SWISA to allow for sufficient flow into the pump station. Two new screens are required and new penstocks on the inlet and outlet of each screen well.

6.1.4 Structure

Structure and condition assessments[4][5] highlighted a number of maintenance tasks required for the Great Bend Pump Station to extend its life for an additional 100 years. Safety upgrades to access and rock wall stability are also required[6]. Works to the site include:

- Filling cracks in the concrete structure
- Re-coating system applied to the concrete structure[7]
- Access and safety improvements
- Rock wall stability upgrades
- Drainage repairs
- Grouting void under slab
- Vegetation removal

[4] Rare 2020, Structural Engineering Assessment Report – SWISA Great Bend Pump Station 0. 215029 Structural Engineering Assessment Report - GREAT BEND.pdf

[5] GHD 2022, Great Bend Pump Station Structure and Refurbishment Review, 12585497-LET Great Bend Pumping Station Structure and Refurbishment Review Final.pdf

[6] GHD 2022, Great Bend Pump Station Rockface Geotechnical Assessment, 12585497-LET Great Bend Pumping Station Structure and Refurbishment Review Final.pdf

[7] Maintenance Systems 2021, Great Bend Pump Station Coat System Proposal Quote MS25955.1 Great Bend Pump Station.docx

7 Rising Main

A new pump manifold at Great Bend Pump Station discharges into the 3.0 km long rising main. The rising main follows the Great Bend Pump Station access road to the boundary gate on Devil Road before cutting through the bush, following the boundary heading east to the Saggers Hill Reservoir site. The last section, before the reservoir, is very steep and identified within the low hazard landslide band.

A minimum pressure class of PN10 has been assumed for the rising main as transient analysis has not been undertaken at this stage.

8 Saggers Hill Reservoir

A reservoir is to be constructed on Saggers Hill, which is approximately 2 km east of the existing Great Bend Reservoir, at 158 Native Plains Road. At a usable volume of 2.1 ML the reservoir will have 30 minutes of storage at full flow. SWISA is designed to operate with a minimum reservoir level of 170 m AHD, the elevation required for Saggers Hill Reservoir is on one property. The next nearest hill with sufficient elevation is a further 2 km south east. The dimensions of the reservoir are:

- Usable volume 2.1 ML (30 minutes)
- Wall height 6 m
- Diameter 23.5 m
- Base level 170 m AHD
- TWL 175 m AHD

The reservoir has been costed as concrete. A full lifecycle cost comparison between concrete and steel will need to be undertaken during detailed design to determine the best option for SWISA needs.

The existing Great Bend Reservoir is nearing the end of its life and is to be decommissioned[8].

[8] Rare 2021, Great Bend Reservoir Structural Engineering Assessment Report 1. 215049 SWISA Great Bend Reservoir.pdf

Figure 6 Saggers Hill Reservoir (left) and Sassafras BPS (right)

9 Booster Pump Station

There is one Booster Pump Stations within SWISA on the Sassafras branch. The Sassafras BPS is located on Native Plains Road, downstream of Saggers Reservoir on the Sassafras branch line.

A preliminary power connection has been assessed and a transformer upgrade is required at a minimum. Power lines along Native Plains Road will enable to facilitate the connection to the proposed pump station site.

The three existing BPS at Sassafras, Harford and Northdown in the SWIS scheme are to be decommissioned (refer section 14 Decommission).

Table 2 Sassafras BPS Requirement

Pump Station	Sassafras
Flow ML/d (including +30%)	10.6
Pump Head m	37
Total Head m AHD	205
Number of Pumps	4
Pump Size kW	30
Installed Power (inc. allowance for ancillaries)	75

10 Pipelines

The demand on the scheme has more than doubled from 37.7 ML/d to 99.1 ML/d and the existing scheme does not have the capacity for the additional flow[9].

The proposed scheme follows much of the existing pipeline alignment. Existing outlet points remain in the same location as it is not reasonable to expect irrigators to potentially alter their private infrastructure to meet a change in the scheme alignment.

The existing pipes are to be replaced with new larger pipes. The SWISA pipework alignment has been designed with a horizontal buffer of 8 m, in most cases, from existing SWIS pipeline. This also provides the benefit that much of the construction can occur during the irrigation period without interrupting service. The total length of for SWISA is 100.4 km (see Figure 7 SWISA Proposed Pipework).

Table 3 SWISA Pipe Lengths [km]

Line	Length km
Rising Main and Trunk	15.7
Sassafras	10.7
Moriarty Loop	37.3
Wesley Vale Loop	34
Extended Outlets	2.7
Total	100.4

[9] TI 2021, SWIS Hydraulic Performance Memo SWIS Hydraulic Performance Memo.pdf

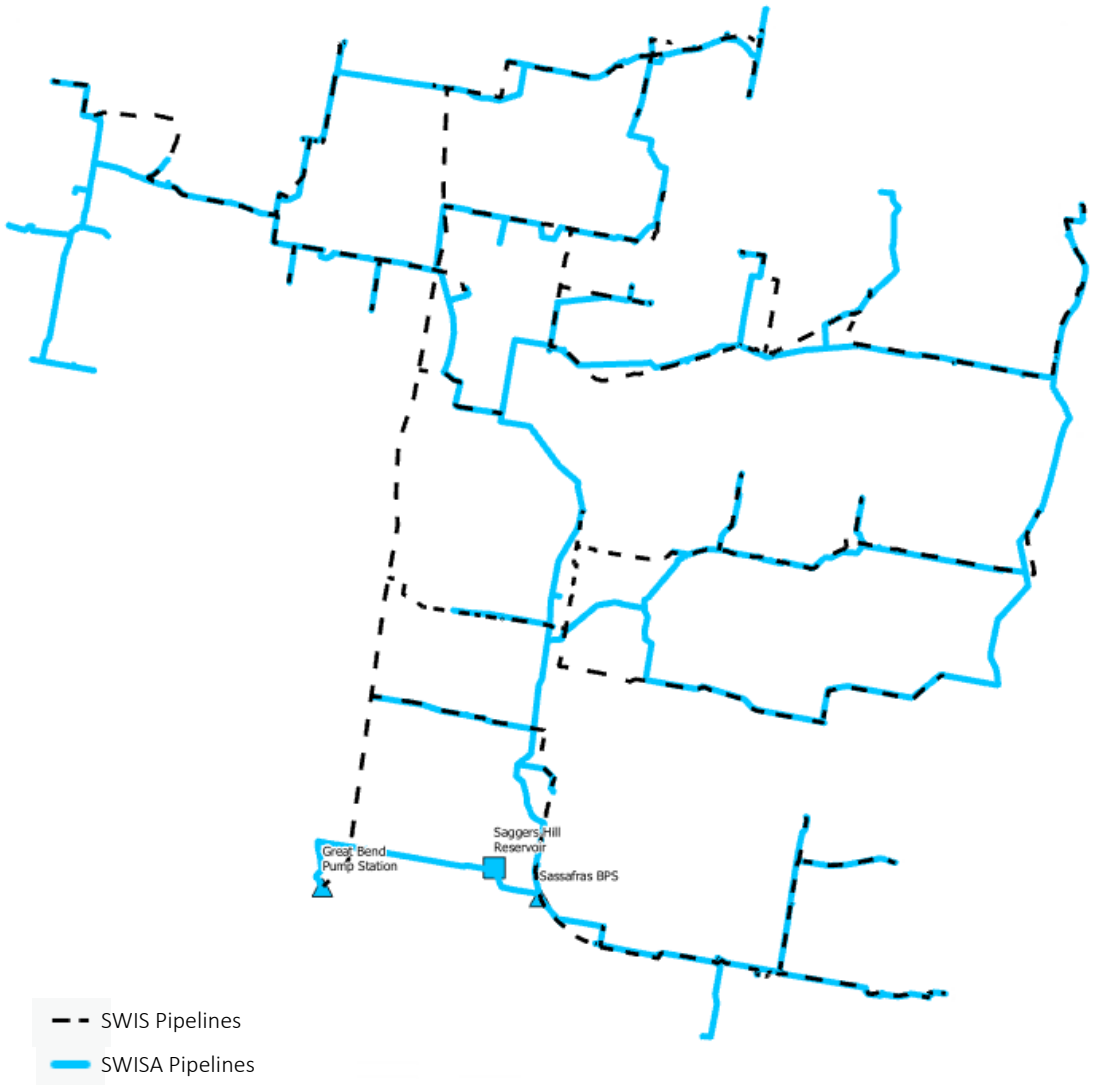


Figure 7 SWISA Proposed Pipework

An option to run new pipes in parallel to the existing system was considered[10]. This doubles the assets in the scheme and some existing pipe still require replacing due to pressure classes being exceeded. This option has been discounted. The existing pipes that are not used are to be decommissioned.

There is an opportunity to reuse some of the existing pipes. The pipes will need to be exhumed, cut up, transported, and installed in a new location. This has been deemed cost prohibitive and has the potential to disrupt supply so has been ruled out.

The proposed SWISA alignments follow closely the current SWIS alignments, however due to unavoidable changes necessary for SWISA the scheme will need to be re-zoned. Some existing outlets are moved from being gravity supplied from the Great Bend Reservoir to being on a

[10] TI 2020, Parallel versus Replacement Pipeline Cost Benefit Analysis SWISA Parallel versus Replacement Pipeline Cost Benefit Analysis.docx

booster pumped line and will be charged additional OPEX.. This has been kept to a minimum where possible.

The scheme has been designed to operate at a minimum water level in Saggers Hill Reservoir of 170 m AHD, and Sassafras BPS operating at 205 m AHD. See Appendix F for Hydraulic Grade Lines (HGL).

There are 31 trading zones in SWISA. The unsold water has been distributed in branches based on likely opportunity for growth.

Table 4 Summary of Branch Demand

Zone	Demand [ML/150d]	Demand [ML/d]
Trunk	1255	8.37
Moriarty	6109	40.7
Wesley Vale	5755	38.4
Sassafras	1740	11.6
Total	14860	**99.1**

A peer review[11] has confirmed the hydraulic model has sufficient capacity to supply the demand and the correct pressure class have been selected. Feasibility design challenge workshop with GHD, Pinion and Blue Tier were conducted to ensure no fatal flaws in the project at this stage.

[11] Pinion 2022, SWISA Hydraulic Review, SWISA Hydraulic Review Rev 2.pdf

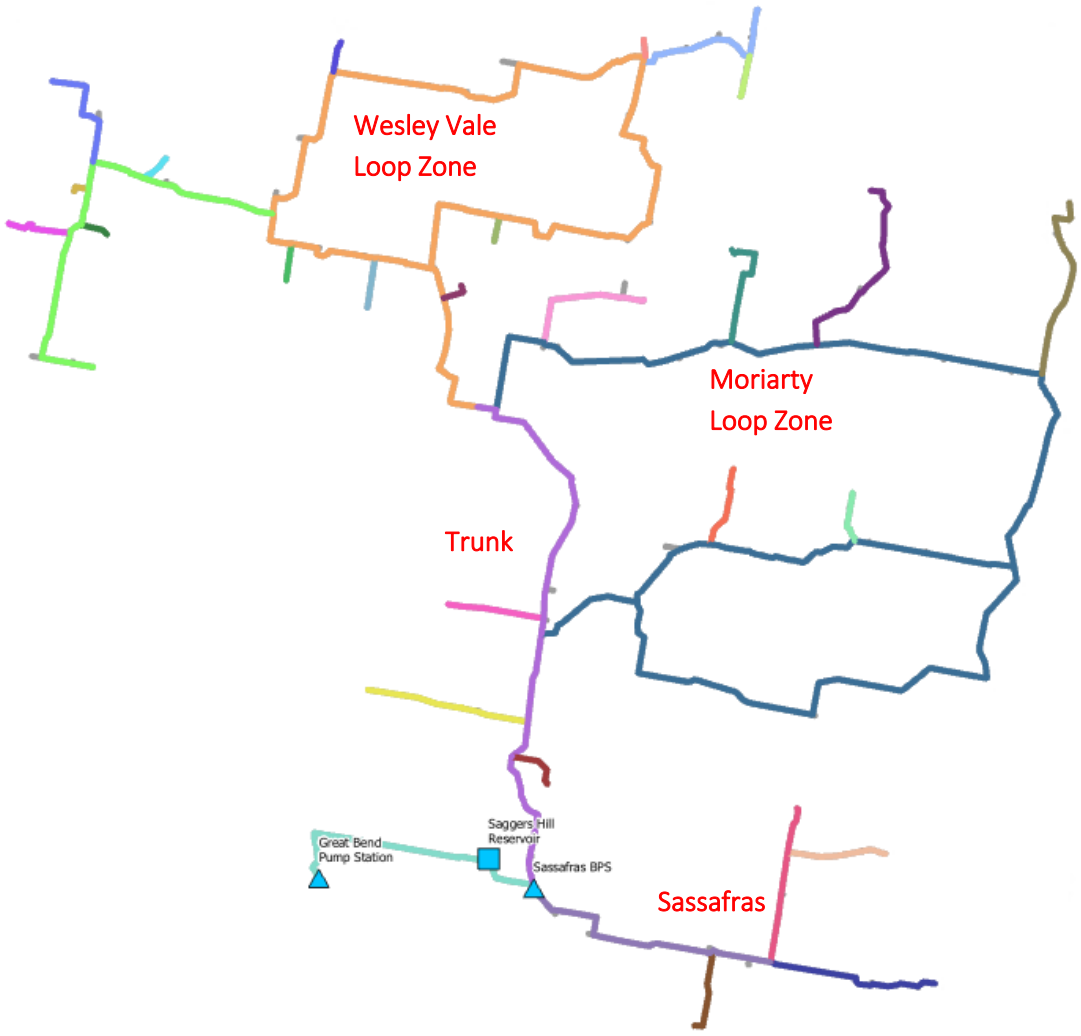


Figure 8 SWISA Trading Zones

10.1 Trunk Main

The 10.2 km trunk main is to bypass to the east the first 7.5 km of the existing SWIS trunk main between the reservoir to the football oval on Wesley Vale Road. There are no outlets on this section of trunk[12].

The trunk main crosses the Bass Highway near Oppenheims Road where it is two lanes. The trunk main incorporates the proposed scheme by joining at the existing Sassafras and Harford branches. The trunk main steps down in size after each zone.

Table 5 Trunk Demand

Zone	SWISA ML/150d	SIWSA ML/d
T1	1115	7.43
TA	20	0.13
TB	90	0.60
TC	30	0.20
Trunk Total	**1255**	**8.37**

[12] TI Jan 2022, Memo SWISA Alternative Options 20220126 Memo SWISA Alternative Options.docx

Figure 9 Trunk Main Zones

10.2 Moriarty Loop

The Moriarty Loop (40.7 ML/d) joins the two Harford lines and the Thirlstane on the eastern side. The full volume within the Moriarty Loop can be traded to any point. The loop consists of one zone and six branches.

The pipe dimeter in the southern section of the zone is a size larger to overcome headlosses that would result otherwise result in low pressure near the intersection of Valley Field Road and Chapel Road. This is a high spot on the Moriarty Loop.

Outlets on Thirlstane currently gravity supplied from Great Bend Reservoir would experience an increase in pressure when supplied from Saggers Hill Reservoir (56 m static).

Table 6 Moriarty Loop Demand

Zone	SWISA ML/150d	SIWSA ML/d
M1	3899	26.0
MA	440	2.93
MB	65	0.43
MC	475	3.17
MD	600	4.00
ME	300	2.00
MF	330	2.20
Moriarty Total	**6109**	**40.7**

Figure 10 Moriarty Loop

10.3 Wesley Vale Loop

The Wesley Vale Loop (38.7 ML/d) joins together the first section of Thirlstane to Northdown on Wrights Lane and loops them to Pardoe on Mill Road. The full volume within the Moriarty Loop can be traded to any point. The loop consists of one main zone with 14 sub zones and branches off it. One of the branches, Latrobe 1, crosses the Bass Highway at Winspears Road to supply the area north of Latrobe.

Outlets on Thirlstane, Pardoe and first section of Northdown are currently gravity supplied from Great Bend Reservoir. These outlets will experience an increase in pressure when supplied from Saggers Hill Reservoir of 56 m static.

Table 7 Wesley Vale Loop Demand

Zone	SWISA ML/150d	SIWSA ML/d
W1	2920	19.5
WA	40	0.27
WB	40	0.27
WC	260	1.73
WD	10	0.07
WE	260	1.73
WF	155	1.03
L1	550	3.67
LA	10	0.07
LB	235	1.57
LC	20	0.13
LD	130	0.87
LE	20	0.13
N1	515	3.43
NA	590	3.93
Wesley Vale Total	**5755**	**38.4**

Figure 11 Wesley Vale Loop

10.4 Sassafras Branch

The Sassafras Branch has a demand of 11.6 ML/d. The Sassafras Branch follows the existing alignment with an a new branch down to Paramatta Creek to supply new irrigators. There are two zones and 3 branches.

A BPS is required in this zone set to target a head of 205 m AHD. The proposed scheme is designed to balance pump head with headloss to ensure pressure is improved and any low pressures issues are no longer present in the Sassafras branch.

Table 8 Sassafras Demand

Zone	SWISA ML/150d	SIWSA ML/d
S1	870	5.80
S2	380	2.53
SA	110	0.73
SB	250	1.67
SC	130	0.87
Sassafras Total	**1740**	**11.6**

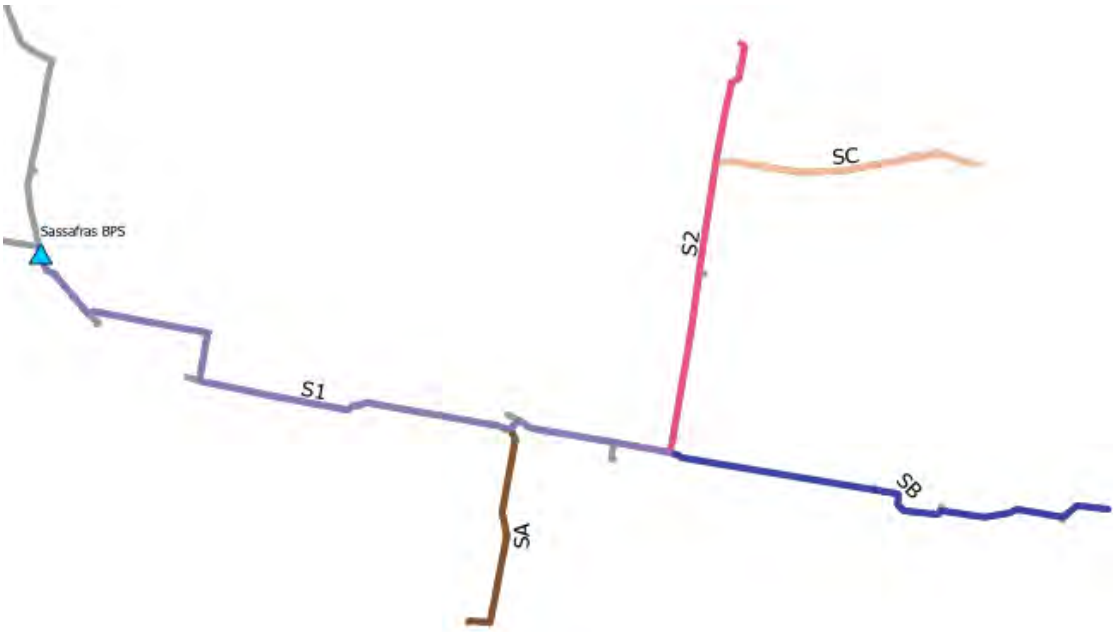


Figure 12 Sassafras Branch

11 Outlets

There are 127 outlets in current SWIS. 83 water sale applications have been received. 39 are additional water for existing outlets and 44 are new outlets. This brings the total number of outlets in SWISA to 171.

Existing outlets that are currently undersized and have not submitted an EOI for additional water have also been included for a new outlet.

Existing outlets that adequately sized shall be disconnected from the existing SWIS main connected and into the new SWISA main during construction. The meters are approaching the end of their useful life and will be renewed through ARL.

Radio operated telemetry is to be applied to selected outlets that have been identified as likely to trade water regularly. This is to facilitate operation of water trading within the scheme.

Table 9 Outlet Summary

Size	Existing Outlet	New Outlet no Telemetry	New Outlet with Telemetry
50	43	0	0
80	11	15	25
100	10	6	15
150	1	8	20
200	0	1	8
300	0	0	5
Total	**65**	**30**	**73**

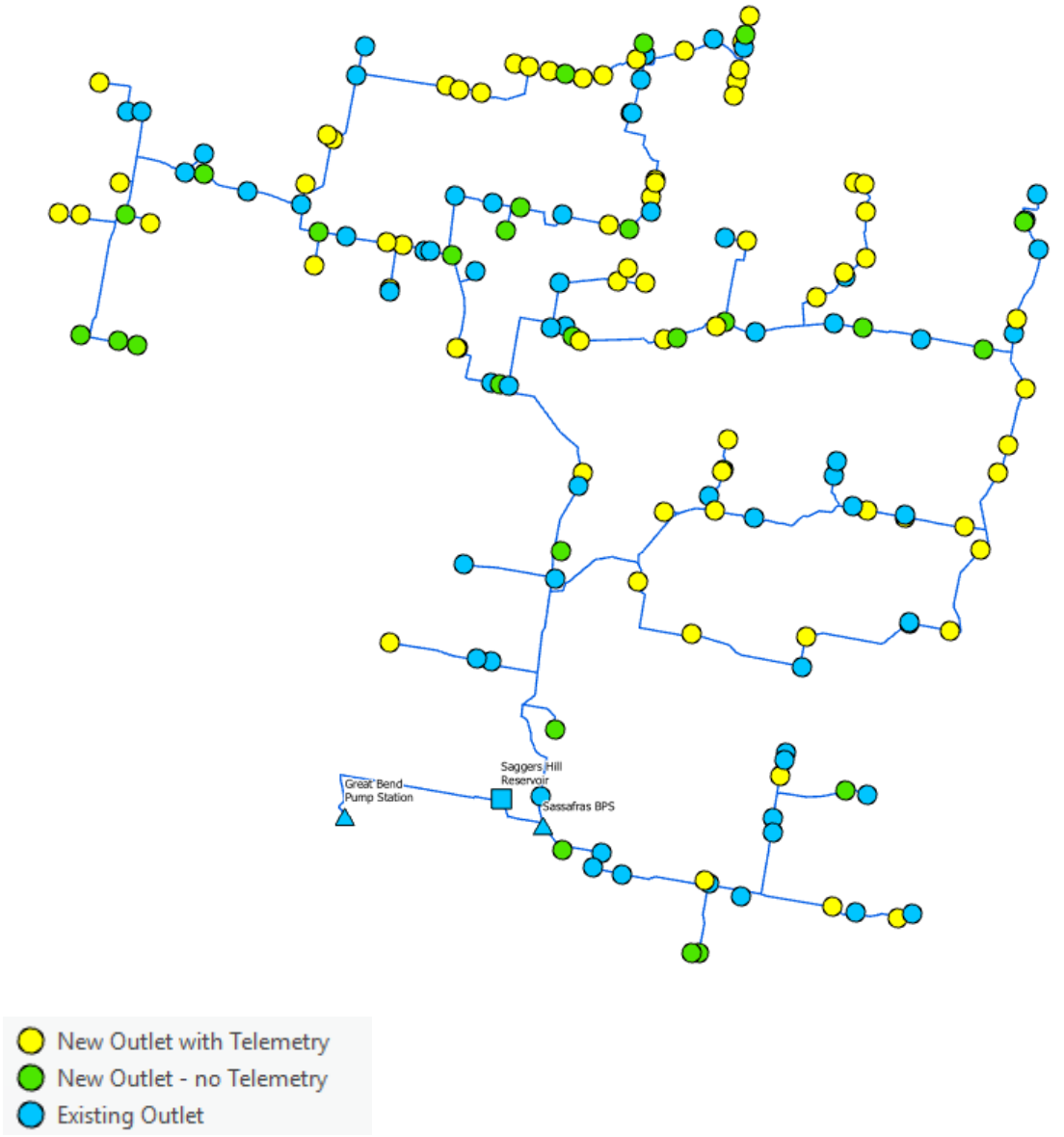


Figure 13 SWISA Outlet Summary Overview Map

12 Crossings

A visual field inspection of high-risk areas, including crossings, was undertaken during the preferred option design. Areas of interest were identified from a desktop assessment using aerial imagery. The assessment was undertaken in partnership with Sub41, construction management consultants.

A schedule of road crossings is available. The most considered crossing method has been listed, such as trench (dig, lay, backfill) or under-bore, as advised by Sub41. Generally, major road crossings will be under-bored unless shallow hard material prevents this. Most stream crossing will be trenched, especially ephemeral lines. The Contractor may decide a more appropriate method after reviewing the site and machinery requirements. APIA guidelines are to be employed during crossings.

The pipeline crosses the Bass Highway three times with one major crossing in DN1000 which has been assumed to be thrust bored. Crossing and working around other features have been included in the costing including water courses, TasWater water and sewer pipelines, and existing TI SWIS pipelines.

A full walk through of the pipeline alignments will be undertaken during detailed design and hence, the crossing schedule should not be considered exhaustive at the current stage.

The crossing schedule was incorporated into TI's Costing Model with costs allocated to each major crossing (crossings more significant than a simple trench). Simple trenched crossings are captured by the pipeline installation allowance in the Hydraulic Model.

13 Timing

SWISA is a brownfield site with most of the infrastructure required for SWISA being new. Only the Great Bend Pump Station building, and 65 existing outlets are being reused for SWISA. This will allow the new scheme to be constructed with minimal disruptions to the existing scheme. Any construction related scheme disturbances can be scheduled for outside of the irrigation season to minimise impact.

14 Decommission

As SWISA is a brownfield site and will result in some existing assets not being needed[13]. Decommissioned assets fall into two categories:

- Conserved
  - Asset is in good condition but does not have sufficient capacity to meet SWISA requirements
  - Asset is to be taken out of service but remain in a state where they could be used in the future
- Retired
  - Asset condition is poor or does not meet SWISA lifetime objectives
  - Asset to be permanently removed from current and future use

Retired and conserved assets include:

- The WVPM MSCL trunk main including air valves and scour valves
- Great Bend Pump Station transformers and electrical
- Great Bend Reservoir
- Sassafras, Harford and Northdown BPS
- HDPE pipeline branches including air and scour valves
- Outlets, where renewed
- Pipeline road crossings

All retired and conserved assets are to remain TI assets and be marked as retired or conserved on the asset register and in the GIS.

[13] 2021 TI, SWIS Decommission for SWISA Memo SWIS Decommission for SWISA Memo.docx

15 Constructability and Safety in Design

The Business case design has as far as possible considered the potential pipeline hazards by selecting routes which avoid hazardous areas and selecting equipment which can be safely installed and operated. Generally the "Principals of Safe Design For Work" and "Safe Design of Structures" have been applied.

The scheme design was considered to maximise its constructability while reducing the extent of external and route factors during construction, and to improve operability once completed.

Considerations in the Design included:

- Following as reasonable grade as possible to allow safe machine operation and spoil placement to limit potential for trench collapses and machine slides.
- The alignment followed the road as far as possible to permit access and materials delivery. Where this was not possible it followed alignments to avoid the imposition of infrastructure in actively farmed areas, and to avoid centre pivot operations as far as possible.
- Power lines were avoided wherever possible with unavoidable crossings to be at right angles to transmission lines. The alignment was maintained outside the exclusion corridor for the remainder of the route.
- Stream crossings were selected were selected to allow reasonable access to the feature to allow the contractor sufficient options to consider in making the crossing.
- Sensitive areas of cultural heritage and sensitive environmental values have been avoided as far as possible, with minor impacts dealt with by permits.
- Pipeline alignments were selected to minimise the impact on residential areas and concomitant services as far as possible.
- The pump station has been sited to maintain clearance from floods per the available data, and to allow construction access, ease of pipeline access into the building, and good access to the river under all flow scenarios.
- Pump station sites were selected to minimise the impact on landowners and property infrastructure, whilst being in reasonable proximity to power supplies.
- Safety in Design has been considered during development of pump station concept designs and selecting of pump station locations, including:
    - Safety of operators;
    - Safety of the public;
    - Minimizing operational and maintenance cost;
    - Prioritizing simplicity and ease of use in terms of operability.

15.1 Field Inspection and Constructability Assessment

As discussed in section 12, visual field inspection of high risk areas were undertaken in partnership with Sub41[14] and Blue Tier during the preferred option design.

The assessment covered the following design elements:

- Pump station sites
- Balance tank sites
- Major crossings (identified from desktop assessment using LiDAR imagery)
- Areas suspected of having rocky ground.

The assessment was undertaken with a view to:

- Assess the constructability of the proposed design elements
- Recommend alternative designs/alignments/locations for infrastructure
- Check the cost allowances made in cost modelling are sufficient
- Recommend further investigation tasks if applicable

15.2 Detailed Constructability Assessment and Fatal Flaws Workshop

Further detailed constructability assessment is required during the detailed design, particularly in relation to pump stations and balance tanks. Findings from the geotechnical investigation, the results of which are forthcoming, will also need to be taken into account.

As part of the Detailed Design, constructability assessment of the full pipeline alignment, including detailed constructability assessments and fatal flaws workshops of key infrastructure (pump stations, balance tanks) will be undertaken and facilitated by the Design Partner.

15.3 Safety in Design Workshop

Further to the measure discussed above, full Safety in Design workshops will be undertaken and facilitated by the Design Partner during Detailed Design for key infrastructure items covering the whole scheme, including:

- Pump stations
- Reservoirs
- Pipelines (for the entire alignment)

[14] Sub41 2020, SWISA Site Visit Report and Commentary on Constructability and Costing 2012_TI_Rpt_001 SWIS Rev0.pdf

16 CAPEX

The concept design has been itemised, costed, and independently reviewed by Blue Tier[15][16] to reflect the current market rates in FY22 dollars. Items have been escalated by applying 5% for CPI and 8% for construction market increase over 2.5 years to the construction mid-point at July 2025. Each item has been split into a percentage of CPI versus construction market increase for applying the escalation.

Blue Tier have calculated the P50 and P90 inherent and contingent risks for the project. Refer to Appendix D CAPEX Summary and SWISA Cost Estimate[17] for full detail of the breakdown of the project.

The escalated project P50 CAPEX has been estimated at $112.9 M including contingencies for a single package contract.

Table 10 SWISA CAPEX Summary

Risk Allowance		
Base Design and Construction Cost	**$82,414,797**	
	P50	**P90**
Inherent and Contingent Risk Allowance	$14,548,459	$24,248,336
Base Estimate plus Risk Contingency	**$96,963,256**	**$106,663,133**
Total Contingency % From Base	17.7%	29.4%
Escalation (Applied to Base Case and Contingency)		
Escalation - 2 years to 05/10/2024	$11,537,056	$12,691,184
Escalation - additional 9 months to midpoint July 2025	$4,399,688	$4,839,818
Total Contingency (%) Above Base Estimate Including Contingency & Escalation	31.7%	44.8%
	P50	**P90**
Total Out Turn - Including Escalation & Contingency	**$112,900,000**	**$124,194,135**

[15] Blue Tier 2022, SWISA Estimate Report 05102022 REVA SWISA_Estimate Report_05102022_REVA.pdf

[16] Blue Tier 2022, SWISA Option 2 Budget Estimate 13102022 SWISA_OPTION 2 - P50-P90 Budget Estimate Rev B_13102022.xlsx

[17] TI 2022, SWISA Cost Estimate 20221020 SWISA Cost Estimate.xlsx

17 OPEX

The OPEX is broken into two main components: variable and fixed. Refer to the SWISA Cost Estimate[18] for the full breakdown.

The variable OPEX includes the pumping costs from the two pump stations in the scheme, Great Bend Pump Station and Sassafras Booster Pump Station.

Asset Renewal Levy (ARL) is calculated using the forecast replacement CAPEX cost plus the value of existing SWIS reused for SWISA. Repairs and Maintenance (R&M) cost has been calculated based off the SWIS R&M and factored up and added to represent the proposed SWISA.

Water purchase from off Hydro Tasmania from Lake Parangana has been included as a fixed, levy, cost. It is only applicable to SWISA water (refer Section 4).

A 215-day, 7800 ML winter season has been factored into the OPEX. Purchasing water from Lake Parangana is not required as there is available winter DPIPWE water available in the Mersey River. The fixed OPEX unit rate is to be equal for both summer and winter irrigation seasons. This also provides an incentive to purchase winter water to reduce the summer fixed OPEX.

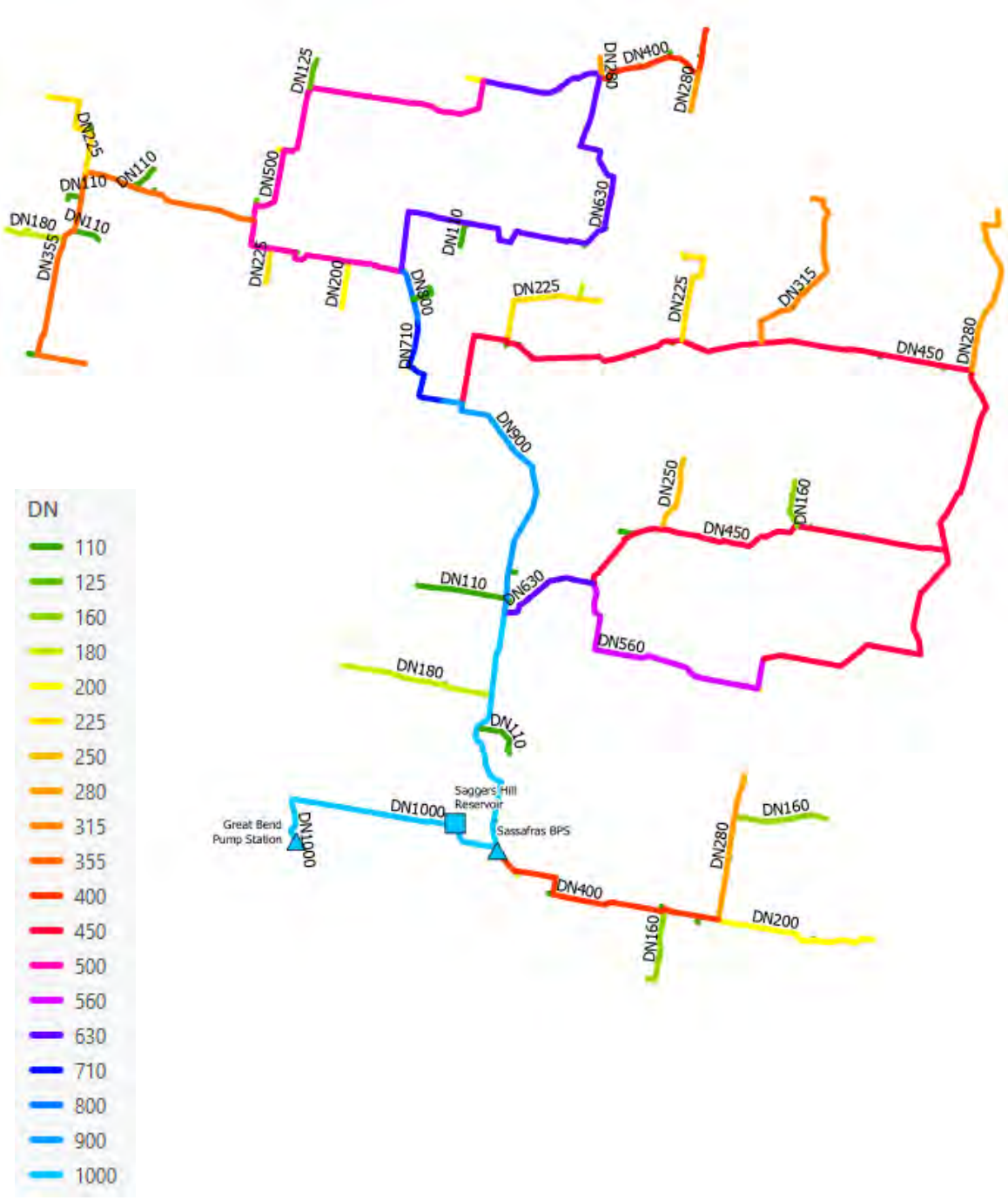
[18] TI 2022, SWISA Cost Estimate 20221020 SWISA Cost Estimate.xlsx

Table 11 SWISA OPEX

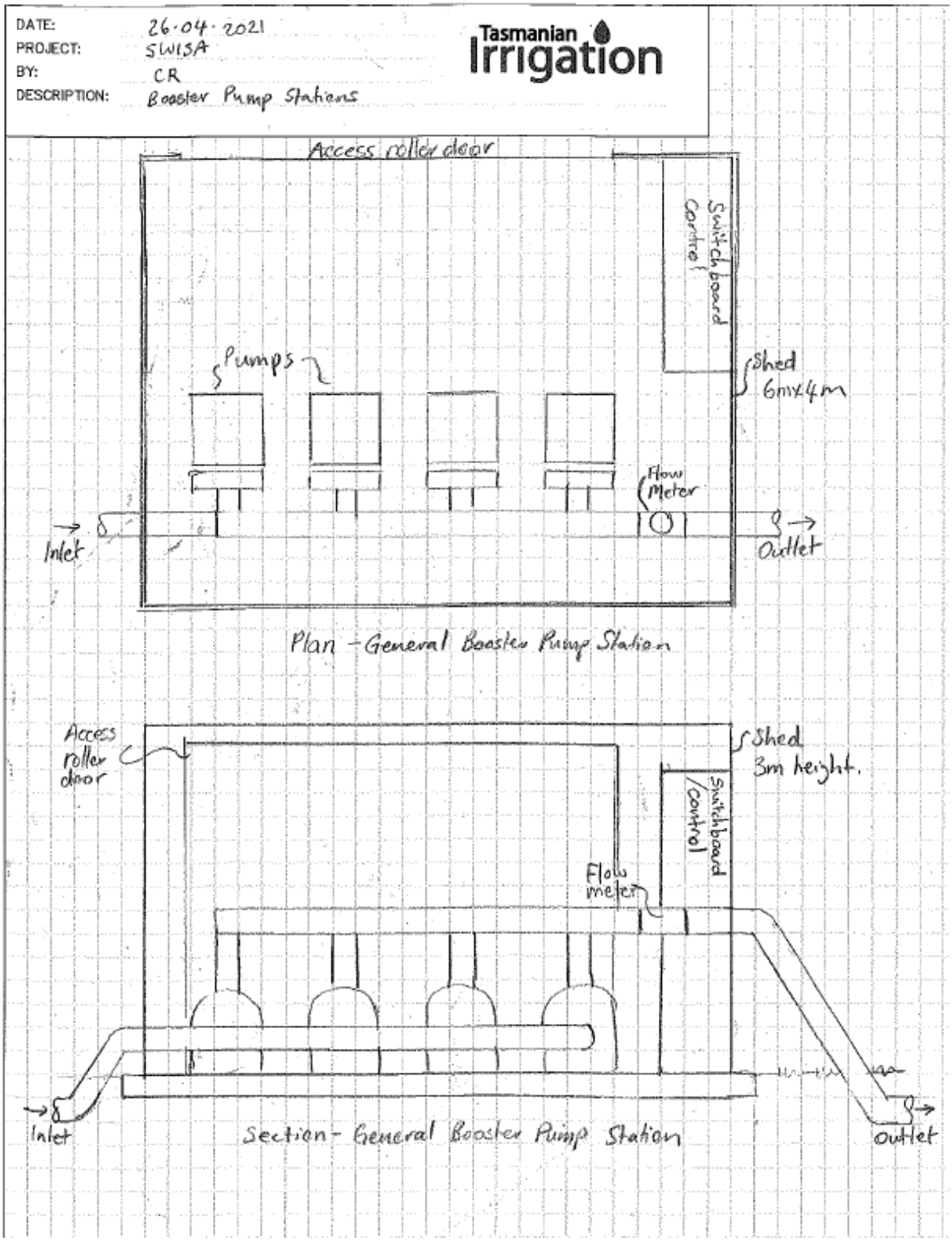
Component	Quantity	Total	Fixed/ML	Variable/ ML	Total/ML
Parangana Water Levy (SWISA Only)	9200	$329,600	$35.83		
ARL	22661	$697,785	$30.79		
R&M	22661	$59,724	$2.64		
Fixed Management	22661	$537,112	$23.70		
Great Bend Pump Station	22661	$129,414	$5.71	$58.49	
Sassafras BPS			$0.08	$22.26	
Fixed telemetry cost	22661	$13,479	$0.59		
Total Summer OPEX based on pressure supply area - SWIS					
Saggers Hill Reservoir			$63.44	$58.49	$121.92
Sassafras BPS			$63.51	$80.75	$144.26
Total Summer OPEX based on pressure supply area - SWISA					
Saggers Hill Reservoir			$99.26	$58.49	$157.75
Sassafras BPS			$99.34	$80.75	$180.09
Total Winter OPEX based on pressure supply area					
Saggers Hill Reservoir			$63.44	$58.49	$121.92
Sassafras BPS			$63.51	$80.75	$144.26

18 Appendices

Appendix A SWISA by Pipe Size



Appendix B General BPS Layout



Appendix C Pipe Size and Lengths by Branch

Material PN	DN	Rising Main and Trunk Main					Sassafras					Moriarty Loop							Wesley Vale Loop including Northdown and Latrobe														Extended Outlets	Total
		XX	T1	TA	TB	TC	S1	S2	SA	SB	SC	M1	MA	MB	MC	MD	ME	MF	W1	WA	WB	WC	WD	WE	WF	L1	LA	LB	LC	LD	LE	N1	NA	EO	
HDPE6.3	110			85																													248	333
	160								1116																									1116
	180				520																												4	524
	200									845																							36	880
	280							723																										723
	400						2721																											2721
	560											418																						418
	1000	785	866																															1651
HDPE8	110			638		698																											150	1486
	160										781																							781
	180				82																												66	148
	200									1156																								1156
	225																	61																61
	280							1093																										1093
	400						1030																									858		1888
	450											3225																						3225
	560											1384																						1384
	630											660							1177															1836
	710																		421															421
	900		1306																															1306
	1000		2171																															2171
HDPE10	110			16		272																											508	795
	160										562																							562
	180				464																												106	569
	200									256																							255	511
	225																	1092																1092
	250												104																					104
	280							310														255												565
	355																									622								622
	400																															732		732
	450											4829																						4829
	500																		448															448
	560											1440																						1440
	630											438							3815															4253
	710																		1204															1204
	900		2048																															2048
	1000	682	624																															1305
HDPE12.5	110					332														368	299												339	1338
	125																																36	36
	160													692																				692
	180				1001																												285	1287
	200									99														574									672
	225																262	708					498				36						23	1527
	250												1018																					1018
	280																															563		563
	355																									1089								1089
	400																															677		677
	450											7495																						7495
	500																		2831															2831
	560											671																						671
	630											405							2529															2933
	800																		775															775
	900		591																															591
	1000	1370																																1370
HDPE16	110																				47						415		242		372		317	1393
	125																																83	83
	180				156																									937			135	1227
	200																							99									90	189
	225																1411										1641							3051
	280														2044																			2044
	315															2815																		2815
	355																									4343								4343
	450											5524																						5524
	500																		4525															4525
	630																		974															974
	1000	901																																901
HDPE20	125																						416										26	443
	280														632																			632
	500																		179															179
	1000	100																																100
Total		3838	7606	739	2222	1301	3751	2126	1116	2355	1343	26489	1122	692	2676	2815	1672	1860	18876	368	345	255	416	498	673	6054	415	1676	242	937	372	2267	563	2707	100389

Appendix D CAPEX Summary

Item	FY22 Base	Escalation	Midpoint escalated	P50 amount	P50 Total	P90 amount	P90 total
Preliminaries	$6,443,285	$1,519,144	$7,962,429	$1,355,170	$9,317,598	$903,531	$10,221,129
Pipe Supply	$16,610,715	$0	$16,610,715	$3,387,925	$19,998,639	$2,258,827	$22,257,466
Pipe Installation	$23,311,742	$5,496,247	$28,807,989	$2,371,547	$31,179,536	$1,581,179	$32,760,715
Pump station cost estimate total	$9,485,316	$1,469,388	$10,954,703	$1,948,057	$12,902,760	$1,298,826	$14,201,586
Pump Station Power supply total	$891,600	$169,137	$1,060,737	$211,745	$1,272,482	$141,177	$1,413,659
Valve Station	$2,667,936	$542,983	$3,210,919	$804,632	$4,015,551	$536,471	$4,552,022
Reservoir	$2,430,022	$517,225	$2,947,247	$762,283	$3,709,530	$508,236	$4,217,766
Dam	$500,000	$95,850	$595,850	$550,538	$1,146,388	$367,059	$1,513,447
Property Outlets	$7,077,777	$1,256,121	$8,333,898	$719,934	$9,053,832	$480,001	$9,533,833
Decommission	$2,886,603	$653,981	$3,540,584	$1,863,359	$5,403,943	$1,242,355	$6,646,298
Other Project Costs	$2,860,125	$410,796	$3,270,921	$550,538	$3,821,459	$367,059	$4,188,518
TI Internal Costs	$3,660,000	$694,303	$4,354,303	$1,143,425	$5,497,727	$762,354	$6,260,081
Detailed Design	$2,813,557	$537,418	$3,350,975	$677,585	$4,028,560	$451,765	$4,480,325
Commissioning and Defects Liability	$776,121	$182,987	$959,108	$592,887	$1,551,995	$395,295	$1,947,289
Total	**$82,414,797**	**$13,545,580**	**$95,960,377**	**$16,939,623**	**$112,900,000**	**$11,294,135**	**$124,194,135**

Appendix E SWISA Zone Demand Breakdown

Zone	SWIS	SWISA Sold	Additional Unsold	Total ML/150d	Total ML/d
S1	340	0	530	870	5.80
S2	190	150	40	380	2.53
SA	0	70	40	110	0.73
SB	80	130	40	250	1.67
SC	60	50	20	130	0.87
Sassafras Total	**1060**	**400**	**280**	**1740**	**11.6**
T1	215	520	380	1115	7.43
TA	0	20	0	20	0.13
TB	90	0	0	90	0.60
TC	10	0	20	30	0.20
Trunk Total	**315**	**540**	**400**	**1255**	**8.37**
M1	820	2300	779	3899	26.0
MA	310	110	20	440	2.93
MB	45	0	20	65	0.43
MC	155	100	220	475	3.17
MD	140	340	120	600	4.00
ME	280	0	20	300	2.00
MF	160	150	20	330	2.20
Moriarty Total	**1910**	**3000**	**1199**	**6109**	**40.7**
W1	1285	955	680	2920	19.5
WA	20	0	20	40	0.27
WB	0	20	20	40	0.27
WC	160	50	50	260	1.73
WD	10	0	0	10	0.07
WE	140	100	20	260	1.73
WF	135	0	20	155	1.03
L1	50	400	100	550	3.67
LA	10	0	0	10	0.07
LB	170	65	0	235	1.57
LC	0	20	0	20	0.13
LD	0	110	20	130	0.87
LE	0	20	0	20	0.13
N1	355	110	50	515	3.43
NA	430	160	0	590	3.93
Wesley Vale Total	**2765**	**2010**	**980**	**5755**	**38.4**
SWISA Total	**6051**	**5950**	**2859**	**14860**	**99.1**

Appendix F Overview Map

Appendix G HGL

18.1 Trunk

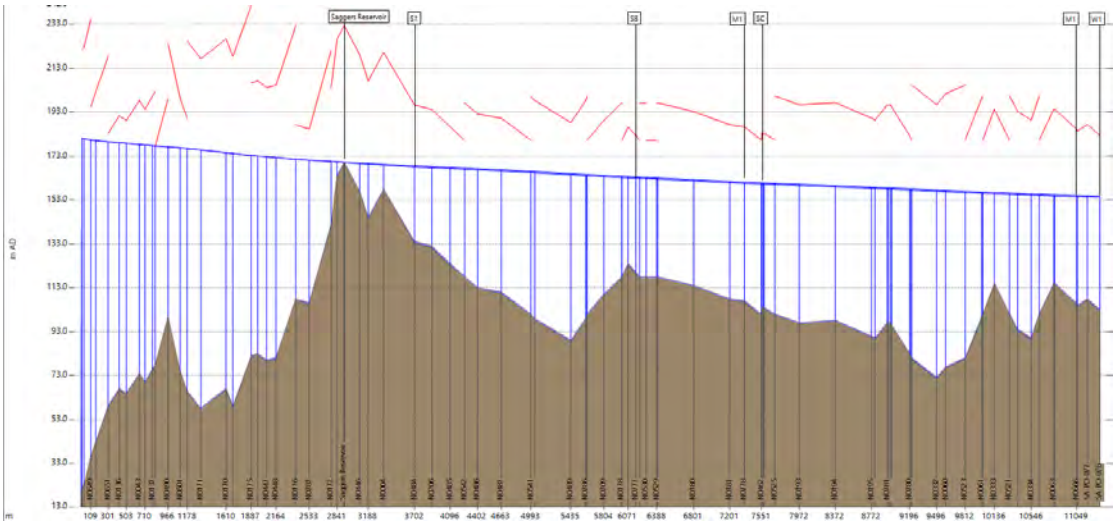


Figure 14 Wesley Vale Trunk Main

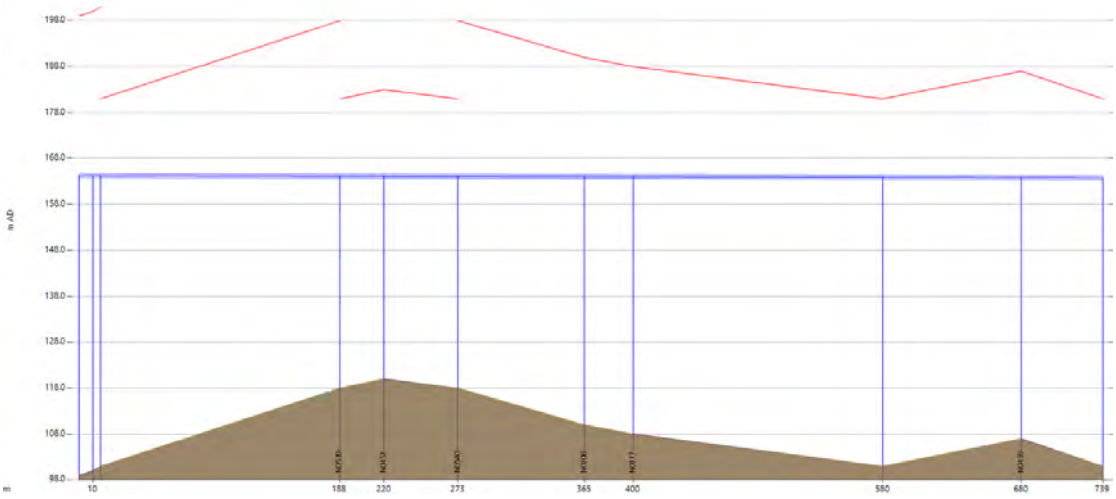


Figure 15 Trunk A

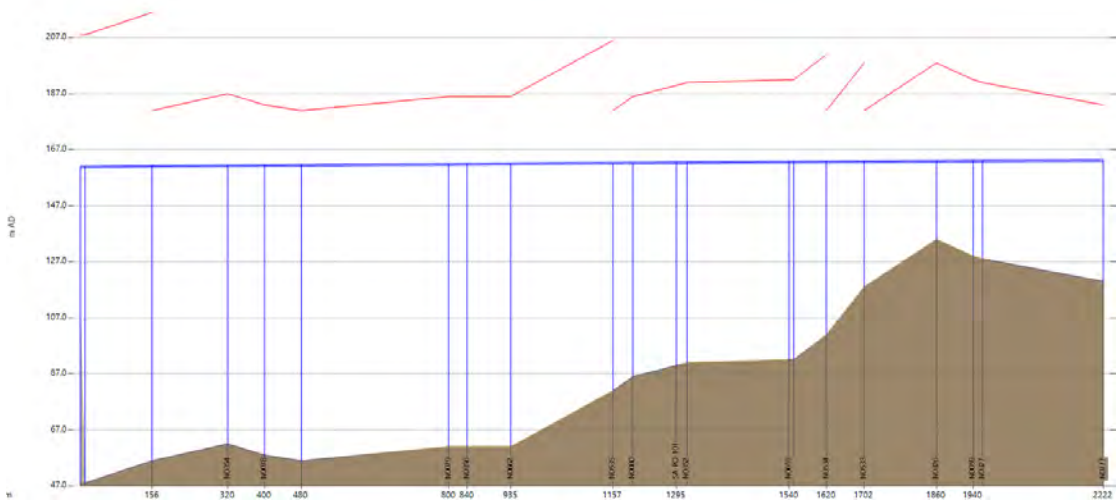


Figure 16 Trunk B

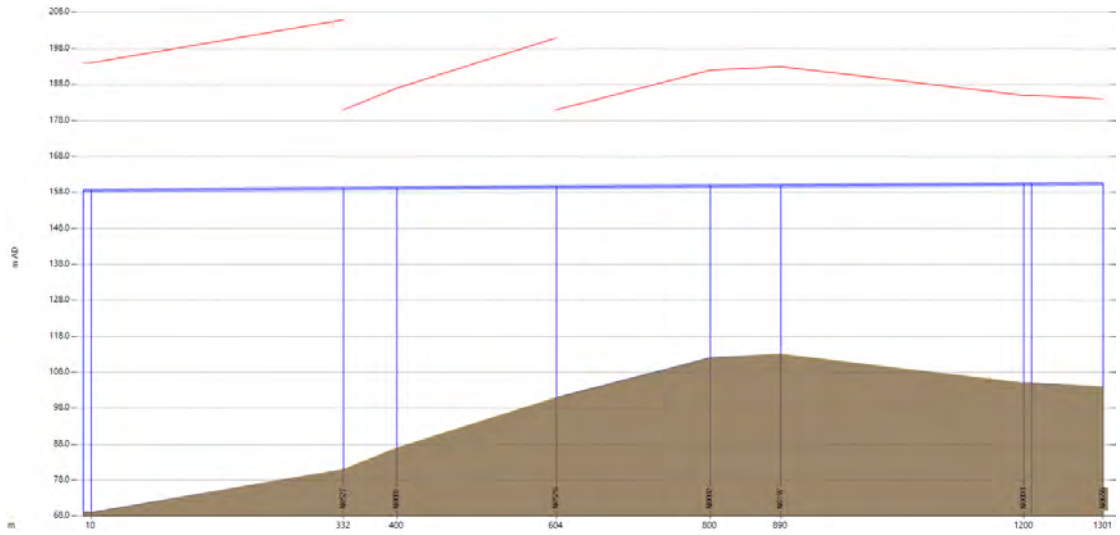


Figure 17 Trunk C

18.2 Moriarty

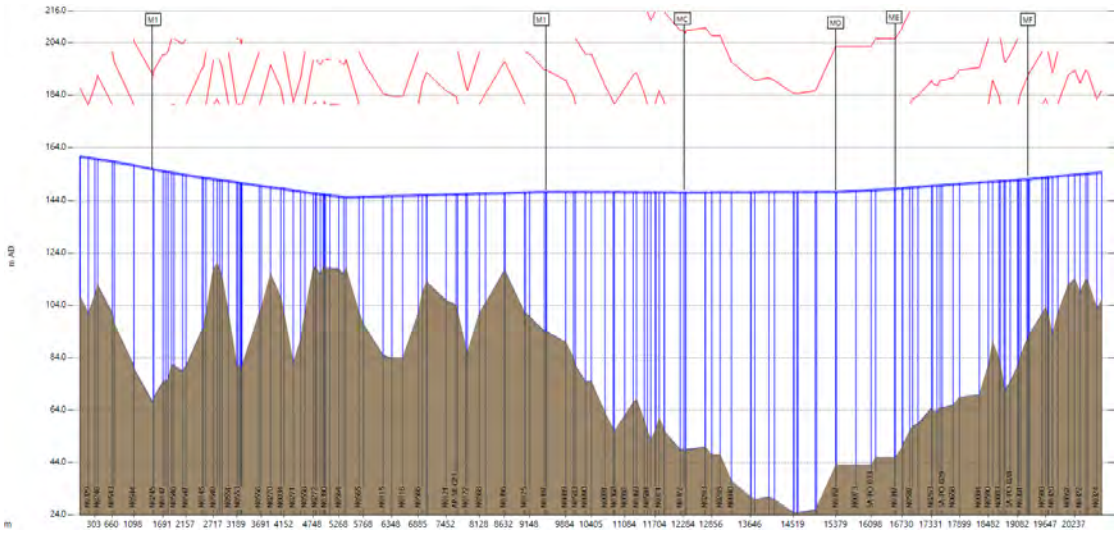


Figure 18 Moriarty 1 - outside loop

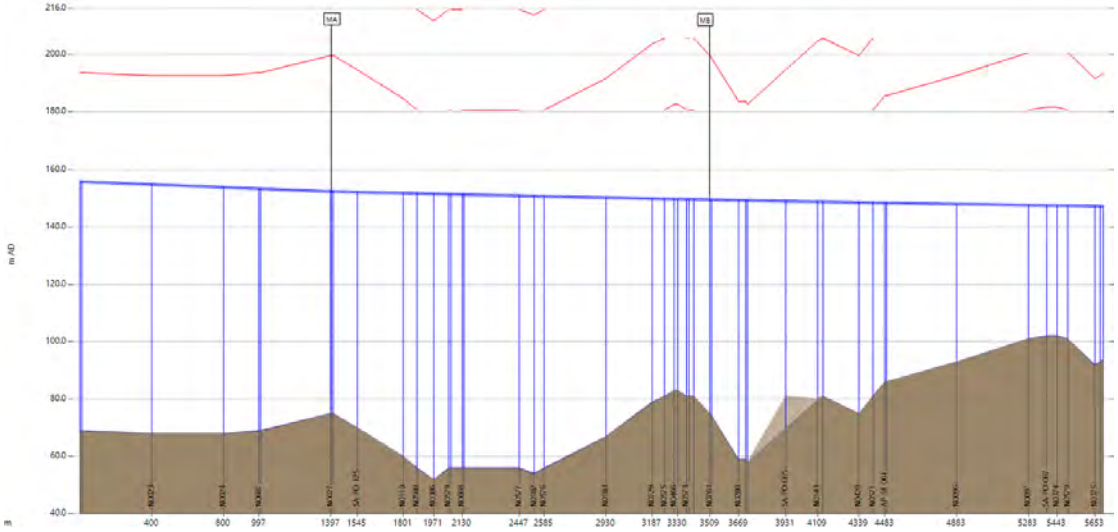


Figure 19 Moriarty 1, middle

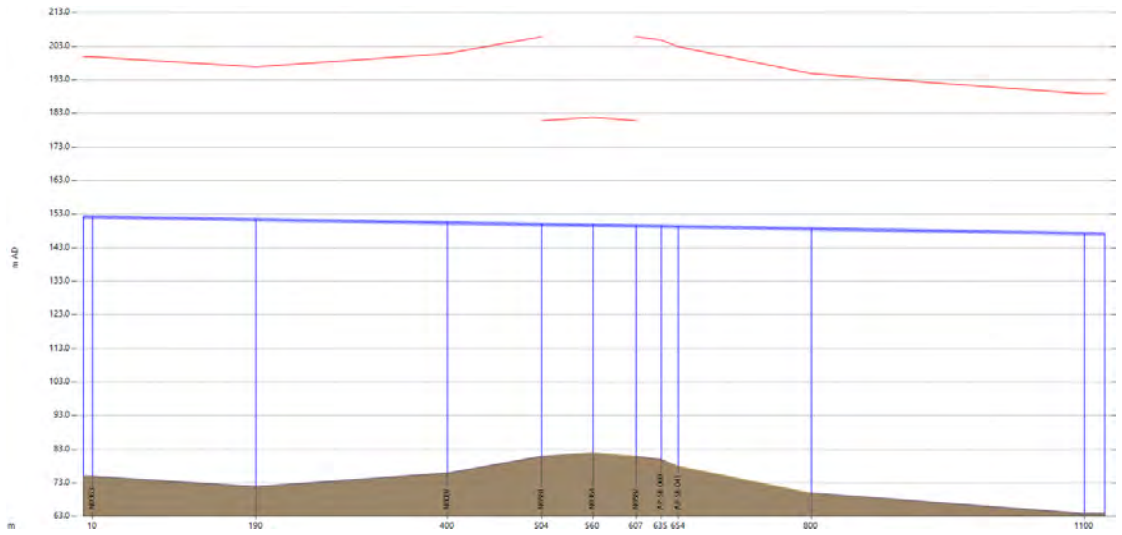


Figure 20 Moriarty A

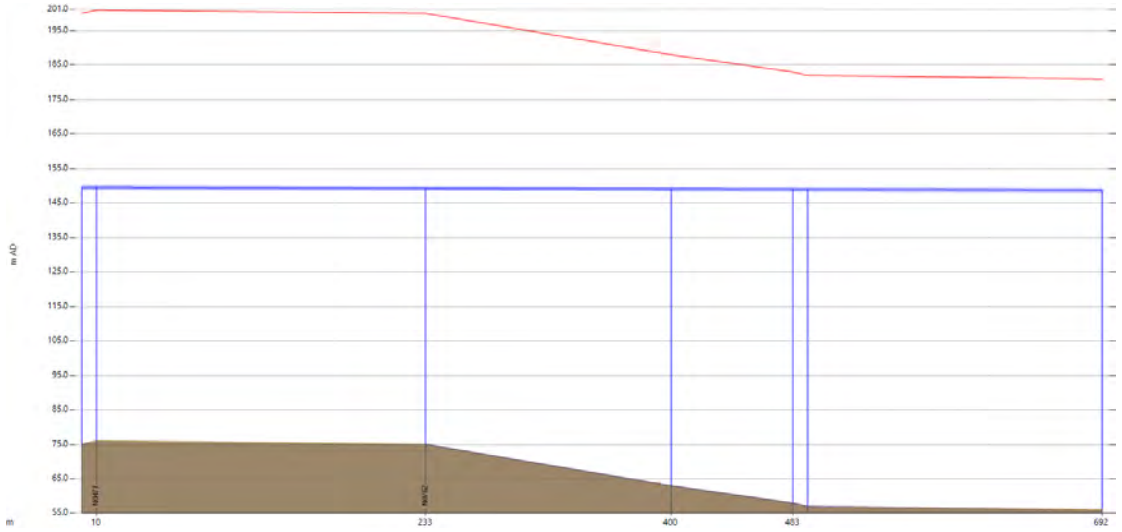


Figure 21 Moriarty B

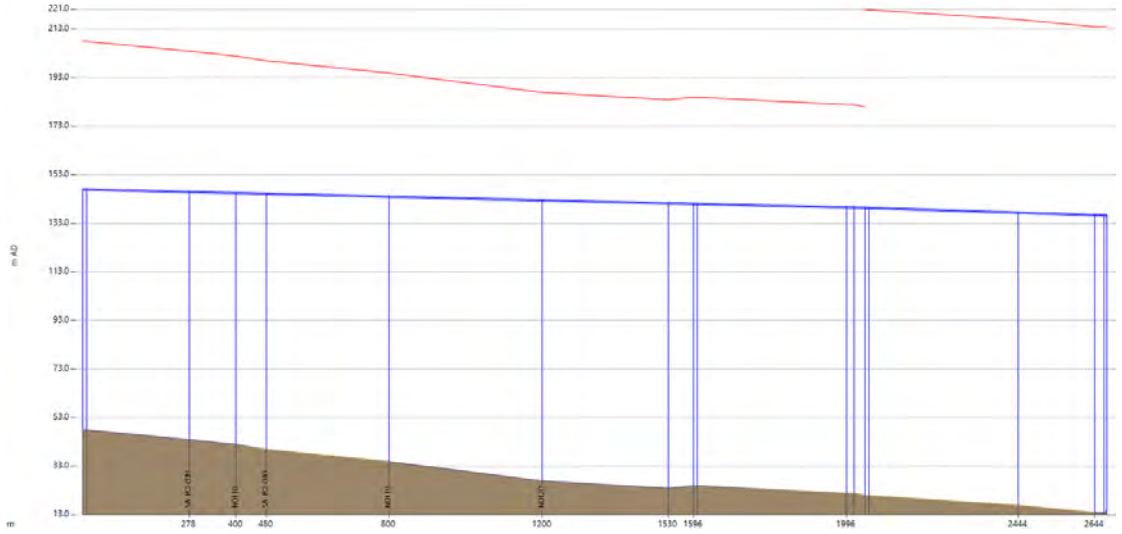


Figure 22 Moriarty C

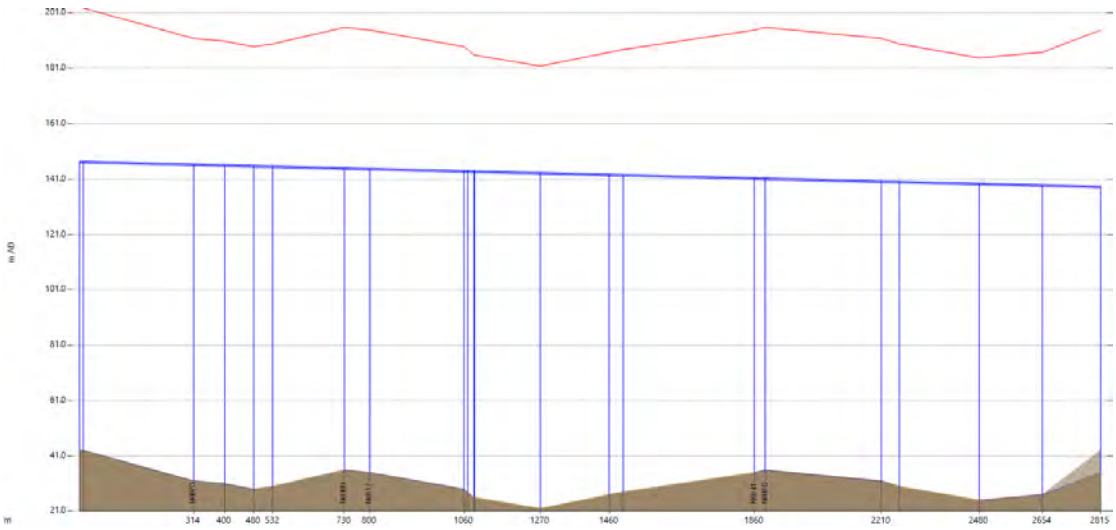


Figure 23 Moriarty D

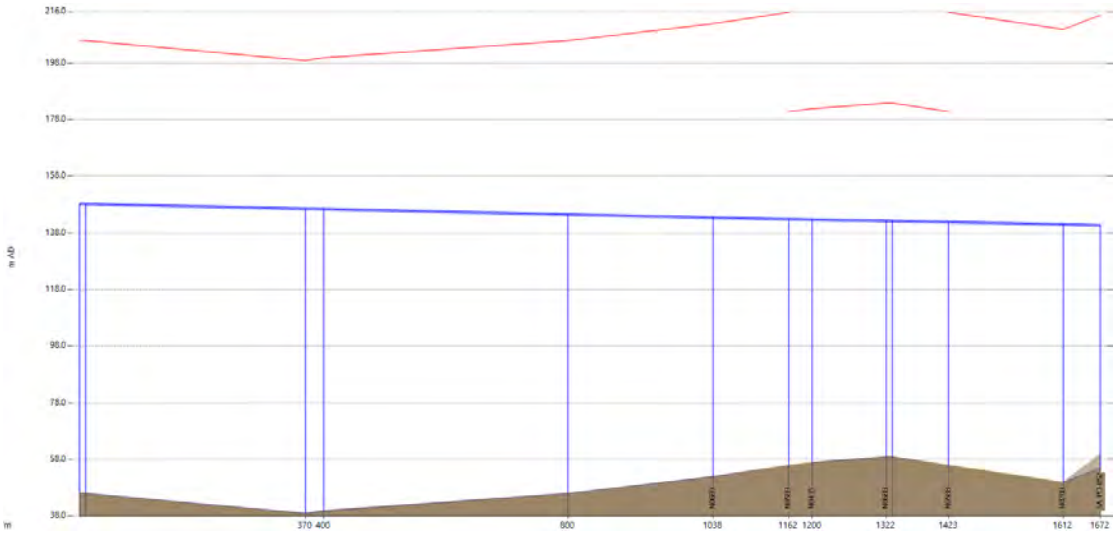


Figure 24 Moriarty E

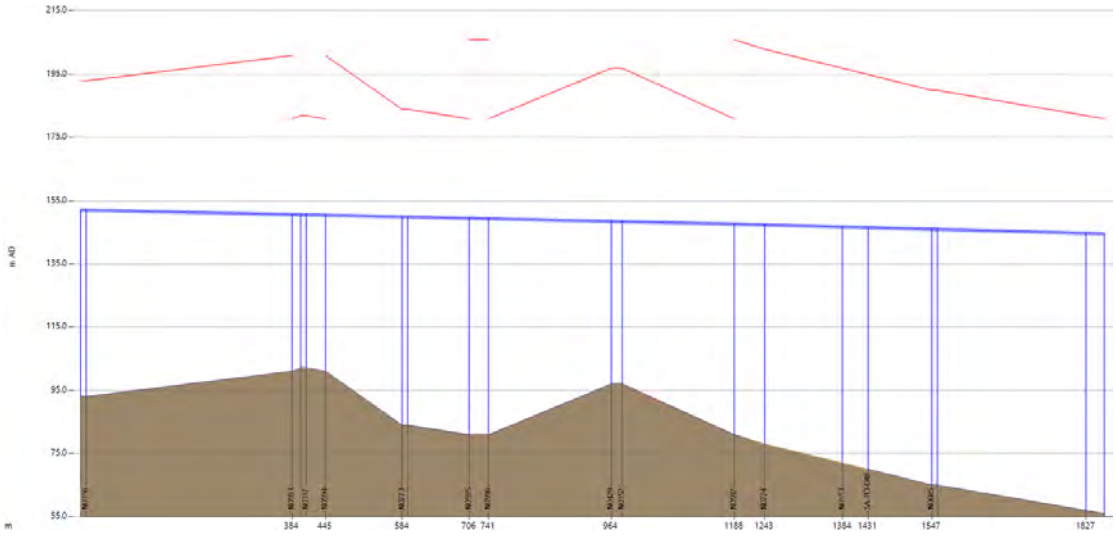


Figure 25 Moriarty F

18.3 Wesley Vale

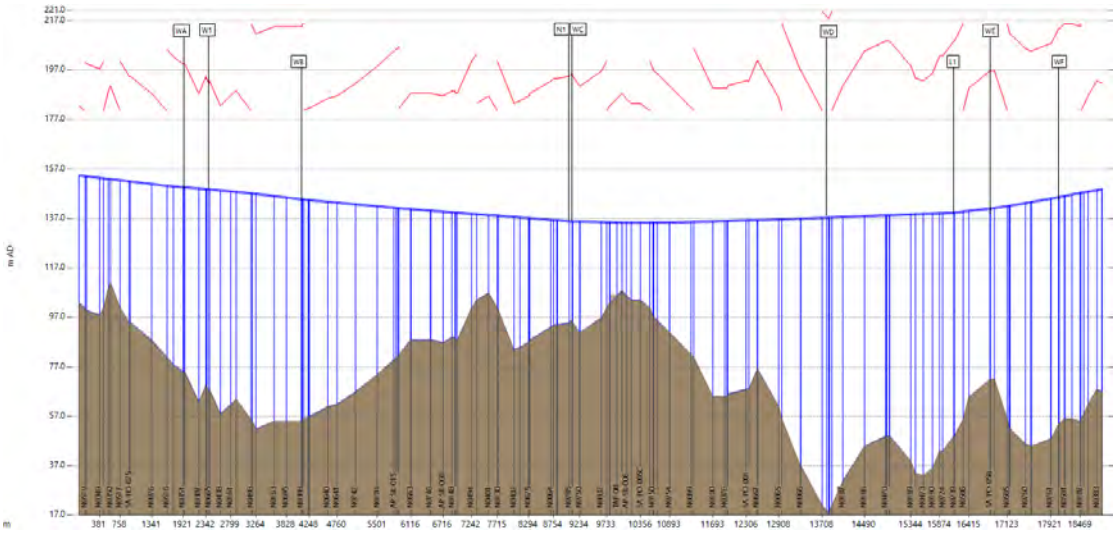


Figure 26 Wesley Vale 1

Figure 27 Wesley Vale A

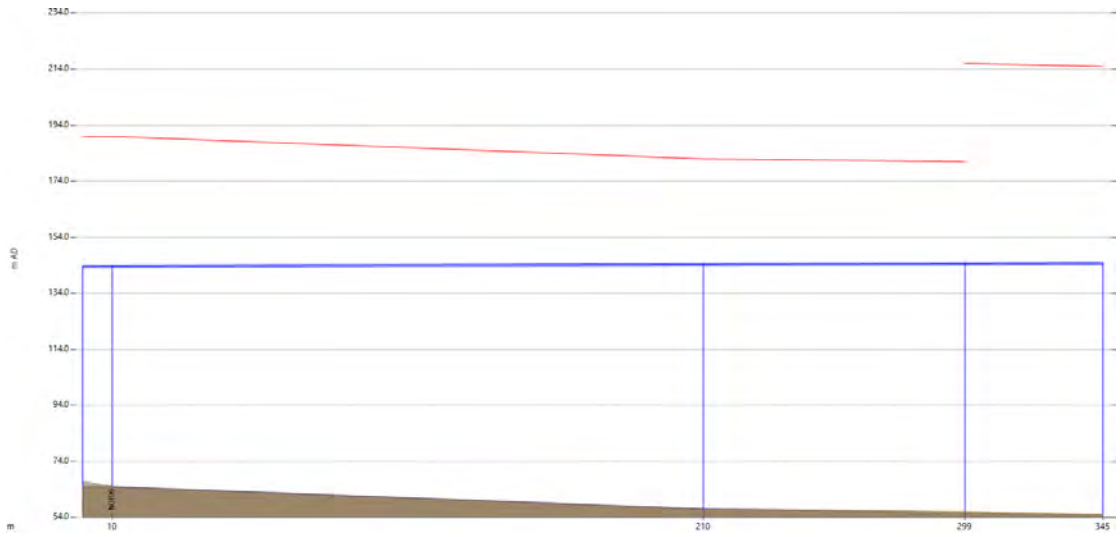


Figure 28 Wesley Vale B

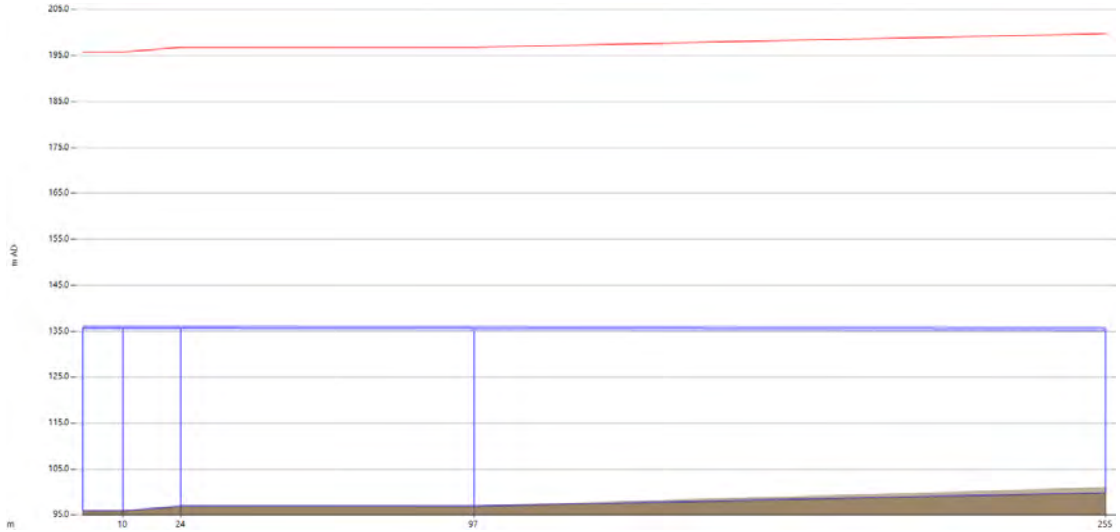


Figure 29 Wesley Vale C

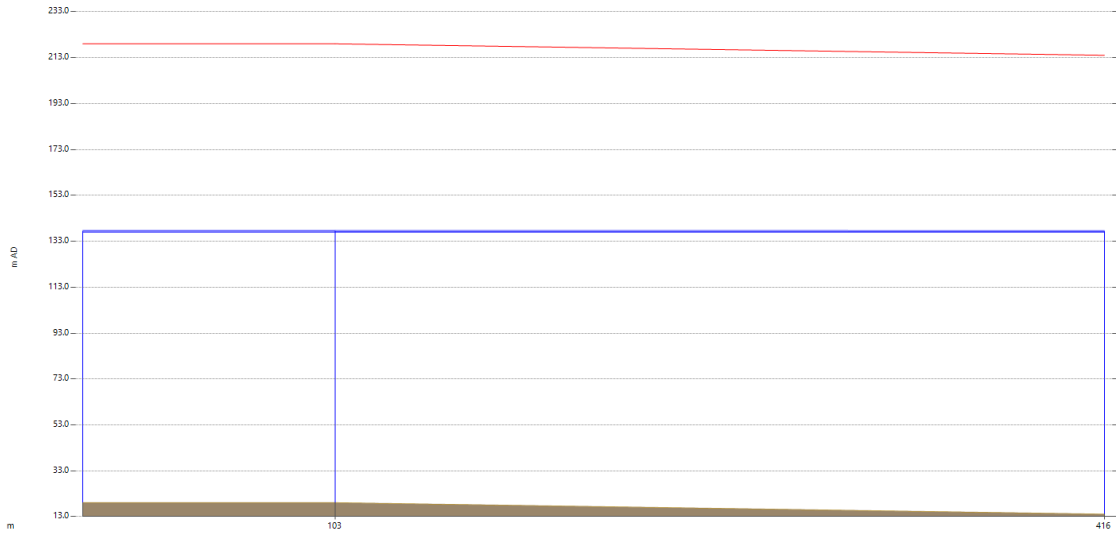


Figure 30 Wesley Vale D

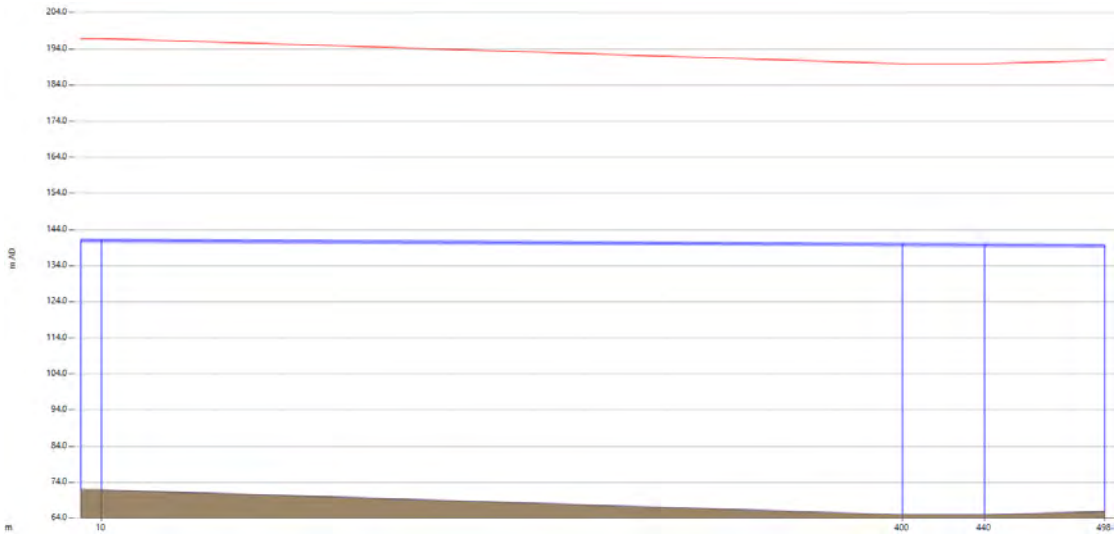


Figure 31 Wesley Vale E

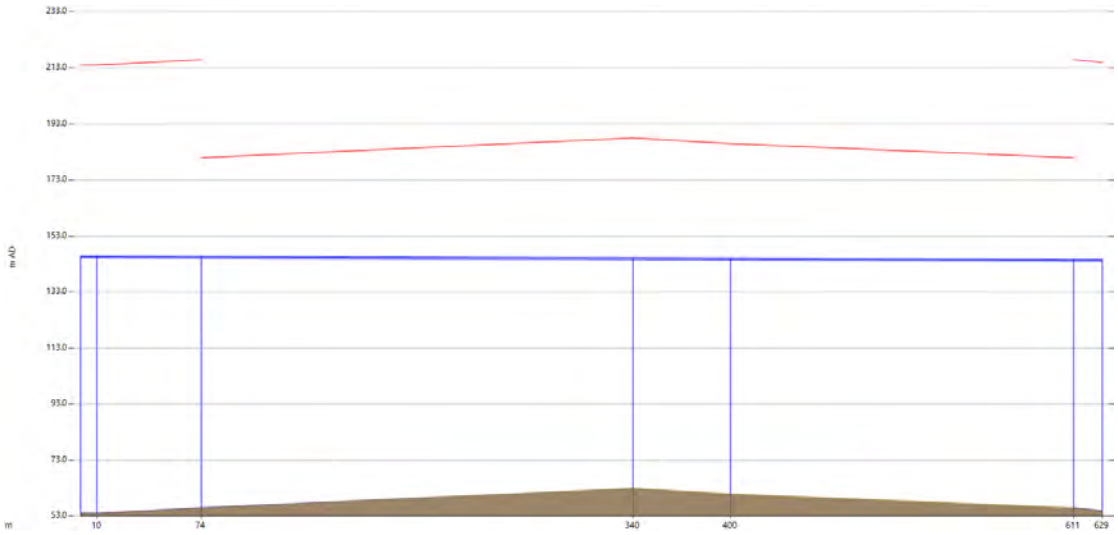


Figure 32 Wesley Vale F

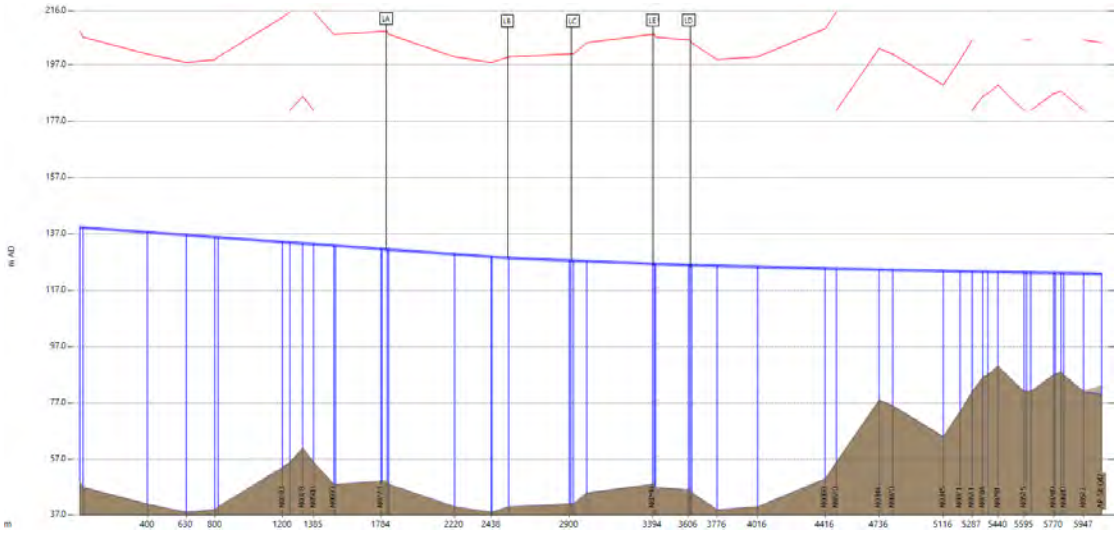


Figure 33 Latrobe 1

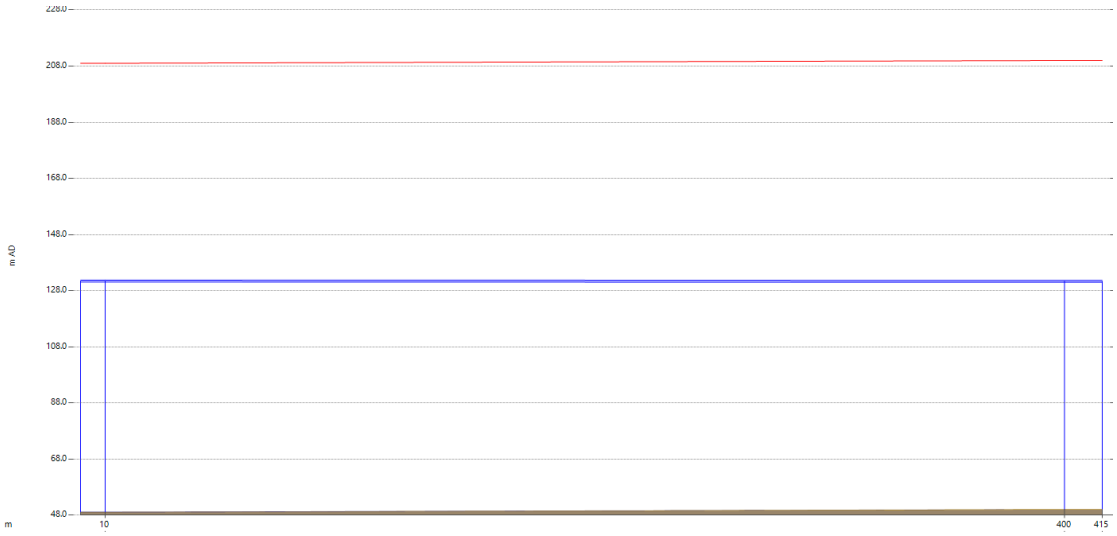


Figure 34 Latrobe A

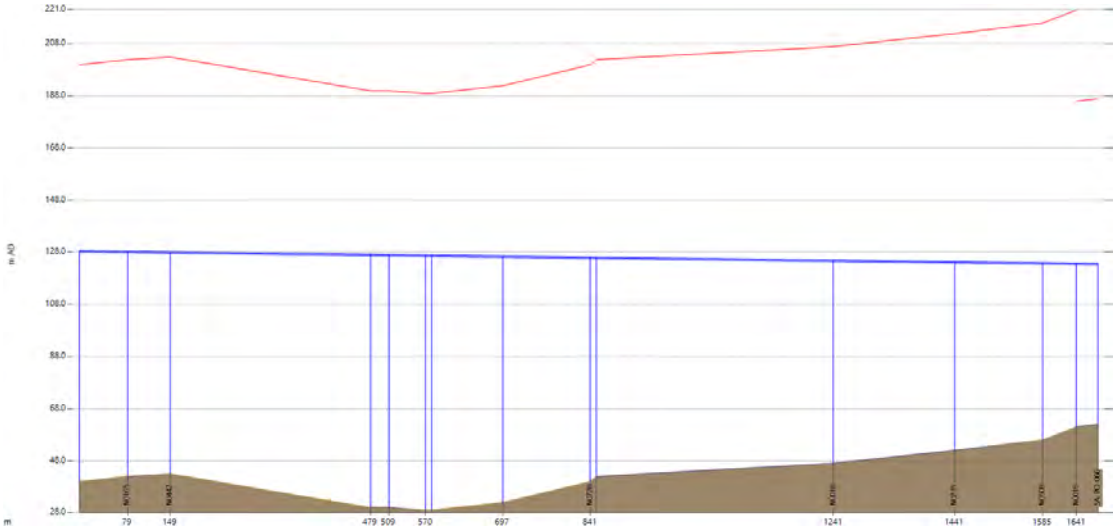


Figure 35 Latrobe B

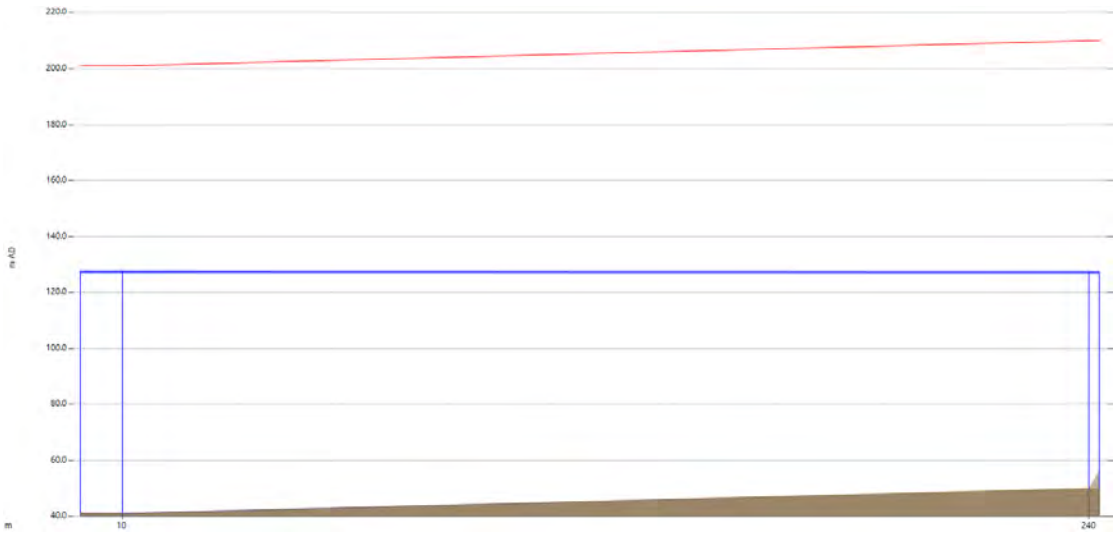


Figure 36 Latrobe C

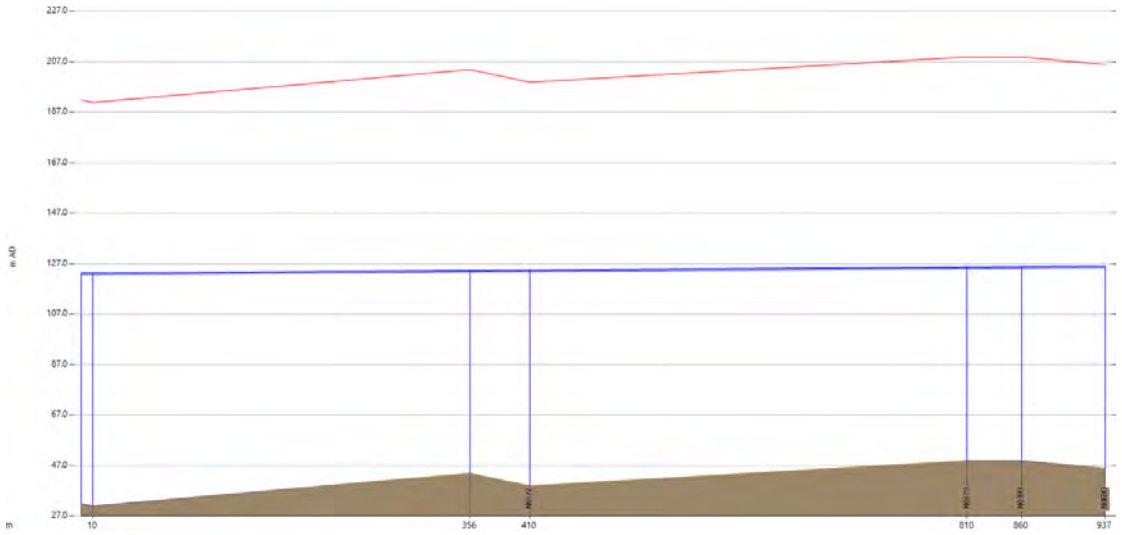


Figure 37 Latrobe D

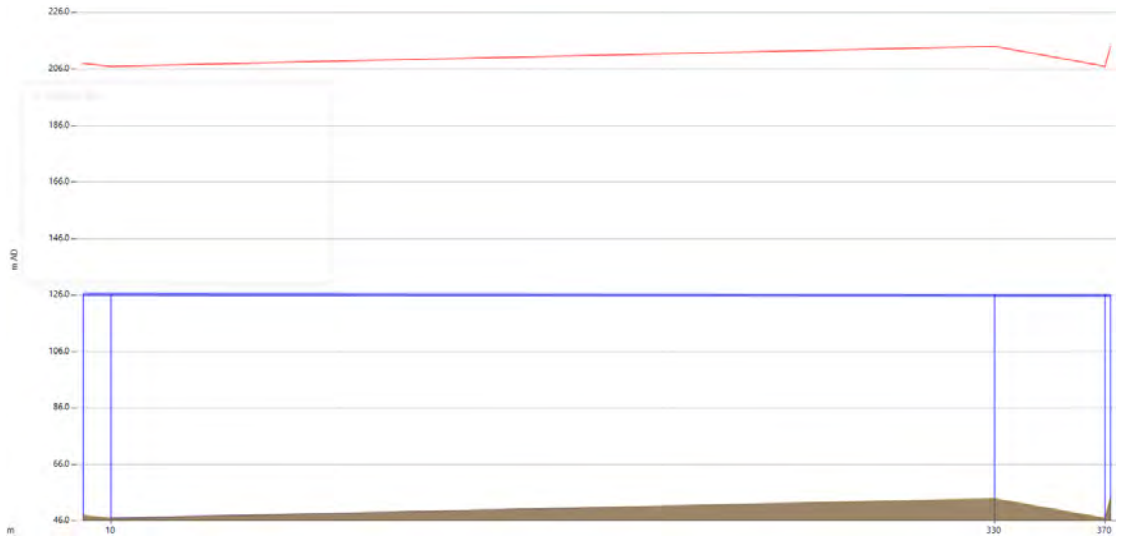


Figure 38 Latrobe E

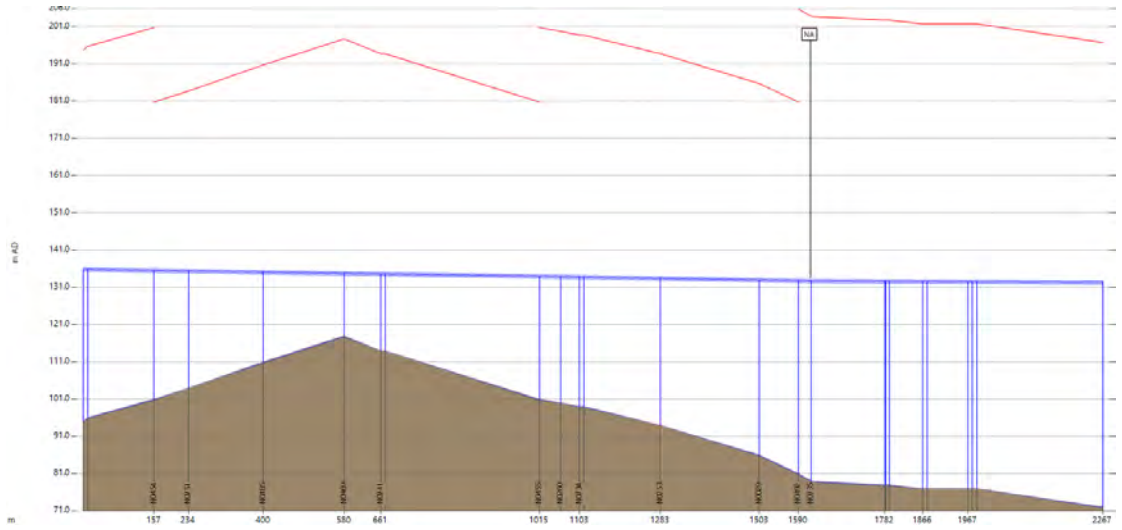


Figure 39 Northdown 1

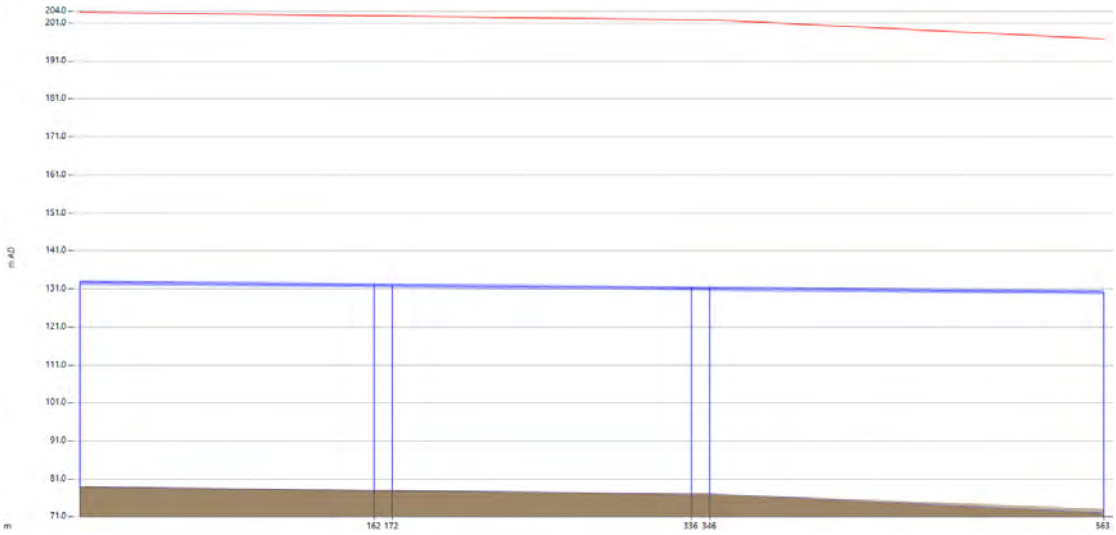


Figure 40 Northdown A

18.4 Sassafras

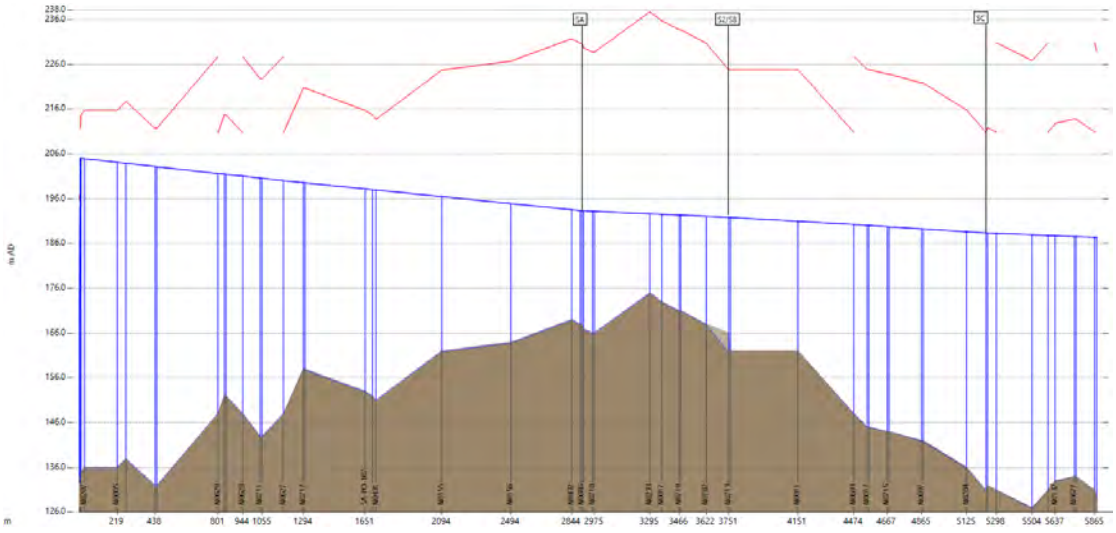


Figure 41 Sassafras Branch

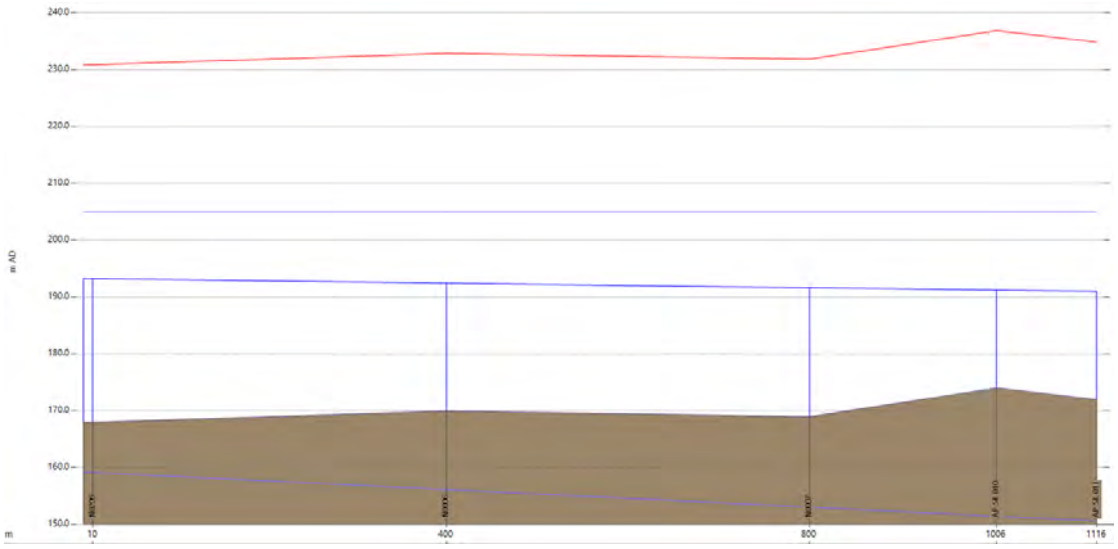


Figure 42 Sassafras A

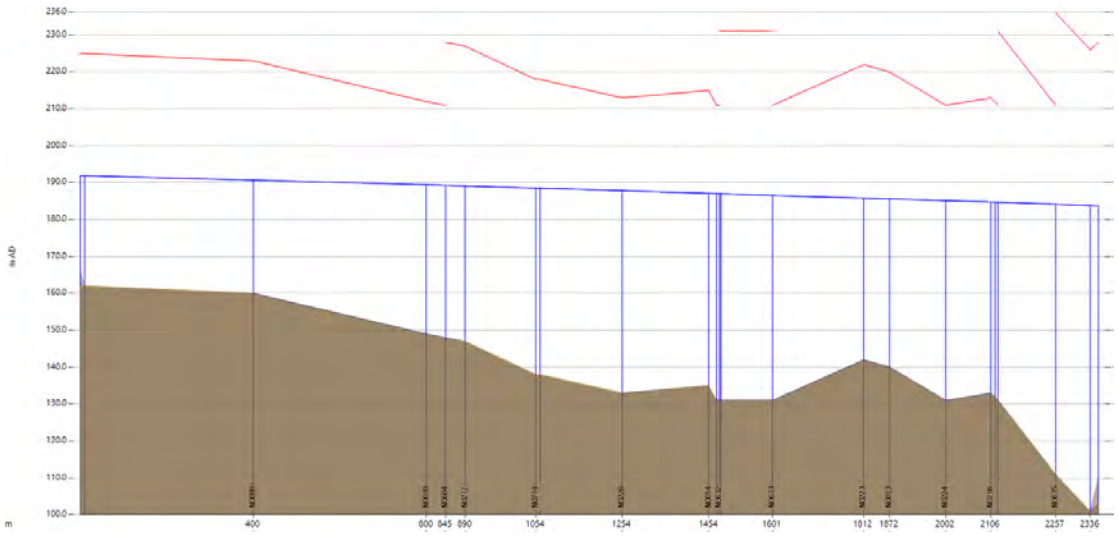


Figure 43 Sassafras B

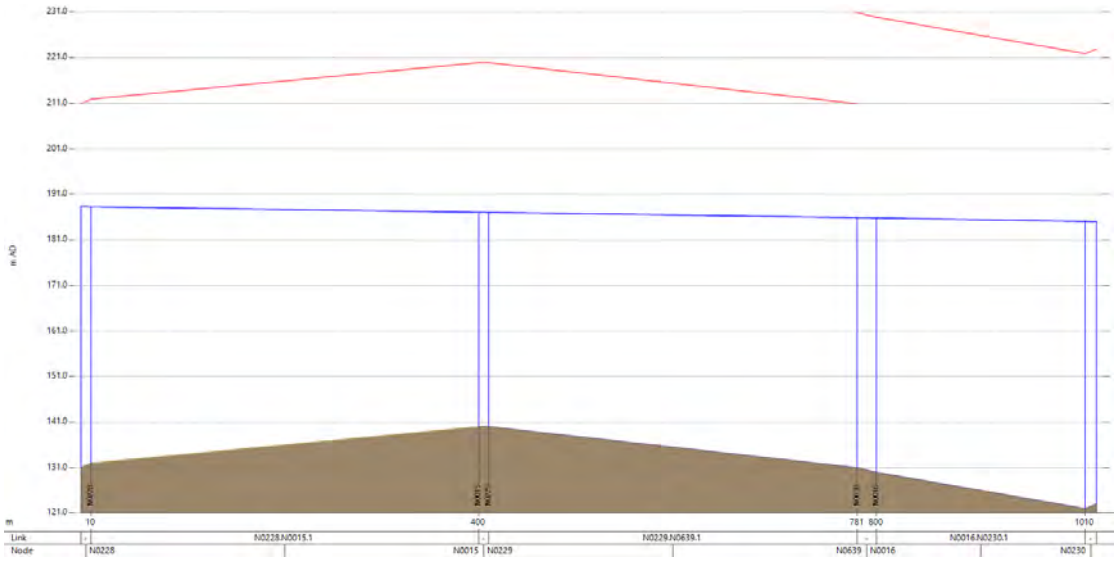


Figure 44 Sassafras C

northbarker
ECOSYSTEM SERVICES

Sassafras - Wesley Vale Irrigation Scheme Augmentation

Natural Values Assessment

V2.1 - 28th August 2023

For Tasmanian Irrigation (IDB031)

313 Macquarie Street, Hobart Tasmania, 7000

03 62319788

admin@northbarker.com.au www.northbarker.com.au

Summary

The Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA) is a proposed redevelopment of the Sassafras Wesley Vale Irrigation Scheme (SWIS). SWIS was developed by TI and commenced operations in the 2011-12 irrigation season servicing areas in Northern Tasmania. TI now proposes several upgrades to the current SWIS infrastructure by way of a "Sassafras Wesley Vale Irrigation Scheme Augmentation Project (SWISA)" which will source water from the existing Great Bend pump station on the Mersey River near Latrobe.

The primary driver for implementation of the SWISA Project is to decommission inefficient end-of-life existing SWIS pipeline networks, upgrade existing infrastructure (such as Great Bend pump station) and implement additional networks to service new customers. A new pipeline will be installed along with one new pump station and a balance tank (Saggers Hill reservoir and Sassafras balance pump station), in addition to the upgrade of Great Bend pump station.

North Barker Ecosystem Services (NBES) has been engaged to provide a natural values assessment of the proposed pipeline route and associated infrastructure for conservation significant natural values, especially values protected under the Tasmanian *Threatened Species Protection Act 1995* (TSPA) and the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBCA).This assessment included a survey for threatened flora, fauna and vegetation, and threatened fauna habitat, and a report on potential impacts to natural values, with recommendations for mitigation, relevant environmental legislation.

The current report is based on the revised alignments, based on feedback from the initial surveys and draft reporting. A summary of the findings is provided below.

Results

Vegetation

Eight native TASVEG 4.0 communities/units were recorded during the survey:

- *Eucalyptus amygdalina* coastal forest and woodland (DAC)
- *Eucalyptus amygdalina* forest on mudstone (DAM)
- *Eucalyptus obliqua* dry forest (DOB)
- *Eucalyptus ovata* forest and woodland (DOV)
- *Eucalyptus amygdalina - Eucalyptus obliqua* damp sclerophyll forest (DSC)
- *Melaleuca ericifolia* swamp forest (NME)
- *Eucalyptus obliqua* forest with broad-leaf shrubs (WOB)
- *Eucalyptus obliqua* forest over *Leptospermum* (WOL)

Of these communities, NME and DOV are listed as threatened under the Tasmanian *Nature Conservation Act 2002* (NCA). Also, DOV may qualify to be listed as threatened communities under the EPBCA if certain patch size and condition thresholds are met. The DOV in the project area are considered unlikely to meet the condition criteria, however avoidance is recommended.

Threatened Flora

148 vascular plant species were recorded along the during our surveys. One threatened flora species - *Persicaria decipiens* – listed as vulnerable under the TSPA - was recorded in several locations in the project area during the surveys. It is expected that some of these will be unavoidable.

Threatened Fauna

Threatened fauna and habitat for threatened fauna was recorded during the surveys; the principal species for consideration are as follows:

Green and gold frog (TSPA and EPBCA Vulnerable): recorded during the surveys and habitat prevalent in many parts of the project area. It is anticipated that areas of breeding habitat can be avoided, however there is still potential for some impacts to individuals and dispersal habitat. Recommendations are as follows:

- Avoid impact to areas of potential breeding habitat.
- The development of protocols to manage the potential to impact frogs, including during construction. Depending on the final impact footprint rehabilitation of habitat may be appropriate to limit any permanent degradation of important terrestrial habitat
- Works within and around potential habitat for these species should be conducted in accordance with *Keeping it clean - A Tasmanian field hygiene manual to prevent the spread of freshwater pests and pathogens*[1]

Central north burrowing crayfish (TSPA and EPBCA Endangered): habitat is prevalent within the project area and chimneys of a crayfish that is likely to be this species were recorded in several locations. Impacts to this species are likely to be unavoidable in some locations. Recommendations are as follows:

- Avoid impact to areas of known chimneys.
- In potential habitat areas where it was not possible to assess the presence of burrows with confidence due to dense vegetation during the 2023 survey, pre-construction reduction in biomass followed by surveys for burrows may be required to avoid or minimise threatened crayfish species. Depending on the extent and location of the impact in the final design, excavation of burrows to determine the identification of the species may be warranted.
- Impact mitigation and habitat management protocols should be developed to limit the likelihood of mortalities and long-term impacts on habitat condition. Additional considerations may include restrictions on timing of construction activity (to avoid hotter drier months), requirement for trained personnel onsite, translocation protocol, sediment and chemical contamination protocols, monitoring of water table, and post construction surveys.

Tasmanian wedge-tailed eagle (TSPA and EPBCA Endangered) - seven eagle nests were recorded within 1 km of the design corridor. Four eagle nests are within 500 m direct distance and/or 1 km line-of-sight from the potential construction corridor alignment, there is the potential for disruption of eagle breeding activities without avoidance and mitigation. Disruption of breeding to the EPCBA listed wedge-tailed eagle could potentially constitute a significant impact to an MNES under the definitions of that Act, requiring referral for consideration as a controlled action.

- If possible, all works within 500 m direct distance and/or 1 km line-of-sight of known nests should be completed outside of the eagle breeding season. Eagle breeding season is typically from the beginning of July until the end of January. It can be extended into February in seasons where breeding progress is later than normal, as is determined annually by the Forest Practices Authority around November. Breeding season can be taken to start as early as June 1st for white-bellied sea eagles.
- If works within 500 m/ 1 km line-of-sight of nests cannot be completed outside of the breeding season, the annual activity status of respective nests can be undertaken, noting that breeding season constraints only need to apply around active nests.
- Activity can only be reliably assessed with an aerial survey[2] and cannot be undertaken until October/November each season – as a result, activity must be assumed, and constraints applied accordingly (*i.e.* no works), from the commencement of the season each year until an activity assessment proves a nest is inactive for that season:

[1] Allen and Gartenstein (2010)

[2] With ground surveys not recommended and being applicable only to nests which adequate vantage points to view into the nest while not risking disturbance

  - If is nest is found to be definitively inactive for that season, no constraints will be required on works for the remainder of that breeding season (with constraints to recommence at the beginning of the next season); or
  - If a nest is found to be active for that season, no works should occur within 500 m and/or 1 km line of sight until the conclusion of that season (either end of January or within February in a late season).
- If the proponent/contractor is compelled to undertake works within 500 m direct distance and/or 1 km line of sight of a known eagle nest within the breeding season in a year when the specific nest is active, or assumed to be active due to not having been subject to an activity assessment, it may be possible for works to be completed without causing unacceptable disturbance to the nest. However, in this circumstance, a case specific nest disturbance mitigation plan, informed by expert advice and with input from relevant authorities, , would be required and no such works should be undertaken without such a plan in place.

Threatened carnivores (TSPA and EPBCA various): Tasmanian devil and spotted-tailed and eastern quoll are expected to utilise at least parts of the project area. No evidence of breeding habitat (i.e. burrows) was recorded, but it is possible such habitat occurs.

- Develop a pre-clearance survey and den management protocol to manage the potential impact to these species.
- Roadkill of threatened carnivores could increase as a result of increased traffic (particularly nighttime, including dusk and dawn) in the construction phase (including the delivery of materials). Accordingly, a traffic management protocol is recommended as a mitigation strategy to manage this risk.

Swift parrot (TSPA endangered and EPBCA Critically Endangered): – nesting and breeding habitat present, and the project area overlaps with the northwest breeding area for swift parrot. It is anticipated that impacts to some potential foraging and/or nesting trees may be unavoidable. Recommendations include:

- Avoid impact to foraging and potential nesting habitat trees through design.
- Where avoidance is not possible, trees should be removed outside of the breeding season (with the breeding season occurring between August and February[3])
- Where removal outside of the breeding season is not possible, a tree-clearance protocol is recommended to manage the potential risk of individuals occupying hollows in habitat trees at the time of works (including limiting the likelihood of interrupting breeding attempts)

Tasmanian masked owl (TSPA and EPBCA Vulnerable) – trees that are potentially suitable for breeding for this species were recorded in the project area. It is anticipated that impacts to some potential nesting/roosting trees may be unavoidable. Recommendations include:

- Avoid potential habitat trees for this species.
- If impact to habitat trees is unavoidable, additional surveying of habitat trees and/or a tree clearance protocol should be developed to manage the potential impact to this species.

Weeds and Pathogens

Eleven introduced plants listed as 'declared weeds' under the Tasmanian *Biosecurity Act 2019*were observed within the survey area. Two of these are listed as Zone A (isolated infestations) species within the Latrobe Council.

Zone A Species

- *Hypericum perforatum* subsp. *veronense* (perforated St Johns-wort)

[3] Department of Climate Change, Energy, the Environment and Water (2023b)

- *Ilex aquifolium* (holly) (in the absence of a statutory weed management plan for this species it is classed as Zone A)
- *Nassella neesiana* (Chilean needle grass)

Zone B Species

- *Carduus tenuiflorus* (winged thistle)
- *Cytisus scoparius* (English broom)
- *Erica lusitanica* (Spanish heath)
- *Foeniculum vulgare* (fennel)
- *Genista monspessulana* (Montpellier broom)
- *Lycium ferocissimum* (African boxthorn)
- *Rubus fruticosus* (blackberry)
- *Salix X fragilis* var. *fragilis* (crack willow)
- *Senecio jacobaea* (ragwort)
- *Ulex europaeus* (gorse)

A Weed and Hygiene Management Plan is required to guide weed control and facilitate containment of weed species by the civil contractors and should include a requirement to systematically survey sections of the construction corridor prior to works and undertake weed mitigation measures as appropriate. In general, control of declared and environmental weeds during and following works will minimise the risk of their spread and the introduction of new weeds. Weed control should include preliminary weed removal prior to works/excavation and be supplemented by follow-up measures to target any regenerating plants post completion.

Throughout the works area, contractors should be required to adhere to best practice guidelines:

- *Weed and Disease Planning and Hygiene Guidelines - Preventing the spread of weeds and diseases in Tasmania* (DPIPWE 2015b)
- *Tasmanian Washdown Guidelines for Weed and Disease Control – Machinery, Vehicles & Equipment* (DPIPWE 2004)

Legislative Implications

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

The project is likely to have some unavoidable impacts to Matters of National Environmental Significance, including green and gold frog, and central north burrowing crayfish. There is also a risk, albeit lower, to other species including swift parrot, Tasmanian masked owl, Tasmanian wedge-tailed eagle, Tasmanian Devil and quolls, and Tasmanian forests and woodlands dominated by black gum or Brookers gum (*Eucalyptus ovata* / *E. brookeriana*).

The proposal is being referred under this Act for these matters for consideration as a controlled action.

Tasmanian *Threatened Species Protection Act 1995*

A permit to take threatened species will be required for where the project cannot directly avoid occurrences of threatened flora or fauna listed under the TSPA, and/or is likely to impact individuals of threatened flora or fauna.

Based on the current construction corridor, a permit to take is likely to be required for:

- *Persicaria decipiens* – slender waterpepper
- *Engaeus granulatus* – central north burrowing crayfish

Pre-clearance surveys may determine permits are required for additional threatened fauna species.

Tasmanian *Biosecurity Act 2019*

The development and application of a project specific weed and hygiene management plan will be sufficient to meet the requirements of this Act.

Tasmanian Planning Scheme

The proposal will be able to sufficiently meet the planning requirements of this scheme through the application of mitigation measures detailed throughout this report.

ACKNOWLEDGMENTS

Project	Sassafras Wesley Vale Irrigation Scheme Augmentation	
Location	Latrobe, Tasmania	
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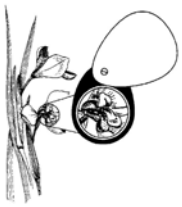
Eagle Nest Search	Erin Harris, Aleida Williams, Adam Hardy (pilot Hoey Stobart from Helicopter Resources Pty Ltd)	
Field Dates	Eagle nest search – 9-10 February 2023 Initial alignment survey – baseline natural values (AW, HK, JL) – 14-17 February 2023 Alignment adjustment survey – baseline natural values (AW, DL, JL) – 17-19 May 2023	
Reporting	Aleida Williams, Richard White, Jared Parry	
Mapping	Eric Hong, Will Tanner	
Eagle Viewshed Analysis	Eric Hong	
External Consultations	Mark Wapstra (ECOtas) – threatened orchids	
Permit Numbers	DA 22261- Permit to take native flora including threatened flora	
Ethics Approval	N/A	
Version	**Date**	**Author/Comment**
Draft 0.1	1/5/2023	A. Williams
Draft 1.0	12/5/2023	R. White –draft issued to client with recommendations for avoidance.
V1.1	26/07/2023	A Williams – Updated for with new field data and new pipeline alignment.
V2.0	28/07/2023	J. Parry – Reviewed and delivered to client.
V2.1	28/08/2023	Minor edit. Provided to TI and EPBCA referral



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List of Acronyms

BSA – Tasmanian *Biosecurity Act 2019*

CEMP – Construction Environmental Management Plan

CFEV – Conservation of Freshwater Ecosystem Values

DAC - *Eucalyptus amygdalina* coastal forest and woodland (TASVEG unit)

DAM - Eucalyptus amygdalina forest on mudstone (TASVEG unit)

DBH – Diameter at breast height (tree trunk size measure)

DCCEEW – Commonwealth Department of Climate Change, Energy, the Environment and Water

DEM – Digital Elevation Model

DEMCHM - Digital Elevation Model Canopy Height Model

DEWHA – Commonwealth Department of the Environment, Water, Heritage and the Arts

DFTD - Devil Facial Tumour Disease

DOB - *Eucalyptus obliqua* dry forest (TASVEG unit)

DOV - *Eucalyptus ovata* forest and woodland (TASVEG unit)

DPIPWE – Department of Primary Industries Water and the Environment

DSC - *Eucalyptus amygdalina* - *Eucalyptus obliqua* damp sclerophyll forest (TASVEG unit)

DSEWPaC – Commonwealth Department of Sustainability, Environment, Water, Population and Communities

EPA – Environment Protection Authority Tasmania

EPBCA – Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*

FAC – Improved pasture with native tree canopy (TASVEG unit)

FAG – Agricultural land (TASVEG unit)

FPA – Forest Practices Authority

FPH – Plantations for silviculture - hardwood (TASVEG unit)

FUR – Urban areas (TASVEG unit)

FWU – Weed infestation (TASVEG unit)

ICV – Integrated conservation value (CFEV)

LUPAA – *Land Use Planning and Approvals Act 1993*

LIST – Land Information System Tasmania

MNES – Matters of National Environmental Significance

NBES – North Barker Ecosystem Services

NME - *Melaleuca ericifolia* swamp forest (TASVEG unit)

NCA – Tasmanian *Nature Conservation Act* 2002

NRE – Department of Natural Resources and Environment Tasmania

NVA – Natural Values Atlas database

RCV - Representative Conservation Value (CFEV)

SPRAT – Species Profile and Threats Database

SRZ – Structural Root Zone

SWIS – Sassafras-Wesley Vale Irrigation Scheme

SWISA – Sassafras-Wesley Vale Irrigation Scheme Augmentation

TI – Tasmanian Irrigation

TPZ – Tree Protection Zone

TSPA – Tasmanian *Threatened Species Protection Act 1995*

VCA – Vegetation Condition Assessment

WOB - *Eucalyptus obliqua* forest with broad-leaf shrubs (TASVEG unit)

WOL - *Eucalyptus obliqua* forest over *Leptospermum* (TASVEG unit)

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1. INTRODUCTION

1.1 BACKGROUND

The Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA) is a proposed redevelopment of the Sassafras Wesley Vale Irrigation Scheme (SWIS). SWIS was developed by TI and commenced operations in the 2011-12 irrigation season. Water is sourced from the Great Bend pump station on the Mersey River near Latrobe and services the Sassafras, Harford, Thirlstane, Moriarty, Wesley Vale, Northdown, Pardoe, and East Devonport areas in Northern Tasmania. For SWISA, TI proposes several upgrades to the SWIS infrastructure and a new trunkline that would feed into existing SWIS pipelines.

The primary driver for the SWISA project is to decommission inefficient end-of-life existing SWIS pipeline networks, upgrade existing infrastructure (such as Great Bend pump station) and implement additional networks to service new customers. To address this, a new pipeline will be installed along with one new pump station and a balance tank (Saggers Hill reservoir and Sassafras balance pump station), in addition to the upgrade of Great Bend pump station. The proposed pipeline network consists of approximately 102 km of large diameter high-density polyethylene pipeline, with a design peak flow of 99.1 ML/day. The seasonal preferred option will deliver 14,860 ML of summer water annually to 140 landholders in the irrigation area (Figure 1), allowing TI to service the majority of properties that submitted an expression of interest. The scheme will thus allow for irrigation water to be provided to an estimated area of 20,000 ha, with the infrastructure having a design lifespan of 100 years.

The works proposed for the pipeline will require excavation along the route, as well as several creek crossing points. The work will occur largely through private land, with minor components occurring within the Warrawee Conservation Area and within production timber plantations.

1.2 NATURAL VALUES ASSESSMENT

In August 2022, TI commissioned a desktop and preliminary field assessment of critical natural values constraints for the project, including a targeted spring survey for threatened orchids[4]. In addition, TI prepared a desktop environmental risk assessment to further inform the pipeline alignment through high-level avoidance of natural values[5]. A preliminary pipeline alignment was thus designed to avoid natural values to the degree possible (limited by design factors and the limits of desktop data), traversing primarily modified/agricultural land and where possible utilising existing tracks/easements through native vegetation.

North Barker Ecosystem Services (NBES) has subsequently been engaged to undertake a natural values assessment of the proposal, including surveying the pipeline alignment and associated infrastructure sites for conservation significant natural values (including threatened flora, fauna and vegetation, and threatened fauna habitat), assessing impacts, providing recommendations for avoidance and mitigation, and quantifying residual impacts in relation to relevant environmental legislation.

The assessment is supported by multiple surveys, including an initial alignment (February 2023) and an updated alignment following recommended avoidance (May 2023). Impacts reported are based on a final refined alignment provided in July 2023.

1.3 STUDY AREA

The scheme application area (the irrigation district) covers the land area between Devonport and the Mersey River to the west, and Port Sorell and the Rubicon River to the east, and as far south as Sassafras. The proposed pipeline route occurs almost entirely within the Latrobe Council, with a small section within the Devonport Council (Figure 1).

[4] ECOtas (2022)
[5] Tasmanian Irrigation (2022)

Surrounding land cover along the route is predominantly non-forest agricultural land with small patches of remnant native vegetation. Native forest areas are more widespread to the south of the project areas and the only significant area of native forest through which the pipeline route passes is within the Warrawee Conservation Area near the Great Bend Pump Station on the Mersey River.

Soils in the local area are derived from the following base materials:

- Basalt (tholeiitic to alkalic) and related pyroclastic rocks
- Dolerite (tholeiitic) with locally developed granophyre
- Dominantly non-marine sequences of gravel, sand, silt, clay and regolith
- Freshwater and paralic sandstone and mudstone with some coal measures
- Lower glaciomarine sequences of mudstone, pebbly mudstone, pebbly sandstone, minor limestone and tasmanite oil shale
- Sand gravel and mud of alluvial, lacustrine and littoral origin
- Undifferentiated pelitic rocks and quartzite sequences, with greenschist facies metamorphism
- Upper glaciomarine sequences of pebbly mudstone, pebbly sandstone and limestone

Elevation along the route ranges from 10 to 170 m a.s.l. (above sea level).

Mean annual rainfall for the area is around 905 mm per annum[6], with limited seasonality, albeit with precipitation greatest in the winter months of July and August. Annual mean maximum temperatures[7] are around 17.1 °C, with mean maximum temperatures during summer around 21 °C, and mean minimum temperature in winter of 5.0 °C.

Box 1 – Terminology used within this report regarding surveys and impact areas

Terminology

Project area: Broad area covering the irrigation scheme and the **irrigation district**.

Survey area: The area covered by field surveys. Ground survey area is the combined survey area of all surveys: 50 m buffer (100 m corridor width) of pipeline alignment/s and 100 m buffer around the pump stations and a balance tank as provided by TI prior to field surveys. Additional survey areas for secondary field surveys were the same buffers of any alignment outside the original survey area, plus previously unsurveyed areas requested by TI. Nest survey area takes in a greater area and is shown below in Figure 2.

Design corridor: Is the area in which the pipeline can be situated without requiring further survey work. It is generally a 100 m corridor width around the pipeline alignment and 100 m buffer around the pump stations and balance tank, except where areas of significant natural value have been excised from the design corridor to avoid impacts.

Construction corridor: 15 m buffer (30 m diameter corridor) around the nominal pipeline alignment. In areas where large, dual pipelines are required, the construction corridor has a 20 m buffer on the pipeline alignment. The construction corridor is used to assess indicative impacts of the project. The final alignment of the construction corridor may vary within the approved design corridor.

[6] Station details: East Sassafras (Elphin Grove), 41.27°S, 146.55°E, 81 m asl, commenced 1966
[7] Station details: Devonport Airport, 41.17°S, 146.43°E, 8 m asl, commenced 1992

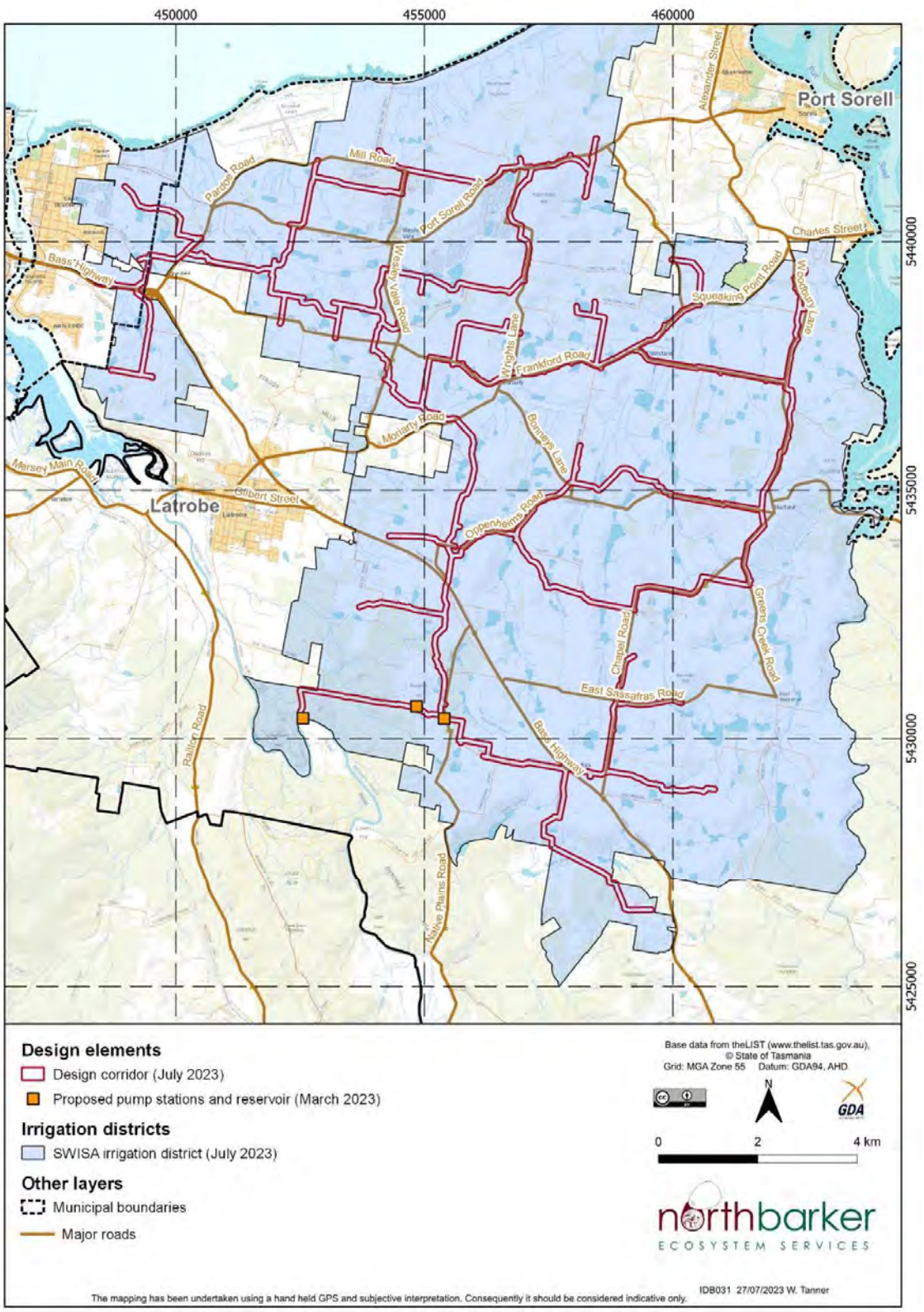

Figure 1: Map of proposed pipeline alignment and infrastructure with reference to the Sassafras - Wesley Vale Irrigation Scheme Augmentation District

2. METHODS

2.1 SURVEY AREA AND DATES

Terminology used within this report is detailed in Box 1. A summary of field survey dates is provided below.

- Initial alignment ground field surveys were conducted 14-17 February 2023 to coincide with optimal flowering times for potentially occurring threatened flora (see methods below).
- Following initial surveys, areas of significant natural values were identified and recommendations of areas of avoidance were made.
- The alignment was adjusted to avoid natural values where practical and possible.
- Supplementary areas were surveyed 17-19 May 2023.

The eagle nest survey area is defined as a buffer of 1.5 km around the alignment (Figure 2). A 1 km buffer will capture any nests where breeding may be impacted, and a further 500m buffer outside the 1 km buffer was add in order to account for subsequent realignments. Further detail is provided in section 2.4.1.

- The aerial eagle nest search was conducted 9-10 February 2023.
- The adjusted alignment was within the 1.5 km buffer surveyed in February, therefore no supplementary nest surveys were required.

2.2 VEGETATION MAPPING

In Tasmania, the primary source on the distribution of vegetation is the state-wide TASVEG[8] mapping database (with TASVEG 4.0 being the latest published version, and current distribution data available in the TASVEG-Live database version). The compilation of TASVEG has been an iterative process of improvement and refinement upon an original base layer that was collated from several sources[9]. As a result, data within TASVEG do not completely represent vegetation extent and distribution at a single date. Indeed, some areas are still mapped at a coarser scale than the general 1: 25,000, or are based on interpretation of imagery over ten years old[10]. Furthermore, vegetation mapping at any scale can be an exercise in judgement, with an inherent potential for errors in interpretation. Subsequently, it is standard practice to truth TASVEG data using recent imagery and ground sampling[11].

The image interpretation process for the current proposal involved several satellite images accessed via Google Earth Pro[12]. The images had a resolution of no more than 2.5 m, with capture dates ranging from 25/11/2021 to 04/02/2022. Imagery was examined for patterns of tone, texture, colour, and contrast to identify homogeneous patches of vegetation (aerial signatures). This was also informed by the interpretation of environmental traits such as slope, aspect, and elevation, due to their consistent associations with vegetation units[13]. Patches were then manually assigned to TASVEG units based on correlation with existing polygons within the TASVEG database and evident aerial signatures.

Ground sampling was undertaken over the course of all field visits. Ground sampling involved one or two ecologists traversing the survey area (mostly on foot) in a stratified fashion that ensured ground sampling of the complete range of image signatures. When a patch was ground sampled, the observer assessed the requisite traits of vegetation structure, floristics, geology, and environment to discriminate the patch from any other possible TASVEG units using the descriptions and stepwise keys within the online versions

[8] Department of Primary Industries, Parks, Water, and Environment (2020)
[9] Harris and Kitchener (2005)
[10] Kitchener and Harris (2013)
[11] Tasmanian Vegetation Monitoring and Mapping Program (2013)
[12] Google Earth Pro (2023), March 2023 – DigitalGlobe, TerraMetrics, CNES/ Airbus
[13] Kirkpatrick and Nunez (1980)

of the current TASVEG companion manual[14]. Boundary discrimination was based on image interpretation and aided by point data collected on a hand-held GPS unit. All ground sampling was undertaken during the daytime, mostly in fine weather due to the potential sampling constraints associated with reduced visibility from rain and/or low light.

This combination of image interpretation followed by stratified ground sampling and interpolation is consistent with the NRE guidelines for natural values assessments (section 7, DPIPWE 2015a[15]) as well as the methods applied within vegetation mapping elsewhere[16] and described in ecological manuals[17].

TASVEG units observed on site were cross-referenced against all vegetation communities listed as threatened under the Tasmanian *Nature Conservation Act 2002* (NCA) and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA).

Only native vegetation communities have been mapped. Following TASVEG[18], minimum mappable vegetation patch size was set at 0.25 ha except where patches as small as 0.1 ha of forest and woodland communities of high conservation significance were assessed as viable and therefore mapped.

2.2.1 EPBCA listed vegetation communities

The protected matters search tool[19] indicates that the Critically Endangered communities of Tasmanian forests and woodlands dominated by black gum or Brookers gum (*Eucalyptus ovata/E. brookeriana*), and Tasmanian white gum (*Eucalyptus viminalis*) wet forest, may occur in the area.

To determine if any of the vegetation in the survey area had the potential to quality as these ecological community and thus to be protected as a matter of national environmental significance, vegetation was assessed against the key diagnostic characteristics and condition requirements of the relevant community.

Tasmanian forests and woodlands dominated by black gum or Brookers gum (*Eucalyptus ovata/E. brookeriana*)

This community is primarily comprised three TASVEG communities:

- DOV – *Eucalyptus ovata* forest and woodland;
- DOW – *Eucalyptus ovata* heathy woodland; and
- WBR – *Eucalyptus brookeriana* wet forest.

Other TASVEG units may have a component that is consistent with the description of the listed ecological community while the remainder of the unit is dominated by another eucalypt species. DSC - *Eucalyptus amygdalina – Eucalyptus obliqua* damp sclerophyll forest for example, may include internal patches that match the description of the listed community.

Once the key diagnostics around composition have been met, in order to qualify as the listed community, the vegetation must also meet minimum condition thresholds set out in Table 1.

Thus, any vegetation in the survey area classified as these TASVEG communities was assessed against the requisite condition criteria to determine if they qualified as Tasmanian forests and woodlands dominated by black gum or Brookers gum (*Eucalyptus ovata / E. brookeriana*).

[14] Kitchener and Harris (2013)
[15] Department of Primary Industries, Parks, Water, and Environment (2015a)
[16] The Nature Conservancy (1994)
[17] Kuchler and Zonneveld (2012)
[18] Kitchener and Harris (2013)
[19] Department of Climate Change, Energy, the Environment and Water (2023) - Protected Matters-MNES layers - March 15th 2023

Table 1: Condition and categories[20] used to identify those patches that retain sufficient conservation values to qualify as listed Tasmanian forests and woodlands dominated by black gum or Brookers gum (*Eucalyptus ovata / E. brookeriana*. Category A= highest quality, category B = good quality.

Class A – Highest Quality

Patches with the best chance for longer-term survival that retain a high degree of intact vegetation, habitat value, or connectivity. Such remnants are more able to provide buffers from disturbance, sources of natural regeneration, and natural wildlife corridors and habitats.

Category and Rationale	Native Cover and Habitat Thresholds	Minimum Patch Size Thresholds
Category A1 Large patch with few weeds and habitat trees	≥ 70% of perennial vegetation[1] cover in the understorey is made up of native species. **AND** The patch has at least 4 locally indigenous trees per 1 ha that either: have hollows OR are large (> 60 cm DBH[2]) OR are in either of these categories.	≥ 2 ha
Category A2 Patches with mostly native understorey and connected to a larger native vegetation remnant.	≥ 70% of perennial vegetation cover in the understorey is made up of native species. **AND** The patch is contiguous[3] with a native vegetation remnant.	≥ 0.5 ha for a patch of the ecological community **AND** ≥ 2.0 ha for the entire native vegetation remnant.

Class B – Good Quality

Patches that retain conservation value(s) and may or may not be isolated from other native vegetation remnants.

Category and Rationale	Native Cover and Habitat Thresholds	Minimum Patch Size Thresholds
Category B1 Isolated patch that remains largely intact and has few weeds.	≥ 70% of perennial vegetation cover in the understorey is made up of native species.	≥ 0.5 ha
Category B2 A larger isolated patch with a mostly native understorey remaining.	≥ 50% of perennial vegetation cover in the understorey is made up of native species.	≥ 2 ha
Category B3 A patch with mostly native understorey and high plant species diversity. May or may not be isolated.	≥ 50% of perennial vegetation cover in the understorey is made up of native species. **AND** ≥ 15 native understorey species per 0.5 ha **OR** ≥ 8 native understorey species per 0.5 ha for patches dominated by *E. brookeriana*[2].	≥ 0.5 ha

[1] Perennial understorey vegetation cover includes vascular plant species of the ground and mid layers with a lifecycle of more than two growing seasons. The ground layer includes herbs (i.e., graminoids, forbs, and low shrubs [woody plants <0.5 m high]). Measurements of perennial understorey vegetation cover exclude annuals, leaf litter or exposed soil. The mid layer is typically comprised of shrubs and small trees and may include juvenile canopy trees.

[20] Department of the Environment & Energy (2019)

[2] DBH is diameter at breast height. The DBH is used as a surrogate measure to determine whether mature trees are present. The requirement for locally indigenous trees refers to any large eucalypt trees naturally present in the patch of the ecological community (i.e., the area dominated by *E. ovata* and/or *E. brookeriana*). The patch may or may not be part of a larger native vegetation remnant that may contain additional mature trees.

[3] Contiguous means a patch of the ecological community is continuous with or close to (periphery within 50 m) another area of native vegetation. The native vegetation remnant that is contiguous includes any native vegetation where the cover in each layer present is dominated by native plant species. It includes forest and non-forest native vegetation structures. The minimum total area of native vegetation (i.e., patch of the ecological community plus contiguous remnant) is 2 ha.

2.3 Floristic Surveys, Including Threatened Flora Searches

To support the determination of TASVEG units (as per NRE guidelines[21]) and provide general floristic data, within each native community at least one full vascular plant species list was taken in representative ¼ ha plots using a Timed Meander Search Procedure[22]; this method requires the observer to continue survey effort until survey yields (*i.e.*, new species observations) diminish towards zero. Outside the ¼ ha plots, threatened species observations, and observations of additional non-threatened plant species were noted as encountered while traversing the site and while conducting all other observations – where nodes of additional plants were present, additional plots were undertaken. Outside plots, flora survey effort was concentrated within locations considered as likely threatened species habitat (based on NBES knowledge and NRE habitat descriptions[23]). In addition, locations of previous threatened flora observations within the project area (based on the Natural Values Atlas (NVA) observation data) were visited for verification of identification and to establish if the species were still present.

The initial baseline natural values survey was timed to maximise the potential for recording threatened species known within 5 km[24].

Areas of agricultural land were surveyed in a stratified fashion, prioritising known locations and areas containing habitat of threatened species (e.g. drainage channels and damp areas). Timber plantations, urban areas, paddocks, roadsides, and large-scale weed infestations were able to be surveyed less intensively based on the lower suitability of habitat for conservation significant values. Areas subject to cropping and/or pivot irrigation were not surveyed other than where suitable localised niches for conservation significant values were evident.

Declared[25] and environmental weeds, as well as symptomatic evidence of plant pathogens, were recorded where evident within or close to (such as on an adjacent road) the project area.

Botanical nomenclature follows the current census of Tasmanian plants[26].

2.4 Fauna Field Methods

Observations of habitat suitability for fauna (particularly threatened fauna) were made concurrently with the flora ground surveys across the project area. Areas of potential habitat were marked using a handheld GPS and notes on the condition/status of the habitat were recorded. Particular survey attention was given to the following species, and targeted surveys were undertaken for eagle nests and for Tasmanian devils and quolls.

[21] Department of Primary Industries, Parks, Water, and Environment (2015a)
[22] Goff *et al.* (1982)
[23] Threatened Species Section (2023)
[24] Department of Natural Resources and Environment (2022); Threatened Species Section (2023)
[25] Tasmanian *Biosecurity Act 2019*
[26] de Salas & Baker (2022)

2.4.1 Green and gold frog (*Litoria raniformis*)

The design corridor is within the known core range for this species and there are 9 records of green and gold frogs within 500m of the design corridor[27]. In addition, the preceding SWIS project was approved under the EPBCA as a controlled action with conditions for the protection of populations and habitat of green and gold frogs. As such it is accepted that green and gold frogs will occur within the design corridor and therefore targeted surveys for this species were not deemed necessary to determine the presence of this species. Incidental observations of the species were recorded.

Potential breeding habitat within the design corridor was surveyed during field surveys and optimal and suboptimal suitable breeding habitat was mapped as follows. Green and gold frogs can tolerate a degree of poor water quality[28], therefore the modified nature of the landscape does not preclude their use of waterbodies in this environment. Habitat was mapped at its maximum extent (ie maximum water capacity) with the aid of aerial imagery and hydrological data (LIST data).

- Optimal breeding habitat for the green and gold frog includes the following elements:
    - still or slow-moving water bodies including shallow areas (up to approximately 1.5 m deep) with a complex vegetation structure often containing emergent plants such as water ribbons (*Triglochin* spp.) and spikerush (*Eleocharis* spp.)[29]
- Suboptimal breeding habitat was mapped where waterbodies contained some vegetation but not complex vegetation structure. These areas may qualify as optimal breeding habitat in the future.

2.4.2 Central north burrowing crayfish (*Engaeus granulatus*)

The entirety of the project area is within the core range of *Engaeus granulatus*, the central north burrowing crayfish (CNBCF)[30]. *E. granulatus* is the only burrowing crayfish within most of its range (as determined by field surveys and environmental modelling), although it overlaps with one non listed species *E. mairener* to the east of the project area[31]. Therefore, it is highly likely that any colony within the majority of project is that of *E. granulatus*.

Previously recorded CNBCF locations and potential habitat within the survey area were targeted with search effort during field surveys. Potential habitat for CNBCF includes areas where the water table rises seasonally such as swamps, wetlands, stream sides, and floodplains, drain edges and roadside seeps and culverts[32]. Chimneys/ burrows were counted where possible, or density and area were recorded where number of chimneys was too great to count. Potential CNBCF habitat was mapped as follows:

- Optimal CNBCF: presence of burrowing crayfish chimneys/tunnels and/or inundation-prone areas as described above, particularly within or near to damp native vegetation units including remnant vegetation (eg DOV and NME). Remnant vegetation impacted by cattle is classed as optimal if the canopy is intact. Constructed farm dams within optimal habitat, eg a pond or small dam within a naturally occurring swamp or wetland, are included.
- Suboptimal CNBF: areas surrounding drainage lines not as above. For example:
    - drainage areas within paddocks as evidenced by the presence of rushes, but not near seasonal or permanent water
    - constructed farm dams outside natural swamps, wetlands and streams (CNBCF have not been recorded around constructed dams outside natural wet habitats[33])

[27] Department of Natural Resources and Environment (2022)
[28] Department of the Environment, Water, Heritage and the Arts (2009); Forest Practices Authority (2014a)
[29] Forest Practices Authority (2014a)
[30] Richardson *et al.* (2008)
[31] Richardson *et al.* (2008)
[32] Threatened Species Section (2023b); Richardson *et al.* (2008); Richardson *et al.* (2019)
[33] A. Richardson (pers. comm. 2023)

- areas heavily impacted by stock

- Unsuitable: potential habitat areas that have been ploughed, cropped or not protected from heavy ongoing stock impacts

There is evidence that an as yet undescribed *Engaeus* species has been discovered within the project area near Latrobe[34]. The undescribed *Engaeus* species is known from very deep burrows in paddocks and is not necessarily affiliated with areas where the water table rises or permanent surface water[35]. Therefore, there is potential for this species to occupy habitat described above as suboptimal for CNBCF. As such, all damp areas that had not been ploughed were searched for evidence of burrowing crayfish.

2.4.3 Tasmanian wedge-tailed eagle (*Aquila audax* subsp. *fleayi*) & white-bellied sea eagle (*Haliaeetus leucogaster*)

Eagle nest search

Ten eagle nests were known to occur within 1.5 km of the alignment based on data within the NVA. Furthermore, based on the Forest Practices Authority (FPA) potential eagle nesting habitat model[36] (Figure 2) additional undocumented nests within 1.5 km were considered likely to be present. This precipitated the need for an aerial nest search.

The nest search was undertaken on the 9-10/2/2023 according to FPA standards by Erin Harris (NBES) and Adam Hardy, with Aleida Williams (NBES) as an additional spotter. E Harris and A Hardy are experienced in aerial and ground eagle nest surveying and the identification of suitable habitats. Flights were conducted using Helicopter Resources Pty Ltd., with pilot and Hoey Stobart who has flown eagle nest surveys frequently in the past.

A total of 8 hours was spent searching the nest survey area (to a buffer of 1.5 km around the alignment at that time). The weather was optimal for the duration of the survey, with winds trending from light to moderate.

The survey involved slow flying (5-10 knots) above the tree canopy or, where possible, below the adjacent canopy level, such as through gullies. Transects were flown over the whole area to ensure complete coverage (*i.e.* not just those areas predicted by the FPA model) but additional survey effort was concentrated on high quality potential habitat. All known nest locations (NVA database) within the survey area were visited to verify condition and presence. Any previously recorded nests that could not be found (using their recorded position and spatial accuracy as a guide), were also searched for within surrounding suitable trees and habitat until it was considered that continued searching would be futile.

Once a nest was located, its condition and features were described in-situ with the assistance of 10 x 40-50 mm binoculars, enabling the observers to remain distant from the nest. Nest checks were limited to the time necessary to verify presence and condition (typically less than 1-2 minutes in an area) in order to reduce risks to local birds and the observers while hovering near the canopy. To further reduce potential disturbance, all nest observations were photographed using a Canon 5D Mark2 Camera with a manual optical zoom and the location only recorded (using a handheld non-differential GPS, Garmin GPSMap 64s) if the previously recorded position had low reported spatial accuracy or the nest was a new record.

To support the in-situ observations, images of each nest were later examined to further inform the condition assessment. Condition characteristics included: fresh green leaves, stick tone (brown or grey), white-wash, algal smears, nest shape (flat-topped or bowl), down/feathers, and prey remains. The integrity of the nest was then given a classification based on it being prime, viable, derelict or remnant. These factors represent the viability of the nest for breeding.

[34] A. Richardson (pers. comm. 2023)
[35] A. Richardson (pers. comm. 2023)
[36] Forest Practices Authority (2014)

Eagle nest viewshed modelling

Following the aerial survey, a viewshed analysis was undertaken for all new and previously recorded nest locations. The viewshed analysis was undertaken in Geographic Information Systems (GIS) modelling to determine project infrastructure/alignment visibility in relation to the locations of the nests under investigation. Within a 1 km radius, two separate models were run for each nest to explore the potential visibility for two different scenarios:

1. A non-vegetated landscape (*i.e.* topographic constraints only, informed by a digital elevation model [DEM] only)
2. A vegetated landscape (DEM plus canopy height (DEMCHM) [LIDAR data from theLIST and TASVEG 4.0 data from theLIST])

The resulting viewsheds were post-processed to provide an indication of ground surface area visible from a nest and demonstrate whether the extant vegetation provides additional screening to topographic constraints (noting that because vegetation is ephemeral it cannot be relied on as a screen indefinitely).

The GIS methodology used to determine the viewsheds is described below.

Datasets

Non-vegetated landscape (DEM only)

- A 2 m Digital Elevation Model (DEM) was compiled for the project area and its surrounds, with a DEM tile covering each nest location downloaded respectively from ELVIS (https://elevation.fsdf.org.au/) and merged into a single DEM dataset. The 5 m DEM was then resampled to 2 m resolution.

Vegetated landscape

- The DEMCHM model was created by combining the DEM data with a 2 m LiDAR and TASVEG derived Canopy Height Model (CHM) modified to include the 60 m wide proposed easement clearance.
- This additional DEMCHM model approximated the canopy height of vegetation draped over the raw DEM and allows comparison of the viewshed in vegetated and hypothetical unvegetated states.

Visibility Analysis

The viewpoint was then created to compute the following viewsheds using the visibility analysis tool in QGIS (Visibility Analysis QGIS plugin version 1.7). For all viewshed scenarios, the target height was set to 1.8 m with a 1000 m radius from each nest site.

- The first viewshed assumed a non-vegetated landscape (DEM only) and the observer height was the field verified nest height.
- The second viewshed assumed a vegetated landscape (DEMCHM) that included extant canopy heights. The difference between the vegetated and non-vegetated landscapes was calculated, if the vegetation was height was greater than 1.8 m it was assumed that this would provide screening and the associated visible pixels of the canopy removed. The observer height was set to the height value of the nest.
- The raster outputs were converted to polygons (QGIS vectorisation), with polygons assigned binary values indicating visibility.

2.4.4 Tasmanian devil (*Sarcophilus harrisii*), spotted-tail quoll (*Dasyurus maculatus* subsp. *maculatus*) & eastern quoll (*Dasyurus viverrinus*)

Surveys were conducted during baseline natural values surveys across the duration of field assessments, following the general search techniques specified in the State guidelines[37]. Broad scale habitat suitability was assessed and presence/absence was surveyed concurrently with other survey efforts. For presence/absence[38], diurnal searching was undertaken for scats and prints, with particular attention to potential dispersal routes (e.g., tracks) and soft substrate. Scats in particular are often detectable in latrine sites such as at track junctions and creek crossings[39].A total of 14 person days (>140 hours) targeted search effort was undertaken during the two ground surveys. A total of 60 ha was mapped as native vegetation and hardwood plantation. The Tasmanian devil and quoll survey effort in these areas accounted for >50 hrs, as they provide the highest suitability for denning structures and prey availability[40]. Thus, survey effort exceeded the minimum survey requirement for indirect searches for diurnal mammals defined in the *Survey guidelines for Australia's threatened mammals*[41]. The guidelines recommend a minimum day-time search effort of two hours for every one-hectare survey site of a stratified sampling program in a subject site up to 5 hectares. A search survey effort of > 50 hours was spent within this habitat, equating to an average of around 0.9 hours of survey searching within every hectare of native vegetation, which far exceeds the recommendation of 2 hours of searching for 1 in every 5 hectares (average 0.4 hrs/ha).

In addition, three trail cameras were implemented in areas of suitable habitat within the SWISA study area between the 2nd-30th March 2023, totalling 28 nights each at the three separate locations. All camera footage was assessed by a NBES ecologist, with each observation identified to the species level and threatened fauna species noted along with the date and time of occurrence, sex, approximate age, behaviour exhibited, body condition, and signs of devil facial tumour disease (DFTD) where relevant.

2.4.5 Swift parrot and Tasmanian masked owl

Potential habitat for swift parrots and Tasmanian masked owl were recorded concurrently with baseline flora and fauna surveys.

Swift parrot - potential hollow bearing trees (nesting habitat) and areas of foraging habitat as per published descriptions[42] were recorded during the surveys.

Tasmanian masked owl - potential hollow bearing trees which may provide suitable breeding or roosting habitat for these species as per published descriptions[43] were mapped during the surveys. Any tree with a large hollow (≥15 cm entrance diameter) was considered potential habitat for masked owls, and as trees less than 100 cm diameter at breast height (DBH) are unlikely to contain hollows suitable for masked owls, tree DBH >100 cm was used as a measure of potential hollow bearing masked owl breeding habitat.

Native forest vegetation and native paddock trees were assessed as potential habitat as follows:

- In small areas of potential habitat, individual trees were recorded within the design corridor.
- Larger areas of potential habitat were mapped as areas and an individual tree survey will need to be undertaken when the survey alignment is finalised.

[37] Natural and Cultural Heritage Division (2015)
[38] Department of Sustainability, Environment, Water, Population and Communities (2011); Department of Primary Industries, Parks, Water, and Environment (2015a)
[39] Department of Sustainability, Environment, Water, Population and Communities (2011)
[40] Andersen *et al.* (2017); Andersen *et al.* (2020); Jones & Rose (1996); Troy (2014)
[41] Department of Sustainability, Environment, Water, Population and Communities (2011)
[42] Forest Practices Authority (2014b)
[43] Forest Practices Authority (2014c)

2.5 LIMITATIONS

Due to seasonal variations in detectability and accurate discrimination (*i.e.* identification of closely related species), there may be some herb, orchid and/or graminoid species present on the route that have been overlooked. Flora surveys were strategically timed to maximise the opportunity to detect seasonal threatened flora, though may not have been ideal for detection of all species. Due to lack of visibility, submerged species could also be under-surveyed to some degree. To compensate for this, field data from the present study were supplemented with data from the Tasmanian Natural Values Atlas[44] and the EPBCA Significant Matters Database[45]. All threatened plant species known to occur in the local area (500 m) were considered in terms of habitat suitability on site. A wider radius of 5 km was considered in our background assessment, but due to the nature of the works (relatively confined impact area) and the species in question, it was not considered necessary to present consideration of the additional species in the report.

Due to the scale of infestation, weed mapping represents indicative nodes of concentration only unless the species was uncommon and/or highly localised.

Threatened fauna habitat, including the presence of tree hollows, was assessed from ground level only, other than for the aerial assessment of eagle nesting habitat.

Burrowing crayfish surveys were limited in some areas by high biomass load. In some potential roadside and farm ditch habitat, the likelihood of finding chimneys was limited by high grass and herb biomass, *i.e.*, if burrows were present, they would not be seen under the dense vegetation.

Spatial data was collected with a handheld non-differential GPS with an average accuracy of between 3 and 10 m.

[44] Department of Natural Resources and Environment (2022)
[45] Department of Climate Change, Energy, the Environment and Water (2023) - Protected Matters-MNES layers - March 15th 2023

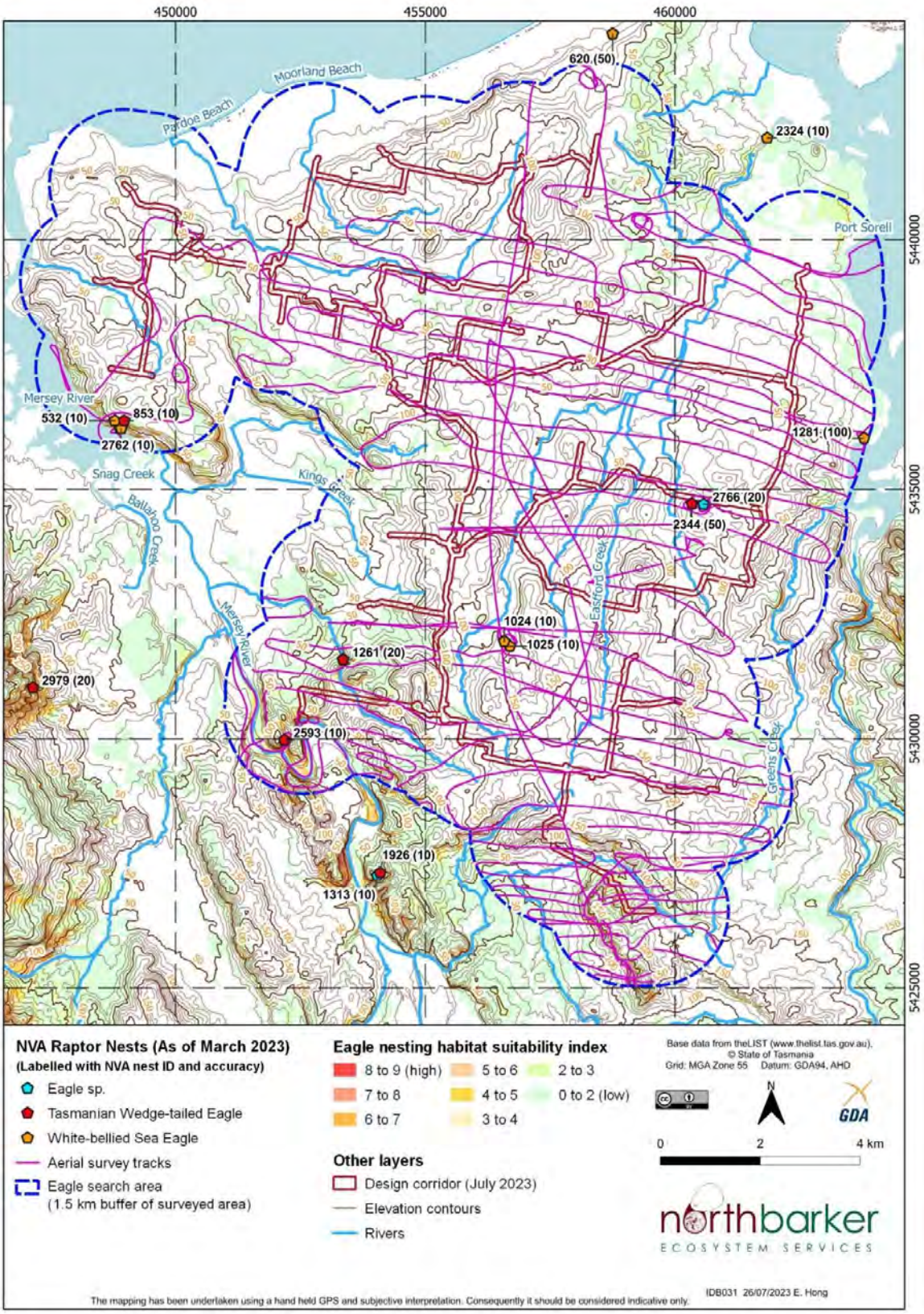

Figure 2: Wedge-tailed eagle habitat suitability modelling and known nest locations prior to 2023 search

3. BIOLOGICAL VALUES

3.1 VEGETATION

The vast majority of the pipeline (94 %) traverses extensive areas of agricultural land predominantly used for vegetable crops, dairy and cattle farming (Plate 1), and a further 2 % is other modified land classes (ie non-native vegetation units). Small remnants of native vegetation exist within, and some larger native forest areas surround, this modified landscape. Thirty-six ha (4%) of native vegetation was mapped with in the 1,036 ha design corridor.

Eight native TASVEG 4.0 communities/units were recorded during the survey:

- *Eucalyptus amygdalina* coastal forest and woodland (DAC)
- *Eucalyptus amygdalina* forest on mudstone (DAM)
- *Eucalyptus obliqua* dry forest (DOB)
- *Eucalyptus ovata* forest and woodland (DOV)
- *Eucalyptus amygdalina* - *Eucalyptus obliqua* damp sclerophyll forest (DSC)
- *Melaleuca ericifolia* swamp forest (NME)
- *Eucalyptus obliqua* forest with broad-leaf shrubs (WOB)
- *Eucalyptus obliqua* forest over *Leptospermum* (WOL)

Of the TASVEG units on the route, DOV and NME constitute threatened communities under the NCA[46]. Table 3 displays the extent and reservation statuses of the native communities within the design corridor compared to the broader region. None are wholly listed threatened communities under the EPBCA, however if certain condition thresholds are met, DOV can qualify for listing as the critically endangered Tasmanian forests and woodlands dominated by black gum or Brookers gum (*Eucalyptus ovata* / *E. brookeriana*).

The distribution of the native vegetation communities is mapped in Appendix A (with plant species lists in Appendix B) – the remaining modified land (Plate 1) comprised the following non-native vegetation units has not been mapped.

- Improved pasture with native tree canopy (FAC);
- Agricultural land (FAG);
- Plantation forest for silviculture - hardwood (FPH);
- Extra-urban miscellaneous (FUM);
- Urban areas (FUR)

[46] Schedule 3a NCA 2002

Plate 1 a-c :Modified land is extensive throughout the design corridor. Pasture and crops are the predominant land use with some remnant canopy trees (FAC) and small remnant patches of native vegetation .

DAC - *Eucalyptus amygdalina* coastal forest and woodland

This community occurs within the survey area only as remnant patches adjacent to Port Sorell, along Woodbury Lane. The patches have limited viability as small remnants within an agricultural matrix. As a result, floristic diversity is poor, particularly in the shrub and ground levels, and weeds are prevalent.

The canopy is dominated by *Eucalyptus amygdalina*, with occasional localised patches of *E. ovata* in low-lying areas. The understorey largely consists of a tall shrub/small tree layer, with *Acacia dealbata*, *Bedfordia salicina* and *Exocarpos cupressiformis* the most frequent species (Plate 2). Where low shrubs are present, *Cassinia aculeata* is dominant. The understorey is dominated by *Pteridium esculentum* and *Juncus* species, or *Lepidosperma longitudinale* and *Lomandra longifolia*; along the margins pasture grasses and weeds are prevalent on account of edge effects. Woody weeds common throughout, including patches of gorse (*Ulex europaeus)*, blackberry (*Rubus fruticosus*), Spanish heath (*Erica lusitanica*). Garden escapes such as arum lilies (*Zantedeschia aethiopica)* and agapanthus (*Agapanthus* sp.) were also recorded within the forest area.

This community is not listed as threatened under the NCA nor does it correspond to any threatened community under the EPBCA.

DAM - *Eucalyptus amygdalina* forest on mudstone

This community was mapped in two locations, near Abeys Road and along the Creeleys Road alignment. Both patches are contiguous with larger forest blocks, however near Abeys Road the alignment reduces the potential need for clearance by utilising an existing cleared easement through the forest block.

These patches occur on dry hill sides and are fairly open and floristically species poor. The canopy is almost purely *Eucalyptus amygdalina* with some *E. obliqua* present within damper areas. The understorey tall shrub layer is dominated by *Allocasuarina littoralis* and *Exocarpos cupressiformis*, while the ground layer is open with a sparse covering of *Lepidosperma concavum, Lomandra longifolia* and patches of *Pteridium esculentum*, interspersed with almost complete ground cover of leaf litter (Plate 3).

This community is not listed as threatened under the NCA nor does it correspond to any threatened community under the EPBCA.

DOB – *Eucalyptus obliqua* dry forest

This community is the most extensive native forest community throughout the alignment. The largest area of DOB is on forestry land between the Great Bend pump station and the Saggers Hill reservoir, where the forest continues outside the design corridor; it also occurs within the Warrawee Conservation Area.

The canopy is dominated by medium height (20-30 m) *E. obliqua*, occurring in a mosaic with smaller, subdominant patches of *E. amygdalina*. The understorey is shrubby and dominated by *Acacia* species. The tall shrub layer also includes *Allocasuarina littoralis, Bursaria spinosa, Exocarpos cupressiformis* and *Pomaderris apetala*. The ground layer varies with aspect, hydrology, and disturbance history (Plate 4) but generally includes *Pteridium esculentum*, graminoids such as *Gahnia grandis, Lepidosperma concavum* and *Patersonia fragilis*, and herb species such as *Chiloglottis reflexa, Dipodium roseum* and *Gonocarpus teucrioides.* The TSPA endangered and EPBCA Critically Endangered orchid *Caladenia tonellii* was recorded within the DOB forest on the slopes between the proposed alignment and the current reservoir tank near Great Bend, and thus is not at risk of impacts.

This community is not listed as threatened under the NCA nor does it correspond to any threatened community under the EPBCA.

DOV - *Eucalyptus ovata* forest and woodland

Seven remnant patches of DOV were recorded within the survey area, though these are not all within the current design corridor. All patches are surrounded by modified vegetation unit, either cleared land for paddock or crops (FAG), or paddock trees over pasture grasses (FAC).

The dominant canopy tree is *Eucalyptus ovata,* with subdominant *Eucalyptus obliqua* and *Eucalyptus viminalis* in some patches. The understorey typically consists of a tall shrub/small tree layer with *Acacia melanoxylon, Acacia verticillata, Bedfordia salicina,* and *Melaleuca ericifolia* the most frequent species. The ground layer consists of sedges, rushes, and grasses such as *Carex appressa, Juncus sarophorus* and *Lepidosperma longitudinale*, as well as *Lomandra longifolia*. Ferns such as *Blechnum nudum, B. wattsii, Polystichum proliferum* and *Pteridium esculentum* vary in prevalence with hydrology. Patches that are within the farm paddocks and have stock grazing pressure have a modified understorey structure and/or diversity of characteristic species, and have a greater proportion of pasture grass ground cover and weed presence (such as blackberry, briar rose and gorse) (Table 2).

The DOV community is listed as threatened under the NCA and can qualify for listing as the critically endangered ecological community Tasmanian forests and woodlands dominated by black gum or Brookers gum (*Eucalyptus ovata* / *E. brookeriana*) under the EPBCA. As six of the patches are ≥0.5 ha in size, these sites have potential to meet the benchmark required to be listed as this community. Targeted vegetation condition assessments (VCA) would be required to determine the class and category of each patch (Table 1). Based on the initial surveys, patch size, and isolation from neighbouring native vegetation, it is unlikely that any of the patches would qualify as 'Class A High Quality'. Patches may meet the criteria for, and qualify as, Class B good quality depending on patch size and proportion cover and number of native species.

Table 2: DOV Patches mapped within the survey area. See map in Appendix A for locations

Location (Nearby Feature)	Patch Size (ha)	Area Within Design Corridor (ha)	Comment on Potential to Qualify as EPBCA Listed Community
Pardoe/Miltons Road (Appendix A - Map 3) Plate 5	1.5	Pipeline has been realigned to avoid this patch	This patch has not been degraded by stock access. Community is floristically and structurally intact. Weed cover >5 %. This patch is not contiguous with other native forest.
Creeleys Road extension (Appendix A - Map 14) Plate 6	1.78	0.42	These patches are within the farm paddocks and have stock grazing pressure. Modified understorey structure and reduced diversity of characteristic species. Pasture grass prevalent. Woody weeds present (such as blackberry, briar rose and gorse). No patches are contiguous with native vegetation units. Oppenheims Road, Port Sorell Road, and Woodbury Lane areas are contiguous with FAC vegetation units.
Oppenheims Road (Appendix A - Map 10)	0.53	0.24	
Port Sorell Road, north of Frankford Road (Appendix A - Map 1)	0.78	0.24	
Bass Highway/Bishton Creek (Appendix A - Map 1)	2.63	0.004	
Beer Street (Appendix A - Map 2)	2.79	0.51	
Woodbury Lane/Ibbotts Road (Appendix A - Map 7)	0.46	0.11	

DSC - *Eucalyptus amygdalina - Eucalyptus obliqua* damp sclerophyll forest

This community was mapped in four locations in damper areas - 2 remnants in the western extent of design corridor, and in two gullies which intergrade with the drier DAM forest community along the Creeleys Road extension.

Damp sclerophyll forest is characterised by the lack of a clear dominant eucalypt species and typically a variety of species grow in a mixed stand or mosaic that changes over short distances[47].

Four codominant eucalypt species (*E. amygdalina, E. obliqua, E. ovata,* and *E. viminalis*.) were recorded either as mixed stands or a mosaic of patches. *Acacia melanoxylon* frequently occurs alongside these canopy eucalypts. The understorey consists of a tall shrub/tree layer with *Acacia verticillata, Bursaria spinosa, Melaleuca ericifolia, Pomaderris apetala,* and *Exocarpos cupressiformis* the most common species. Low shrubs such as *Coprosma quadrifida and Cassinia aculeata* also occur often over a ground layer consisting of sedges such as *Carex appressa, Gahnia grandis, Lepidosperma laterale* and *Lomandra longifolia,* and ferns such as *Blechnum wattsii, Polystichum proliferum,* and *Pteridium esculentum.*

The remnant DSC patches within the alignment are situated within the agricultural landscape (Plate 7) and are weed infested to varying degrees with blackberry and gorse, as well as pasture grasses accounting for a considerable proportion of the ground layer.

This community is not listed as threatened under the NCA nor does it correspond to any threatened community under the EPBCA.

NME - *Melaleuca ericifolia* swamp forest

NME vegetation is likely to have been more widespread in the project area in the past where the land has been modified for agricultural purposes particularly in the northern area. Remaining are many tiny remnant and regrowth patches of the key species (*Melaleuca ericifolia*) along ditches and damp areas, which are too small and depauperate to be considered a viable example of a vegetation community. Where the patches were > 0.1 ha they were considered to meet the TASVEG definitions of NME and have been mapped accordingly.

The patches of NME are dominated by a canopy of dense, even-aged *M. ericifolia* (Plate 8). *Acacia melanoxylon* is a subdominant canopy species within the largest patch within the design corridor. The understorey is generally simple and devoid of shrubs other than sparse *Coprosma quadrifida*; it is dominated by *Carex appressa* and/or *Gahnia grandis*, with *Blechnum wattsii* and *Histiopteris incisa* occasional. Weeds were present and abundant, varying with the apparent level of disturbance.

This community is listed as threatened under the Tasmanian NCA.

WOB - *Eucalyptus obliqua* forest with broad-leaf shrubs

This community occurs in the damp gullies and lower slopes within the forested area between the Great Bend pump station and Saggers Hill reservoir. This community grades into DOB vegetation upslope with decreasing soil moisture.

The closed canopy is comprised *E. obliqua* trees (> 25 m) and occasional *Acacia melanoxylon*, with an understorey of predominantly *Pomaderris apetala* interspersed with areas of a more diverse shrub layer including *Coprosma nitida, Acacia dealbata* and *A. verticillata*. In gullies where the canopy and tall shrub layer is dense, the ground layer is a sparse layer of *Gahnia grandis*, *Lepidosperma laterale,* mosses and localised *Dicksonia antarctica*. On the lower slopes within the Warrawee Conservation Area (Plate 9) the ground layer is denser, predominantly *Pteridium esculentum,* with *Gahnia grandis, Lepidosperma longitudinale, Lomandra longifolia* and *Polystichum proliferum.* This area has been selectively logged in the past, with occasional remnant older growth trees (DBH >1.2 m) remaining.

[47] Kitchener and Harris (2013)

This community is not listed as threatened under the NCA nor does it correspond to any threatened community under the EPBCA.

WOL - *Eucalyptus obliqua* forest over *Leptospermum*

This community occurs in a poorly drained area between Great Bend and Saggers Hill reservoir. The area has a land use history of forest production (Sustainable Timber Tasmania) and the hydrology has been altered by historical earth works (possibly for a borrow pit or water source creation) resulting in a disturbed wet area that has now been recolonised. The patch is surrounded by DOB and FPH (hardwood plantation).

The sparse canopy is regrowth *E obliqua* over a tall shrub layer of *Melaleuca squarrosa* and occasional *Acacia verticillata*. The ground layer is dense and dominated by *Gahnia grandis* and *Gleichenia microphylla* (Plate 10).

This community is not listed as threatened under the NCA nor does it correspond to any threatened community under the EPBCA.

Plate 2: Open disturbed DAC forest on Woodbury Road

Plate 3: Open DAM near Abeys Road

Plate 4: Open DOB near Great Bend pump station, Devil Road

Plate 5: High quality remnant DOV adjacent but outside the design corridor

Plate 6: Poor quality remnant DOV within farm paddocks near Cornelius Road

Plate 7: Remnant DSC; mixed canopy *E. amygdalina*, *E. obliqua*, *E. ovata* and *E. viminalis* on Creeleys Road extension

Plate 8: NME vegetation within agricultural land

Plate 9: WOB in near Great Bend pump station

Plate 10: WOL in a historically disturbed area between Great Bend and Saggers Hill

Table 3: Extent and reservation status of the native vegetation communities[48]

TASVEG Community	Extent in Design Corridor (ha)	Extent Within Construction Corridor (ha)	Total Within Latrobe Council	Total Reserved Within Latrobe Council	Current Extent (ha)	Reserved (% of Current Extent in Reserves)	Current Extent: Bioregion	Reserved (% of Current Extent in Reserves)	Total Within Tasmania	Total Reserved in Tasmania
					Furneaux Bioregion		Northern Slopes Bioregion			
DAC *Eucalyptus amygdalina* coastal forest and woodland	1.3	0.2	4,800	2,600 (55%)	77,300	38,900 (50%)	8,200	5,000 (60%)	149,800	79,800 (53%)
DAM *Eucalyptus amygdalina* forest on mudstone	6.8	1.8	1,600	300 (20%)	2,100	1,200 (59%)	3000	600 (19%)	40,700	15,700 (39%)
DOB *Eucalyptus obliqua* dry forest	16.36	3.69	5,700	3,800 (65%)	6,500	3,800 (58%)	29,100	14,700 (50%)	182,700	82,300 (45%)
DOV *Eucalyptus ovata* forest and woodland	1.6	0.09	260	40 (15%)	900	500 (55%)	3,400	900 (28%)	14,600	4,400 (30%)
DSC *Eucalyptus amygdalina - Eucalyptus obliqua* damp sclerophyll forest	4.1	1.1	3,800	1,400 (38%)	900	200 (19%)	34,100	12,800 (38%)	49,300	18,000 (37%)

[48] Department of Primary Industries, Parks, Water, and Environment (2021), Knight (2012)

TASVEG Community	Extent in Design Corridor (ha)	Extent Within Construction Corridor (ha)	Total Within Latrobe Council	Total Reserved Within Latrobe Council	Current Extent (ha)	Reserved (% of Current Extent in Reserves)	Current Extent: Bioregion	Reserved (% of Current Extent in Reserves)	Total Within Tasmania	Total Reserved in Tasmania
					Furneaux Bioregion		Northern Slopes Bioregion			
NME *Melaleuca ericifolia* swamp forest	0.56	0.02	200	100 (57%)	3,800	1,400 (37%)	100	40 (31%)	10,100	4,200 (41%)
WOB *Eucalyptus obliqua* forest with broad-leaf shrubs	4.45	1.27	500	200 (36%)	500	500 (86%)	19,500	9,000 (46%)	120,200	53,200 (44 %)
WOL *Eucalyptus obliqua* forest over *Leptospermum*	0.67	0.15	0	0	20	0	400	200 (39%)	24,100	11,200 (46%)

3.2 THREATENED FLORA

In total, 148 vascular plant species were recorded within the design corridor (Appendix B). One species, *Persicaria decipiens* (slender waterpepper), is listed under the TSPA.

Threatened species previously recorded within 500 m[49] and threatened species habitat likely to occur within 5 km[50] have been considered for the potential to occur within the design corridor (Appendix C).

Persicaria decipiens (slender waterpepper) (TSPA vulnerable)

This species was recorded at 30 locations within the design corridor along the northern half of the project area through agricultural land (Appendix A). It was found in wet to damp sites including margins of dams and creeks, drainage ditches, damp paddocks, and ephemeral soaks. The number of plants recorded at each location ranged from a single plant to forming carpets of interminable number of plants (Plate 11). Therefore, this species was recorded by area. A total of 1,490 m^2 was recorded with in the design corridor.

Abundance and the number of occurrences were significantly greater than for the same general area in 2009 (Tasmanian Irrigation data), consistent with a statewide increase in the number of reported occurrences since the threatened flora notesheet for this species was published[51], which has led to call for the status of this species to be reviewed[52].

Plate 11: *Persicaria decipiens* abundant along a slow flowing creek in agricultural land

Caladenia tonellii (robust fingers) (TSPA endangered, EPBCA critically endangered) and *Caladenia caudata* (tailed spider-orchid) (TSPA vulnerable, EPBCA vulnerable)

A targeted search for *Caladenia tonellii* and *C. caudata* was undertaken at peak flowering time for these species in November 2022[53]. No evidence of *C. caudata* was detected from any of the targeted areas, however several *C. tonellii* plants were recorded around the existing SWIS pipeline. Plants were recorded in the same area in 2021[54]. As a result of these findings the proposed SWISA pipeline alignment has been situated away from the *C. tonellii* population (and thus the existing pipeline), to be adjacent to Devil Road. The closest past record of *C. tonellii* (recorded in 2006) is attributed to 20 m from the edge of the proposed design corridor, albeit with spatial inaccuracy of 100 m, which could mean the earlier

[49] Department of Natural Resources and Environment (2022)
[50] Department of Climate Change, Energy, the Environment and Water (2023) - Protected Matters-MNES layers - March 15th 2023
[51] Natural Values Atlas data as at July 28 2023
[52] ECOtas (2022)
[53] ECOtas (2022)
[54] Department of Natural Resources and Environment (2022)

occurrence was in the design corridor – nonetheless, this area (and spatial radius) was included in the targeted search and not found to support any plants.

The 2022 survey covered all potentially suitable habitat for these species within the current proposed design corridor, concluding that the extent of possible *Caladenia tonellii* distribution had been reasonably determined and that the species is not likely to occur in the realigned section adjacent to Devil Road (Appendix D).

3.3 THREATENED FAUNA AND THREATENED FAUNA HABITAT

The following threatened fauna were directly or indirectly observed during the ground and aerial surveys (additional detail is provided below):

- Green and gold frogs – four individuals observed
- Central north burrowing crayfish – numerous chimneys recorded and potential habitat present
- Tasmanian wedge tailed eagle and/or white bellied sea eagle - eagle nests recorded within 500 m and 1 km line of sight of the proposed alignment
- Tasmania devil and spotted tail quoll – observed on camera traps, scats recorded

The following threatened fauna species are considered likely to occur based on habitat present:

- Swift parrot – potential nesting and foraging habitat recorded
- Masked owl – large trees that may contain hollows suitable for breeding and/or roosting recorded.

Additional threatened species previously recorded within 500 m[55] and/or threatened species habitat likely to occur within 5 km[56] from the alignment have been considered (Appendix E).

3.3.1 Green and gold frog (*Litoria raniformis*)

The green and gold frog (TSPA vulnerable, EPBCA vulnerable) is known from the area, particularly the northern half of the irrigation scheme (Appendix J). Four opportunistic sightings of green and gold frogs (Plate 12) were recorded at three locations within the design corridor (Appendix A, Maps 3 and 9). Two locations were within 50 m of farm dams mapped as breeding habitat within the design corridor. The third location was adjacent to an overgrown section of Tullamona Creek (Plate 13) 300 m from the nearest potential breeding habitat.

Breeding habitat for the green and gold frog includes the following elements: still or slow-moving water bodies including shallow areas with a complex vegetation structure often containing emergent plants such as water ribbons (*Triglochin* spp.) and spikerush (*Eleocharis* spp.). Green and gold frogs can tolerate a degree of poor water quality[57]. Eighty-two optimal breeding habitat areas (8.6 ha) were recorded within the design corridor (Plate 14, Appendix A).

Dispersal habitat for green and gold frogs includes aquatic corridors, open ground, and native vegetation. Terrestrial vegetation, fallen logs, and ground debris are also important to provide shelter and hibernation for adult frogs[58]. Frogs may move up to 2 km from water bodies[59], and with the high number of water bodies within the irrigation district in close proximity to the design corridor, the whole design corridor can be considered to be dispersal habitat.

[55] Department of Natural Resources and Environment (2022)
[56] Department of Climate Change, Energy, the Environment and Water (2023) - Protected Matters-MNES layers - March 15th 2023
[57] Department of the Environment, Water, Heritage and the Arts (2009), Forest Practices Authority (2014a)
[58] Department of the Environment, Water, Heritage and the Arts (2009)
[59] Department of the Environment, Water, Heritage and the Arts (2009)

Plate 12: Green and gold frog located in irrigator track

Plate 13: Green and gold frog dispersal habitat adjacent to Tullamona Creek (location of green and gold frog sighting)

Plate 14: Optimal green and gold frog breeding habitat, farm dam.

3.3.2 Central north burrowing crayfish (*Engaeus granulatus*)

The entirety of the project area is within the core range of *Engaeus granulatus*, the central north burrowing crayfish (TSPA endangered, EPBCA endangered)[60].

No direct observations of burrowing crayfish (*Engaeus* species) were recorded during field surveys; however fifteen burrowing crayfish colonies were recorded within the survey area, thirteen are within the current design corridor (Appendix A). Numbers of chimneys/tunnels ranged from one to hundreds per location. Crayfish tunnels were recorded in damp areas under remnant *Melaleuca ericifolia* patches within farmland (Plate 15), in roadside ditches, and along the margins of natural streams. In optimal habitat, a number of chimneys were located beneath blackberry patches and adjacent to areas disturbed by stock (Plate 16).

One of the largest number of chimneys recorded in one area was within an area that appears to have been managed for the protection of CNBCF (Plate 18, Appendix A - Map 2). The drainage lines have been fenced to protect them from cattle, and the vegetation has been managed to reduce biomass.

A total of 2.1 ha of optimal CNBCF habitat was mapped within the current design corridor (Appendix A) after realignments were made to avoid optimal habitat. A total of 6.6 ha of suboptimal habitat (Plate 19) was mapped within the design corridor. This area may also be habitat for the new (as yet undescribed) *Engaeus* species.

Plate 15: Crayfish habitat; remnant *Melaleuca ericifolia* patches within farmland.

[60] Richardson *et al.* (2008)

Plate 16: Crayfish chimneys in optimal habitat (closed canopy remnant NME) adjacent to disturbed areas (left) and beneath blackberry patches (right).

Plate 17: Crayfish habitat in roadside ditches. Native vegetation is no longer present on the road edge chimney location is <5 m from vegetated watercourse.

Plate 18: Fenced drainage lines harbour 100s of crayfish chimneys within cow and crop paddocks.

Plate 19: Suboptimal crayfish habitat.

3.3.3 Tasmanian wedge-tailed eagle (*Aquila audax* subsp. *fleayi*) & white-bellied sea eagle (*Haliaeetus leucogaster*)

The aerial nest search established that eleven eagle nests are located within 1.5 km of the original alignment (Figure 3). Three nests were new nest records (Table 4) and eight were confirmed known nests (Table 5). Two previously recorded nests were not relocated. One of these nests is outside of any potential line-of-sight conflicts, and another is within potential line-of-sight, however previous nest searches by NBES have failed to detect this nest and it is assumed to be absent.

Three nests (3142, 2344, 2766) are within 500 m of the construction corridor. These nests are within 250 m of each other. New nest 3142 is 50 m southwest from known nest 2344, within a remnant patch of DOB. Nest 2766 is separated from these two by a block of pine plantation and is 235 m east of nest 2344 and 260 m east of nest 3142 (Figure 3). It is unlikely that these three nests would be utilised at the same time, but rather only one at the time.

An additional four nests (853, 2593, 1261, 3143) are within 1 km from the construction corridor of which one nest (nest 1261) is within line-of-sight of the construction corridor (Appendix F).

All recorded nests, with the exception of nest 1281, were deemed to be in prime or viable condition.

3.3.4 Tasmanian devil (*Sarcophilus harrisii*), spotted-tail quoll (*Dasyurus maculatus* subsp. *maculatus*) & eastern quoll (*Dasyurus viverrinus*)

Tasmanian devil and spotted-tail quoll were recorded by camera traps within the survey area (Appendix A). Two scats were recorded within the survey area near Big Bend pump station and Creeleys Road. One fauna burrow was recorded.

One Tasmanian devil (Table 6) observation (camera trap) and one scat were recorded within the Creeleys Road extension design corridor (Appendix A - Map 14). Three individual Tasmanian devils were also observed (camera trap) near Abeys Road on 5 separate occasions (Table 6, Appendix A - Map 8). No Tasmanian devils were recorded by the camera placed within the Warrawee Conservation Area; however a devil scat was recorded within 100 m of the Great Bend pump station (Appendix A - Map 11). Moreover, the Warrawee Conservation Area and the Abeys Road area form a continuous forest block, therefore it is expected that this species will utilise this entire forest area.

A spotted-tail quoll was recorded on one camera in forest habitat near Abeys Road, with 3 occurrences (total) consisting of two adults (Table 7). The species was not recorded at the other two camera locations, noting however as above, the Warrawee Conservation Area is part of the same forest area and thus it can be expected that spotted-tail quoll utilise the whole forest area.

No eastern quolls (*Dasyurus viverrinus*) were recorded during the surveys. The nearest known record is 2 km away on the western side of the Mersey River, and they could be expected to be present within the project area based on being relatively widespread in eastern and northern Tasmania and the availability of potentially suitable habitat.

One fauna burrow was recorded within the design corridor in a bank alongside Knights Creek (Plate 20, Appendix A - Map 14). There was no evidence of scats or tracks nearby. While there is some small patches of remnant vegetation along the creek, the surrounding land has been cleared for paddocks. This fauna burrow is 380 m from the nearest camera record.

No burrows with the potential to be used by devils or quolls were recorded within native forest vegetation within the design corridor. Potentially suitable breeding habitat for all three species is nonetheless present.

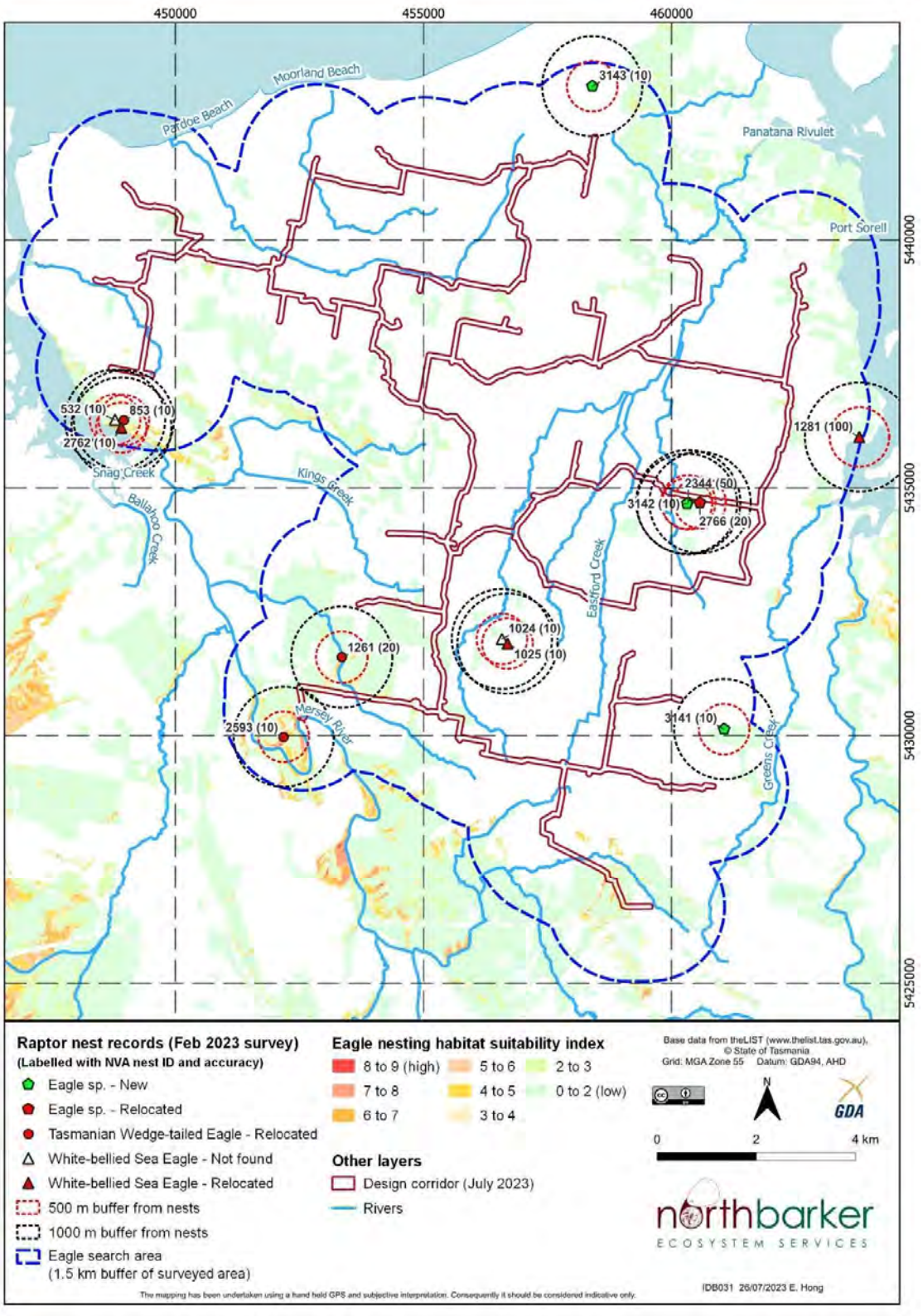

Figure 3: Raptor nests recorded February 2023 during aerial searches

Table 4: Nest location details and integrity classifications for new nest records from within the survey area during 2023. Bold denotes potential for management constraints

Date Surveyed	Nest ID	Easting	Northing	Distance from Design Corridor (m)*	Classification	Position Accuracy	Likely Species	Comments
09/02/2023	3141	461056	5430131	1011	Viable	10	Eagle sp.	A moderate sized nest in a remnant patch of native vegetation by a dam. This nest is roughly 28 m up a 35 m high *Eucalyptus obliqua*. This nest has a slight bowl and is bleached underneath.
09/02/2023	3142	460309	5434678	**106**	Viable	10	Eagle sp.	A medium sized bleached nest with loose sticks on one side where sloping has occurred. This nest was found within 50 m of nest #2344 and is roughly 16 m up a 21 m high *E. obliqua*.
09/02/2023	3143	458402	5443100	**980**	Prime	10	Eagle sp.	A large robust nest in an *E. viminalis*.

Table 5: Nest location details from within the survey area and 2023 integrity classifications. Bold denotes potential for management constraints. WTE = wedge-tailed eagle, WBSE = white-bellied sea eagle

Date Surveyed	Nest ID	Easting	Northing	Distance from Design Corridor (m)*	Classification	Position Accuracy	Likely Species	Comments
09/02/2023	2593	452178	5429970	**535**	Prime	10	WTE	This nest is roughly 27 m up a 35 m high *E. obliqua* and was obscured by the canopy. The nest appeared to have a slight bowl in it with brown leaves and sticks.
09/02/2023	1261	453353	5431584	**670**	Viable	20	WTE	This nest is large and slightly sloping with a lot of loose sticks underneath and a small amount of algal leeching. White-wash is present on the adjacent branches. This nest is roughly 29m up a 35 m high *E. obliqua*. This nest is heading towards being derelict if its structure keeps deteriorating.
09/02/2023	1025	456692	5431854	1310	Viable	10	WBSE	This nest is in a 31 m height exposed dead stag roughly 28 m high. The nest is bleached with a slight bowl. Nearby nest #1024 could not be found.

Date Surveyed	Nest ID	Easting	Northing	Distance from Design Corridor (m)*	Classification	Position Accuracy	Likely Species	Comments
09/02/2023	2766	460570	5434697	**44**	Prime	20	Eagle sp.	This nest is roughly 15 m up a 20 m high *E. obliqua.* This nest has a flat top with brown leaves and white-wash on adjacent branch.
09/02/2023	2344	460335	5434707	**73**	Viable	50	WTE	A small, bleached nest roughly 14 m up an 18 m high *E. obliqua*. The nest has a slight bowl with old dry green leaves in the centre.
09/02/2023	853	448960	5436361	**960**	Viable	10	WTE	This nest has a lot of white-wash on adjacent branches and a very flat top. It was likely active during the last breeding season. Algal leaching is present under this nest. The nest is roughly 18 m up a 25 m high *E. obliqua.* Nests 2762 and 853 are with 160 m of each other. A pair of white-bellied sea eagles was observed near to these nests during the survey in February 2023.
09/02/2023	2762	448906	5436210	1106	Viable	10	WBSE	This large nest has been added to over the years and is not very large and in two large clumps of material. Two adult WBSE were perched near this nest and it has been noted as being active this year. This nest is roughly 17 m up a 24 m high *E. obliqua* and is starting to slope a lot. Nests 2762 and 853 are with 160 m of each other. A pair of white-bellied sea eagles was observed near to these nests during the survey in February 2023.
09/02/2023	1281	463782	5436023	1410	Derelict	100	WBSE	This nest was hard to spot under the canopy. It is roughly 20 m up a 24 m high *E. viminalis*. The sticks on this nest are bleached and loose on top and sloping has started to occur.
09/02/2023	532	448781	5436372	970	N/A	10	WBSE	**Nest not found.** Recorded in 1985. Nest not found during ground search undertaken in 2020 by E Harris.
09/02/2023	1024	456579	5431949	1174	N/A	10	WBSE	**Nest not found.** Nest record within 150 m of nest 1025

Table 6: Tasmanian devil records from camera traps 2-30 March 2023.

Location Date Time	Species	Unique ID	Sex	Approx. age	Behaviour	Approx. body condition (1-5)*	DFTD present	Determinate markings
Creeleys Road Extension (113) 6/03/2023 23:26:47	Tasmanian devil	TD_01	M	2-3	Anal dragging- scent marking	3	Not clear - but some evidence of facial scaring most likely from mating/ conspecific aggression	No rump markings. White star on right shoulder blade
Abeys Road (114) 4/03/2023 5:28:48	Tasmanian devil	TD_02	Unknown	Juvenile (under 18 months)	Initially travelling gait (at this age possibly still seeking own home territory). Then investigating where possums had been seen 5 hours prior.	3	No - no facial scarring present	Almost all black - small white chest marking extending onto left side of chest
Abeys Road (114) 22/03/2023 21:02:25	Tasmanian devil	TD_02	Unknown	Juvenile (under 18 months)	Scratching. Then travelling	3	Not able to tell	Almost all black
Abeys Road (114) 23/03/2023 22:14:40	Tasmanian devil	TD_03	F	Juvenile (under 24 months)	Paused, maybe responding to the camera. Then travelling.	3	Slight scaring on right side of face - not clearly DFTD or ulcerated	No rump marking white stripe extending across right side of chest onto forearm
Abeys Road (114) 25/03/2023 4:10:15	Tasmanian devil	TD_03	F	Juvenile (under 24 months)	Paused, maybe responding to the camera. Then travelling.	3	Slight scaring on right side of face - not clearly DFTD or ulcerated	No rump marking white stripe extending across right side of chest onto forearm
Abeys Road (114) 29/03/2023 5:26:10	Tasmanian devil	TD_04	M	Adult	Travelling and smelling the air. Often displayed around mating time or hunting behaviour	4	No marks present	No clear markings at all

*Approximate body condition 1-5 where 1 = emaciated, 2= underweight, 3 = good weight, 4 = overweight, 5 = obese

Table 7: Spotted-tail quoll records from camera traps 2-30 March 2023.

Location Date Time	Species	UNIQUE_ID	Sex	Approximate Age	Behaviour	Approximate body condition (1-5)*
Abeys Road (114) 21/03/2023 6:18:00	Spotted-tail quoll	SQ_1	Unknown	Adult	Running - most likely hunting/lapping boundary of territory	Unknown
Abeys Road (114) 21/03/2023 6:34:48	Spotted-tail quoll	SQ_1	Unknown	Adult	Running - most likely hunting/lapping boundary of territory	Unknown
Abeys Road (114) 24/03/2023 2:26:32	Spotted-tail quoll	SQ_2	Unknown	Adult	Running - most likely hunting/lapping boundary of territory	Unknown

*Approximate body condition 1-5 where 1 = emaciated, 2= underweight, 3 = good weight, 4 = overweight, 5 = obese

Plate 20: Fauna burrow adjacent to Knights Creek

3.3.5 Swift parrot (*Lathamus discolor*)

The swift parrot (TSPA endangered, EPBCA critically endangered) occurs as a single migratory population that breeds in Tasmania in the summer months and spends the remainder of the year in south-eastern mainland Australia. Breeding range is mainly in the south-east regions of Tasmania and is determined largely by the distribution of blue gum (*E. globulus*) and black gum (*E. ovata*) trees (foraging habitat)[61]. The northwest breeding range is defined as the area swift parrots are most likely to breed and is based on known nesting localities, bird foraging observations during breeding season, and extent of nesting and foraging habitat[62]. Twenty percent of the design corridor (185 ha) falls within the northwest breeding range (Figure 4).

No naturally occurring blue gum trees or *E. globulus* vegetation communities were recorded within the survey area. Black gum foraging trees (*E. ovata*) were recorded in numerous locations throughout the survey area within *Eucalyptus ovata* forest and woodland (DOV), within mixed eucalypt communities

[61] Commonwealth of Australia (2021)
[62] Forest Practices Authority (2010)

(such as DSC), and as individual trees in remanent vegetation or paddock trees. In total 8.1 ha of foraging habitat and an additional 20 individual foraging habitat trees were recorded within the design corridor.

Large (DBH >70 cm) potential hollow bearing trees were also recorded during the survey, both within forest block and remnant vegetation, and paddocks in agricultural land. These trees provide potential nesting habitat for swift parrots. A total of 7.8 ha of forest potentially supporting breeding habitat trees and 58 individual breeding habitat trees were recorded within the design corridor. In addition, 8 large (DBH >70 cm) *E. ovata* trees that qualify as potential breeding and foraging trees were recorded within the design corridor.

3.3.6 Tasmanian masked owl (*Tyto novaehollandiae* subsp. *castanops*)

The Tasmanian masked owl (TSPA endangered, EPBCA vulnerable) core range is below 600 m altitude includes mature native forests and woodlands as well as agricultural areas with a mosaic of native vegetation and pasture[63]. Masked owls occupy a permanent territory and require large hollows (≥15 cm entrance diameter) in old-growth trees (DBH >100 cm) for nesting and roosting[64].

The project area is within masked owl core range and although there is no old growth forest within the survey area, 62 large eucalypt trees (DBH >100 cm) are present in remanent vegetation in agricultural land and previously logged areas. Although isolated, these trees are potentially viable breeding and/or roosting habitat for masked owl. In addition 2.6 ha was determined to potentially supports masked owl nesting habitat trees.

3.4 AQUATIC VALUES

The design corridor contains areas of aquatic habitat in the form of small natural creeks and farm drainage lines. The majority of water courses within the irrigation district are classified as having a high to very high integrated conservation value (ICV) by the Conservation of Freshwater Ecosystem Values (CFEV) program. ICV rank attributed to water courses within the project area are based on the representative conservation value (RCV) of that watercourse, and the presence of distinctive features or special values[65] (SV). A 'very high' ranking is attributed if outstanding SVs are present, and a high rank if 'non-outstanding or undifferentiated SVs' are present. It is likely that the ICV attributed within the project area take into account the high likelihood of waterways supporting threatened values including potential central north burrowing crayfish habitat, green and gold frog habitat and *Persicaria decipiens*. Mitigation of impacts on these values will thus by default preserve the ICV.

[63] Forest Practices Authority (2014)
[64] Forest Practices Authority (2014)
[65] https://nre.tas.gov.au/water/water-monitoring-and-assessment/cfev-program/about-the-cfev-project

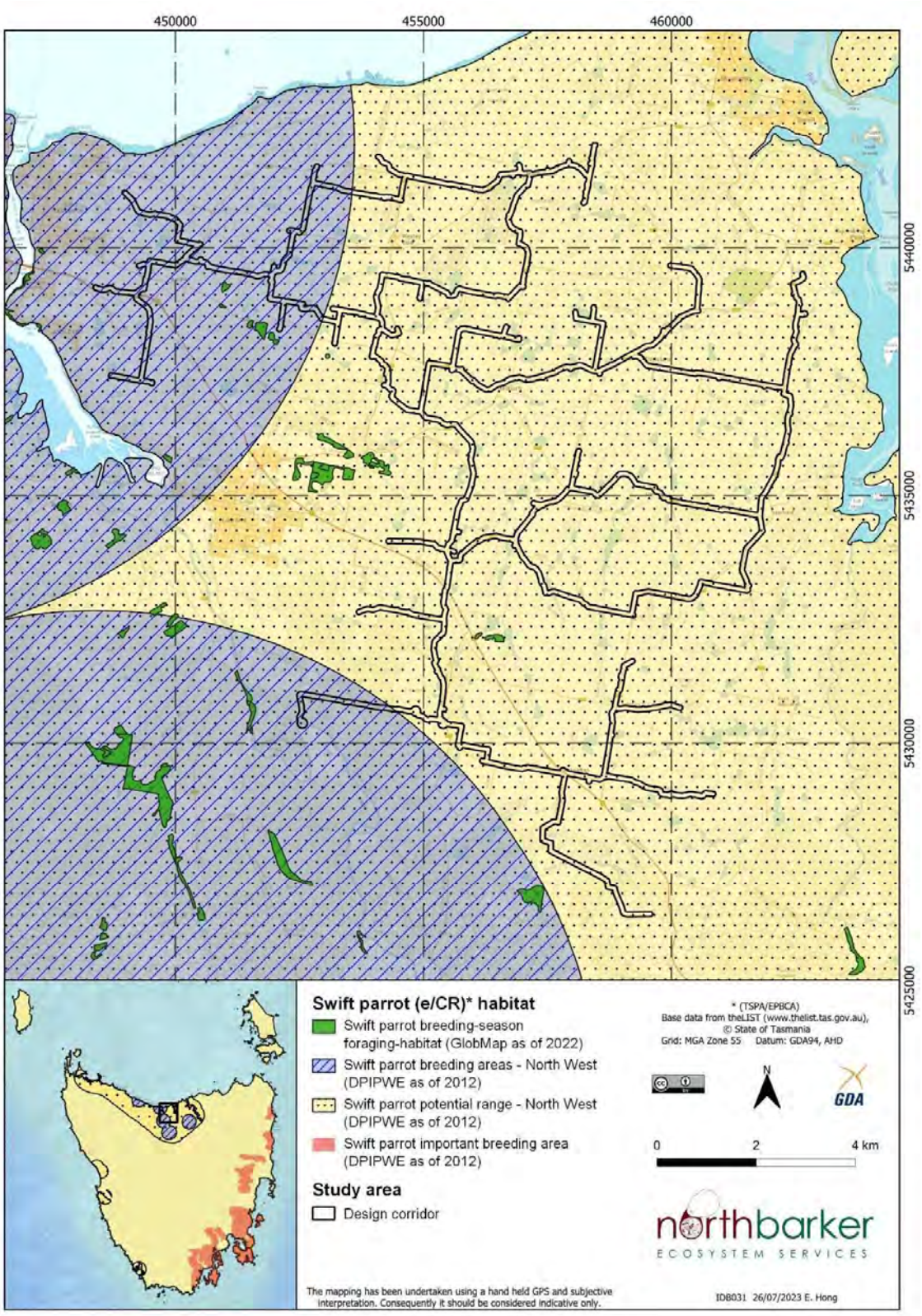

Figure 4: Swift parrot habitat

3.5 INTRODUCED PLANTS AND PLANT PATHOGENS

3.5.1 Weeds

Any occurrence of weeds listed as 'declared' under the Tasmanian *Biosecurity Act 2019* was recorded when encountered, as was any occurrence of significant weeds listed as 'environmental' under the BSA (Figure 5). Weeds are a common feature in the agricultural landscape and declared weeds should be treated as potentially present throughout the design corridor for the purposes of management and mitigation.

Chilean needle grass (*Nassella neesiana*) is known to occur in an area on Frankford Road within the design corridor. This area is managed as part of the Department of State Growth's Priority Weed Program. No Chilean needle grass was recorded at this site during the ground surveys as it was not possible to identify whether it was present. It was evident that there has been grassy weed control undertaken in the area recently (Plate 21). Nevertheless, appropriate weed hygiene is required for this species to prevent spread and/or re-establishment.

Plate 21: Treated Chilean needle grass area Frankford Road (February 2023)

Twelve introduced flora species listed as 'declared' under the Tasmanian *Biosecurity Act 2019* were recorded within the design corridor (Figure 5):

Carduus tenuiflorus (winged thistle)

This species was recorded from one location within a paddock, with a dense patch containing a large number of plants adjacent to the pipeline alignment. Thickets of gorse and spear thistle (*Cirsium vulgare*, not declared) occur in the same area.

Cytisus scoparius (English broom)

English broom was recorded at one location at the interface between paddock and native bushland, adjacent to apple orchards on Native Plains Road (Plate 22). A number of other declared weeds occur at this location.

Erica lusitanica (Spanish heath)

A small number of Spanish heath (Plate 23) were recorded at three locations along roadsides and fence lines in the northern part of the survey area.

Foeniculum vulgare (fennel)

Fennel was recorded in occasional patches along Oppenheim Road, on the roadside and in agricultural land (Plate 24).

Genista monspessulana (Montpellier broom)

Montpelier broom was recorded around the proposed site of the Saggers Hill reservoir. No mature plants were observed, but seedlings were abundant throughout the pasture grass beneath trees. Mature plants were also recorded adjacent to apple orchards on Native Plains Road (Plate 25).

Hypericum perforatum subsp. *veronense* (perforated St Johns-wort)

One patch (8 x 2 m) was recorded on Beer Street adjacent to a driveway.

Ilex aquifolium (holly)

Holly was recorded at three locations within the survey area. The two main populations are on Knights Creek and the gully running into Knights Creek. At both these sites there are numerous mature trees and recruits (Plate 26).

Lycium ferocissimum (African boxthorn)

African boxthorn was recorded at one location under native forest at the interface with agricultural land.

Rubus fruticosus (blackberry)

Blackberry is widespread and abundant throughout agricultural lands of the survey area. This species was particularly prevalent along fence lines, agricultural drains and wet areas, and under damp areas of remnant vegetation such as *Melaleuca ericifolia* swamp forest (Plate 27).

Salix X fragilis var. *fragilis* (crack willow)

Crack willow occurs as isolated infestations along creeks and rivers and occasional large individual trees on agricultural land near farm dams and drains. The main infestation is on the Mersey River opposite the Great Bend pump station (Plate 28), with smaller infestations on the Eastford, Pardoe, and Tullamona creeks.

Senecio jacobaea (ragwort)

Ragwort was recorded from a single location within farmland between Cornelius Road and Knights Creek. Scattered individuals occur in remnant vegetation and paddocks in this area.

Ulex europaeus (gorse)

Gorse occurs as localised infestations at a number of locations throughout the design corridor. It was recorded predominantly within the margins of native forest patches at the interface with agricultural land (Plate 29). Few individual plants or treated plants were observed, rather where this species occurs, it forms large thickets.

As well as declared weeds, several notable 'environmental' weeds occur throughout the survey area. These species are largely widespread agricultural weeds:

- *Cirsium vulgare* (spear thistle)
- *Crataegus monogyna* (hawthorn)
- *Rosa rubiginosa* (briar rose)
- *Typha latifolia* (great reedmace)
- *Vinca major* (blue periwinkle)
- *Watsonia meriana* var. *bulbillifera* (watsonia)

Plate 22: English broom (*Cytisus scoparius*) near Native plains road

Plate 23: Spanish heath (*Erica lusitanica*)

Plate 24: Fennel (*Foeniculum vulgare*) in farmland

Plate 25: Mature Montpellier broom bush near Native Plains Road

Plate 26: Large holly trees in remanent vegetation adjacent to Knights Creek

Plate 27: Blackberry infestation within NME vegetation

Plate 28: Crack willow on the Mersey River opposite Great Bend pump station

Plate 29: Dense gorse (*Ulex europaeus*) infestation under DAM near Abeys Road

3.5.2 Cinnamon Root-rot Fungus (*Phytophthora cinnamomi*)

Commonly referred to as dieback or root rot fungus, *Phytophthora cinnamomi* (PC) is a soil-borne fungus exotic to Tasmania. The fungus is pathogenic, requiring plant tissue as a food source. High degrees of susceptibility to PC are known to occur within members of the Epacridaceae and Proteaceae[66]. When infected, susceptible species display a characteristic progression of morphological traits, beginning with leaf yellowing, progressing to substantive dieback (browning), and ending in death. Other potentially fatal processes, such as drought, can cause similar visual symptoms to PC, but the impact of drought at a given location tends to vary less within and between species. Thus, a mosaic of symptomatic and healthy plants can be a good indicator of the presence of PC, in particular if symptoms are concentrated in susceptible species and in moist locations.

The project area is within the altitudinal and rainfall range for PC and there are five previous records of PC within 5 km of the survey area, last recorded in 2017[67], none of these records are within the irrigation district.

No signs of PC were observed during our field surveys.

3.5.3 Chytrid Fungus

Chytrid fungus (*Batrachochytrium dendrobatidis*) causes the infectious disease chytridiomycosis, which is affecting amphibians worldwide, including Tasmania. The spread of the pathogen is likely to be promoted by human activity and in Tasmania has been associated with gravel roads near water bodies. One record (2004) of chytrid fungus from near Hawley Beach is known from within five kilometres of the project area[32]. It can be expected to be present within the irrigation district.

[66] Podger and Brown (1990); Barker and Wardlaw (1995)
[67] Department of Natural Resources and Environment (2022)

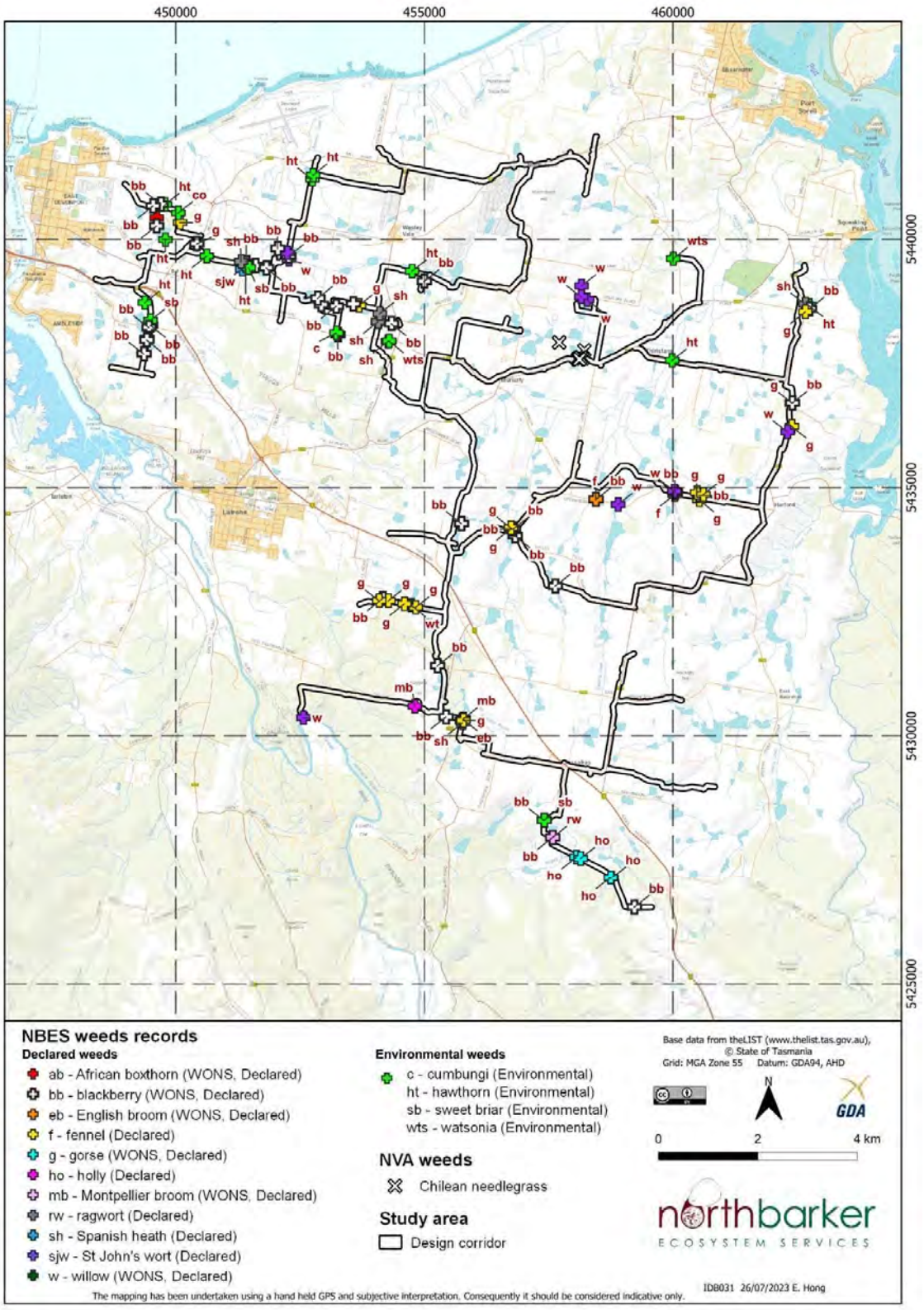

Figure 5: BSA declared weeds and environmental weeds recorded during surveys. Chilean needlegrass previously recorded.

4. ASSESSMENT OF IMPACT AND MITIGATION

Although our natural values mapping has covered the 100 m buffer acting as the design corridor for the proposed pipeline route, the eventual works will be contained to a narrower corridor. The width of the actual construction impact corridor will vary along the length of the pipeline depending on the pipeline diameter and environmental constraints. A minimum impact corridor of 5 m and a maximum of 30 m (including indirect impacts such as disturbance to tree roots) is anticipated. Therefore a 30 m construction corridor (15 m buffer of the pipeline) is used to determine the maximum indicative impacts to natural values. The construction corridor alignment will be subject to variations within the design corridor, which may allow for impact mitigation and avoidance of important natural values. For context in the discussion of potential impacts below we refer to both extent and abundance of values overall within the design corridor, as well as indicative potential amounts within the construction corridor. An indicative diagram of a construction corridor is provided in Figure 6.

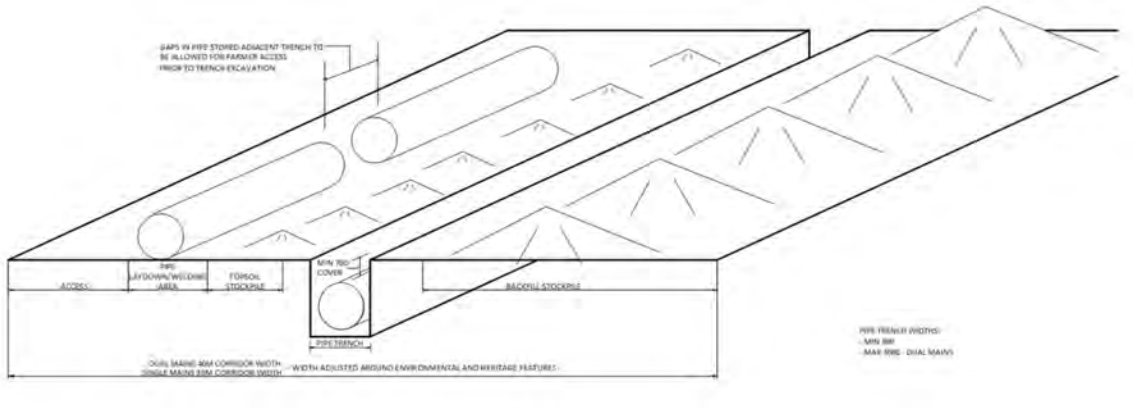

Figure 6: Indicative drawing of a typical construction corridor layout

4.1 VEGETATION

Overall, the impact to native vegetation is expected to be minor (Table 8) due to the relatively narrow impact area and the prevalence of modified land units (97 % of the design corridor area as listed in Section 3.1) throughout much of the design corridor. The prevalence of modified land surrounding native vegetation also means that even where native vegetation is mapped in the design corridor, the alignment can be routed through adjacent agricultural land, or existing tracks or easements. Therefore, although the final impact corridor is subject to minor alterations during the construction phase, it is anticipated that approximately 8.6 ha of native vegetation will be directly impacted due to construction works. Of this 8.6 ha, less than 0.2 ha is listed as threatened under the NCA.

Table 8: Vegetation community impact area summary

Vegetation Community	Total Within Design Corridor	Total Within Indicative Construction Corridor	Design Corridor Within Reserves	Status
DAC	1.3	0.2	-	-
DAM	6.8	1.8	-	-
DOB	16.4	3.9	7.71	-
DOV	1.6	0.09	-	NCA threatened

Vegetation Community	Total Within Design Corridor	Total Within Indicative Construction Corridor	Design Corridor Within Reserves	Status
DSC	4.1	1.1	-	-
NME	0.56	0.02	-	NCA threatened
WOB	4.45	1.27	2.49	-
WOL	0.67	0.15	-	-
Total	**35.8**	**8.6**	**10.20**	

Seven patches of DOV were identified during field surveys, one of which has been avoided through design. The other patches are within highly modified agricultural environments, with a high proportion of weeds and low native flora diversity. TI have committed to excluding these patches from the final construction corridor.

DOV has potential to qualify for listing as Tasmanian forests and woodlands dominated by black gum or Brookers gum (*Eucalyptus ovata/E. brookeriana*) under the EPBCA. Based on the initial surveys, patch size, and isolation from neighbouring native vegetation, it is unlikely that any of the patches would qualify as 'Class A High Quality'. Patches may meet the criteria for, and qualify as, Class B good quality depending on patch size and proportion cover and number of native species.

Recommendations

- For the process of refining the alignment of the construction corridor, the following should be the order of priority for avoidance:
  - EPBCA-listed communities – this is the DOV if it is shown to qualify as an EPBCA-listed community.
  - NCA-listed communities – NME and DOV.
  - Other native vegetation – all other native vegetation communities
- Areas of impact associated with ancillary needs such as laydown areas, site offices, washdown stations etc should be situated in areas of modified land (ie. plantation or pasture).

  Prior to the commencement of works, the impact area near areas of native vegetation should be marked (in situ and clearly on construction plans) and all contractor agreements should specify that works, vehicles and materials must be confined within the designated impact areas. Areas of threatened communities beyond the impact footprint should be designated as exclusion zones and marked on the ground and/or in construction plans to the degree necessary to ensure no inadvertent impacts.
- To further minimise net losses, revegetation could be considered as a minor form of mitigation in areas where clearance of native vegetation is not required to be a permanent loss (e.g. borrow pits [if required], temporary access routes and temporary construction disturbance footprints). Suitable species for revegetation should be sourced from the local environment. Revegetation specifics, such as seed application rates, use of established plants, specific planting details, etc., are best outlined in a revegetation plan once specific project details, timing, locations, etc., are finalised, and may be included as a requirement in a post-construction management plan.

4.2 THREATENED FLORA

One threatened flora species was recorded within the survey area; *Persicaria decipiens* (TSPA vulnerable). While efforts have been made to avoid threatened flora through the design process and realigning the design corridor (informed by field surveys), there are likely to be some unavoidable impacts to threatened flora species (Table 9). TI have committed to excluding 660 m^2 of *P. decipiens* from the design corridor outside the construction corridor.

Table 9: Summary of impacts to *Persicaria decipiens* (areas given in m^2)

	Within Design Corridor	Within Indicative Construction Corridor (% of Total in Design Corridor)
Total area recorded	1,490	300 (20 %)
Exclude/avoid	660	-

No *Caladenia tonellii TSPA endangered, EPBCA critically endangered)* were recorded within the design corridor, during the spring 2022 targeted surveys and it was determined that the species is not likely to occur within the design corridor. Nevertheless, it is recommended that a follow up, pre-clearance spring survey is undertaken to confirm no plants are within the final impact corridor.

Recommendations

- Undertake a pre-clearance spring survey for *Caladenia tonellii* within potential habitat within Warrawee Conservation Area
- Exclude as many of the known locations (NBES surveys and accurate NVA records) of both species of *Persicaria decipiens* as possible from the impact footprint. These areas should be designated as exclusion zones and buffered by at least 10 m. These zones should be designated exclusion zones and specified within the detailed design plans. Exclusions should cover but not be limited to mechanical disturbance, dumping of fill, alteration of drainage patterns and soil compaction. Physical barriers or cordons should be applied as necessary to enforce the exclusion requirements.

A permit to take threatened flora species will be required for instances when threatened flora listed under the TSPA are impacted. Current survey data will be adequate for the permit purposes.

Further to the potential for direct impacts to threatened flora species, potential facilitated impacts from operation of the irrigation scheme will require assessment and mitigation under Tasmanian Irrigations Farm WAP process.

4.3 THREATENED FAUNA AND THREATENED FAUNA HABITAT

4.3.1 Green and gold frog (*Litoria raniformis*)

Green and gold frogs may be impacted by this project by direct impacts to frogs, tadpoles, and eggs, and indirect impacts caused by the loss and/or degradation of breeding and adjacent dispersal habitat. Impact to this EPCBA listed species could potentially constitute a significant impact to an MNES under the definitions of that Act (Appendix H), requiring referral for consideration as a controlled action; the potential for this will be better understood once the final design of the corridor is settled.

Despite 26 (0.35 ha) optimal breeding habitat areas being within the indicative construction corridor (Table 10), it is unlikely that any breeding habitat will be directly impacted during construction as the pipeline will not intersect with any water bodies. However, the entire design and construction corridor

can be considered as dispersal habitat and therefore construction works are highly likely to interact with frogs. Accordingly, recommendations to reduce impact are required to limit the long-term impacts on habitat condition and limit the likelihood of mortalities.

Table 10: Summary of impacts to green and gold frog breeding habitat (areas given in ha, % is of the total in design corridor)

Habitat Suitability		Within Design Corridor	Within Indicative Construction Corridor
Optimal	Number of breeding areas	82	**26 (32 %)**
	Area of breeding habitat (ha)	8.62	**0.35 (0.04 %)**
Suboptimal	Number of breeding areas	28	**4 (14 %)**
	Area of breeding habitat (ha)	1.90	**0.16 (8 %)**

Recommendations

- Avoid impact to areas of potential breeding habitat.
- The development of protocols to manage the potential to impact frogs, including during construction. Such protocols have been implemented in similar projects elsewhere with potential inclusions as follows:
  - seasonal timing for construction;
  - construction protocols, including exclusion zones around breeding habitat adjacent to the construction corridor;
  - relocate refuge habitat;
  - contamination protocols
- Depending on the final impact footprint rehabilitation of habitat may be appropriate to limit any permanent degradation of important terrestrial habitat
- Works within and around potential habitat for these species should be conducted in accordance with *Keeping it clean - A Tasmanian field hygiene manual to prevent the spread of freshwater pests and pathogens*[68]

4.3.2 Central north burrowing crayfish (*Engaeus granulatus*)

The current design corridor has been realigned to avoid recorded colonies. 0.41 ha of optimal habitat (including known burrowing crayfish colonies) is within the construction corridor (Table 11). TI have committed to avoiding 0.62 ha of optimal habitat outside the construction corridor within the design corridor, however, it is likely that the current alignment cannot avoid impacts to optimal burrowing crayfish habitat. Impact to this EPCBA listed species is likely to constitute a significant impact to an MNES under the definitions of that Act (Appendix H), requiring referral for consideration as a controlled action. Realignment of the design corridor to avoid know colonies of burrowing crayfish will maximise

[68] Allen and Gartenstein (2010)

avoidance of impact. Where this is not an option, measures to reduce impact are required to limit the long-term impacts on habitat condition and limit the likelihood of mortalities.

Table 11: Summary of impacts to burrowing crayfish habitat (areas given in ha, % is of the total in design corridor)

Habitat Type		Within Design Corridor	Within Indicative Construction Corridor
Optimal (includes recorded colonies)	Recorded	2.07	**0.41 (20 %)**
	Avoid/exclude	0.62	**0.02**
Suboptimal	Recorded	6.56	**1.92 (30%)**
	Avoid/exclude	-	**-**

Recommendations

- Avoid impact to areas of known chimneys.
- In potential habitat areas where it was not possible to assess the presence of burrows with confidence due to dense vegetation during the 2023 survey, pre-construction reduction in biomass followed by surveys for burrows may be required to avoid or minimise threatened crayfish species. Depending on the extent and location of the impact in the final design, excavation of burrows to determine the identification of the species may be warranted.
- Impact mitigation and habitat management protocols should be developed to limit the likelihood of mortalities and long-term impacts on habitat condition. Additional considerations may include restrictions on timing of construction activity (to avoid hotter drier months), requirement for trained personnel onsite, translocation protocol, sediment and chemical contamination protocols, monitoring of water table, and post construction surveys.

4.3.3 Tasmanian wedge-tailed eagle (*Aquila audax* subsp. *fleayi*) & white-bellied sea eagle (*Haliaeetus leucogaster*)

Disturbances from development are known to have a negative effect on breeding eagle species, particularly the Tasmanian wedge-tailed eagle. Therefore, during the breeding season, constraints on development following FPA guidelines are applied to reduce the impact to breeding pairs. Eagle breeding season constraints are typically applied between the 1st of July and 31st of January, however in some years are extended until the end of February to capture late breeding events, and white-bellied sea eagle breeding season can start as early as June 1st.

With 4 eagle nests within 500 m direct distance and/or 1 km line-of-sight from the potential construction corridor alignment, there is the potential for disruption of eagle breeding activities without avoidance and mitigation. Disruption of breeding to the EPCBA listed wedge-tailed eagle could potentially constitute a significant impact to an MNES under the definitions of that Act, requiring referral for consideration as a controlled action.

Given that complete avoidance of areas within 500 m direct distance and/or 1 km line-of-sight has not been possible with realignments and corridor adjustments within the planning phase, the following mitigation measures are recommended.

Recommendations

- If possible, all works within 500 m direct distance and/or 1 km line-of-sight of known nests should be completed outside of the eagle breeding season. Eagle breeding season is typically

from the beginning of July until the end of January. It can be extended into February in seasons where breeding progress is later than normal, as is determined annually by the Forest Practices Authority around November. Breeding season can be taken to start as early as June 1st for white-bellied sea eagles.

- If works within 500 m/ 1 km line-of-sight of nests cannot be completed outside of the breeding season, the annual activity status of respective nests can be undertaken, noting that breeding season constraints only need to apply around active nests.
- Activity can only be reliably assessed with an aerial survey[69] and cannot be undertaken until October/November each season – as a result, activity must be assumed, and constraints applied accordingly (*i.e.* no works), from the commencement of the season each year until an activity assessment proves a nest is inactive for that season:
    - If is nest is found to be definitively inactive for that season, no constraints will be required on works for the remainder of that breeding season (with constraints to recommence at the beginning of the next season); or
    - If a nest is found to be active for that season, no works should occur within 500 m and/or 1 km line of sight until the conclusion of that season (either end of January or within February in a late season).
- If the proponent/contractor is compelled to undertake works within 500 m direct distance and/or 1 km line of sight of a known eagle nest within the breeding season in a year when the specific nest is active, or assumed to be active due to not having been subject to an activity assessment, it may be possible for works to be completed without causing unacceptable disturbance to the nest. However, in this circumstance, a case specific nest disturbance mitigation plan, informed by expert advice and with input from relevant authorities, , would be required and no such works should be undertaken without such a plan in place.

From a project planning level, it should be noted that because new nests are regularly built or discovered, aerial eagle nest search results are typically only seen to remain valid for two years. Subsequently, if construction is not complete by the non-breeding season of 2025, there should be a resurvey of all habitats within 1 km of the remaining works areas (and this process repeated every two years until completion). While it may be infeasible to physically avoid new nests discovered in proximity to works areas once construction has commenced, their discovery will nonetheless be informative for applying seasonal constraints on potentially disruptive works and/or devising nest-specific prescriptions for minimising construction impacts on the new nest/s. For the same reason, all the above avoidance recommendations and procedures should apply to any new nest discovered within 500 m direct distance and/or 1 km line of sight of the works area until construction is completed.

4.3.4 Tasmanian devil (*Sarcophilus harrisii*), spotted-tail quoll (*Dasyurus maculatus* subsp. *maculatus*) & eastern quoll (*Dasyurus viverrinus*)

The spotted-tailed quoll and Tasmanian devil were recorded during field surveys and the project area is within the core range for eastern quolls. All three species are EPCBA listed species and the impact and could potentially constitute a significant impact to an MNES under the definitions of that Act, requiring referral for consideration as a controlled action.

Although there may be some suitable habitat for these species within the project area, works of the scale proposed are unlikely to impact on the persistence of these species in the area given the deficiency of ground burrows within the design corridor and the resultant low likelihood of them being found in the construction corridor, and the largely temporary nature of the works (~1.5 ha of modified land is

[69] With ground surveys not recommended and being applicable only to nests which adequate vantage points to view into the nest while not risking disturbance

anticipated to be permanent loss, the remainder will be rehabilitated post-construction). However, given that impacts to even a single burrow can be important if it is occupied, it is recommended that an unanticipated den and burrow management protocol (for devils and quolls) is applied to the project and includes a walkover of any impact areas prior to ground disturbance (*i.e.* trenching or boring).

Habitat loss

Vegetation mapping established that there is 35.8 ha of native forest/woodland vegetation within the design corridor and 8.6 ha within the construction corridor. From the long-term perspective of devil and quoll habitat use, construction will merely be habitat disturbance, with the extent of the pipeline post-works once more becoming viable habitat for foraging, dispersal (and potentially denning but less likely based on landscape attributes such as the extent of cleared land). The nature of the permanent works is such that permanent habitat loss (~1.5 ha of modified land) is extremely minor in the context of the broader area. Only areas proposed to contain the reservoir and pump stations are considered to be permanent habitat loss areas, and these are not likely to impact native vegetation. All other impacts are expected to be short-term, with construction consisting of excavation and filling over the course of a two-week period in most cases. The foraging habitat for this species with thus not be significantly compromised during the construction of the pipeline.

Roadkill

The '*Survey guidelines and management advice for development proposals that may impact on the Tasmanian Devil 2015*[70] (the *Survey Guidelines*) outlines a process for assessing the potential impacts of developments requiring road usage on Tasmanian devils. This process focuses on identifying and mitigating impacts on devils, but the mitigation measures are also suitable for reducing road mortalities for other native fauna, including quolls. The process involves completing a traffic impact assessment, then, if Tasmanian devil roadkill mortalities are expected to increase by more than 10 % (based on equivalent predicted rise in night-time traffic for existing roads, and general increase in traffic on new roads), a roadkill assessment and roadkill mitigation plan must be completed. Mitigation measures for the current project therefore will focus on existing roads expected to surpass the 10 % night-time threshold based on being identified as having an estimated > 10 % traffic increase during the construction of the proposed development (particularly based on predictions much higher than 10 % increase during peak hours, which are the most likely to overlap with the definition of night-time in the *Survey Guidelines*).

Recommendations

- Develop a pre-clearance survey and den management protocol to manage the potential impact to these species.
- Roadkill of threatened carnivores could increase as a result of increased traffic (particularly nighttime, including dusk and dawn) in the construction phase (including the delivery of materials). Accordingly, a traffic management protocol is recommended as a mitigation strategy to manage this risk.

4.3.5 Swift parrot (*Lathamus discolor*)

The project area is within and adjacent to the northwest breeding range for swift parrots. Foraging trees (*E. ovata* and *E. globulus*) and potential nesting habitat trees (*Eucalyptus* species over 70 cm DBH) were recorded during field surveys. The design corridor has been realigned to avoid swift parrot habitat. As a result, a residual total of 66 potential breeding and foraging habitat trees were recorded within the current design corridor. Foraging habitat areas made up of communities containing *E. ovata,* breeding habitat areas that have the potential to contain breeding habitat trees covers 15.84 ha within the design

[70] Natural and Cultural Heritage Division (2015)

corridor (Table 12). TI have committed to excluding 3.15 ha and 47 habitat trees from the design corridor. The construction corridor contains 30 potential habitat trees and 2.97 ha of potential habitat. It is expected that most trees can be avoided during construction by micro siting of the construction corridor to avoid values. However, complete avoidance of all these potential habitat trees is unlikely to be possible and at least some will be required to be cleared and/or impacted structurally to the degree that failure is likely. It should be noted that avoidance to structural impacts to tree roots is included here as such impacts can be fatal and thus being equivalent to clearance; these areas are defined as the structural root zone (SRT) and/or impact to >10% of the tree protection zone (TPZ)[71], noting that impacts within a tree's TPZ typically requires consultation with an arborist to determine available mitigation measures and quantify impacts. The TPZ is calculated in a radius from the trunk (12 x DBH) up to a maximum of 15 m from the tree, and the construction corridor is 15 m each side of the pipeline.

Direct impacts to birds utilising hollows can be avoided primarily through avoiding the removal of trees within the swift parrot breeding season (with the breeding season occurring between August and February[72]), and secondly through pre-clearance mitigation protocols to limit the likelihood of impacts to individuals (of any species) that may be occupying hollows in the habitat trees that will be required to be removed. Nevertheless, habitat loss is a major threat to the persistence of this swift parrots [73] and halting habitat loss is critical to maintaining and maximising breeding habitat[74]. Impact to this EPCBA listed species could potentially constitute a significant impact to an MNES under the definitions of that Act, requiring referral for consideration as a controlled action.

Table 12: Summary of impacts to swift parrot habitat (areas given in ha, % is of the total in design corridor)

Habitat type		Within design corridor		Within indicative construction corridor	
		Area of potential containing habitat trees	Number of habitat trees	Area of potential containing habitat trees	Number of habitat trees
Breeding habitat	Recorded	7.77	58	1.5	15
	Excluded	1.20	28	0	1
Foraging habitat	Recorded	8.07	20	1.47	7
	Excluded	1.95	12	0.05	1
Breeding and foraging habitat	Recorded	-	8	-	8
	Excluded	-	7	-	0
TOTAL	Recorded	**15.84**	**66**	**2.97 (19%)**	**30 (45%)**
	Excluded	**3.15**	**47**	**0.05**	**2**

[71] The Australian Standard AS4970-2009 Protection of Trees on Development Sites
[72] Department of Climate Change, Energy, the Environment and Water (2023b)
[73] Saunders & Tzaros (2011)
[74] Webb *et al.* (2018)

Recommendations

- Avoid impact to foraging and potential nesting habitat trees through design.
- Where avoidance is not possible, trees should be removed outside of the breeding season (with the breeding season occurring between August and February[75])
- Where removal outside of the breeding season is not possible, a tree-clearance protocol is recommended to manage the potential risk of individuals occupying hollows in habitat trees at the time of works (including limiting the likelihood of interrupting breeding attempts)

4.3.6 Tasmanian masked owl (*Tyto novaehollandiae* subsp. *castanops*)

Sixty-two large trees/stags that have potential to contain habitat suitable for nesting/roosting habitat for Tasmanian masked owl and an additional 2.6 ha of forest likely to contain habitat trees were recorded within the construction corridor. 1.2 ha and 30 individual trees can be excluded from the construction corridor (Table 13). Twenty individual nesting habitat trees and 0.26 ha of potential habitat was recorded within the construction corridor. It is expected that most trees can be avoided during construction by micro siting of the construction corridor to avoid values. However, complete avoidance of all these potential habitat trees is unlikely to be possible and at least some will be required to be cleared and/or impacted structurally to the degree that failure is likely. It should be noted that avoidance to structural impacts to tree roots is included here as such impacts can be fatal and thus being equivalent to clearance; thee areas are defined as the structural root zone and/or impact to >10% of the tree protection zone[76], noting that impacts within a tree's TPZ typically requires consultation with an arborist to determine available mitigation measures and quantify impacts. The TPZ is calculated in a radius from the trunk (12 x DBH) up to a maximum of 15 m from the tree, and the construction corridor is 15 m each side of the pipeline.

The risk to the masked owl is low due to the relatively low likelihood of the species being present however, there remains a risk of the species utilising one of the trees in the impact area for breeding or roosting[77]. Impact to this EPCBA listed species could potentially constitute a significant impact to an MNES under the definitions of that Act, requiring referral for consideration as a controlled action.

Table 13: Summary of impacts to masked owl habitat (areas given in ha, % is of the total in design corridor)

Habitat type	Within design corridor		Within indicative construction corridor	
	Area containing potential habitat trees (ha)	Number of habitat trees	Area containing potential habitat trees (ha)	Number of habitat trees
Breeding habitat	2.6	62	0.26 **(10 %)**	20 **(32 %)**
Excluded	1.2	30	0.002	1

[75] Department of Climate Change, Energy, the Environment and Water (2023b)
[76] The Australian Standard AS4970-2009 Protection of Trees on Development Sites
[77] Webb et al. (2018)

Recommendations

- Avoid potential habitat trees for this species.
- If impact to habitat trees is unavoidable, additional surveying of habitat trees and/or a tree clearance protocol should be developed to manage the potential impact to this species.

4.4 INTRODUCED PLANTS AND PLANT PATHOGENS

Earthworks associated with clearance and soil disturbance present a risk of spreading weeds and pathogens, both onsite and offsite. Disturbance activities on the proposed route may result in the spread of up to eleven declared weed species. It is recommended the proponent consider widespread distribution of weeds in relation to their various construction practices. A Weed and Hygiene Management Plan is required to guide weed control and facilitate containment of weed species by the civil contractors and should include a requirement to systematically survey sections of the construction corridor prior to works and undertake weed mitigation measures as appropriate. In general, control of declared and environmental weeds during and following works will minimise the risk of their spread and the introduction of new weeds. Weed control should include preliminary weed removal prior to works/excavation and be supplemented by follow-up measures to target any regenerating plants post completion.

Throughout the works area, contractors should be required to adhere to best practice guidelines:

- *Weed and Disease Planning and Hygiene Guidelines - Preventing the spread of weeds and diseases in Tasmania* (DPIPWE 2015b)
- *Tasmanian Washdown Guidelines for Weed and Disease Control – Machinery, Vehicles & Equipment* (DPIPWE 2004)

4.5 AQUATIC VALUES

4.5.1 Construction Impact Recommendations

There is potential for construction to reduce habitat quality for aquatic species occurring within watercourses. Due to this risk, it is our recommendation that an aquatic crossing construction protocol be developed and implemented as part of a project specific Construction Environmental Management Plan (CEMP). This may include:

- Wherever practicable, construct crossings without disturbing the waterway, either by utilising above-ground crossing, or a horizontal directional drilling techniques;
- Scheduling stream works in drier months (September – March) to avoid higher flow rates;
- Minimising disturbance to stream flow, channel sediment, form, coarse woody debris, and aquatic vegetation by reducing the construction footprint as much as is practical;
- Diverting natural flow as is necessary to reduce the mobilisation of fine sediments. Stream beds must be reinstated to match the existing layers post-works;
- Utilise existing crossings where possible;
- Restrict machinery and vehicular use within stream areas to avoid unnecessary disturbance;
- Install sediment traps downstream of any ground disturbance upon commencement of construction; and
- Rehabilitate disturbed areas with native flora sourced from the local area.
- Works should be undertaken generally in accordance with the following:
    - *Wetlands and Waterways Works Manual* (DPIPWE, 2003)

- *Keeping it clean - A Tasmanian field hygiene manual to prevent the spread of freshwater pests and pathogens (Allen and Gartenstein, 2010)*

4.5.2 Operational Impact Recommendations

Changed hydrology

Whilst Tasmania Irrigation has not implemented any hydrological studies at this juncture, it would be expected that changes to hydrology will occur with the realisation of proposed infrastructure. For example, irrigation activity is likely to facilitate altered hydrology to the area. Indirect impacts of altered hydrology may include soil erosion, changes in salinity and changes in surface hydrology (e.g. farm ditches and damp areas). This may have flow-on effects for threatened flora and fauna species and threated vegetation communities which have niche habitat requirements.

It is recommended that such impacts be considered during the Farm WAP assessment process.

Water quality

The typical land use across the district is broadacre crops and dry land livestock. Large areas of the proposed scheme are highly modified and with implementation of Farm Water Access Plans, the risk of environmental water quality degradation should be assessed. Such risks can be mitigated through management practices, with the implementation of an operational water quality program, targeting key discharge areas.

Transfer of pests and pathogens

Chytrid fungus is expected to occur within the irrigation district. Water is currently being transferred between source and receiving waters through the Sassafras-Wesley Vale Irrigation Scheme. Further risk in the potential spread of chytrid fungus through the SWISA may not be increased although more thorough consideration of this is required.

Phytophthora cinnamomi is not known from within the irrigation district. The closest known records are the other side of the Mersey River and Port Sorell. Risk of infection being brought in from outside the area can be mitigated by appropriate hygiene procedures.

5. LEGISLATIVE IMPLICATIONS

5.1 COMMONWEALTH *ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999*

The EPBCA is structured for self-assessment; the proponent must determine whether the project has the potential for significant impacts to MNES and the potential to be a 'controlled action', which if confirmed, would require assessment and approval from the Commonwealth Minister.

Referral under the EPBC Act will be necessary if, as the Act states:

> *'An action has, will have, or is likely to have a significant impact on an endangered or vulnerable species if it does, will, or is likely to (amongst other things):*
>
> > *modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.'*

The project is likely to have some unavoidable impacts to Matters of National Environmental Significance, including green and gold frog, and central north burrowing crayfish. There is also a risk, albeit lower, to other species including swift parrot, Tasmanian masked owl, Tasmanian wedge-tailed eagle, Tasmanian Devil and quolls, and Tasmanian forests and woodlands dominated by black gum or Brookers gum (*Eucalyptus ovata* / *E. brookeriana*). Other MNES are likely to interact with the proposal but with less potential for significant impacts. A complete assessment of all MNES and the potential

impact is in Appendix G, and a significant impact assessment of those MNES that are likely to have a significant impact is in Appendix H.

It is understood that the project will be referred under the EPBCA for a decision as to whether it constitutes a controlled action.

5.2 TASMANIAN *THREATENED SPECIES PROTECTION ACT 1995*

Under the TSPA, a person cannot knowingly without a permit 'take' a listed species. With the definition of 'take' encompassing actions that kill, injure, catch, damage, destroy and/or collect threatened species or vegetation elements that support threatened species, e.g. nests and dens.

A permit to take threatened species will be required for where the project cannot directly avoid occurrences of threatened flora or fauna listed under the TSPA, and/or is likely to impact individuals of threatened flora or fauna.

Based on the current construction corridor, a permit to take is likely to be required for:

- *Persicaria decipiens* – slender waterpepper
- *Engaeus granulatus* – central north burrowing crayfish

Pre-clearance surveys may determine permits are required for additional threatened fauna species.

5.3 TASMANIAN *BIOSECURITY ACT 2019*

Twelve declared weeds were recorded across the survey area. In addition Chilean needle grass is known (though not recorded during the surveys) to occur.

According to the provisions of the Tasmanian *Biosecurity Act 2019*, Zone B municipalities are those which host moderate or large infestations of the declared weed that are not deemed eradicable because the feasibility of effective management is low at this time. Therefore, the objective is containment of infestations. This includes preventing spread of the declared weed from the municipality or into properties currently free of the weed or which have developed or are implementing a locally integrated weed management plan for that species. As well there is a requirement to prevent spread of the weeds to properties containing sites for significant flora, fauna, and vegetation communities.

Zone A municipalities are areas in which eradication is deemed feasible (generally due to the existence of a targeted management plan) and is the responsibility of the landowner or land manager, or in the case of disturbance the development proponent.

The relevant statutory weed management plans define the Latrobe and Devonport Councils as Zone B municipality for infestations of:

- *Carduus tenuiflorus* (winged thistle)
- *Cytisus scoparius* (English broom)
- *Erica lusitanica* (Spanish heath)
- *Foeniculum vulgare* (fennel)
- *Genista monspessulana* (Montpellier broom)
- *Lycium ferocissimum* (African boxthorn)
- *Rubus fruticosus* (blackberry)
- *Salix X fragilis* var. *fragilis* (crack willow)
- *Senecio jacobaea* (ragwort)
- *Ulex europaeus* (gorse)

The relevant statutory weed management plans define the Latrobe and Devonport Councils as Zone A municipality for infestations of:

- *Hypericum perforatum* subsp. *veronense* (perforated St Johns-wort)
- *Ilex aquifolium* (holly) (in the absence of a statutory weed management plan for this species it is classed as Zone A)
- *Nassella neesiana* (Chilean needle grass)

5.4 TASMANIAN *NATURE CONSERVATION ACT 2002*

Protection of communities listed under the NCA is administered through LUPAA or under the *Forest Practices Code 2015* in areas where Forest Practices Plans apply. In this case consideration will be via LUPAA and the local planning scheme provisions and a Forest Practices Plan is not required.

If preclearance checks of mature trees dictates that a hollow requiring clearing was in use by a species listed under Schedule 1, 5 or 8 of the Tasmanian *Nature Conservation (Wildlife) Regulations 2021*, then a permit to take a product of wildlife would be required for removal of the nest. Permits to take are administered under the NCA.

5.5 TASMANIAN *LAND USE PLANNING AND APPROVALS ACT 1993*

LUPAA states that 'in determining an application for a permit, a planning authority must (amongst other things) seek out the objectives set out in Schedule 1[78].

Schedule 1 includes 'The objectives of the Resource Management and Planning System of Tasmania' which are (amongst other things):

> 'To promote sustainable development of natural and physical resources and the maintenance of ecological processes and genetic diversity'.

Sustainable development includes 'avoiding, remedying or mitigating any adverse effects of activities on the environment'[79].

5.6 TASMANIAN *NATIONAL PARKS AND RESERVES MANAGEMENT ACT 2002*

The current design corridor parallel to Devil Road from the Great Bend pump station is within the Warrawee Conservation Area. Conservation Areas are managed under the NCA and any activity on reserved land must be in accordance with a Reserve Activity Assessment approved under the Tasmanian *National Parks and Reserves Management Act 2002* or the Tasmanian *Nature Conservation Act 2002*. A Reserve Activity Assessment must therefore be undertaken for this project.

The pipeline alignment also passes through two private reserves adjacent to Warrawee Conservation Area and over Bonney's Creek on privately owned land (Forico).

5.7 TASMANIAN PLANNING SCHEME

In consideration of the requirements of LUPAA, each municipal area incorporates development standards codes under the appropriate planning scheme. The majority of the proposed route is located within the Latrobe Council Area, less than 2 km of the alignment is within the Devonport Council Area. Latrobe Council both of which operate under the Tasmanian Planning Scheme.

As the pipeline route largely passes through agricultural land, the dominant zone in the region is Rural and Agriculture. Smaller areas of general industrial, recreation, village zone are scattered throughout the project area. Neither the rural, agriculture, recreation, village, or general industrial zones have any specifications in relation to the protection of natural values, so the project will not conflict with zone

[78] Section 51(2)(b) – Part 4 Enforcement of Planning Control – Division 2 Development Control (*LUPAA 1993*)
[79] page 56 – *LUPAA 1993*

purpose statements (in relation to natural values). The Warrawee Conservation Area is subject to the Environmental Management Zone; however it is not addressed in this report as it will satisfy the permit requirements through the RAA process.

The code overlays that apply to the proposal area include:

- Bushfire-Prone Areas
- Landslip Hazard
- Airport Obstacle Limitation Area
- Electricity Transmission Infrastructure Protection
- Scenic Protection Area
- Flood Prone Area
- Natural Assets Code
    - Waterway and Coastal Protection Area
    - Priority Vegetation

Natural Assets Code

Several small watercourses crossings are subject to the Waterway and Coastal Protection Area Overlay. The waterways through which the pipeline alignment passes are predominantly all farm drains (Figure 7). Only the pipeline alignment passes through areas with the overlay, no other infrastructure (e.g. pumpstations and balance tanks) are situated within overlay areas. It is anticipated that only a very small area of the overlay area will be impacted in the final impact corridor.

The design corridor is subject to the Priority Vegetation overlay within one area where the pipeline intersects with the Bass Highway (Figure 7), and within the Warrawee Conservation Area. There is no priority vegetation within the Bass Highway overlay area; the area is wholly highway alignment and adjacent managed land. As there will be some impact to the overlay areas, and there are no exemptions from the planning scheme, the Natural Assets Code must be addressed (Table 14 and Table 15).

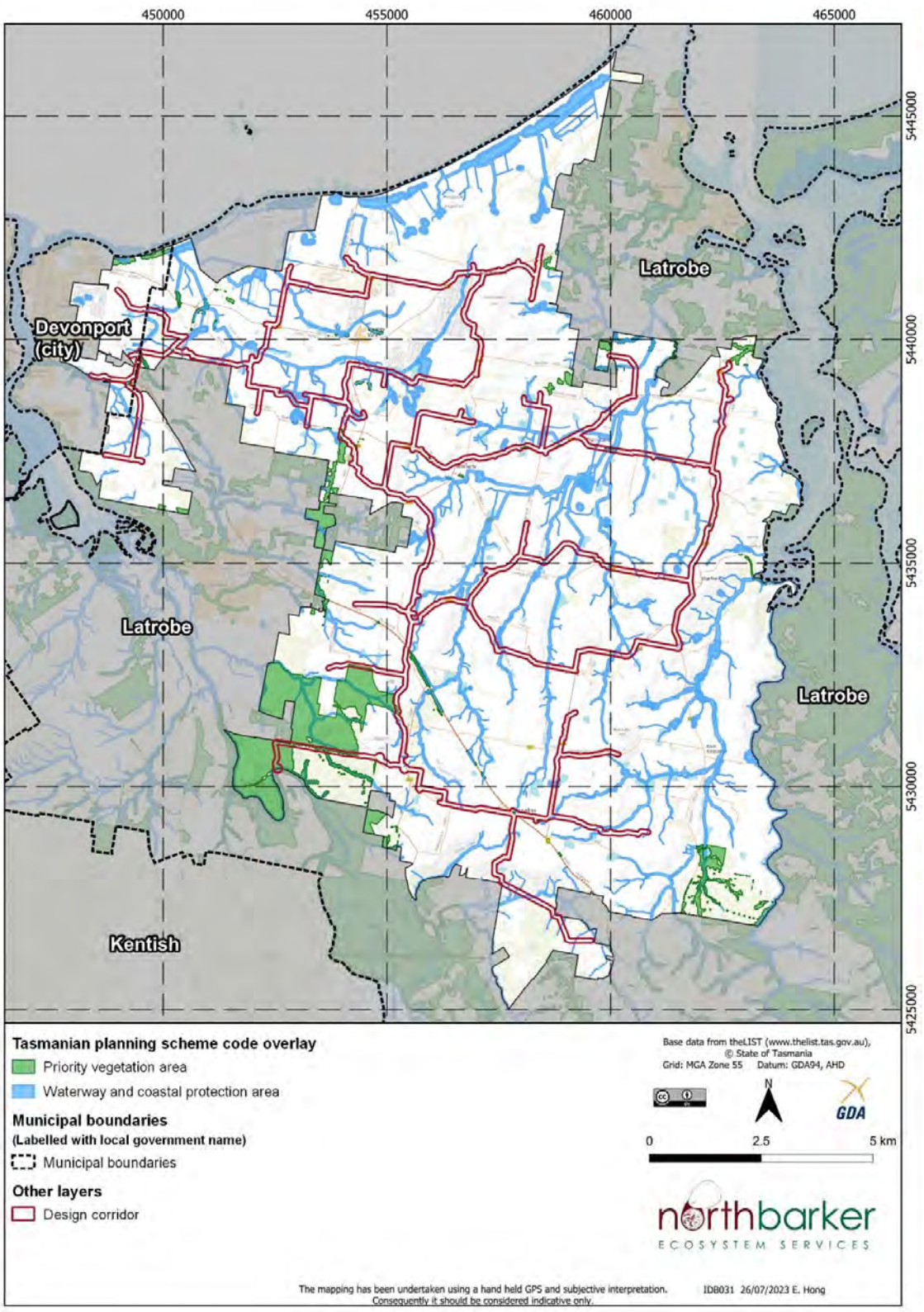

Figure 7: Natural assets code overlays in relation to the project area

Table 14: C7.6.1 Buildings and works within a waterway and coastal protection area or a future coastal refugia area

Objective		
That buildings and works within a waterway and coastal protection area or future coastal refugia area will not have an unnecessary or unacceptable impact on natural assets.		
Acceptable Solutions		
A1 Buildings and works within a waterway and coastal protection area must:		
(a)	Be within a building area on a sealed plan approved under this planning scheme.	This acceptable solution cannot be met.
(b)	In relation to a Class 4 watercourse, be for a crossing or bridge not more than 5m in width.	This acceptable solution cannot be met.
(c)	If within the spatial extent of tidal waters, be an extension to an existing boat ramp, car park, jetty, marina, marine farming shore facility or slipway that is not more than 20% of the area of the facility existing at the effective date.	Not applicable to this proposal.
Performance Criteria		
P1.1 Buildings and works within a waterway and coastal protection area must avoid or minimise adverse impacts on natural assets, having regard to:		
(a)	Impacts caused by erosion, siltation, sedimentation, and runoff.	Project specific erosion and sedimentation plans will be included within a Construction Environmental Management Plan.
(b)	Impacts on riparian or littoral vegetation.	Waterways are farm drainage lines and as such vegetation is largely non-native. The proposed works provide an opportunity to improve riparian vegetation by means of the removal of woody weeds.
(c)	Maintaining natural streambank and streambed condition, where it exists.	Natural streambank and streambed will be maintained where it exists.
(d)	Impacts on in-stream natural habitat, such as fallen logs, bank overhangs, rocks and trailing vegetation.	In-stream habitat will be maintained where it exists.
(e)	The need to avoid significantly impeding natural flow and drainage.	The need to avoid significantly impeding natural flow and drainage will primarily be avoided by conducting small stream crossings during drier months. Stream flow will be maintained in larger streams during construction.

(f)	The need to maintain fish passage, where known to exist.	Where applicable, fish passage will be maintained during construction by not impeding water flow and fish movement.
(g)	The need to avoid land filling of wetlands.	Land filling of wetlands will occur during the construction of the scheme.
(h)	The need to group new facilities with existing facilities, where reasonably practical.	The pipeline is sited strategically to minimise impacts and to maximise efficiency of the proposed infrastructure
(i)	Minimising cut and fill.	Cut and fill will only be conducted to the minimal extent required for the construction of access and primary assets.
(j)	Building design that responds to the particular size, shape, contours, or slope of the land.	The pipeline designs in waterway areas are designed with the landscape in mind.
(k)	Minimising impacts on coastal processes, including sand movement and wave action.	This criterion is not applicable to this proposal.
(l)	Minimising the need for future works for the protection of natural assets, infrastructure and property.	There is very little requirement for ongoing works. Major maintenance will be limited to periodic checks.
(m)	The environmental best practice guidelines in the *Wetlands and Waterways Works Manual*.	All contractors will adhere to these best practice guidelines.
(n)	The guidelines in the *Tasmanian Coastal Works Manual*.	All contractors will adhere to these best practice guidelines.
P1.2 Buildings and works within the spatial extent of tidal waters must be for a use that relies upon a coastal location to fulfil its purpose, having regard to:		
	These Performance Criteria are not applicable to this project	

Table 15: C7.6.2 Clearance within a priority vegetation area

Objective		
That clearance of native vegetation within a priority vegetation area: (a) Does not result in unreasonable loss of priority vegetation; (b) Is appropriately managed to adequately protect identified priority vegetation; and (c) Minimises and appropriately manages impacts from construction and development activities.		
Acceptable Solutions		
A1	Clearance of native vegetation within a priority vegetation area must be within a building area on a sealed plan approved under this planning scheme.	This acceptable solution cannot be met
Performance Criteria		
P1.1 Clearance of native vegetation within a priority vegetation area must be for:		
(a)	An existing use on the site, provided any clearance is contained within the minimum area necessary to be cleared to provide adequate bushfire protection, as recommended by the Tasmanian Fire Service or an accredited person.	Not applicable to this proposal.
(b)	Buildings and works associated with the construction of a single dwelling or an associated outbuilding.	Not applicable to this proposal.
(c)	Subdivision in the General Residential Zone or Low-Density Residential Zone.	Not applicable to this proposal.
(d)	Use or development that will result in significant long term social and economic benefits and there is no feasible alternative location or design.	Although outside of our scope as ecologists, we understand that the proposal will bring significant long-term social and economic benefits to the local region through the ongoing provision of irrigation water.
(e)	Clearance of native vegetation where it is demonstrated that on-going pre-existing management cannot ensure the survival of the priority vegetation and there is little potential for long-term persistence.	Clearance of vegetation will not impact on the priority vegetations persistence in the local area post-works.
(f)	The clearance of native vegetation that is of limited scale relative to the extent of priority vegetation on the site.	The proposed pipeline utilises existing easements and non-native land as much as

		possible to minimise the extent of native vegetation required to be cleared.
P1.2 Clearance of native vegetation within a priority vegetation area must minimise adverse impacts on priority vegetation, having regard to:		
(a)	The design and location of buildings and works and any constraints such as topography or land hazards.	The proposed infrastructure is located appropriately to fit with the requirements of the infrastructure.
(b)	Any particular requirements for the buildings and works.	The proposal requires trenching along an ~100 km network of pipeline, mostly through agricultural land. Within the priority vegetation area, the proposed works are to upgrade the existing pump station infrastructure on the Mersey River, and install a new pipeline to a balance tank on Saggers Hill.
(c)	Minimising impacts resulting from bushfire hazard management measures through siting and fire-resistant design of habitable buildings.	Not applicable to this proposal.
(d)	Any mitigation measures implemented to minimise the residual impacts on priority vegetation.	Weed and hygiene management protocols will be sufficient to mitigate against any potential residual impacts
(e)	Any on-site biodiversity offsets.	No offsets have been considered for this proposal
(f)	Any existing cleared areas on the site.	The proposed pipeline utilises existing easements and cleared land as much as is possible.

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Farm Water Access Plans – Fact Sheet

***Farm WAPs** – empowering farmers to manage their impact to the environment and ensure sustainable water use for future generations.*

9 May 2023

What is a Farm WAP?

Farm Water Access Plans or Farm WAPs help identify and manage environmental risks on irrigated properties and the surrounding environment including:

- Soil health
- Streams, rivers and waterways
- Biodiversity and natural values

Why is a Farm WAP needed?

- Sustainable water use and land stewardship
  - Environmental due diligence
  - An environmental risk management planning tool.
- Funding requirement
  - Farm WAPs demonstrate good environmental practice to the state and federal governments who fund our irrigation schemes.
  - Required to comply with Irrigation District By-laws.
- Condition of signing up to a water entitlement – all land and dams receiving TI water in designated irrigation districts require a Farm WAP.

How do I get one?

- When your irrigation scheme is ready just apply for a water entitlement to get started
- Irrigators purchasing new entitlements are already in the process of developing Farm WAPs.
- Tasmanian Irrigation will help you by coordinating a prequalified consultant to prepare your Farm WAP.
- A prequalified consultant (approved by the Minister) has expertise in water, soil and biodiversity.

Farm WAP Benefits

Farm WAPs can benefit farmers and their surrounding communities including:

Improved water use efficiency

Farm WAPs can help farmers use water more efficiently by providing a clear understanding of water requirements for different crops, the timing and amount of water required, and the best irrigation techniques to use. This can help to reduce water waste, lower water use costs, and increase yields.

Reduced environmental impact

Farm WAPs can help to reduce the environmental impact of farming activities by reducing water use, minimising nutrient leaching, and reducing soil erosion. This can help to protect water quality and maintain ecosystem health.

Compliance with regulations

Farm WAPs can help farmers to comply with water use regulations and guidelines. By ensuring that irrigation practices are sustainable and efficient, Farm WAPs can help to reduce the risk of penalties for non-compliance.

Improved risk management

Farm WAPs can help farmers to manage risk associated with water availability and quality.

Improved farm productivity

Farm WAPs can help to improve farm productivity by providing a systematic approach to water management. By optimising irrigation practices for each soil type, farmers can increase crop yields, reduce production costs, and improve the quality of their crops.

Increased market access

Farm WAPs can help farmers to access new markets by demonstrating their commitment to sustainable water management practices. This can help to improve their marketability and attract customers who are interested in environmentally-friendly farming practices.

Water conservation

With an effective water management plan, farmers can use water more efficiently, reducing their water usage and conserving this valuable resource.

Reduced water pollution

Correct water management practices can reduce the risk of agricultural runoff, which can cause water pollution and harm aquatic ecosystems.

Improved soil health

Effective water management practices can also help maintain healthy soil conditions, which can promote better crop growth and reduce erosion.

Frequently Asked Questions

Preparing your Farm WAP

Who needs a Farm WAP?

Properties receiving water from Tasmanian Irrigation (TI water) schemes are required under by-laws to have a Farm WAP.

What is included in a Farm WAP?

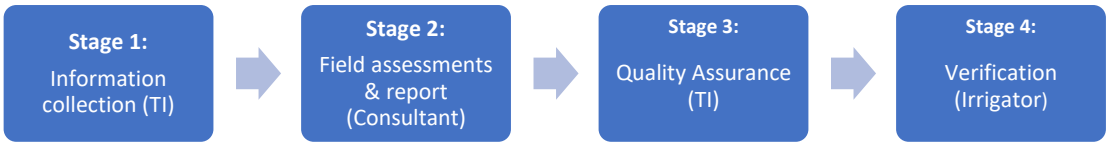
Farm WAPs are required for each individual property. A Farm WAP does not have to cover an entire property but must include all on-farm dams and land where TI water will be stored or applied both now and in the future.

Farm WAPs include information on:

- soil, biodiversity and water resources,
- current and proposed future water use,
- potential irrigable land (based on land capability and divided into land use categories such as root cropping, surface cropping, irrigated pasture, dryland pasture, horticulture, forestry),
- actions required to manage risks including monitoring schedules, and
- best management practices and other relevant guidelines.

What is involved in preparing a Farm WAP?

Tasmanian Irrigation facilitates the preparation of Farm WAPs to help reduce the cost to irrigators. There are four stages in preparing your Farm WAP. Tasmanian Irrigation will approach you when Stage 1 commences.



Farm WAPs can only be completed by a prequalified consultant who has been approved by the Minister for Water and are prepared in accordance with the soil, water and biodiversity modules approved by the Department of Natural Resources and Environment (Tasmania).

Irrigators taking or planning to take water from a scheme will be contacted by Tasmanian Irrigation directly to arrange for a Farm WAP to be developed. Farm WAPs are usually prepared in batches which provide cost efficiencies for each irrigator.

How is the process started?

When your scheme or zone is ready to commence Stage 1, Tasmanian Irrigation will send you draft property maps and a farm checklist questionnaire. seeking to identify where you currently or propose to apply and store TI water. Multiple properties that will be operated as separate entities, require a separate farm checklist for each property.

What are the likely costs to prepare a Farm WAP?

Tasmanian Irrigation engages a prequalified consultant to undertake this work. The consultant's field assessments and reports vary in complexity depending on the size, soil and biodiversity characteristics of your property.

Factors affecting the price of a Farm WAP include:

- the size of the area to be assessed,
- existing land capability data for the area to be assessed, and
- the likelihood of threatened species, ecological communities or other matters of national environmental significance (MNES) occurring in or near the area to be assessed.

The cost of Farm WAPs for most schemes can often be subsidised.

What if I don't know exactly how or where I'll use TI water yet?

Farm WAPs consider a wide range of suitable long-term future options, so your property will not be restricted to growing the particular crop or pasture you indicate now. The significant decisions involve selecting the area that may be irrigated in the future and the dams in which you propose to store TI water (you may wish to select all your dams). Choosing a larger area or incorporating properties that you have long term leases on may save paying for extensions to your Farm WAP in the future.

What if I want to engage my own consultant (for Stage 2)?

If you do not choose to take advantage of the TI facilitated process, you may engage your own consultant to prepare your Farm WAP. A list of prequalified consultants who can perform the work can be obtained from Tasmanian Irrigation upon request.

Ongoing Management of your Farm WAP

Who is responsible for and complying with a Farm WAP?

Usually the landowner is the irrigator and therefore the person responsible for obtaining a Farm WAP and complying with management and reporting requirements. In situations where water is transferred or land is leased, a business arrangement between the irrigator and the landowner and/or lessee may be required to facilitate obtaining the Farm WAP.

Farm WAPs should be reviewed and checked upon transfer, and prior to each irrigation season, to ensure the Farm WAP area covers the proposed irrigation area and that the land capability is appropriate.

What is a Farm WAP linked to?

A Farm WAP is developed for each specific property. They are attached to land and not individual property owners or irrigators. If land is sold or leased, the Farm WAP can be transferred to another property owner or irrigator at no cost.

What compliance monitoring related to Farm WAPs?

In accordance with condition of approval of the irrigation schemes under the Tasmanian *Water Management Act 1999*, Tasmanian Irrigation has implemented a Farm WAP auditing program. The program includes annual audits of randomly selected Farm WAPs, and triggered audits where non-compliance is identified or monitoring results indicating a decline in scheme water quality.

What is a Farm WAP audit?

Farm WAP audits are simply a quality assurance check to ensure that the irrigator is (still) managing and can achieve the environmental management actions in their Farm WAP, review and changed farm operations that pose potential risks to the environment and review any changed environmental aspects that may be affected and may be at risk from irrigation activities.

Audits focus on compliance with the management prescriptions set out in each Farm WAP. Criteria to be addressed include whether water has been applied in accordance with the Farm WAP, and whether land capability limitations and biodiversity have been managed, monitoring has been undertaken and required records are being kept in accordance with the Farm WAP.

Can a Farm WAP be amended to include an additional area?

Yes. A Farm WAP is a 'live' document that can be amended. Contact Tasmanian Irrigation's Farm WAP Team to request an additional area or other change to your existing Farm WAP. Some changes may need a prequalified consultant to complete, which may incur a cost.

Farm WAP Team Contact Details

The Farm WAP Team is happy to answer your questions.

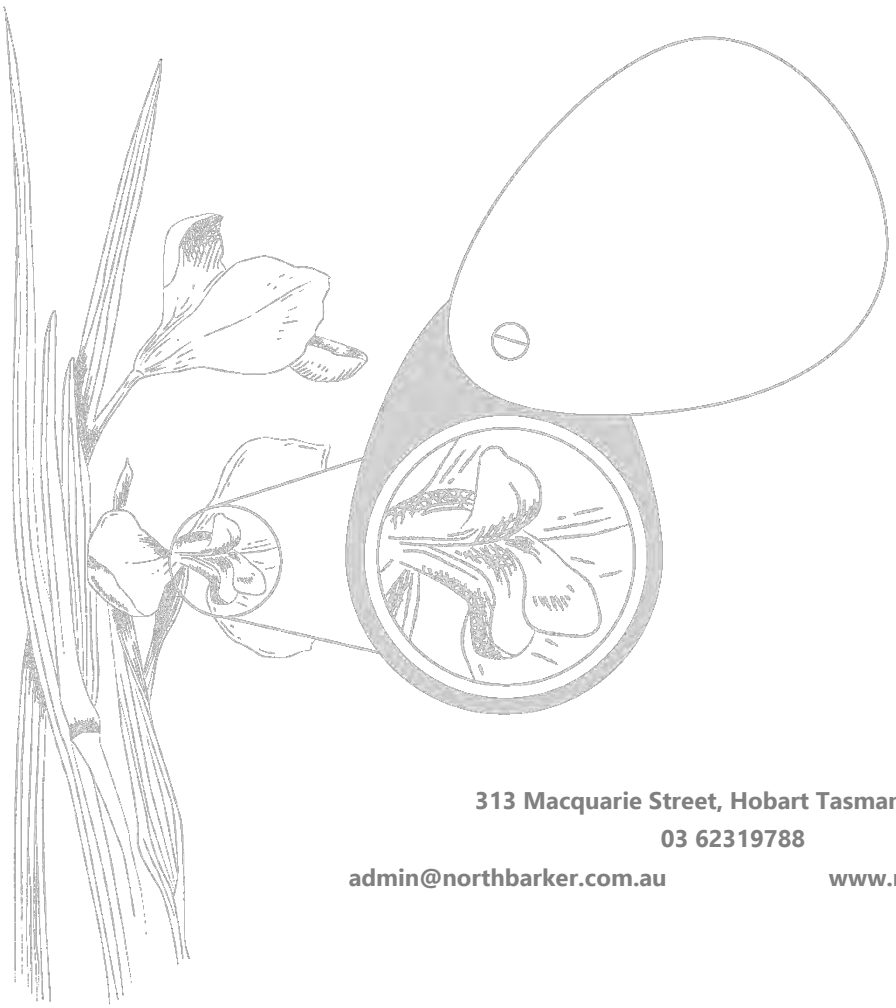
Farm WAP Officer
FarmWAP@tasirrigation.com.au
Ph: (03) 6398-8433

List of Legislation Relevant to the Proposal

Sassafras-Wesley Vale Irrigation Scheme Augmentation

31st July 2023

For Tasmanian Irrigation (IDB031)



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Legislation Relevant to the SWISA Proposal

The legislative and planning framework that governs the protection and management of Tasmania's environment and heritage has been considered in the planning and design of the NMIS. The relevant instruments and their relationship to the protection of matters listed on the EPBC Act are discussed below. The EPBC Act assessment is the only Commonwealth approval that is required for the project.

The project will not require assessment as a project of State significance or via the major projects planning pathway. However, the project will need to meet the requirements of various State Acts, including the Tasmanian *Water Management Act 1999*, *Threatened Species Protection Act 1995*, and the *Nature Conservation Act 2002*. The purpose of the latter two acts is to provide for the protection and management of threatened native flora and fauna and to enable and promote the conservation of native flora and fauna. Under these acts, the crown can issue a 'permit to take' a threatened species or the product of a threatened species (e.g. a possible burrow) for the planned activity, with mitigation and offset requirements determined by the nature of the proposed impact.

TASMANIAN *WATER MANAGEMENT ACT 1999*

Instrument: Water Licence (Part 6, Section 54)

This instrument is in place to ensure that water is allocated in accordance with National Water Initiative (NWI) principles. It sets environmental flows, daily take limits and cease to take limits for watercourses.

Relevance to EPBC Act

It ensures that the aquatic habitat requirements for threatened aquatic flora and fauna are protected.

Instrument: Dam Permit (Part 8, Section 146)

This instrument is in place to ensure that dams built over 1 ML are environmentally sensitive and adhere to national dam building standards. Sets requirements for offsets to impacts to threatened species and communities, as well as sediment and erosion controls during construction.

Relevance to EPBC Act

The dam permit identifies if assessment under the EPBC Act is required. It assesses impacts on jointly listed species. Sets offset requirements for jointly listed fauna and flora species. Manages indirect impacts on aquatic environment by approving a sediment and erosion control plan for construction.

Instrument: Water Entity Status (Part 9, Section 166)

The purpose of this instrument is to establish TI as a water entity responsible for the management of an irrigation district.

Relevance to EPBC Act

It ensures that TI manages the irrigation district in accordance with irrigation district conditions and by-laws.

Instrument: Irrigation District (Part 9, Section 176)

This sets the area in which irrigation rights can be established, where water can be applied and traded. It establishes the requirement for all water to be supplied under the Farm WAP Framework. It establishes an annual reporting framework.

Relevance to EPBC Act

This instrument ensures that impacts to flora and fauna species and ecological communities are identified and managed in the irrigation footprint for each scheme, as well as outlining requirements of annual audits of Farm WAPs, and ensures that an annual report is provided on how legislative requirements of the scheme are being met.

TASMANIAN *IRRIGATION CLAUSES ACT 1973*

Instrument: Power to Grant Irrigation Rights (Section 23)

This instrument ensures that water from TI schemes can only be used via approved irrigation rights.

Relevance to EPBC Act

This ensures that irrigation schemes are not over allocated and that all water is accounted for and managed in accordance with approvals.

TASMANIAN *LAND USE AND PLANNING APPROVALS ACT 1993* (LUPAA)

Instrument: Development Application

LUPAA ensures that construction activities are in accordance with set guidelines and are in the public interest. It manages impacts on soil, water, visual amenity, and heritage.

Relevance to EPBC Act

LUPAA considers local environment, visual amenity, potential impact to riparian areas and heritage.

TASMANIAN *THREATENED SPECIES PROTECTION ACT 1995*

Instrument: Permit to Take (Flora and Fauna)

Any impacts on State-listed threatened flora and fauna are assessed. Permits to take (for flora and fauna) are issued if impacts are assessed as acceptable or capable of being offset.

Relevance to EPBC Act

This ensures that habitat for threatened species is considered and sets processes for ensuring that significant impacts do not occur to threatened flora and fauna.

TASMANIAN *NATURE CONSERVATION ACT 2002*

Instrument: Permit to Take (Products of Wildlife)

The permit to take (products of wildlife) allows for the decommissioning of unused nests and dens and the translocation of species to avoid mortality for species protected under the Nature Conservation (Wildlife) Regulations 2021.

Relevance to EPBC Act

This ensures that habitat for native species is considered and sets processes for ensuring that unacceptable impacts do not occur to fauna.

TASMANIAN *ABORIGINAL LANDS ACT 1995*

Instruments: Land Vested in Council (Part 3, Section 27), Local Management of Certain Areas (Part 3, Section 31)

The Aboriginal Lands Act 1995 establishes Tasmania's Aboriginal Land Council. Section 27 of the Act permits the Council to bestow in trust areas of land in perpetuity for Aboriginal people as protected Aboriginal Land. Part 3 of the Act details how Aboriginal land is managed, and Section 31 identifies that the Council can invite local Aboriginal people with an important association with that land to manage it if they possess the ability to do so.

Relevance to EPBC Act

Considers Aboriginal heritage and allows for indigenous association and management of land.

TASMANIAN *ABORIGINAL RELICS ACT 1975*

Instrument: Permit to Take, Destroy, Conceal, or Remove

To ensure that all Aboriginal heritage sites of significance are considered and protected.

Relevance to EPBC Act

Considers Aboriginal sites listed on national registers.

TASMANIAN *BIOSECURITY ACT 2019*

Instrument: Weed Management Plan

This Act states that landowners and managers must take all reasonable measures to control the impact and spread of declared weeds, particularly to prevent the spread into the habitat of threatened species, threatened communities and reserves.

Relevance to EPBC Act

This act ensures that declared weeds are appropriately managed, and infestations are contained or removed according to local council weed management strategies. The weed management plan ensures

that areas containing MNES are not significantly altered, transformed, or destroyed by the proposed works.

TASMANIAN *CROWN LAND ACT 1976*

Instrument: Works Permit

The works permit ensures that any works undertaken in land owned by the Tasmanian Government is undertaken in an environmentally sensitive matter.

Relevance to EPBC Act

Any MNES that occur within crown lands will be assessed and risks mitigated.

TASMANIAN PLANNING SCHEME

Instrument: Planning Permit

The purpose of planning permits is to ensure that all activities are consistent with the relevant local government planning schemes, which regulate the requirements of LUPAA for various projects not triggering other Acts (or requiring multiple assessments).

Relevance to EPBC Act

The Natural Assets Code of the Tasmanian Planning Schemes considers EPBC listed matters as priority biodiversity values for protection. The project area is subject to rural, agriculture, general industrial, recreation, and village zones, and is also subject to the following code overlays:

- Bushfire-Prone Areas
- Landslip Hazard
- Airport Obstacle Limitation Area
- Electricity Transmission Infrastructure Protection
- Scenic Protection Area
- Flood Prone Area
- Natural Assets Code
    - Waterway and Coastal Protection Area
    - Priority Vegetation

Tasmanian Irrigation - Community Consultation Summary

(Provided to NBES 29/08/23)

Table 1: Summary of consultation undertaken with the Tasmanian community

Communication Type	Number of contacts	Comments
Community Newsletters	287	SWISA Project Team has sent Newsletters to landowners in the district impacted by the scheme, 287 is the number land parcels impacted.
Media	Numerous	SWISA scheme has received substantial coverage from local Tasmanian newspapers and on occasions in the national press. It has also been the subject of ABC radio interviews and local television articles. This included the minster for water announcing the opening of water sales.
Public Meetings	2	Circa 140 parties have been directly invited to public meetings. Meetings have been held at the Latrobe memorial hall, These meetings have been held to discuss the design, operation, and water sales. The meetings have been well supported with good community engagement.
Water sales	115	All landholders who could be potentially serviced by the scheme were sent the information package regarding water sales for the scheme. 40 persons attended the public launch. Of the 115 people who had registered interest in the scheme 90 contracts for water have been completed to date – total of circa 7000ML sold.
1 to 1 contact	Numerous	Every water sales contract was completed in person at the landowner's property or at one of six water sales drop-in days. Scheme details were made available and Tasmania Irrigation staff took landowners through the scheme in detail when requested.
Local "kitchen table" meeting	Numerous	Project Manager, Assistant Project Manager and Landowner Liaison, worked through all landowner enquiries face to face during the finalisation of the scheme design. Working co-operatively to establish the most practical alignment considering all impacts and factors.
Web page	1	The Tasmanian Irrigation website contains relevant information on SWISA.

Notification of survey to affected landholders	Circa 200	Pre-entry requests for flora, fauna, geology, and heritage surveys to be conducted. Contact by letter, email, and telephone, if not in person.
Aboriginal heritage consultation meetings	1	The Heritage consultants completed the initial interaction with Aboriginal Heritage Tasmania (AHT) when it engaged with AHT to complete a search of the Aboriginal Heritage Register of the initial proposed SWISA alignment. The SWISA project has two (2) designated Aboriginal Heritage Officers (AHOs). Both AHOs have been operating as AHOs for 20 years and have worked on projects across Tasmania. They are both very familiar with the Aboriginal community consultation requirements for assessments. One of the primary roles of the AHOs is to consult with Aboriginal community groups. The main purpose of this consultation process is: • to advise Aboriginal community groups of the details of the project, • to convey the findings of the Aboriginal heritage assessment, • to document the Aboriginal social values attributed to Aboriginal heritage resources in the study area, • to discuss potential management strategies for Aboriginal heritage sites, and • to document the views and concerns expressed by the Aboriginal community representatives. As part of the consultation process, draft copies of the Aboriginal heritage assessment report will be sent out to a number of Tasmanian Aboriginal organisations with an interest in this project. The AHOs will then be contacting these organisations to arrange a time to meet and discuss the findings of the assessment and management options for identified Aboriginal heritage values. The heritage consultants will assist in co-ordinating this component of the project. The outcomes of the Aboriginal consultation program will be presented in the final Aboriginal heritage report prepared for this project. Copies of the report will also be sent to the Aboriginal Heritage Council (AHC) for review and comment.
European heritage surveys	1	Formal survey for information undertaken by consultants of the alignment and infrastructure
Meetings with Councils	0	Nil direct presentations to council, however both Latrobe/Kentish and Devonport council planning offices have been made aware of the project and understand that Development Application documentation will follow.
Tasmanian Department of Natural Resources	Numerous	Meetings, comment, and advice relating to business case, Irrigation District, project design, approvals, and consultant briefs.

SWISA community representatives working group	Numerous	SWISA is an Augmentation of the original SWIS scheme, the process to move to develop a new scheme was based on significant consultation with the Irrigation Representative Group. Addressing such issues as, delivery of water, repair and maintenance of the scheme, design of the new scheme, impact and actions to lessen impact.
Public Consultation Feedback	6 weeks	SWISA, after preferred option undertook a period of public consultation for 6 weeks, the scheme was published on the local paper, flyers and information packs were located at the Wesley Vale Store and "Big Spud" at Sassafras. Several landowners engaged Tasmania Irrigation through during this time, providing feedback of their ideas and concerns. These conversations have been document within the public consultation report and where appropriate actions taken to implement change.

PUBLIC CONSULTATION AND DESIGN SUMMARY

Sassafras Wesley Vale Irrigation Scheme Augmentation

Abstract

This report consolidates the feedback and activities undertaken as part of the public consolation period for the Sassafras Wesley Vale Irrigation Scheme Augmentation.
17th November 2021 to 4th January 2022

Damien Butler
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[C]Smart Sheet Register Link

(20) SWISA Preferred Option Feedback Register - Smartsheet.com

[0.0] Introduction

The purpose of this report is to outline the activities undertaken to address public feedback and concerns through consultation. The *'Sassafras Wesley Vale Irrigation Scheme Augmentation'* (SWISA) project has a defined preferred option design developed and presented. The preferred option design was established from captured *'Expressions of Interest'* (EOI's) and influenced by the existing *'Sassafras Wesley Vale Irrigation Scheme'* (SWIS). The design also incorporates the need to undertake remedial activities to repair critical infrastructure used in the delivery of water through the scheme.

The consultation period was used to capture landowner feedback and concerns about the SWISA project and to seek out ways to better understand what is needed to increase the likelihood of scheme success.

The report uses both pre-existing information, feedback and developed methodologies and ideas to address previously unknown impediments to scheme success and to validate the preferred option EOI's and scheme design methodology.

Thought the consolation period, gathered information has helped establish the key inhibitors to scheme success. Whilst the volumes captured and preferred option design look to promote scheme success. The reality presented a different picture, the scheme has the potential to be successful, however the consolation period has uncovered several impediments to a successful outcome. These impediments and proposals to remedy the situation have been captured within the report.

The report has a mix of direct feedback, developed theories and potential activities to address concerns hampering success. The document uses information provided by, landowners, papers such as the SWISA Preferred Option Design, SIWSA Mix and Margin Document, NRE Water allocation documentation, University of Tasmania Website (crop water usage) , Tas Water Volumes and a general developed understanding of the region.

[1.0] Executive Summary

Directly after the official 'Preferred Option Launch' on the 17th of November, a six-week period of public consultation was provided ending on the 4th of January. To support this period Tasmania Irrigation advertised the schemes preferred option in the Tas Country and Advocate, it was posted on the Tasmania Irrigation Website and physical information and feedback forms were placed at high traffic locations in the district.

In general, the scheme has been received positively, we have captured 39 direct enquiries, with most enquiries relating to the provision of additional information, general conversations about the scheme, meetings to discuss volume increases/ decrease, pipeline alignment concerns and general advice on how the existing infrastructure could be better utilised, along with pricing structure and payment terms improvements.

Furthermore, we took a proactive approach by using this time to review and update the scheme contact register. There are 155 people on the register, this is made up of a combination of existing 'Water Entitlement Holders' and new EOI's.

Spending time in the scheme talking with landowners has provided some significant insight into the challenges the landowner face when it comes to purchasing water and the infrastructure to support it. these challenges include.

[1.1] Scheme Success Impediment Topics and Proposed Remedial Activities

1. Pricing structure inhibits the promotion of investment in larger entitlements
    a. Addressed through the preparation of a price break structure proposal,
        i. Ref: [4.0] Pricing Model Proposal
2. Payment terms inhibit investment
    a. Addressed through the preparation of an alternative payment plan proposal,
        i. Ref [5.0] Payment Plan Proposal
3. Provision of outlets for SWIS entitlement holders purchasing an entitlement in SWISA
    a. Addressed by clarification of SWISA as a new entitlement
        i. Ref [6.0] New Entitlement Outlet
4. The impact non-viable water has on scheme volumes and success
    a. Addressed by proactive efforts to advice purchasing requirements
    b. Action to review the benchmark for non-viable water
        i. Ref, [7.0] Non-Viable Water Volumes
5. Capture of proposed pipeline alignment rejection by landowners
    a. Addressed by seeking alternative routes where possible
        i. Ref, [8.0] Pipeline Route Rejections or Redirections
6. Understanding the process to purchase water from the Hydro and the presence of the dissatisfaction of the Mersey Irrigator group on the proposed scheme development, Hydro water, and the risk of increase cease to take events
    a. Addressed and in Action – Meeting with Hydro Tasmania
        i. Ref [10.0] Meeting with Hydro Tasmania
    b. Addressed and in Action – Communication and proposed meeting with Mersey Irrigator Group
        i. Ref, [10.1] Meeting with Mersey Irrigation Group
7. Scheme redesign to remove construction risk and develop methodologies to ensure adding addition volume to the scheme later can be achieved
    a. Addressed by actively looking at alternative designs
    b. Actions to include these into a design challenge workshop
        i. Ref, [11.0] Scheme Design Changes

Current T3 Scheme EOI Expectation

From reviewing the EOI's, talking with Landowners. The below volume is the latest estimate for water sales within SWISA. The proposals outlined below if implemented could improve the total volume sold.

Volume /Variance	EOI Total	Irrigator ($) /Variance
4632ML	**68**	**$7.96M**
(-3394ML)	**(+/-0)**	**(-$5.84M)**

[2.0] Table of Recorded Landowner Feedback/Requests

Summary of direct communication through the consolation period, recorded in Smart Sheet

[(20) SWISA Preferred Option Feedback Register - Smartsheet.com]

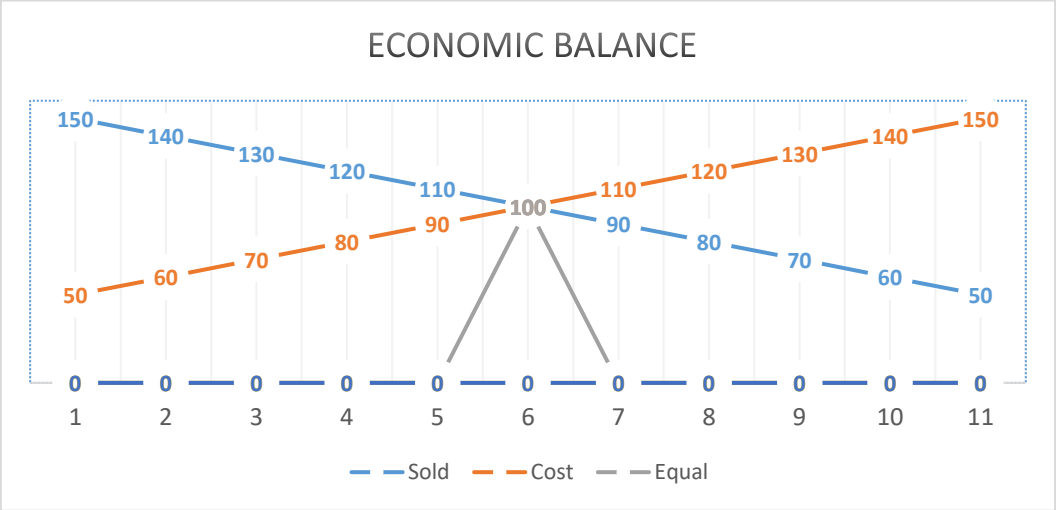
Table 1: Public Feedback Table

Reference No	Contact	Request/Action
SWIS/100	[redacted]	Keep 20ML Tank repair only
SWIS/101	[redacted]	Keep Main Pipeline repair only
SWIS/102	[redacted]	Weighted Pricing Model based on Volume
SWIS/103	[redacted]	Does not want pipeline cutting through property
SWIS/104	[redacted]	Does not want pipeline cutting through property
SWIS/105	[redacted]	Wants Reimbursement for outlet purchased
SWIS/106	[redacted]	Non-Viable Water Discussion and information provided
SWIS/107	[redacted]	5ML water wanted in SWISA
SWIS/108	[redacted]	200ML water discussion
SWIS/109	[redacted]	Non-Viable Water – 32ML to 65ML discussion
SWIS/110	[redacted]	New EOI – 20ML investment (next to Leanne Brooks)
SWIS/111	[redacted]	Realignment of Zone A – Palmers Road
SWIS/112	[redacted]	Non-Viable water – 111 Milldam Road
SWIS/113	[redacted]	Forward Scheme Information for Review
SWIS/114	[redacted]	Forward Scheme Information for Review
SWIS/115	[redacted]	Forward Scheme Information for Review
SWIS/116	[redacted]	Forward Scheme Information for Review
SWIS/117	[redacted]	250ML enquiry Windspears Road
SWIS/118	[redacted]	Forward Scheme Information 100ML Enquiry
SWIS/119	[redacted]	Forward Scheme Information – review of 200ML Enquiry
SWIS/120	[redacted]	Non-Viable Water 100ML difficult location
SWIS/121	[redacted]	Non-Viable Water review 200ML
SWIS/122	[redacted]	Latrobe Line Volume Review
SWIS/123	[redacted]	Torquay Road – Davey, Rattray
SWIS/124	[redacted]	EOI review request – no return communication
SWIS/125	[redacted]	50ML – Torquay Road
SWIS/126	[redacted]	Pipeline Alignment through property
SWIS/127	[redacted]	Northdown Line Review Crossing near Wrights Lane
SWIS/128	[redacted]	Forward Scheme Information for Review
SWIS/129	[redacted]	Forward Scheme Information for Review
SWIS/130	[redacted]	Forward Scheme Information for Review
SWIS/131	[redacted]	Meeting to discuss water entailment
SWIS/132	[redacted]	Forward Scheme Information for Review
SWIS/133	[redacted]	Forward Scheme Information Review 330ML EOI
SWIS/134	[redacted]	Water Sales Information Request Appleby Road
SWIS/135	[redacted]	Water Sales Information Request Harford Property
SWIS/136	[redacted]	Water Sales Information Requested
SWIS/137	[redacted]	Water Sales Information Requested
SWIS/138	[redacted]	Disruption, Planning and Entailments - Costa
SWIS/139	[redacted]	Water Sales Enquiry

[3.0] Pricing & Payment Terms

Through the consultation period, both price and payment terms came up as a major topic for discussion. Landowners presented strong arguments as to why we should consider alternative offers to enhance participation in the scheme by landowners

Figure 1:Economic Balance Chart



The cost and trading conditions when correct should promote maximum water sales. This can be achieved when the landowner contribution sits within their means, allowing them to invest without hampering growth potential or stretching them to the point where one bad season means foreclosure.

The chart above shows this concept graphically, the cross point is where the available resource is secured, and the price or percentage of investment is such that companies can afford to invest with confidence.

The feedback would suggest that the cost and conditions associated to purchasing water in SWISA is making it more difficult than desired. The landowners have an appetite to invest in the water but are hamstrung by the cost and trading conditions.

Volume Per Hectare Examples – Sassafras Wesley Vale District

The district is state as having 20,000Ha of land of which its estimated that 6,500Ha is prime agricultural land. Cropping and grazing volume per hectare sits somewhere between 5ML per Ha to 2ML per Ha.

The purpose of the tables below is to establish, water resource needs and to validate if the frustration presented by landowners is based on their desired to simply achieve a better deal or based on the real prospect of not being able secure the volume they need for the future.

Total utilisation of land and maximum volume per hectare example

Total Land Area	Average Volume Per Ha	Total Potential Volume
20,000Ha	5ML	100,000ML

It would be unlikely the district would ever be in a situation where the volume of water required would reach this level. As such the volume of 100,000ML should be considered not appropriate for the scheme today or into the future at any stage.

Total utilisation of land with an average volume per hectare example

Total Land Area	Average Volume Per Ha	Total Potential Volume
20,000Ha	3.5ML	70,000ML

This could be a volume utilised in an environment where the entire region has the land 100% allocated to crop products, the average volume per hectare is more in line with a diverse region. Whilst it's stated that only 6,500 Ha is current highly productive land, production and farming practices could advance improving opportunities to maximise the use of lower value land.

The value of 70,000ML could be considered as the unreachable goal. On the basis that production would need to be at the upper limits. Environmental impacts and operational impacts could limit the opportunity to reach this level of water utilisation.

Realistic Medium Term Water Usage Potential

Total Land Area	Average Volume Per Ha	Total Potential Volume
12,000	3.5ML	42,000ML

The above is a more likely achievable target. The current high value land could double, and new water will continue to provide business opportunities for companies to invest in the region. Berry production is moving to substrate production, as such the land type is less important than the provision on water. Speaking with Costa's an average of 5ML per hectare is needed. Costa's interest in the region is continuing to increase and they feel that other berry growers will also look to locate to the area. Implementation of vines for wine production also looks to be gaining momentum. At 4ML per hectare and not necessarily requiring traditional cropping land to be successful. These two areas combined could see significant water expansion needs in the future.

Current Water Available – Sassafras Wesley Vale

NRE Water	SWIS / SWISA Water	TasWater	Total
14,500ML	20,000ML (Combined Total)	500ML	35,000ML

Based on the combined volumes estimated, it's likely that a fully developed scheme could provide the water needed to sustain medium to long term growth, however there are some important factors associated to the region which seem to be influencing Landowner's decision making over and above their need to secure the water.

The Northwest Coast of Tasmania traditionally doesn't generate the same value of wealth as other area of the state and the land is a mix of generational and non-generational landowners. Corporatisation is in its early stages.

Up until 10 years ago the water wasn't available in the region to make it hugely profitable and whilst scheme water is providing a means to improve this, developed wealth as a result is still in its early stages.

The area is set for growth, but this growth requires investment in areas outside of just water, the region doesn't have the capacity to invest heavily in both areas at once. the feedback suggests that landowners need time to grow or flexibility in the way debt is managed.

Land parcels in the district are small and the price of land per Hectare is high, furthermore landowners in general don't have enough existing infrastructure or adjoining land to benefit from the model Tasmanian Irrigation uses to sell water.

Note: The above information should be viewed as being developed from general conversations and a historical understanding of the region.

Ref: NRE Water provided by NRE on the 5/1/2022: SWIS/SWISA estimations of total volume proposed including summer and winter water.

[4.0] Pricing Model Proposal

The feedback we have suggest that some landowners with the capacity to purchase larger volumes of water, have the view that they cover the cost of the pipeline, whereas smaller entitlements mostly cover the cost of their own outlet.

- Larger entitlement holders make a small capacity scheme like SWISA viable, the scheme needs a few large volume customers.
- Larger entitlements on a single outlet proportionally cost less to deliver to and maintain.

As such some members of community would like to see price breaks implemented. Proposed pricing model explained below.

[4.1] Pricing Review & Model

SWISA entitlement price is set at $1720.00 ML based on a volume of 8026ML sold, this included additional irrigator capacity for the future. (At approximately 20%)

Preferred Option Forecast

Table 2: Preferred Option Statistics

Total ML Sold	Average Price	Landowner ($) Contribution	Viability	Delta
8026ML	$1720ML	13.8M	100%	$0.00

Forecast Water Sales Result

Table 3: Likely Water Sales Results

Total ML Sold	Average Price	Landowner ($) Contribution	Viability	Delta
4632ML	$1720ML	7.96M	57.71%	$0.00

Landowner feedback stating that "If the entitlement price was $1300, I would buy 500ML". clearly, Tasmanian Irrigation shouldn't be in the business of doing one off deals, but the notion of a pricing model which encouraging the upselling of volume is attractive to the landowner in the region and it would also aid in securing critical volume to increase scheme viability.

Given that its likely, the sold volume of water in SWISA will be in the range of 57% viable and the contributing factors to this include such things as finance and furnishing repayments. TI could consider a pricing break model to help with sales growth.

The pricing model is based on a price break structure, benched at volume levels. Pricing levels could be as listed below.

Table 4: Price Break Model

20ML to 50ML	55ML to 200ML	205ML to 300ML	305ML +
$1720	$1620	$1520	$1420

Example of pricing model calculation

Landowner 1: purchase 50ML of water in an entitlement

50 x $1720ML = $86,000

Average entitlement price = **$1720.00ML**

Landowner 2: purchases 150ml of water in an entitlement

50 x $1720 = $86,000 + 100 x $1620 = $162,000 = $248,000

Average Entitlement price = **$1653.00ML**

The majority of EOI's in the district are small, as such the pricing model doesn't damage the budget heavily, however it would encourage enough landowners to purchase additional water to make the scheme viable. below is the mix of estimated landowner EOI's by volume bracket.

Table 5: EOI's By Volume

20ML to 50ML	55 to 200ML	205ML to 300ML	305ML +
48	20	2	1

Below is a model of the potential volume sold, and cost should the pricing model be implemented. Early indications suggest this is a small investment for the potential return. At the top end of the volume market it will help secure the scheme critical volume and overall it will encourage the purchase of water volume within the next trading bracket.

Table 6: Result of Pricing Model

Total ML Sold	Average Price	Landowner ($) Contribution	Viability	$ Delta
5670ML	$1665ML	9.44M	70.6%	0.364M

(The numbers are based on reviewing the EOI's from 2019, hedging upselling numbers based on current volumes and reinstating high volume EOI's previously downgraded because of issues listed above)

1 = Preferred Option, 2 = Current Estimations 3 = Pricing Model Adoption

Table 7: Volume & Cost Comparison

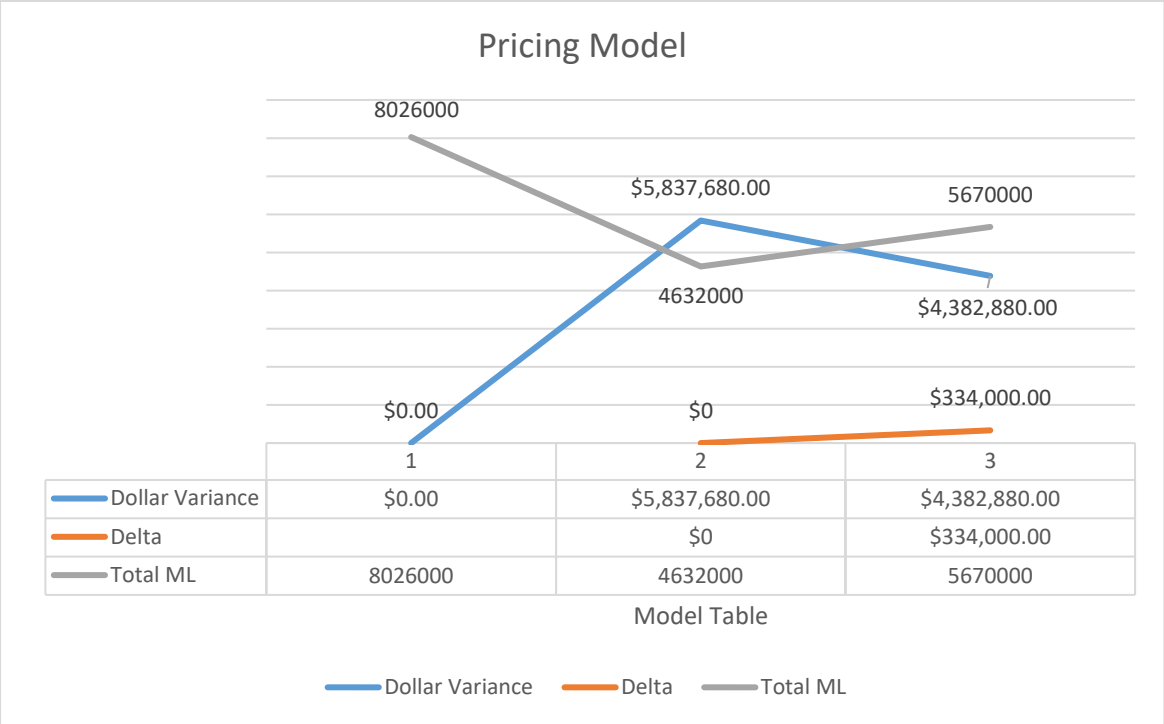
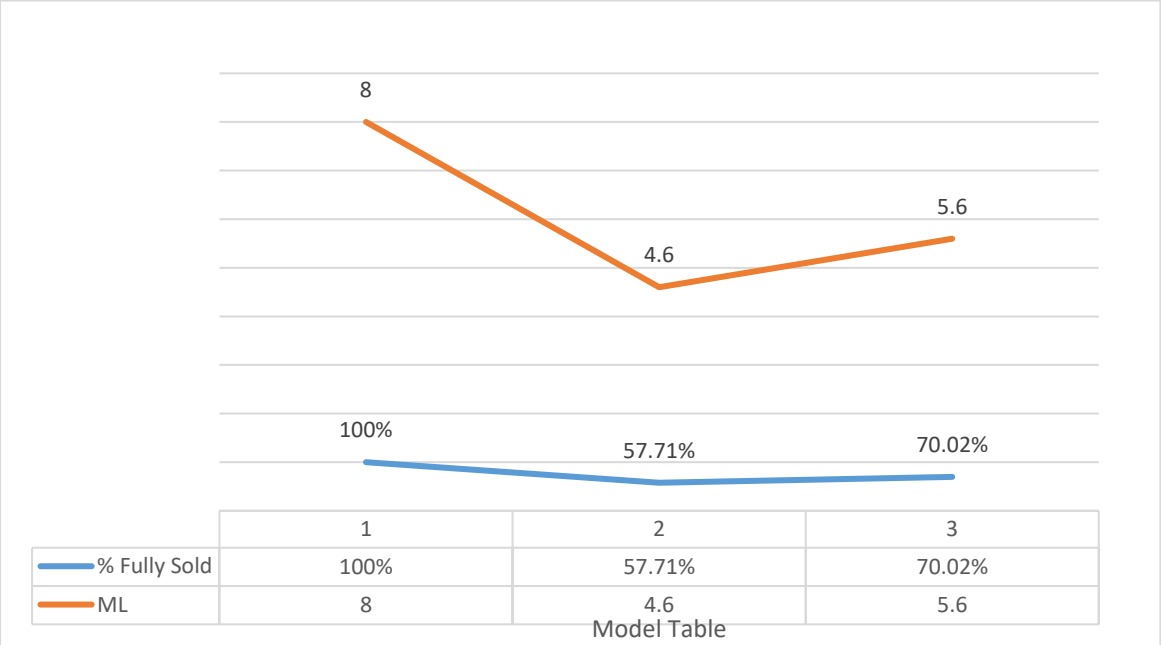


Table 8: Volume & Viability



(Ref: SWISA Volume Review.xls) information collated in the tables above have been developed using a document called SWISA Volume Review.xls in conjunction with SWISA Smart Sheet Contact Register, this register has EOI's listed from 2019, these numbers have been reviewed and remodelled to represent the market in 2021.

[5.0] Payment Model Review & Proposal

Additional feedback suggesting that due to stated issued whereby its difficult secure loans for water in the region. Tasmania Irrigation could change the payment terms to reduce financial stress on landowners by providing extended terms. Landowners would benefit from a payment model which allows them to pay part of the entitlement from a return on the investment of new water. (The current payment plan is as shown below)

Table 9: Current Payment Plan

Sign Contract	Business Case	Scheme Commissioned	Total
2%	8%	90%	100%

[5.1] Proposed Payment Model

The proposed payment model provides landowners with two options, the first is to use the current payment plan listed above. The second is to provide an option to pay two additional seasonal instalments. These two instalments would coincide with the first two seasons of scheme operation. It would be expected that the additional two instalments are subject to X.xx% interest.

Sign Contract	Business Case	Scheme Commissioned	Season 1 completion	Season 2 Completion	Total
2%	8%	60%	15% (+X.xx%)	15% (+X.xx%)	100% (+X.xx%)

(The rate of interest applied and if the debt is held within TI or managed outside of the business needs to be investigated)

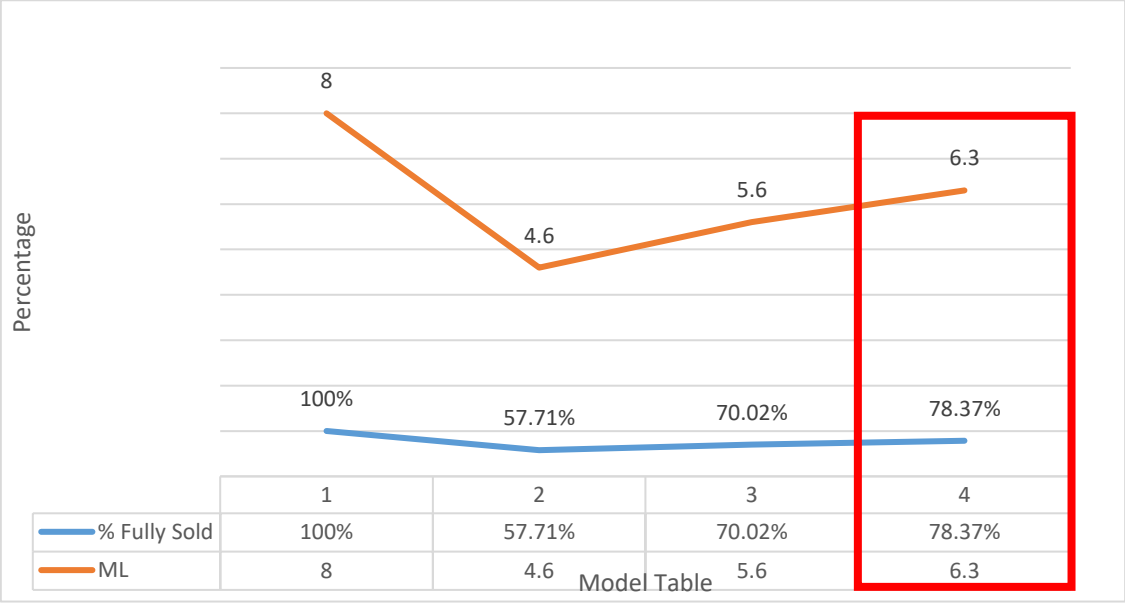
Combining both the pricing and payment model proposals could see the scheme reach the following result. $0.718M Delta. Higher investment from irrigators in dollar terms and an opportunity to recover some of the debt through the imposed interest rate. *(Note, the rate should be higher than landowners could achieve through their financial broker)*

Total ML Sold	Average Price	Landowner ($) Contribution	Viability	$ Delta
6290	$1605ML	10.1M	78%	0.718M

(Note Figures developed by factoring existing EOI's, Market feedback and estimating the likely volume increase because of the pricing and payment model proposal.

1 = Preferred Option 2= Current Estimations 3= Pricing Model Adoption 4= Pricing and Payment Term Adoption

Table 10: Payment Term Variance Included



[6.0] New Entitlement Outlets

It was agreed that SWISA is a new water entitlement for everyone, including SWIS entitlement holders, as such SWIS entitlement holders can ask for an outlet similarly to people who are purchasing their first outlet. Meaning there could be more than one outlet on a property if a SWIS entitlement holder purchase a new entitlement in SWISA. Additional outlets will impact ARL, the scheme already has approx. 140 outlets and as such we should be informing SWIS entitlement holders who intend to purchase an additional entitlement to consider their need wisely. The same rules apply in terms of where an outlet can be located. Providing the flexibility to add an additional outlet could aid the water sales process.

(Note: additional conversations need to be had with Hayden Thorp to co-ordinate replacement of outlets at end of life during the construction phase and to ensure these replacements are funded by ARL and not the SWISA project.)

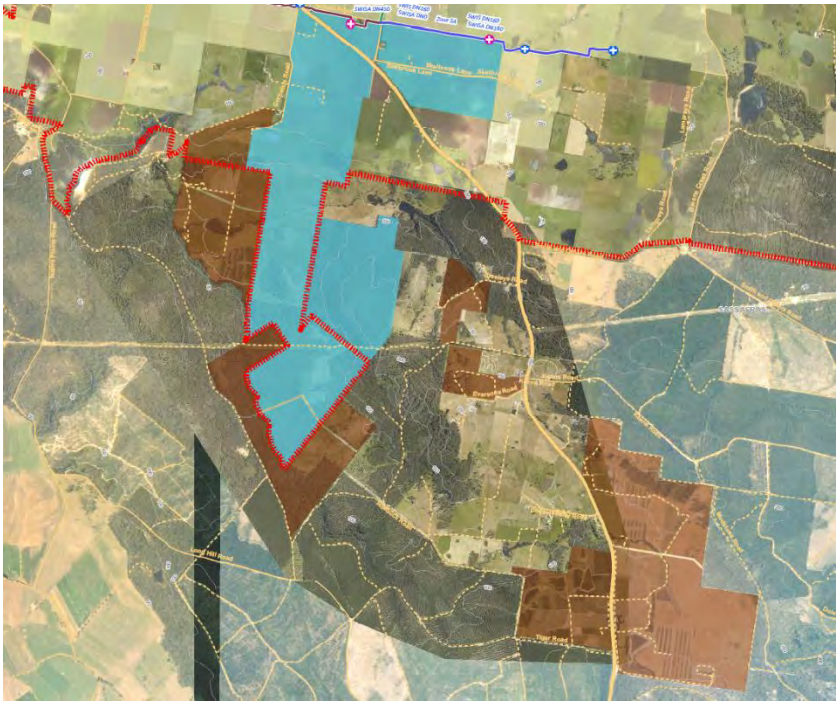
[7.0] Non-Viable Water Volumes

Non-viable water is a concern. The outer reaches of the district are always going to struggle to be viable. but economic growth can come in the form of extending the district.

Areas of interest below, with actions undertaken to review and or improve the supply of water to non-viable regions.

[7.1] Cornelius Road to Huon Aquaculture

Figure 2: Cornelius Road to Huon Aquaculture



The area above shaded in [Brown] indicates non-viable water within this section of the scheme. The volumes are as listed below.

Table 11: EOIs Cornelius Road to Huon Aquaculture

[redacted]	[redacted]	[redacted]	Huon Aquaculture
50ML	50ML	10ML	200ML

To make this line viable, the volume needs to be approx. 550ML and our current EOI is 300ML. The main concern for this non-viable line is that the volume is important to the scheme, and it also promote that the scheme is there to help aid economic growth. Huon Aquaculture is important employer in the community and water is important to their operation. [redacted] owns 'Callipari Wines, Ned Kelly Red' he has purchased land in between [redacted] and Huon Aquaculture with the intention to purchase more land if it becomes available. [redacted] stated he could increase his purchase to 100ML.

This could add 350ML to 400ML to the scheme, we have made allowance by making additional water available within the scheme so part of this should be to make it available for companies who are on the fringes of viability. A holistic approach to the region could be considered here.

Note: We do not expect [redacted] to purchase water.

[7.2] Latrobe Line and Torquay Road

Figure 3: Latrobe Line and Torquay Road

Torquay Road and the Latrobe line both had some issue with viability, in principle this has been addressed. Actions taken during the public consolation period will be enough to secure this non-viable water and to increase the overall capacity in this section of the scheme.

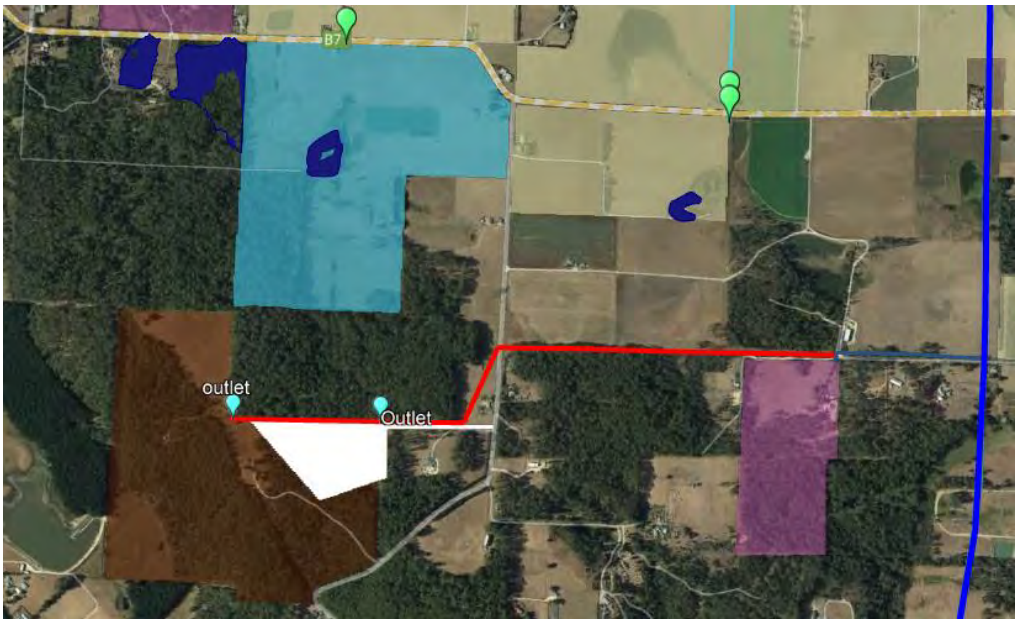
Note: TI should not expect [redacted] to purchase the full EOI amount. (Based on our conversation, where he stated the price was too high and Tasmanian Irrigation was price gouging)

Table 12: EOI's Latrobe Line and Torquay Road

[redacted]	Botanical Recourses	[redacted]	[redacted]	[redacted]
200ML	250ML	32ML	50ML	200ML

[7.3] Palmers Road

Figure 4: Palmers Road



Communication with the landowners in and around Palmers Road has been undertaken, outlining what would be required to provide water. the line in red is based on [redacted] purchasing water along with both [redacted] and [redacted] (shown in Brown and White respectively) purchasing the minimum entitlement.

Table 13: EOI's Palmers Road

[redacted]	[redacted]	[redacted]
20ML	20ML	30ML

[7.4] Parker Ford Road and Milldam Road

Figure 5: Parker Ford and Mill Dam Road

A review of both expression of interest shown as non-viable volumes is underway, the key points to understand are. The volume it would take to make these two EOI's viable, the proposed route and if there is an option to connection Zone NB1 to T1 (not shown) to make it viable for the landowners to purchase a volume at Mill Dam Road which can also be utilised further back within the scheme.

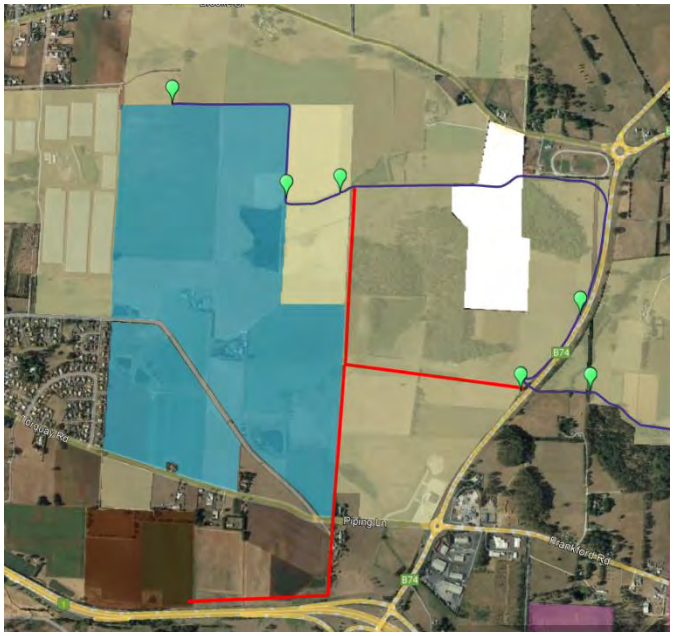
[redacted]	[redacted]	[redacted]	[redacted]
50ML	30ML	150ML	20ML

[8.0] Pipeline Alignment Rejections or Redirections

The preferred option review has seen several pipeline alignments be rejected or a change requested by the community, detail of each is listed below.

[8.1] [redacted]

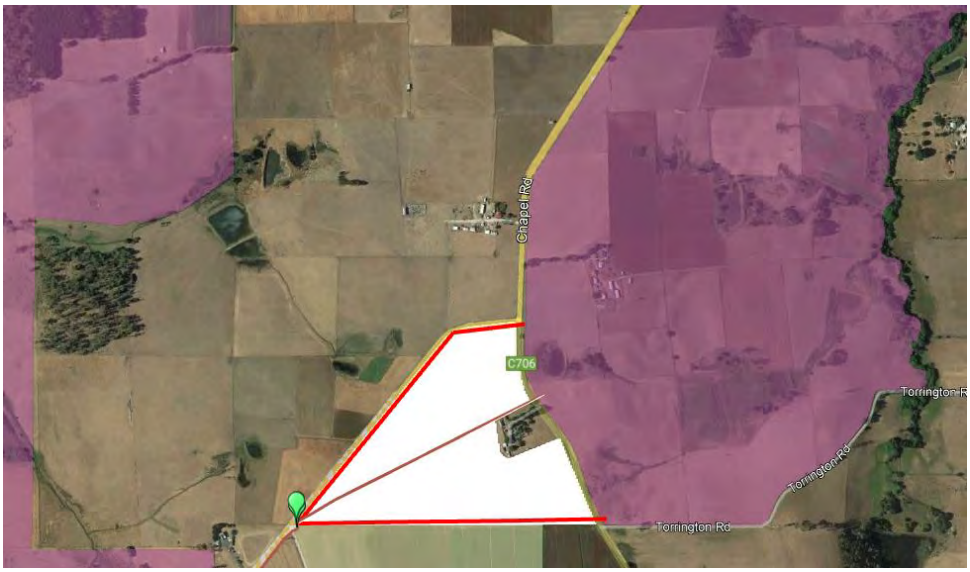
Figure 6 [redacted] Pipeline Reroute



[redacted] made contact in relation to the proposed alignment of the SWISA pipeline. They do not want the pipeline running through there property for personal health reasons.

[8.2] [redacted]

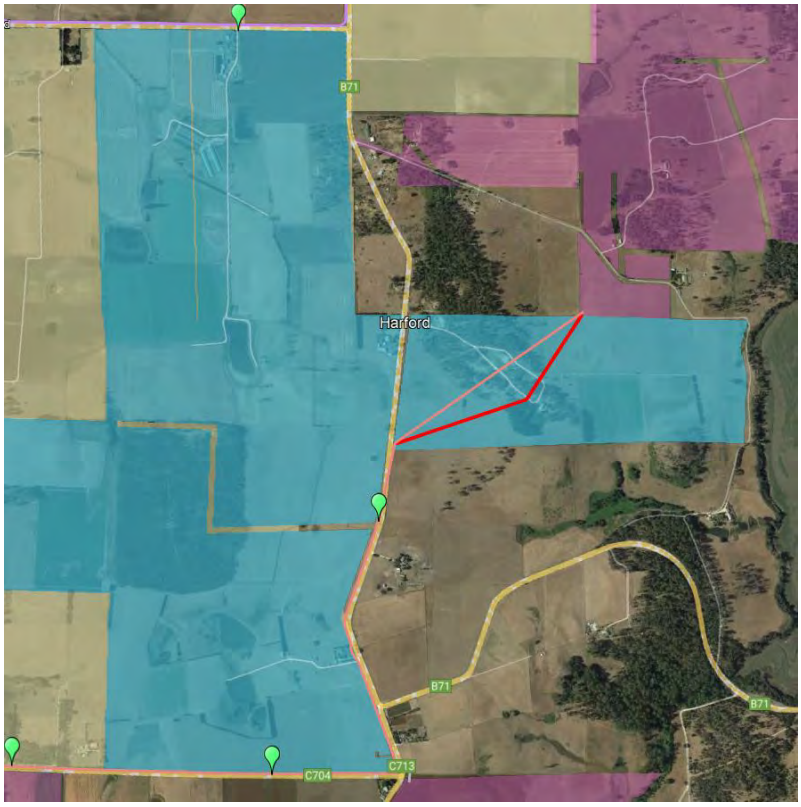
Figure 7: [redacted] Pipeline Reroute



[redacted] requested that the pipeline did not cross their property. No specific reason just doesn't want it on their land.

[8.3] [redacted] Landfall Pipeline Realignment

Figure 8: [redacted] Pipeline Reroute



[redacted] requested a minor redirection of the pipeline to take the water closer to his dam, this is a minimal increase in pipe and is easy to accommodate. It's a better situation than having to go around his boundary should he oppose the current alignment. [redacted] is also interested in purchasing a considerable amount of water with this entitlement and potentially paying to upgrade his other two outlets to make best use of the available flow.

[9.0] General Feedback & Requests

Please find below a summary of the remainder of general feedback points.

1. Additional outlet connection tap points to be included during construction. These points would not be outlets, rather buried tap in points at each change of title. The purpose for this would be to make it more efficient and cost effective to connect a property post the initial construction phase.
2. Scheme specific detail provided, water sales information, flow rate verses volume information and general conversations to field questions about the scheme.
3. Discussion with [redacted] in relation to transferring their direct water entitlement across to Tasmanian Irrigation and making it possible to provide water to [redacted] If the situation allows us to. Process to complete this is underway.
4. Meeting with Costa to discuss scheme outage timing during cut across and their proposed period of minimal impact should the follow of water be disrupted.

[10.0] Hydro Water & Mersey Irrigator Group

As part of the process to understand what is required to be articulated within in the water sales documents and off the back of various people through the scheme asking about the details of Hydro Water. A meeting was organised with Hydro staff in Hobart, with a plan to discuss the new scheme water needs.

In attendance: [redacted]

Meeting Points.

1. The Hydro requires all water to be purchased under one order, combining volume from SWIS, SWISA and the Mersey Irrigation Group
2. The Hydro endorses the concept of automated ordering rather than emails but would not allow direct access to actuate the control valve at Parangana Dam.
3. The valve upgrade is the responsibility of TI, and the size of the valve should accommodate additional flows, such as that required by the Mersey Irrigator Group.
4. There is a planned upgrade of the tunnel at Parangana Dam in the next 5 to 10 years. This will be a major disruptor to the availability of water and TI will need to reinstate the valve at its own cost post or during the upgrade.

In addition, the current price per ML is approximately $75ML to $80ML at 22/12/2021 depending on water delivery methods. The price used to workout scheme charges was based on $67.49ML which equated to $31.00ML to the irrigator.

A discrepancy of approximately $10ML between the published and actual Hydro water cost has been established. The change in price will likely see the allocated price for Hydro water to SWISA enlistment holders being $40 to $42ML,

Calculation Example

3676ML x $75.00 ML = $275,700
275,700 / 6894 = $40.00 ML

3676ML x $80.00 ML = $294,080
294,080 / 6894 = $42.65 ML

- 3676ML = The expected volume purchased from the Hydro
- 6894ML = is the scheme volume used to amortise the price

[10.1] Mersey Irrigator Group

Considering that the Hydro requires Tasmania Irrigation to facilitate the purchasing of water, it was timely to open lines of communicate with the Mersey irrigator Group. Initial contact was made with [redacted] how provided contact details for [redacted]

After talking to [redacted] and providing him with some basic context around the reason to seek a meeting, it was agreed that we would meet in the new year.

The following people are also aware of the intent to meet and propose attending.

- [redacted]
- [redacted]
- [redacted]
- [redacted]

The underlying issues the Mersey Irrigator Group have are.

1. Concerns that taking more water from the river will bring forward and extend cease to take periods.
2. If there is a requirement for a larger valve, they shouldn't have to contribute to the cost.

[11.0] Proposed Scheme Design Changes

The construction and management of SWIS/SWISA has several challenges which will impact areas such as

- Timeline
- Safety
- Constructability
- Performance
- Customer Experience
- Flexibility and longevity

These are all important factors, and they should be considered in the final design. understanding these challenges with a focus on risk mitigation and improved constructability a review of the preferred option should be undertaken.

1. Any new design must work within the budget presented as part of the preferred option.
2. Any new design must not greatly impact the operating costs to landowners.
3. To be implemented the design change must aid to improve one of the areas listed above.

[11.1] Augmentation Design Review

The major areas of concern with the project construction and ongoing delivery of water are.

1. **Tracking back over the existing Wesley Vale pipeline**.
    a. There are areas of residential and lifestyle blocks, which could pose significant risk to the project construction timeframe.
    b. There is an area of threatened species timer the route would have to go through.
    c. The route is not critical to the deliver of water for the first 7km, as there is only one outlet located on the mainline between the reservoir and [redacted] property Outlet.
2. **Boost Pump Stations and Reducing Friction Loss**
    a. The number of boost pump station located in the scheme is directly linked to the elevation of the exiting reservoir.
    b. Reducing system friction loss can be achieved by ringing branch lines but requires the removal of boost pump stations. This is achieved by creating a higher head pressure.
3. **Construction Risk and Operational Risk at Existing Reservoir**
    a. Building and operating scheme assets at the existing reservoir site poses significant risk during construction. The existing reservoir is a failing asset meaning at some point in time accessing the area to maintain the new scheme could prove challenging or unsafe, in addition the existing reservoir could be damaged rending the current scheme inoperable. There is also the potential significant risk to health and safety should something go wrong, furthermore a failure of the reservoir may cause damage to the pump station in the event of a catastrophic failure.
4. **Future Proofing and Trading Flexibility**
    a. Reducing the complexity of the overall scheme, by removing boost pump stations, will also help with additional trading flexibility because of ringing parts of the scheme. in addition, the design should consider how to best manage future expansion.
5. **New Switch Room at Great Bend Pump Station**
    a. There is adequate room at the west facing end of the Great Bend pump station to construct a new switch room, the construction of this room will allow for the safe construction and wiring of the new electrical infrastructure. New transformer, mains cable, switch gear and motor supply cables can all be installed without the need to work in and around energised infrastructure.
    b. Current hardware can be removed as part of the cut over process and the remainder can be removed when it's appropriate to do so.

[11.2] Rising Main and Header Tank Location – Saggers Hill.

Locating the balance tank on top of Saggers Hill, with a new rising main through a forestry road corridor from Great Bend pump station provides some significant advantages over the existing raising main and reservoir location.

Saggers Hill provides approx. 43 metre of elevation gain over the existing reservoir location.

The additional pressure within the lower half of the scheme removes the need for all but one boost pump station, there is still a need for a new pump station on the Sassafras line. The removal of these pump station aids in the removal of 7km of existing Wesley Vale Pulp Mill Line. The scheme can follow an alternative route without compromising pressure loss. Removal of the boost pump stations will aid in ringing the lower half of the scheme. This will in turn provide greater trading flexibility and reduced friction loss.

From an infrastructure perspective we no longer need to schedule in the construction of new boost pump station(s), manage the cut across process of these pump station and the ongoing maintenance associated to having these assets. they will be decommissioned at the end of the project and the Latrobe pump station will not need to be constructed.

The risk of constructing a new reservoir in the vicinity of the existing reservoir is also mitigated.

The Great Bend pump station construction cost will be increased and the cost of a new rising main will need to be added. New risk and cost will be assumed for the construction corridor through what looks to be forestry land.

Early calculation suggests that the construction cost for the design changes will come in close or under the preferred option design. and scheme charges will be similar. Approx. 22 irrigators may pay a slightly higher pumping cost from Great Bend as a result, however they will benefit from high line pressure.

Figure 9: Saggers Hill Rising Main & Tank

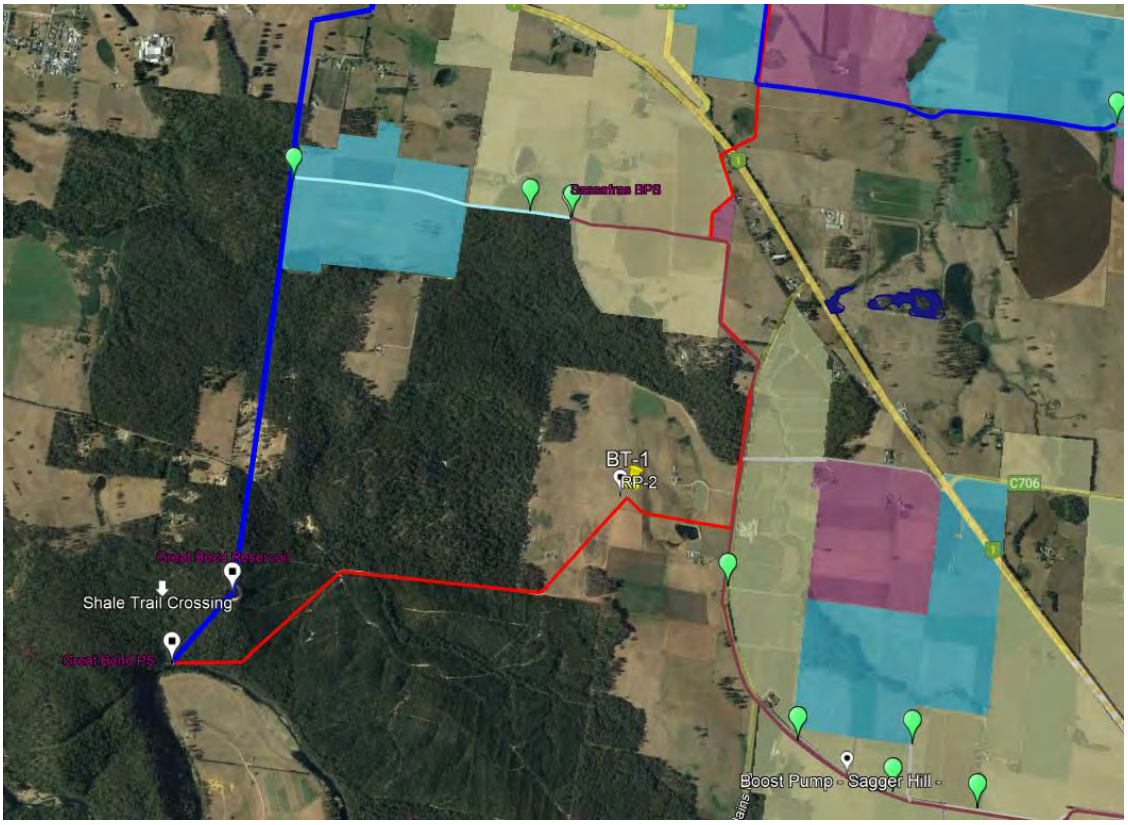
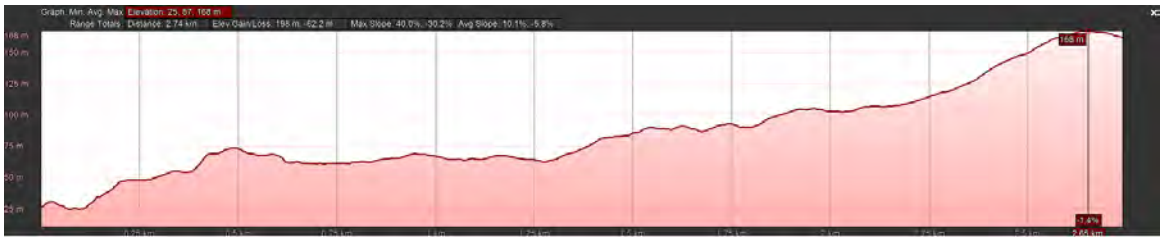


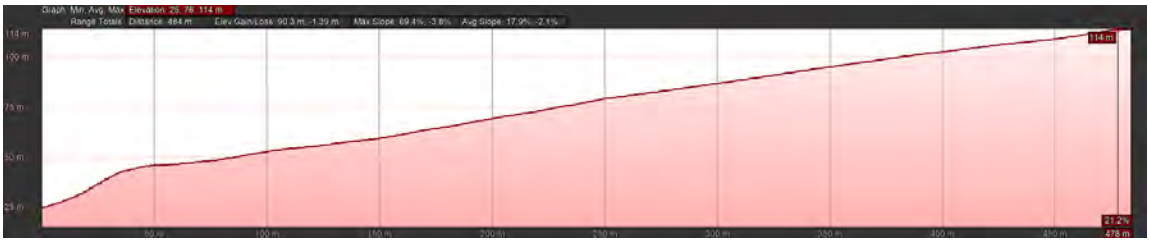
Figure 10:Great Bend to Saggers Hill Reservoir



Great Bend to Saggers Hill Reservoir Statistics

- Elevation Gain from Pump Station =143 metres approx.
- Pressure = 238 PSI at Sea Level – less friction loss.
- Rising Main Length = 2.6KM

Figure 11: Great Bend to Existing Reservoir



Great Bend to Existing Reservoir Statistics

- Elevation Gain from Pump Station =90 metres approx.
- Pressure = 161 PSI at Sea Level – less friction loss.
- Rising Main Length = 0.48KM

[11.3] New Pump Station – Rising Main and Dam Site – [redacted] Property

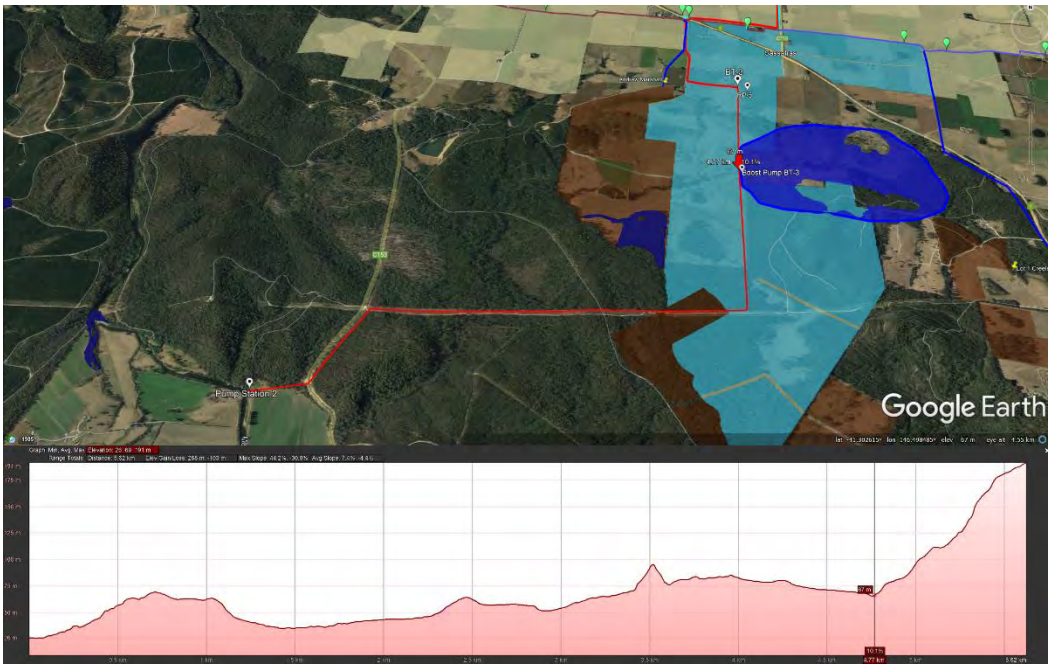
Taking on board some comments from the community regarding how the scheme could be designed to enable later expansion, we investigated a second pump site location, new rising main and the potential for a dam at the top of the scheme.

There are several benefits to this approach

1. It can be built without impacting the existing scheme
2. It could be used as future summer expansion, water could be stored in winter and used in summer
3. The dam storage could do away with the need to buy hydro water during cease to take periods
4. The site lends to a dam and the dam location is where there would be a boost pump station.

Considerations

To make this design beneficial for the future the pipe sizing within the scheme would need to be such that it could carry the additional flow. This upfront cost would be an investment for the future rather than an immediately recoverable cost.



[11.4] New Switch Room at Great Bend Pump Station

There is significant benefit in designing and constructing a new switch room on the western side of great bend pump station, this will provide additional safety and mitigate risk during construction.

Figure 12: Great Bend Switch Room Location

[11.5] Other Design Considerations

1. A second balance tank located on [redacted] property at the top of the scheme, this will provide additional stored capacity and will provide operational flexibility for the new Sassafras boost pump station.
2. Consideration to run 2 x mainlines South to North rather than the existing main Pulp Mill line
    a. The first would source supply from the Saggers Hill balance tank and the second from the proposed Marshall Balance Tank.

[12.0] Summary

The preferred option public consultation period has been straightforward, in general most people are accepting of the scheme and see the value in its implementation. During this period no major complaints have been made which could inhibit the progression of the project from a social, environment or economic perspective. The project does however have challenges to overcome. many of which have been highlighted above and summarised below.

Issues Hampering Water Sales

1. Pricing is an inhibitor for some large volume EOI's – Flexibility will provide a better deal, this is not a fully supported issue, but has been mentioned by several people in the scheme.
2. Payment terms are an inhibitor for some EOI's – People want to secure more water but don't have the capital to purchase everything they need for the future right now.
3. Competing interests and cash flow management.
4. Non-viable water calculator is an impactor to securing additional volume, this is applicable on the scheme fringes.

[13.0] Recommendations

In review of the preferred option feedback and examining the potential results of water sales based on what is known the following recommendation could aid in securing additional water within the scheme.

1. Adopt and communicate the pricing model strategy
    a. This does not have the full support of the IRC, as some on the IRC don't want to be seen as trying to influence the outcome to suit their own business interests.
2. Adopt and communicate the payment model strategy
3. Communication the outlet offers for new entitlements
4. Modify the non-viability measure and provide water to the currently non-viable sites where appropriate
5. Update all documentation to highlight the key changes to the offer
6. Launch Water Sales as an Open Event – focus on these key changes
7. Open Water Sales and run for six weeks and work to maximise the volume sold.
8. Hold a media release to promote the scheme and the opening of water sales.
9. Consider building the scheme to the full licence volume and hold the unsold water as an asset. This water would then be sold at the value of the time.
10. Build the scheme with adequate volume expansion through the pipeline infrastructure, plan, and detail how the next stage of the scheme would be built.

[14.0] Conclusion

In conclusion the scheme would benefit from implementing the changes outlined above. There is enough evidence to suggest that landowner concern and frustration is based on their need for additional water. however, the conditions are hampering their ability to purchase the volume they need long term.

The region is growing, and additional water will aid in continued growth. The scheme would benefit from a long-term approach for the entire irrigation district. With a focus not only on how to provide the stated volume of water proposed now but more broadly develop a plan to ensure increasing capacity in twenty years doesn't require rebuilding the entire scheme for a third time.

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Tasmanian Irrigation Environmental Management Processes

Tasmanian Irrigation Environmental Management Processes provides a chronological framework for all Environmental processes and templates to be completed at each project phase.

Concept and Design			
Task	**Output**	**Guiding documents / processes**	**Who does it**
Undertake a desktop Environmental Risk Assessment Report (ERA)	Protected Matters Search Tool report Natural Values Atlas Report Complete literature review for scheme area. Desktop Environmental Risk Assessment (ERA) report.	Environmental Risk Assessment Template	TI Ecologist
Conduct Flora and Fauna surveys Surveys are to be completed for both terrestrial and aquatic flora and fauna species for pipelines, dam sites and scheme infrastructure. A Survey area if of 100 metres is to be applied with the final construction corridor being 10 m - 30 m. Surveys are to be completed in accordance with National Survey Guidelines Significant impact guidelines to be applied within the report Survey reports will be reviewed by appropriate areas of DPIPWE	Flora and Fauna survey report for dams and pipelines Aquatic habitat report for dam sites and waterways to be used for harvesting or delivering water.	Flora and Fauna Peak Survey Times Survey guidelines for Australia's threatened fish Survey guidelines for Australia's threatened mammals Survey guidelines for Australia's threatened birds Survey guidelines for Australia's threatened frogs MNES Significant impact guidelines Significant impact guidelines for migratory shorebirds Significant impact guidelines for the vulnerable growling grassfrog	Independent consultants
Complete Hydrological Model Hydrological modelling to be completed to determine water availability, establish eflows and determine water operating rules. Report will be used to obtain water licences, dam permits and watercourse authorities Report will be reviewed by appropriate areas of DPIPWE	Habitat preference curves Sustainable yields report Eflow for waterways established Water Licence Dam Permit Watercourse authority	CSIRO Sustainable Yields Tasmanian Environmental Flows Framework (TEFF) Water Management Plans	Independent Consultant TI Manager Environment

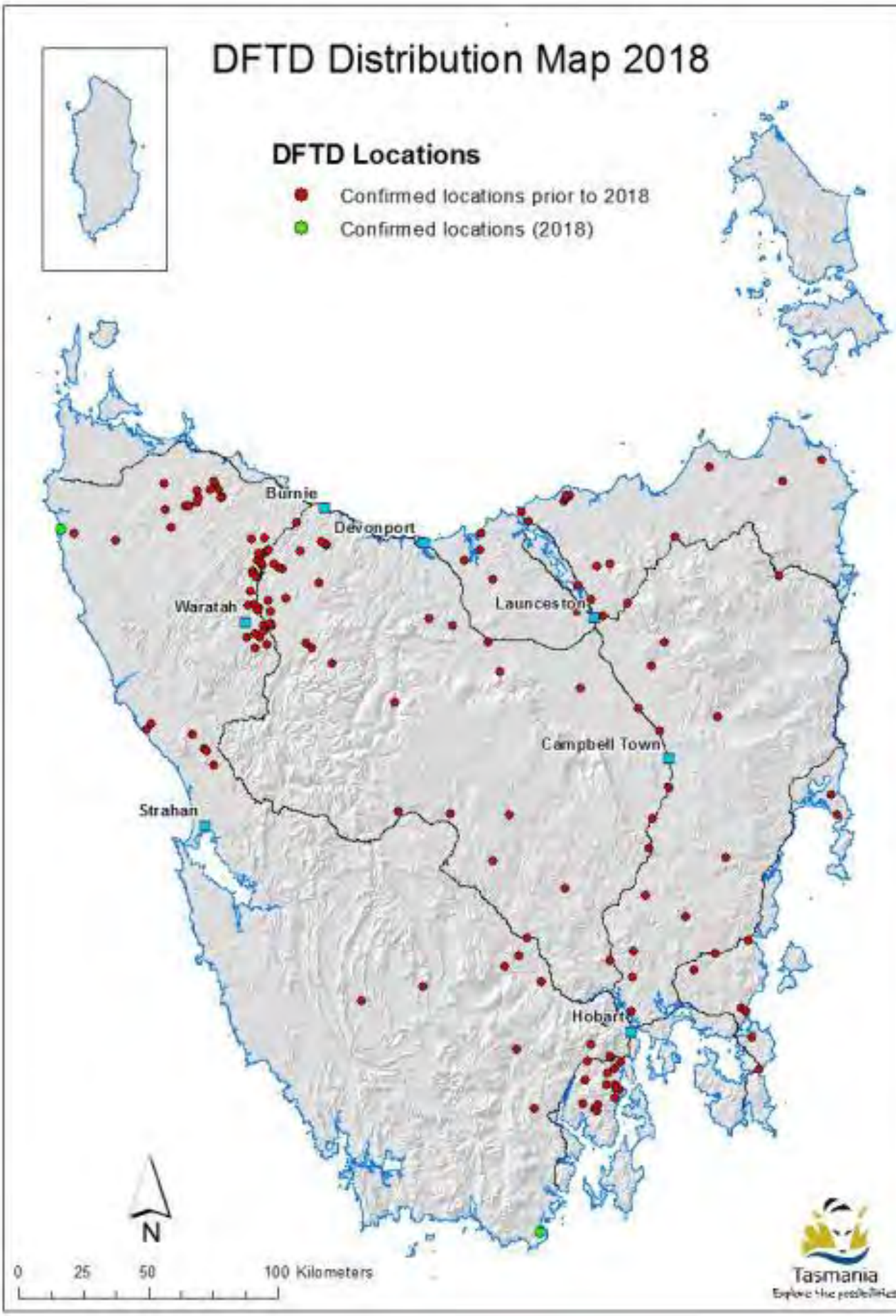
Concept and Design			
Task	**Output**	**Guiding documents / processes**	**Who does it**
Commence water quality monitoring Baseline water quality monitoring is conducted for a minimum of 2 years before construction. Water quality is then continually monitored for the life of the scheme.	Scheme water quality monitoring program Site specific water quality triggers	ANZECC Guidelines DPIPWE Baseline Water Quality Monitoring Program (BWQMP)	TI Ecologist / Scheme operators
Develop Environmental Protection Requirements and Environmental Protection Guidelines This document is used to outline the specific environmental requirements that the contractor must adhere to during construction.	Scheme specific Environmental Protection Requirements and Environmental Protection Guidelines	APIA Guidelines Standard Environmental Protection Requirements Standard MNES management actions	TI Manager Environment
Development of rehabilitation and offset plans for construction Where impacts on MNES cannot be avoided and offset proposal will be developed. The offset proposal will be approved by the ACDC.	Offset plan for area impacted.	ACDC Offset Guidelines EPBC Act environmental offsets policy EPBC Act environmental offsets assessment guide	TI Manager Environment
Construction Alignment sheets (Environmental Constraints Map) This document is used to inform the construction contractor of environmental constraints that need to be managed during construction. They are also used to monitor compliance.	Completed alignment sheet map series	Environmental Constraints Maps/ Alignment sheets	TI Environment Manager
Develop contract documents for the Tender process and awarded construction contractor	Standardised tender and contract documents clearly outlining environmental requirements for the project.	Example Documents to be provided to the contractor to assist them in developing a CEMP • APIA guide • Weekly Environmental Inspection Checklist • CEMP example • Environmental Constraints Map/Alignment sheets • Erosion and Sediment Control Plan example	TI Project Manager and Manager Environment

		• Erosion and Sediment Control Procedure • Weed Management Plan example • Water Quality monitoring example • Tasmanian Washdown Guidelines for Weed and Disease Control-Machinery, Vehicles & Equipment Edition 1 • Keeping it clean A Tasmanian field hygiene manual to prevent the spread of freshwater pests and pathogens • Forestry Practices Code	

Construction			
Task	**Output**	**Guiding documents / processes**	**Who does it**
Approval of Construction Environmental Management Plan The contractor is required to lodge a CEMP with TI that complies with all permits, approvals and guidelines. A review template is used to review the contractors CEMP. Construction work cannot be approved until and approved CEMP is in place.	Approved CEMP	CEMP Review Template Example CEMP	Manager Environment
Conduct any required pre-construction ecological surveys and translocation (Giant freshwater crayfish, Tasmanian Devils, Green and Gold Frog) For schemes that have management requirements for Giant freshwater crayfish, Tasmanian Devils, Green and Gold Frog, or threatened flora and ecological communities, pre-construction surveys must be conducted. Any identified individuals must be or avoided or translocated in accordance with a translocation and rehabilitation plan.	Survey Report	Burrowing Monitoring and Decommissioning Protocol Giant Freshwater Crayfish Protection Protocol	Independent Consultant TI Ecologist

Ecological surveys for areas of pipeline realignment This survey is required only if the contractor changes the proposed alignment outside of the 100m survey corridor which was assessed during the Design phase.	Ecological Risk Assessment Report for minor alignment changes Flora and Fauna Report for substantial re-alignments.	Ecological Risk Assessment Procedure	Independent Consultant TI Ecologist
Implementation of the Construction Environmental Audit Schedule. Three audits of the contractors approved CEMP are conducted as a minimum standard during construction. The purpose of the audits is to determine whether the contractor is complying with the CEMP and regulatory requirements.	Audit reports	ISO 19001 Guidelines for auditing management systems Environmental Audit Schedule Procedure Audit Plan	Environmental Officer
Construction Water Quality Monitoring Program Water quality monitoring is to be conducted by the contractor for all major watercourse crossing, during dam construction and across the construction area. Water quality readings must be provided to TI weekly.	Weekly water quality monitoring report	Water Quality Monitoring Framework	TI Manager Environment
Implementation of Incident Management System Environmental incidents/ non-conformances are raised during the construction phase when the contractor contravenes administrative conditions or causes environmental harm. TI will oversee there implementation of corrective actions and report progress to management and reports any notifiable incidents to DoE and EPA.	Incident Reports Environmental Impact Assessment Reports	Environmental Incident Procedure Environment incident report Environmental Incident Investigation Report	TI Manager Environment
CEMP Compliance Report Tasmanian Irrigation will lodge a Construction Environmental Compliance Report with DoE one month after practical completion.	Construction Environmental Compliance Report		TI Manager Environment

Operations			
Task	**Output**	**Guiding Documents**	**Who does it**
Water Quality Monitoring Undertake monthly water quality monitoring for each operational scheme.	Monthly water quality monitoring data Annual water quality report card	Water quality monitoring programme and site specific triggers	TI Scheme operators / Ecologist
Aquatic Habitat Monitoring Undertake habitat monitoring (AusRivas, Pest Fish, aquatic habitat) according to MNES risk profile.	Aquatic Habitat monitoring report Fish monitoring report template	AusRivas Guidelines	TI Ecologist
Implement Farm WAP Framework Any area of land that receives TI Water must have a Farm Water Access Plan in place. Water applied within the Farm WAP area must be in accordance with the Farm WAP.	Farm WAP for each area of land to be irrigated with TI water. Annual Farm WAP audits	Farm WAP Modules Farm WAP Framework Farm WAP Audit Programme Farm WAP Audit Protocol Farm WAP Compliance Framework Farm WAP Prequalification Process	TI
Implementation of Incident Management System Environmental incidents/ non-conformances are raised during operations when scheme operations contravenes administrative conditions or causes environmental harm. TI will oversee there implementation of corrective actions and report progress to management and reports any notifiable incidents to DoE and EPA.	Incident Reports Environmental Impact Assessment Reports	Environmental Incident Procedure Environment incident report Environmental Incident Investigation Report	TI Manager Environment
Annual Water Entity Report Completed annually for each scheme the water entity reports documents compliance against permits and approvals.	Water Entity Report	Annual Report Guidelines for Water Entities Administering Irrigation Districts	TI Manager Environment


DFTD Distribution Map 2018
DFTD Locations
Confirmed locations prior to 2018
Confirmed locations (2018)
Burnie
Devonport
Waratah
Launceston
Campbell Town
Strahan
Hobart
N
0
25
50
100 Kilometers
Tasmania

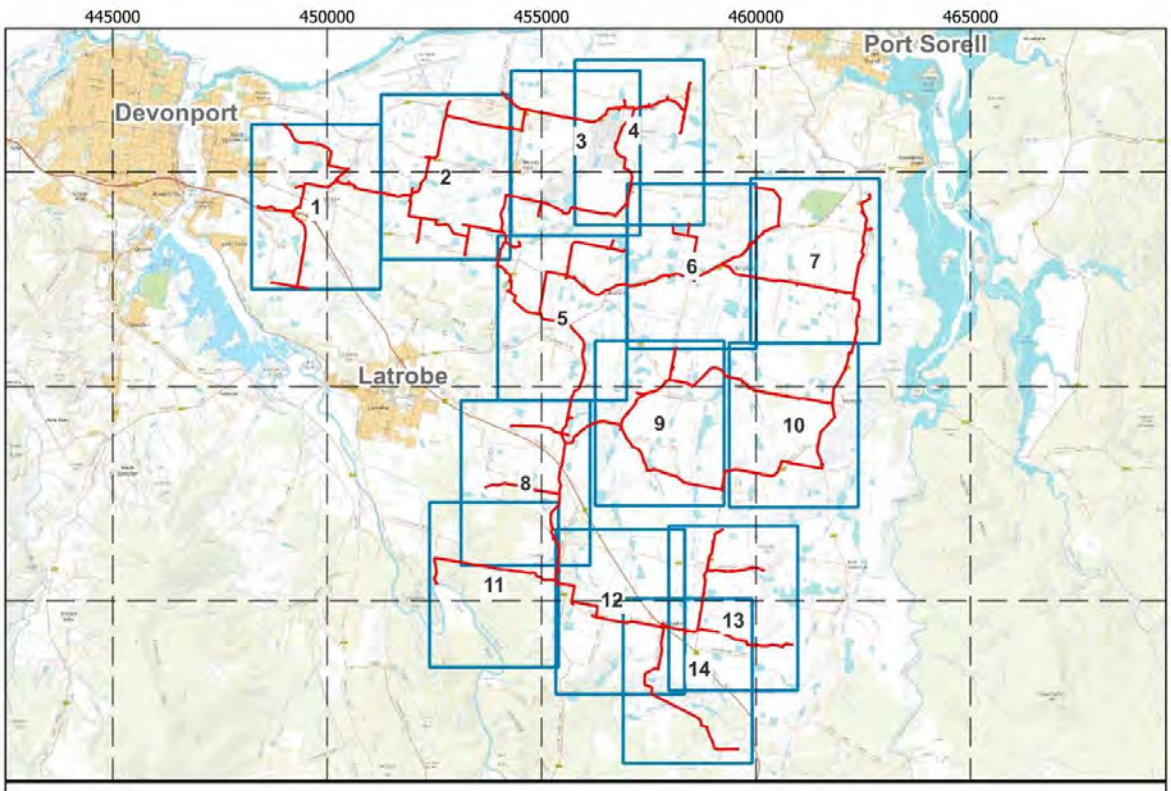
Sassafras - Wesley Vale Irrigation Scheme Augmentation

Appendix A – Map of Natural Values

For Tasmanian Irrigation (IDB031)

313 Macquarie Street, Hobart Tasmania, 7000
03 62319788
admin@northbarker.com.au www.northbarker.com.au

Appendix A – Map of Natural Values



Natural value records (TSPA/EPBCA)

Threatened fauna observations

- Green and gold frog (v/VU)
- Tasmanian devil (e/EN)*
- Spotted-tail quoll (r/VU)*
- Burrowing crayfish (e/EN)
- Central north burrowing crayfish (e/EN)
- Central north burrowing crayfish (e/EN)

Threatened fauna habitat

- Central north burrowing crayfish (e/EN) potential habitat
- Green and gold frog (v/VU) potential habitat
- Eagle nests (labelled with NVA ID and accuracy)

Hollow nesting birds potential habitat

- Swift parrot** foraging and nesting trees
- Swift parrot** nesting trees
- Swift parrot** foraging trees
- Swift parrot** areas of habitat trees
- Masked owl** nesting trees
- Masked owl** and swift parrot** areas of habitat trees

Other threatened fauna habitat

- Fauna burrow

Threatened flora

- Persicaria decipiens (r/-)
- Persicaria decipiens (v/-)

Vegetation

Using TASVEG 4.0 mapping units

- (DAC) Eucalyptus amygdalina coastal forest and woodland
- (DAM) Eucalyptus amygdalina forest on mudstone
- (DOB) Eucalyptus obliqua dry forest
- (DOV) Eucalyptus ovata forest and woodland
- (DSC) Eucalyptus amygdalina - Eucalyptus obliqua damp sclerophyll forest
- (NME) Melaleuca ericifolia swamp forest
- (OAQ) Water, sea
- (WOR) Eucalyptus obliqua forest over rainforest
- (WOL) Eucalyptus obliqua forest overLeptospermum

Design elements

- Proposed SWISA alignment (July 2023)
- Construction corridor
- Design corridor
- Pump station
- Saggers Hill reservoir

NVA threatened flora points

(Source: Natural Value Atlas as of July 2023)

- Ba - Brunonia australis (r/-)
- Cac - Caladenia congesta (e/-)
- Cc - Caladenia caudata (v/VU)
- Cd - Comesperma defoliatum (r/-)
- Cn - Corunastylis nuda (r/-)
- Cr - Cassinia rugata (e/VU)
- Cs - Calystegia soldanella (r/-)
- Ct - Caladenia tonellii (e/CR)
- Dg - Desmodium gunnii (v/-)
- Gp - Gratiola pubescens (r/-)
- Gyp - Gynatrix pulchella (r/-)
- Is - Isolepis stellata (r/-)
- La - Leucopogon affinis (r/-)
- Ls - Lythrum salicaria (v/-)
- Pcg - Pimelea curviflora var. gracilis (r/-)
- Pd - Persicaria decipiens (v/-)
- Pl - Prasophyllum limnetes (e/CR)
- So - Solanum opacum (e/-)

* Labelled with observation type
** Swift parrot (e/CR), Tasmanian masked owl (e/VU)

Base data from theLIST (www.thelist.tas.gov.au)
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD

N

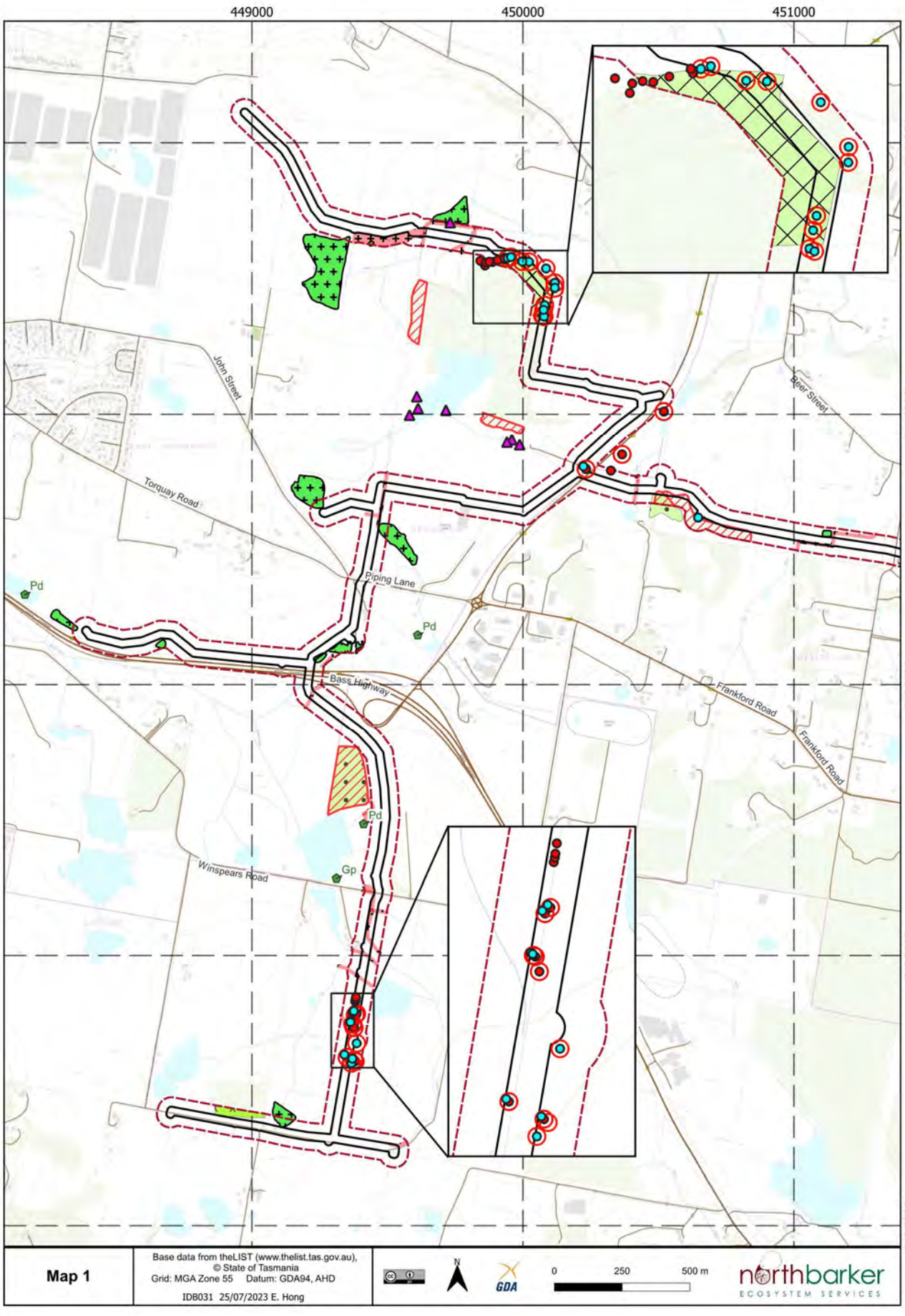
GDA

0 2.5 5 km

northbarker ECOSYSTEM SERVICES

IDB031 27/07/2023 E. Hong

The mapping has been undertaken using a hand held GPS and subjective interpretation. Consequently it should be considered indicative only.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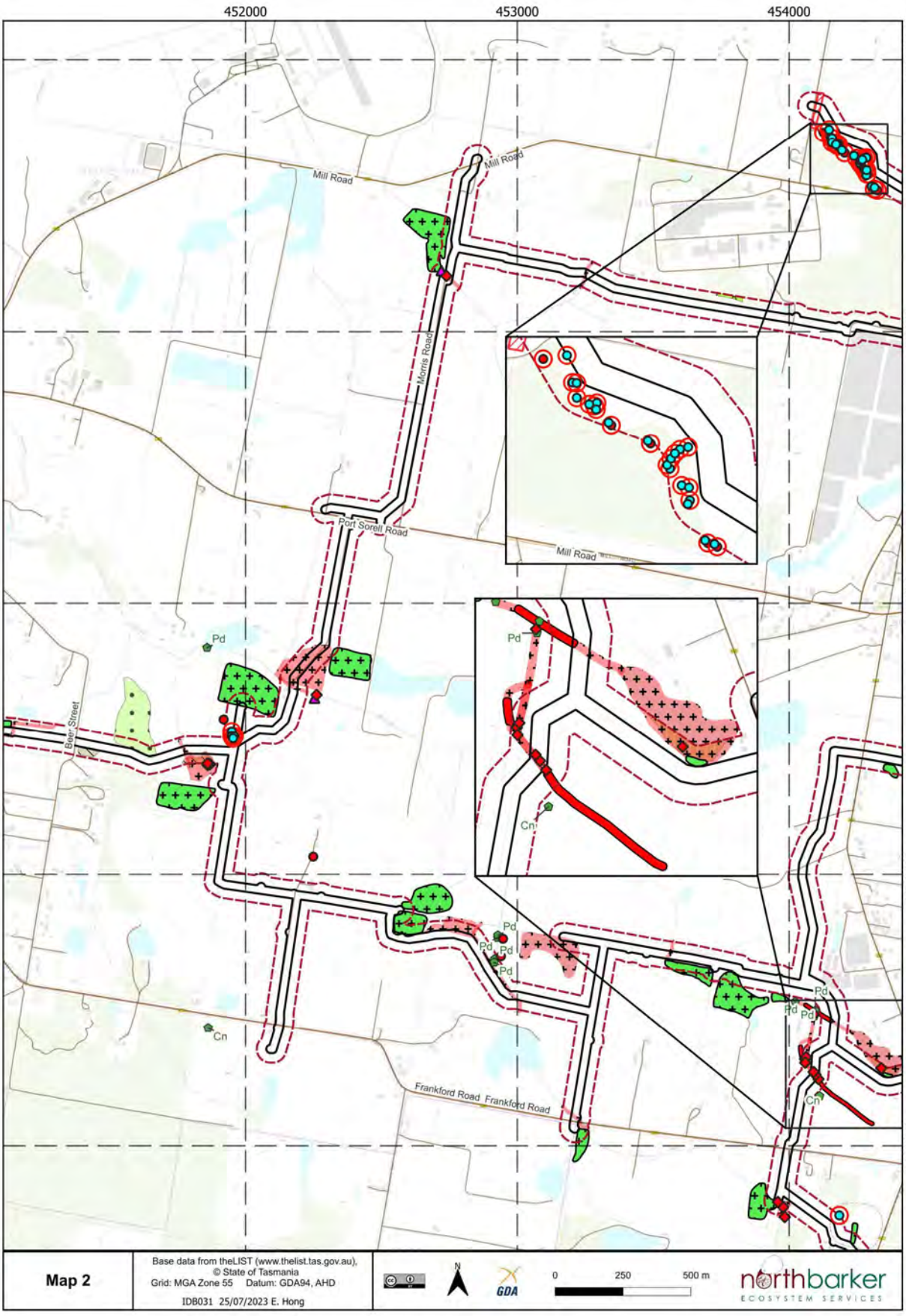
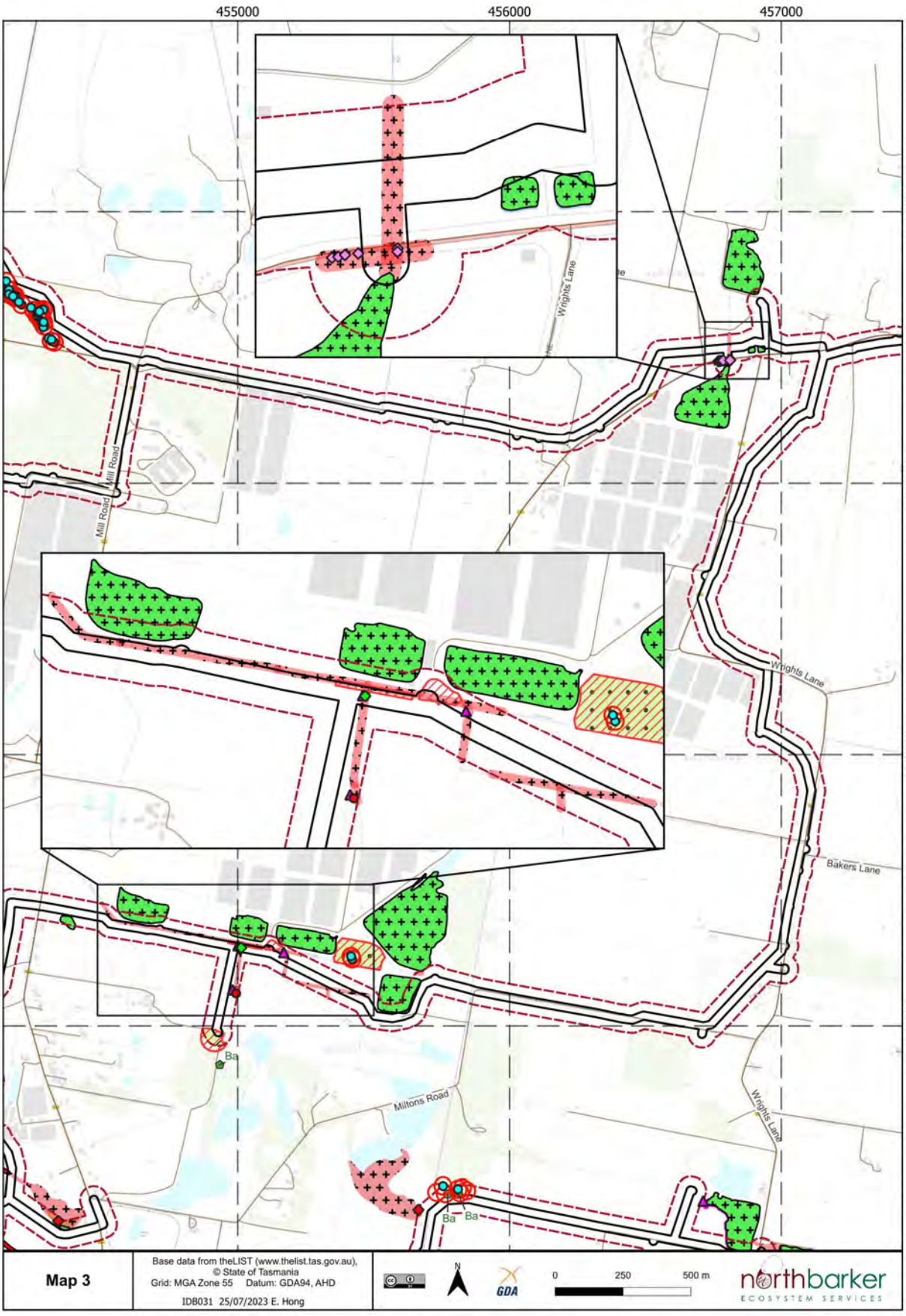
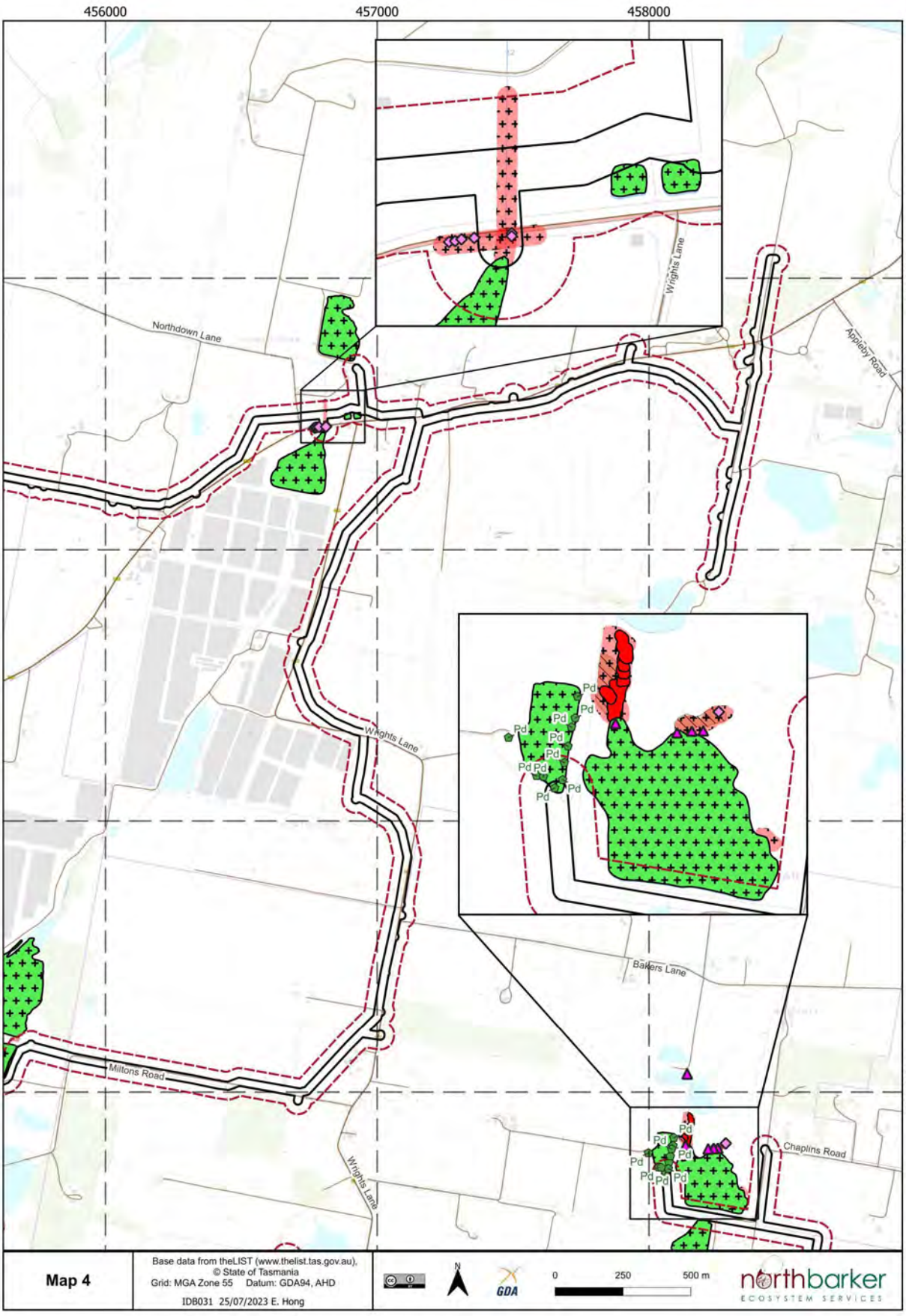
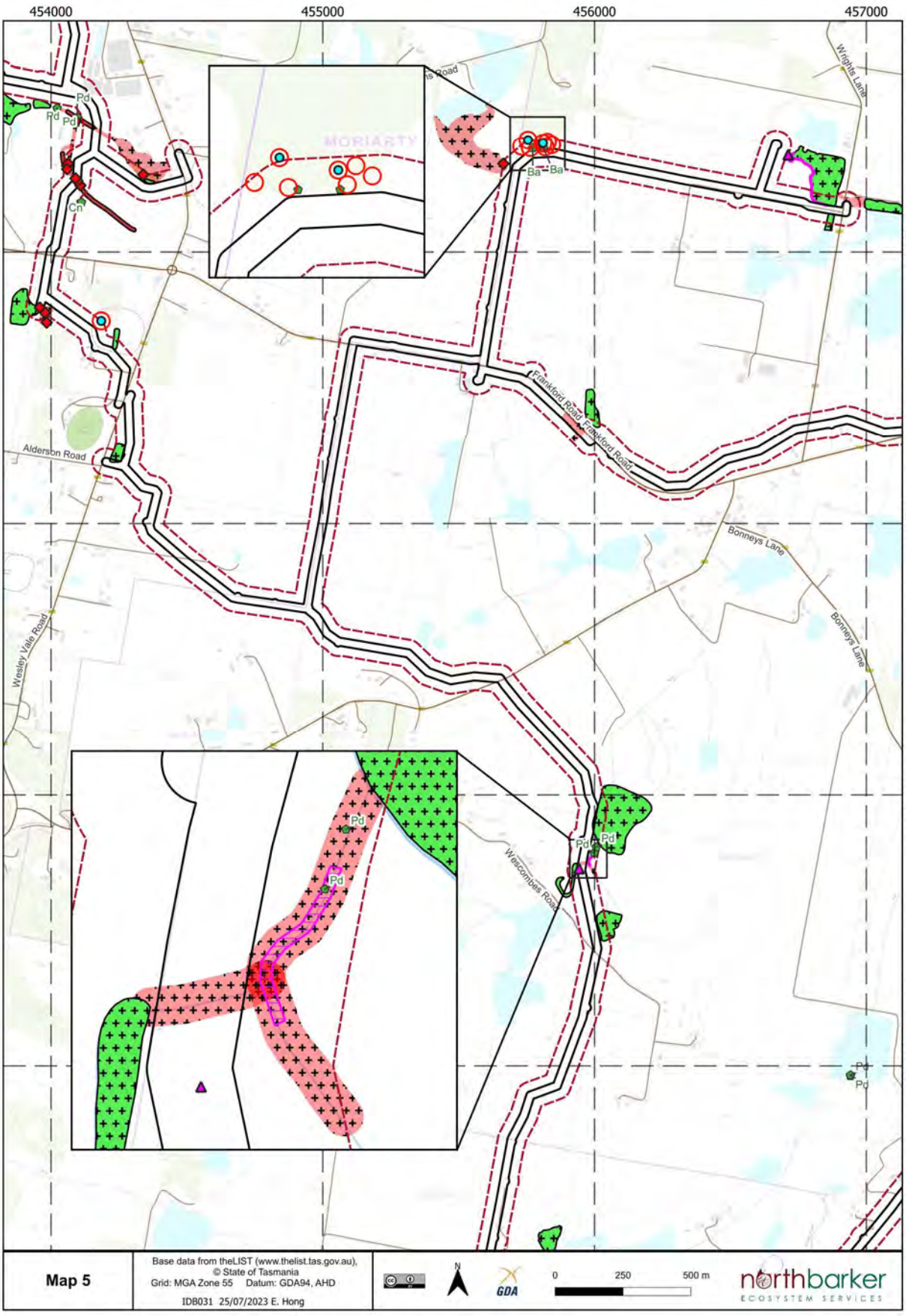
450000
451000
5441000
5440000
5439000
5438000
5437000
John Street
Beer Street
Torquay Road
Piping Lane
Bass Highway
Frankford Road
Frankford Road
Winspears Road
Pd
Pd
Pd
Gp
Map 1
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
IDB031 25/07/2023 E. Hong
N
GDA
0
250
500 m
northbarker
ECOSYSTEM SERVICES


452000
453000
454000
5442000
5441000
5440000
5439000
5438000
Mill Road
Mill Road
Morris Road
Port Sorell Road
Mill Road
Beer Street
Frankford Road
Frankford Road
Pd
Cn
Map 2
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
IDB031 25/07/2023 E. Hong
N
GDA
0
250
500 m
northbarker
ECOSYSTEM SERVICES


455000
456000
457000
5442000
5441000
5440000
5439000
Wrights Lane
Mill Road
Mill Road
Wrights Lane
Bakers Lane
Miltons Road
Wrights Lane
Ba
Ba
Ba
Map 3
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
IDB031 25/07/2023 E. Hong
N
GDA
0
250
500 m
northbarker
ECOSYSTEM SERVICES


456000
457000
458000
5442000
5441000
5440000
5439000
Northdown Lane
Wrights Lane
Appleby Road
Wrights Lane
Bakers Lane
Miltons Road
Wrights Lane
Chaplins Road
Pd
Map 4
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
IDB031 25/07/2023 E. Hong
N
GDA
0
250
500 m
northbarker
ECOSYSTEM SERVICES


454000
455000
456000
457000
5438000
5437000
5436000
5435000
Wrights Lane
Frankford Road
Alderson Road
Bonneys Lane
Wesley Vale Road
Wescombes Road
Pd
Rd
Cn
Ba
Map 5
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
IDB031 25/07/2023 E. Hong
N
GDA
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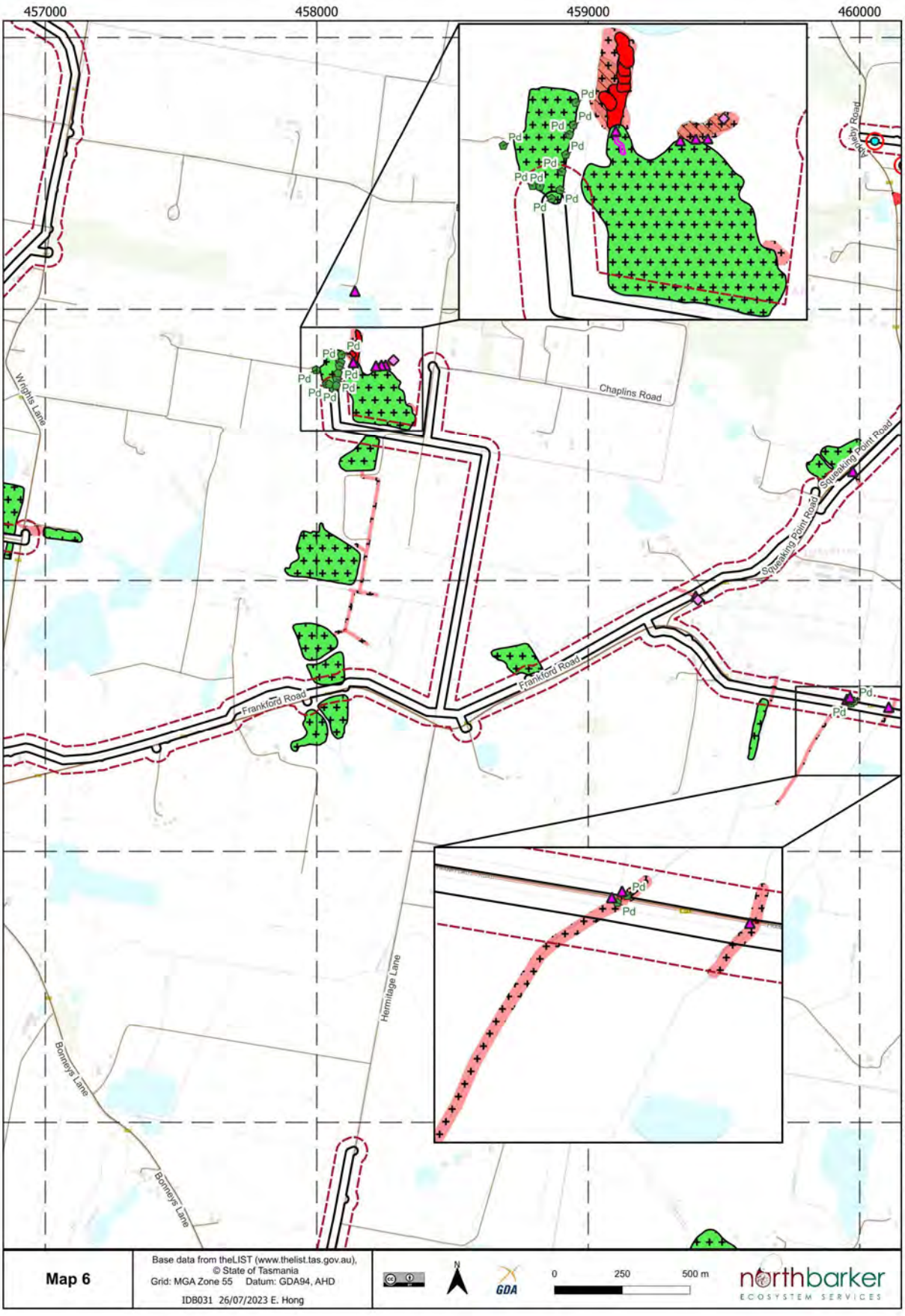
250
500 m
northbarker
ECOSYSTEM SERVICES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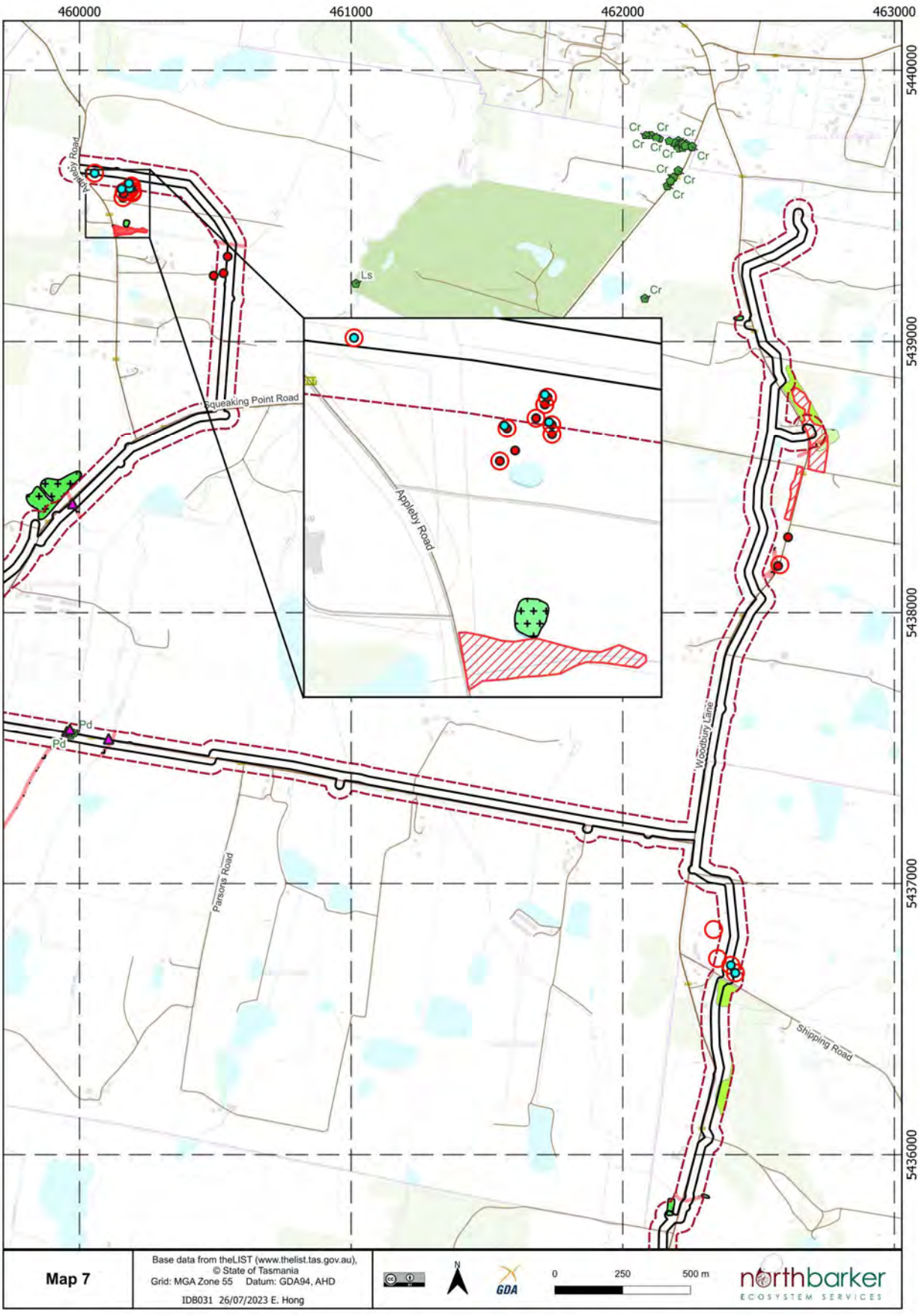
458000
459000
460000
5440000
5439000
5438000
5437000
5436000
Pd
Chaplins Road
Wrights Lane
Frankford Road
Frankford Road
Squeaking Point Road
Squeaking Point Road
Hermitage Lane
Bonneys Lane
Bonneys Lane
Map 6
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
IDB031 26/07/2023 E. Hong
N
GDA
0
250
500 m
northbarker
ECOSYSTEM SERVICES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461000
462000
463000
5440000
5439000
5438000
5437000
5436000
Squeaking Point Road
Appleby Road
Woodbury Lane
Parsons Road
Shipping Road
Cr
Ls
Pd
Map 7
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
IDB031 26/07/2023 E. Hong
GDA
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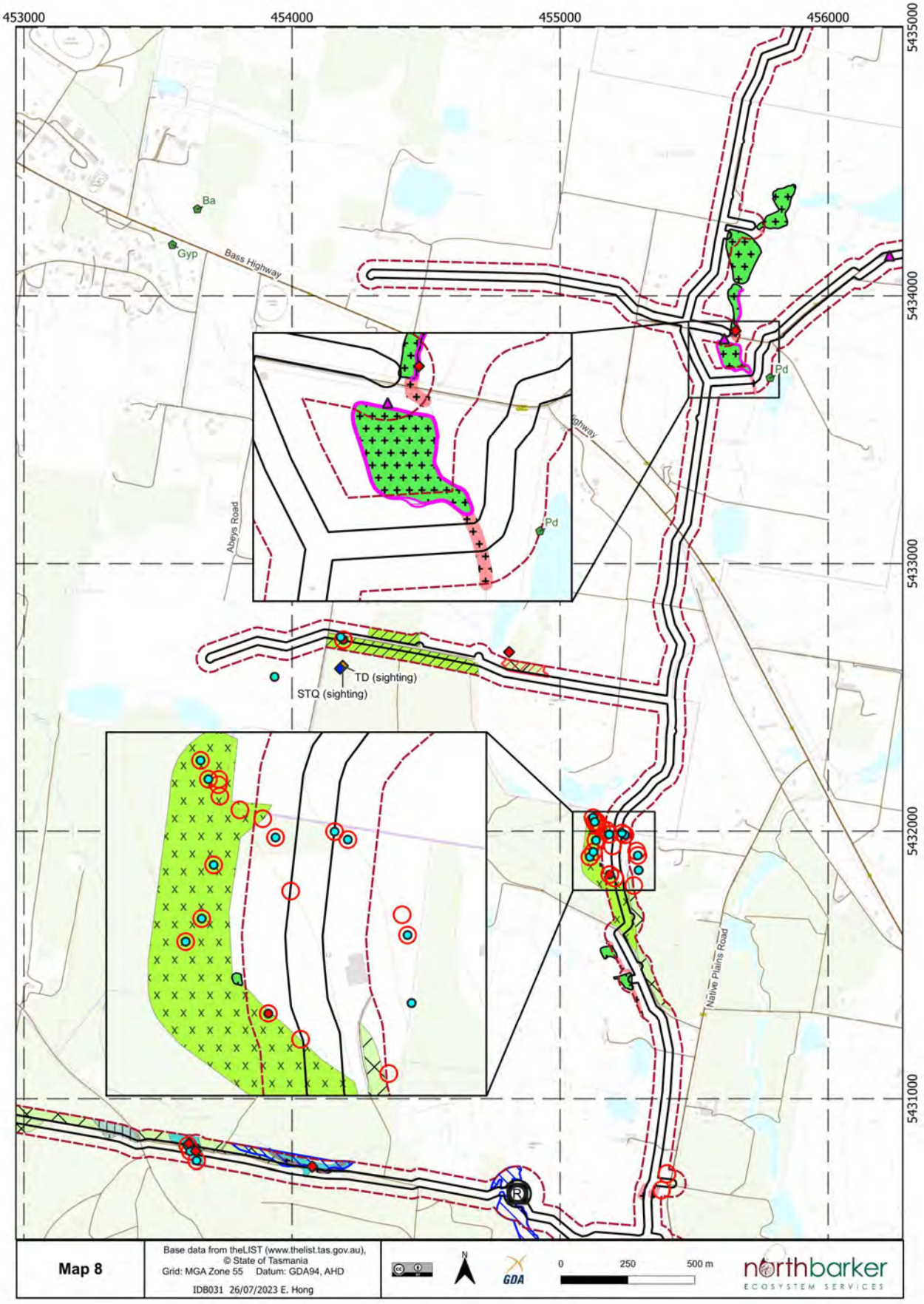
500 m
northbarker
ECOSYSTEM SERVICES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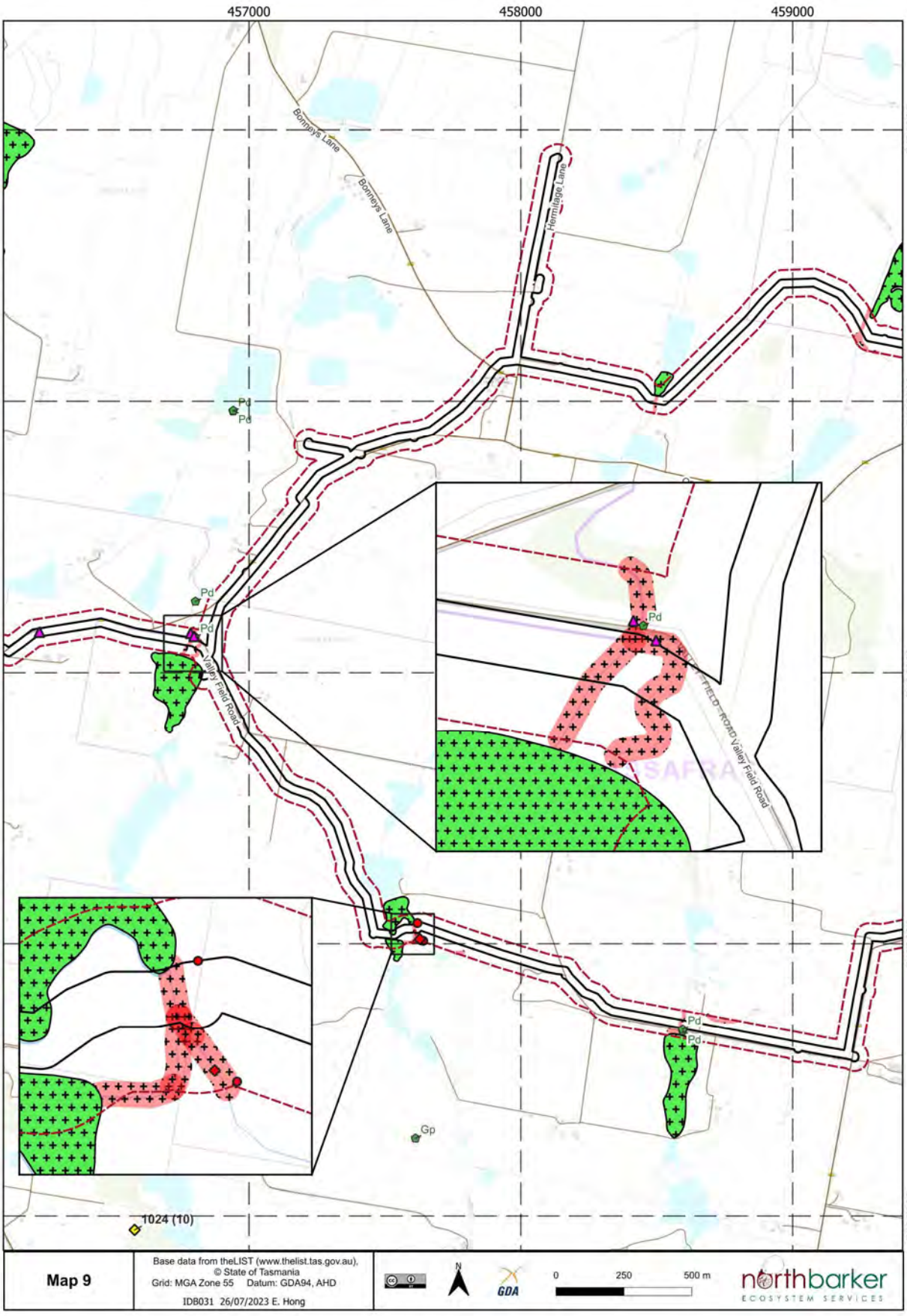
454000
455000
456000
5435000
5434000
5433000
5432000
5431000
Ba
Gyp
Bass Highway
Pd
Pd
Abeys Road
TD (sighting)
STQ (sighting)
Native Plains Road
Map 8
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
IDB031 26/07/2023 E. Hong
N
GDA
0
250
500 m
northbarker
ECOSYSTEM SERVICES


457000
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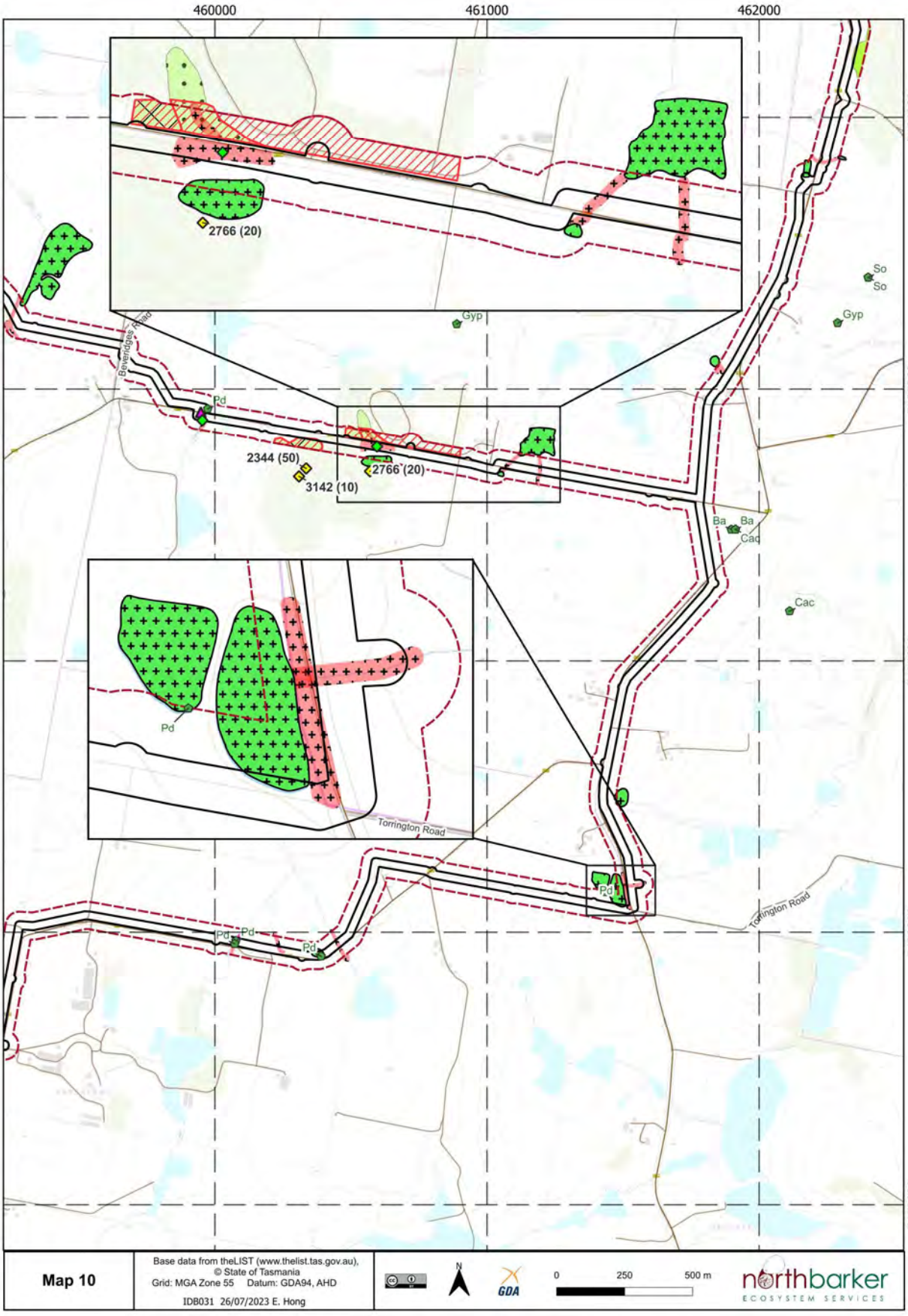
459000
5436000
5435000
5434000
5433000
5432000
Bonneys Lane
Bonneys Lane
Hermitage Lane
Valley Field Road
Valley Field Road
Pd
Gp
1024 (10)
Map 9
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
IDB031 26/07/2023 E. Hong
N
GDA
0
250
500 m
northbarker
ECOSYSTEM SERVICES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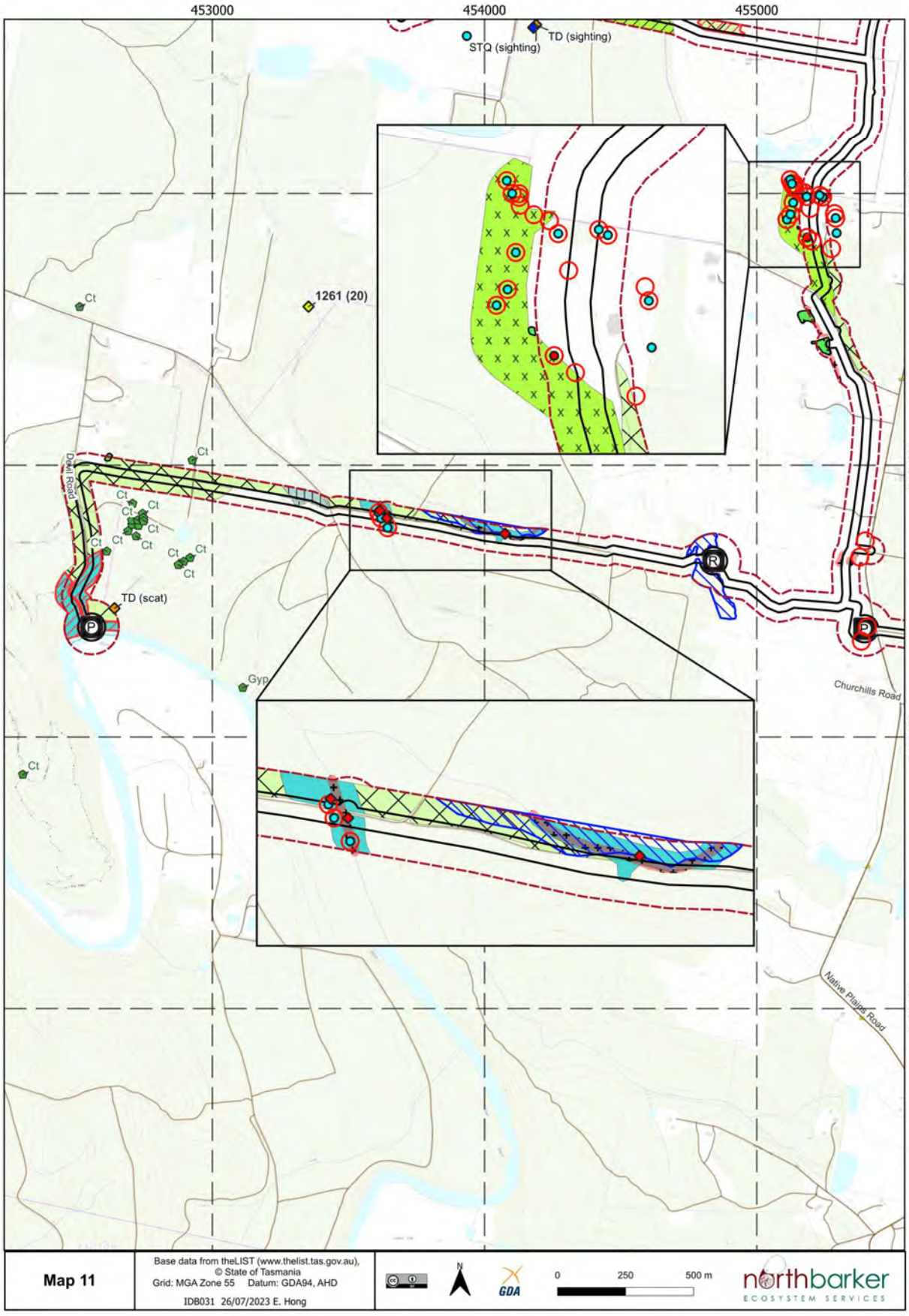
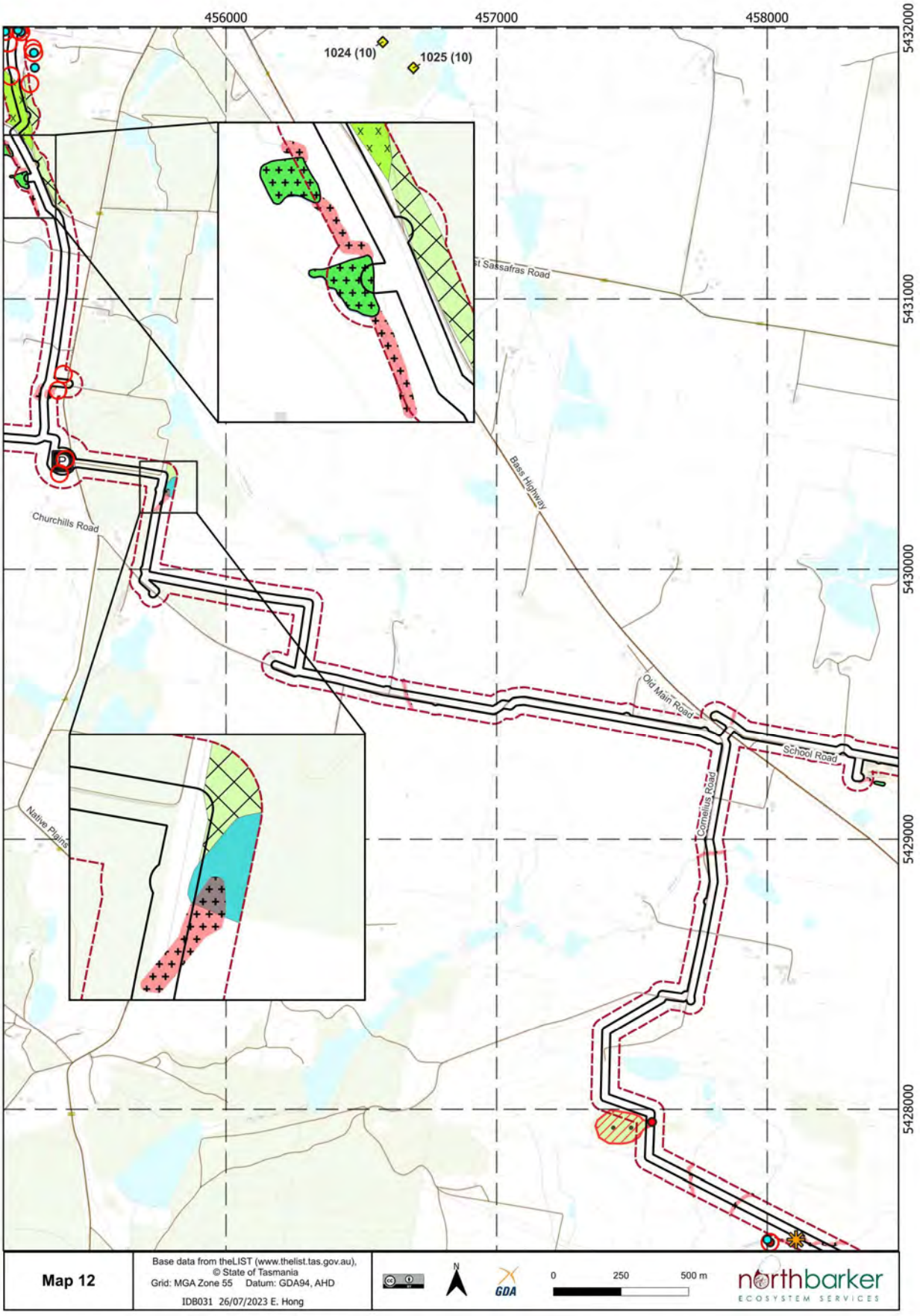
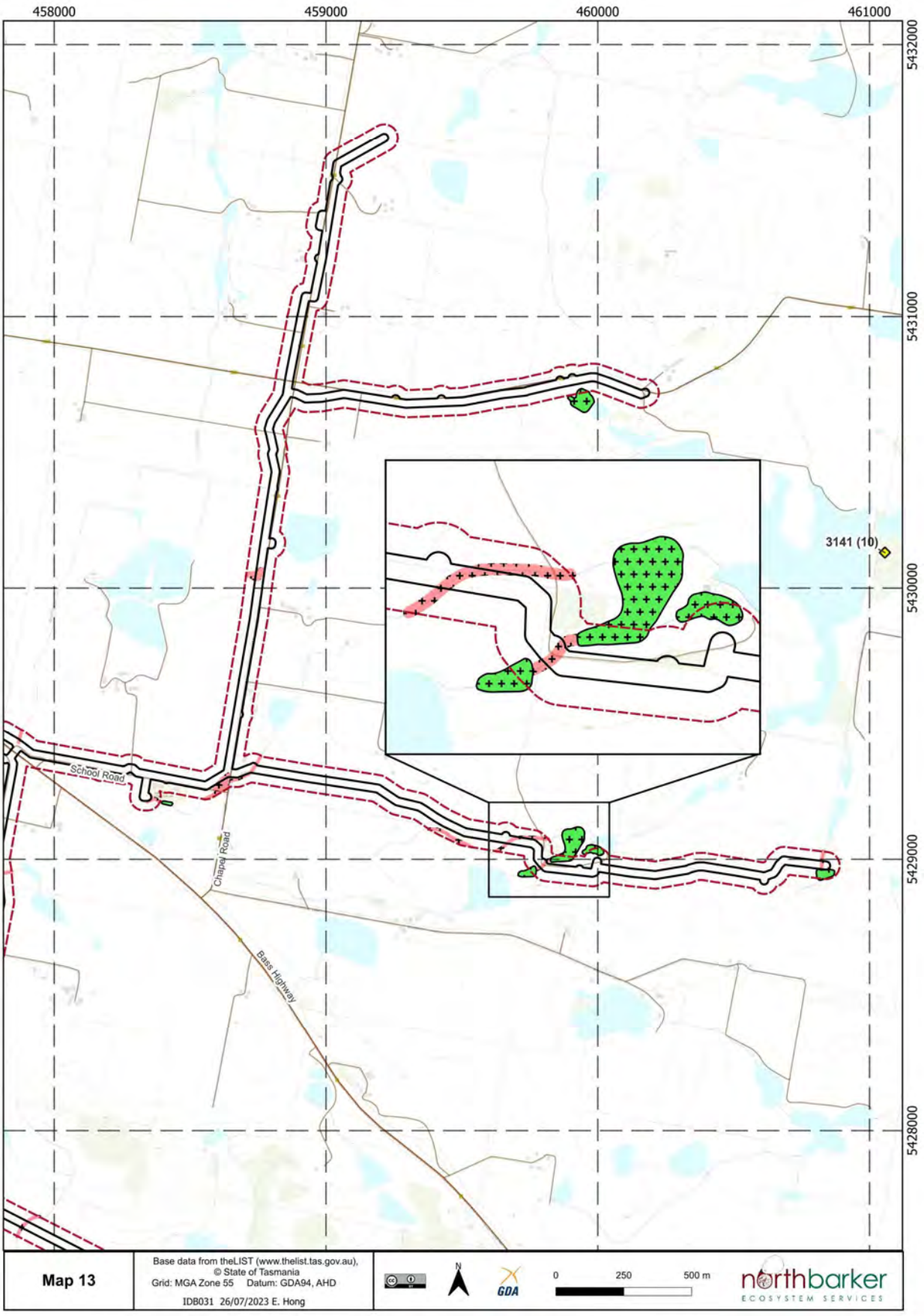
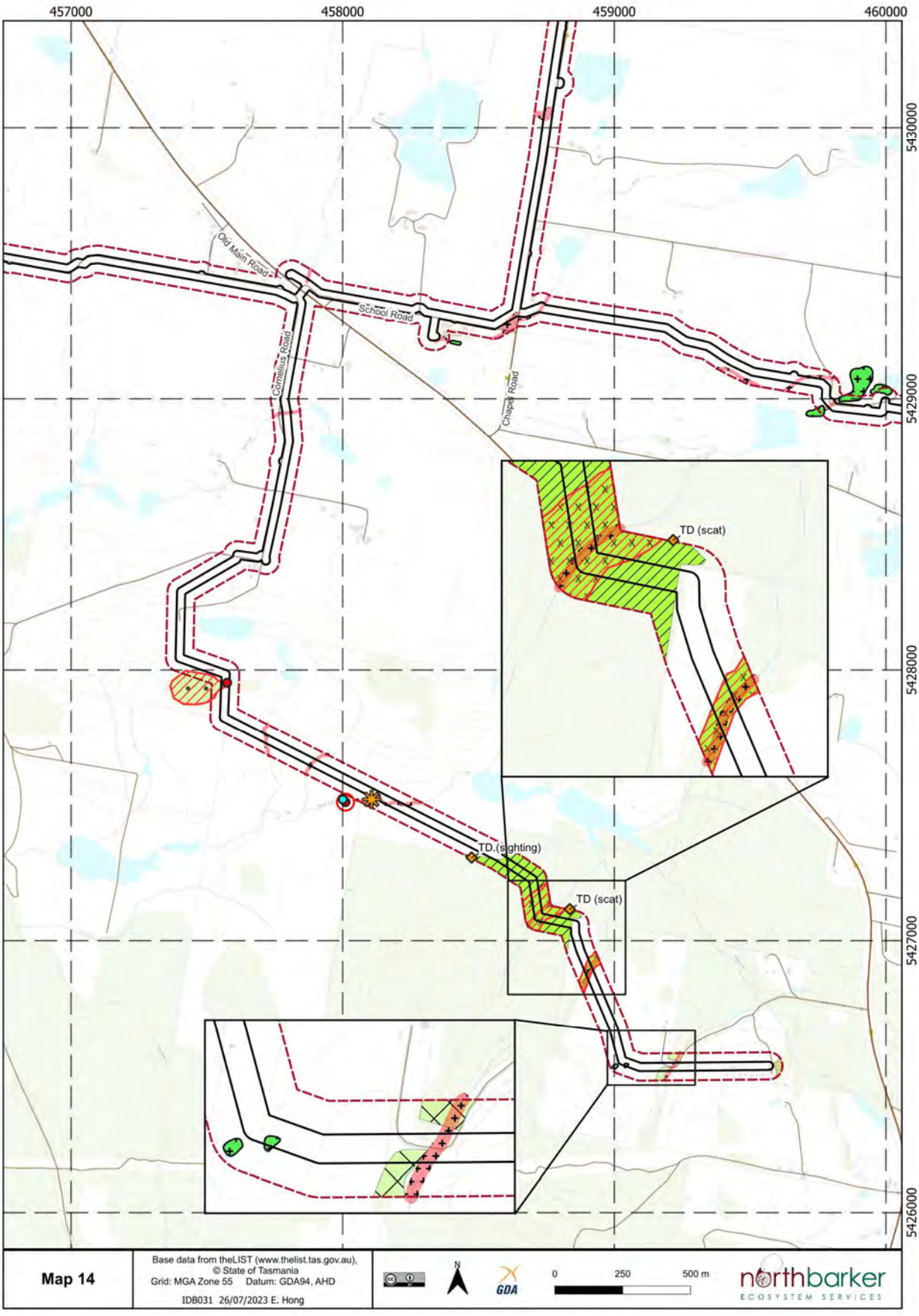
461000
462000
5436000
5435000
5434000
5433000
5432000
2766 (20)
2344 (50)
3142 (10)
2766 (20)
Gyp
Gyp
So
So
Pd
Ba
Ba
Cac
Cac
Pd
Torrington Road
Torrington Road
Pd
Pd
Pd
Pd
Map 10
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
IDB031 26/07/2023 E. Hong
N
GDA
0
250
500 m
northbarker
ECOSYSTEM SERVICES


453000
454000
455000
5432000
5431000
5430000
5429000
STQ (sighting)
TD (sighting)
1261 (20)
Ct
Gyp
TD (scat)
Devil Road
Churchills Road
Native Plains Road
Map 11
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
IDB031 26/07/2023 E. Hong
N
GDA
0
250
500 m
northbarker
ECOSYSTEM SERVICES


456000
457000
458000
5432000
5431000
5430000
5429000
5428000
1024 (10)
1025 (10)
Sassafras Road
Bass Highway
Churchills Road
Old Main Road
School Road
Cornelius Road
Native Plains
Map 12
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
IDB031 26/07/2023 E. Hong
N
GDA
0
250
500 m
northbarker
ECOSYSTEM SERVICES

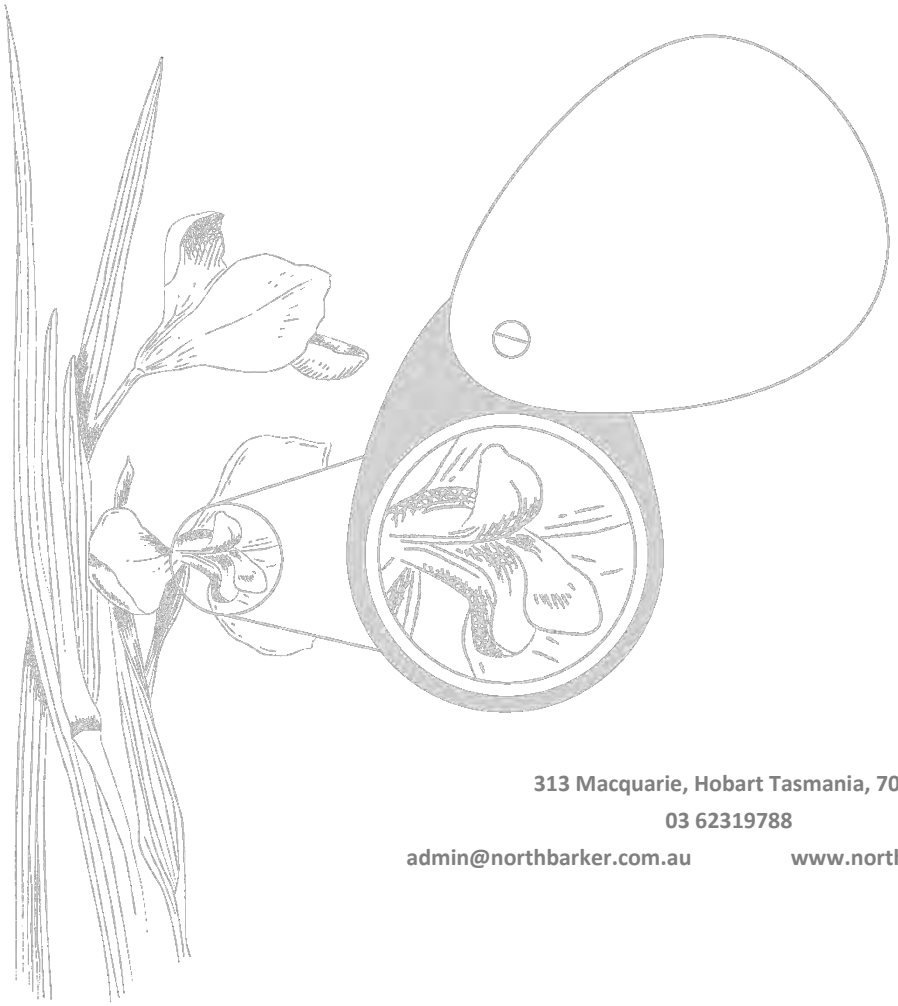

458000
459000
460000
461000
5432000
5431000
5430000
5429000
5428000
3141 (10)
School Road
Chapel Road
Bass Highway
Map 13
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
IDB031 26/07/2023 E. Hong
N
GDA
0
250
500 m
northbarker
ECOSYSTEM SERVICES


457000
458000
459000
460000
5430000
5429000
5428000
5427000
5426000
Old Main Road
School Road
Camellius Road
Chapel Road
TD (scat)
TD (sighting)
TD (scat)
Map 14
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
IDB031 26/07/2023 E. Hong
N
GDA
0
250
500 m
northbarker
ECOSYSTEM SERVICES

Sassafras - Wesley Vale Irrigation Scheme Augmentation

Appendix B – Vascular Plant Species

For Tasmanian Irrigation (IDB031)



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03 62319788
admin@northbarker.com.au www.northbarker.com.au

Appendix B - Vascular Plant Species

Status codes:

ORIGIN	NATIONAL SCHEDULE	STATE SCHEDULE
i - introduced	EPBC Act 1999	TSP Act 1995
d - declared weed WM Act	CR - critically endangered	e - endangered
en - endemic to Tasmania	EN - endangered	v - vulnerable
t - within Australia, occurs only in Tas.	VU - vulnerable	r - rare

Sites:

2	DOB - E460248, N5434801	14/02/2023 Aleida Williams
3	DOV remnant- E460164, N5439407	15/02/2023 Aleida Williams
4	NME remnant (BCF habitat) - E458143, N5438817	15/02/2023 Aleida Williams
5	DOV - E455524, N5439209	15/02/2023 Aleida Williams
6	DOV - E452261, N5439663	16/02/2023 Aleida Williams
7	DSC creek-line remnant - E458029, N5427533	16/02/2023 Aleida Williams
8	DOB - E452508, N5430872	16/02/2023 Aleida Williams
9	DSC - E450487, N5439712	17/02/2023 Aleida Williams
10	DOB - E454275, N5437949	17/02/2023 Aleida Williams
11	DAM - E454281, N5432718	17/02/2023 Aleida Williams
12	DAC - E462708, N5438722	15/02/2023 Hayley Kingsley
13	DOV - E462716, N5438648	15/02/2023 Hayley Kingsley
14	DAC - E462382, N5436194	15/02/2023 Hayley Kingsley
15	DOB - E460522, N5434840	17/02/2023 Hayley Kingsley
16	DOV - E457627, N5433012	15/02/2023 Hayley Kingsley
17	WVI - E459216, N5426535	16/02/2023 Hayley Kingsley
18	DSC - E458918, N5426935	16/02/2023 Hayley Kingsley
19	DSC - E458748, N5427138	16/02/2023 Hayley Kingsley
20	DSC - E449617, N5440428	17/02/2023 Hayley Kingsley
21	DAM - E449908, N5439977	17/02/2023 Hayley Kingsley
22	DSC - E454273, N5432697	17/02/2023 Hayley Kingsley
23	farm dams and wet areas -	17/02/2023 Aleida Williams
24	WOB - E452542, N5430636	12/03/2023 Aleida Williams
25	DOB - E455297, N5431528	16/05/2023 Aleida Williams
26	DOB WOL interface - E455245, N5431687	16/05/2023 Aleida Williams
27	WOL - E455786, N5430281	16/05/2023 Aleida Williams
28	DOV - E543830, N5438604	16/05/2023 Aleida Williams
29	NAF - E454331, N5438298	17/05/2023 Aleida Williams
30	dry DOV/NME edges, remnant patch - E451664, N5439472	17/05/2023 Aleida Williams
31	DOB north facing slope - E450021, N5440526	17/05/2023 Aleida Williams

Site	Name	Common name	Status
	DICOTYLEDONAE		
	APOCYNACEAE		
1 15	*Vinca major*	blue periwinkle	i
	AQUIFOLIACEAE		
7 20	*Ilex aquifolium*	holly	d
	ASTERACEAE		
2 5 14 15	*Bedfordia salicina*	tasmanian blanketleaf	en
2 14 15 18	*Cassinia aculeata subsp. aculeata*	dollybush	
23	*Centipeda elatinoides*	spreading sneezeweed	
1 2 3 7 10 14 15 16 18 20 21 28	*Cirsium vulgare*	spear thistle	i
12 13 14	*Hypochaeris radicata*	rough catsear	i
6	*Senecio jacobaea*	ragwort	d
1	*Senecio linearifolius var. linearifolius*	common fireweed groundsel	

3	*Senecio minimus*	shrubby fireweed	
3	*Sonchus hydrophilus*	native sowthistle	
	CAMPANULACEAE		
3	*Lobelia anceps*	angled lobelia	
2	*Wahlenbergia sp.*	bluebell	
	CARYOPHYLLACEAE		
19	*Stellaria sp.*	chickweed	i
	CASUARINACEAE		
8 11	*Allocasuarina littoralis*	black sheoak	
	CONVOLVULACEAE		
31	*Dichondra repens*	kidneyweed	
	ERICACEAE		
10	*Acrotriche serrulata*	ants delight	
8 10 25	*Epacris impressa*	common heath	
14	*Epacris sp.*	heath	
12 21	*Erica lusitanica*	spanish heath	d
	EUPHORBIACEAE		
1	*Euphorbia lathyris*	caper spurge	i
	FABACEAE		
8 12 14 15 17 24	*Acacia dealbata subsp. dealbata*	silver wattle	
2 3 4 5 6 7 8 10 13 15 16 17 18 19 22 24 27 29	*Acacia melanoxylon*	blackwood	
22	*Acacia mucronata*	variable sallow wattle	
10	*Acacia myrtifolia*	redstem wattle	
8 25	*Acacia stricta*	hop wattle	
8 10	*Acacia terminalis*	sunshine wattle	
1 3 5 9 10 18 27 28 31	*Acacia verticillata*	prickly moses	
31	*Aotus ericoides*	golden pea	
12	*Bossiaea cinerea*	showy bossiaea	
31	*Daviesia ulicifolia subsp. ulicifolia*	yellow spiky bitterpea	
15	*Dillwynia glaberrima*	smooth parrotpea	
12	*Genista monspessulana*	canary broom	d
31	*Indigofera australis subsp. australis*	native indigo	
21	*Lotus sp.*	trefoil	i
3 15	*Lotus uliginosus*	greater birdsfoot-trefoil	i
10	*Psoralea pinnata*	blue butterflybush	i
2 25 31	*Pultenaea daphnoides*	heartleaf bushpea	
10	*Pultenaea gunnii*	golden bushpea	
8	*Pultenaea gunnii subsp. gunnii*	golden bushpea	
2 10 26 28 31	*Pultenaea juniperina*	prickly beauty	
13 14 15 20 21 22 31	*Ulex europaeus*	gorse	d
	GENTIANACEAE		
3 9 10	*Centaurium erythraea*	common centaury	i
	GERANIACEAE		
3	*Geranium potentilloides var. potentilloides*	mountain cranesbill	
19 22	*Geranium sp.*	native geranium	
31	*Pelargonium sp.*	stork's-bill	

	GOODENIACEAE		
19	*Goodenia lanata*	trailing native-primrose	
8 27	*Goodenia ovata*	hop native-primrose	
	HALORAGACEAE		
14 19	*Gonocarpus sp.*	raspwort	
2 3 8 15 20 31	*Gonocarpus teucrioides*	forest raspwort	
	LAMIACEAE		
3	*Prunella vulgaris*	selfheal	i
	LAURACEAE		
10	*Cassytha pubescens*	downy dodderlaurel	
15 22	*Cassytha sp.*	dodder-laurel	
	LYTHRACEAE		
3	*Lythrum hyssopifolia*	small loosestrife	
	MYRTACEAE		
8 11 12 13 14 15 20 21 22 31	*Eucalyptus amygdalina*	black peppermint	en
5	*Eucalyptus globulus subsp. globulus*	tasmanian blue gum	
2 6 7 8 9 10 15 16 17 18 19 20 21 24 25 26 27 28 31	*Eucalyptus obliqua*	stringybark	
3 5 6 7 9 12 13 16 18 19 20 21 22 28 30	*Eucalyptus ovata var. ovata*	black gum	
1 6 7 15 17 18 19 20 25 28 31	*Eucalyptus viminalis subsp. viminalis*	white gum	
14	*Leptospermum scoparium*	common tea-tree	
1 3 4 9 10 13 15 16 18 19 20 21 22 26 27 28 30	*Melaleuca ericifolia*	coast paperbark	
5 15 27 29	*Melaleuca squarrosa*	scented paperbark	
	ONAGRACEAE		
27	*Epilobium sp.*	willowherb	
	OXALIDACEAE		
9 19 20 21 31	*Oxalis sp.*	woodsorrel	
	PITTOSPORACEAE		
10	*Billardiera heterophylla*	bluebell creeper	i
22	*Billardiera longiflora*	purple appleberry	en
8 10 31	*Billardiera mutabilis*	green appleberry	
1 6 7 8 19 31	*Bursaria spinosa subsp. spinosa*	prickly box	
20	*Pittosporum undulatum*	sweet pittosporum	i
	POLYGALACEAE		
20 22	*Comesperma volubile*	blue lovecreeper	
	POLYGONACEAE		
12 13 14	*Acetosella vulgaris*	sheep sorrel	i

23	*Persicaria decipiens*	slender waterpepper	v
23	*Persicaria lapathifolia*	pale knotweed	i
23	*Persicaria prostrata*	creeping waterpepper	
12 13 15	*Polygonum aviculare*	creeping wireweed	i
3	*Rumex brownii*	slender dock	
	PRIMULACEAE		
2 3 15	*Lysimachia arvensis*	scarlet pimpernel	i
	PROTEACEAE		
10	*Lomatia tinctoria*	guitarplant	en
	RANUNCULACEAE		
5 10	*Clematis aristata*	mountain clematis	
19	*Clematis sp.*	clematis	
27	*Ranunculus repens*	creeping buttercup	i
	RHAMNACEAE		
1 7 8 15 18 19 20 24	*Pomaderris apetala*	common dogwood	
	ROSACEAE		
3 4 6 9 20 21 27 31	*Acaena novae-zelandiae*	common buzzy	
2 7 13 15 16 20	*Crataegus monogyna*	hawthorn	i
30	*Rosa rubiginosa*	sweet briar	i
2 4 7 9 10 12 13 15 16 17 18 27 28 29 30	*Rubus fruticosus*	blackberry	d
3 9 31	*Rubus parvifolius*	native raspberry	
	RUBIACEAE		
24	*Coprosma nitida*	mountain currant	
1 3 4 17 19 20 22 31	*Coprosma quadrifida*	native currant	
	RUTACEAE		
5	*Zieria arborescens*	stinkwood	
	SANTALACEAE		
2 8 10 11 14 15 17 19 20 21 22 24 25 26 31	*Exocarpos cupressiformis*	common native-cherry	
25	*Leptomeria drupacea*	erect currantbush	
	SOLANACEAE		
20	*Lycium ferocissimum*	african boxthorn	d
	THYMELAEACEAE		
31	*Pimelea humilis*	dwarf riceflower	
	VIOLACEAE		
21	*Viola hederacea*	ivyleaf violet	
	WINTERACEAE		
3	*Tasmannia lanceolata*	mountain pepper	
	GYMNOSPERMAE		
	PINACEAE		
14	*Pinus radiata*	radiata pine	i

MONOCOTYLEDONAE

	AGAPANTHACEAE		
14	*Agapanthus praecox subsp. orientalis*	agapanthus	i
	ALISMATACEAE		
23	*Alisma lanceolatum*	narrowleaf water plaintain	i
	ARACEAE		
14	*Zantedeschia aethiopica*	arum lily	i
	ASPARAGACEAE		
2 5 7 10 11 13 14 18 20 21 22 24 25 26 28 30	*Lomandra longifolia*	sagg	
	CYPERACEAE		
29	*Baumea tetragona*	square twigsedge	
1 4 6 7 17 19 20 27 28 29	*Carex appressa*	tall sedge	
15 16	*Cyperus eragrostis*	drain flatsedge	i
3 23	*Eleocharis acuta*	common spikesedge	
23	*Eleocharis sphacelata*	tall spikesedge	
4 5 7 8 13 15 17 19 22 24 26	*Gahnia grandis*	cutting grass	
3	*Isolepis cernua*	nodding clubsedge	
3	*Isolepis producta*	nutty clubsedge	
8 11	*Lepidosperma concavum*	sand swordsedge	
19 20 21 22	*Lepidosperma laterale*	variable swordsedge	
2 3 6 9 14 24 26 27 28 30	*Lepidosperma longitudinale*	spreading swordsedge	
	HEMEROCALLIDACEAE		
10 15	*Dianella tasmanica*	forest flaxlily	
	IRIDACEAE		
3	*Crocosmia Xcrocosmiiflora*	montbretia	i
8	*Patersonia fragilis*	short purpleflag	
21	*Watsonia meriana var. bulbillifera*	bulbil watsonia	i
	JUNCACEAE		
9	*Juncus filicaulis*	thread rush	
3	*Juncus holoschoenus*	jointleaf rush	
12 15 16 20 27 28	*Juncus pallidus*	pale rush	
1 3 12 15 30	*Juncus procerus*	tall rush	
6 27 28 29 30	*Juncus sarophorus*	broom rush	
13	*Juncus sp.*	Rush	
	JUNCAGINACEAE		
23	*Cycnogeton procerum*	greater waterribbons	
	ORCHIDACEAE		
8	*Chiloglottis reflexa*	autumn bird-orchid	
8	*Dipodium roseum*	rosy hyacinth-orchid	
	POACEAE		
6	*Agrostis capillaris*	brown top bent grass	i
7 15	*Anthoxanthum odoratum*	sweet vernalgrass	i
1 6	*Arrhenatherum elatius var. bulbosum*	bulbous oatgrass	i

15	*Austrostipa sp.*	speargrass	
1	*Bromus catharticus*	prairie grass	i
1 3 6 14 16 17 20 30	*Dactylis glomerata*	cocksfoot	i
27	*Distichlis distichophylla*	australian saltgrass	
23	*Glyceria maxima*	reed sweetgrass	i
2 6 7 10 12 14 15 17 18 20	*Holcus lanatus*	yorkshire fog	i
19 20 22	*Microlaena stipoides*	weeping grass	
10 15	*Paspalum dilatatum*	paspalum	i
7	*Poa labillardierei*	silver tussockgrass	
9	*Poa tenera*	scrambling tussockgrass	
	TYPHACEAE		
1	*Typha sp.*		
	PTERIDOPHYTA		
	ASPIDIACEAE		
6 17 19 24	*Polystichum proliferum*	mother shieldfern	
	BLECHNACEAE		
29	*Blechnum minus*	soft waterfern	
5 7 27 29	*Blechnum nudum*	fishbone waterfern	
5 18 19 20 27 29	*Blechnum wattsii*	hard waterfern	
	DENNSTAEDTIACEAE		
4 29	*Histiopteris incisa*	batswing fern	
1 5 6 7 8 10 11 12 13 14 15 17 18 19 20 21 22 24 25 26 27 29 31	*Pteridium esculentum subsp. esculentum*	bracken	
	DICKSONIACEAE		
4 16 20 29	*Dicksonia antarctica*	soft treefern	
	GLEICHENIACEAE		
5	*Gleichenia microphylla*	scrambling coralfern	

Sassafras - Wesley Vale Irrigation Scheme Augmentation

Appendix C – Threatened Flora Within 500 m

For Tasmanian Irrigation (IDB031)

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Appendix E – Threatened Flora Within 500 m[1,2]

Species	National Status EPBCA	State Status TSPA	Records within 500 m/5 km	Habitat	Likelihood of Occurrence/Impact	Commentary
Brunonia australis blue pincushion[1]	-	Rare	4	Grassy woodlands and dry sclerophyll forests dominated by *E. amygdalina*. Commonly found on sandy/gravelly alluvial soils.	**LOW**	Suitable habitat for this species occurs within forest patches throughout the survey area, however this is a distinctive species and is unlikely to be overlooked unless restricted in extent, very low in abundance, and/or suppressed by grazing/mowing during our assessments.
Caladenia caudata tailed spider-orchid[1]	Vulnerable	Vulnerable	2	This species is widespread but localised in coastal and near-coastal areas up to about 250 m elevation soils northern, eastern and southeastern Tasmania. It occurs in heathy and grassy open eucalypt forest and woodland, often with sheoaks (*Allocasuarina* species), and heathland on sandy and loamy	**LOW**	This species is known primarily from the Henry Somerset Conservation Area on Railton Road (Forico Pty Limited private sanctuary), also older sightings from the Devil Road-Old Deloraine Road area. All areas of dry forest within and adjacent to the proposed pipeline corridor between the Mersey River and the Bass Highway be surveyed in November by ECOtas. No evidence of this species was found[3].
Caladenia congesta blacktongue finger-orchid[1]		Endangered	2	Lowland areas to around 600 m in altitude. The species is mainly found in heathy woodland and open forest, frequently among grass tussocks on slopes. Sites supporting the species are usually dry, with sandy and loamy soils that are often gravelly. The species has also been found in other open vegetation	**LOW**	Limited undisturbed heathy or open forest vegetation present within the survey area.
Caladenia tonellii robust fingers[1]	Critically Endangered	Endangered	17	*Eucalyptus amygdalina* dominated forest with a shrubby understorey on shallow clay loam and shallow gravelly loam over clay. Topography varies	**LOW**	This species is known primarily from the Henry Somerset Conservation Area on Railton Road (Forico Pty Limited private

[1]NRE (2022);
[2] DAWE (2021a)
3 ECOtas (2022)

Species	National Status EPBCA	State Status TSPA	Records within 500 m/5 km	Habitat	Likelihood of Occurrence/Impact	Commentary
				from flats to slopes up to about 80 m elevation. lowland near-coastal parts of the north coast, extending inland by a few kilometres in the Railton-Latrobe area		sanctuary), also recently been confirmed from the Devil Road-Old Deloraine Road area (M. Wapstra, 2022, surveys for Forico Pty Limited), including from within the proposed pipeline corridor. The known habitat adjacent to pipeline alignment was surveyed in November by ECOtas[3] and 5 individual *C tonellii* recorded up slope from the current pipeline alignment. The current proposed alignment is lower in the landscape in wetter habitat than is suitable for this species
Cassinia rugata wrinkled dollybush[1]	Vulnerable	Endangered	20	Wet heathland and heathy woodland (usually with impeded drainage) but also occurs on disturbed road verges.	**LOW**	This species is known only from the Parkers Ford Road-Squeaking Point Road area, with no records associated with the currently proposed pipeline route. Native vegetation in this area was surveyed in February 2023 and no individuals were recorded. Field survey suggests limited potential habitat for the species is present within the alignment
Corunastylis nuda tiny midge-orchid[1]		Rare	3	*Corunastylis nuda* occurs in a wide range of habitats including scrub, subalpine grassland, heathy open forest, open rock plates among forest, shrubby dry sclerophyll forest and open wet sclerophyll forest, from near sea level to 1000 m elevation on a range of different soil types and parent geologies.	**MODERATE**	The most record of this species within 500m of the design corridor is from 1986. Although this species has a wide range of suitable habitat, surveys were undertaken at peak flowering time. If plants were not flowering at the time of survey, they could have been overlooked.
Gratiola pubescens hairy brooklime[1]		Rare	2	Permanently or seasonally damp, swampy ground, including the margins of farm dams	**MODERATE**	This species has been recorded from three locations within 5 km of the project area since 2000. Suitable habitat for this species is present throughout the design

Species	National Status EPBCA	State Status TSPA	Records within 500 m/5 km	Habitat	Likelihood of Occurrence/Impact	Commentary
						corridor. The survey was undertaken at peak flowering time however no plants were recorded during surveys
Gynatrix pulchella fragrant hempbush[1]		Rare	3	In Tasmania, *Gynatrix pulchella* occurs as a riparian shrub, found along rivers and drainage channels, sometimes extending onto adjacent floodplains (including old paddocks).	**LOW**	This species is know from the larger creeks and Mersey River within the project area. There is limited habitat within the design corridor. This is a tall shrub/ tree 2-5 m and is unlikely to be overlooked
Lythrum salicaria purple loosestrife[1]		Vulnerable	2/	Inhabits swamps, stream banks and rivers mainly in the north and north-east of the State. It can also occur between gaps in *Melaleuca ericifolia* forest. This species can act as a weed, proliferating along roadsides and other disturbed areas, and, as horticultural strains are in cultivation and birds can disperse seed, some occurrences may not be native.	**LOW**	The closest records of this species are 300m from the design corridor on the Panatana Rivulet, recorded in 2007/2008. While there is suitable within the design corridor, this species is conspicuous when flowering and is unlikely to have been missed during the February field survey.
Persicaria decipiens slender waterpepper[1]		Vulnerable	42	This species occurs in wet to damp sites including dam margins, creek margins, drainage ditches, damp paddock areas, and ephemeral soaks.	**PRESENT**	This species was recorded at 20 locations along the northern half of the project area through agricultural land. The number of plants recorded at each location ranged from single plants to locally abundant in large numbers. Plant numbers and recorded locations were significantly greater than for the same general area in 2009 (SWIS alignment).
Pimelea curviflora var. *gracilis* slender curved riceflower[1]	-	Rare	2	Wet and dry sclerophyll forest to hardwood plantations. Understories vary from open and grassy to densely shrubby. It can densely colonise disturbed sites such as firebreaks, log landings and tracks.	**LOW**	This species occurs in a variety of habitats, including modified lands. There is limited habitat for this species within the design corridor. This is a distinctive

Species	National Status EPBCA	State Status TSPA	Records within 500 m/5 km	Habitat	Likelihood of Occurrence/Impact	Commentary
						species and is unlikely to have been overlooked.
Solanum opacum greenberry nightshade[1]	-	Endangered	2	Known from nine sites in the northern Tasmania and the Bass Strait Islands. It occurs predominantly in poorly-drained swamp forests and riparian habitats.	**LOW**	The only records of this species within 100 km of the project area are from the 1800s and 1932. While this species short lived, there is limited habitat availability within the design corridor.

Sassafras - Wesley Vale Irrigation Scheme Augmentation

Appendix D – Preliminary Natural Values Report and Clarification of *C. tonellii* Distribution - Prepared by ECOtas

For Tasmanian Irrigation (IDB031)

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Appendix D - Clarification of population distribution of *C. tonellii*

FILE NOTE: Mark Wapstra (ECOtas) to Richard White (NBES)

18 May 2023

Richard White enquired about the extent of targeted threatened flora surveys undertaken by ECOtas in the Devil Road area, specifically in relation to *Caladenia tonellii* (but note this is also relevant to *Caladenia caudata*).

ECOtas was engaged by TI to assess for threatened flora during the peak flowering species. Our report was clear that our timing in spring 2022 was appropriate. The primary focus of our surveys was the then nominal 100 m wide survey corridor based on the existing pipeline between the pump station on the Mersey River and the reservoir at the top of the hill (and then along the track to the east, plus some other miscellaneous areas). This area was searched and findings on *Caladenia tonellii* presented. All data has been entered into the NVA.

As part of those assessments, initial discussions on the potential impacts to *Caladenia tonellii* were had, which resulted in the possibility of the new pipeline running along Devil Road and then east up the hill. This was prior to the on-ground surveys (i.e. we discussed "just in case" scenarios to ensure that surveys did not miss the critical window should changes be made). As such, our surveys also covered this route (specifically the areas indicated in the map provided via text), although we did not survey wet forest (as unsuitable habitat). Note that I also searched either side of the road between Devil Road and the reservoir.

The records in the NVA attributed to Mark Wapstra from the last 2 years appropriately show what I believe to be the distribution of *Caladenia tonellii* in this area. Note caveats in my report and also in NVA records regarding taxonomy and identification. ECOtas will continue monitoring this population (and undertaking miscellaneous/opportunistic extension surveys) as part of our engagement by Forico Pty Limited (landowner). If novel sites of threatened flora are detected that may be impacted by the irrigation pipeline, I will ensure you and TI are advised direct (and data will be entered into NVA).

Mark Wapstra

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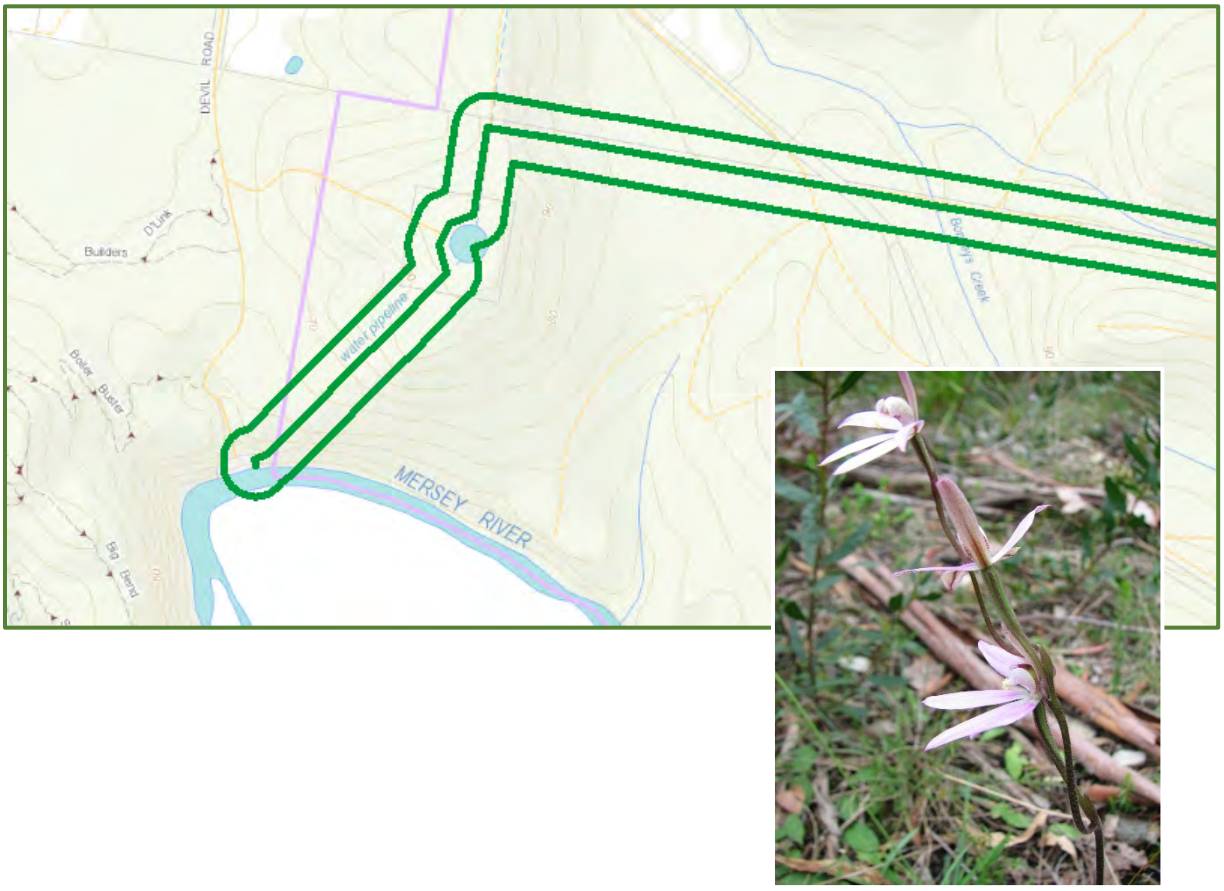
CRITICAL CONSTRAINTS REVIEW OF NATURAL VALUES ASSOCIATED WITH PROPOSED SASSAFRAS WESLEY VALE IRRIGATION SCHEME AUGMENTATION PROJECT



Environmental Consulting Options Tasmania (ECO*tas*) for Tasmanian Irrigation Pty Ltd

8 September 2022

Update 1: 18 December 2022

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AUTHORSHIP

Field assessment: Mark Wapstra

Report production: Mark Wapstra

Base data for mapping: LISTmap, Tasmanian Irrigation Pty Ltd

Digital and aerial photography: GoogleEarth, LISTmap

ACKNOWLEDGEMENTS

Tasmanian Irrigation Pty Ltd (Jesse Lewis & Damian Butler) provided background information on the project.

QUALIFICATIONS

Except where otherwise stated, the opinions and interpretations of legislation and policy expressed in this report are made by the author and do not necessarily reflect those of the relevant agency. The client should confirm management prescriptions with the relevant agency before acting on the content of this report. This report and associated documents do not constitute legal advice.

Note that any reference to the Department of Primary Industries, Parks, Water & Environment (DPIPWE) now refers to the Department of Natural Resources and Environment Tasmania.

COVER ILLUSTRATIONS

Main: section of proposed pipeline north of Mersey River. Inset: *Caladenia tonellii* (robust fingers), a threatened orchid species known from this section of the project area.

Please note: the blank pages in this document are deliberate to facilitate double-sided printing.

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INTRODUCTION

Purpose

Tasmanian Irrigation Pty Ltd engaged Environmental Consulting Options Tasmania (ECO*tas*) to undertake a critical constraints review of natural values associated with proposed Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA) project, primarily to highlight critical matters likely to influence the business case and design of the scheme, with particular reference to issues such as threatened vegetation types, flora and fauna, and likely approval pathways under Commonwealth, State and local government assessment and approval frameworks.

Scope

This report is a critical constraints ("fatal flaws", due diligence) review of natural values only. It is based on available natural values information held in readily available databases. A drive-through site assessment (29 Aug. 2022) has been undertaken to provide a broad overview of the natural values setting/context only.

This report relates to:

- flora and fauna species of conservation significance, including a discussion of listed threatened species (under the Tasmanian *Threatened Species Protection Act 1995* and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*) potentially present, and other species of conservation significance/interest;
- vegetation types (forest and non-forest, native and exotic) likely to be present, including a discussion of the distribution and conservation significance of each community;
- plant and animal disease management issues;
- weed management issues; and
- a discussion of some of the policy and legislative implications of the identified natural values.

PROJECT OUTLINE

Refer to separate documentation on Tasmanian Irrigation's web site. See also Figure 1 for a broad overview of the project area.

For the purposes of this review, a GIS shape file of the indicative pipeline route was used to inform the drive-through site assessment and this statement of findings. It is understood that the design will inevitably change as project planning progresses, so any findings/recommendations are preliminary and indicative only.

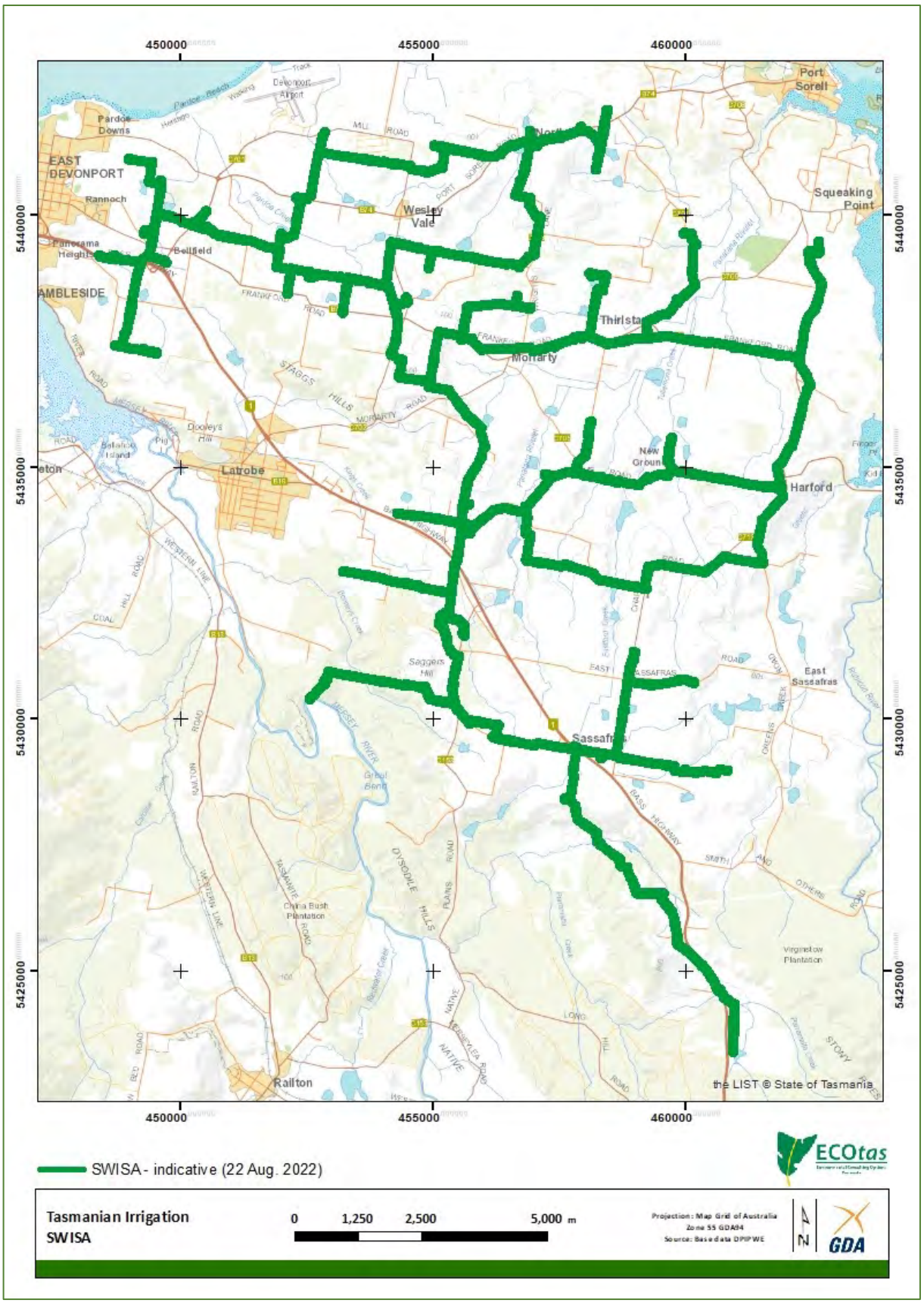

Figure 1. Overview of SWISA

METHODS

Available sources of threatened flora and fauna records, vegetation mapping and other potential natural values were interrogated. These sources include:

- Tasmanian Department of Natural Resources & Environment Tasmania's *Natural Values Atlas* records for threatened flora and fauna (GIS coverage maintained by the author current as at date of report);
- the TASVEG 3.0, 4.0 & Live vegetation coverages (as available through GIS coverage and via LISTmap);
- GoogleEarth and LISTmap aerial orthoimagery; and
- other sources listed in tables and text as indicated.

A broad overview of the project area was obtained by drive-through (with selected short sections walked) on 29 Aug. 2022 (Mark Wapstra & Jesse Lewis).

FINDINGS

Vegetation types

Comments on TASVEG mapping

This section, which comments on the existing TASVEG 4.0 mapping for the project area, is included to indicate the available information only. Note that TASVEG mapping, which was mainly a desktop mapping exercise based on aerial photography, is often substantially different to ground-truthed vegetation mapping, especially at a local scale. An examination of existing vegetation mapping, however, is usually a useful pre-assessment exercise to gain an understanding of the range of habitat types likely to be present, the level of previous botanical surveys and to guide the intensity of future surveys.

Table 1 outlines the existing TASVEG mapping for the project area.

Table 1. TASVEG mapping units identified from the project area (existing mapping only)

[conservation status: NCA – as per Schedule 3A of the Tasmanian *Nature Conservation Act 2002*, using units described by Kitchener & Harris (2013+), relating to TASVEG mapping units (DNRET 2022); EPBCA – as per the listing of ecological communities on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, relating to communities as described under that Act, but with equivalencies to TASVEG units]

TASVEG mapping unit (Kitchener & Harris 2013+)	Conservation priority NCA *EPBCA*	Comments
Dry eucalypt forest and woodland		
Eucalyptus amygdalina coastal forest and woodland (DAC)	not threatened *not threatened*	POTENTIAL MANAGEMENT CONSTRAINTS Confirm veracity of mapping. Likely to be highly modified. Low likelihood of critical threatened flora and fauna co-issues. No significant constraints (pipeline shown as largely avoiding patches).

TASVEG mapping unit (Kitchener & Harris 2013+)	Conservation priority NCA *EPBCA*	Comments
Eucalyptus amygdalina forest on mudstone (DAM)	not threatened *not threatened*	POTENTIAL MANAGEMENT CONSTRAINTS Confirm veracity of mapping. Likely to be somewhat to highly modified. Low likelihood of critical threatened flora and fauna co-issues (but suggest spring survey for orchid species). No significant constraints (pipeline shown as largely avoiding patches).
Eucalyptus obliqua dry forest (DOB)	not threatened *not threatened*	POTENTIAL MANAGEMENT CONSTRAINTS Confirm veracity of mapping. Likely to be somewhat to highly modified. Low likelihood of critical threatened flora and fauna co-issues (but suggest spring survey for orchid species). No significant constraints (pipeline shown as largely avoiding patches).
Eucalyptus ovata forest and woodland (DOV)	threatened *threatened*	POTENTIAL MANAGEMENT CONSTRAINTS Confirm veracity of mapping. Likely to be somewhat to highly modified. Low likelihood of critical threatened flora and fauna co-issues. No significant constraints (pipeline shown as avoiding single patch).
Eucalyptus amygdalina – Eucalyptus obliqua damp sclerophyll forest (DSC)	not threatened *not threatened*	POTENTIAL MANAGEMENT CONSTRAINTS Confirm veracity of mapping – at least some near Devil Road (pump station) known to be DOB not DSC (M. Wapstra unpubl. obs.). Need to confirm DSC is not DOV (or other communities). Likely to be in relatively good condition. Patch near Devil Road (pump station) known to support *Caladenia tonellii* (robust fingers) but extension surveys required. Constraints will be largely related to co-issues not vegetation classification per se.
Wet eucalypt forest and woodland		
Eucalyptus obliqua wet forest (undifferentiated) (WOU)	not threatened *not threatened*	POTENTIAL MANAGEMENT CONSTRAINTS Confirm veracity of mapping – in this part of the State, WOU can almost always be allocated to *Eucalyptus obliqua* forest with broad-leaf shrubs (TASVEG code: WOB), which is also not threatened, but WOU is often mapped inaccurately at a local scale (i.e. could be DOB, DSC, DAD, WVI, etc.). Low likelihood of co-issues except at a localised scale. No significant constraints (pipeline shown as largely avoiding patches).
Eucalyptus viminalis wet forest (WVI)	threatened *threatened*	POTENTIAL MANAGEMENT CONSTRAINTS Confirm veracity of mapping – aerial imagery strongly suggests not WVI. Likely to be somewhat to highly modified. Low likelihood of critical threatened flora and fauna co-issues. No significant constraints (pipeline shown as avoiding single patch).
Scrub, heathland and coastal complexes		
eastern riparian scrub (SRE)	possibly threatened *not threatened*	POTENTIAL MANAGEMENT CONSTRAINTS Confirm veracity of mapping – aerial imagery suggests much more likely as highly modified FAG or FRG. Low likelihood of co-issues except at a localised scale. No significant constraints (pipeline shown as avoiding patches).
Non-eucalypt forest and woodland		
Acacia dealbata forest (NAD)	not threatened *not threatened*	POTENTIAL MANAGEMENT CONSTRAINTS Confirm veracity of mapping. Low likelihood of co-issues. No significant constraints (pipeline shown as largely avoiding patches).

TASVEG mapping unit (Kitchener & Harris 2013+)	Conservation priority NCA *EPBCA*	Comments
Melaleuca ericifolia swamp forest (NME)	threatened *not threatened*	POTENTIAL MANAGEMENT CONSTRAINTS Confirm veracity of mapping. Moderate likelihood of co-issues e.g. *Litoria raniformis* (green and golden frog); possible *Engaeus granulatus* (Central North burrowing crayfish) in boggy areas; species such as *Persicaria decipiens* (slender waterpepper). Constraints may be limited (pipeline shown as largely avoiding patches).
Other natural environments		
water, sea (OAQ)	not threatened *not threatened*	POTENTIAL MANAGEMENT CONSTRAINTS Confirm veracity of mapping – all seem to be related to farm dams. Moderate likelihood of co-issues e.g. *Litoria raniformis* (green and golden frog) in and around dams; possible *Engaeus granulatus* (Central North burrowing crayfish) in boggy areas; species such as *Persicaria decipiens* (slender waterpepper). Constraints will be largely related to co-issues not vegetation classification per se (pipeline appears to avoid all these sites with buffers applied).
Modified land		
urban areas (FUR)	not threatened *not threatened*	A band of ca. 5-10 m wide along the northeastern boundary has been mapped as FUR because it has now been long-maintained (presumably by neighbours) as clear of "native vegetation". Older maps actually show an old road passing along this part of the boundary. Whether FUR is the correct allocation or whether it could be coded as extra-urban miscellaneous (TASVEG code: FUM) or even a weed infestation (TASVEG code: FWU) is considered moot in terms of conservation management. FUR has also been mapped along the fringe of Corin Street, this extended upslope along the southeastern boundary into disturbed native vegetation (this could now be technically mapped as DVG as per the balance but site assessment and aerial imagery confirm high levels of disturbance). FUR also extends up along the powerline clearing and near Denison Road. Whether this is all better mapped as a fine-scale combination of FUR, FUM, FWU and even permanent easements (TASVEG code: FPE) is considered moot in terms of conservation management.
agricultural areas (FAG)	not threatened *not threatened*	POTENTIAL MANAGEMENT CONSTRAINTS Confirm veracity of mapping – most looks to be correct but may be some areas of FRG and other modified land mapping units (low likelihood of native vegetation mapping units, except at a localised scale). Moderate likelihood of threatened flora and fauna co-issues but at a localised scale only e.g. *Persicaria decipiens* (slender waterpepper) in drainage lines; *Engaeus granulatus* (Central North burrowing crayfish) in boggy areas. Constraints will be largely related to co-issues not vegetation classification per se.
regenerating cleared land (FRG)	not threatened *not threatened*	As above – the classification of FAG vs FRG is of little consequence in this type of agricultural context.
plantations for silviculture – hardwood (FPH) & plantations for silviculture – softwood (FPS) & unverified plantations for silviculture (FPU)	not threatened *not threatened*	POTENTIAL MANAGEMENT CONSTRAINTS Confirm veracity of mapping – most looks to be correct but may be some areas better allocated to FAG. Very low likelihood of threatened flora and fauna co-issues. No significant constraints (pipeline shown as largely avoiding patches).

TASVEG mapping unit (Kitchener & Harris 2013+)	Conservation priority NCA *EPBCA*	Comments
extra-urban miscellaneous (FUM)	not threatened *not threatened*	POTENTIAL MANAGEMENT CONSTRAINTS Classification of FUM vs FUR VS permanent easements (TASVEG code: FPE) will need to be determined at a local scale. Low likelihood of threatened flora and fauna co-issues but at a localised scale only e.g. *Persicaria decipiens* (slender waterpepper) in drainage lines; *Engaeus granulatus* (Central North burrowing crayfish) in boggy areas. Constraints will be largely related to co-issues not vegetation classification per se
urban areas (FUR)	not threatened *not threatened*	As above

Management issues

There is a moderate likelihood of native vegetation communities that equate to listed entities under Schedule 3A of the Tasmanian *Nature Conservation Act 2002* being present. The most likely candidates are:

- *Eucalyptus ovata* forest and woodland (TASVEG code: DOV);
- *Eucalyptus viminalis* wet forest (TASVEG code: WVI); &
- *Melaleuca ericifolia* swamp forest (TASVEG code; NME).

It is likely that occurrences of these communities will be highly localised. At present, the design of the pipeline route either wholly avoids patches of native vegetation or impinges marginally into the disturbed fringes of such vegetation (so may simply be a minor design adjustment to further avoid any higher priority vegetation types).

There is a moderate likelihood that some occurrences of DOV and WVI will equate to the following threatened ecological communities listed on the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA):

- Tasmanian Forests and Woodlands dominated by Black Gum or Brookers Gum (*Eucalyptus ovata* / *E. brookeriana*); &
- Tasmanian White Gum (*Eucalyptus viminalis*) Wet Forest.

Any such occurrences will need to be assessed against the critical thresholds (area, condition, composition, etc.) but it is unlikely that such occurrences will be extensive or impractical to avoid.

RECOMMENDATION: Vegetation types

Undertake ground-truthing of project area to map all vegetation communities.

There are no specific constraints in terms of timing to undertake this type of assessment but spring-summer is usually considered ideal to maximise recording species diversity. This is less critical if there have already been timed-targeted surveys of particular vegetation types for threatened flora (see section below).

Threatened flora

The following analysis is based on a review of GIS coverages (*Natural Values Atlas* records), my own experience of the wider project area and the drive-through preliminary site assessment. It highlights the key species and issues only.

- *Caladenia tonellii* (robust fingers) [TSPA: endangered; EPBCA: Critically Endangered]

This species is known primarily from the Henry Somerset Conservation Area on Railton Road (Forico Pty Limited private sanctuary) but has also recently been confirmed from the Devil Road-Old Deloraine Road area (M. Wapstra, 2022, surveys for Forico Pty Limited), including from within the proposed pipeline corridor. The species occurs in dry forest only so will be absent from wet sclerophyll forest. The status of this species means that it should be considered a potential critical constraint to design and implementation, with the key objective to avoid any impact on the species.

RECOMMENDATION: It is recommended that all areas of dry forest within and adjacent to the proposed pipeline corridor between the Mersey River and the Bass Highway be surveyed in spring. The ideal timing is the first week of November. The survey should be conducted with someone suitably familiar with the complex taxonomy and identification issues of the *Caladenia carnea-tonellii* species-complex. The survey should be extended to include the Devil Road verge option of installing the pipeline (D. Butler pers. comm.) because this is largely through wetter forest that will not be suitable for the species. The survey should also extend well beyond the pipeline corridor to provide context to any findings such that the proportional impact of any option can be estimated.

- *Caladenia caudata* (tailed spider-orchid) [TSPA: vulnerable; EPBCA: Vulnerable]

This species is known primarily from the Henry Somerset Conservation Area on Railton Road (Forico Pty Limited private sanctuary) but there are also older sightings from the Devil Road-Old Deloraine Road area. The species occurs in dry forest only so will be absent from wet sclerophyll forest.

RECOMMENDATION: It is recommended that all areas of dry forest within and adjacent to the proposed pipeline corridor between the Mersey River and the Bass Highway be surveyed in spring. The ideal timing is mid-October in northern Tasmania. See also comments under *C. tonellii*.

- *Cassinia rugata* (wrinkled dollybush) [TSPA: endangered; EPBCA: Vulnerable]

This species is known only from the Parkers Ford Road-Squeaking Point Road area, with no records associated with the currently proposed pipeline route. The species occurs in wet heathland and heathy woodland (usually with impeded drainage) but also occurs on disturbed road verges. The recent drive-through examined some known sites along road verges and it appeared that road and property maintenance activities have largely eliminated the species from the strip of land between fencelines and the sealed road edge. Examination of topographic maps and aerial imagery, combined with the drive-through assessment, suggests limited potential habitat for the species will be present.

RECOMMENDATION: A spring survey of remnant patches of native vegetation in the Parkers Ford Road-Squeaking Point Road area is suggested (ideal in spring when in flower and most easily detected).

- *Persicaria decipiens* (slender waterpepper) [TSPA: vulnerable; EPBCA: not listed]

There are several sites for this species within the project area, almost all recorded in July 2009 and assigned to the "Thirlstane Irrigation Pipeline" project. This is a species that is becoming increasingly recorded as a consequence of both development assessments and better recognition (separate from the also widespread *Persicaria hydropiper*). While it is still listed as vulnerable, there is widespread recognition that the status of the species warrants review (downlist to rare or even delist). In my opinion, this is how the species should be treated i.e. as a widespread and locally abundant species that thrives in disturbed habitats such as roadside and paddock ditches, as well as more naturally poorly-drained sites.

RECOMMENDATION: Surveys for this species can be undertaken at any time of the year.

- Other species

There may be other species that will be recorded as a consequence of routine natural values assessments. In my opinion, except for the presence of threatened orchids near Devil Road-Old Deloraine Road, there is a relatively low likelihood of species that will present as critical constraints elsewhere in the project area.

RECOMMENDATION: Threatened flora

Undertake mid-October surveys of dry sclerophyll forest for *Caladenia caudata*.

Undertake early November surveys of dry sclerophyll forest for *Caladenia tonellii*.

Undertake surveys of balance of project area at any time of the year for other species.

Threatened fauna

The following analysis is based on a review of GIS coverages (*Natural Values Atlas* records), my own experience of the wider project area and the drive-through preliminary site assessment. It highlights the key species and issues only.

- *Aquila audax* subsp. *fleayi* (wedge-tailed eagle) [TSPA: endangered; EPBCA: Endangered]

There are two elements in relation to this species that will require consideration: (1) known nests and (2) potential nesting habitat.

Known nests

Any nests within 500 m or 1 km line-of-sight will need to be taken into account. In theory, the key issue will be construction timing on the assumption that (a) the pipeline will not require removal of a nest (obviously not proposed) and (b) no forest within ca. 200 m of a nest site needs to be removed (i.e. outside of what would be a generally accepted permanent 10 ha reserve around a site).

At present, the following nest sites are identified that may present constraints to the project:

- RND #2344 ("adjacent to pine plantation on Oppenheimer's Road Sassafras")

This site is actually described as "2 nests in adjacent trees at the same location, 1 nest looks a bit rough, other looks fresh and larger than the first, some chain sawing just occurring in the same coupe, approx. 20m from nest site, eagle seen flying overhead, land owner made aware of site" and is within ca. 125 m of the proposed pipeline. However, the pipeline is proposed to pass through a gap between forest remnants through pasture such that the disturbance will be temporary.

- RND #2766 ("approx. 1.5km WNW of Harford")

This site is actually described as "Eagle nest in what appears to me to not be a typical location (beside a road in remnant native vegetation) The observer had seen Wedge tailed eagles in the area of the new nest and thought they might be a young pair. There is another pre-existing nest ne…" and is within ca. 100 m of the proposed pipeline. However, the pipeline is proposed to pass through a gap between forest remnants through pasture such that the disturbance will be temporary.

Nests RND #2344 & RND 2766 can be observed directly from Oppenheimers Road, which is public road.

Potential nesting habitat

At this stage, only a preliminary analysis has been made of potential nesting habitat within ca. 1 km of the proposed pipeline route. Based on grid codes 4-8 (i.e. highest potential), limited areas are shown. However, it is recommended that these be searched by helicopter at the appropriate time of year (February to June, inclusive i.e. outside the breeding season).

The main area of concern is associated with the slopes above the Mersey River, with known nests located to the north and south (both greater than 500 m from the proposed pipeline and not within line-of-sight). These are too steep and challenging to search effectively on foot.

There are additional slopes and gullies in the Creeleys Road-Knights Creek area west of the Bass Highway in the south of the project area that are marginally suitable.

RECOMMENDATION: Undertake a helicopter-based survey of the Mersey River and Knights Creek area between February and June (inclusive).

- *Engaeus granulatus* (Central North burrowing crayfish) [TSPA: endangered; EPBCA: Endangered]

The whole project area is within the known range of the species. There are numerous records of the species. However, many records attributed to the species simply represent sightings of burrows and an assumption of "ownership". In my experience, excavation and identification of individuals in the hand must be undertaken because several species can co-occur and there is an undescribed species present in the Latrobe area. The first stage will be to undertake a habitat-level assessment to map sites with evidence of any *Engaeus* species. This can be undertaken at any time of the year. This is then used to target excavations, ideally capturing the geographic range of mapped burrows and also the range of micro-habitats present. Excavations can also be undertaken at any time of the year but mid-winter is not ideal (for many reasons).

RECOMMENDATION: Map evidence of species as part of routine natural values assessments followed by targeted excavations (with expert identification).

- *Litoria raniformis* (growling grass frog) [TSPA: vulnerable; EPBCA: Vulnerable]

This species should be relatively simple to manage in so far as the ideal habitat will be the numerous farm dams and associated ditches throughout the project area. Current design indicates virtually no intention to materially impact on this habitat element. Routine natural values assessments can be undertaken to map potential habitat but provided works do not significantly alter habitat conditions, targeted surveys may not become needed.

RECOMMENDATION: Map potential habitat as part of routine natural values assessments.

- Other species

Potential habitat for other species can be mapped as part of routine natural values assessments but without specific timing indicated.

RECOMMENDATION: Threatened fauna

Wedge-tailed eagle: undertake a helicopter-based survey of the Mersey River and Knights Creek area between February and June (inclusive).

Central North burrowing crayfish: Map evidence of species as part of routine natural values assessments followed by targeted excavations (with expert identification).

Growling grass frog: Map potential habitat as part of routine natural values assessments.

Other natural values

Apart from the specific matters discussed above, it is recommended that the proposed pipeline route (with appropriate buffer i.e. 50 m each side) be subject to assessments that meet the intent and specifics of the *Guidelines for Natural Values Surveys – Terrestrial Development Proposals*.

SPRING UPDATE: Targeted surveys for *Caladenia tonellii* & *Caladenia caudata*

Preamble

As part of the initial critical constraints review, some timed-targeted surveys for threatened orchid species was recommended, as follows:

- *Caladenia tonellii* (robust fingers) [TSPA: endangered; EPBCA: Critically Endangered]

This species is known primarily from the Henry Somerset Conservation Area on Railton Road (Forico Pty Limited private sanctuary) but has also recently been confirmed from the Devil Road-Old Deloraine Road area (M. Wapstra, 2022, surveys for Forico Pty Limited), including from within the proposed pipeline corridor. The species occurs in dry forest only so will be absent from wet sclerophyll forest. The status of this species means that it should be considered a potential critical constraint to design and implementation, with the key objective to avoid any impact on the species.

RECOMMENDATION: It is recommended that all areas of dry forest within and adjacent to the proposed pipeline corridor between the Mersey River and the Bass Highway be surveyed in spring. The ideal timing is the first week of November. The survey should be conducted with someone suitably familiar with the complex taxonomy and identification issues of the *Caladenia carnea-tonellii* species-complex. The survey should be extended to include the Devil Road verge option of installing the pipeline (D. Butler pers. comm.) because this is largely through wetter forest that will not be suitable for the species. The survey should also extend well beyond the pipeline corridor to provide context to any findings such that the proportional impact of any option can be estimated.

- *Caladenia caudata* (tailed spider-orchid) [TSPA: vulnerable; EPBCA: Vulnerable]

This species is known primarily from the Henry Somerset Conservation Area on Railton Road (Forico Pty Limited private sanctuary) but there are also older sightings from the Devil Road-Old Deloraine Road area. The species occurs in dry forest only so will be absent from wet sclerophyll forest.

RECOMMENDATION: It is recommended that all areas of dry forest within and adjacent to the proposed pipeline corridor between the Mersey River and the Bass Highway be surveyed in spring. The ideal timing is mid-October in northern Tasmania. See also comments under *C. tonellii*.

Methods

Based on evidence of flowering times from both database information, the author's own records for both species and social media posts of the species from nearby sites (as well as personal communications with knowledgeable local orchid enthusiasts), the surveys were timed as follows:

- 1 Nov. 2022: Brian French (ECO*tas*) & Jesse Lewis (Tasmanian Irrigation)

&

- 16 Nov. 2022: Mark Wapstra (ECO*tas*).

Findings

Caladenia caudata

No evidence of *Caladenia caudata* was detected from any of the target sites.

Caladenia tonellii

No evidence of *Caladenia tonellii* was recorded on the first survey of 1 Nov. 2022. This included navigating to the database locations of the species between the Mersey River and the TI concrete reservoir on the Forico Pty Limited property. At some of these locations, the closely-related *Caladenia carnea* was reported. In theory, this is expected as at the type location of Henry Somerset Conservation Area, *Caladenia tonellii* tends to flower slightly later (at least in some years) than *Caladenia carnea*. What is interesting is that no convincing evidence of *Caladenia tonellii* could be found at precise locations where it had been previously recorded. That said, this is also in accordance with my previous observations at this site where the two species co-occur closely and separating them is somewhat a matter of expert opinion guided by some relatively nebulous variables.

The follow-up survey of 16 Nov. 2022 covered the same approximate area, but once again specifically targeting the previously reported sites within the Forico title. On this occasion, I allocated several specimens to *Caladenia tonellii*, although the vast majority of flowering *Caladenia* were clearly attributable to *Caladenia carnea*. As part of the present survey, I walked many hundreds of metres in two directions. This included walking down the existing water pipeline opening and then two parallel transects either side (up and down), as well as more meandering transects throughout the balance of the Forico title. This included walking the verge of Devil Road, both verges of the gravel road between Devil Road and the concrete reservoir, along the track bordering the plantation, and along the northern boundary of the Forico title. I am comfortable that between the two survey efforts, the extent of possible *Caladenia tonellii* has been reasonably determined.

While the taxonomy and identification of individual remains highly challenging and problematic, on the basis of some characters I am reasonably confident in assigning five individuals only to *Caladenia tonellii*. Three of these sites were effectively at the same location as previously recorded by the author, again noting that the specimens assigned to *Caladenia tonellii* occur amongst a swathe of "good" *Caladenia carnea* (Figure 2). Two novel sites were detected (Figure 2). One is on the edge of the notional 100 m wide survey corridor, well downslope of the existing water pipeline. The other is on the northwest side of the track that runs around the northwestern side of the concrete reservoir, the individual several metres into the shrubby understorey (Plates 1-3; Figure 2).

Provided that the design avoids the reported locations of *Caladenia tonellii*, a permit under Section 51 of the Tasmanian *Threatened Species Protection Act 1995* should not be required (indeed, is probably not technically possible) because works will not result in a specimen being "knowingly taken". This should be practical to achieve by accepting the GPSed location of the plants as accurate, establishing a buffer (e.g. barrier mesh) ca. 10 m around each site and inducting contractors working in the area of the management constraints.

If the above recommendations are implemented, and works are kept tight to a works corridor such that "edge effects" do not reasonably arise as a longer-term management issue (noting that this species appears to thrive under some level of disturbance), and longer-term impacts from weed invasion are appropriately considered (gorse, spanish heath and canary broom are all recorded in

the area), I do not believe that the works will represent a "significant" impact within the intent of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Plate 1. (LHS) Typical tall growth habit of Caladenia tonellii – this specimen from northwest of the reservoir with two flowers, the upper flower set at an almost right angle from the first (a character I consider diagnostic)

Plate 2. (RHS) Lower flower of specimen from Plate 1 showing the large flowers with "droopy" segments and large lateral lobes with the less than erect dorsal sepal

Plate 3. Same specimen/flower from a slightly different angle showing the length of the segments and widely separated segments

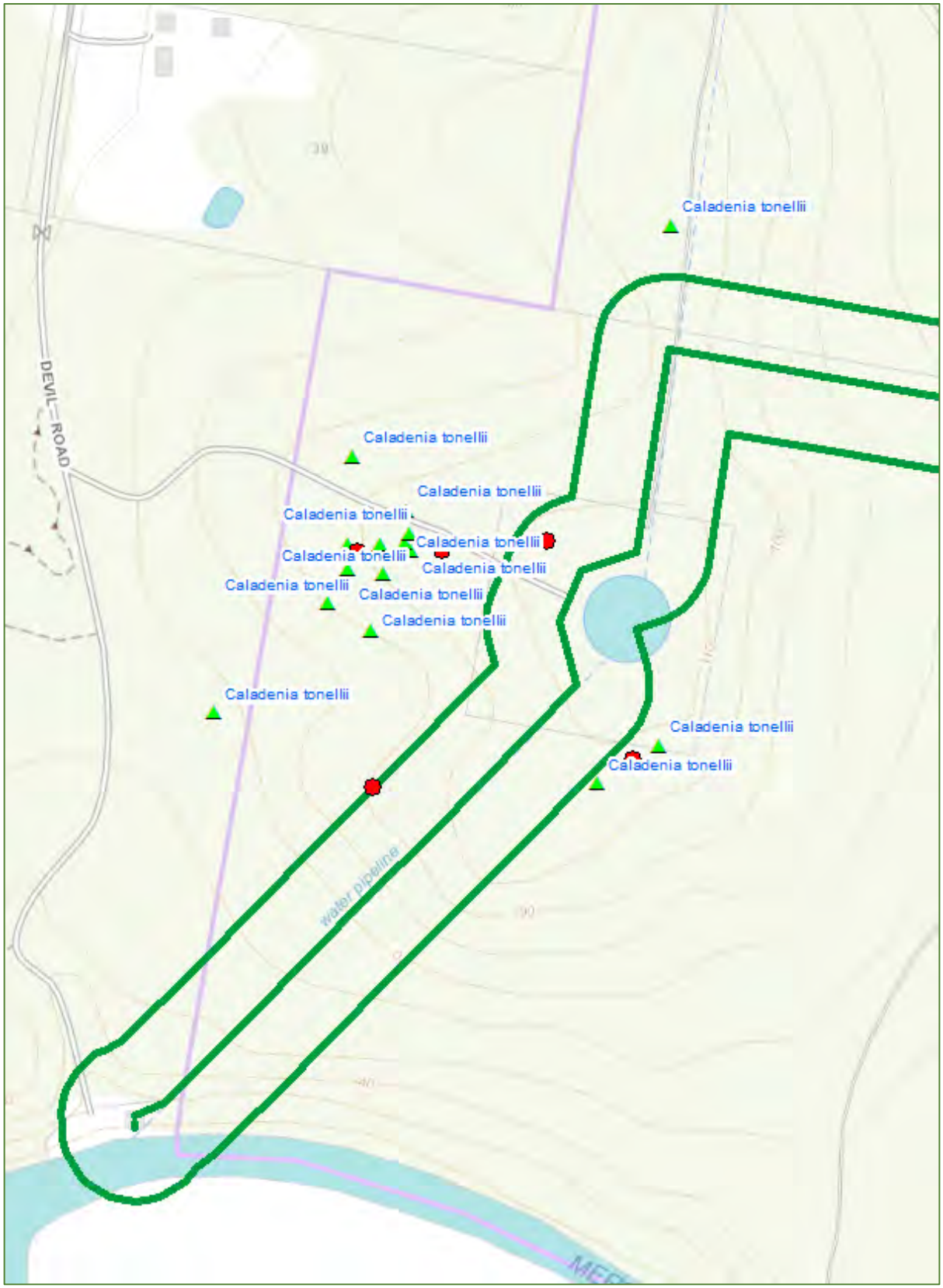

Figure 2. Revised distribution of *Caladenia tonellii*: green = indicative pipeline; green triangles = 2021 records of *Caladenia tonellii* (M. Wapstra, surveys for Forico Pty Limited); red points = *Caladenia tonellii* (present survey)

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ECOSYSTEM SERVICES

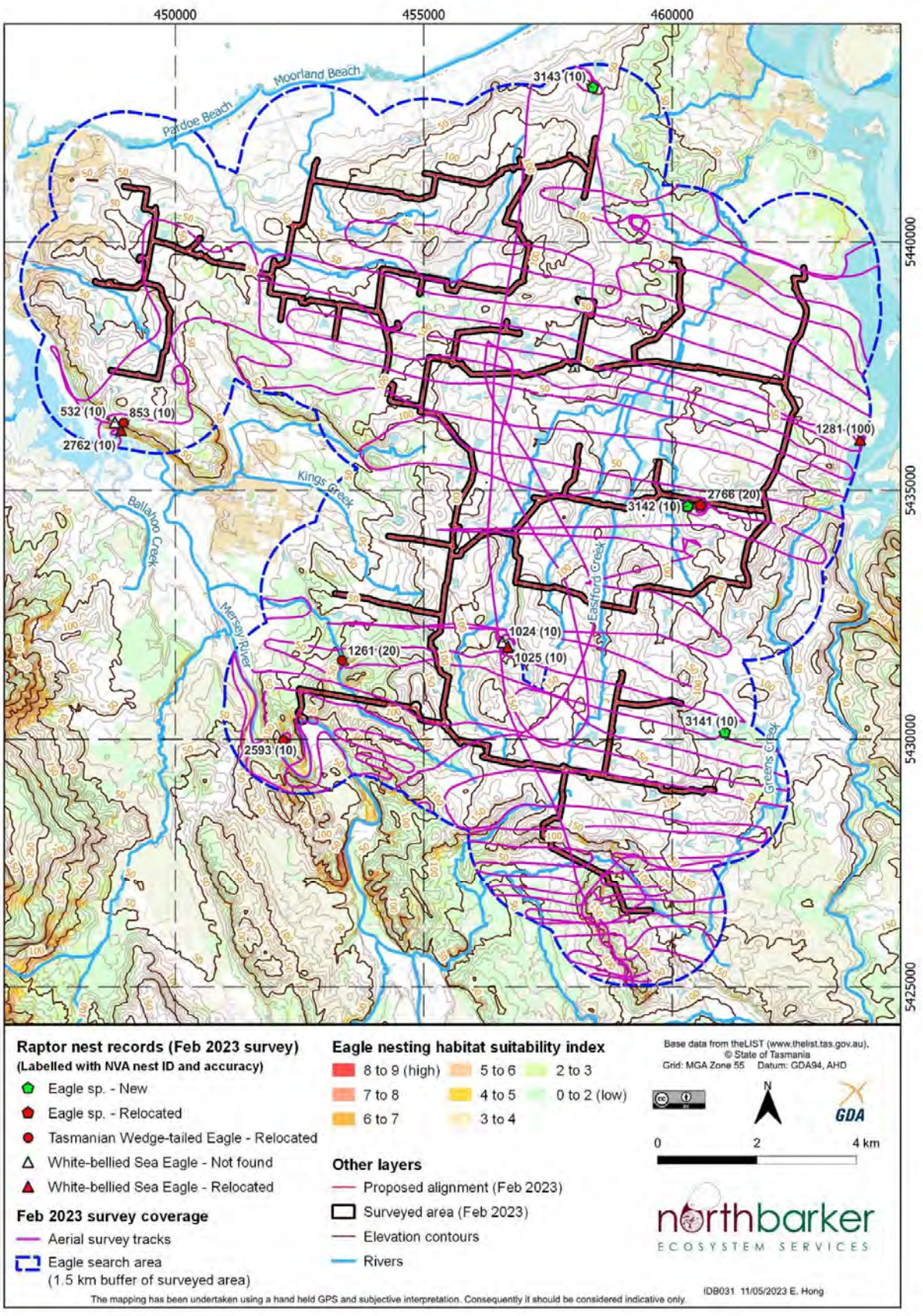
Sassafras - Wesley Vale Irrigation Scheme Augmentation

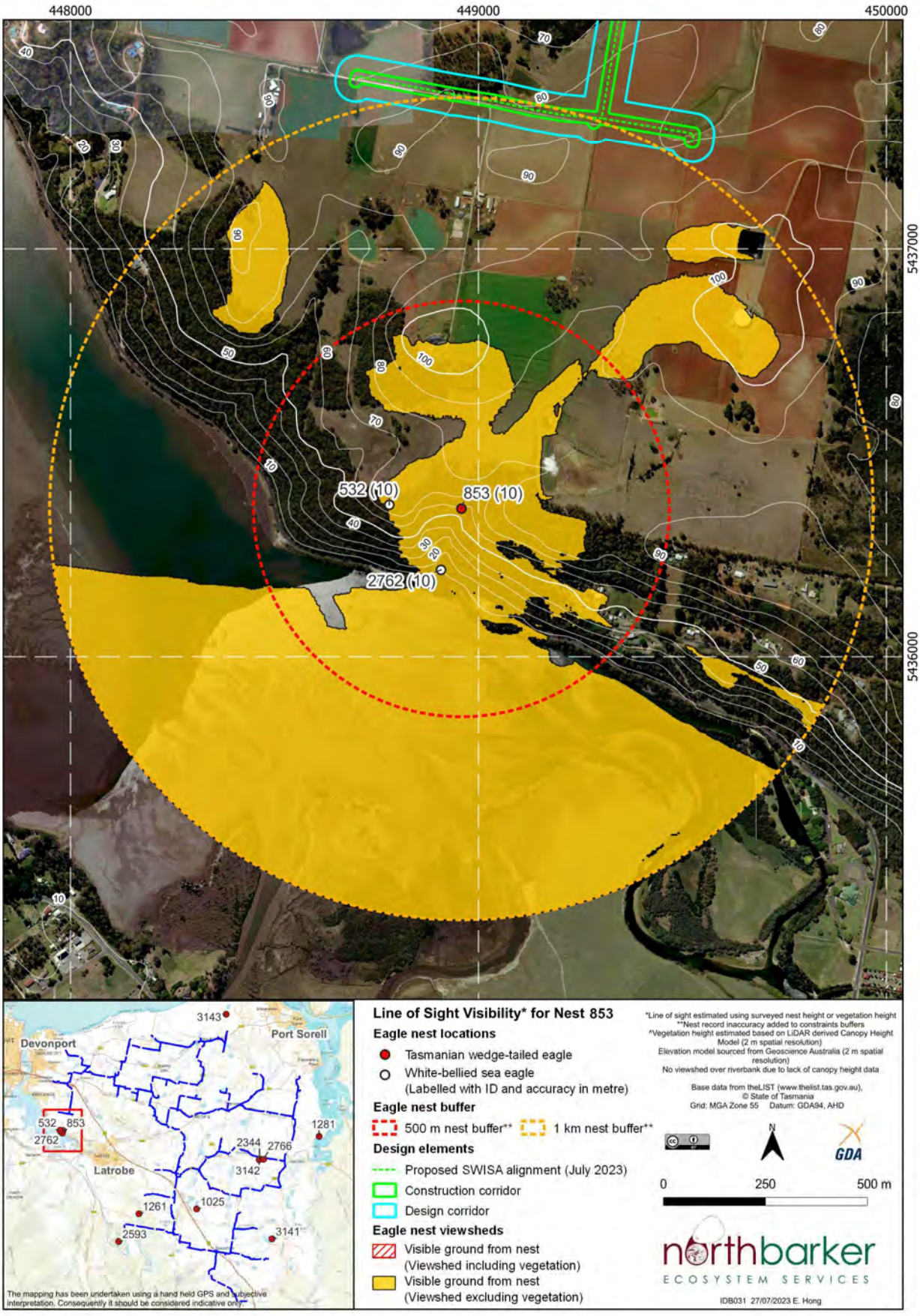
Appendix F –Eagle Nest Visibility Maps

For Tasmanian Irrigation (IDB031)

313 Macquarie Street, Hobart Tasmania, 7000
03 62319788
admin@northbarker.com.au www.northbarker.com.au

Appendix F –Eagle Nest Visibility Maps

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2344
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1281
3142
1025
1261
2593
3141
The mapping has been undertaken using a hand held GPS and subjective interpretation. Consequently it should be considered indicative only.
Line of Sight Visibility* for Nest 853
Eagle nest locations
Tasmanian wedge-tailed eagle
White-bellied sea eagle
(Labelled with ID and accuracy in metre)
Eagle nest buffer
500 m nest buffer**
1 km nest buffer**
Design elements
Proposed SWISA alignment (July 2023)
Construction corridor
Design corridor
Eagle nest viewsheds
Visible ground from nest
(Viewshed including vegetation)
Visible ground from nest
(Viewshed excluding vegetation)
*Line of sight estimated using surveyed nest height or vegetation height
**Nest record inaccuracy added to constraints buffers
^Vegetation height estimated based on LiDAR derived Canopy Height Model (2 m spatial resolution)
Elevation model sourced from Geoscience Australia (2 m spatial resolution)
No viewshed over riverbank due to lack of canopy height data
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
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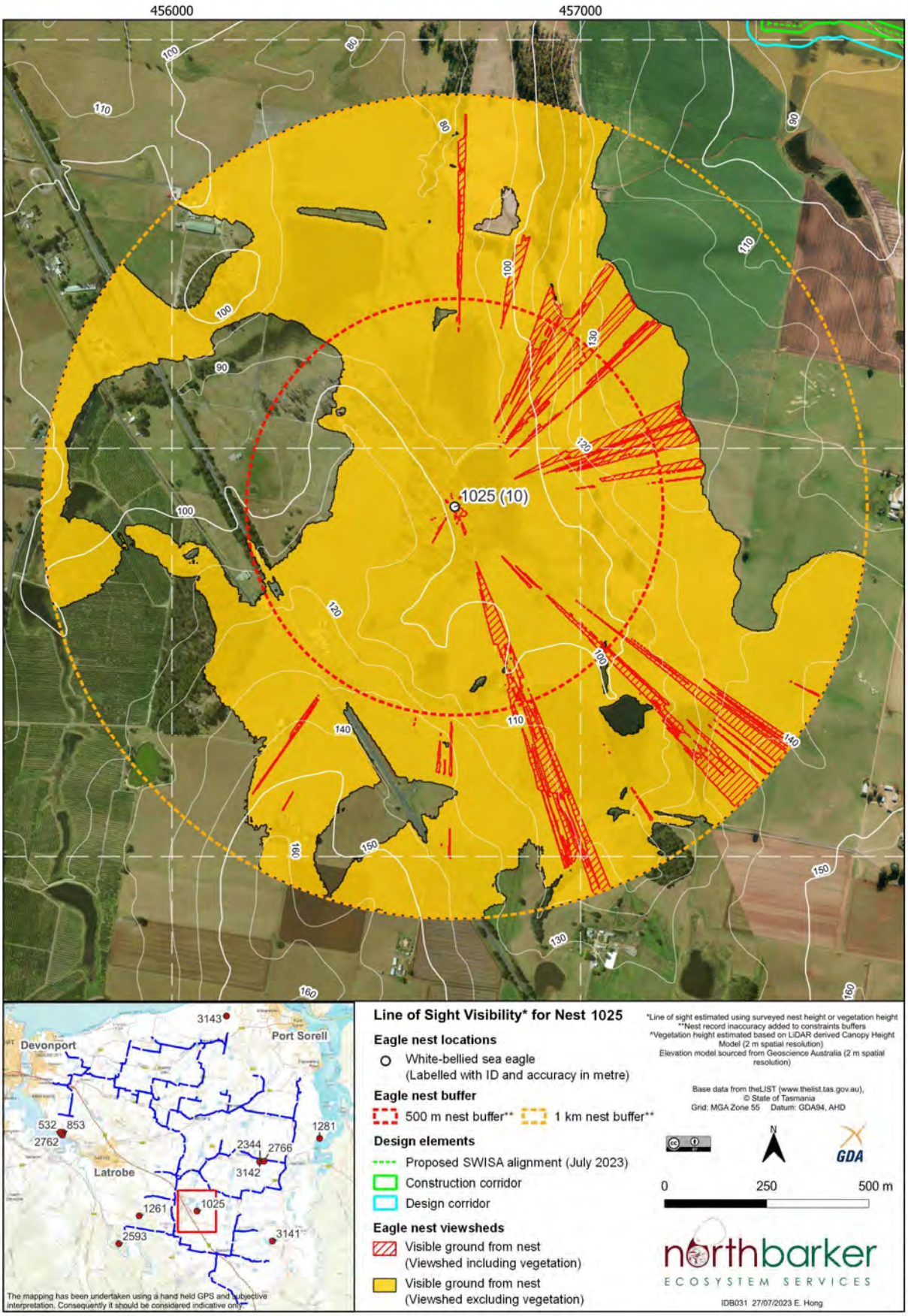
IDB031 27/07/2023 E. Hong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Line of Sight Visibility* for Nest 1025
Eagle nest locations
White-bellied sea eagle
(Labelled with ID and accuracy in metre)
Eagle nest buffer
500 m nest buffer**
1 km nest buffer**
Design elements
Proposed SWISA alignment (July 2023)
Construction corridor
Design corridor
Eagle nest viewsheds
Visible ground from nest
(Viewshed including vegetation)
Visible ground from nest
(Viewshed excluding vegetation)
*Line of sight estimated using surveyed nest height or vegetation height
**Nest record inaccuracy added to constraints buffers
*Vegetation height estimated based on LiDAR derived Canopy Height Model (2 m spatial resolution)
Elevation model sourced from Geoscience Australia (2 m spatial resolution)
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
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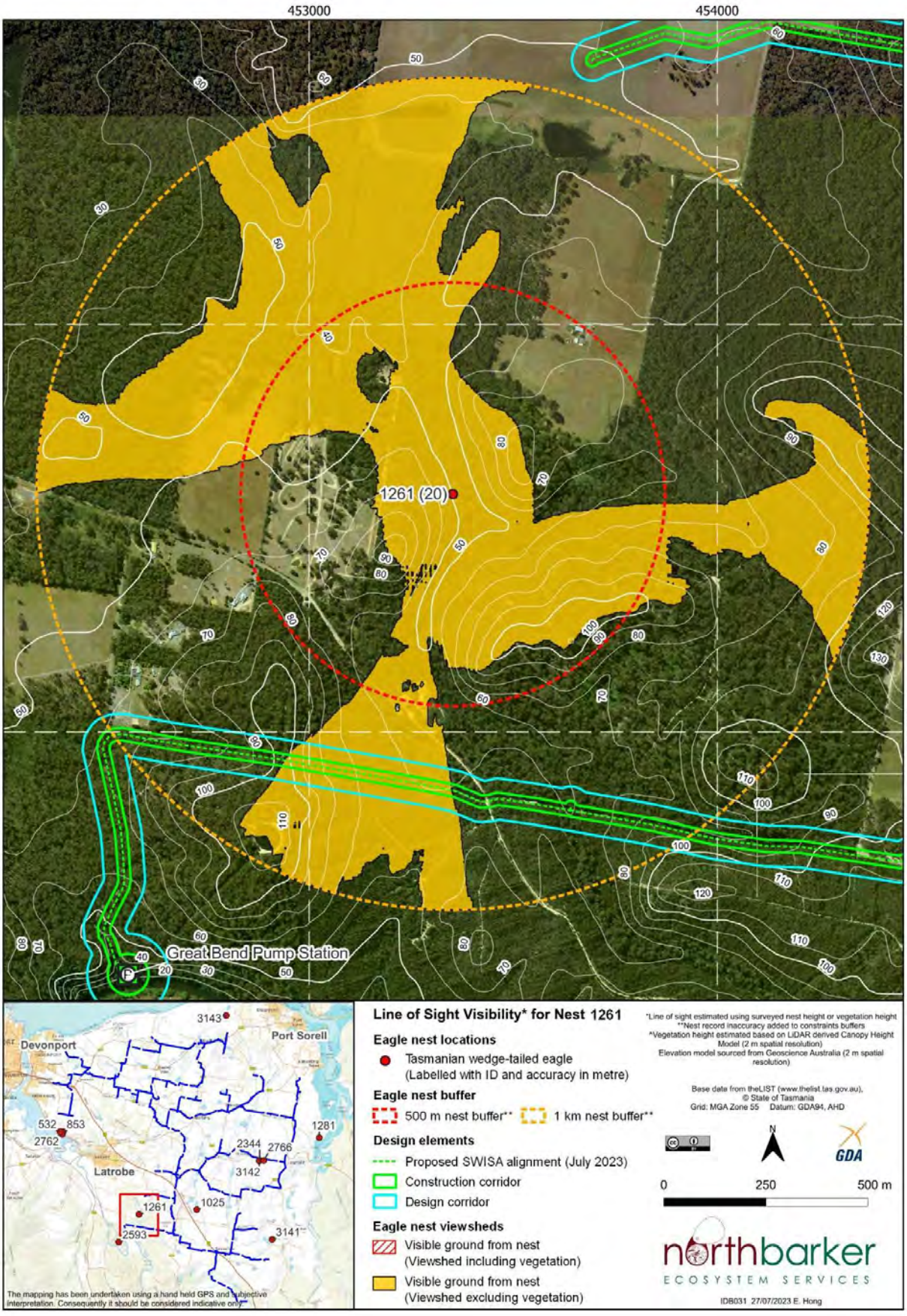
The mapping has been undertaken using a hand held GPS and subjective interpretation. Consequently it should be considered indicative only.


453000
454000
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5431000
1261 (20)
Great Bend Pump Station
Line of Sight Visibility* for Nest 1261
*Line of sight estimated using surveyed nest height or vegetation height
**Nest record inaccuracy added to constraints buffers
*Vegetation height estimated based on LiDAR derived Canopy Height Model (2 m spatial resolution)
Elevation model sourced from Geoscience Australia (2 m spatial resolution)
Eagle nest locations
Tasmanian wedge-tailed eagle
(Labelled with ID and accuracy in metre)
Eagle nest buffer
500 m nest buffer**
1 km nest buffer**
Design elements
Proposed SWISA alignment (July 2023)
Construction corridor
Design corridor
Eagle nest viewsheds
Visible ground from nest
(Viewshed including vegetation)
Visible ground from nest
(Viewshed excluding vegetation)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
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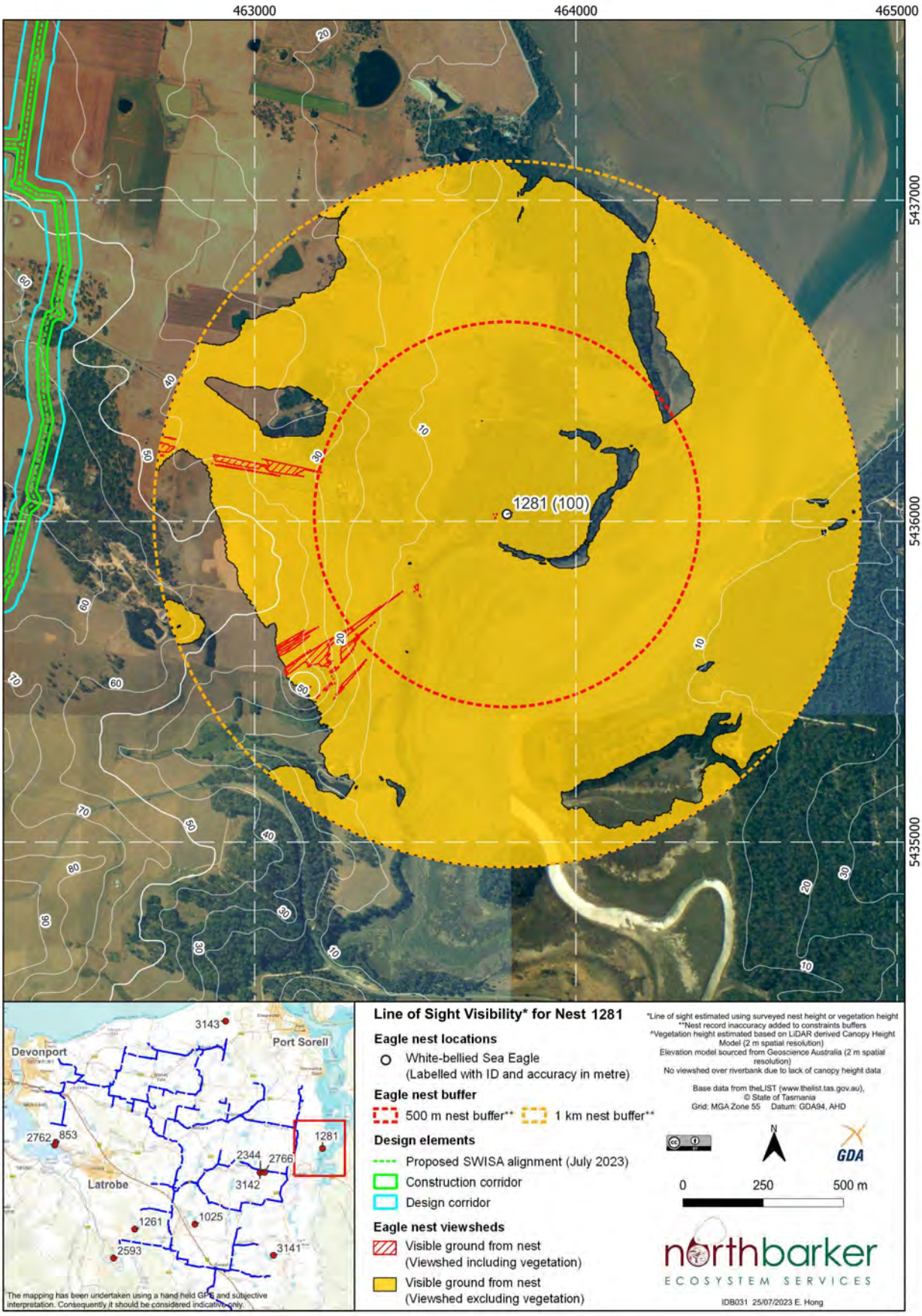
The mapping has been undertaken using a hand held GPS and subjective interpretation. Consequently it should be considered indicative only.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3142
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The mapping has been undertaken using a hand held GPS and subjective interpretation. Consequently it should be considered indicative only.
Line of Sight Visibility* for Nest 1281
Eagle nest locations
White-bellied Sea Eagle
(Labelled with ID and accuracy in metre)
Eagle nest buffer
500 m nest buffer**
1 km nest buffer**
Design elements
Proposed SWISA alignment (July 2023)
Construction corridor
Design corridor
Eagle nest viewsheds
Visible ground from nest
(Viewshed including vegetation)
Visible ground from nest
(Viewshed excluding vegetation)
*Line of sight estimated using surveyed nest height or vegetation height
**Nest record inaccuracy added to constraints buffers
^Vegetation height estimated based on LiDAR derived Canopy Height Model (2 m spatial resolution)
Elevation model sourced from Geoscience Australia (2 m spatial resolution)
No viewshed over riverbank due to lack of canopy height data
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
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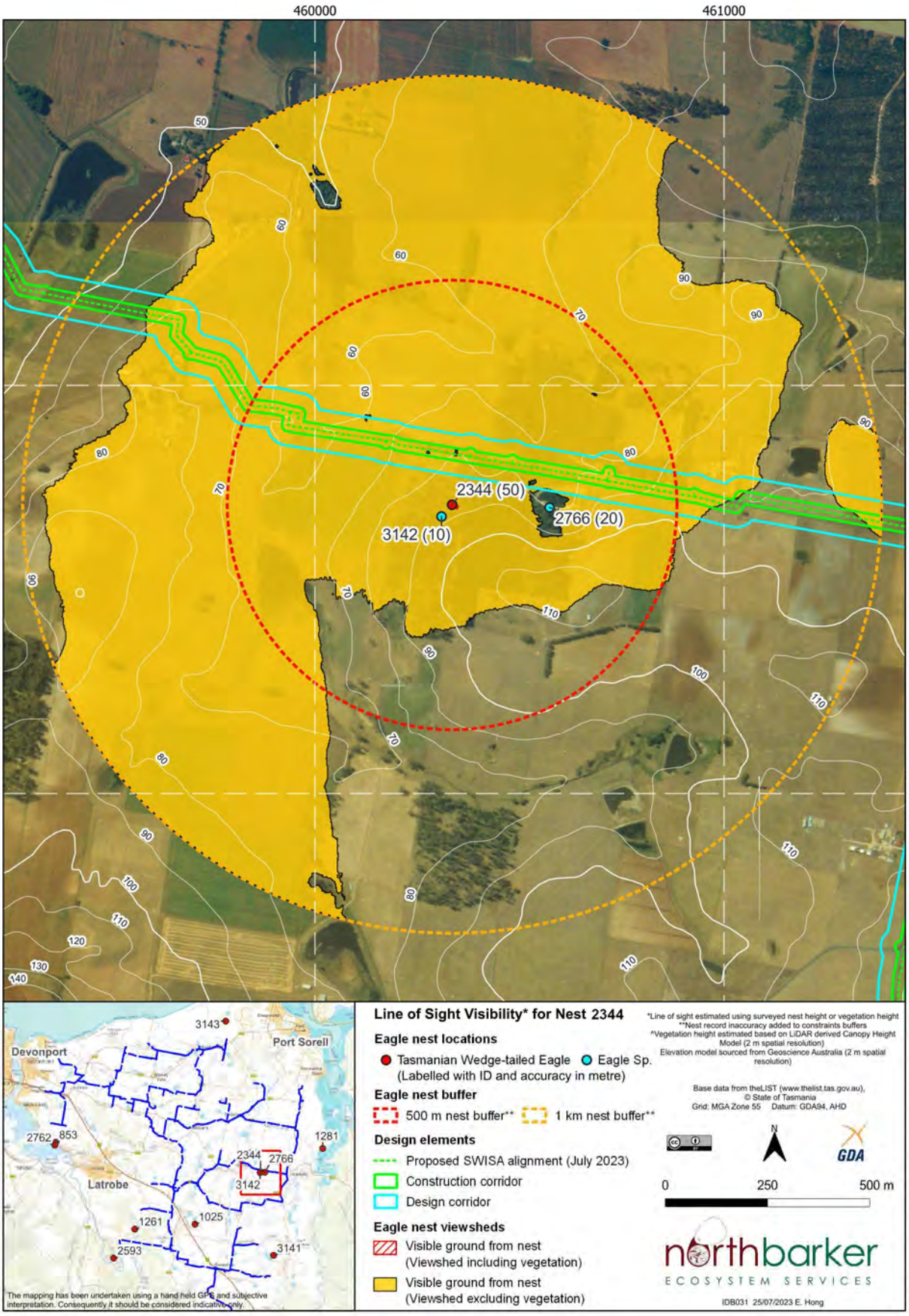
ECOSYSTEM SERVICES
IDB031 25/07/2023 E. Hong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The mapping has been undertaken using a hand held GPS and subjective interpretation. Consequently it should be considered indicative only.
Line of Sight Visibility* for Nest 2344
Eagle nest locations
Tasmanian Wedge-tailed Eagle
Eagle Sp.
(Labelled with ID and accuracy in metre)
Eagle nest buffer
500 m nest buffer**
1 km nest buffer**
Design elements
Proposed SWISA alignment (July 2023)
Construction corridor
Design corridor
Eagle nest viewsheds
Visible ground from nest
(Viewshed including vegetation)
Visible ground from nest
(Viewshed excluding vegetation)
*Line of sight estimated using surveyed nest height or vegetation height
**Nest record inaccuracy added to constraints buffers
*Vegetation height estimated based on LiDAR derived Canopy Height Model (2 m spatial resolution)
Elevation model sourced from Geoscience Australia (2 m spatial resolution)
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
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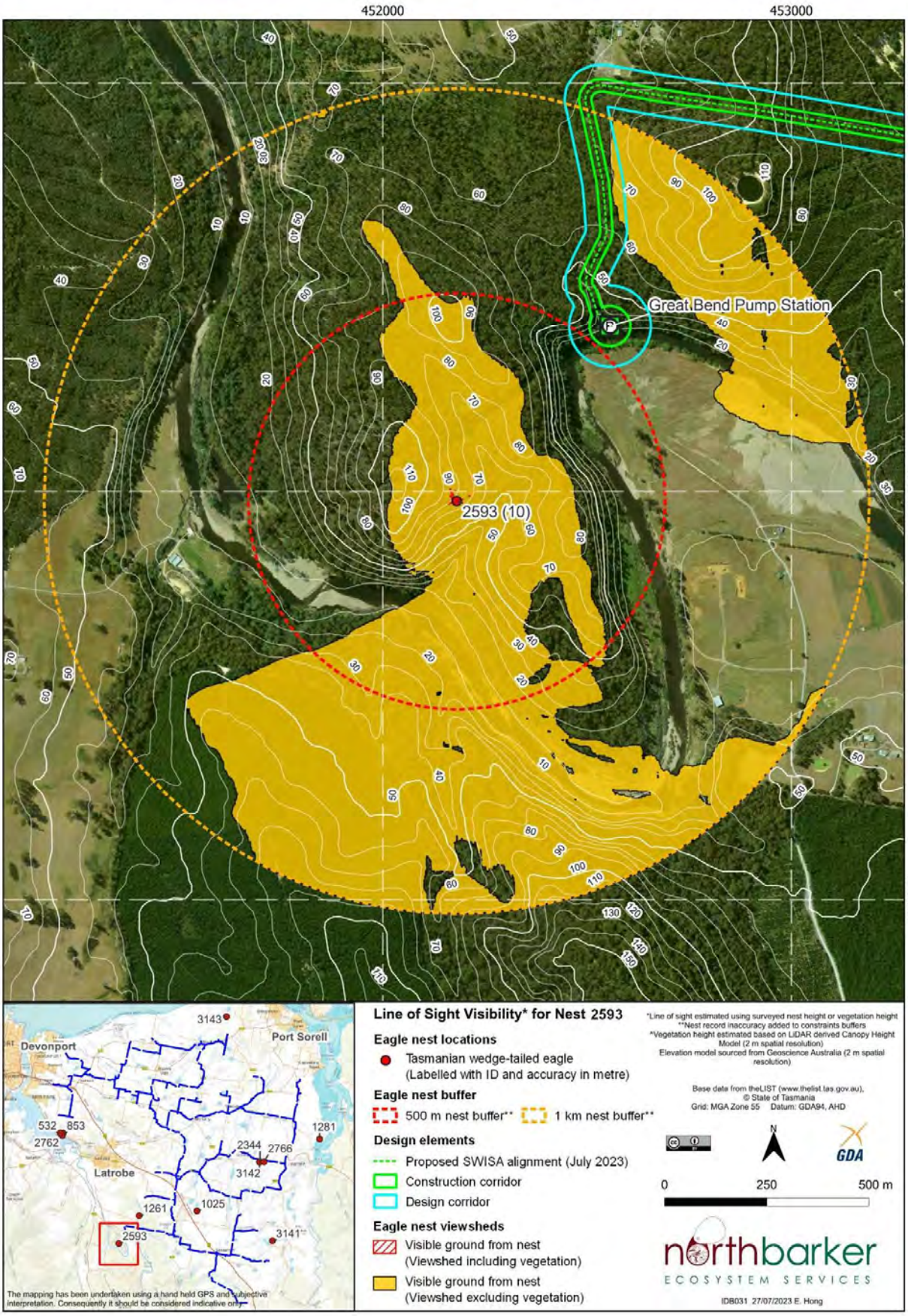
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The mapping has been undertaken using a hand held GPS and subjective interpretation. Consequently it should be considered indicative only.
Line of Sight Visibility* for Nest 2593
Eagle nest locations
Tasmanian wedge-tailed eagle
(Labelled with ID and accuracy in metre)
Eagle nest buffer
500 m nest buffer**
1 km nest buffer**
Design elements
Proposed SWISA alignment (July 2023)
Construction corridor
Design corridor
Eagle nest viewsheds
Visible ground from nest
(Viewshed including vegetation)
Visible ground from nest
(Viewshed excluding vegetation)
*Line of sight estimated using surveyed nest height or vegetation height
**Nest record inaccuracy added to constraints buffers
*Vegetation height estimated based on LiDAR derived Canopy Height Model (2 m spatial resolution)
Elevation model sourced from Geoscience Australia (2 m spatial resolution)
Base data from theLIST (www.thelist.tas.gov.au),
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Grid: MGA Zone 55 Datum: GDA94, AHD
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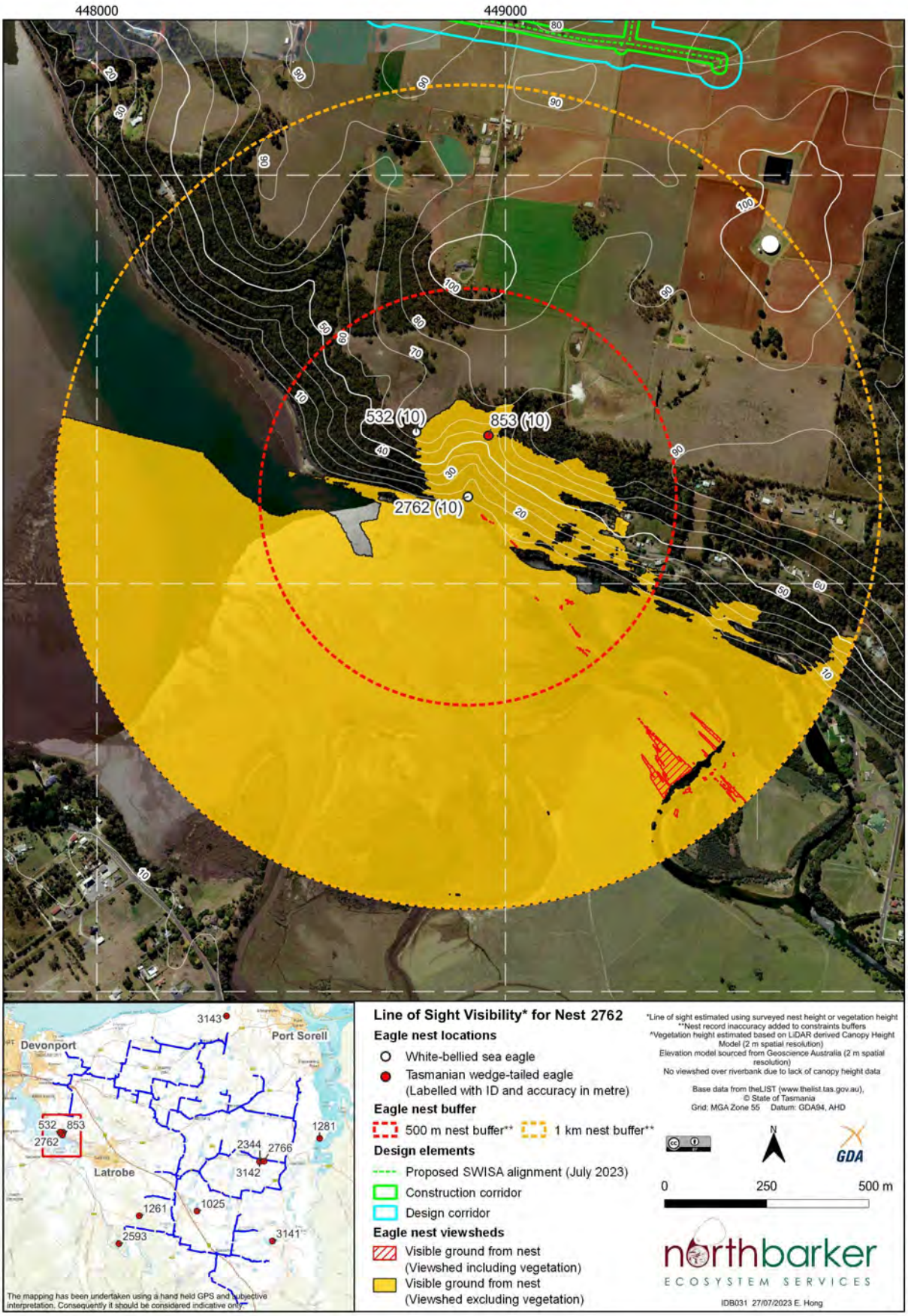
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The mapping has been undertaken using a hand held GPS and subjective interpretation. Consequently it should be considered indicative only.
Line of Sight Visibility* for Nest 2762
Eagle nest locations
White-bellied sea eagle
Tasmanian wedge-tailed eagle
(Labelled with ID and accuracy in metre)
Eagle nest buffer
500 m nest buffer**
1 km nest buffer**
Design elements
Proposed SWISA alignment (July 2023)
Construction corridor
Design corridor
Eagle nest viewsheds
Visible ground from nest
(Viewshed including vegetation)
Visible ground from nest
(Viewshed excluding vegetation)
*Line of sight estimated using surveyed nest height or vegetation height
**Nest record inaccuracy added to constraints buffers
*Vegetation height estimated based on LiDAR derived Canopy Height Model (2 m spatial resolution)
Elevation model sourced from Geoscience Australia (2 m spatial resolution)
No viewshed over riverbank due to lack of canopy height data
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
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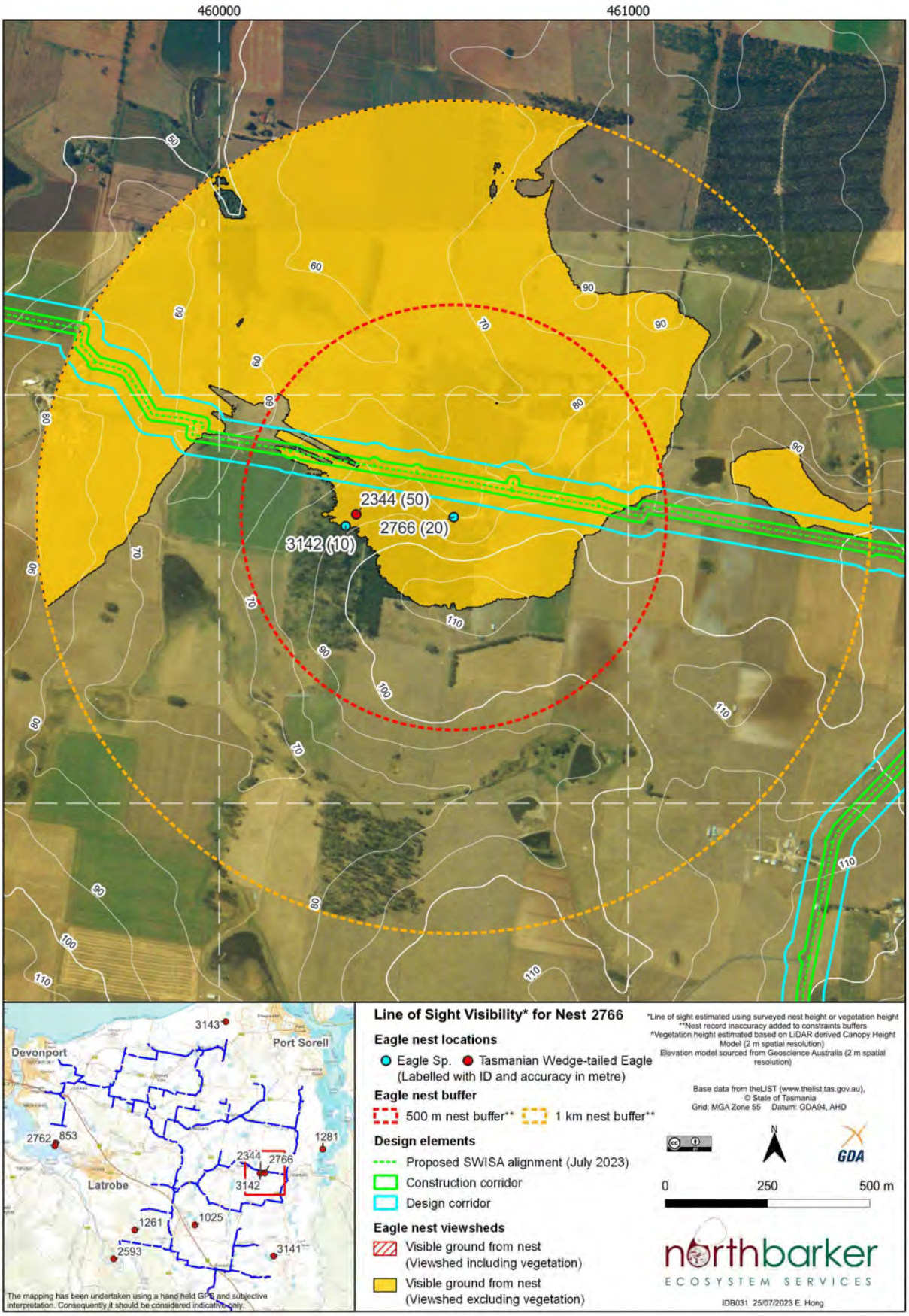
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The mapping has been undertaken using a hand held GPS and subjective interpretation. Consequently it should be considered indicative only.
Line of Sight Visibility* for Nest 2766
Eagle nest locations
Eagle Sp.
Tasmanian Wedge-tailed Eagle
(Labelled with ID and accuracy in metre)
Eagle nest buffer
500 m nest buffer**
1 km nest buffer**
Design elements
Proposed SWISA alignment (July 2023)
Construction corridor
Design corridor
Eagle nest viewsheds
Visible ground from nest
(Viewshed including vegetation)
Visible ground from nest
(Viewshed excluding vegetation)
*Line of sight estimated using surveyed nest height or vegetation height
**Nest record inaccuracy added to constraints buffers
*Vegetation height estimated based on LiDAR derived Canopy Height Model (2 m spatial resolution)
Elevation model sourced from Geoscience Australia (2 m spatial resolution)
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
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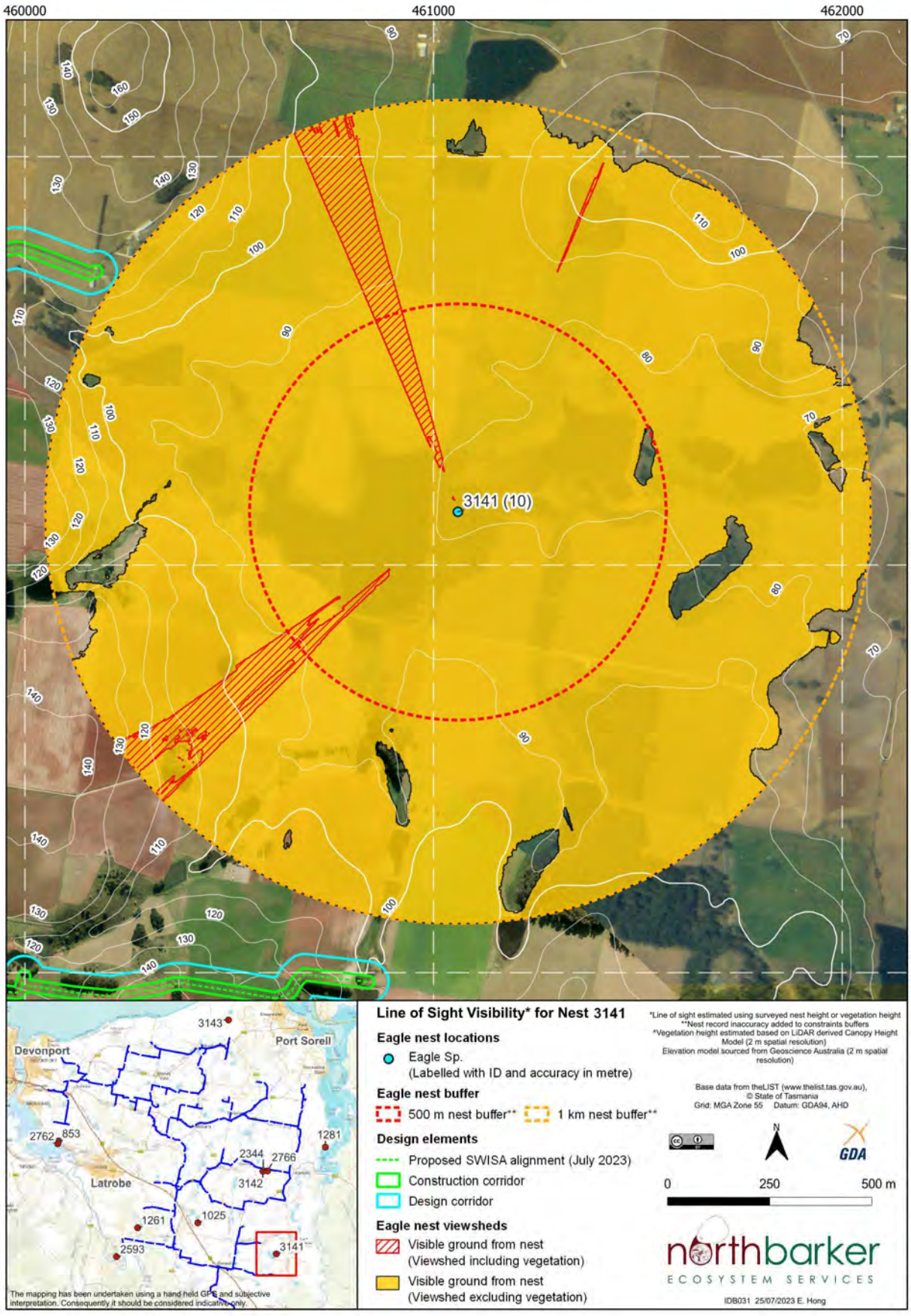
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Line of Sight Visibility* for Nest 3141
Eagle nest locations
Eagle Sp.
(Labelled with ID and accuracy in metre)
Eagle nest buffer
500 m nest buffer**
1 km nest buffer**
Design elements
Proposed SWISA alignment (July 2023)
Construction corridor
Design corridor
Eagle nest viewsheds
Visible ground from nest
(Viewshed including vegetation)
Visible ground from nest
(Viewshed excluding vegetation)
*Line of sight estimated using surveyed nest height or vegetation height
**Nest record inaccuracy added to constraints buffers
*Vegetation height estimated based on LiDAR derived Canopy Height Model (2 m spatial resolution)
Elevation model sourced from Geoscience Australia (2 m spatial resolution)
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
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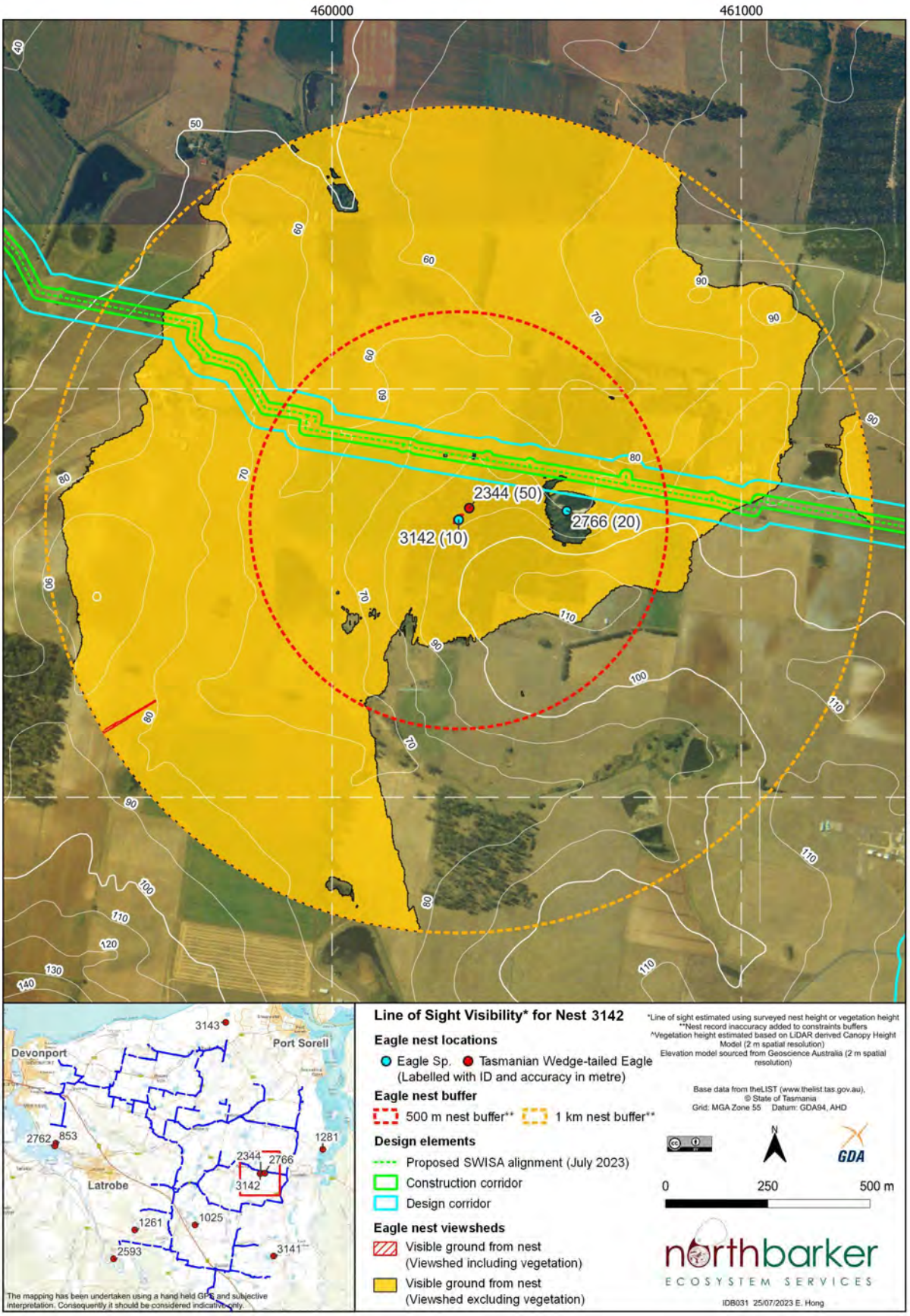
The mapping has been undertaken using a hand held GPS and subjective interpretation. Consequently it should be considered indicative only.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The mapping has been undertaken using a hand held GPS and subjective interpretation. Consequently it should be considered indicative only.
Line of Sight Visibility* for Nest 3142
Eagle nest locations
Eagle Sp.
Tasmanian Wedge-tailed Eagle
(Labelled with ID and accuracy in metre)
Eagle nest buffer
500 m nest buffer**
1 km nest buffer**
Design elements
Proposed SWISA alignment (July 2023)
Construction corridor
Design corridor
Eagle nest viewsheds
Visible ground from nest
(Viewshed including vegetation)
Visible ground from nest
(Viewshed excluding vegetation)
*Line of sight estimated using surveyed nest height or vegetation height
**Nest record inaccuracy added to constraints buffers
^Vegetation height estimated based on LiDAR derived Canopy Height Model (2 m spatial resolution)
Elevation model sourced from Geoscience Australia (2 m spatial resolution)
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
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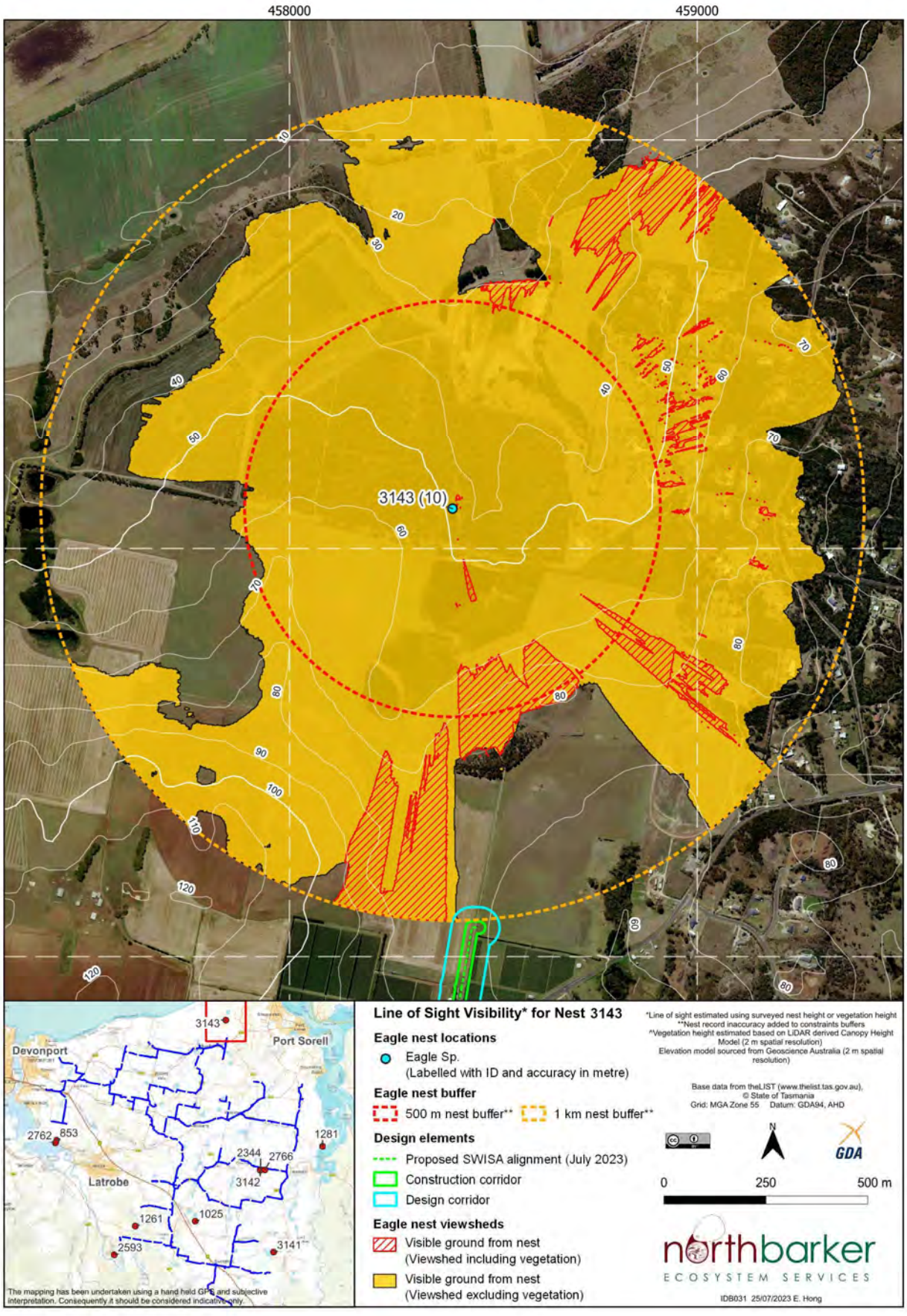
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The mapping has been undertaken using a hand held GPS and subjective interpretation. Consequently it should be considered indicative only.
Line of Sight Visibility* for Nest 3143
Eagle nest locations
Eagle Sp.
(Labelled with ID and accuracy in metre)
Eagle nest buffer
500 m nest buffer**
1 km nest buffer**
Design elements
Proposed SWISA alignment (July 2023)
Construction corridor
Design corridor
Eagle nest viewsheds
Visible ground from nest
(Viewshed including vegetation)
Visible ground from nest
(Viewshed excluding vegetation)
*Line of sight estimated using surveyed nest height or vegetation height
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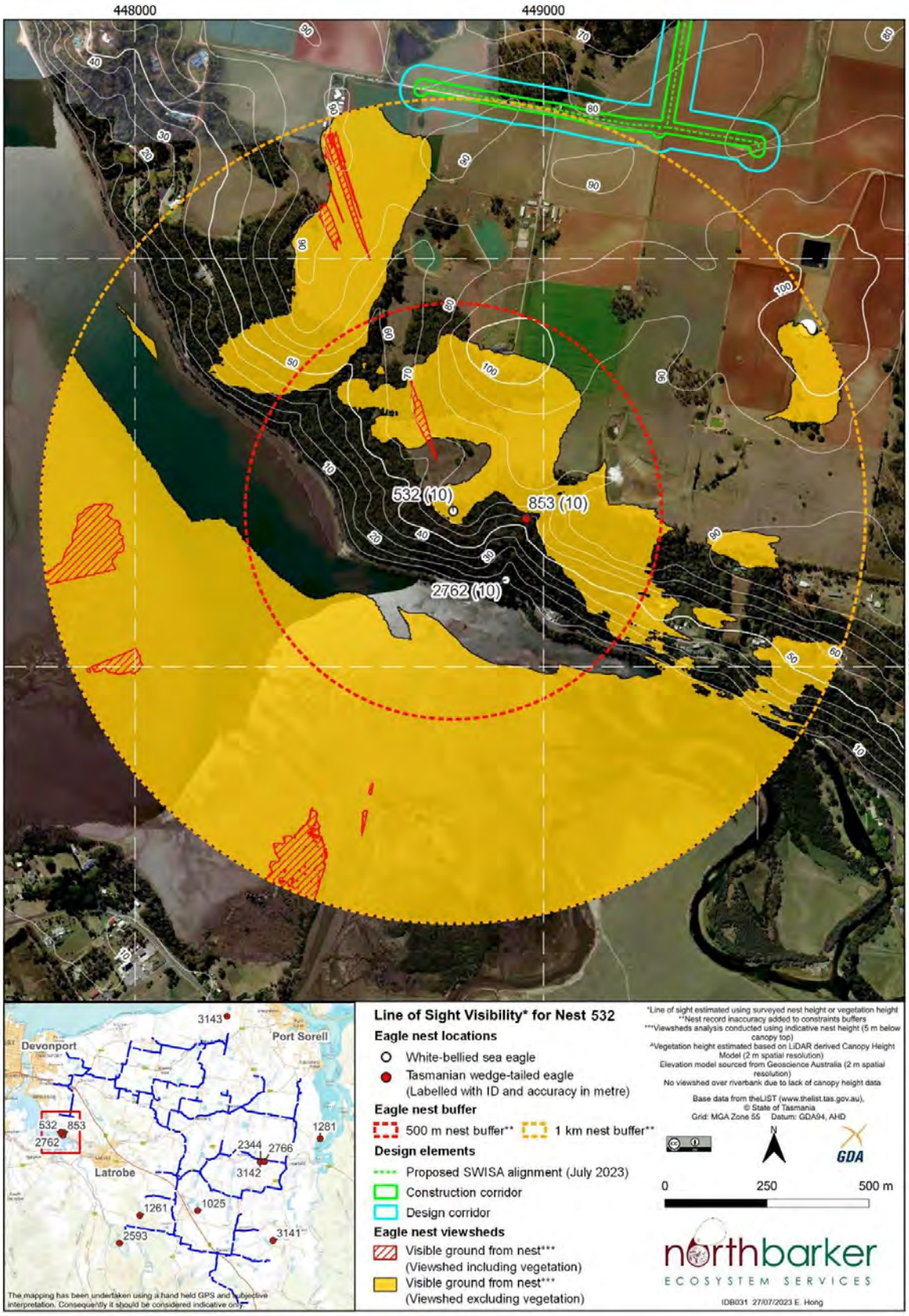

Nest 532 was not located during aerial survey and is thought to be absent. This map shows that the pipeline is outside line of site if it was present.

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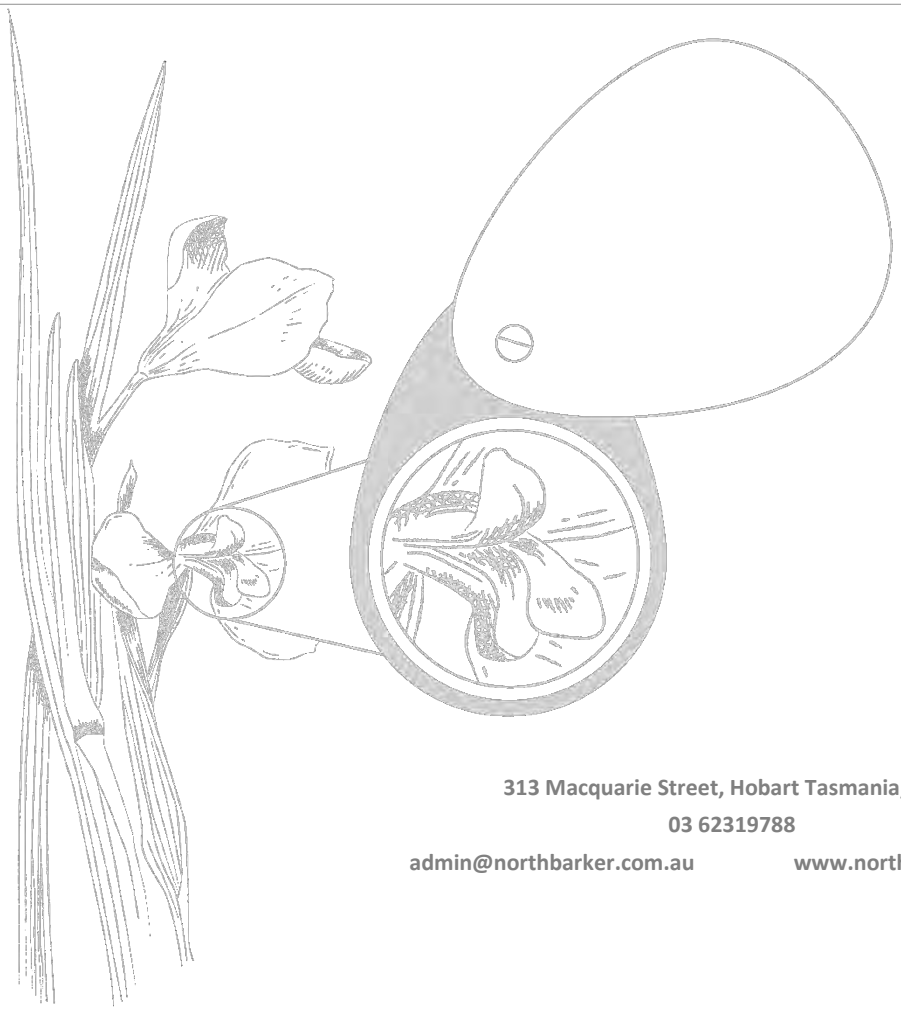
Sassafras - Wesley Vale Irrigation Scheme Augmentation

Appendix G - Matters of National Environmental Significance

For Tasmanian Irrigation (IDB031)



313 Macquarie Street, Hobart Tasmania, 7000
03 62319788
admin@northbarker.com.au www.northbarker.com.au

MNES (and other matters protected by the Act)	Context[1]	Potential Significant Impact	Justification (for all MNES with no potential for significant impacts) / Comments and Mitigation (for all MNES with potential for significant impacts)
World Heritage Properties			
None	-	No	None identified.
National Heritage Places			
None	-	No	None identified
Wetlands of International Importance (Ramsar)			
None	-	No	None identified.
Great Barrier Reef Marine Park			
None	-	No	None identified.
Commonwealth Marine Area			
None	-	No	None identified.
Listed Threatened Ecological Communities			
3	▪ Giant Kelp Marine Forests of Southeast Australia ▪ Tasmanian Forests and Woodlands dominated by black gum or Brooker's gum (*Eucalyptus ovata / E. brookeriana*) ▪ Tasmanian white gum (*Eucalyptus viminalis*) wet forest.	-	See details below
Listed Threatened Species			
64	See details below	-	-
Listed Migratory Species			
37	See details below	-	-
Commonwealth Land			
3	Unnamed sites with only the ID numbers of: ▪ 60192 ▪ 60189 ▪ 60194	-	The location of these sites is not defined; thus it is not possible to determine the extent of potential impacts to these lands.
Commonwealth Heritage Places			
None	-	No	None identified
Listed Marine Species			
65	See details below	-	-
Whales and Other Cetaceans			
10	See details below	-	-

[1] Includes comments from SPRAT profiles and EPBCA listing advice and conservation advice

MNES (and other matters protected by the Act)	Context[1]	Potential Significant Impact	Justification (for all MNES with no potential for significant impacts) / Comments and Mitigation (for all MNES with potential for significant impacts)
Critical Habitats			
None	-	No	None identified.
Commonwealth Reserves Terrestrial			
None	-	No	None identified.
Australian Marine Parks			
None	-	No	None identified.
Habitat Critical to the Survival of Marine Turtles			
None	-	No	None identified.
State and Territory Reserves			
4	1 Conservation Covenant- Rubicon Sanctuary 3 Conservation Areas – Pardoe Northdown, Port Sorell and Warrawee	-	The pipeline works will be in close proximity to a number of Conservation Covenant boundaries and will pass through the Warrawee Conservation Area. Impacts to reserves managed under the Tasmanian *National Parks and Reserves Management Act 2002* may require further assessment under the Reserve Activity Assessment process. Impacts to conservation covenants will require consultation with the NRE Private Land Consultation Program.
Regional Forest Agreements			
1	Tasmanian RFA	-	It is understood that the proposal has no requirement for a Forest Practices Plan, which is administered under the Tasmanian *Forest Practices Act 1985*. The proponent will require the contractor to undertake forest clearance in accordance with a project specific protocol which will fulfil the intentions of a Forest Practices Plan including, but not limited to considerations of the Regional Forest Agreement.
Nationally Important Wetlands			
None	None	No	None identified.
EPBCA Act Referrals			
3	**Controlled action** ▪ Tasmanian Natural Gas Project-Stage 2 (2001/211) ▪ Water Pipeline (2010/5327) **Not controlled action** ▪ Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia (2015/7522)	-	The original Sassafras-Wesley Vale Irrigation Scheme (EPBC Reference: 2010/5327) was determined to be a controlled action under the EPBCA subject to conditions intended to mitigate impacts to threatened natural values. These conditions were met and the proposed development was approved. The construction and operation of an onshore gas pipeline, known as Stage 2 of the Tasmanian Natural Gas Project (EPBC Reference: 2001/211) was determined to be a controlled action under the EPBCA and approved subject to various conditions to mitigate impacts to threatened natural values. These conditions were met, and the proposed development was approved. The improving rabbit biocontrol: releasing another strain of RHDV, southern two thirds of Australia proposal (EPBC reference: 2015/7522) was determined to be a non-controlled action and was subsequently approved.
Key Ecological Features (Marine)			
None	-	No	None identified.
Biologically Important Areas			
8	<u>Seabirds</u> ▪ *Ardenna tenuirostris* - Short-tailed shearwater ▪ *Eudyptula minor* – Little penguin ▪ *Pelagodroma marina* – White-faced storm petrel ▪ *Pelecanoides urinatrix* – Common diving-petrel		The proposed development has been flagged by the Protected Matters Search Tool (PMST) to have potential for biologically important areas for coastal seabirds and whales. However, the proposed works lie within agricultural and forestry areas several kilometres inland and there is no potential for significant impacts to any of these listed coastal and marine species.

MNES (and other matters protected by the Act)	Context[1]	Potential Significant Impact	Justification (for all MNES with no potential for significant impacts) / Comments and Mitigation (for all MNES with potential for significant impacts)
	▪ *Phalacrocorax fuscescens* – Black-faced cormorant ▪ *Thalassarche cauta cauta* – Shy albatross <u>Whales</u> ▪ *Balaenoptera musculus brevicauda* – Pygmy blue whale ▪ *Eubalaena australis* – Southern right whale		
Bioregional Assessments			
None		No	None identified.
Geological and Bioregional Assessments			
None		No	None identified.
Listed Threatened Ecological Communities – maps for context of distribution is in Appendix I			
Giant Kelp Marine Forests of Southeast Australia Endangered	The survey area does not support the EPBCA listed 'Giant Kelp Marine Forests of Southeast Australia' ecological community, despite being predicted as being likely to occur in the area by the Protected Matters Search Tool (PMST). This community is entirely restricted to marine areas and grows from rocky reefs on the sea floor. As the proposed development is entirely terrestrial there is no chance of this community occurring.	No	No likelihood of occurrence – no potential for impacts.
Tasmanian forests and woodlands dominated by black gum or Brookers gums (*Eucalyptus ovata/ E. brookeriana*) Critically Endangered	Field surveys of the project area recorded the TASVEG unit *Eucalyptus ovata* forest and woodland (DOV) which if certain condition thresholds are met can qualify for listing as the critically endangered Tasmanian forests and woodlands dominated by black gum or Brookers gums (*Eucalyptus ovata* / *Eucalyptus brookeriana*) under the EPBCA. Seven patches of DOV with potential to qualify for listing were identified during field surveys, one of which has been avoided through design. The other patches are within highly modified agricultural environments, with a high proportion of weeds and low native flora diversity.	**Yes**	Although unlikely to qualify for listing, the remnant DOV patches have not been assessed in detail, and thus there remains a potential for significant impacts until further surveys can establish the status of these remnants. A detailed assessment against the significant impact criteria is provided in Appendix H.
Tasmanian white gum (*Eucalyptus viminalis*) wet forest. Critically Endangered	This ecological community is characterised by a canopy dominated by *E. viminalis* with a wet forest understorey, often containing ferns and broad-leaved shrubs, or tall *Leptospermum* / *Melaleuca*, or rainforest species, and is not dominated by grasses, heath, or narrow-leaved shrubs. Although there is a potential for this to occur in the irrigation district, it was not recorded within the pipeline alignment during field surveys.	No	Not present within the project area, and thus there is no potential for impacts
Listed Threatened Species **Fauna– 64 identified – maps for context of distribution is in Appendix J**			
Birds (31)			
Aquila audax fleayi wedge-tailed eagle Endangered	Wedge-tailed eagles' nest in a range of old growth native forests and are dependent on forest for nesting. This species requires large, sheltered trees for nesting and is highly sensitive to anthropogenic disturbances during the breeding season. Territories can contain up to five alternate nests usually close to each other but may be up to 1 km apart where habitat is locally restricted. They hunt and scavenge on a wide variety of fauna including fish, reptiles, birds, and mammals. An aerial habitat search was conducted on the 9th of February 2023 and established that eleven eagle nests are located within 1.5 km of the original alignment. Three nests were new nest records and eight were confirmed known nests. Two previously recorded nests were not relocated. Three nests (IDs: 3142, 2344, 2766) are within 500 m from the construction corridor. These nests are within the same vicinity of each other. New nest 3142 is 50 m from known nest 2344 within a remnant patch of DOB. Nest 2766 is within 260 m of both these nests and separated by a block of pine plantation. It is unlikely that these three nests would be utilised at the same time, but rather only one at the time. An additional four nests (IDs: 853, 2593, 1261, 3143) are within 1 km from the construction corridor of which one nest is within line of site of the construction corridor (Appendix D line of sight maps). All surveyed nests, with the exception of nest 1281, were deemed to be in prime or viable condition.	**Yes**	This species uses the surrounding areas for both nesting and foraging. It is likely the site extends over a number of territories based on the distance between nests and the size of the proposed pipeline. Due to the nature of the pipeline being laid underground and the pipeline avoiding all known eagle nests, there are no expected potential impacts to eagles so long as the development is constructed outside the breeding season for the six nests within 1 km of the pipeline site. If works cannot be completed outside of the breeding season, it is recommended to realign the route of the construction corridor to the degree possible to avoid areas within 500 m direct distance and/or within 1 km line of sight of eagle nests. Failing complete avoidance by these measures, breeding season constraints stipulating no potentially disruptive works should be adhered to within 500 m direct distance and/or within 1 km line of sight of active eagle nests (constraints do not need to apply within a season if a nest is definitively inactive). In these cases, activity can only be assessed with an aerial survey undertaken in October/November to establish if the constraints can be lifted for the remainder of that season around inactive nests – from the commencement of any season until an activity assessment proves a nest is inactive, activity must be assumed, and constraints applied accordingly. Provided that the proponent adheres to the recommended impact mitigation measures, the project will have: • No likelihood of leading to a long-term decrease in the size of a population. • No risk of a reduction in the area of occupancy of this species if large suitable nesting trees are avoided - wedge-tailed eagles will likely still utilise the area after the development due to it being an underground pipeline. • No risk of fragmenting an existing population into two or more populations – as this species is a strong flyer, and has the capacity

MNES (and other matters protected by the Act)	Context[1]	Potential Significant Impact	Justification (for all MNES with no potential for significant impacts) / Comments and Mitigation (for all MNES with potential for significant impacts)
	Three nests are not within the Forest Practices Authorities 500 m or 1 km line of sight recommended exclusion zone (for active nests) for development during the breeding season. It has been well documented that the wedge-tailed eagle is a very timorous nester, particularly in Tasmania[2]. Their low tolerance to disturbance means they are likely to abandon their nest if distressed, even when their nest contains an egg or chick, resulting in an unsuccessful breeding season[3]. Thus, the greatest risk of this development on the wedge-tailed eagle is the disturbance created during the development stage. This can easily be avoided through the completion of all works during the non-breeding season and outside 500 m of 1 km line of sight of a nest.		to fly between habitat patches; as such it can be expected to be less vulnerable to habitat fragmentation than sedentary and terrestrial species • No risk of adversely affecting habitat critical to the survival of this species • A possible moderate risk of disrupting the breeding cycle of a population if mitigation measures aren't adopted. • No likelihood that the proposal will modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline. • No likelihood that the project will result in invasive species that are harmful to the species becoming established in the species' habitat • No likelihood that the project will introduce disease that may cause the species to decline. • No likelihood of interfering with the recovery of the species - Recovery of this species is primarily dependent upon the protection of existing critical habitat. The habitat within the footprint is not considered critical and the suboptimal habitat in the area will be protected from impact and so will not affect recovery. A detailed assessment against the significant impact criteria is provided in Appendix H.
Botaurus poiciloptilus Australasian bittern Endangered	Australasian bitterns are a highly cryptic species, utilising wetlands, and lakes with a dense cover of vegetation. While formerly widespread in Tasmania, particularly in the east of the state, over the last two decades the species has declined in numbers and range following an extended period of dryness. This species has not been recorded within 500 m of the project area and no suitable wetland habitat exists within the project area.	No	There is no suitable habitat on site for this species and a low likelihood of occurrence. There is no potential for significant impacts to this species.
Calidris canutus red knot Endangered/migratory /marine	The red knot is a coastal species that inhabits mudflats, sandflats, and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours. They are occasionally seen on terrestrial saline wetlands near the coast, such as lakes, lagoons, pools, and pans, and recorded on sewage ponds and saltworks. This species rarely uses inland lakes or swamps. No suitable habitat occurs within the study area.	No	There is no suitable habitat on site for this species and no likelihood of occurrence. There is no potential for significant impacts to this species.
Calidris ferruginea curlew sandpiper Critically Endangered /migratory /marine	The curlew sandpiper was once a common visitor to Tasmania, but their numbers have declined significantly since the 1950's[4]. It frequents intertidal mudflats in sheltered coastal areas, with the most important sites for them in Tasmanian centred on the north and east coast of Tasmania[5]. However, they are also occasionally recorded inland, along the open edges of ephemeral and permanent lakes and other water bodies. No suitable habitat occurs within the study area.	No	There is no suitable habitat on site for this species and no likelihood of occurrence. There is no potential for significant impacts to this species.
Ceyx azureus diemenensis azure kingfisher Endangered	This species is found along rivers in the south, west, north, and northwest of Tasmania with outlying occurrences in the northeast, east, centre and Bass Strait islands. This species occurs in the forested margins of major river systems where it perches on branches overhanging rivers waiting for prey items such as small fish, insects, and freshwater crayfish to come down the river. It nests in holes along the top of riverbanks and is therefore susceptible to clearing and modification of river-side vegetation. There is thought to be fewer than 500 mature individuals left in Tasmania 400+/-100 (based on Holdsworth *et al.* 2021) with the overall distribution of Tasmania's azure kingfisher reflecting the higher rainfalls in the west and north-west regions of Tasmania. This species primarily utilises riverine environments, particularly in western Tasmania. No suitable habitat on site.	No	Whilst the site contains a number of creeks and rivers, the habitat and riverbanks of these river are not considered well suited for this species to inhabit. This species is also unlikely to occur in the area with seldom sightings occurring this far east. There is no potential for significant impacts to this species.
Albatross species (14) *Diomedea antipodensis* Antipodean albatross Vulnerable *Diomedea antipodensis gibsoni* Gibson's albatross	Albatrosses are large seabirds that range widely in the Southern Ocean and the North Pacific. Albatrosses are among the largest of flying birds and species of the genus *Diomedea* (great albatrosses) have the longest wingspans of any extant birds. The genus *Thalassarche* refers to a group of medium-sized albatrosses (mollymawks) restricted to the southern hemisphere. Albatross populations are under threat and have declined significantly due to feather harvesting, introduction of feral cats and rats that prey on albatross nests, pollution, overfishing and longline fishing. The proposed works are entirely terrestrial and occur several kilometres away from the coast. No suitable habitat occurs within the study area.	No	There is no suitable habitat on site for any of these species and no likelihood of occurrence. There is no potential for significant impacts to any of these species.

[2] Mooney & Holdsworth (1991)
[3] Mooney & Holdsworth (1991); Threatened Species Section (2006); Bekessy *et al.* (2009); Wiersma (2010); O'Sullivan (2014)
[4] Reid and Park (2003)
[5] Bryant (2002)

MNES (and other matters protected by the Act)	Context[1]	Potential Significant Impact	Justification (for all MNES with no potential for significant impacts) / Comments and Mitigation (for all MNES with potential for significant impacts)
Vulnerable *Diomedea epomophora* southern royal albatross Vulnerable *Diomedea exulans* wandering albatross Vulnerable *Diomedea sanfordi* northern royal albatross Endangered *Thalassarche bulleri* Buller's albatross Vulnerable *Thalassarche bulleri platei* northern Buller's albatross Vulnerable *Thalassarche carteri* Indian yellow-nosed albatross Vulnerable *Thalassarche cauta* shy albatross Endangered *Thalassarche chrysostoma* grey-headed albatross Endangered *Thalassarche impavida* Campbell albatross Vulnerable *Thalassarche melanophrys* black-browed albatross Vulnerable *Thalassarche salvini* Salvin's albatross Vulnerable *Thalassarche steadi* white-capped albatross Vulnerable			
Fregetta grallaria grallaria white-bellied storm petrel Vulnerable	The white-bellied storm petrel is a small migratory marine bird with a widespread range throughout the oceans of the southern hemisphere including the Pacific, Atlantic and Indian Oceans. This species is highly pelagic, rare, and not commonly observed. As a result, there is limited knowledge of its behaviour and ecology. Visits to land are uncommon and occur near breeding colonies. This species has not been recorded within the study area and no suitable habitat occurs within the study area.	No	There is no suitable habitat on site for this species and no likelihood of occurrence. There is no potential for significant impacts to this species.
Hirundapus caudacutus white-throated needletail	The white-throated needletail is a migratory species, breeding in central and north-eastern Asia in Siberia, Mongolia, northern-eastern China, and northern Japan. It migrates south through eastern China, Korea and Japan spending its non-breeding season in eastern and south-eastern Australia including Tasmania. This	No	This species is almost entirely aerial in nature and infrequently seen in Tasmania. The ground-based activities of the proposed development are not a risk to this species. There is no potential for significant impacts to this species.

MNES (and other matters protected by the Act)	Context[1]	Potential Significant Impact	Justification (for all MNES with no potential for significant impacts) / Comments and Mitigation (for all MNES with potential for significant impacts)
Vulnerable / migratory /marine	species is almost exclusively aerial, occurring over most types of habitat with a preference to wooded areas, open forests, heathland, and rainforests. The species is migratory, and when in Australia individuals are at risk of collision with overhead wires, wind turbines, windows, and lighthouses, thus the project, being ground base poses no risk to this aerial species.		
Lathamus discolor swift parrot Critically Endangered /marine	Swift parrots are a migratory species, undertaking annual flights from Tasmania to the mainland of Australia. When in Tasmania they are semi-nomadic, crossing much to the State to coincide with the erratic and patchy flowering patterns of their preferred food plants, *Eucalyptus globulus* and *Eucalyptus ovata*. Breeding occurs in hollow-bearing trees within 10 km of flowering food stands. The *E. ovata* or *E. globulus* and large hollow bearing trees within the project area are important potential breeding and foraging habitat for swift parrots. No naturally occurring blue gum trees or *E. globulus* vegetation communities were recorded within the survey area, though there are a number of areas of blue gum plantation and swift parrot will utilise plantation trees when foraging. Black gum trees (*E. ovata*) were recorded in throughout the survey area within *Eucalyptus ovata* forest and woodland vegetation community (DOV), within mixed eucalypt communities (such as DSC), and as individual trees in remanent vegetation or paddock trees. A number of large (dbh >70 cm) potential hollow bearing trees were also recorded during the survey, both within forest block and remnant vegetation, and paddocks in agricultural land. These trees provide potential nesting habitat for swift parrots.	**Yes**	Foraging and potential breeding habitats exist throughout the design corridor, and it is highly likely that swift parrots use these resources. Design changes have reduced the potential impact to foraging and breeding habitat these trees as far as practicable. Construction protocols will further reduce impacts on trees within the design corridor and trees that require clearance will be subject to a habitat tree protocol, further reducing potential impacts to swift parrots. Provided the proponent adheres to the recommended impact mitigation measures, the project should have: • A low likelihood of leading to a long-term decrease in the size of a population. • A low risk of a reduction in the area of occupancy of this species if large suitable nesting trees are avoided - Given the highly mobile nature of this species and the habitat that will remain within the surrounding vicinity, the species will still have the same potential for local occupancy and thus the project will not reduce the area of occupancy for this species or any population. • No risk of fragmenting an existing population into two or more populations. • No risk of adversely affecting habitat critical to the survival of this species – Due to the small residual impact to habitat trees, no adverse effects to nesting or foraging habitat of this species is anticipated. • A low risk of disrupting the breeding cycle of a population. • A low likelihood that the proposal will modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline - whilst removal of these trees might not result in the decline of the species, it could result in the displacement of individuals. The ongoing accumulative loss of suitable breeding habitat however is resulting in the decline of swift parrots. • No likelihood that the project will result in invasive species that are harmful to the species becoming established in the species' habitat. • No likelihood that the project will introduce disease that may cause the species to decline. • No likelihood of interfering with the recovery of the species. A detailed assessment against the significant impact criteria is provided in Appendix H.
Limosa lapponica baueri Nunivak Bar-tailed Godwit Vulnerable	The Bar-tailed Godwit is a migratory wader which undertakes the largest non-stop flight of any bird. The trans-Pacific route from its breeding grounds in the Arctic to its non0breeding grounds in the southern hemisphere covers over 11,000 km. This species is mostly recorded along major coastal river estuaries and sheltered embayment's. It is a coastal species and rarely visits wetlands away from the coast. This species has not been recorded within the study area and no suitable habitat occurs within the study area.	No	There is no suitable habitat on site for this species and no likelihood of occurrence. There is no potential for significant impacts to this species.
Petrel species (3) *Macronectes giganteus* southern giant-petrel Endangered *Macronectes halli* northern giant petrel Vulnerable *Pterodroma leucoptera leucoptera* Gould's petrel Endangered	Giant petrels form belong to the genus *Macronectes* and are large pelagic seabirds that breed on six subantarctic and Antarctic islands within Australian territory. *Pterodroma leucoptera leucoptera* is a smaller petrel that occurs off the Tasman Sea. Petrel species are in continued rapid decline and are under threat from invasive mammals including feral cats, mice, rats, pigs and dogs, light pollution, fisheries bycatch, anthropogenic exploitation, pollution, habitat clearing and overfishing. These species has never been recorded as far inland as the proposed site and there is no habitat suitable for this species within the project area. Due to their pelagic nature, they are unlikely to occur on site.	No	There is no suitable habitat on site for this species and no likelihood of occurrence. There is no potential for significant impacts to this species.
Numenius madagascariensis eastern curlew	Much like the curlew sandpiper, the eastern curlew was once a common visitor to Tasmania, but their numbers have declined significantly since the 1980's[6]. It frequents intertidal mudflats in sheltered coastal areas, with the	No	There is no suitable foraging or nesting habitat on site for this species. There is no potential for significant impacts to this species.

[6] Reid and Park (2003)

MNES (and other matters protected by the Act)	Context[1]	Potential Significant Impact	Justification (for all MNES with no potential for significant impacts) / Comments and Mitigation (for all MNES with potential for significant impacts)
Critically Endangered /marine	most important sites for them in Tasmanian centred on the northwest coast of Tasmania[7]. However, they are also occasionally recorded inland, along the open edges of ephemeral and permanent lakes and other water bodies. This species has never been recorded as far inland as the proposed site and there is no habitat suitable for this species within the project area.		
Pachyptila turtur subantarctica fairy prion Endangered	The fairy prion is a small seabird with that breeds on Macquarie Island and a number of other subantarctic islands outside of Australia. There are 80 to 250 breeding pairs in Australia and a global population of 80,000. In Australia, breeding is recorded on two rock stacks off Macquarie Island and on the nearby Bishop and Clerk Island. This species has never been recorded as far inland as the proposed site and there is no habitat suitable for this species within the project area.	No	There is no suitable foraging or nesting habitat on site for this species. There is no potential for significant impacts to this species.
Sternula nereis nereis Australian fairy tern Vulnerable	The Australian fairy tern is a small tern found on coastal beaches, inshore and offshore islands, sheltered inlets, sewage farms, harbours, estuaries, and lagoons. They nest above the high-tide mark on sandy beaches, spits or ridges. This species has never been recorded as far inland as the proposed site and there is no habitat suitable for this species within the project area.	No	There is no suitable foraging or nesting habitat on site for this species. There is no potential for significant impacts to this species.
Thinornis cucullatus cucullatus eastern hooded plover Vulnerable	The eastern hooded plover is a small beach nesting bird that occurs on wide beaches backed by dunes with large amounts of seaweed and jetsam, creek mouths and inlet entrances. Nests are found above the high-water mark on flat beaches, on stony terraces or on sparsely vegetated dunes. This species has never been recorded as far inland as the proposed site and there is no habitat suitable for this species within the project area.	No	There is no suitable foraging or nesting habitat on site for this species. There is no potential for significant impacts to this species.
Tyto novaehollandiae castanops Tasmanian masked owl Vulnerable	The Tasmanian masked owl is endemic to Tasmania. The species inhabits a diverse range of forests and woodlands, including agricultural and forest mosaics. Highest densities occur in the east and the north of the State, with lowest densities at elevations above 600 m asl. Particularly favoured are forests with relatively open understorey, especially when this habitat adjoins areas of open or cleared land. Nesting occurs in large tree hollows of living or dead trees, sometimes in vertical spouts or horizonal limbs but generally in the main trunk. The presence of such trees is thus used to define habitat value. Potential habitat for the masked owl is defined as all areas that have trees with large hollows (≥ 15 cm entrance diameter), with trees over 100 cm DBH (diameter at breast height) having a higher probability of containing such hollows. Remnants and paddock trees in agricultural areas may also constitute significant habitat if they include large old hollow-bearing trees. Threats to the masked owl are considered to be habitat clearing and fragmentation, loss of nesting habitat through tree dieback, competition for tree hollows, secondary poisoning, and collision mortality. The project area is within masked owl core range and although there is no old growth forest within the survey area, large eucalypt trees (DBH > 100 cm) are present within remnant vegetation in agricultural land and previously logged areas. Although isolated, these trees are potentially viable breeding and/or roosting habitat for masked owl.	**Yes**	It is unlikely a significant conservation impact may result from the expected impacts to potential habitat trees. If these trees require removal, some level of pre-clearance mitigation is warranted to ensure impacts are minimal and inform the proponent of any permits that need to be obtained. The priority mitigation strategy should be to avoid the removal of large trees with potential to support hollows wherever it is feasible. Designs have been modified to reduce potential impacts to habitat trees. If there are potential habitat trees within the construction corridor that cannot be avoided, it is recommended that they are subject to a habitat tree protocol involving targeted hollow use inspections, which may in some cases involve tree climbing. If the checks established that a hollow requiring clearing was in use by a species listed under Schedule 1, 5 or 8 of the Tasmanian *Nature Conservation (Wildlife) Regulations 2021*, then a permit to take a product of wildlife would be required for removal of the nest. Permits to take are administered under the NCA. Provided that the proponent adheres to the recommended impact mitigation measures, the project will have: • No likelihood of leading to a long-term decrease in the size of a population. • No risk of a reduction in the area of occupancy of this species if large suitable nesting trees are avoided - Given the highly mobile nature of this species, their large home range and the habitat that will remain within the surrounding vicinity, the species will still have the same potential for local occupancy and thus the project will not reduce the area of occupancy for this species or any population. • No risk of fragmenting an existing population into two or more populations – Because of the ecology of this species (highly nomadic, highly mobile and found in a range of environments including fragmented land), they are resilient to fragmentation. • A low risk of adversely affecting habitat critical to the survival of this species - Given the lack of critical habitat (*e.g.*, mature habitat trees) within the development footprint, adverse effects to nesting habitat of this species is expected to be negligible. • No risk of disrupting the breeding cycle of a population if potential breeding trees are avoided. • A low likelihood that the proposal will modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline - whilst removal of these trees might not result in the decline of the species, it could result in the displacement of individuals. The ongoing accumulative loss of suitable breeding habitat however is resulting in the decline of Tasmanian masked owls[8]. • No likelihood that the project will result in invasive species that are harmful to the species becoming established in the species' habitat. • No likelihood that the project will introduce disease that may cause the species to decline. • No likelihood of interfering with the recovery of the species - There is no recovery plan for this species.

[7] Bryant (2002)
[8] DPIPWE (2009) - *Records held in DPIPWE's Threatened fauna files*.

MNES (and other matters protected by the Act)	Context[1]	Potential Significant Impact	Justification (for all MNES with no potential for significant impacts) / Comments and Mitigation (for all MNES with potential for significant impacts)
			A detailed assessment against the significant impact criteria is provided in Appendix H.
Crustacean (2)			
Astacopsis gouldii giant freshwater crayfish Vulnerable	The known range of the giant freshwater crayfish includes rivers and streams in the Arthur River catchment and all rivers and streams flowing into Bass Strait except those of the Tamar River catchment and rivers east of Gladstone. The potential range of the species is not likely to extend outside the known range. The project area is unlikely to support this species due to insufficient habitat elements including good quality waterbodies, low water temperature, stream-side vegetation, snags, pools, undercut banks and canopy cover shading. Waterbodies within the project area include small natural creeks and farm drainage lines that have been heavily modified and are unlikely to support this species.	No	There is no suitable habitat on site for this species. There is no potential for significant impacts to this species.
Engaeus granulatus central north burrowing crayfish Endangered	The central north burrowing crayfish (CNBCF) is endemic to Tasmania and occurs between the Mersey River and Port Sorell. Its core range overlaps with 3 common congeners: *E. mairener* to the east, *E. nulloporius* to the southeast, and *E. fossor* to the west. No crayfish species were recorded during field surveys; however, the project area is within the core range for the central north burrowing crayfish (CNBCF) and therefore colonies (chimneys) are attributed to this species. Crayfish colonies were recorded at 17 separate locations within the survey area (15 are within the current design corridor). Numbers of individual chimneys ranged from one to hundreds at any one location. Crayfish tunnels were recorded in damp areas under remnant *Melaleuca ericifolia* patches within farmland in roadside ditches, and along the margins of natural streams. A number of chimneys were located beneath blackberry patches and adjacent to heavily cow disturbed areas.	**Yes**	It is likely that a conservation impact may result from the impacts to recorded colonies or optimal habitat of this species. The priority mitigation strategy should be to avoid any impact on known colonies and optimal habitat wherever it is feasible. Designs have been modified to reduce potential impacts. Impact mitigation and habitat management protocols should be developed to limit the likelihood of mortalities and long-term impacts on habitat condition. Additional considerations may include restrictions on timing of construction activity (to avoid hotter drier months), requirement for trained personnel onsite, translocation protocol, sediment and chemical contamination protocols, monitoring of water table, and post-construction surveys. Provided that the proponent adheres to the recommended impact mitigation measures, the project will have: • A moderate likelihood of leading to a long-term decrease in the size of a population. • A moderate risk of a reduction in the area of occupancy of this species. Appropriate mitigation strategies aim to limit this risk. • No risk of fragmenting an existing population into two or more populations – Area of impact will be minimal Because of the ecology of this species (highly nomadic, highly mobile and found in a range of environments including fragmented land), they are resilient to fragmentation. • A moderate likelihood of adversely affecting habitat critical to the survival of this species – mitigation strategies should allow this species to recolonise the construction area at the completion of works. Where a colony is required to be completely removed from an area, additional mitigation strategies may be required. • Low likelihood disrupting the breeding cycle of a population if impacts during breeding season are avoided. • A low likelihood that the proposal will modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline. • No likelihood that the project will result in invasive species that are harmful to the species becoming established in the species' habitat. • No likelihood that the project will introduce disease that may cause the species to decline. • A low likelihood of interfering with the recovery of the species Detailed assessment against the significant impact criteria is provided in Appendix H
Fish (2)			
Galaxiella pusilla eastern dwarf galaxias Vulnerable	Confined to lowland swampy areas where it shelters amongst aquatic vegetation in shallows of slow flowing water in backwaters of creeks and drainage ditches in the far NE and NW parts of Tasmania and Flinders Island.	No	There is no suitable aquatic habitat on site for this species. There is no potential for significant impacts to this species.
Prototroctes maraena Australian grayling Vulnerable	In Tasmania, the diadromous Australian Grayling has been found in northern, eastern, and western rivers. Little is known of the population size. The major threat to the species is the construction of barriers that prevent adult fish moving upstream and juveniles downstream. There is no suitable aquatic habitat present in the study area to support this species.	No	There is no suitable aquatic habitat on site for this species. There is no potential for significant impacts to this species.
Frogs (1)			

MNES (and other matters protected by the Act)	Context[1]	Potential Significant Impact	Justification (for all MNES with no potential for significant impacts) / Comments and Mitigation (for all MNES with potential for significant impacts)
Litoria raniformis green and gold Frog Vulnerable	In Tasmania, the species occurs in lowland areas in the south-east (where it is very rare) and north, It is dependant on a matrix of aquatic and terrestrial habitat for breeding, foraging, shelter and dispersal[9]. Breeding habitat requires permanent freshwater or slightly brackish habitats, generally with emergent vegetation. The species has declined significantly (over 20 %) in range and abundance over the last 20 years, having mostly disappeared from the Midlands, Derwent Valley, much of the Hobart region and parts of the north-west coast (although historical records are also less common in that region). Much of the habitat for the green and gold frog has been isolated or fragmented, as such, any viable population is considered to be an important population for the persistence and recovery for this species[10]. Individual frogs and potential breeding habitat were recorded within the design corridor. Any area within 2 km of a waterbody is treated as dispersal habitat.	**Yes**	Although no water bodies considered as optimal breeding habitat will be impacted, a conservative definition of optimal breeding habitat can be taken as 'Permanent, slow-flowing, water bodies within 500 m of a known record are buffered by 60 m'[11]. Designs have been modified to reduce potential impacts on breeding habitats. However, given the prevalence of green and gold frog habitat throughout the design corridor, it is unlikely that any pipeline alignment through the area completely avoids any impacts to this species. Accordingly, recommendations to reduce impacts are required to limit long-term impacts on habitat condition and limit the likelihood of mortalities. Provided that the proponent adheres to the recommended impact mitigation measures, the project will have: • No likelihood of leading to a long-term decrease in the size of a population. • A low risk of a reduction in the area of occupancy of this species if large suitable nesting trees are avoided – some identified breeding habitat will be impacted; however impacts to this habitat will be temporary. • No risk of fragmenting an existing population into two or more populations. • No risk of adversely affecting habitat critical to the survival of this species – Habitat loss will be temporary. • No risk of disrupting the breeding cycle of a population if impacts are outside breeding season. • No likelihood that the proposal will modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline. • No likelihood that the project will result in invasive species that are harmful to the species becoming established in the species' habitat. • A low likelihood that the project will introduce disease that may cause the species to decline. – chytrid fungus is known in the area however hygiene protocols will decrease risk of spread • No likelihood of interfering substantially with the recovery of the species Detailed assessment against the significant impact criteria is provided in Appendix H.
Mammals (4)[12]			
Dasyurus maculatus maculatus spotted-tail quoll Vulnerable	The spotted-tailed quoll is a medium-sized carnivorous marsupial found mostly in forest habitats in south-eastern mainland Australia and Tasmania. Its distribution across much of the eastern mainland is highly fragmented. This species occurs in a variety of wooded habitats, from coastal health to inland rainforests. Priority habitat for the species in Tasmania is lowland, high-rainfall forest particularly in the north of the state. The spotted-tail quoll is predominately nocturnal and solitary with large home ranges. Males generally have larger overlapping home ranges compared to females, whom typically have smaller, non-overlapping home ranges. Home ranges of spotted-tail quolls can be anywhere between 359 – 2,512 ha for males and 88 – 1,515 ha for females[13]. Habitat loss, fragmentation and modification pose the greatest threat to the spotted-tailed quoll. An estimated 50 % of suitable habitat has been removed throughout Tasmania, with the remaining habitat undergoing modification and fragmentation that reduce the suitability of habitat and viability of populations. Additional threats are posed by timber harvesting, road mortality, poison baiting, persecution, competition / predation from introduced carnivores (dogs and cats), and inappropriate fire regimes. The recovery for this species is primarily dependent upon the protection of existing habitat[14]. There are two observations on the NVA attributed to within 500 m of the proposed pipeline with the most recent sighting recorded in March 2021[15]. No evidence of scats were observed during surveys. Denning habitat can include rocky outcrops, large logs, and underground hollows. Potential den sites are widespread in the area, although no denning habitat was observed. The implementation of NRE preclearance den management protocols prior to works can be implemented to reduce impact to breeding adult Tasmanian devil, spotted-tail quoll, and eastern quoll. The protocols should involve:	**Yes**	The project does pass through a core range patch for this species. The small loss of potential habitat is unlikely to result in a decrease to any local population, particularly in the context of the abundance of equivalent or better habitat in the broader landscape. Regardless of this, a den and burrow management protocol must be included within the CEMP. Provided mitigation measures are implemented, the project has the project has: • No likelihood of leading to a long-term decrease in the size of an important population - An important population is not present in the location of the project and the small loss of marginal potential habitat within an area unlikely to support resident individuals is unlikely to result in a decrease to any local population. • No risk of a reduction in the area of an important population of this species. • No risk of fragmenting an existing important population into two or more populations • No risk of adversely affecting habitat critical to the survival of this species – Critical habitat is dependent on the availability of denning habitat and prey density[16]. • No risk of disrupting the breeding cycle of an important population if preclearance den management protocols are followed. • A low likelihood that the proposal will modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline. • No likelihood that the project will result in invasive species that are harmful to the species becoming established in the species' habitat. • No likelihood that the project will introduce disease that may cause the species to decline. • No likelihood of interfering with the recovery of the species.

[9] DEWHA (2009))
[10] DEWHA (2009)
[11] Bryant and Jackson (1999)
[12] Marine mammals such as whales have been excluded due to no likelihood of occurring on site.
[13] DCCEW (2023)
[14] Department of Environment, Land, Water and Planning (2016)
[15] Department of Natural Resources and Environment Tasmania (2023)
[16] Department of Environment, Land, Water and Planning (2016)

MNES (and other matters protected by the Act)	Context[1]	Potential Significant Impact	Justification (for all MNES with no potential for significant impacts) / Comments and Mitigation (for all MNES with potential for significant impacts)
	- A 'den monitoring assessment' to be applied to all potentially used dens or highly suitable dens. Dens under monitoring will be monitored using motion sensor cameras and should have a 50 m radius exclusion zone around them until an ecologist deems them not in use. Maternal dens will be monitored and zoned off until the den becomes inactive. Active non-maternal dens will be fitted with a one-way gate to ensure animals have vacated the den prior to decommissioning.		Detailed assessment against the significant impact criteria is provided in Appendix H.
Dasyurus viverrinus eastern quoll Endangered	The eastern quoll is a medium-sized marsupial carnivore listed under the EPBCA as Endangered but not currently listed as rare or threatened in Tasmania. Eastern quolls are widespread in Tasmania but recorded less frequently in the wettest third of the State. They are considered extinct on the mainland of Australia with the last wild sighting being in 1963 (though some reintroductions have since been undertaken). Home ranges for this species are upwards of 35 to 44 ha (females and males respectively), with an extensive amount of overlap between individuals. Suitable habitat includes dry grasslands and forest mosaics, including adjacent agricultural lands. No recovery plan has been developed for this species. As an endangered species, all populations are seen as important, although some areas might be considered as the primary strongholds for the species (e.g., Cradoc and North Bruny Island). One record of this species exists within 5000 m of the proposed corridor and was recorded in February 2022[17]. Potential den sites are widespread in the area and may extend into the vicinity of the of the development footprint. Rocky outcrops occur along the alignment which may be utilised by eastern quolls. Denning sites for this species, especially natal dens, are located in well concealed locations to provide protection from predators. No denning sites were observed during surveys of the proposal alignment. The implementation of NRE preclearance den management protocols prior to works can be implemented to reduce impact to breeding adult Tasmanian devil, spotted-tail quoll and eastern quoll. The protocols should involve: - A 'den monitoring assessment' to be applied to all potentially used dens or highly suitable dens. Dens under monitoring will be monitored using motion sensor cameras and should have a 50 m radius exclusion zone around them until an ecologist deems them not in use. Maternal dens will be monitored and zoned off until the den becomes inactive. Active non-maternal dens will be fitted with a one-way gate to ensure animals have vacated the den prior to decommissioning.	**Yes**	The project is within the core range for this species. The small loss of potential habitat is unlikely to result in a decrease to any local population, particularly in the context of the abundance of equivalent or better habitat in the broader landscape. Regardless of this, a den and burrow management protocol must be included within the CEMP. Provided mitigation measures are implemented, the project has the project has: • No likelihood of leading to a long-term decrease in the size of a population. • No risk of a reduction in the area of a population of this species. • No risk of fragmenting an existing population into two or more populations • No risk of adversely affecting habitat critical to the survival of this species. • No risk of disrupting the breeding cycle of a population if preclearance den management protocols are followed • A low likelihood that the proposal will modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline. • No likelihood that the project will result in invasive species that are harmful to the species becoming established in the species' habitat. • No likelihood that the project will introduce disease that may cause the species to decline. • No likelihood of interfering with the recovery of the species. Detailed assessment against the significant impact criteria is provided in Appendix H.
Perameles gunnii gunnii eastern barred bandicoot Vulnerable	The eastern barred bandicoot is listed as Vulnerable under the EPBCA but is not currently listed as rare or threatened in Tasmania. It is extinct in the wild on mainland Australia, while the Tasmanian population has undergone marked population shifts in response to human land use changes, with population decreases in some areas and increases in others. Observation records are now concentrated within the southeast and north of the State, compared to the Midlands. Important populations in Tasmania have yet to be formally identified but based on the distribution of modern observations and the finding that they are more frequent in intermediately modified areas with low density residential use than they are in natural bushland, important populations would probably be those of peri urban and semi-rural areas in the southeast, plus any relict populations in the pre-European stronghold of the Midlands. The site is within the core range for this species. There have been 17 observation records recorded on the NVA of this species within 500 m with the most recent dated September 1994[18]. The most likely areas to support this species are the properties with pasture and gardens with forest interface. Bandicoots may forage in the grassy habitats along the route.	No	In terms of general impacts to the species or potentially individuals, it is considered very unlikely that bandicoots would suffer direct mortality during works or clearance, as they are capable of flushing rapidly from shelter and moving to other locations within a range. Similarly, nests for the species are ephemeral grassy constructions, with multiple non-natal nests typically present within a home range. Eastern barred bandicoots do not have full saturation of occurrence across suitable habitats within a population, with various fine-scale factors influencing local distribution, with ostensibly ideal areas of habitat not always occupied due to chance, land management, and/or past events[19]. It can thus be expected that within the thousands of hectares of suitable bandicoot habitat around the project area, there will be some spare capacity to compensate for any individuals that could be evicted from the local area due to clearance within the footprint. The project has: • No likelihood of leading to a long-term decrease in the size of an important population. • No risk of a reduction in the area of a population of this species. • No risk of fragmenting an existing population into two or more populations • No risk of adversely affecting habitat critical to the survival of this species. • No risk of disrupting the breeding cycle of a population. • No risk that the proposal will modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline. • No likelihood that the project will result in invasive species that are harmful to the species becoming established in the species' habitat. • No likelihood that the project will introduce disease that may cause the species to decline. • No likelihood of interfering with the recovery of the species.

[17] Department of Natural Resources and Environment Tasmania (2022)
[18] Department of Natural Resources and Environment (2023)
[19] Daniels (2011)

MNES (and other matters protected by the Act)	Context[1]	Potential Significant Impact	Justification (for all MNES with no potential for significant impacts) / Comments and Mitigation (for all MNES with potential for significant impacts)
Sarcophilus harrisii Tasmanian devil Endangered	The Tasmanian devil is listed under the EPBCA as Endangered, with the listing being a response to widespread rapid declines that occurred with the emergence of the infectious cancer, Devil Facial Tumour Disease (DFTD). In addition to DFTD, habitat loss/ modification, road mortality, persecution, and the potential competition/ predation by introduced foxes are potential threatening processes. The protection of breeding opportunities such as den sites, is particularly important for the species due to the mortalities from demographic pressures. The proposal area is within the known geographical and ecological range of the Tasmanian devil and overlaps with the core range of the species as defined on the Tasmanian Natural Values Atlas as the area within the known range known to support the highest densities of the species and/or thought to be of greatest importance for the maintenance of breeding populations of the species. There are 20 observations of the species known from within 500 m of the proposal footprint with the most recent record occurring in January 2023[20]. NBES surveys detected for individual Tasmanian devils. The implementation of NRE preclearance den management protocols prior to works can be implemented to reduce impact to breeding adult Tasmanian devil, spotted-tail quoll, and eastern quoll. The protocols should involve: - A 'den monitoring assessment' to be applied to all potentially used dens or highly suitable dens. Dens under monitoring will be monitored using motion sensor cameras and should have a 50 m radius exclusion zone around them until an ecologist deems them not in use. Maternal dens will be monitored and zoned off until the den becomes inactive. Active non-maternal dens will be fitted with a one-way gate to ensure animals have vacated the den prior to decommissioning.	**Yes**	The small loss of potential habitat is unlikely to result in any meaningful decrease in the area of occupancy of any local population, particularly in the context of the abundance of equivalent or better habitat in the broader landscape which can be expected to have some spare capacity given that species with broad ecological niches are unlikely to have full saturation of use of all available habitat within their range due to various factors. Regardless of this, a den and burrow management protocol must be included within the CEMP. Provided mitigation measures are implemented, the project has the project has: • No likelihood of leading to a long-term decrease in the size of a population. • No risk of a reduction in the area of a population of this species. • No risk of fragmenting an existing population into two or more populations • No risk of adversely affecting habitat critical to the survival of this species. • No risk of disrupting the breeding cycle of a population if preclearance den management protocols are followed • A low likelihood that the proposal will modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline. • No likelihood that the project will result in invasive species that are harmful to the species becoming established in the species' habitat. • No likelihood that the project will introduce disease that may cause the species to decline. No likelihood of interfering with the recovery of the species. Detailed assessment against the significant impact criteria is provided in Appendix H
Flora (18) – maps for context of distribution is in Appendix K			
Barbarea australis native wintercress Endangered	*Barbarea australis* is a riparian species found near river margins, creek beds and along flood channels adjacent to the river. It tends to favour the slower reaches and has not been found on steeper sections of rivers. It predominantly occurs in flood deposits of silt and gravel deposited as point bars and at the margins of base flows, or more occasionally or between large cobbles on sites frequently disturbed by fluvial processes. Some of the sites are a considerable distance from the river, in flood channels scoured by previous flood action, exposing river pebbles. Most populations are in the Central Highlands, but other populations occur in the north-east and upland areas in the central north. This species was not recorded during surveys	No	Suitable habitat occurs within flood channels and riparian vegetation adjacent to the Mersey River. However, this species has not been recorded within 500 m of the project area and was not observed during field surveys. The potential for this species to be directly impacted under the project is very low.
Caladenia caudata tailed spider-orchid Vulnerable	This species is widespread but localised in coastal and near-coastal areas up to about 250 m elevation soils northern, eastern and southeastern Tasmania. It occurs in heathy and grassy open eucalypt forest and woodland, often with sheoaks (*Allocasuarina* species), and heathland on sandy and loamy	No	This species is known primarily from the Henry Somerset Conservation Area on Railton Road (Forico Pty Limited private sanctuary), also older sightings from the Devil Road-Old Deloraine Road area. All areas of dry forest within and adjacent to the proposed pipeline corridor between the Mersey River and the Bass Highway be surveyed in November by ECOtas. No evidence of this species was found[21] and there is no potential for direct impacts.
Caladenia pallida rosy spider orchid Critically Endangered	*Caladenia pallida* appears to be restricted to lowland areas with an annual rainfall less than 1,000 mm. In recent years it has only been recorded from dry *Eucalyptus amygdalina* forest in the northern Midlands at Epping Forest and in the central north at Railton. However, it was once more widespread, and it may have occupied more diverse habitats. Surveys were conducted during peak flowering season for this species. No observations were made during the surveys, although some suitable habitat is present.	No	This species is not known from within the project area and has a low likelihood of occurrence within the design corridor – no potential for direct impacts.
Caladenia tonellii robust fingers Critically endangered	*Eucalyptus amygdalina* dominated forest with a shrubby understorey on shallow clay loam and shallow gravelly loam over clay. Topography varies from flats to slopes up to about 80 m elevation. lowland near-coastal parts of the north coast, extending inland by a few kilometres in the Railton-Latrobe area	No	This species is known primarily from the Henry Somerset Conservation Area on Railton Road (Forico Pty Limited private sanctuary), also recently been confirmed from the Devil Road-Old Deloraine Road area (M. Wapstra, 2022, surveys for Forico Pty Limited), including from within the original proposed pipeline corridor. The known habitat adjacent to pipeline alignment was surveyed in November by ECOtas[22] and 5 individual *C tonellii* recorded up slope from the pipeline alignment. As a result of these findings, the proposed pipeline alignment has been situated away from the *C. tonellii* population to be adjacent to Devil Road. A single NVA record, albeit with spatial inaccuracy of 100 m, is located immediately adjacent to the design corridor, which could mean this occurrence was in the design corridor - nonetheless, this area (and spatial radius) was included in the targeted search and not found to support any plants. As such there is no potential for direct impacts.

[20] Department of Natural Resources and Environment (2023)
[21] ECOtas 2022
[22] ECOtas 2022

MNES (and other matters protected by the Act)	Context[1]	Potential Significant Impact	Justification (for all MNES with no potential for significant impacts) / Comments and Mitigation (for all MNES with potential for significant impacts)
Cassinia rugata wrinkled dollybush Vulnerable	Wet heathland and heathy woodland (usually with impeded drainage) but also occurs on disturbed road verges.	No	This species is known only from the Parkers Ford Road-Squeaking Point Road area, with no records associated with the currently proposed pipeline route. Native vegetation in this area was surveyed in February 2023 and no individuals were recorded. Field survey suggests limited potential habitat for the species is present within the alignment- no potential for direct impacts.
Glycine latrobeana clover glycine Vulnerable	*Glycine latrobeana* occurs in a range of habitats, geologies, and vegetation types. Soils are usually fertile but can be sandy when adjacent to or overlaying fertile soils. The species mainly occurs on flats and undulating terrain over a wide geographical range, including near-coastal environments, the Midlands, and the Central Plateau. It mainly occurs in grassy/heathy forests and woodlands and native grasslands. There is a low likelihood that this species occurs on site, some areas of habitat are suitable, but no species were found during surveys.	No	This species is not known from within the project area and has a low likelihood of occurrence within the design corridor – no potential for direct impacts.
Leucochrysum albicans tricolor hoary sunray Endangered	*Leucochrysum albicans* subsp. *tricolor* occurs in the west and on the Central Plateau and the Midlands, mostly on basalt soils in open grassland. This species would have originally occupied *Eucalyptus pauciflora* woodland and tussock grassland, though most of this habitat is now converted to improved pasture or cropland. There is no likelihood that this species occurs on site, with no habitat suitable present and/or land use not considered to be compatible with the occurrence of the species. No species were found during surveys.	No	Potential habitat within the project area is limited and no indication of species presence was determined within the design corridor – no potential for direct impacts.
Prasophyllum apoxychilum tapered leek-orchid Endangered	*Prasophyllum apoxychilum is* restricted to eastern and north-eastern Tasmania where it occurs in coastal heathland or grassy and scrubby open eucalypt forest on sandy and clay loams, often among rocks. It occurs at a range of elevations and seems to be strongly associated with dolerite in the east and south-east of its range.	No	Potential habitat within the project area is limited and no indication of species presence was determined within the design corridor – no potential for direct impacts.
Prasophyllum limnetes marsh leek-orchid Critically endangered	*Prasophyllum limnetes* is known only from one site near Port Sorell where it occurs in the ecotone between low-lying marshy heath/sedgeland dominated by rushes and sedges with scattered patches of *Lomandra longifolia* (sagg) and *Themeda triandra* (kangaroo grass), and coastal *Eucalyptus amygdalina* woodland with a heathy/grassy understorey.	No	Species is restricted to only on site and is not known to occur within the project area – no potential for direct impacts.
Prasophyllum pulchellum pretty leek-orchid critically endangered	*Prasophyllum pulchellum* is known from widely scattered coastal and near-coastal sites in the north, north-west and south-east of the State. It occurs in dense low sedgy heath with pockets of *Melaleuca* (paperbark) or *Leptospermum* (teatree) on poorly to moderately drained sandy or peaty loam. Recent collections ascribed to the species from the Tasman Peninsula were from dolerite outcrops among wind-pruned coastal scrub/low eucalypt woodland.	No	Limited suitable habitat is present within the project area to support this species and species was not found within design corridor during field surveys – no potential for direct impacts.
Prasophyllum robustum robust leek-orchid critically endangered	*Prasophyllum robustum is* now known only from one small site in grassy and shrubby *Eucalyptus amygdalina* forest on well-drained brown loam derived from basalt. The species has a much wider historical distribution.	No	Species is restricted to only one site and is not known to occur within the project area – no potential for direct impacts.
Pterostylis ziegeleri grassland greenhood vulnerable	*Pterostylis ziegeleri* is restricted to the east and north of Tasmania. In coastal areas, the species occurs on the slopes of low stabilised sand dunes and in grassy dune swales, while in the Midlands it grows in native grassland or grassy woodland on well-drained clay loams derived from basalt.	No	*Pterostylis ziegeleri* is known from a range of habitats across Tasmania, however it is only known from 25-30 subpopulations, the largest of which is near Brighton (3-4000 plants in 2008). This species was not observed within the design corridor during field surveys and is unlikely to occur within the project area – no potential for direct impacts.
Senecio psilocarpus swamp fireweed vulnerable	*Senecio psilocarpus* is known from six widely scattered sites in the northern half of the State, including King and Flinders islands. It occurs in swampy habitats including broad valley floors associated with rivers, edges of farm dams amongst low-lying grazing/cropping ground, herb-rich native grassland in a broad swale between stable sand dunes, adjacent to wetlands in native grassland, herbaceous marshland, and low-lying lagoon systems.	No	There is limited suitable habitat for this species in the project area and this species is not known to occur within the area – no potential for direct impacts.
Spyridium obcordatum creeping dusty miller vulnerable	*Spyridium obcordatum* is restricted to the Central North Coast. In hills to the east of the Dazzler Range near Beaconsfield, it primarily occurs amongst serpentine outcrops in dry open forest or woodland dominated by *Eucalyptus amygdalina*. In coastal areas from Greens Beach to Hawley Beach at Port Sorell, it occurs on sandstone and dolerite in *Allocasuarina verticillata* woodland and *Allocasuarina monilifera-Leptospermum scoparium* heath. The species is often associated with outcropping rocks, exposed rock plates and rocky ground. It occurs at altitudes less than 180 m above sea level. It is most abundant in disturbed areas, as it can proliferate from soil-stored seed after disturbance.	No	There is some suitable habitat for this species within the project area. However, this species has not been recorded within 500 m of the project area and was not observed during field surveys. This species is unlikely to occur within the design corridor – no potential for direct impacts.
Thelymitra jonesii sky-blue sun orchid	*Thelymitra jonesii* is restricted to Tasmania, where it occurs in moist coastal heath on sandy to peaty soils and in *Eucalyptus obliqua* forest in deep loam soil over dolerite.	No	There is limited suitable habitat for this species in the project area and this species is not known to occur within the area – no potential for direct impacts.

MNES (and other matters protected by the Act)	Context[1]	Potential Significant Impact	Justification (for all MNES with no potential for significant impacts) / Comments and Mitigation (for all MNES with potential for significant impacts)
endangered			
Xanthorrhoea arenaria sand grasstree vulnerable	*Xanthorrhoea arenaria* is restricted to coastal areas from Bridport in the north-east to Coles Bay on the East Coast, where it occurs in coastal sandy heathland, extending into heathy woodland and forest, mainly dominated by *Eucalyptus amygdalina*.	No	There is limited suitable habitat for this species in the project area and this species is not known to occur within the area – no potential for direct impacts.
Xanthorrhoea bracteata shiny grasstree endangered	*Xanthorrhoea bracteata* is restricted to coastal areas from the Asbestos Range to Waterhouse Point in the north-east, where it occurs in sandy soils, often acid and waterlogged, in coastal heathland, extending into heathy woodland and forest, mainly dominated by *Eucalyptus amygdalina*.	No	There is limited suitable habitat for this species in the project area and this species is not known to occur within the area – no potential for direct impacts.
Xerochrysum palustre swamp Everlasting Vulnerable	Has a scattered distribution with populations in the north-east, east coast, Central Highlands, and Midlands, all below about 700 m elevation. It occurs in wetlands, grassy to sedgy wet heathlands and extends to associated heathy *Eucalyptus ovata* woodlands. Sites are usually inundated for part of the year. This is distinct from Victoria where it also extends into subalpine areas.	No	There is limited suitable wetlands and associated habitat to support this species and it has not been recorded within the project area or observed during field surveys – no potential for direct impacts.
Migratory and Marine birds (15) – maps for context of distribution is in Appendix L			
Actitis hypoleucos common sandpiper Migratory	Found in coastal or inland wetlands, both saline and fresh. It is found mainly on muddy edges or rocky shores.	No	No likelihood of occurrence – no potential for impacts.
Apus pacificus fork-tailed swift Migratory/marine	An aerial insectivore occasionally recorded in Tasmania. Most records of the Fork-tailed swift are from Bass Strait Islands with fewer on mainland northern Tasmania. Almost exclusively an aerial species. This species has not been recorded within 5 km of the proposed site but may fly over rarely.	No	No likelihood of occurrence – no potential for impacts.
Ardenna carneipes flesh-footed shearwater Migratory/marine	The Flesh-footed Shearwater mainly occurs in the subtropics over continental shelves and slopes and occasionally inshore waters. Individuals also pass through the tropics and over deeper waters when on migration. Most records of this species are from Bass Strait Islands with fewer on the mainland of northern Tasmania. This species has not been recorded within 5 km of the proposed site but may fly over rarely.	No	No likelihood of occurrence – no potential for impacts.
Ardenna grisea sooty shearwater Migratory/marine	This species breeds on islands off New South Wales and Tasmania. The species occurs off the coast of south-east Queensland in small numbers and is a moderately common migrant and visitor to Victoria and South Australia. Individuals also pass through the tropics and over deeper waters when on migration. Most records of this species are from Bass Strait Islands with fewer on the mainland of northern Tasmania.	No	No likelihood of occurrence – no potential for impacts.
Calidris acuminata sharp-tailed sandpiper Migratory	The Sharp-tailed Sandpiper prefers the grassy edges of shallow inland freshwater wetlands. It is also found around sewage farms, flooded fields, mudflats, mangroves, rocky shores, and beaches.	No	No likelihood of occurrence – no potential for impacts.
Calidris canutus red knot Migratory	This coastal species occurs within intertidal mudflats, sandflats, and sandy beaches of sheltered coasts in estuaries, bays, inlets, lagoons and harbours. Sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs.	No	No likelihood of occurrence – no potential for impacts.
Calidris ferruginea curlew sandpiper Migratory	The curlew sandpiper was once a common visitor to Tasmania, but their numbers have declined significantly since the 1950's. It frequents intertidal mudflats in sheltered coastal areas, with the most important sites for them in Tasmanian centred on the north and east coast of Tasmania. However, they are also occasionally recorded inland, along the open edges of ephemeral and permanent lakes and other water bodies.	No	No likelihood of occurrence – no potential for impacts.
Calidris melanotos pectoral sandpiper Migratory	In Tasmania the Pectoral Sandpiper is very rare, however records exist for Cape Portland, Orielton Lagoon-Sorell, Barilla Bay, Clear Lagoon, Cameron Inlet and Flinders Island. Typically seen in small flocks in muddy marshes or wet grassy habitats, sometimes mixed with other shorebirds. Much less common on open mudflats or beaches.	No	No likelihood of occurrence – no potential for impacts.
Gallinago hardwickii Latham's snipe	Latham's snipe utilises a broad range of habitats from coastal / inland lakes and wetlands to rivers and wet grassland. Around wetlands, Latham's snipe favour a variety of vegetation cover such as sedges, lignum, grasses, rushes, and reeds. Whilst they were once widespread throughout Tasmania's coastline and inland lakes	No	No likelihood of occurrence – no potential for impacts.

MNES (and other matters protected by the Act)	Context[1]	Potential Significant Impact	Justification (for all MNES with no potential for significant impacts) / Comments and Mitigation (for all MNES with potential for significant impacts)
Migratory	in the early 80s, there are fewer recent records which may reflect a declining abundance and distribution throughout the state.		
Hirundapus caudacutus white-throated needletail Migratory/marine	The white-throated needletail is a migratory species, breeding in central and north-eastern Asia in Siberia, Mongolia, northern-eastern China, and northern Japan. It migrates south through eastern China, Korea and Japan spending its non-breeding season in eastern and south-eastern Australia including Tasmania. This species is almost exclusively aerial, occurring over most types of habitat with a preference to wooded areas, open forests, heathland, and rainforests.	No	No likelihood of occurrence – no potential for impacts.
Limosa lapponica bar-tailed godwit Migratory	The bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons, and bays. It is found often around beds of seagrass and, sometimes, in nearby saltmarsh. It has been sighted in coastal sewage farms and saltworks, salt lakes and brackish wetlands near coasts, sandy ocean beaches, rock platforms, and coral reef-flats. It is rarely found on inland wetlands or in areas of short grass, such as farmland, paddocks, and airstrips, although it is commonly recorded in paddocks at some locations overseas.	No	No likelihood of occurrence – no potential for impacts.
Myiagra cyanoleuca satin flycatcher Migratory/marine	An interstate migrant, of which some of the population spends the summer breeding months in Tasmania. Widely distributed across forested environments but is sensitive to fragmentation and canopy thinning. Riparian habitats are preferred, and the species is infrequently recorded within regrowth and suburban environments.	No	No likelihood of occurrence – no potential for impacts.
Numenius madagascariensis eastern curlew Migratory	Much like the curlew sandpiper, the eastern curlew was once a common visitor to Tasmania, but their numbers have declined significantly since the 1950's. It frequents intertidal mudflats in sheltered coastal areas, with the most important sites for them in Tasmania centred on the north and east coast of Tasmania. However, they are also occasionally recorded inland, along the open edges of ephemeral and permanent lakes and other water bodies.	No	No likelihood of occurrence – no potential for impacts.
Sternula albifrons little tern Migratory/marine	The species is widespread in Australia, with breeding sites widely distributed from north-western Western Australia, around the northern and eastern Australian coasts to south-eastern Australia. Approximately 13 colonies are known to occur within Tasmania. This species has not been recorded within 5 km of the proposed site but may fly over rarely.	No	No likelihood of occurrence – no potential for impacts.
Tringa nebularia common greenshank	The Common Greenshank is found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves, or seagrass. In Tasmania it mainly occurs along the coast, from around Temma in the north-west to Hobart in the south-east. Habitats include embankments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats, and rock platforms. The species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes, and inundated floodplains, claypans and salt flats. The edges of the wetlands used are generally of mud or clay, occasionally of sand, and may be bare or with emergent or fringing vegetation, including short sedges and saltmarsh, mangroves, thickets of rushes, and dead or live trees.	No	No likelihood of occurrence – no potential for impacts.

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Sassafras - Wesley Vale Irrigation Scheme Augmentation

Appendix H – Significant Impact Assessment

For Tasmanian Irrigation (IDB031)

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Table A1. Summary of impact consideration of MNES

Threatened Species - Birds	Direct Impact	Indirect Impact	Potential Significant Impact	Potential to Mitigate so Residual Impact is Not Significant
Actitis hypoleucos common sandpiper	No	No	No	No
Apus pacificus fork-tailed swift	No	No	No	No
Ardenna carneipes flesh-footed shearwater	No	No	No	No
Ardenna grisea sooty shearwater	No	No	No	N/A
Aquila audax fleayi Tasmanian wedge-tailed eagle	No	**Yes**	**Yes**	**Yes**
Botaurus poiciloptilus Australasian bittern	No	No	No	N/A
Calidris acuminata sharp-tailed sandpiper	No	No	No	N/A
Calidris canutus red knot	No	No	No	N/A
Calidris ferruginea curlew sandpiper	No	No	No	N/A
Calidris melanotos pectoral sandpiper	No	No	No	N/A
Ceyx aureus diemenensis azure kingfisher	No	No	No	N/A
Gallinago hardwickii Latham's snipe	No	No	No	N/A
Hirundapus caudacutus white-throated needletail	No	No	No	N/A
Lathamus discolor swift parrot	No	**Yes**	**Yes**	**Yes**

Limosa lapponica bar-tailed godwit	No	No	No	N/A
Limosa lapponica baueri Nunivak bar-tailed godwit	No	No	No	N/A
Myiagra cyanoleuca satin flycatcher	No	No	No	N/A
Numenius madagascariensis eastern curlew	No	No	No	N/A
Pachyptila turtur subantarctica fairy prion	No	No	No	N/A
Sternula albifrons little tern	No	No	No	N/A
Sternula nereis nereis Australian fairy tern	No	No	No	N/A
Thinornis cucullatus cucullatus eastern hooded plover	No	No	No	N/A
Tringa nebularia common greenshank	No	No	No	N/A
Tyto novaehollandiae castanops Tasmanian masked owl	No	**Yes**	**Yes**	**Yes**
Albatross species (14)	No	No	No	N/A
Petrel species (4)	No	No	No	N/A
Threatened Species - Mammals	**Direct Impact**	**Indirect Impact**	**Potential Significant Impact**	**Potential to Mitigate so Residual Impact is Not Significant**
Balaenoptera musculus blue whale	No	No	No	N/A
Caperea marginata pygmy right whale	No	No	No	N/A
Dasyurus maculatus maculatus spotted-tail quoll	No	**Yes**	**Yes**	**Yes**

Dasyurus viverrinus eastern quoll	No	**Yes**	**Yes**	**Yes**
Eubalaena australis southern right whale	No	No	No	N/A
Lagenorhynchus obscurus dusky dolphin	No	No	No	N/A
Lamna nasus porbeagle	No	No	No	N/A
Megaptera novaeangliae humpback whale	No	No	No	N/A
Perameles gunnii gunnii eastern barred bandicoot	No	No	No	N/A
Sarcophilus harrisii Tasmanian devil	No	**Yes**	**Yes**	**Yes**
Threatened Species - Flora	**Direct Impact**	**Indirect Impact**	**Potential Significant Impact**	**Potential to Mitigate so Residual Impact is Not Significant**
Barbarea australis native wintercress	No	No	No	N/A
Caladenia caudata tailed spider-orchid	No	No	No	N/A
Caladenia pallida rosy spider-orchid	No	No	No	N/A
Caladenia tonellii robust fingers	No	No	No	N/A
Cassinia rugata wrinkled dollybush	No	No	No	N/A
Glycine latrobeana clover glycine	No	No	No	N/A
Leucochrysum albicans subsp. *tricolor* hoary sunray	No	No	No	N/A
Prasophyllum apoxychilum tapered leek-orchid	No	No	No	N/A

Prasophyllum limnetes marsh leek-orchid	No	No	No	N/A
Prasophyllum pulchellum pretty leek-orchid	No	No	No	N/A
Prasophyllum robustum robust leek-orchid	No	No	No	N/A
Pterostylis ziegeleri grassland greenhood	No	No	No	N/A
Senecio psilocarpus swamp fireweed	No	No	No	N/A
Spyridium obcordatum creeping dusty miller	No	No	No	N/A
Thelymitra jonesii sky-blue sun orchid	No	No	No	N/A
Xanthorrhoea arenaria sand grasstree	No	No	No	N/A
Xanthorrhoea bracteata shiny grasstree	No	No	No	N/A
Xerochrysum palustre swamp everlasting	No	No	No	N/A
Threatened Species – Other Fauna	**Direct Impact**	**Indirect Impact**	**Potential Significant Impact**	**Potential to Mitigate so Residual Impact is Not Significant**
Carcharodon carcharias white shark	No	No	No	N/A
Galaxiella pusilla eastern dwarf galaxias	No	No	No	N/A
Prototroctes maraena Australian grayling	No	No	No	N/A
Seriolella brama blue warehou	No	No	No	N/A
Thunnus maccoyii southern bluefin tuna	No	No	No	N/A

Litoria raniformis green & gold frog	**Yes**	**Yes**	**Yes**	**Yes**
Astacopsis gouldii giant freshwater crayfish	No	No	No	N/A
Engaeus granulatus central north burrowing crayfish	**Yes**	**Yes**	**Yes**	**Yes**
Chelonia mydas green turtle	No	No	No	N/A
Ecological Communities	**Direct Impact**	**Indirect Impact**	**Potential Significant Impact**	**Potential to Mitigate so Residual Impact is Not Significant**
Giant Kelp Marine Forests of Southeast Australia	No	No	No	N/A
Tasmanian Forests and Woodlands dominated by black gum or Brookers gum (*Eucalyptus ovata* / *E. brookeriana*)	**Yes**	**Yes**	**Yes**	**Yes**
Tasmanian white gum (*Eucalyptus viminalis*) wet forest	No	No	No	N/A

Table A2. Significant impact criteria with regards to the Tasmanian wedge-tailed eagle (Endangered)

Significant Impact Criteria[1]	Potential to Trigger Criteria	Comments
1. Lead to a long-term decrease in the size of a population	No	The Tasmanian wedge-tailed eagle occurs as a single, contiguous population[2] across the state and some islands of Tasmania. The total population size is estimated at less than 1,000 birds, including an estimated adult population of 440 individuals. The only conceivable way that the proposal could lead to a long-term decrease in the size of the population across that entire region would be if the proposal led to major changes in habitat availability or substantially increased demographic pressures on the species at the regional level. The scale of this proposal and anticipated works is therefore highly unlikely to lead to a long-term decrease in the size of the population.
2. Reduce the area of occupancy of the species	No	The species has an estimated 220 km^2 area of occupancy across Tasmania[3]. An aerial search established that eleven eagle nests are located within 1.5 km of the original design corridor, and as such the entire irrigation district is likely to fall within foraging/breeding territory for a number of breeding pairs. The small scale of permanent vegetation clearance will not reduce the area of occupancy for this species in any meaningful way as the entirety of the footprint will remain viable habitat after works. No nesting trees will be removed nor impacted, ample foraging habitat will remain post-construction, and all of the habitat will remain equally suitable for flying over, hunting, and dispersal.
3. Fragment an existing population into two or more populations	No	Fragmentation is not a listed threat to this species[4]. This species is highly mobile (found throughout the state and several offshore islands) and occurs in a range of environments (including modified land), making Tasmanian wedge-tailed eagles resilient to fragmentation. To fragment a population into two or more populations, this project would have to create a barrier that eagles could not/would not cross, for example, the Bass Strait that acts as a barrier between the Tasmanian subspecies and mainland Australian wedge-tailed eagle populations.

[1] Commonwealth of Australia (2013)
[2] Department of Climate Change, Energy, the Environment and Water (2023a)
[3] Department of Climate Change, Energy, the Environment and Water (2023a)
[4] Threatened Species Section (2006)

Significant Impact Criteria[1]	Potential to Trigger Criteria	Comments
		There is no likelihood that this proposal will prevent ongoing interaction among eagles in the population nor impact the ability of eagles to disperse through the surrounding landscape.
4. Adversely affect habitat critical to the survival of a species	No	The Threatened Tasmanian Eagles Recovery Plan[5] defines habitat critical to the survival of the Tasmanian wedge-tailed eagle as nesting habitat, described as forests of predominantly old growth trees greater than 10 ha in area and occurring on sites sheltered from prevailing strong winds. Four eagle nests are located within 500 m direct distance and/or 1 km line of sight from the proposed construction corridor. The proposal will not directly impact on any of the nesting habitat; however, the disturbance caused by the development may deter breeding eagles from returning to the nests adjacent to the construction corridor (Criterion 5). Visual disturbance at the nest level has been well documented for this species[6]. It has been documented in Tasmania that eagles will still utilise a site for foraging during and after developments[7]. Thus wedge-tailed eagles will likely still utilise the area after the development and are unlikely to be deterred by the disturbance with regards to foraging. The potential for nest disturbance is however sufficient to warrant consideration as a significant impact.
5. Disrupt the breeding cycle of a population	**Yes**	Loss of nesting habitat and disturbance of nesting birds are listed as key threats to the Tasmanian wedge-tailed eagle[8]. Tasmanian eagles, in particular the Tasmanian wedge-tailed eagle, are sensitive to disturbance during breeding season. Possible outcomes of exposing breeding eagles to disturbance include, but are not limited to[9]: • Failure to breed • Permanent abandonment of nests • Predation of eggs or young if an adult leaves the nest

[5] Threatened Species Section (2006)
[6] Threatened Species Section (2006); Bekessy *et al.* (2009); Wiersma (2010); O'Sullivan (2014); Munks & Crane (2017).
[7] Hull and Muir (2013)
[8] Department of Climate Change, Energy, the Environment and Water (2023a); Threatened Species Section (2006)
[9] Forest Practices Authority (2023)

Significant Impact Criteria[1]	Potential to Trigger Criteria	Comments
		• Interference with food provision to young As stated above, four eagle nests are located within 500 m direct distance and/or 1 km line of sight from the proposed construction corridor alignment. Without mitigation measures in place, the project may indirectly impact the breeding of nesting pairs. To mitigate the potential for nest disturbance all works within 500 m direct distance and/or 1 km line of sight from a known nest will be completed outside of the eagle breeding season where possible. The eagle breeding season is typically from the beginning of July until the end of January. It can be extended into February in seasons where breeding progress is later than normal, as is determined annually by the Forest Practices Authority around November. If works within 500 m/1 km line of sight of any nest cannot be completed outside of the breeding season, the annual activity status will be assessed through an aerial survey. No works will commence each year until an assessment proves a nest is inactive for that season. • If a nest is found to be definitely inactive for that season, no constraints will be required on works for the remainder of that breeding season (with constraints to recommence at the beginning of next season). • If a nest is found to be active for that season, no works will occur within 500 m and/or 1 km line of sight until the conclusion of that season (either end of January or within February in a late season). If works must be undertaken within 500 m direct distance and/or 1 km line of sight of a known eagle nest within the breeding season in a year when the specific nest is active or assumed to be active due to not having been subject to an activity assessment, it may be possible for works to be completed without causing an unacceptable disturbance to the nest. However, in this circumstance, a case specific nest disturbance mitigation plan, informed by expert advice and with input from relevant authorities will be required and sought and no such works will be undertaken without such a plan in place. Management of disturbances to nests will be managed at a site level and has been outlined above. Implementing these measures will ensure residual impacts from the proposal are not significant.
6. Modify, destroy, remove, isolate, or decrease the availability or quality of	No	The application of the scheme will not facilitate a change in land use that will affect foraging habitat for this species to a meaningful degree as essentially any habitat can be searched for prey and flown over in search of prey – nor will it lead to the clearing of potential nesting habitat, as any potential areas would be on land that is unsuitable

Significant Impact Criteria[1]	Potential to Trigger Criteria	Comments
habitat to the extent that the species is likely to decline		for irrigation. Thus, the proposed works will not modify, destroy, remove, isolate, or decrease the availability of habitat such that this species is likely to decline
7. Result in invasive species that are harmful to the species becoming established in the species' habitat	No	There is no likelihood that the project will result in invasive species that are harmful to the species becoming established in the species' habitat – numerous invasive species already present in the area provide prey opportunities or merely have a benign presence in relation to eagles.
8. Introduce disease that may cause the species to decline	No	There is no likelihood that the proposed works will introduce disease that may cause this species to decline, and no disease is considered to be a risk to the species in the context of the proposed action.
9. Interfere with the recovery of the species	No	Recovery of this species is primarily dependent upon the protection of critical breeding habitat. No critical habitat will be cleared. The proposed project is thus not considered to pose any interference to the recovery of the species.

Table A3. Significant impact criteria with regards to the swift parrot (Critically Endangered)

Significant Impact Criteria[10]	Potential to Trigger Criteria	Comments
1. Lead to a long-term decrease in the size of a population	**Yes**	The swift parrot occurs as a single, migratory population[11]. The total population size is estimated at less than 2,000 individuals[12], with more recent modelling suggesting the population could be much smaller[13]. This species migrates to Tasmania to breed, generally in the eastern and southern parts of the state and is determined largely by the distribution of blue gum (*Eucalyptus globulus*) and black gum (*E. ovata*) trees (foraging habitat)[14]. Potential nesting-habitat is typically considered to comprise eucalypt forests that contain hollow-bearing eucalypt trees of any species. Nest trees typically contain multiple hollows, have a large trunk diameter (> 70 cm diameter at breast height [DBH]), and have signs of advanced senescence[15]. Potential foraging-habitat is typically considered to be *E. globulus* and/or *E. ovata* capable of flowering and above 40 cm DBH[16]. The pipeline alignment partially falls within the north-west breeding range (20 % of design corridor) and is entirely within the potential breeding range[17] for this species. The design corridor contains both potential nesting and foraging habitat. No naturally occurring blue gum trees or vegetation communities were recorded within the design corridor. Black gum trees (*E. ovata*) were recorded in numerous locations throughout the survey area within *E. ovata* forest and woodland (DOV) and mixed eucalypt communities such as *E. amygdalina – E. obliqua* damp sclerophyll forest (DSC), and as individual trees in remnant vegetation or paddock trees. Any removal of mature *E. ovata* or *E. globulus* as a result of the proposal may result in a significant impact to the species as a whole. It is expected that most habitat trees can be avoided during construction by micro-siting of the construction corridor to avoid values. It should be noted that structural impacts to tree roots can be fatal and thus being

[10] Commonwealth of Australia (2013)
[11] Saunders & Tzaros (2011); Threatened Species Scientific Committee (2016); Department of Climate Change, Energy, the Environment and Water (2023b)
[12] Threatened Species Scientific Committee (2016)
[13] Olah *et al.* (2021)
[14] Department of Climate Change, Energy, the Environment and Water (2023b)
[15] Forest Practices Authority (2014a)
[16] Forest Practices Authority (2014a)
[17] Forest Practices Authority (2014a)

Significant Impact Criteria[10]	Potential to Trigger Criteria	Comments
		equivalent to clearance. To mitigate the residual potential impacts to this species where tree impact can not be avoided, the following measures will be implemented: • Trees will be removed outside of the breeding season (breeding season is typically between August and February[18]) • Where removal outside of the breeding season is not possible, a tree-clearance protocol may be required to manage the potential risk of individuals occupying hollows in habitat trees at the time of works (including limiting the likelihood of interrupting breeding attempts) • A site-specific management plan will be developed to mitigate any additional risks to the species. Implementation of these measures will ensure residual impacts from the proposal are not significant.
2. Reduce the area of occupancy of the species	**Yes**	A major threat to the swift parrot is the loss and alteration of foraging and nesting habitat through forestry activities, and residential, industrial, and agricultural development[19]. The swift parrot important breeding areas (SPIBAs) is largely restricted to the east and south-east coast of Tasmania where it occupies an area of less than 500 km^2; the breeding range closely mirrors the distribution of blue gum (*Eucalyptus globulus*) in Tasmania[20]. However, swift parrots are known to breed within the north-west region and the area has been identified as a potential breeding range under FPA planning guidelines[21] While the extent of habitat to be cleared within the construction corridor is minor in the context of the wider region, any removal of mature *E. ovata* or *E. globulus* as a result of the proposal may risk impacting the area of occupancy of the species as a whole. Reducing the impact on trees as described above will reduce the residual impact to this species.
3. Fragment an existing	No	This species is highly mobile and able to move through modified habitat; the proposed development would not

[18] Department of Climate Change, Energy, the Environment and Water (2023b)
[19] Saunders & Tzaros (2011)
[20] Saunders & Tzaros (2011)
[21] Forest Practices Authority (2014a)

Significant Impact Criteria[10]	Potential to Trigger Criteria	Comments
population into two or more populations		prevent movement within their existing range and thus will not fragment the population nor its habitat.
4. Adversely affect habitat critical to the survival of a species	**Yes**	Habitat critical to the survival of the species includes blue gums and black gums in close proximity to hollow bearing trees. Hollow-bearing trees (HBTs) utilised by swift parrots typically have a large trunk diameter (> 70 cm DBH) and have signs of advanced senescence[22]. Potential nesting habitat occurs onsite within forest blocks, remnant vegetation, and paddocks in agricultural land. Individual trees within the extent of the alignment corridor may require removal. However, implementation of the mitigation measures described above will reduce the residual impact to this specie.
5. Disrupt the breeding cycle of a population	**Yes**	As mentioned above, the project occurs partially within the north-west breeding areas for swift parrot, and potential nesting habitat (in the form of mature hollow-bearing eucalypts within close proximity to potential foraging resources) is present within the design corridor. Any disruption to individual breeding as a result of the proposal may result in a significant impact to the species as a whole. Avoidance of all HBTs have been prioritised to avoid potential impact on this species and the aforementioned mitigation measures and a site-specific management plan will be developed to mitigate any additional risks to the species. This plan will consider undertaking removal of foraging and potential nesting habitat outside of the breeding season of the species and pre-clearance nesting hollow searches to mitigate any impacts on the breeding cycles of this species. Implementation of these measures will ensure residual impacts from the proposal are not significant.
6. Modify, destroy, remove, isolate or decrease the availability or quality of	**Yes**	Habitat likely to be cleared appears to be mostly of low quality (according to the FPA guidelines[23]) and the project is not located within a SPIBA. Whilst the removal of these trees might not result in the decline of the species, it could result in the displacement of individuals. The ongoing cumulative loss of suitable breeding habitat, however,

[22] Forest Practices Authority (2014a)
[23] Forest Practices Authority (2014a)

Significant Impact Criteria[10]	Potential to Trigger Criteria	Comments
habitat to the extent that the species is likely to decline		is resulting in the decline of swift parrots.
7. Result in invasive species that are harmful to the species becoming established in the species' habitat	No	Predation by sugar gliders (*Petaurus breviceps*) is listed as a key threat to the species[24]. Predation by sugar gliders has been recorded at all locations on mainland Tasmania where swift parrots breed. The project area is within highly modified environment and it is unlikely that the proposed development will lead to an increase in predatory species in the local area.
8. Introduce disease that may cause the species to decline	No	Psittacine Beak and Feather Disease (PBFD) is a widespread, lethal parrot disease, which is known to occur in swift parrots and has been recorded in swift parrot nestlings in the wild population. The proposal is unlikely to have an impact upon the spread or introduction of PBFD to the local population of swift parrots as no change to the disease vector including oral, faecal or feather transmission[25] will occur.
9. Interfere with the recovery of the species	No	Recovery of this species centres around the management and protection of swift parrot habitat at the landscape scale as well as reducing impacts from collision, competition, and disease[26]. Habitat to be impacted and residual disturbance following the implementation of the prescribed mitigation measures is not expected to be significant on a landscape scale and is unlikely to affect the recovery of this species.

[24] Threatened Species Scientific Committee (2016)
[25] Department of the Environment and Heritage (2004)
[26] Saunders & Tzaros (2011)

Table A4. Significant impact criteria with regards to the Tasmanian masked owl (Vulnerable)

Significant Impact Criteria[27]	Potential to Trigger Criteria	Comments
1. Lead to a long-term decrease in the size of an important population	No	Conservation listing advice treats the entire population of the subspecies on Tasmania as one population[28], thus the entire population is classed as important. Population estimates for the Tasmanian masked owl range from 520 to 1330 breeding individuals[29] The species range covers a large portion of Tasmania and some near-shore islands, generally <600 m a.s.l, with the highest densities occurring in low land areas of dry mature forest in the east and north[30], however recent investigations have established their presence in the west and northwest of the state[31]. To lead to a long-term decrease in the size of the population would require a proposal to cause major changes in habitat availability or to substantially increase demographic pressures on the species at the state level. It is not conceivable that a proposal of this size would lead to a long-term decrease in the size of the population.
2. Reduce the area of occupancy of an important population of the species	No	The Tasmanian masked owl Species Profile and Threats Database (SPRAT) profile[32] lists the extent of occurrence for the species as 50,000 km^2, and the area of occupancy as 7,300 km^2. The scale of this project would represent < 0.1 % of the species' area of occupancy. Given the highly mobile nature of this species, their large home range and the availability of habitat that will remain undisturbed, the species will still have the same potential for local occupancy and thus the project will not reduce the area of occupancy for this species or any population.
3. Fragment an existing important population into two or more	No	Fragmentation is not a listed threat for this species[33]. The ecology of this species (highly nomadic, highly mobile and found in a range of environments including modified land and habitat mosaics) means they are resilient to fragmentation, with no documented evidence that

[27] Commonwealth of Australia (2013)
[28] Threatened Species Scientific Committee (2010)
[29] Department of the Environment, Water, Heritage and the Arts (2010)
[30] Department of Climate Change, Energy, the Environment and Water (2023c); Department of the Environment, Water, Heritage and the Arts (2010)
[31] North Barker Ecosystem Services (2023) – various ongoing investigations
[32] Department of Climate Change, Energy, the Environment and Water (2023c)
[33] Department of the Environment, Water, Heritage and the Arts (2010)

Significant Impact Criteria[27]	Potential to Trigger Criteria	Comments
populations		population fragmentation has ever been reported for the species. Thus, there is no risk of fragmenting an existing population into two or more populations (noting also that a population of the species can only be taken to cover a much greater area than that at risk of impacts from this proposal).
4. Adversely affect habitat critical to the survival of a species	**Yes**	The species' listing advice does not define critical habitat, however the Tasmanian Forest Practices Authority defines 'significant habitat' for the masked owl as any area of native dry forest, within the core range, with trees with large hollows (≥15 cm entrance diameter), while remnant and paddock trees in agricultural areas may also constitute significant habitat[34]. Masked owls occupy a permanent territory and require hollows in old growth trees (DBH >100 cm) for nesting and roosting[35]. The project area is within masked owl core range and although there is no old growth forest within the design corridor, sixty-two large eucalypt trees (DBH > 100 cm) are. Although isolated, these trees are potentially viable breeding and/or roosting habitat for masked owl. Any tree that is located within the construction corridor may be impacted by construction activities. Therefore, the proposal has the potential to adversely affect habitat critical to this species. To mitigate impacts to the Tasmanian masked owl, all potential habitat trees that may be utilised by this species will be avoided where possible through design. If impact to habitat trees is unavoidable, additional surveying of habitat trees and/or a tree clearance protocol will be developed to manage the potential impact to this species. Implementing these measures will ensure residual impacts from the proposal are not significant.
5. Disrupt the breeding cycle of an important population	**Yes**	There are 62 large trees/stags within the design corridor that have potential to be suitable for nesting habitat for the Tasmanian masked owl, of which 20 may be impacted by the proposal. The removal of a small number of potential nesting trees would however be highly unlikely to result in the decline of the species, though could result in the displacement of a breeding pair. No disruption to breeding is anticipated unless the hollows are occupied. If this is the case, further management measures will be required.

[34] Forest Practices Authority (2014b); Forest Practices Authority & Threatened Species Section (DPIPWE) (2022)
[35] Forest Practices Authority (2014b)

Significant Impact Criteria[27]	Potential to Trigger Criteria	Comments
		The development of a tree clearance protocol which includes pre-clearance hollow searches and conducting removal of potential nesting trees outside of the peak breeding season will minimise any risk to this species and the local population.
6. Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No	Whilst removal of these trees could result in the displacement of individuals, it is unlikely to result in the decline of the species. Habitat loss related to this project, when considered in the context of the species' range, is not expected to have a significant impact on the species.
7. Result in invasive species that are harmful to the species becoming established in the species' habitat	No	There is no likelihood that the project will result in invasive species that are harmful to the species becoming established in the species' habitat. The project area is within highly modified environment and it is unlikely that the proposed development will lead to an increase in invaisive species in the local area.
8. Introduce disease that may cause the species to decline	No	There are no diseases applicable to the nature of works that are listed as threats to the species[36] and no likelihood that the project will introduce disease that may cause the species to decline.
9. Interfere with the recovery of the species	No	There is no recovery plan for this species. The key threats to this species are habitat clearing, fragmentation and rural tree decline along with competition for hollows, collision and secondary poisoning[37]. Given the action is not anticipated to increase the risk of the key threats or affect on the likelihood of local persistence of the species, it cannot conceivably be seen to have a likelihood of interfering with the recovery of this species overall.

[36] Department of Climate Change, Energy, the Environment and Water (2023c)
[37] Department of the Environment (2021e)

Table A5. Significant impact criteria with regards to the spotted-tail quoll (Vulnerable)

Significant Impact Criteria[38]	Potential to Trigger Criteria	Comments
1. Lead to a long-term decrease in the size of an important population	**Yes**	The National Recovery Plan[39] identifies several important populations for the spotted-tail quoll in Tasmania, while the Tasmanian Threatened Fauna Handbook[40] complements this by outlining key sites. The irrigation district overlaps with the Central-north Tasmania important population site and is known as a stronghold and research population for the species. The permanent loss of 1.5 ha of potential habitat is unlikely to result in a decrease to any local population, particularly in the context of the abundance of equivalent or better habitat in the broader landscape. Increased traffic (particularly nighttime, including dusk and dawn) during the construction phase (including the delivery of material) may increase the risk of roadkill, though it unclear if this will have a long-term effect on the population size. Development of a traffic management protocol to mitigate the risk of increase quoll mortality associated with increased traffic (particularly nighttime, including dusk and dawn) in the construction phase will reduce the potential for long-term decrease in the size of an important population.
2. Reduce the area of occupancy of an important population of the species	No	The largely temporary nature of the proposed action and the very small permanent impact footprint will not meaningfully reduce the area of occupancy of this species given its range of occurrence of several tens of thousands of square kilometres[41]. Thus, the proposal will not reduce the area of occupancy of the species.
3. Fragment an existing important population into two or more populations	No	The small (1.5 ha) loss of potential habitat resulting from this proposal will not result in the fragmentation of existing populations into two or more populations. In addition, the works will also be undertaken progressively throughout the SWISA network and will not present a barrier to this species' passageway throughout the region. The largely temporary nature of the proposed action and the very small permanent footprint changes in any one area thus will not fragment the existing population into two or more populations and is unlikely even to have a noticeable impact on individual movements at a local scale.
4. Adversely affect habitat	**Yes**	Habitat that is critical to the survival of the spotted-tail quoll includes large patches of forest with adequate denning

[38] Commonwealth of Australia (2013)
[39] Department of Environment, Land, Water and Planning (2016)
[40] Bryant & Jackson (1999)
[41] Long & Nelson (2010)

Significant Impact Criteria[38]	Potential to Trigger Criteria	Comments
critical to the survival of a species		resources and relatively high densities of medium-sized mammalian prey[42]. There is very little contiguous native forest within the project area. The most significant habitat within the design corridor includes the Warrawee Conservation Area and surrounding forest. This area forms a continuous forest habitat that is likely utilised by this species. Three kilometres of the SWISA alignment passes through this area. Construction impacts to habitat in this area are temporary and there will be no permanent critical habitat loss in this area. To minimise impacts, the design corridor has been aligned adjacent to the existing access trail, Devil Road, and will not permanently impact any significant habitat critical for the survival of this species. The majority of the proposed impacts are temporary in nature and will not reduce the extent of foraging and denning habitat.
5. Disrupt the breeding cycle of an important population	**Yes**	Denning habitat can include rocky outcrops, large logs and underground hollows[43]. Potential denning habitat occurs within the design corridor within the Warrawee Conservation Area and surrounding forest, though no dens or potential den structures were recorded. The project has the potential to disrupt the breeding of individuals but is unlikely to disrupt the breeding cycle of an important population. Despite the large area of unsuitable denning habitat across the SWISA project area (largely due to the heavily modified agricultural landscape), pre-clearance den searches and an unanticipated den discovery protocol will be implemented throughout the construction phase of the project. These avoidance of denning habitat and mitigation measures will minimise the potential for disturbance to denning activities.
6. Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No	The upgrade and installation of permanent infrastructure (pumpstations and reservoir) will not significantly impact the quality or availability of potential habitat. The anticipated 1.5 ha of permanent impact area is within modified land units and the temporary loss of a small amount of potential habitat within the construction footprint is unlikely to result in any meaningful reduction in the availability of habitat from the local area and as such is unlikely to cause a measurable decline to this species.
7. Result in invasive species that are harmful to the	No	Invasive species that are harmful to the species include cats, dogs, and foxes[44]. Cats are ubiquitous throughout

[42] Department of Environment, Land, Water and Planning (2016)
[43] Department of Environment, Land, Water and Planning (2016)
[44] Department of Environment, Land, Water and Planning (2016); Threatened Species Scientific Committee (2004)

Significant Impact Criteria[38]	Potential to Trigger Criteria	Comments
species becoming established in the species' habitat		Tasmania, dogs are abundant in peri-urban areas, and foxes are currently understood to be absent from the State[45]. There is no likelihood that the action will result in and invasive species that are harmful to the species (such as foxes) becoming established in the species' habitat as the landscape suitability for invasion of such species will not change as a result of works and there is no conceivable reason the projects works will result in a direct introduction of such a species as the project will operate under weed and hygiene management practices. In addition, the surrounding landscape already continues numerous introduced plants and animals that co-occur with the spotted-tail quoll throughout its range with no apparent detrimental impacts.
8. Introduce disease that may cause the species to decline	No	Disease is not currently listed as a cause of species decline[46]. The action will not conceivably introduce any diseases that may cause the species to decline and is thus not considered to be a risk for this project. Numerous similar projects have been undertaken in suitable habitat for the spotted-tail quoll with no known incidences of a disease resulting from the projects.
9. Interfere with the recovery of the species	No	Recovery of this species is primarily dependent upon the protection of existing habitat[47]. The overall objective of the *National Recovery Plan for the Spotted-tail Quoll Dasyurus maculatus*[48] is to reduce the rate of decline of the spotted-tail quoll and to ensure that viable populations remain throughout its current range in eastern Australia. The small permanent loss of potential habitat within the construction corridor, although located within an area considered to be an important population for the species, is not considered likely to interfere with the recovery of the species.

[45] Ramsey *et al.* (2017)
[46] Department of Environment, Land, Water and Planning (2016)
[47] Department of Environment, Land, Water and Planning (2016)
[48] Department of the Environment (2016)

Table A6. Significant impact criteria with regards to the eastern quoll (Endangered)

Significant Impact Criteria[49]	Potential to Trigger Criteria	Comments
1. Lead to a long-term decrease in the size of a population	**Yes**	The eastern quoll was once abundant throughout south-eastern Australia now survives only in Tasmania. Until recently it was considered widespread and common however recent data compiled from statewide surveys suggest the that the eastern quoll can no longer be presumed secure in Tasmania[50]. The eastern quoll has been found to have several genetically distinct populations across Tasmania: northwest, northeast, and southern[51]. As an endangered species, all populations are seen as important, although some areas might be considered as the primary strongholds for the species (for example the east coast and central highlands[52]). No evidence of this species occurring within the Project area was recorded during field surveys, and there are no previous records of this species with 2 km of the project area[53]. Further targeted surveys are required to establish this species presence within the project area. The small (1.5 ha) permanent loss of potential habitat related to this proposal is unlikely to result in a long-term decrease in the size of a local population of eastern quoll, particularly in the context of the abundance of equivalent or better habitat in the broader landscape. Increased traffic (particularly nighttime, including dusk and dawn) during the construction phase (including the delivery of material) may increase the risk of roadkill, though it is unclear if this will have a long-term effect on the population size should they occur in the project area. Development of a traffic management protocol to mitigate the risk of increase quoll mortality associated with increased traffic in the construction phase will reduce the potential for long-term decrease in the size of an important population.
2. Reduce the area of occupancy of the species	No	Eastern quolls are widespread in Tasmania but have been recorded less frequently in the wettest third of the state. This species is known to have home ranges of upwards of 35 to 44 ha (females and males respectively), with an extensive amount of overlap between individuals[54]. The design corridor overlaps with areas modelled 'Species or species habitat may occur' within the species

[49] Commonwealth of Australia (2013)
[50] Fancourt *et al.* (2013)
[51] Cardoso *et al.* (2014)
[52] Fancourt *et al.* (2013)
[53] Department of Natural Resources and Environment Tasmania (2022)
[54] Threatened Species Scientific Committee (2015); Department of Climate Change, Energy, the Environment and Water (2022d)

Significant Impact Criteria[49]	Potential to Trigger Criteria	Comments
		distribution map[55]. However, the anticipated permanent impact area (1.5 ha) is within modified land units and any impact on potential habitat (foraging and/or denning) is temporary. Therefore, the project is likely to have a low impact on the carrying capacity of the area and is unlikely to result in any meaningful decrease in the area of occupancy of the species.
3. Fragment an existing population into two or more populations	No	The small (1.5 ha) loss of potential habitat resulting from this proposal will not result in the fragmentation of existing populations into two or more populations. In addition, the works will also be undertaken progressively throughout the SWISA network and will not present a barrier to this species' passageway throughout the region. The largely temporary nature of the proposed action and the very small permanent footprint changes in any one area thus will not fragment the existing population into two or more populations and is unlikely even to have a noticeable impact on individual movements at a local scale.
4. Adversely affect habitat critical to the survival of a species	No	The species' listing advice does not define critical habitat[56], however the Tasmanian Forest Practices Authority defines 'preferred habitat' for this species as rainforest, heathland, alpine areas and scrub, with a preference for dry forest and native grassland mosaics which are bounded by agricultural land[57]. The small amount (1.5 ha) of modified land will be permanently impacted by the proposed development. This area is not deemed critical to the survival of the species. Any impact on potential habitat (foraging and/or denning) will be temporary in nature and will return to viable denning and foraging habitat post-construction.
5. Disrupt the breeding cycle of a population	**Yes**	Denning habitat can include rocky outcrops, large logs and underground hollows[58]. Potential denning occurs within the design corridor within the Warrawee Conservation Area and surrounding forest, though no dens or potential den structures were recorded. The project has the potential to disrupt the breeding of individuals but is unlikely to disrupt the breeding cycle of an important population. The presence of this species within the project area has yet to be determined. Despite the large area of unsuitable denning habitat across the SWISA project area (largely due to the heavily modified agricultural landscape), pre-clearance den searches and an unanticipated den discovery protocol will be implemented throughout the construction phase of the project. These avoidance of denning habitat and mitigation measures will minimise the potential for disturbance to denning activities.

[55] Department of Climate Change, Energy, the Environment and Water (2023d)
[56] Fancourt *et al.* (2015)
[57] Forest Practices Authority & Threatened Species Section (DPIPWE) (2022)
[58] Department of Environment, Land, Water and Planning (2016)

Significant Impact Criteria[49]	Potential to Trigger Criteria	Comments
6. Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline	No	The upgrade and installation of permanent infrastructure (pumpstations and reservoir) will not significantly impact the quality or availability of potential habitat. The anticipated 1.5 ha of permanent impact area is within modified land units and the temporary loss of a small amount of potential habitat within the construction footprint is unlikely to result in any meaningful reduction in the availability of habitat from the local area and as such is unlikely to cause a measurable decline to this species.
7. Result in invasive species that are harmful to the species becoming established in the species' habitat	No	The key threats to this species are listed as predation and competition by introduced predators (e.g. cats and foxes)[59]. There is no likelihood that the action will result in and invasive species that are harmful to the species (such as foxes) becoming established in the species' habitat as the landscape suitability for invasion of such species will not change as a result of works and there is no conceivable reason the projects works will result in a direct introduction of such a species as the project will operate under weed and hygiene management practices. In addition, the surrounding landscape already continues numerous introduced plants and animals that co-occur with the eastern quoll throughout its range with no apparent detrimental impacts.
8. Introduce disease that may cause the species to decline	No	Disease is seen as a potentially severe threat to the species (particularly on Bruny Island) based on a historical episode of rapid mortality in which the causative pathogen is unknown[60]. Disease is considered less of a threat to the mainland Tasmanian population, however, on account of the size of the range of the population, population density (relatively low,) and genetic diversity. The action will not conceivably introduce any diseases that may cause the species to decline and is thus not considered to be a risk for this project. Numerous similar projects have been undertaken in suitable habitat for the eastern quoll with no known incidences of a disease resulting from the projects.
9. Interfere with the recovery of the species	No	A Recovery Plan is not considered to be required, as the approved conservation advice for the species provides sufficient direction to implement priority actions and mitigate against key threats[61]. Key recovery actions in the conservation advice are listed as: feral predator control, captive breeding, quarantining island population, translocations/insurance populations/reintroductions, and community engagement. The proposed action will not conceivably interfere with any of these actions nor exacerbate associated threats intended to be addressed by the

[59] Threatened Species Scientific Committee (2015)
[60] Threatened Species Scientific Committee (2015)
[61] Department of Climate Change, Energy, the Environment and Water (2023d)

Significant Impact Criteria[49]	Potential to Trigger Criteria	Comments
		actions. Thus, the action will not interfere with the recovery of the species.

Table A7. Significant impact criteria with regards to the Tasmanian devil (Endangered)

Significant Impact Criteria[62]	Potential to Trigger Criteria	Comments
1. Lead to a long-term decrease in the size of a population	**Yes**	A 'population of a species' is defined under the EPBCA as an occurrence of the species in a particular area, including 'a geographically distinct regional population' or 'a population, or collection of local populations, that occurs within a particular bioregion'. The SPRAT profile for devils divides them into two genetically distinct populations: the north-western and the eastern/south-western populations[63]. With the project area falling within the range of the eastern/south-western population, the only conceivable way that the proposal could lead to a long-term decrease in the size of the Tasmanian devil population across that entire region would be if the proposal led to major changes in habitat availability or substantially increased demographic pressures on the species at the regional level. It is unlikely that the small (1.5 ha) amount of permanent loss and temporary nature of impact on potential habitat will lead to a long-term decrease in the size of the eastern/south-western population, particularly in the context of the abundance of equivalent or better habitat in the broader landscape. Increased traffic (particularly nighttime, including dusk and dawn) during the construction phase (including the delivery of material) may increase the risk of roadkill. The potential impact on the population size has yet to be determined.
2. Reduce the area of occupancy of the species	No	At the scale of an individual devil, the project impact area (~315 ha) is approximately 75 % of the minimum area of an individual devil's home range[64], with only ~1.5 ha of this being permanent impact. Given the temporary nature of much of the proposed works, the action will not reduce the area of occupancy of this species as they will still effectively be able to occur in the same area after works as before.
3. Fragment an existing population into two or more populations	No	Devils are resilient to habitat fragmentation[65]. To fragment a population into two or more populations, this project would have to create a barrier that devils could not/would not cross, for example, the 2 km wide body of water separating Bruny Island from mainland Tasmania (devils have never occurred on Bruny Island). The proposal instead involves a very narrow linear strip of disturbance, mostly being temporary impacts from the point of the

[62] Commonwealth of Australia (2013)
[63] Department of Climate Change, Energy, the Environment and Water (2023e)
[64] Andersen *et al.* (2020)
[65] Andersen *et al.* (2017)

Significant Impact Criteria[62]	Potential to Trigger Criteria	Comments
		ecology of the devil. Devils readily move through human-modified landscapes and will even select roads for movement and foraging[66], so it is highly unlikely that this proposal will prevent ongoing interaction among devils in the population nor impact the ability of devils to disperse through the surrounding already fragmented landscape. As such, the action will not fragment an existing population into two or more populations.
4. Adversely affect habitat critical to the survival of a species	**Yes**	The Draft Tasmanian Devil Recovery Plan[67] states that critical devil habitat includes 'all disease-free areas within mainland Tasmania with suitable devil habitat', 'all areas of pre-disease core habitat', and 'areas that may be required under the recovery program for the future introduction of Tasmanian devils'. 'Disease' refers to Devil Facial Tumour Disease (DFTD), the most significant threat to devils. The proposal falls within historic core habitat for devils, and therefore critical habitat, however the area has likely been diseased for at least 10 years[68]. There is very little potential denning habitat (contiguous native forest) within the project area. The most significant habitat within the design corridor includes the Warrawee Conservation Area and surrounding forest. This area forms a continuous forest habitat that is likely utilised by this species. Three kilometres of the SWISA alignment passes through this area. Construction impacts to habitat in this area are temporary and there will be no permanent critical habitat loss in this area. Potential foraging habitat occurs throughout the action area, however the proposed action has a permanent infrastructure footprint of only 1.5 ha within modified vegetation units. All other impacts are temporary and will not reduce the extent of available foraging and denning habitat beyond the permanent impact areas.
5. Disrupt the breeding cycle of a population	**Yes**	The most significant risk to devil breeding cycles from the proposal is the destruction of den sites. Devils typically den underground, such as in wombat burrows, or in rock/log piles[69]. Habitat clearance could reduce the number of den sites available to devils, and even injure or kill devils trapped inside dens during operations. This is a particular risk to maternal dens, where young devils may be left in dens and unable to escape. Despite the large area of unsuitable denning habitat across the SWISA project area (largely due to the heavily

[66] Andersen *et al.* (2017)
[67] Department of Primary Industries, Parks, Water and Environment (2010)
[68] Cunningham *et al.* (2021)
[69] Threatened Species Section (2023a)

Significant Impact Criteria[62]	Potential to Trigger Criteria	Comments
		modified agricultural landscape), pre-clearance den searches and an unanticipated den discovery protocol will be implemented throughout the construction phase of the project. These avoidance of denning habitat and mitigation measures will minimise the potential for disturbance to denning activities.
6. Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	No	The proposed action has an anticipated permanent infrastructure footprint of 1.5 ha within modified vegetation units. All other impacts are temporary only and will not reduce the extent of available foraging and denning habitat beyond the permanent impact areas, noting that the vast majority of impacts occur within modified land. Thus the proposed action is unlikely to result in any meaningful reduction in the availability or quality of habitat that will cause a measurable decline to this species.
7. Result in invasive species that are harmful to the species becoming established in the species' habitat	No	There is no likelihood that the action will result in and invasive species that are harmful to the species (such as foxes) becoming established in the species' habitat as the landscape suitability for invasion of such species will not change as a result of works and there is no conceivable reason the projects works will result in a direct introduction of such a species as the project will operate under weed and hygiene management practices. In addition, the surrounding landscape already continues numerous introduced plants and animals that co-occur with the devil throughout its range with no apparent detrimental impacts.
8. Introduce disease that may cause the species to decline	No	Disease is listed as a severe threat to the species due to DFTD[70]. DFTD comprises two independent transmissible cancers, DFT1 (first identified in 1996) and DFT2 (first identified in 2014); DFT2 is currently restricted to the southeast of the island whereas DFT1 is spread across most of mainland Tasmania[71]. The irrigation district is within the known range of the DFT1 strain and the proposal is unlikely to have any influence on virility or dispersal or DFT2 within the region.
9. Interfere with the recovery of the species	**Yes**	Given that the main threat to the Tasmanian devil is DFTD, the recovery of the species is contingent on work to manage this disease and cultivate safeguards against the loss of all wild individuals. Currently the recovery of the Tasmanian devil is based around the work being undertaken by the 'Save the Tasmanian Devil Program'. The Draft Tasmanian Devil Recovery Plan[72] identifies the following actions:

[70] Hawkins *et al.* (2006)
[71] Woods *et al.* (2018)
[72] Department of Primary Industries, Parks, Water, and Environment (2010)

Significant Impact Criteria[62]	Potential to Trigger Criteria	Comments
		• Maintain and manage insurance populations • Manage DFTD in the wild • Monitor Tasmanian devils • Conduct disease investigations • Manage other threats in the wild • Research and measure habitat variables • Coordinate recovery program • Communicate with the community and stakeholders 'Other threats' in Action 5 include the threat of foxes in Tasmania, collisions with vehicles, habitat loss and illegal culling. As outlined above, the proposal is unlikely to cause significant habitat loss for devils., however that potential roadkill impact due to the action has yet to be quantified. Mitigation measure, as outlined above will minimise risks to the component of the local devil population from the increased traffic during construction.

Table A8. Significant impact criteria with regards to the green and gold frog (Vulnerable)

Significant Impact Criteria[73]	Potential to Trigger Criteria	Comments
1. Lead to a long-term decrease in the size of an important population	No	According to the National Recovery Plan for the southern bell frog (green and gold frog) *Litoria raniformis*[74], any viable population is considered an important population for the persistence and recovery of the species[75]. For this species, a viable population is one which is not isolated from other populations or waterbodies, such that it has the opportunity to interact with other nearby populations or has the ability to establish new populations when the suitability or availability of water changes. The design corridor supports an important population for this species, as both breeding habitat and frog dispersal between other populations occurs throughout the design corridor. The proposed action will involve temporary degradation of terrestrial habitat within 200 meters of a waterbody in this temperate region. All sites that will contain permanent infrastructure (1.5 ha) are located more than 200m from any frog breeding habitat. Although individual frogs may be impacted during the construction phase of the proposed action, it is not anticipated that there will be a long-term decrease in the population size as a result of the action.
2. Reduce the area of occupancy of an important population of the species	**Yes**	The project area and action area (design corridor) support an important population for this species, as both breeding habitat and frog dispersal between other populations occurs throughout the action area. The majority of locations identified as breeding habitat within the design corridor are farm dams that will be avoided and will not be directly impacted by the proposed development. However, given the prevalence of green and gold frog dispersal habitat (and the confirmed presence of frogs in the area) between breeding habitat throughout the design corridor, it is unlikely that any pipeline alignment option will completely avoid impacts to dispersal habitat. Therefore, the area of occupancy for the green and gold frog is expected to be reduced, albeit temporarily) as a result of the proposal. To mitigate the potential direct impacts to this species from the proposed development the following will be undertaken: ○ Avoidance of potential green and gold frog breeding habitat where possible. ○ Application of an impact mitigation protocol to manage the potential impact to frogs during construction

[73] Commonwealth of Australia (2013)
[74] Clemann and Gillespie (2012)
[75] Clemann and Gillespie (2012)

Significant Impact Criteria[73]	Potential to Trigger Criteria	Comments
		and to include the following: ○ Seasonal timing for construction ○ Reduction of corridor width in areas of habitat ○ Construction protocols, including buffer zones around breeding habitat adjacent to the construction corridor and terrestrial habitat corridors between breeding zones ○ Relocation of refuge habitat ○ Contamination protocols ○ Habitat rehabilitation ○ All works will be undertaken in accordance with *Keeping it clean - A Tasmanian field hygiene manual to prevent the spread of freshwater pests and pathogens*[76]. These mitigation measures measures will be implemented to reduce the residual risk of significant impact to this species.
3. Fragment an existing important population into two or more populations	No	Habitat loss, modification, degradation, and fragmentation of aquatic and adjacent terrestrial habitat is considered a primary threat to green and gold frog populations[77]. The green and gold frog can move at least one kilometre in 24 hours[78] and there is mounting evidence that its persistence in many areas is dependent upon the movement of adults between particular water bodies and between breeding and non-breeding habitat[79]. The proposed development will involve linear trenching and installation of pipeline within potential frog habitat areas. These works will involve the installation of pipeline approximately 1 km in length for a maximum of two weeks, where works will be undertaken gradually. This will provide ample room for frogs to disperse between these works and is not expected to isolate and/or fragment a frog population. The works undertaken in frog dispersal areas will be temporary and no long-term impacts to frog dispersal habitat is expected to occur upon completion of the works.

[76] Allen and Gartenstein (2010)
[77] Clemann and Gillespie (2012)
[78] Department of State Growth (2015)
[79] Clemann and Gillespie (2012)

Significant Impact Criteria[73]	Potential to Trigger Criteria	Comments
4. Adversely affect habitat critical to the survival of a species	**Yes**	The proposed action will avoid all areas of critical habitat including breeding habitat that occurs within farm dams located within the design corridor. However, the proposal has the potential to impact breeding habitat during construction activities. The majority of locations identified as breeding habitat within the design corridor are farm dams that will be avoided and will not be directly impacted by the proposed development. However, given the prevalence of green and gold frog dispersal habitat (and the confirmed presence of frogs in the area) between breeding habitat throughout the design corridor, it is unlikely that any pipeline alignment option will completely avoid impacts to dispersal habitat. Impacts to frog breeding and dispersal habitat within the construction corridor will be temporary in nature and will impact a corridor of a maximum width of 30 m, with scope to reduce this in some areas to minimise impacts. However, habitat critical to the survival of the species will be affected (albeit temporarily) as a result of the proposal. As previously detailed, mitigative measures will be applied to the works area. The proposed pipeline is to be installed in approximately 1 km segments and frogs will be free to disperse between breeding habitat in other locations outside of the construction corridor. No long-term impacts to habitat critical to the green and gold frog survival will occur under the proposal. Importantly, through implementing the aforementioned mitigative measures, the proposed development will not result in the loss of dispersal or overwintering opportunities for an important population.
5. Disrupt the breeding cycle of an important population	**Yes**	Green and gold frogs in Tasmania typically breed in spring and summer (September to January inclusive)[80] and do not appear to be reliant on flooding[81]. The larval stage may last up to 15 months and tadpoles have an aquatic period lasting 2-15months[82]. The construction corridor will avoid all areas identified as breeding habitat within the design corridor other than the occasional farm ditch or natural water course. The proposal will have temporary impacts on frog dispersal habitat adjacent and between breeding habitats. Although the action may significantly disrupt the breeding cycle of individual frogs, the impact on the breeding cycle of the population has not been quantified. Impacts will be temporary in nature and buffer zones around adjacent dispersal areas will be implemented to ensure breeding events can continue. The aforementioned mitigation measures will be implemented to reduce the

[80] Threatened Species Section (2023b)
[81] Ashworth (2001)
[82] Clemann and Gillespie (2012)

Significant Impact Criteria[73]	Potential to Trigger Criteria	Comments
		risk of potentially disrupting the breeding cycle of a green and gold frog population within the action area.
6. Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline	No	While individual frogs may be impacted by the project, the proposal will not modify, destroy, isolate, or decrease the availability or quality of habitat to the extent that the species distribution and numbers is likely to decline.
7. Result in invasive species that are harmful to the species becoming established in the species' habitat	No	According to the National Recovery Plan for green and gold frog *Litoria raniformis*[83] invasive species harmful to green and gold frog include introduced fish including the eastern gambusia *Gambusia holbrooki* and common carp *Cyprinus carpio*. Additionally, the red fox *Vulpes vulpes* and cat *Felis catus* are known to be effective predators of small native vertebrates, including amphibians[84]. The proposed project is highly unlikely to result in the introduction of any of these species.
8. Introduce disease that may cause the species to decline	**Yes**	The disease chytridiomycosis (chytrid) caused by the fungal pathogen *Batrachochytrium dendrobatidis* is a key threatening process to the green and gold frog. This waterborne pathogen infects the keratinised mouthparts of tadpoles and the skin of adults where it impacts the structure and physiological function, ultimately resulting in high mortality in many frog species[85]. In Tasmania, chytrid occurs widely in habitats associated with human disturbance. Once established, it is extremely difficult to eradicate from the natural environment[86]. According to the Natural Values Atlas (NVA), no chytrid fungus has been recorded within the irrigation district[87]. The proposal increases the risk of introducing chytrid fungus to the region and impacting the important population of green and gold frog within the design corridor. To reduce the potential for introducing disease, strict hygiene measures will need to be followed during construction works. To mitigate the potential spread of chytrid fungus, the Tasmanian field guidelines '*Keeping it Clean- A Tasmanian*

[83] Clemann and Gillespie (2012)
[84] Saunders *et al.* (1995), Dickman (1996).
[85] Clemann and Gillespie (2012)
[86] Ashworth (2001)
[87] Department of Natural Resources and Environment Tasmania (2023)

Significant Impact Criteria[73]	Potential to Trigger Criteria	Comments
		Field Hygiene Manual to Prevent the Spread of Freshwater Pests and Pathogens[88] must be followed and contractors will implement measures from these guidelines during all construction activities.
9. Interfere with the recovery of the species	No	The *National Recovery Plan for the Southern Bell Frog Litoria raniformis*[89] outlines the specific objectives for the green and gold frog. These include the following: 1. Secure extant populations of green and gold frogs, particularly those occurring in known breeding habitats, and improve their viability through increases in size and/or area of occurrence. 2. Determine distribution, biology, and ecology of the green and gold frog, and identify causes of the decline of the species across its geographic range. 3. Address known or predicted threatening processes and implement appropriate management practices where possible to ensure that land use activities do not threaten the survival of the green and gold frog. 4. Increase community awareness of and support for green and gold frog conservation. The proposed development will not interfere with any of these objectives or the recovery of this species.

[88] NRM South (2010)
[89] Clemann and Gillespie (2012)

Table A9. Significant impact criteria with regards to the central north burrowing crayfish (Endangered)

Significant Impact Criteria[90]	Potential to Trigger Criteria	Comments
1. Lead to a long-term decrease in the size of a population	**Yes**	The central north burrowing crayfish (*Engaeus granulatus*) only occurs in central north Tasmania and has a restricted and fragmented population with limited connectivity between populations[91]. The design corridor is within the core range of the central north burrowing crayfish[92] Key threats to this species include habitat disturbance include the following: • Current habitat disturbance including agriculture and urban development activities • Activities that severely alter water quality or quantity or soil or food availability • Introduced pests including the freshwater yabby - *Cherax destructor* • Low population vigour • Various anthropogenic related activities including the clearance of vegetation along rivers and drains, ploughing, dam construction, unrestricted stock grazing and similar[93] No direct observations of burrowing crayfish (*Engaeus* species) were recorded during field surveys; however, seventeen burrowing crayfish colonies were recorded within the design corridor by presence of one to hundreds of chimneys at one location. The estimated population range is between 8,000 to 312,000 individuals, considered extremely low for an invertebrate species considering the range over which it is found[94]. The natural values assessment attributed thirteen colonies of *E. granulatus.* Thirty areas of optimal and an additional thirty areas of suboptimal burrowing crayfish habitat were recorded within the design corridor. The species has not been confirmed by excavation and identification of animals; however, it is highly likely that colonies that occur in wet areas outside the species common congener's range are the threatened central north burrowing crayfish. While the pipeline alignment has been designed to avoid crayfish habitat where possible, impact to the habitat and potentially the species is likely unavoidable. Due to the low population numbers and fragmented population distribution, impacts to the optimal and sub-optimal locations within the construction corridor as a result of the proposal could lead to a long-term decrease in the size of a population.

[90] Commonwealth of Australia (2013)
[91] Department of Climate Change, Energy, the Environment and Water (2023f)
[92] Department of Climate Change, Energy, the Environment and Water (2023f)
[93] Department of Climate Change, Energy, the Environment and Water (2023f)
[94] Department of Climate Change, Energy, the Environment and Water (2023f)

Significant Impact Criteria[90]	Potential to Trigger Criteria	Comments
		To mitigate the potential impacts to this species from the proposed development the following will be undertaken: • Avoidance of known chimneys from the construction corridor where possible. • In areas where the presence of burrows was unable to be previously surveyed due to dense vegetation, pre-construction reduction in biomass followed by surveys for burrows will be undertaken to avoid or minimise threatened crayfish species. This will be dependent on the extant and location of the impact in the final design. • Development of an impact mitigation and habitat management protocol to limit the likelihood of mortalities and long-term impacts on habitat condition. This may include restrictions on timing of construction activity (to avoid hotter and drier months), requirement for trained personnel onsite, translocation protocol, sediment and chemical contamination protocols, monitoring of water table and post construction surveys.
2. Reduce the area of occupancy of the species	**Yes**	The estimated extent of occurrence of the central north burrowing crayfish is 512 km^2[95] and the maximum area of occupancy of the species is estimated at 0.5 km^2[96]. A total of 2.07 ha of optimal habitat and an additional 6.56 ha of sub-optimal burrowing crayfish habitat were identified within the design corridor. Although these areas cannot be directly attributed to *E. granulatus* without excavation and identification of animals, it is highly likely that colonies within wet areas are attributed to the central north burrowing crayfish. The proposal is likely to reduce the area of occupancy for the species through impacts to habitat contained within the construction corridor. The total amount of crayfish habitat to be impacted will be understood once the final alignment is settled.
3. Fragment an existing population into two or more populations	**Yes**	The central north burrowing crayfish is known to have a restricted, fragmented population with limited connectivity between populations[97]. Populations can be impacted by modified environments and activities that reduce area of occupancy and fragment a population into two or more populations[98]. Additionally, burrowing crayfish dispersal

[95] Richardson *et al.* (2008)
[96] Department of Climate Change, Energy, the Environment and Water (2023f)
[97] Department of Climate Change, Energy, the Environment and Water (2023f)
[98] Department of Climate Change, Energy, the Environment and Water (2023f)

Significant Impact Criteria[90]	Potential to Trigger Criteria	Comments
		through waterways may be limited, leading to restricted ranges and a high degree of local specialisation[99]. Any trenching for pipework within a burrowing crayfish population has the potential to fragment an existing population into two or more populations. Avoidance of burrowing crayfish colonies and mitigation strategies to reduce impacts on the species will reduce the long term fragmentation of populations.
4. Adversely affect habitat critical to the survival of a species	**Yes**	The proposal has the potential to adversely affect habitat critical to the survival of the central north burrowing crayfish located within the construction corridor. Impacts to habitat could include the following: • Clearance and earthworks during construction that churns and compacts soil. • Altered drainage patterns as a result of the irrigation pipeline and associated infrastructure that impact on seepage. • Removal of vegetation associated with the proposal can lead to drying out of soil, erosion and changes in water table levels and drainage[100]. • Introduction of weeds and fertiliser into burrowing crayfish habitat, • Hydrological impacts associated with drawing water from the nearby Mersey River that may affect the level of water table within the area[101]. The mitigation measures described above will reduce the likelihood of adversely affecting habitat critical to the survival of the species.
5. Disrupt the breeding cycle of a population	**Yes**	The central north burrowing crayfish breeds in mid to late spring[102]. Eggs and larvae are incubated in late spring and early summer with juveniles hatching in mid to late summer and released from the burrow when water levels at high[103]. Burrowing crayfish are particularly vulnerable to threatening processes while visiting the surface during mating and

[99] Doran (2001)
[100] Department of Natural Resources and Environment (2023)
[101] Doran (2001)
[102] Horwitz (1990)
[103] Department of Climate Change, Energy, the Environment and Water (2023f)

Significant Impact Criteria[90]	Potential to Trigger Criteria	Comments
		nurturing young[104]. The proposal has the potential to disrupt breeding activities of central north burrowing crayfish populations located within the construction corridor during construction works and through potential species fragmentation post works.
6. Modify, destroy, remove, isolate, or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Yes**	The proposal has the potential to remove, isolate or decrease the availability and quality of habitat for thirteen locations with the presence of burrowing crayfish chimneys and 2.07 ha optimal habitat. An additional 6.56 ha considered to be sub-optimal habitat within the design corridor. As mentioned above, impacts to habitat will be contained within the construction corridor. The total amount of crayfish habitat to be impacted will be understood once the final alignment is settled.
7. Result in invasive species that are harmful to the species becoming established in the species' habitat	**Yes**	The freshwater yabby - *Cherax destructor* - is not native to Tasmania and is regarded as an introduced pest[105]. This species may pose a threat to the central north burrowing crayfish through competition for food and habitat[106]. Additionally, the establishment of weeds such as gorse (Ulex europaeus) and blackberry (Rubus species) in waterways and seeps can impact water quality, soil quality and food resources[107]. The proposal is unlikely to result in the introduction of freshwater yabby within the irrigation district. However, the spread of weeds poses a risk to this species. To mitigate the risk of introducing plants and plant pathogens a weed and hygiene management plan (WHMP) is proposed to be developed and will include a requirement to systematically survey sections of the construction corridor prior to works and undertake weed mitigation measures as appropriate. Throughout the works area, contractors should be required to adhere to best practice guidelines including the following: o *Weed and Disease Planning and Hygiene Guidelines - Preventing the spread of weeds and diseases in Tasmania*[108]

[104] Horwitz (1990)
[105] Department of Climate Change, Energy, the Environment and Water (2023f)
[106] Department of Primary Industries, Parks, Water and Environment (2007)
[107] Horwitz (1990)
[108] Department of Primary Industries, Parks, Water and Environment (2015)

Significant Impact Criteria[90]	Potential to Trigger Criteria	Comments
		○ *Tasmanian Washdown Guidelines for Weed and Disease Control – Machinery, Vehicles & Equipment*[109] With this measure in place, the proposed action is not likely to result in invasive species harmful to this species becoming established in the species' habitat.
8. Introduce disease that may cause the species to decline	No	Disease is not considered as a significant risk to this species and is not listed under the species SPRAT profile[110]. The proposal is unlikely to introduce disease that may cause this species to decline.
9. Interfere with the recovery of the species	**Yes**	The *Burrowing Crayfish Group Recovery Plan*[111] outlines the recovery plan objectives for the species. The specific objectives of the plan include the following: 1. Improve habitat protection for each species. 2. Increase public awareness and involvement in threatened species protection. 3. Ensure each species persist in the long-term throughout its area of occupancy. The proposal is likely to interfere with the recovery of the species through reducing the area of occupancy of the species within action area.

[109] Department of Primary Industries, Parks, Water and Environment (2004)
[110] Department of Climate Change, Energy, the Environment and Water (2023f)
[111] Doran (2001)

Table A10. Significant impact criteria with regards to Tasmanian Forests and Woodlands dominated by black gum or Brookers gum (*Eucalyptus ovata* / *E. brookeriana*)

Significant Impact Criteria[112]	Potential to Trigger Criteria	Comments
1. Reduce the extent of the ecological community	**Yes**	The TASVEG 4.0 community *Eucalyptus ovata* forest and woodland (DOV) was recorded within the projects design corridor[113]. This community can qualify for listing as the critically endangered 'Tasmanian forests and woodlands dominated by black gum or Brookers gum (*Eucalyptus ovata* / *E. brookeriana*)' upon meeting certain condition thresholds[114]. The design corridor intersects with six remnant patches of DOV. All patches are surrounded by modified vegetation units, either cleared land for paddock or crops, or paddock trees over pasture grasses. No patches are contiguous with native vegetation units. Five patches of DOV are >0.5 ha in size and therefore have potential to meet the benchmark to be listed as this EPBCA community as defined in the approved conservation advice for this community[115]. Targeted vegetation condition assessments (VCA) are required to determine if the patches qualify as the EPBCA listed communities, and the class and category of each patch. These have not been conducted at this stage; however, based on the initial surveys, due to the patch size, and isolation from neighbouring native vegetation, it is unlikely that any of the patches would qualify as 'Class A high quality'. Patches may meet the criteria for, and qualify as, Class B good quality depending on patch size and proportion cover and number of native species. Approximately 1.6 ha of this ecological community are present within the design corridor and 0.09 ha within the indicative construction corridor. Therefore, in the absence of appropriate mitigation measures, the project has the potential to reduce the extent of this ecological community. To mitigate impacts to this ecological community, TI have committed to avoiding all clearing of and indirect impacts to DOV vegetation. Additionally, to further mitigate the potential indirect impacts to this community, the following measures have been recommended by NBES: • Ensure areas of impact associated with ancillary needs such as laydown areas, site offices, washdown stations etc should be situated in areas of modified land (especially plantation or pasture). • Prior to the commencement of works, the impact area near areas of native vegetation should be marked

[112] Commonwealth of Australia (2013)
[113] North Barker Ecosystem Services (2023)
[114] Department of the Environment and Energy (2019)
[115] Department of the Environment and Energy (2019)

Significant Impact Criteria[112]	Potential to Trigger Criteria	Comments
		(in situ and clearly on construction plans) and all contractor agreements should specify that works, vehicles, and materials must be confined within the designated impact areas. • Areas of threatened communities beyond the impact footprint should be designated as exclusion zones and marked on the ground and/or in construction plans to the degree necessary to ensure no inadvertent impacts. The application of these mitigation measures will ensure that should this EPBCA listed community be present within the project area, its extent will not be reduced.
2. Fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines	No	All patches of DOV within the design corridor are isolated in nature and surrounded by modified/cleared land for agricultural activities. The design corridor passes through the modified land adjacent to these patches and therefore only intersects with the margins of od DOV patches. As outlined above, TI have committed to avoiding all clearing of and indirect impacts to DOV vegetation. Therefore, there is no risk of further fragmentation to this community as a result of the proposal.
3. Adversely affect habitat critical to the survival of the ecological community	No	Area critical to the persistence of the ecological community, as defined in the approved conservation advice for this vegetation community[116] includes all patches that meet the key diagnostic characteristics and at least the minimum condition thresholds (Class B) for the ecological community plus the buffer zone (particularly where this includes native vegetation. As aforementioned, a targeted vegetation condition assessment (VCA) is required to determine the class and category of each patch. However, TI has committed to avoiding all areas of DOV from the corridor alignment. The proposed works will predominately be undertaken in modified/cleared land and no impacts that could adversely affect habitat critical to the survival of this ecological community is anticipated.
4. Adversely modify or destroy abiotic (non-living) factors (such as water, nutrients, soil) necessary for an ecological community's survival, including	**Yes**	TI has not implemented any hydrological studies at this juncture, and it is expected that changes to hydrology within the irrigation district will occur with the realisation of the proposed infrastructure. This may include soil erosion, changes in salinity and surface hydrology, and reduced water quality and ground water levels. Changes in land use as a result of the implementation of the irrigation scheme may also result in changes in abiotic factors (such as increase nutrient load with land use changes to cropping/dairy farming) which may adversely affect adjacent areas of native vegetation such as DOV.

[116] Department of the Environment and Energy (2019)

Significant Impact Criteria[112]	Potential to Trigger Criteria	Comments
reduction of groundwater levels, or substantial alteration of surface water drainage patterns.		To mitigate the potential impacts from the proposed development, potential facilitated impacts from operation of the irrigation scheme will be assessed under TI's Farm Water Access Plan (WAP) process. Such impacts can be mitigated through application of management practices including an operational water quality program targeting key discharge areas. Through the implementation of assessment and mitigation it is expected that the proposal will have a negligible impact on abiotic factors necessary for this community's survival.
5. Cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionality important species, for example through regular burning or flora or fauna harvesting.	No	DOV patches have not been assessed against EPBCA class and category criteria but may qualify as Class B good quality depending on patch size and proportion cover and number of native species. All patches are surrounded by modified land, are disturbed and contain weedy species to varying degrees. As aforementioned TI has made a commitment to avoid all areas of this ecological community. Therefore, no substantial change in species composition of the community, including causing a decline or loss of functionality, is anticipated. No adverse impacts including regular burning or flora/fauna harvesting will occur within the ecological community.
6. Cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to: – Assisting invasive species, that are harmful to the listed ecological community, to become established, or – Causing regular	No	As aforementioned, TI has made a commitment to avoid all areas of this ecological community and no substantial reduction in the quality or integrity of this ecological community is expected to occur. Patches of this ecological community that are within farm paddocks and have stock grazing pressure have a modified understorey structure and/or diversity of characteristic species, including a greater proportion of pasture grass ground cover and weed presence (such as blackberry, briar rose and gorse). As this ecological community will be avoided from the construction corridor (including a 30 m buffer) no invasive species are likely to be introduced to this community. Nonetheless, a weed management plan will be implemented to guide weed control and to facilitate the containment of weed species by the civil contractors. This will include a requirement to systematically survey sections of the construction corridor prior to works and undertake weed mitigation measures as appropriate. No introduction of fertilisers, herbicides or other adverse chemical or pollutants into the ecological community will

Significant Impact Criteria[112]	Potential to Trigger Criteria	Comments
mobilisation of fertilisers, herbicides or other chemical or pollutants into the ecological community which kill or inhibit the growth of species in the ecological community, or – Interfere with the recovery of an ecological community		occur under the proposal. Priority actions that support the recovery of this ecological community are outlined in the listing advice and include; • Preventing vegetation clearance and direct habitat damage. • Preventing weeds, feral animals, and diseases. • Use landscape-scale approach and available knowledge on fire histories and age of strands to identify appropriate fire regimes. • Prevent grazing damage. • Implement optimal regeneration, revegetation, and restoration strategies for the ecological community across the landscape. • Communicate, engage with and support people to increase understanding of the value and function of the ecological community and encourage their efforts in its protection and recovery and • Research and monitoring of the ecological community to improve our understanding of the ecological community and methods for restoration and protection over the long-term. The proposal is unlikely interfere with any of these priority actions and therefore will not interfere with the recovery of the ecological community.

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Sassafras – Wesley Vale Irrigation Scheme Augmentation

Appendix I - MNES Threatened Ecological Communities Distribution Maps

For Tasmanian Irrigation (IDB031)

313 Macquarie Street, Hobart Tasmania, 7000
03 62319788
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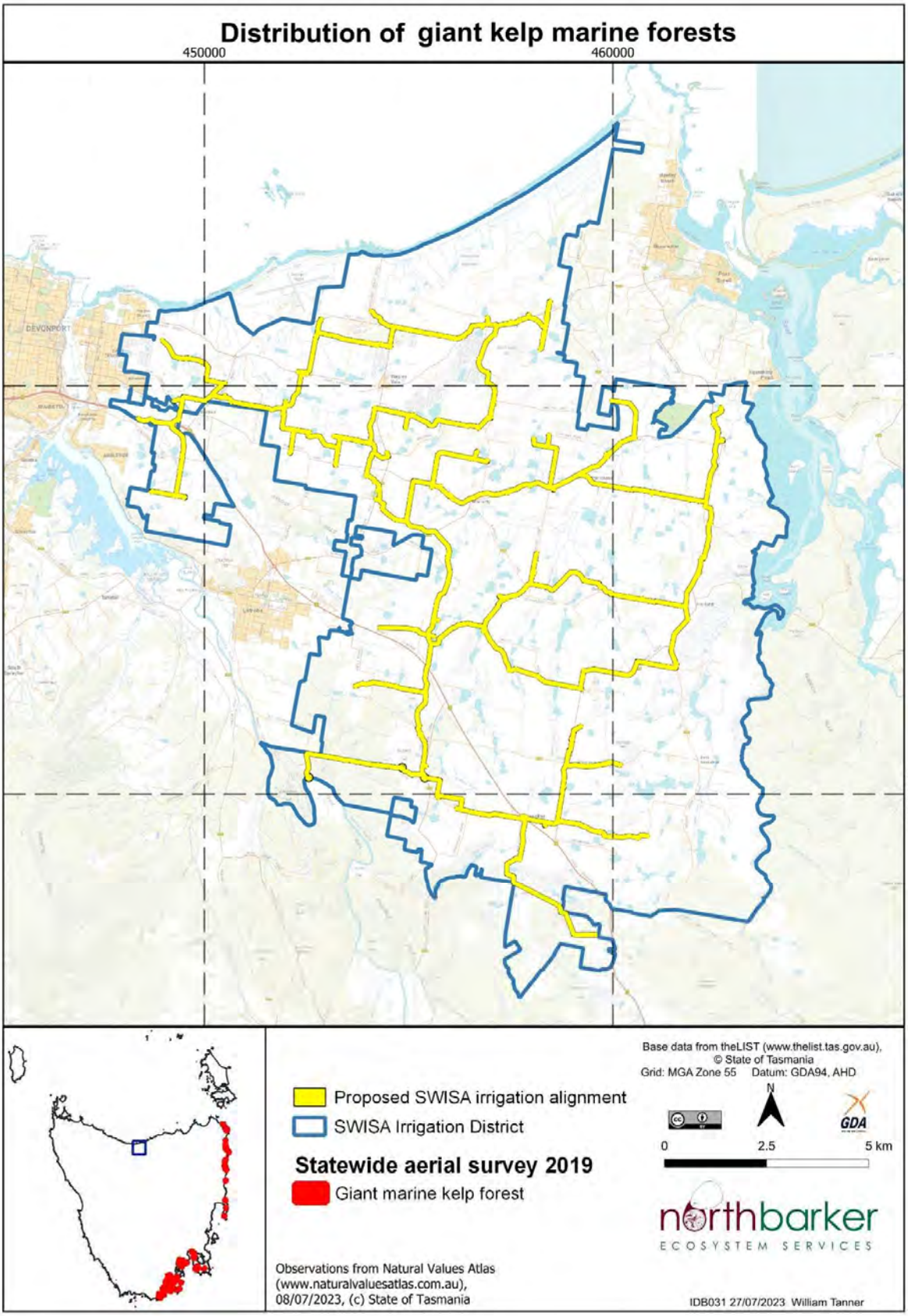
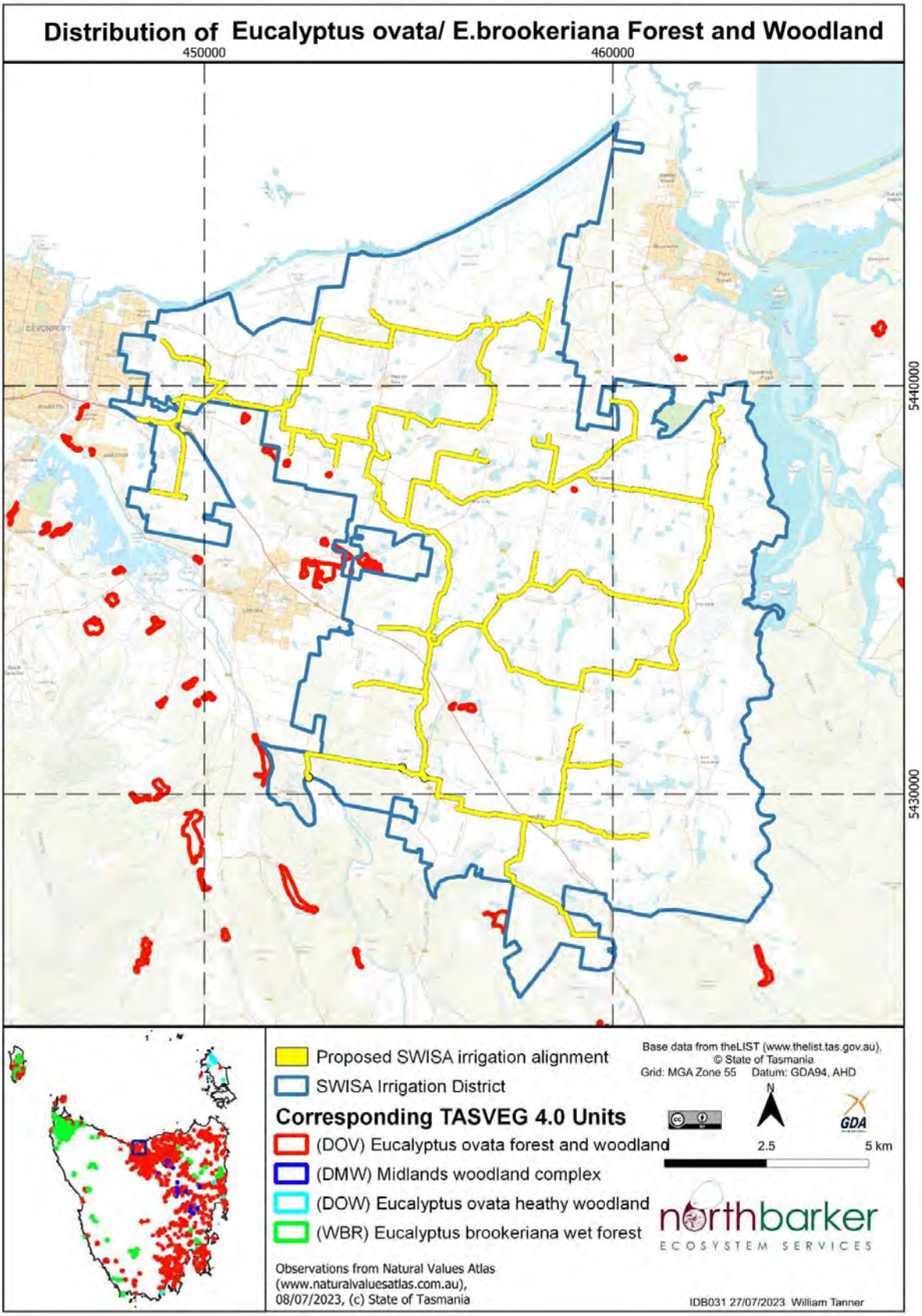
MNES Threatened Ecological Communities Maps




Distribution of Eucalyptus ovata/ E.brookeriana Forest and Woodland
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Corresponding TASVEG 4.0 Units
(DOV) Eucalyptus ovata forest and woodland
(DMW) Midlands woodland complex
(DOW) Eucalyptus ovata heathy woodland
(WBR) Eucalyptus brookeriana wet forest
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
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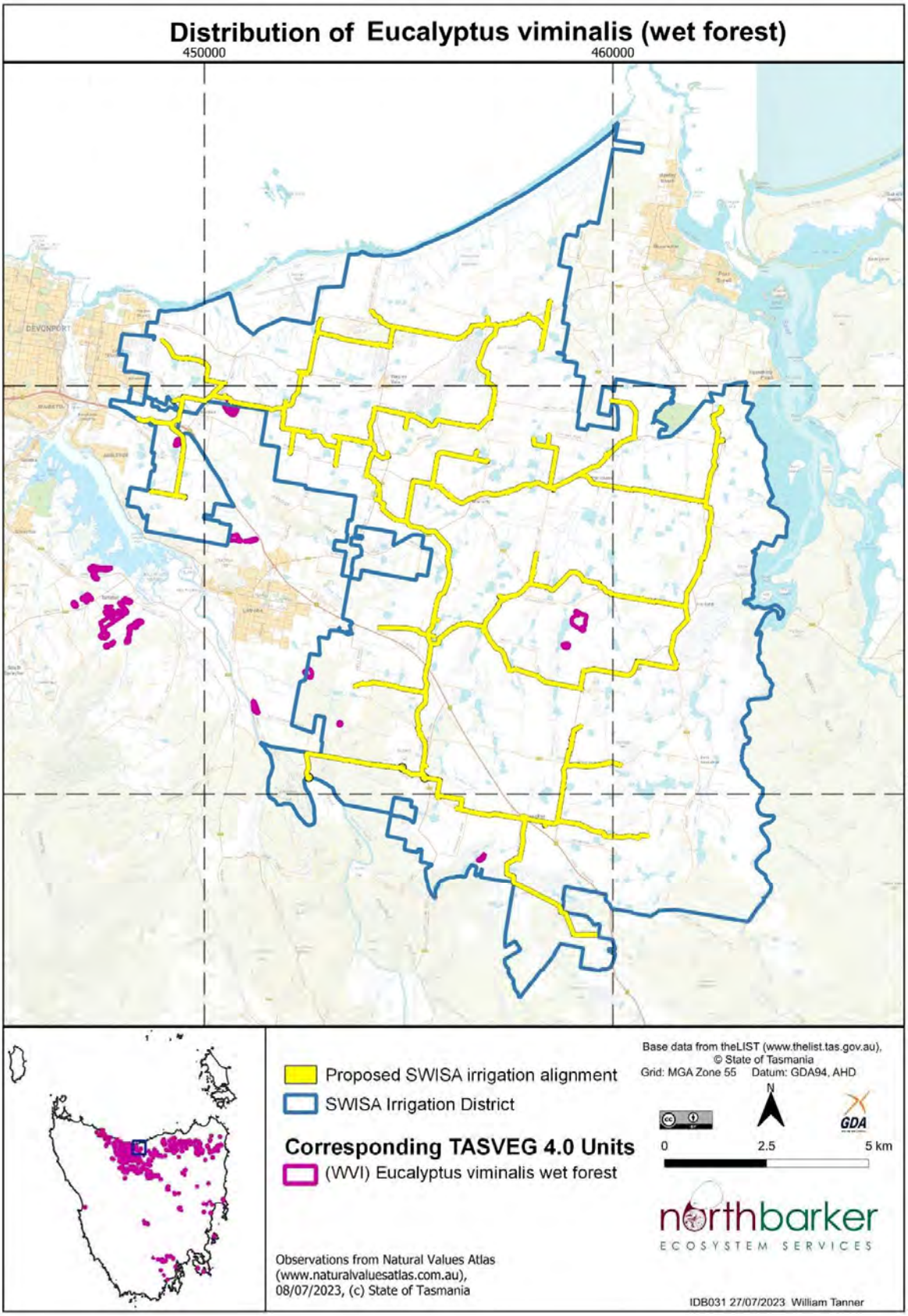
GDA
2.5
5 km
northbarker
ECOSYSTEM SERVICES
IDB031 27/07/2023 William Tanner


Distribution of Eucalyptus viminalis (wet forest)
450000
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DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Corresponding TASVEG 4.0 Units
(WVI) Eucalyptus viminalis wet forest
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
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northbarker
ECOSYSTEM SERVICES
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
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Sassafras – Wesley Vale Irrigation Scheme Augmentation

Appendix J – MNES Threatened Fauna Species Distribution

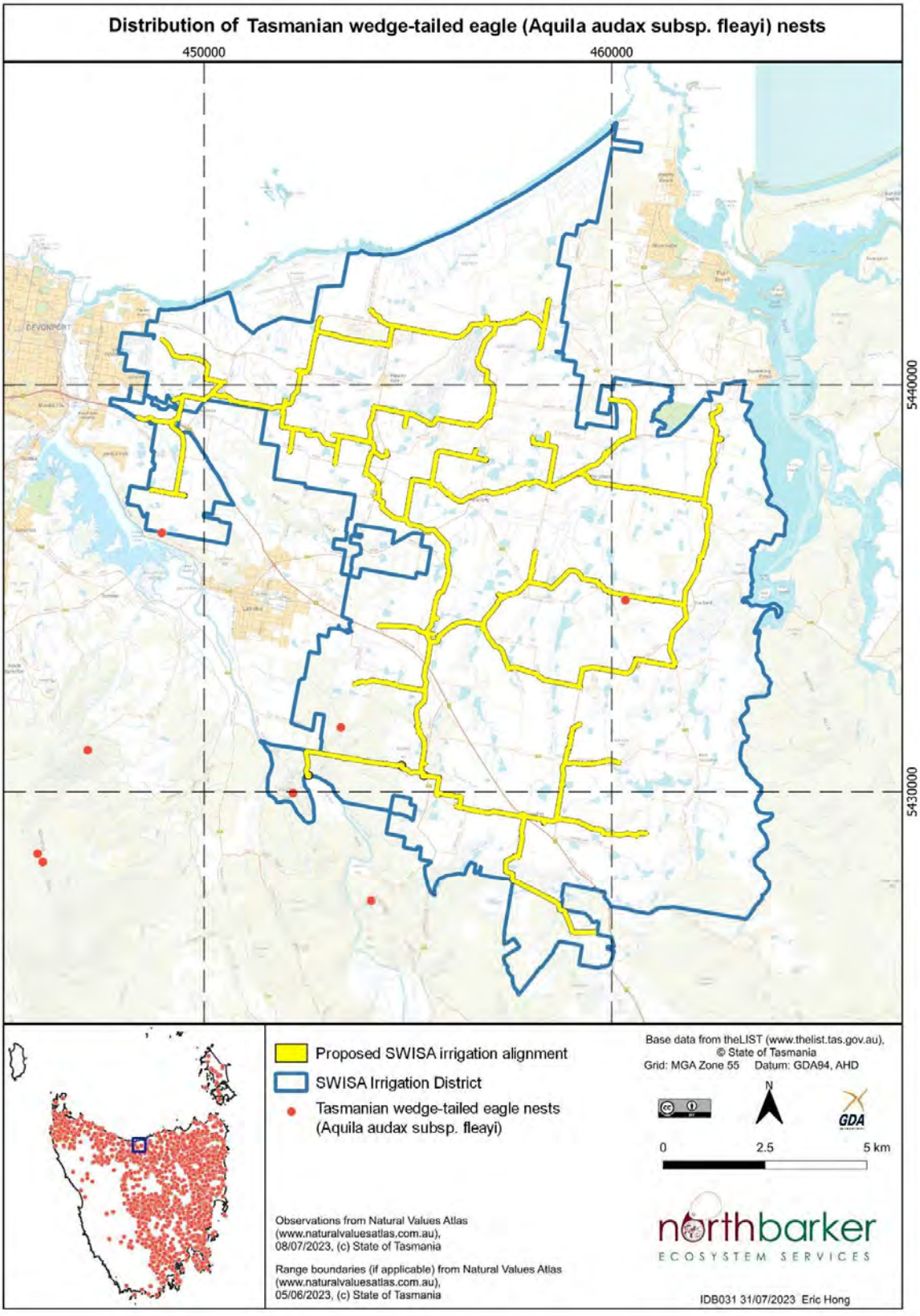
7th August 2023

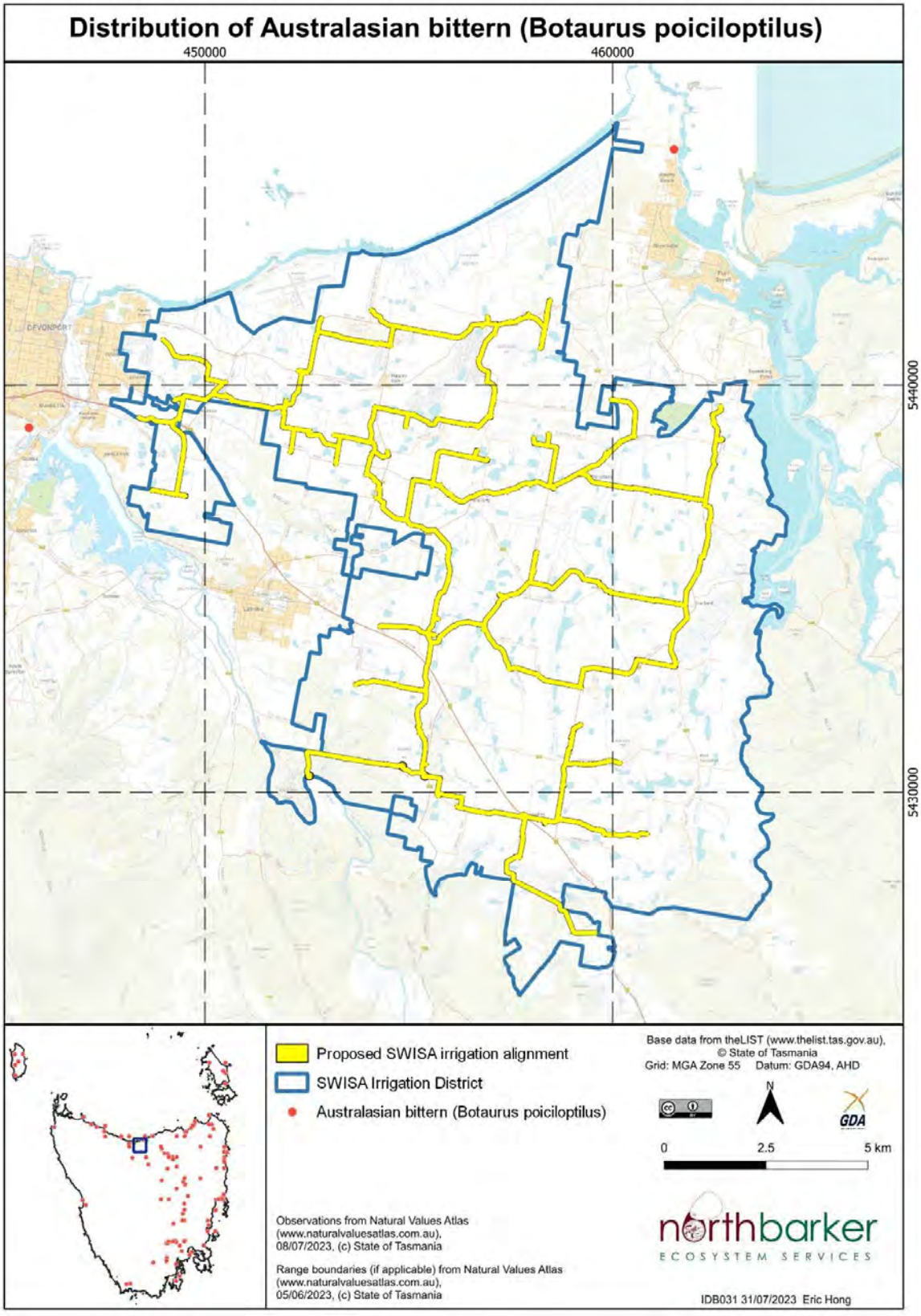
For Tasmanian Irrigation (IDB031)

313 Macquarie Street, Hobart Tasmania, 7000
03 62319788
admin@northbarker.com.au www.northbarker.com.au

MNES Threatened Fauna Species Distribution

Avian Fauna




Distribution of Australasian bittern (Botaurus poiciloptilus)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Australasian bittern (Botaurus poiciloptilus)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
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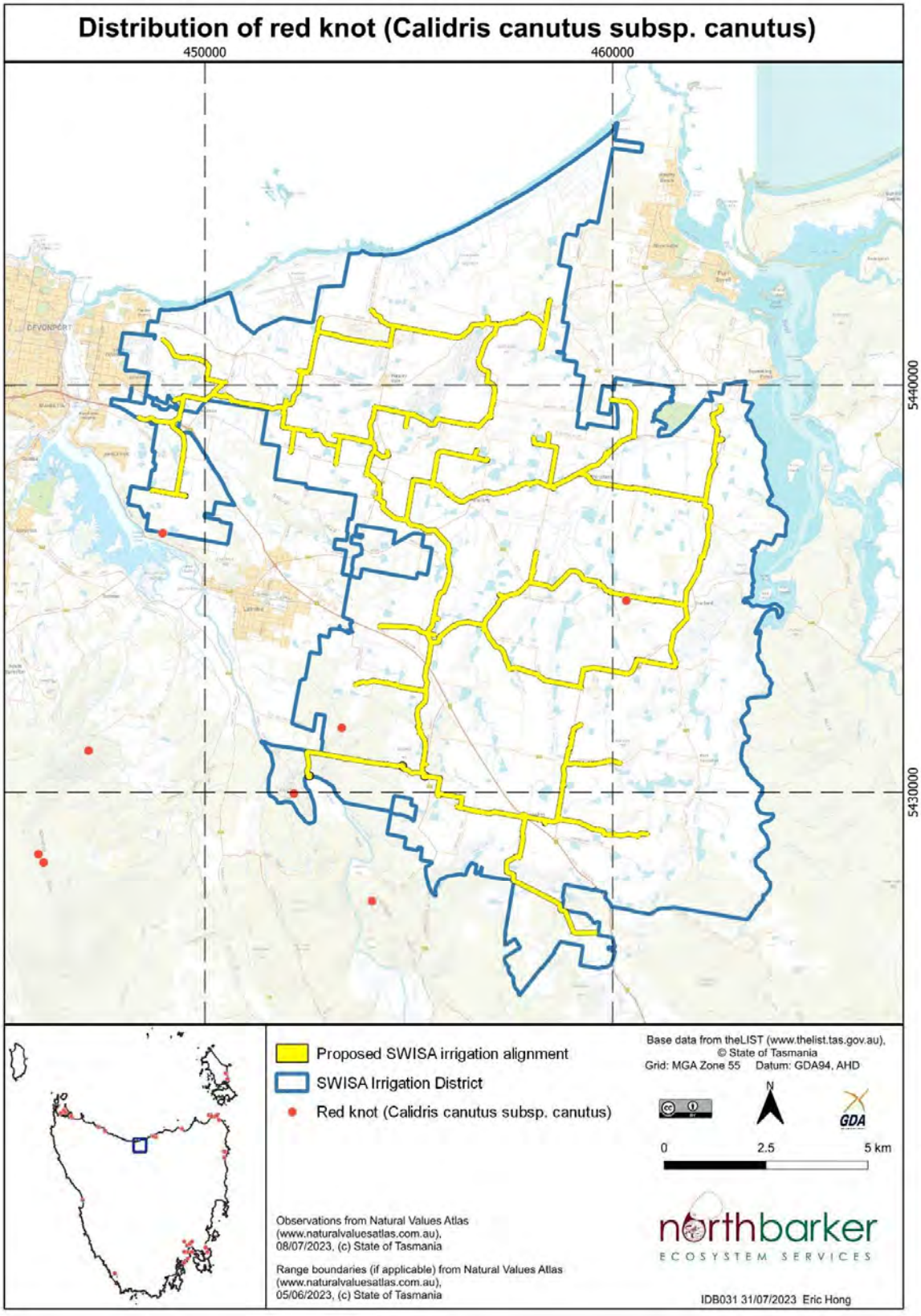
Distribution of red knot (Calidris canutus subsp. canutus)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Red knot (Calidris canutus subsp. canutus)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
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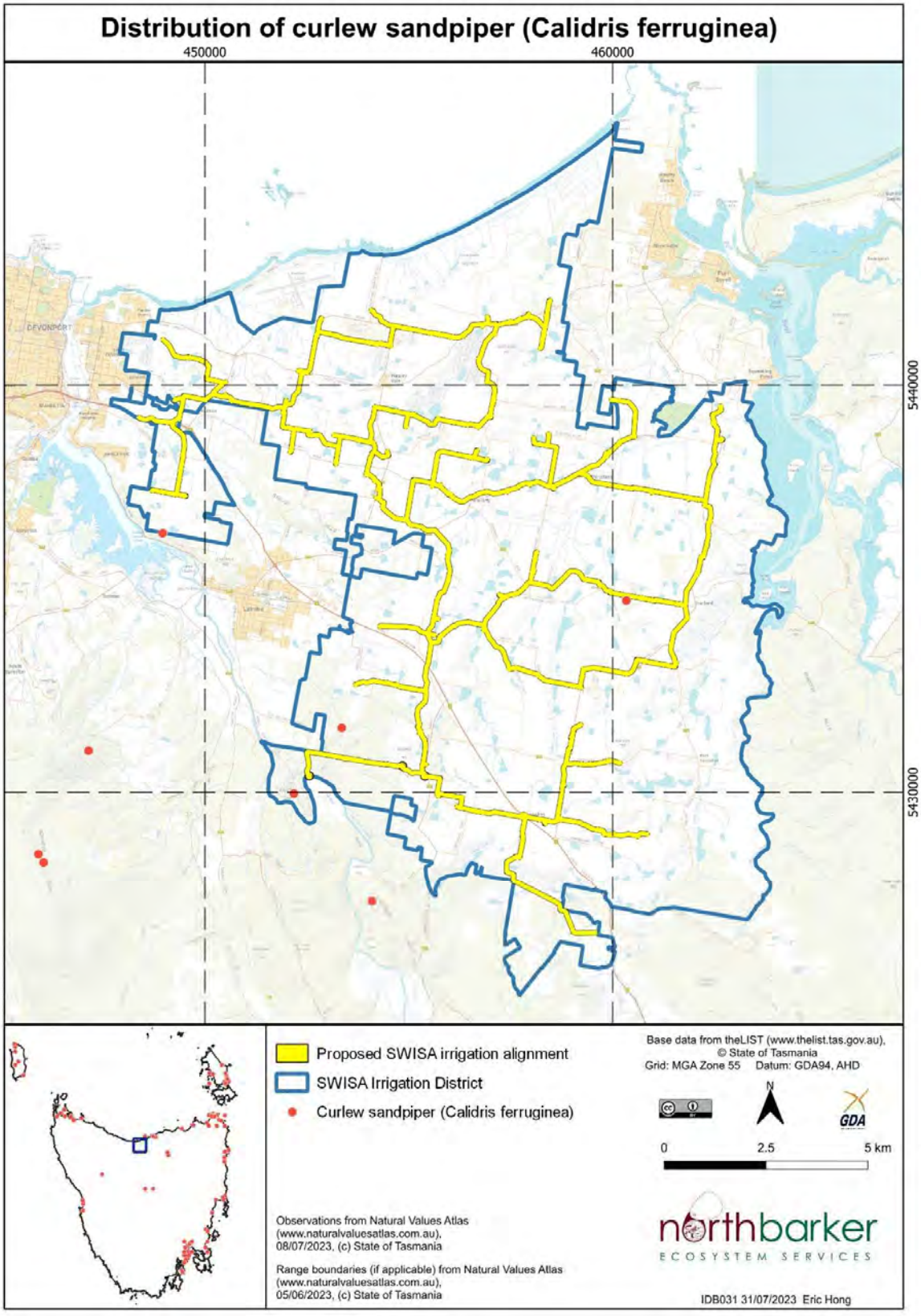
Distribution of curlew sandpiper (Calidris ferruginea)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Curlew sandpiper (Calidris ferruginea)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
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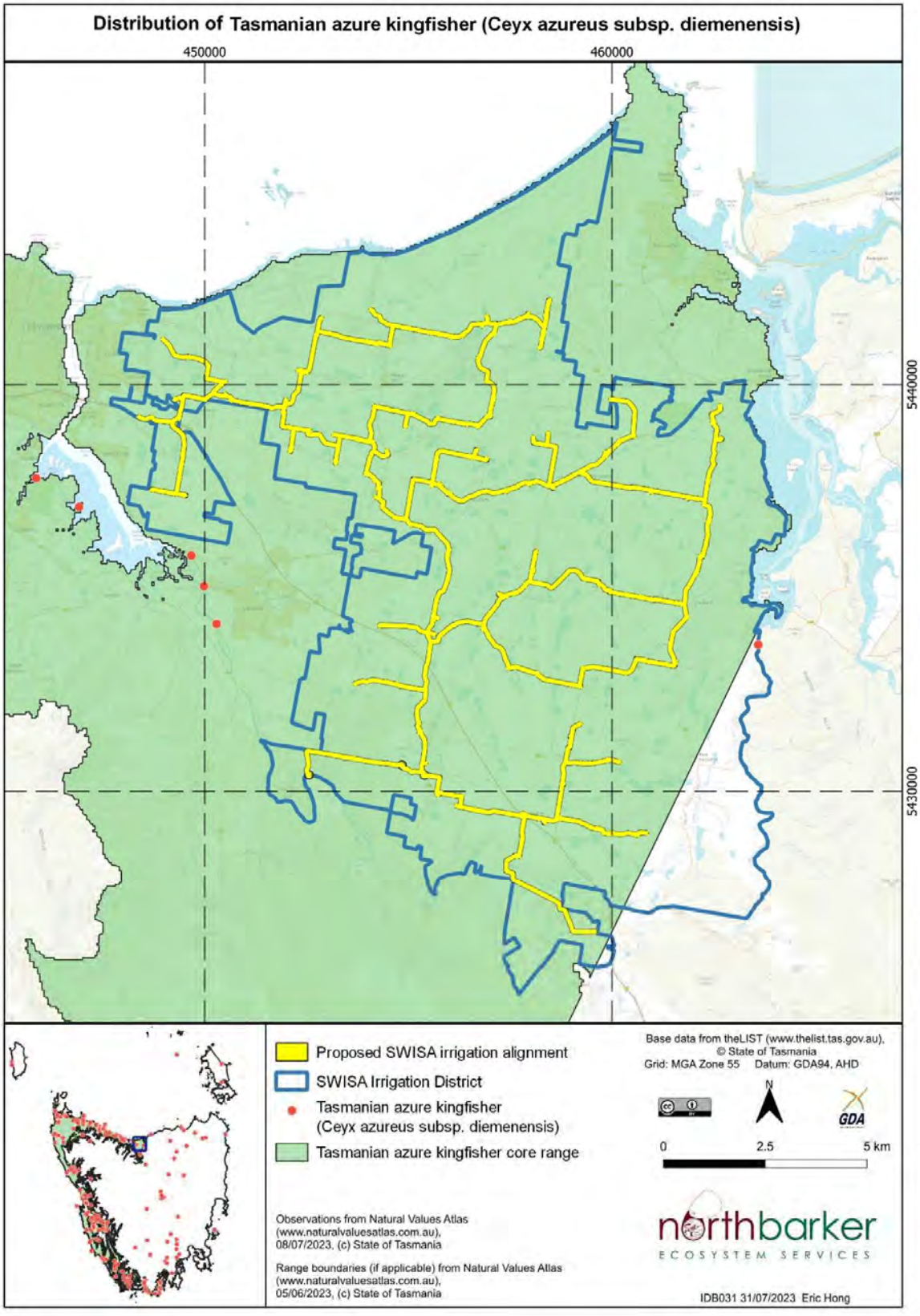
Distribution of Tasmanian azure kingfisher (Ceyx azureus subsp. diemenensis)
450000
460000
5440000
5430000
Proposed SWISA irrigation alignment
SWISA Irrigation District
Tasmanian azure kingfisher
(Ceyx azureus subsp. diemenensis)
Tasmanian azure kingfisher core range
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
northbarker
ECOSYSTEM SERVICES
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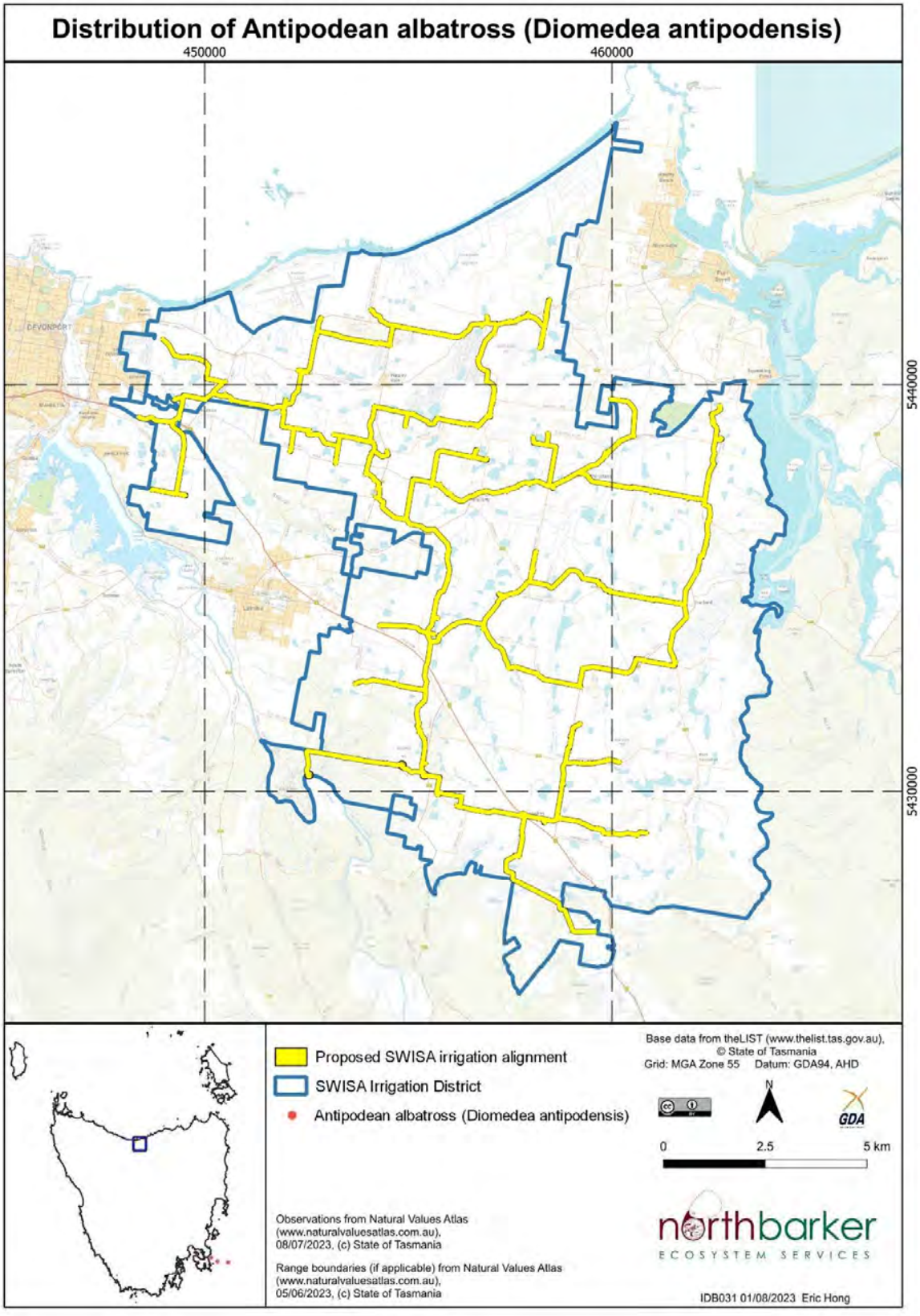
Distribution of Antipodean albatross (Diomedea antipodensis)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Antipodean albatross (Diomedea antipodensis)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
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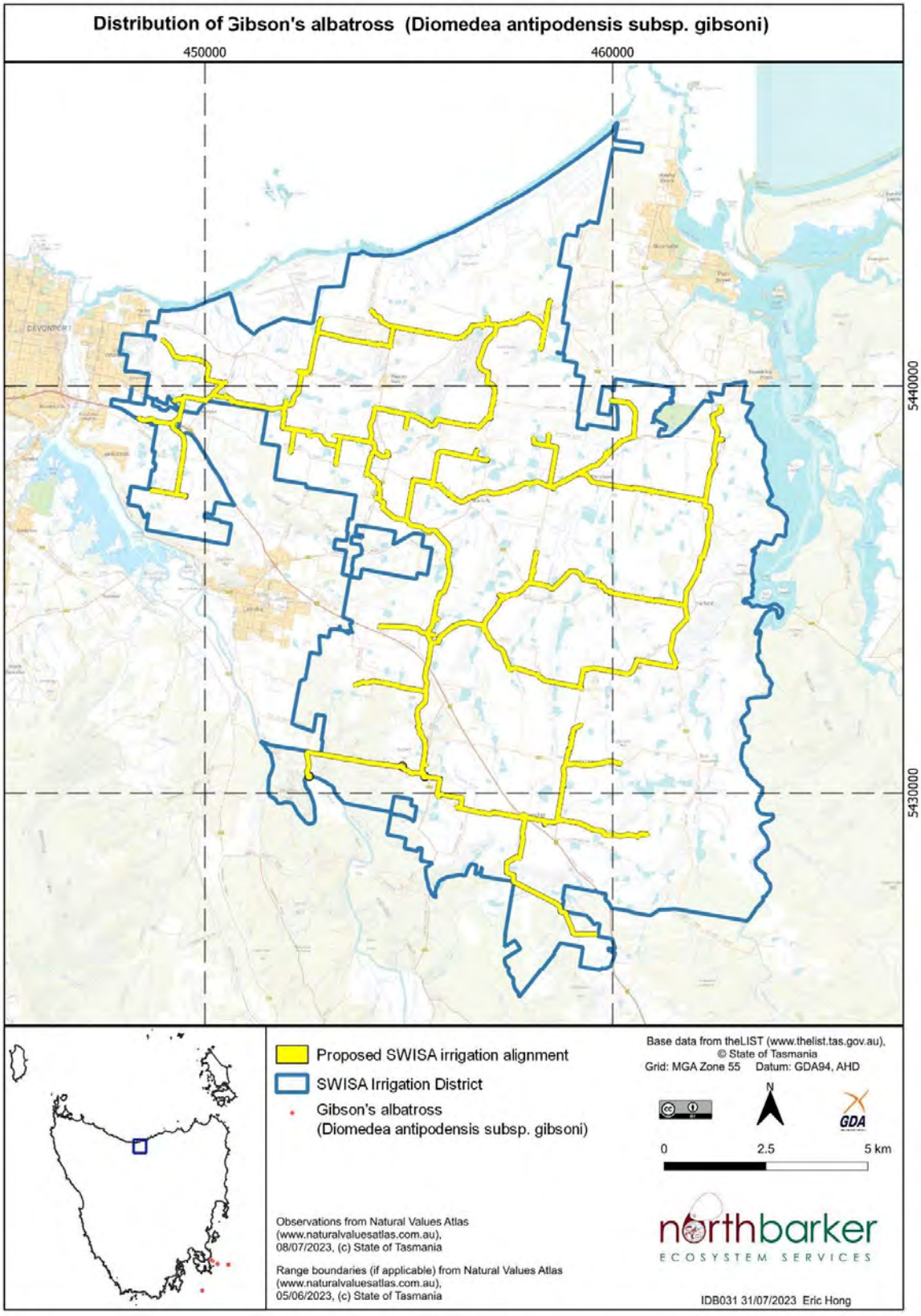
Distribution of Gibson's albatross (Diomedea antipodensis subsp. gibsoni)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Gibson's albatross
(Diomedea antipodensis subsp. gibsoni)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
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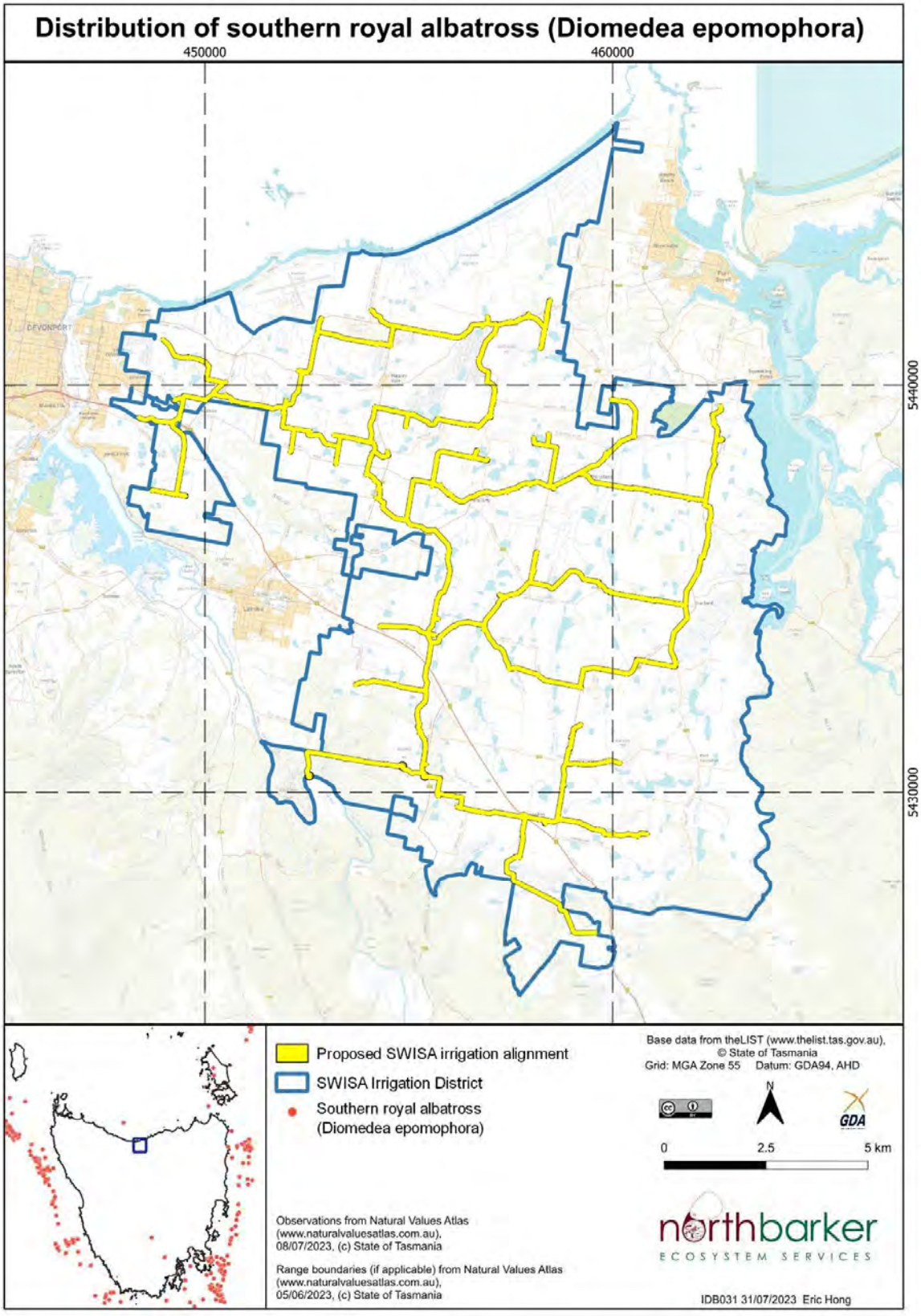
Distribution of southern royal albatross (Diomedea epomophora)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Southern royal albatross
(Diomedea epomophora)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
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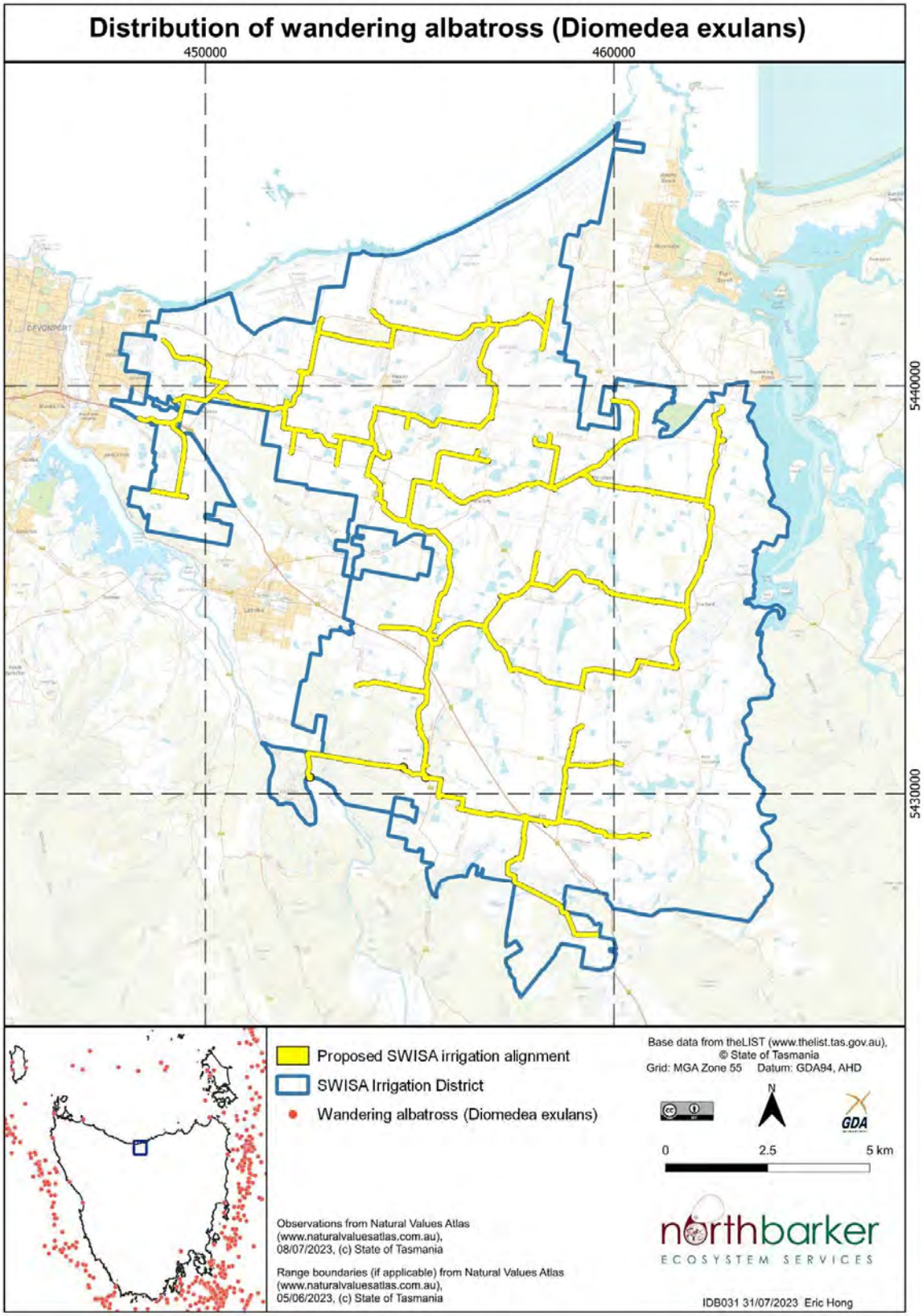
Distribution of wandering albatross (Diomedea exulans)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Wandering albatross (Diomedea exulans)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
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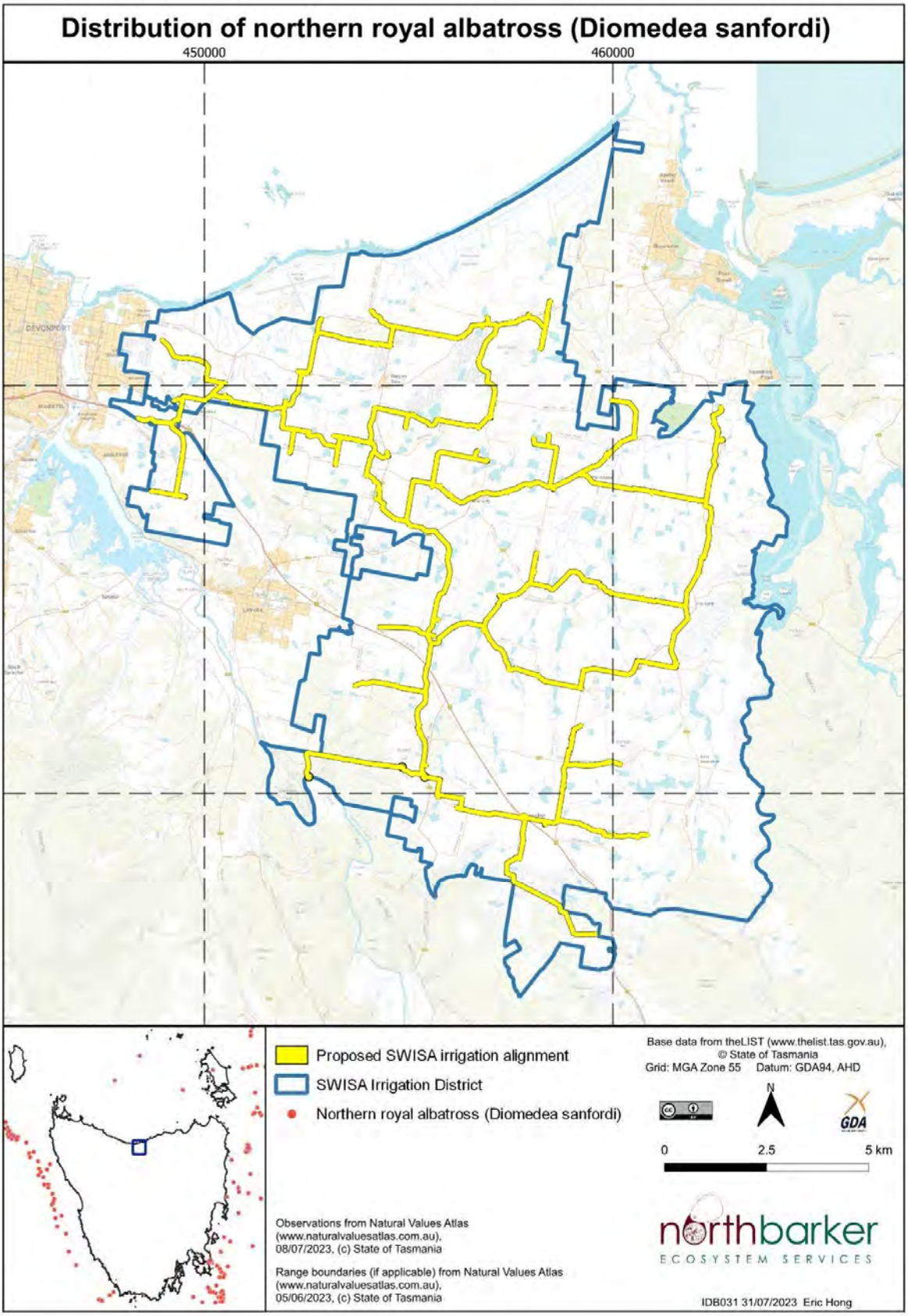
Distribution of northern royal albatross (Diomedea sanfordi)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Northern royal albatross (Diomedea sanfordi)
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas (www.naturalvaluesatlas.com.au), 08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas (www.naturalvaluesatlas.com.au), 05/06/2023, (c) State of Tasmania
northbarker
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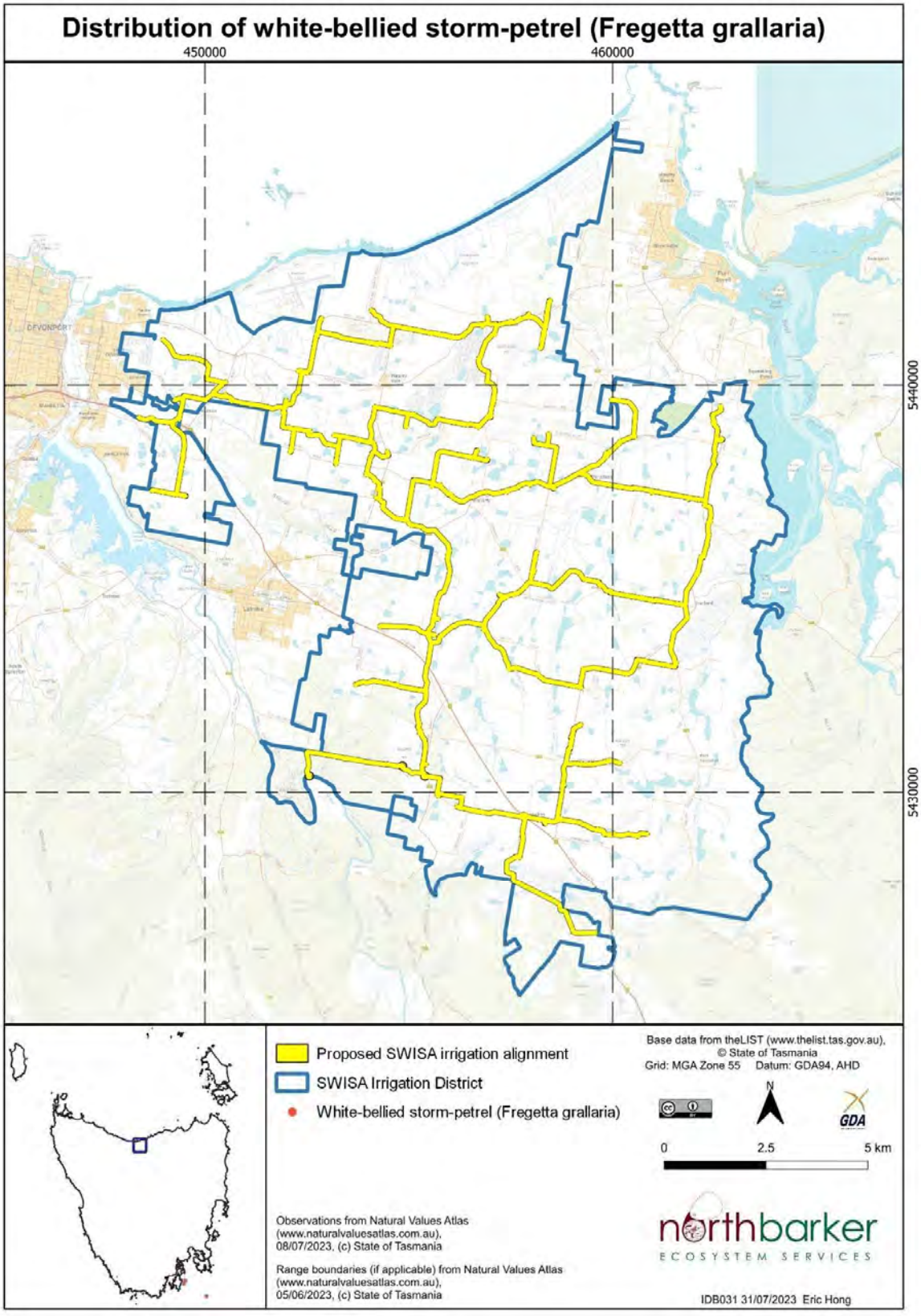
Distribution of white-bellied storm-petrel (Fregetta grallaria)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
White-bellied storm-petrel (Fregetta grallaria)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
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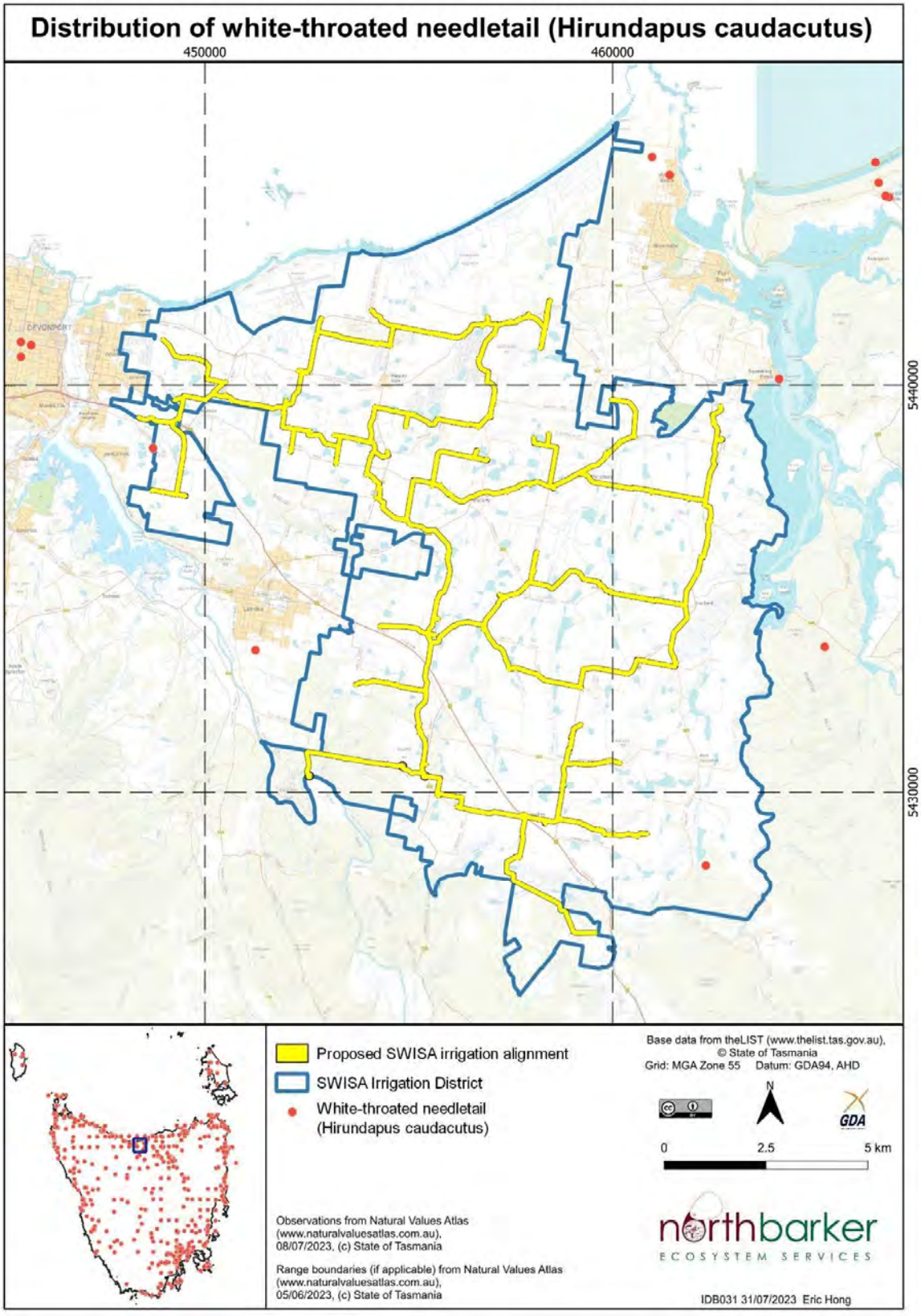
Distribution of white-throated needletail (Hirundapus caudacutus)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
White-throated needletail
(Hirundapus caudacutus)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
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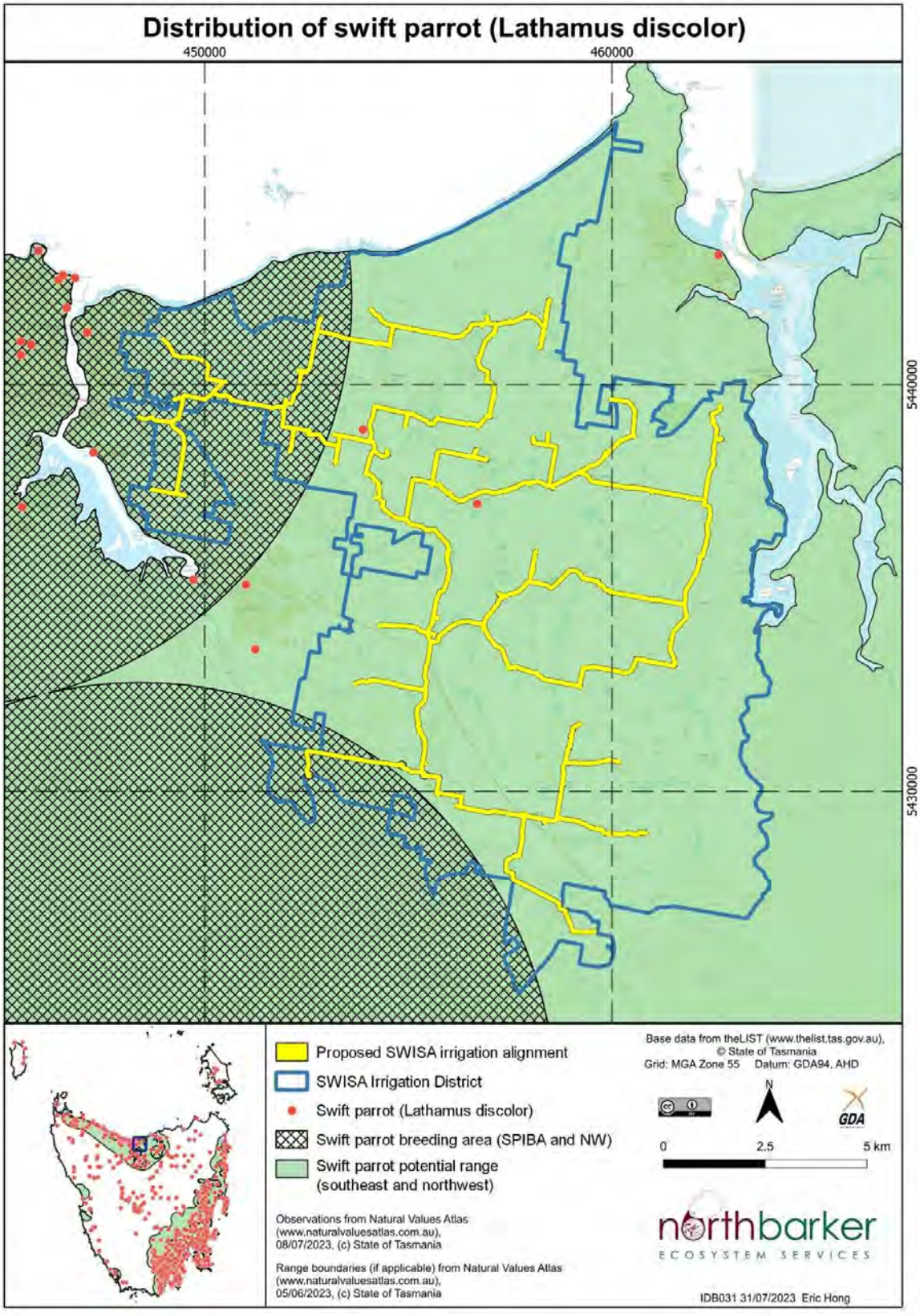
Distribution of swift parrot (Lathamus discolor)
450000
460000
5440000
5430000
Proposed SWISA irrigation alignment
SWISA Irrigation District
Swift parrot (Lathamus discolor)
Swift parrot breeding area (SPIBA and NW)
Swift parrot potential range
(southeast and northwest)
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
northbarker
ECOSYSTEM SERVICES
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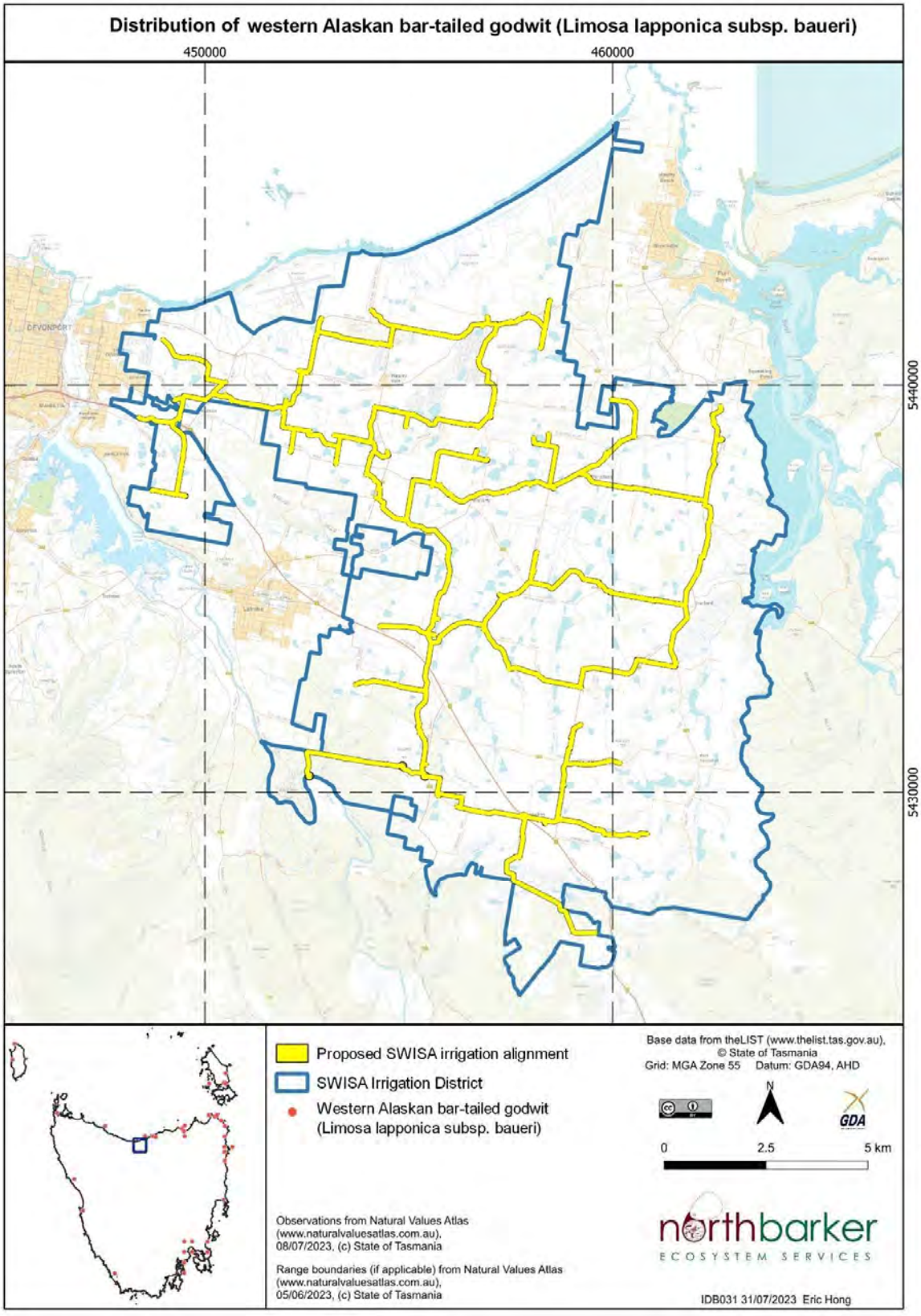
Distribution of western Alaskan bar-tailed godwit (Limosa lapponica subsp. baueri)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Western Alaskan bar-tailed godwit
(Limosa lapponica subsp. baueri)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
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ECOSYSTEM SERVICES
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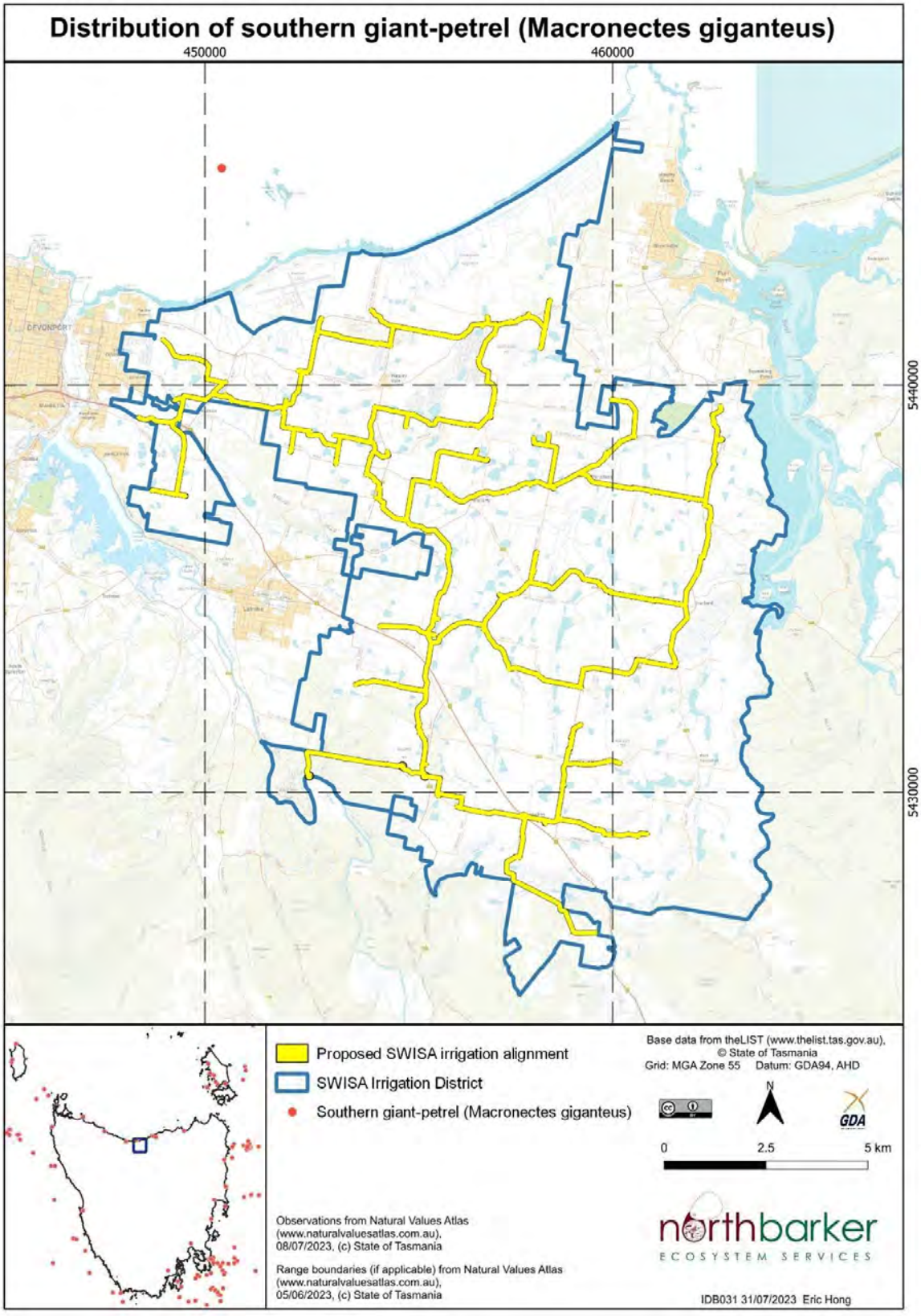
Distribution of southern giant-petrel (Macronectes giganteus)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Southern giant-petrel (Macronectes giganteus)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
ECOSYSTEM SERVICES
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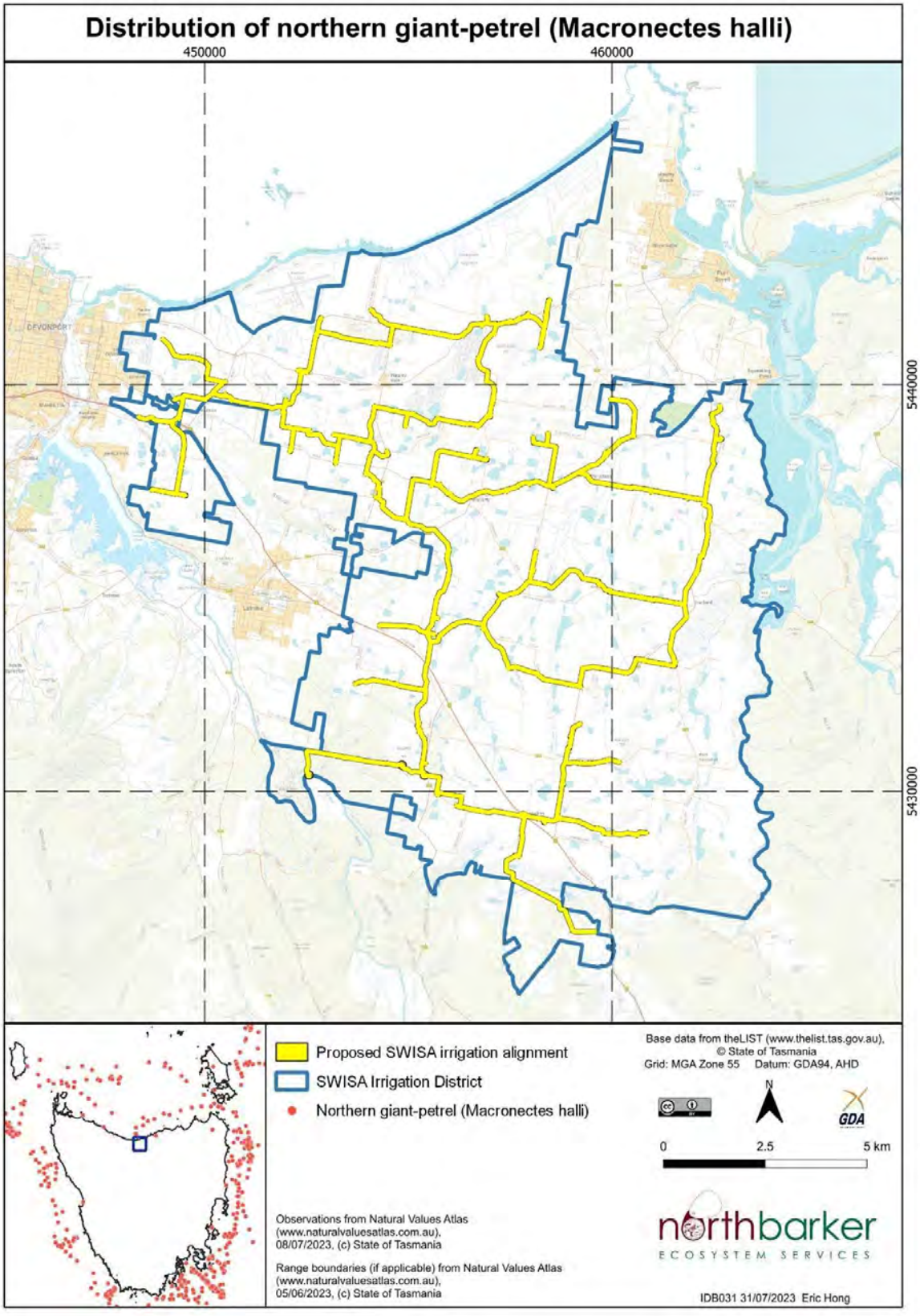
Distribution of northern giant-petrel (Macronectes halli)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Northern giant-petrel (Macronectes halli)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
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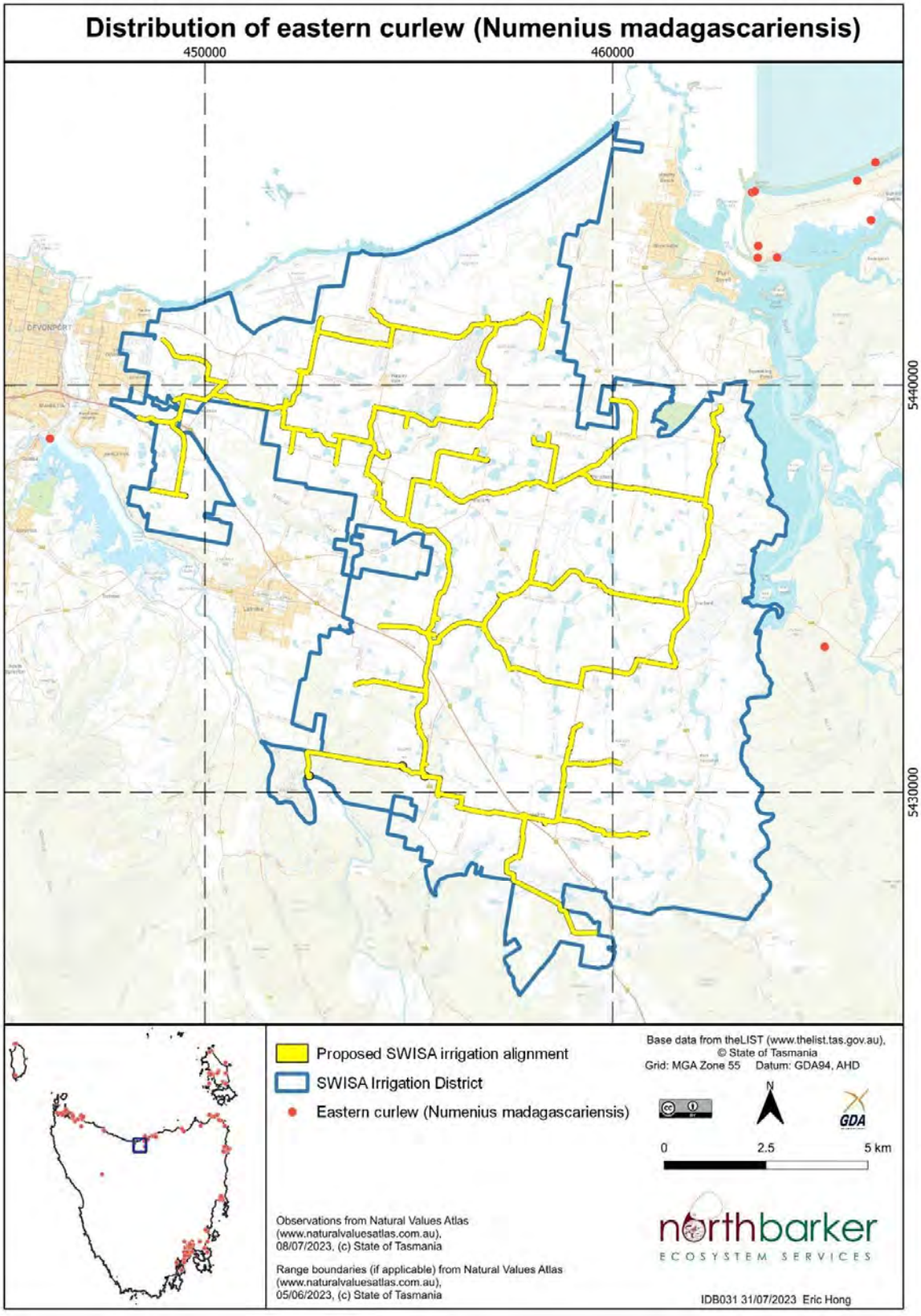
Distribution of eastern curlew (Numenius madagascariensis)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Eastern curlew (Numenius madagascariensis)
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas (www.naturalvaluesatlas.com.au), 08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas (www.naturalvaluesatlas.com.au), 05/06/2023, (c) State of Tasmania
northbarker
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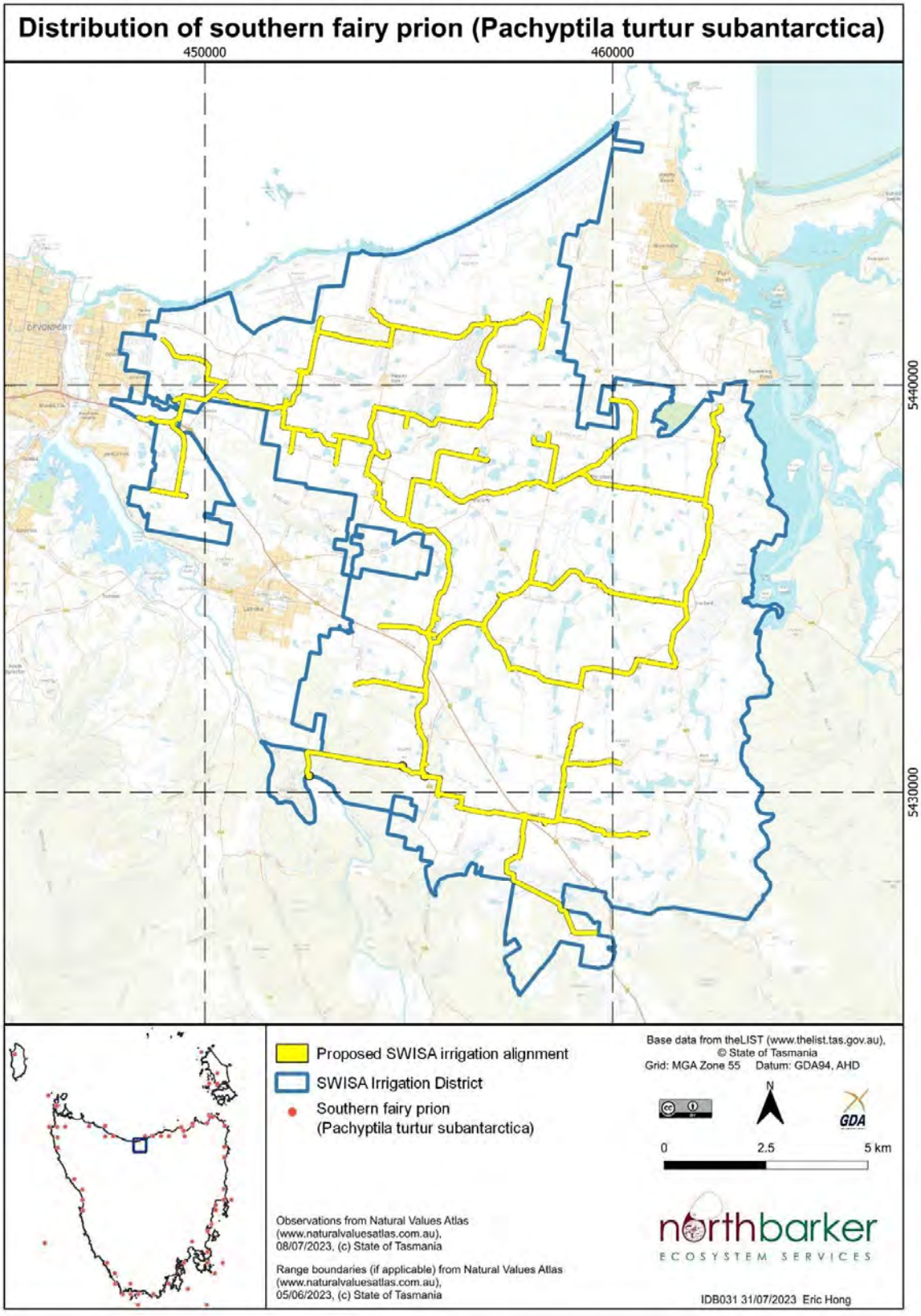
Distribution of southern fairy prion (Pachyptila turtur subantarctica)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Southern fairy prion
(Pachyptila turtur subantarctica)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
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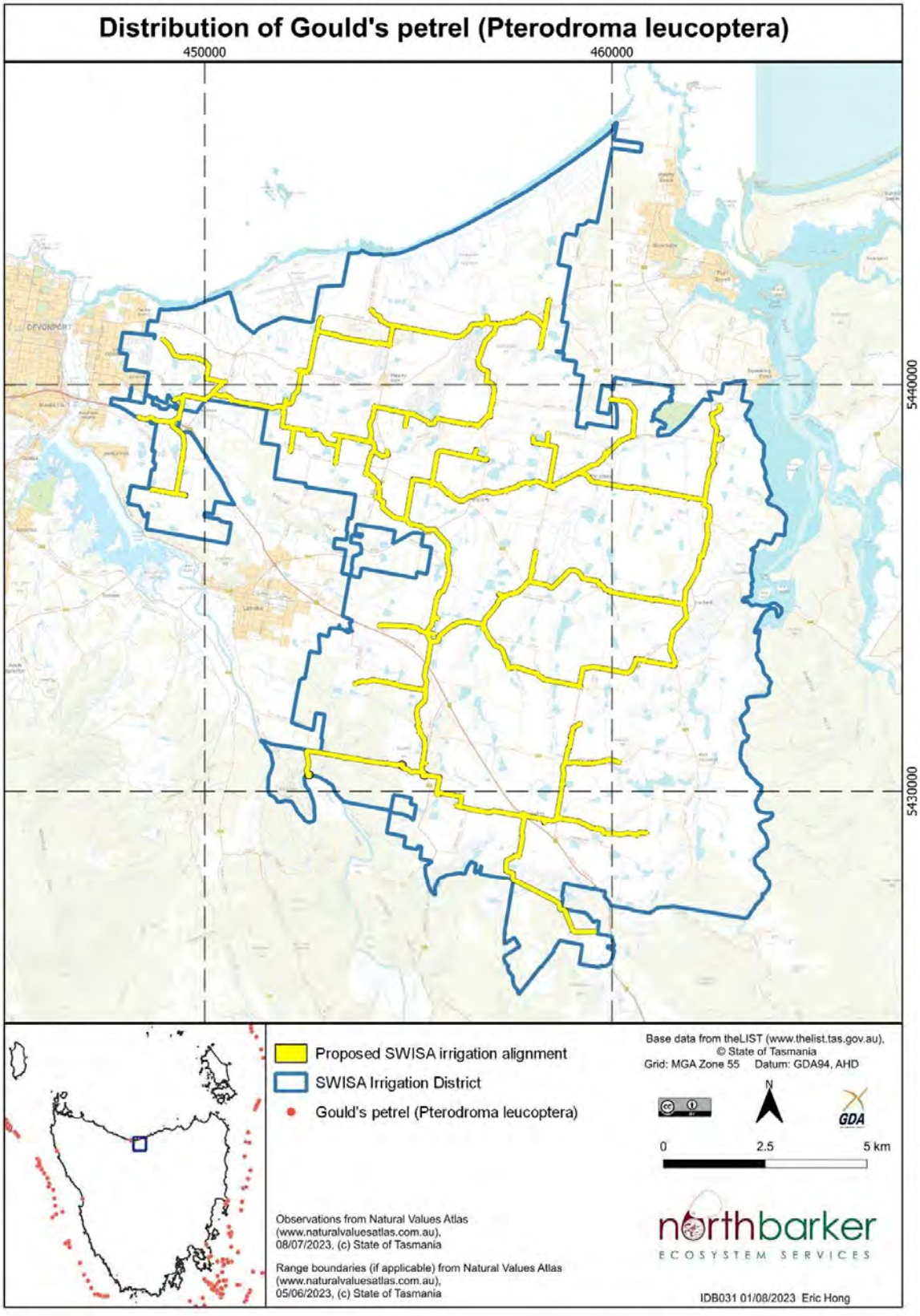
Distribution of Gould's petrel (Pterodroma leucoptera)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Gould's petrel (Pterodroma leucoptera)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
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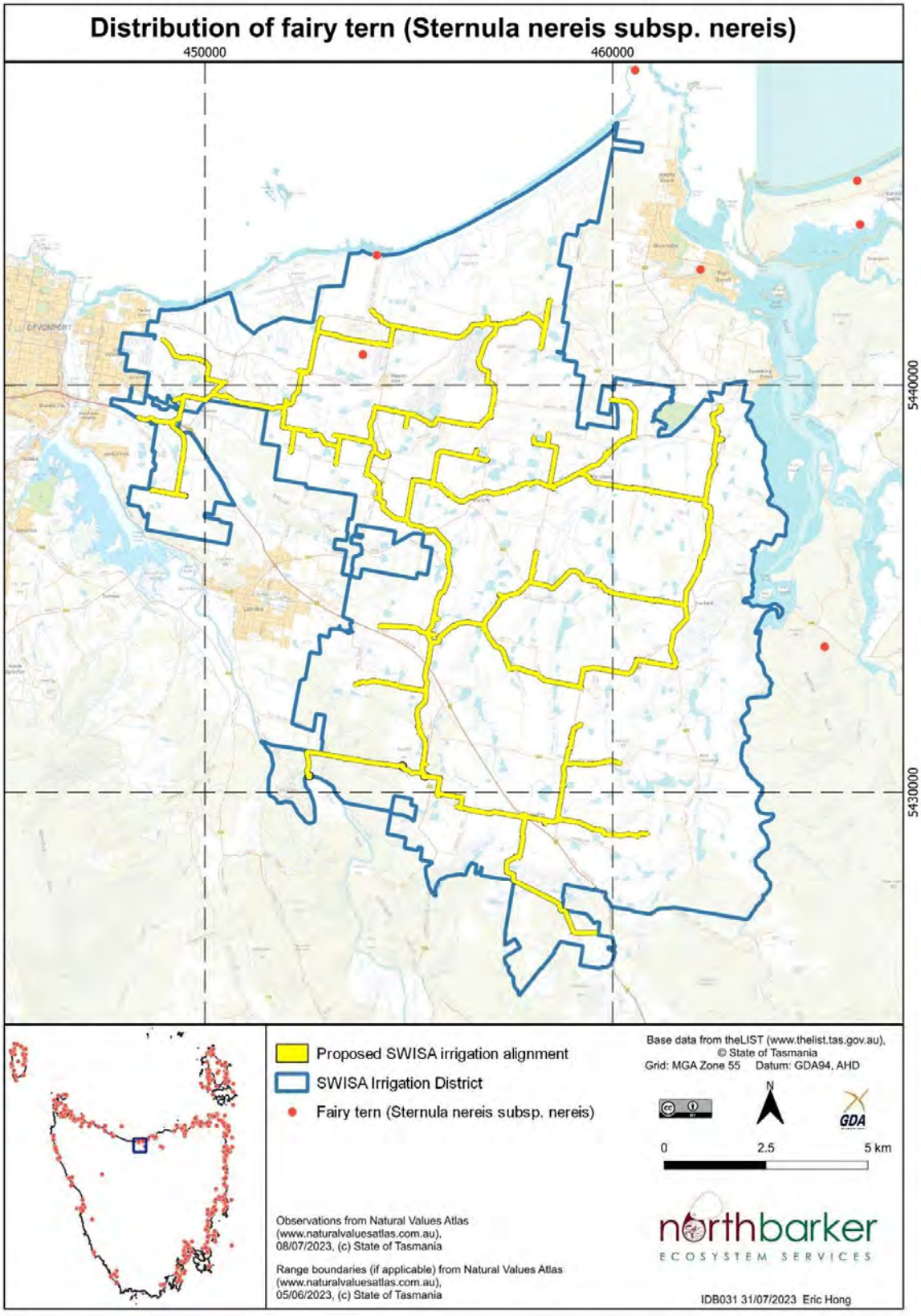
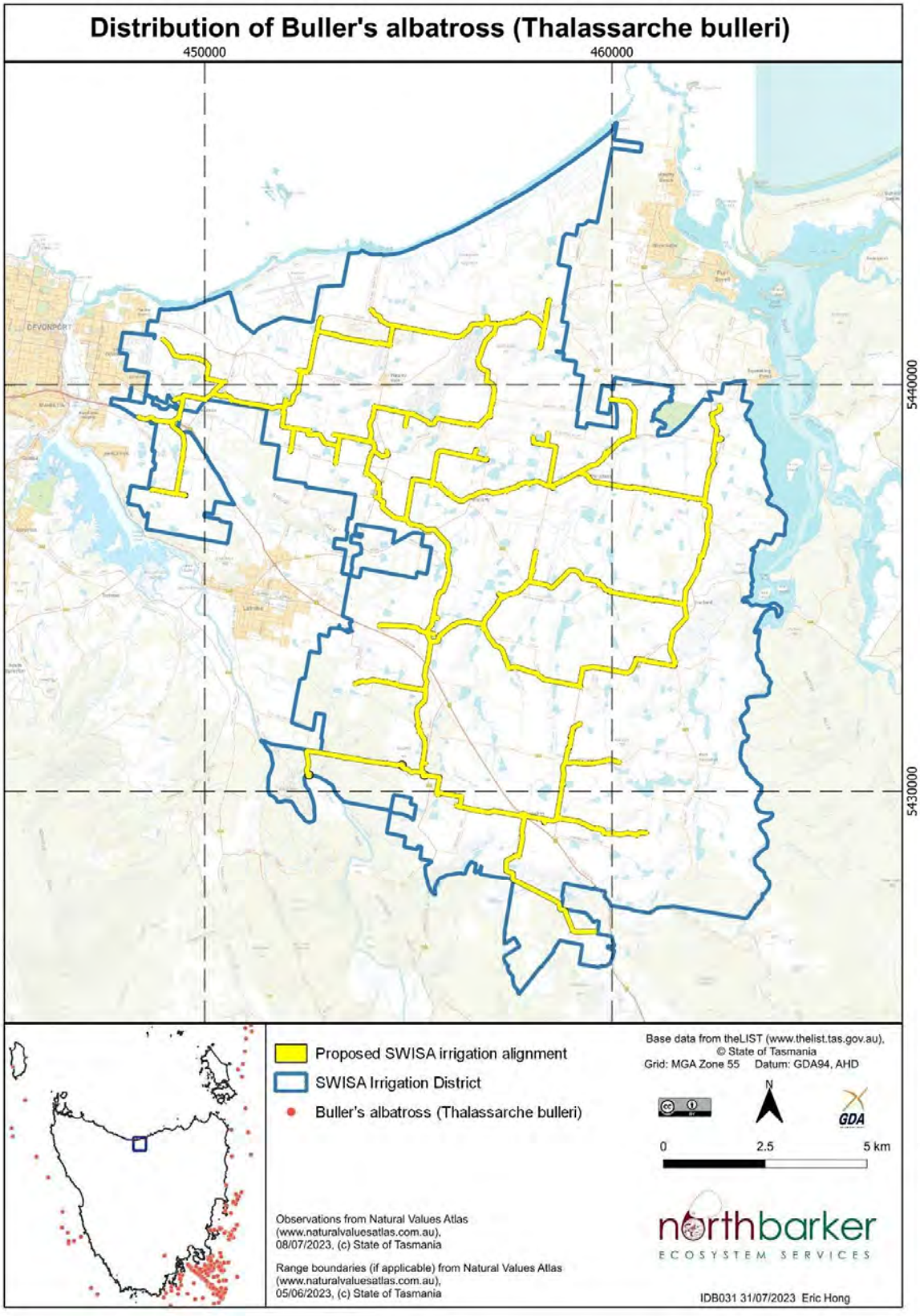

Distribution of fairy tern (Sternula nereis subsp. nereis)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Fairy tern (Sternula nereis subsp. nereis)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
ECOSYSTEM SERVICES
IDB031 31/07/2023 Eric Hong


Distribution of Buller's albatross (Thalassarche bulleri)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Buller's albatross (Thalassarche bulleri)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
ECOSYSTEM SERVICES
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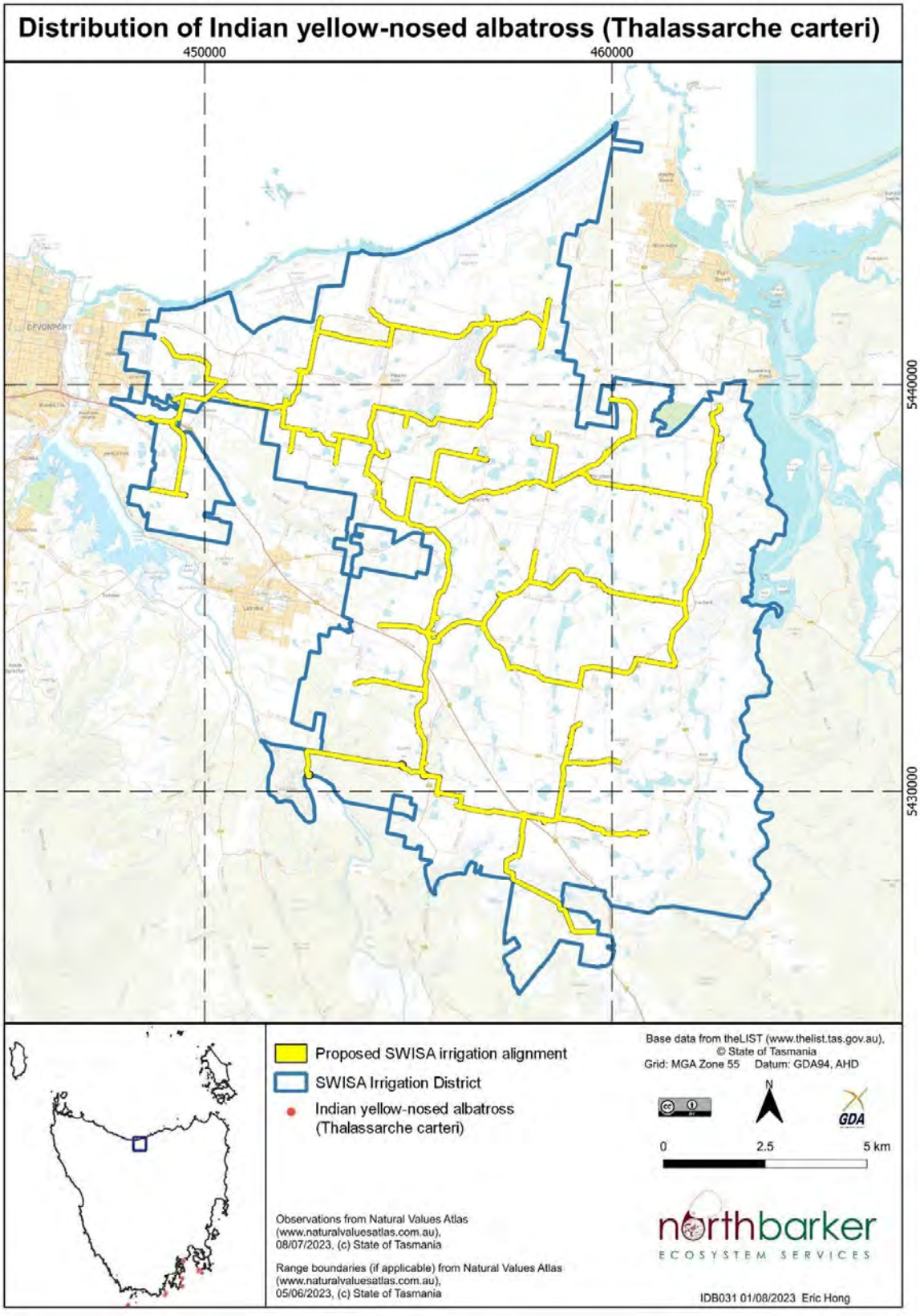
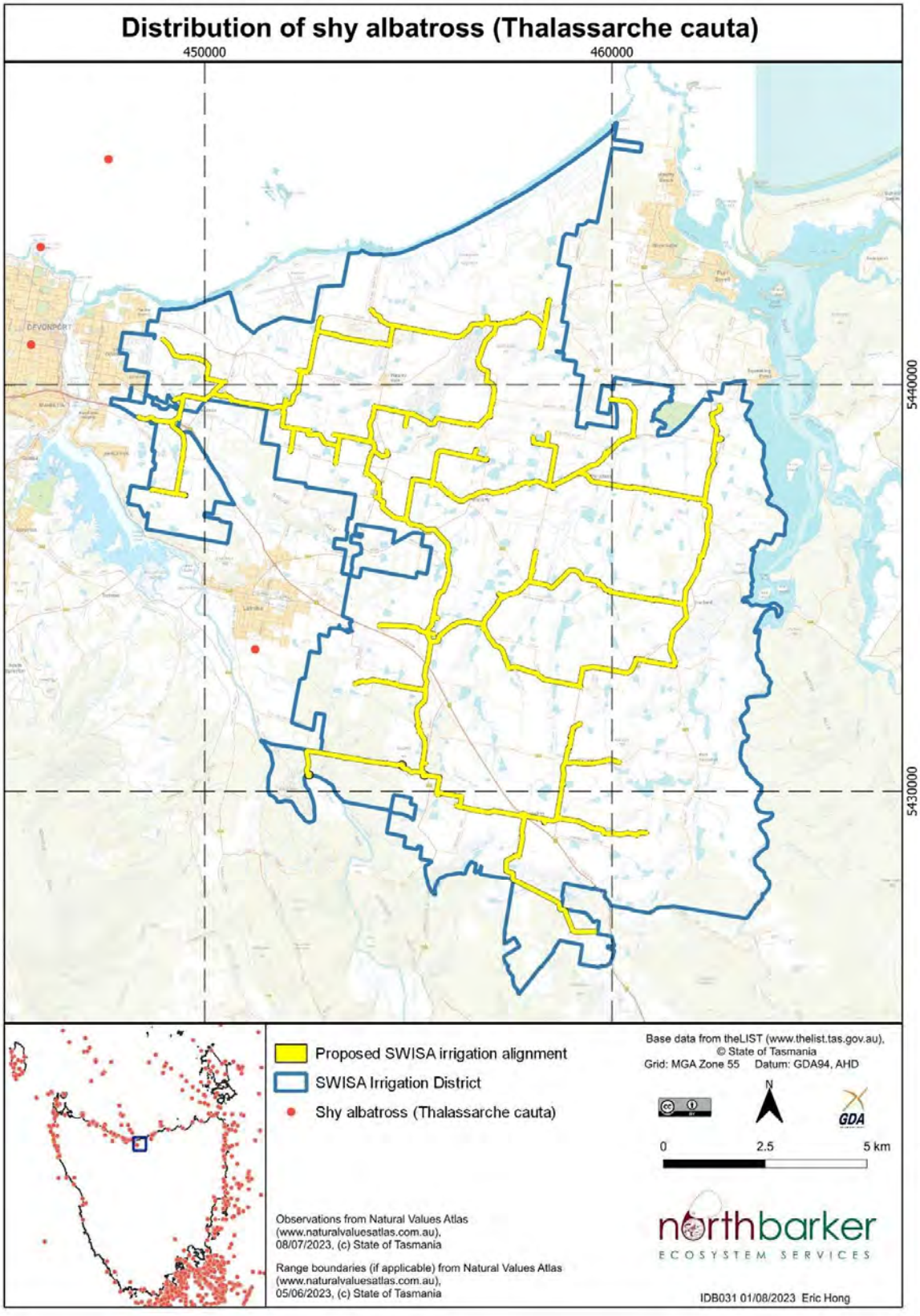
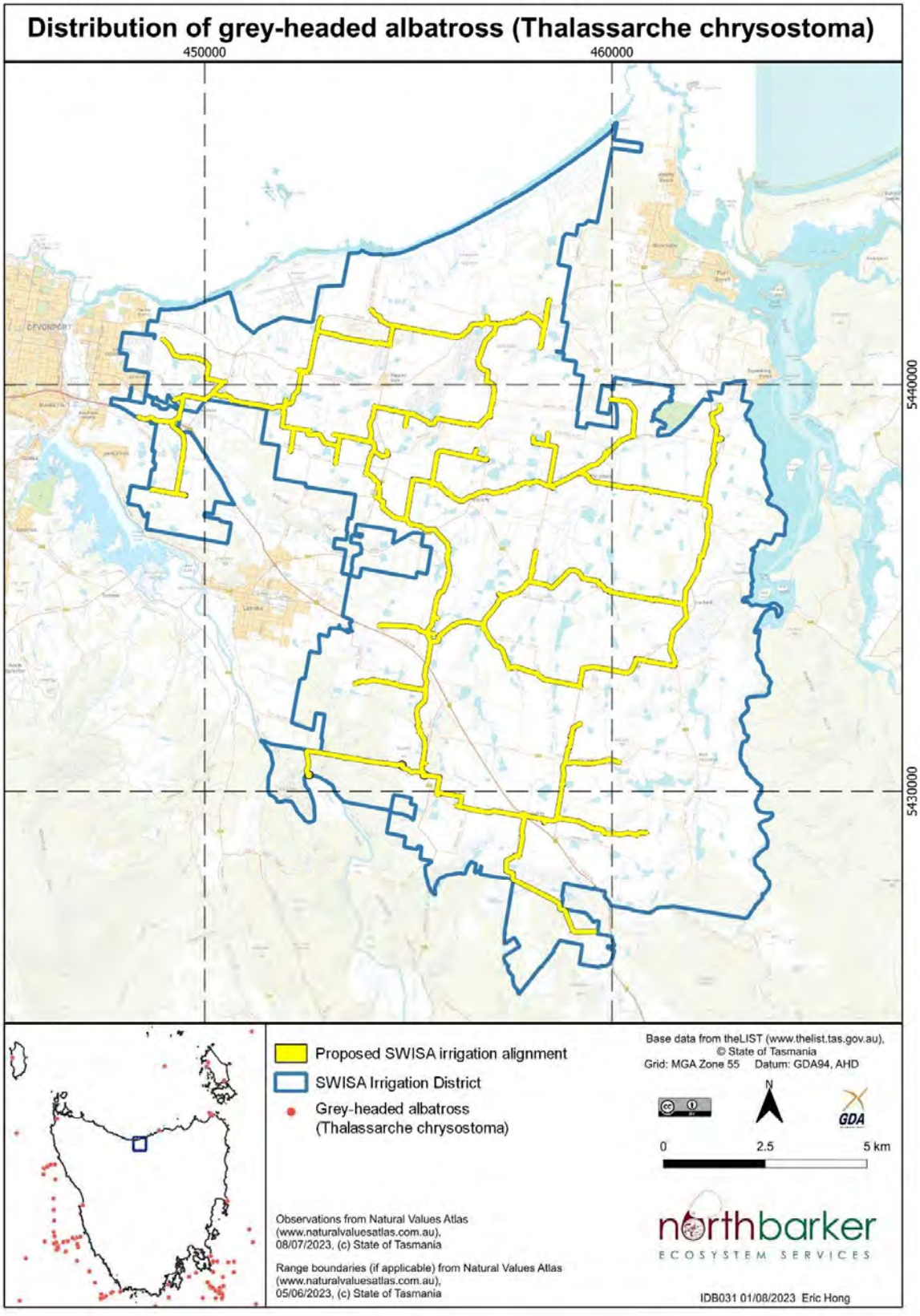

Distribution of Indian yellow-nosed albatross (Thalassarche carteri)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Indian yellow-nosed albatross
(Thalassarche carteri)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
ECOSYSTEM SERVICES
IDB031 01/08/2023 Eric Hong


Distribution of shy albatross (Thalassarche cauta)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Shy albatross (Thalassarche cauta)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
ECOSYSTEM SERVICES
IDB031 01/08/2023 Eric Hong


Distribution of grey-headed albatross (Thalassarche chrysostoma)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Grey-headed albatross
(Thalassarche chrysostoma)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
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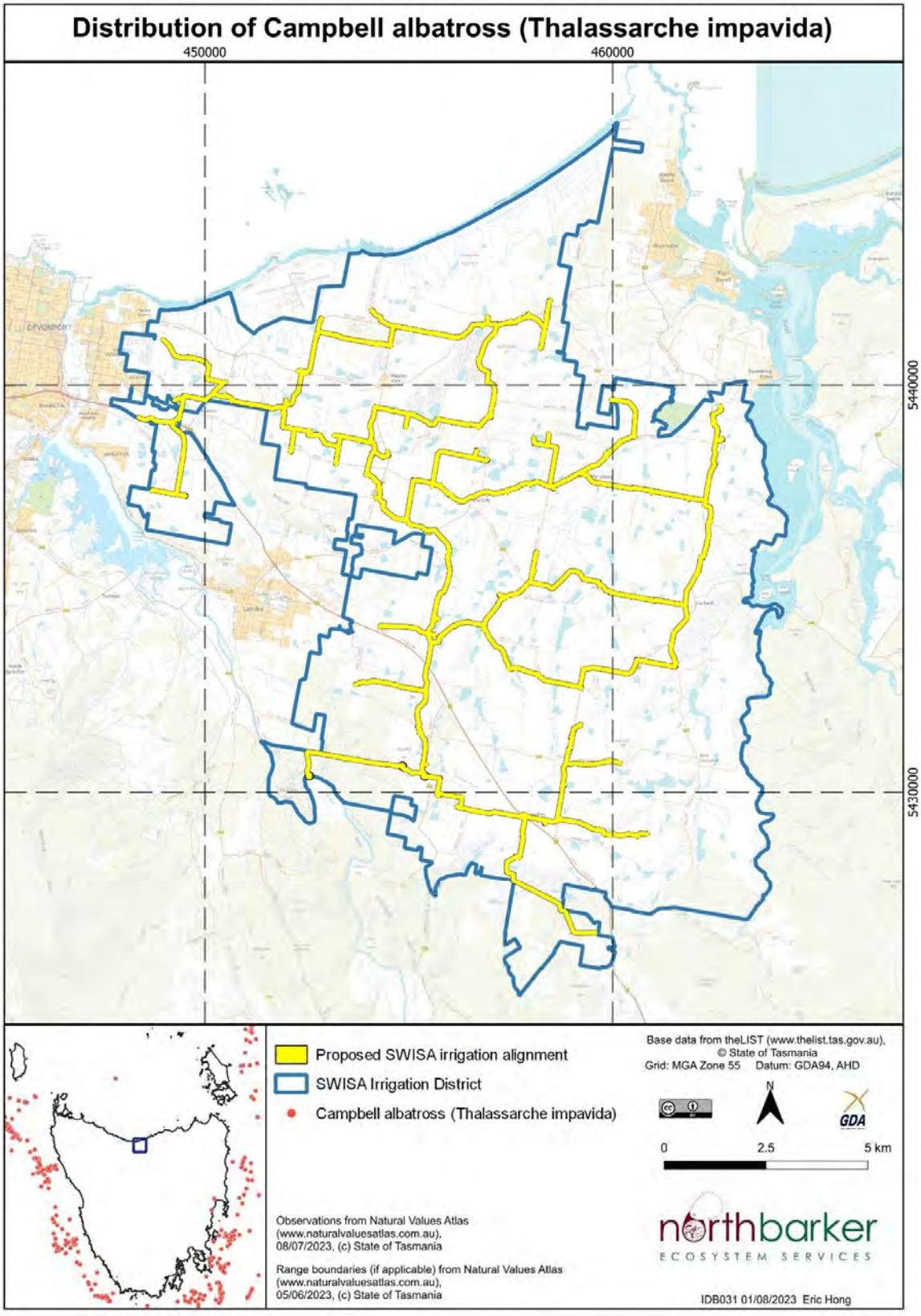
Distribution of Campbell albatross (Thalassarche impavida)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Campbell albatross (Thalassarche impavida)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
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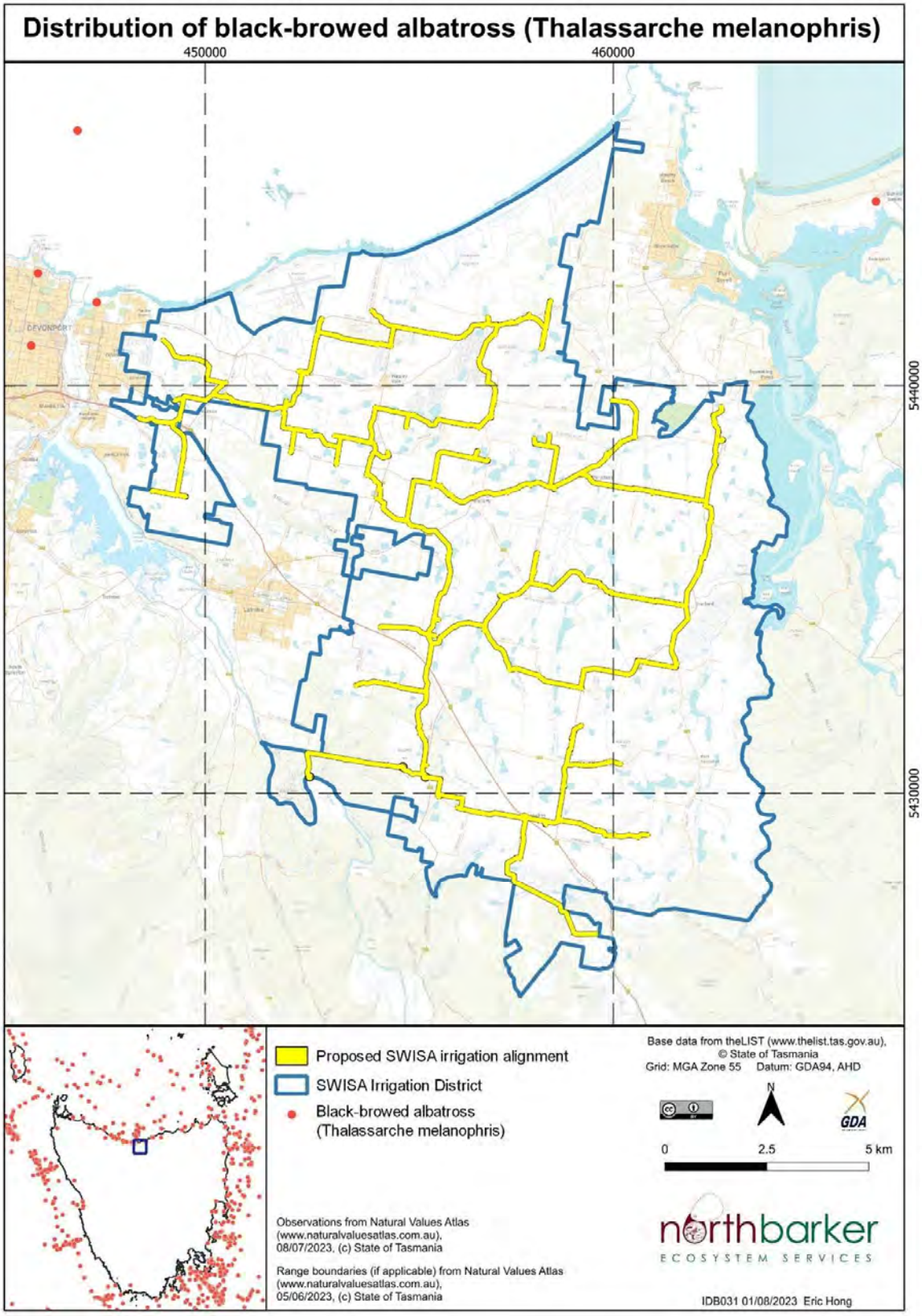
Distribution of black-browed albatross (Thalassarche melanophris)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Black-browed albatross
(Thalassarche melanophris)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
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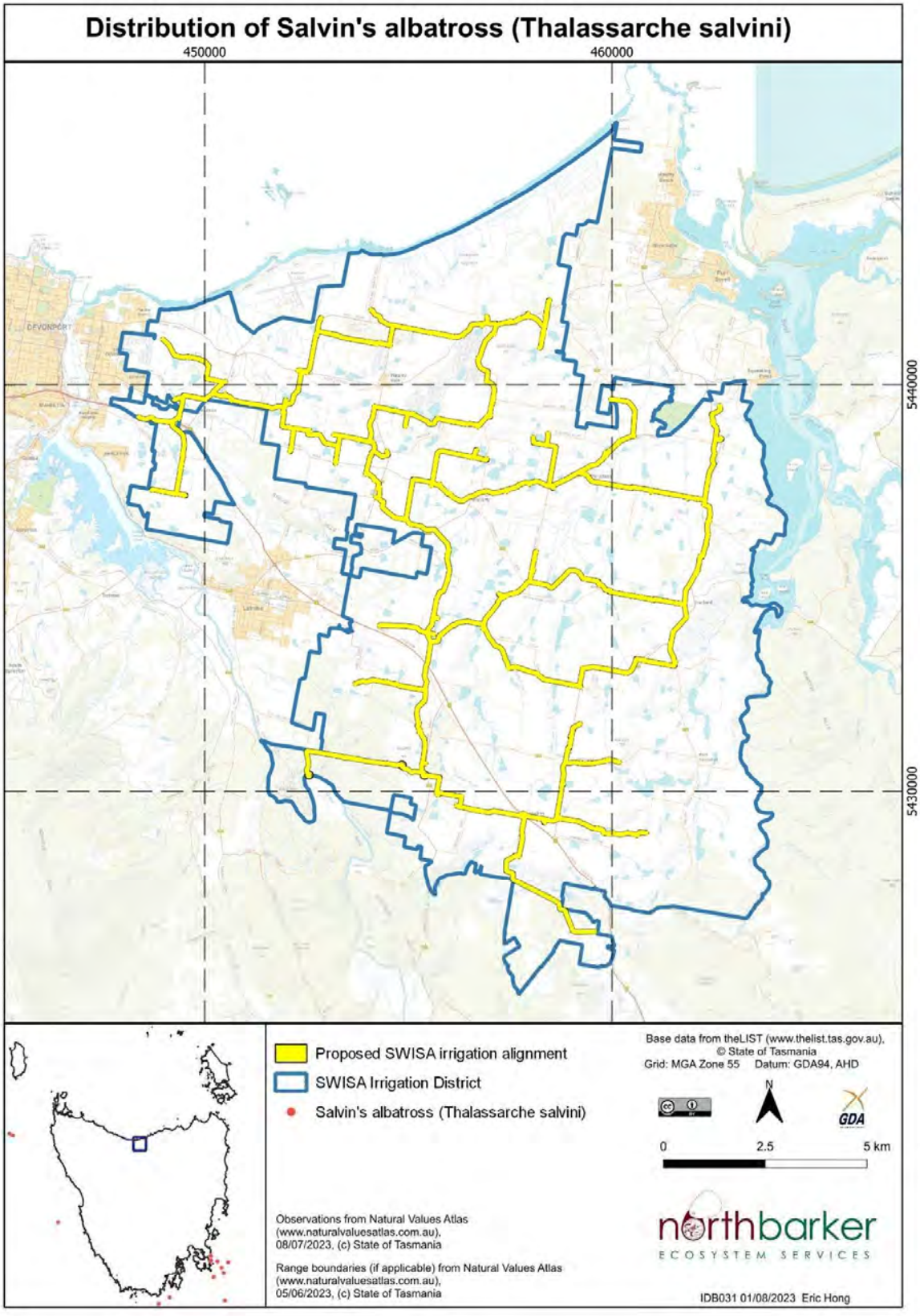
Distribution of Salvin's albatross (Thalassarche salvini)
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460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Salvin's albatross (Thalassarche salvini)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
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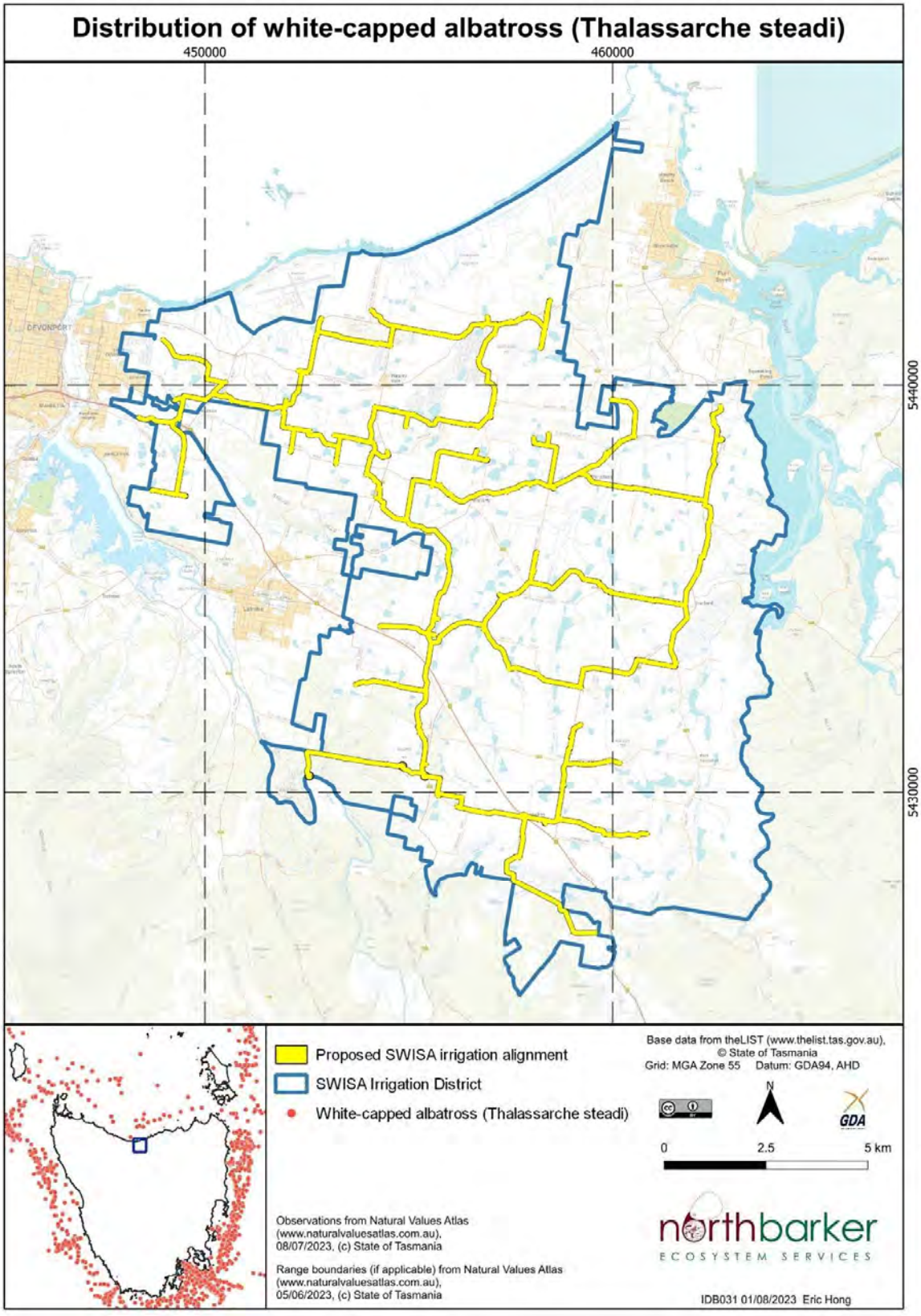
Distribution of white-capped albatross (Thalassarche steadi)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
White-capped albatross (Thalassarche steadi)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
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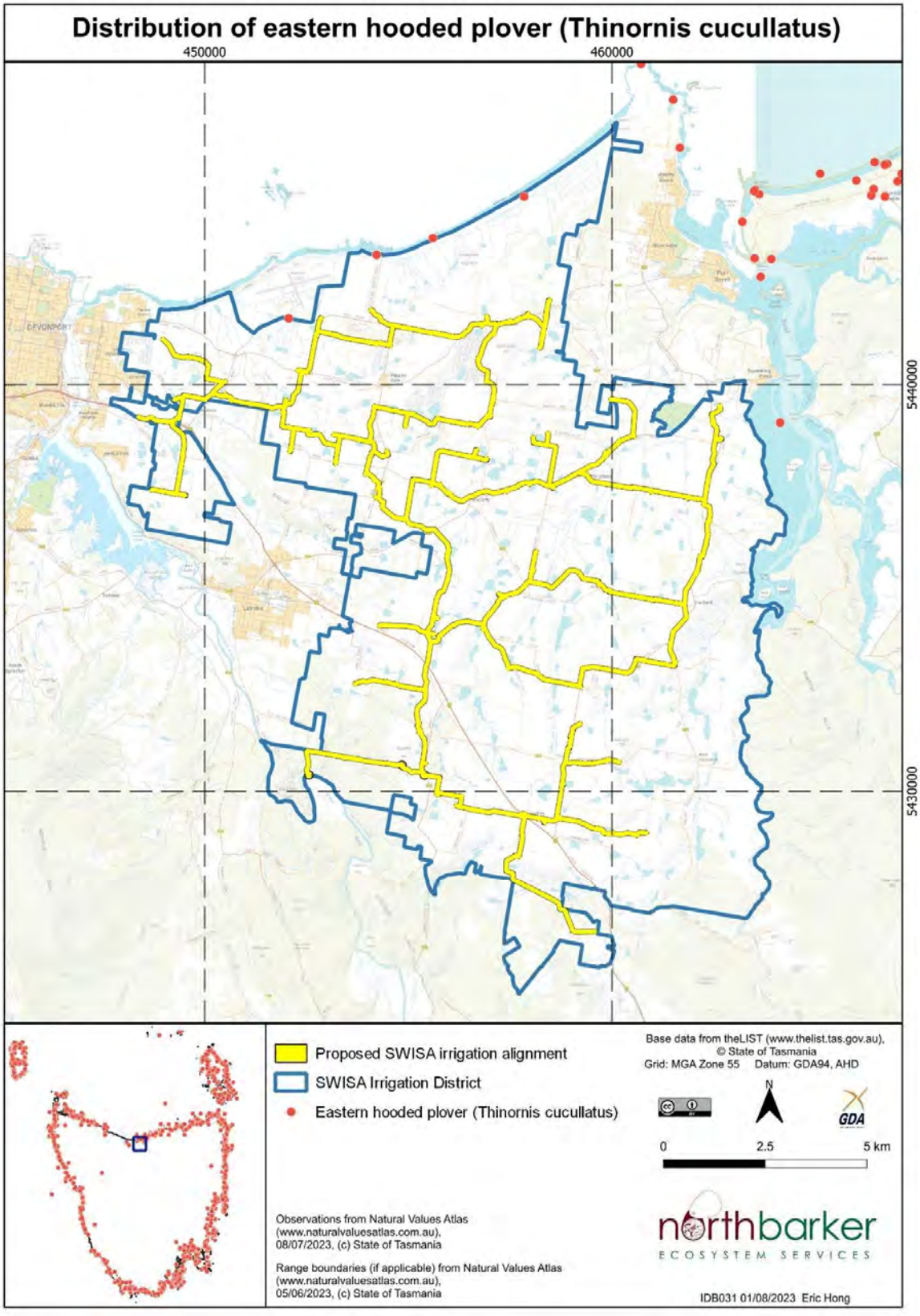
Distribution of eastern hooded plover (Thinornis cucullatus)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Eastern hooded plover (Thinornis cucullatus)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
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5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
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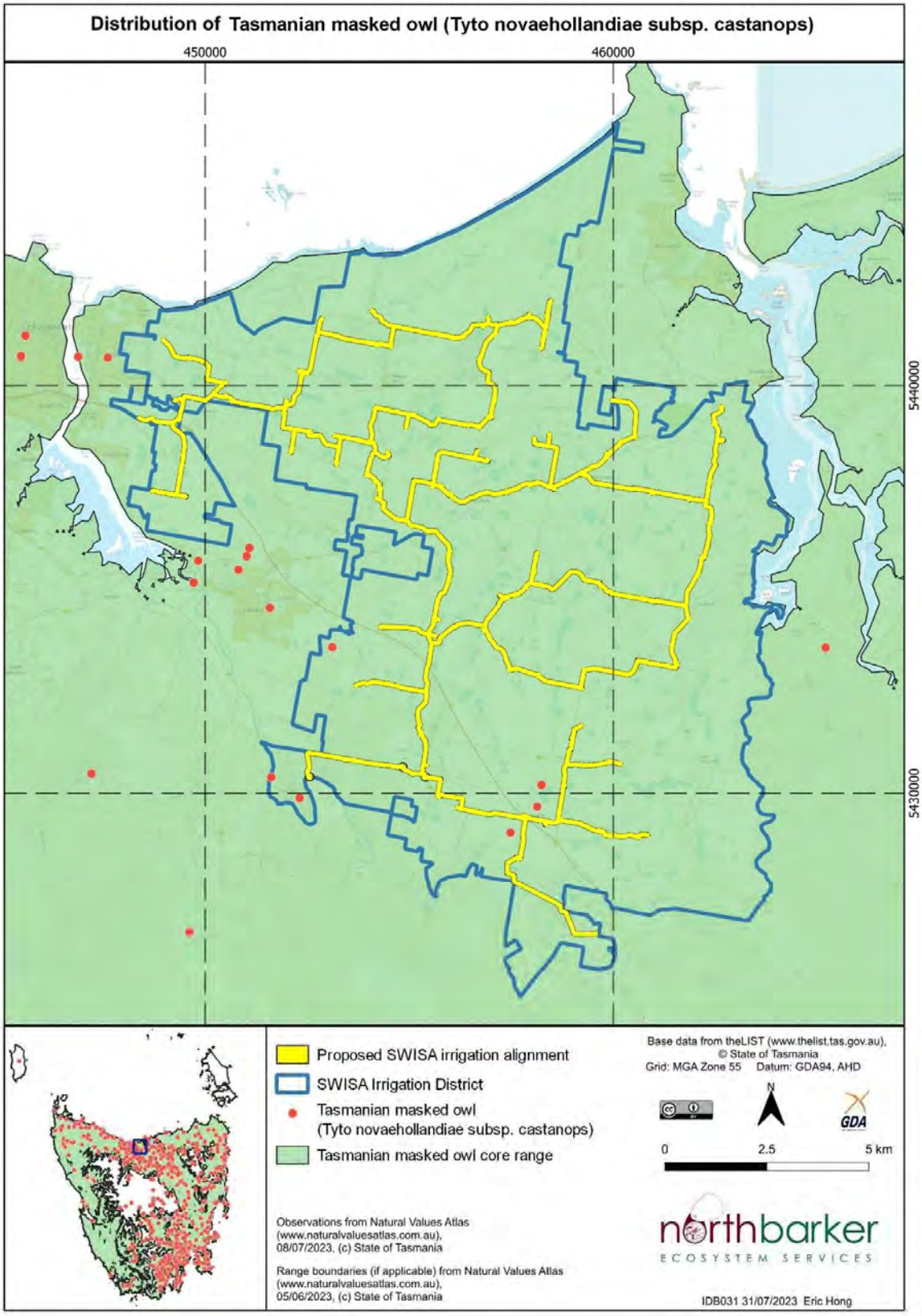
Distribution of Tasmanian masked owl (Tyto novaehollandiae subsp. castanops)
450000
460000
5440000
5430000
Proposed SWISA irrigation alignment
SWISA Irrigation District
Tasmanian masked owl
(Tyto novaehollandiae subsp. castanops)
Tasmanian masked owl core range
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
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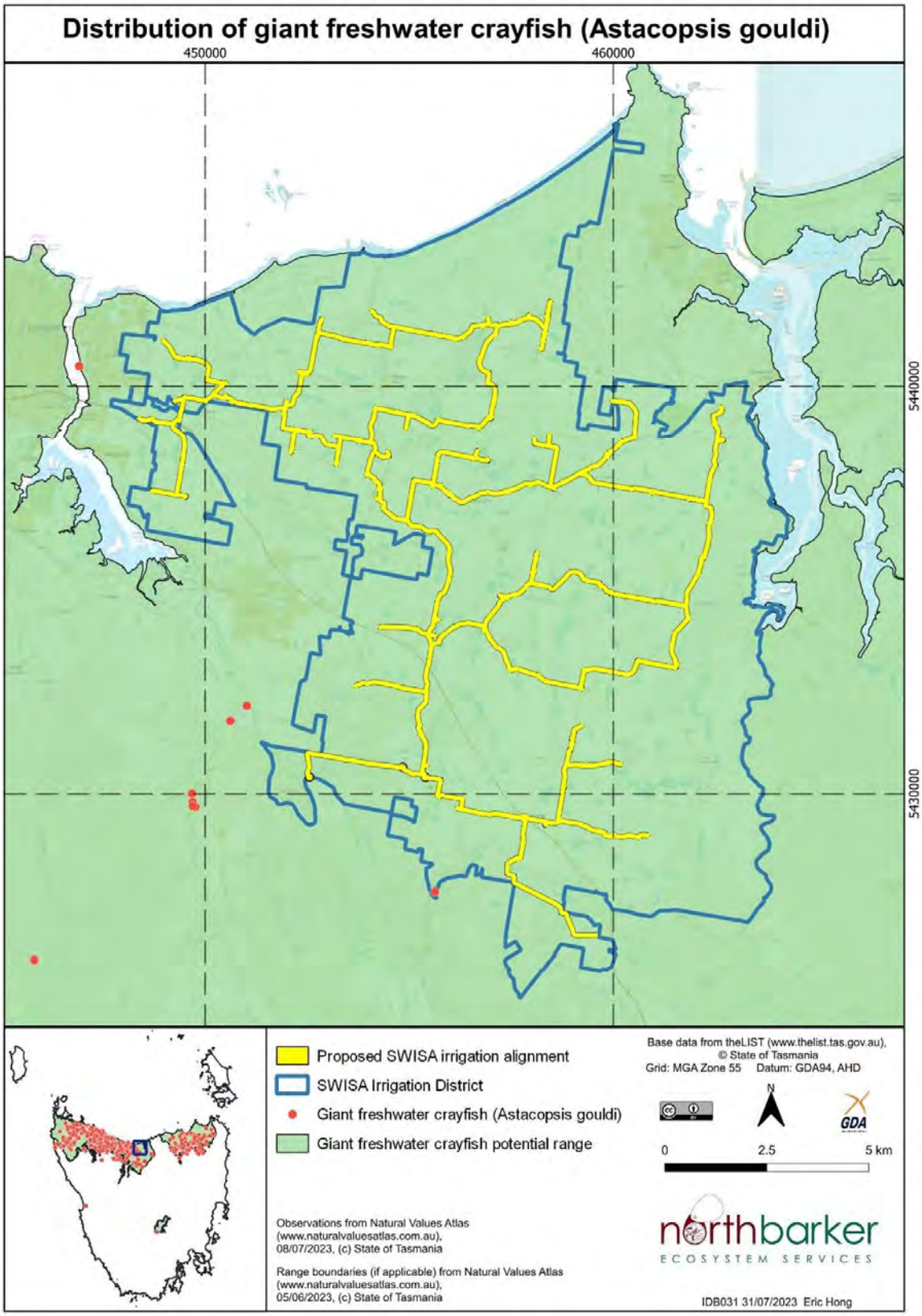
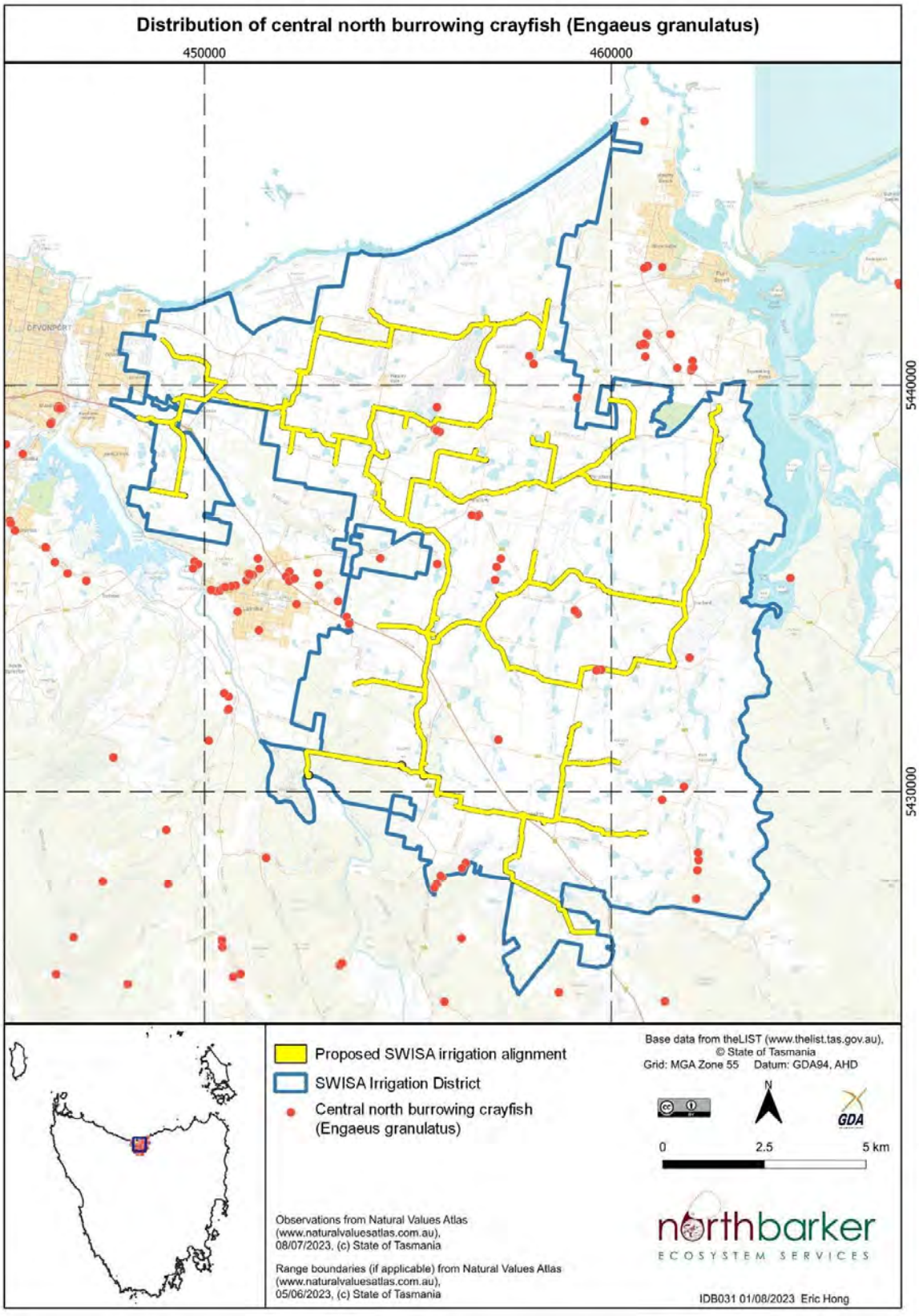
Crustaceans




Distribution of central north burrowing crayfish (Engaeus granulatus)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Central north burrowing crayfish (Engaeus granulatus)
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas (www.naturalvaluesatlas.com.au), 08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas (www.naturalvaluesatlas.com.au), 05/06/2023, (c) State of Tasmania
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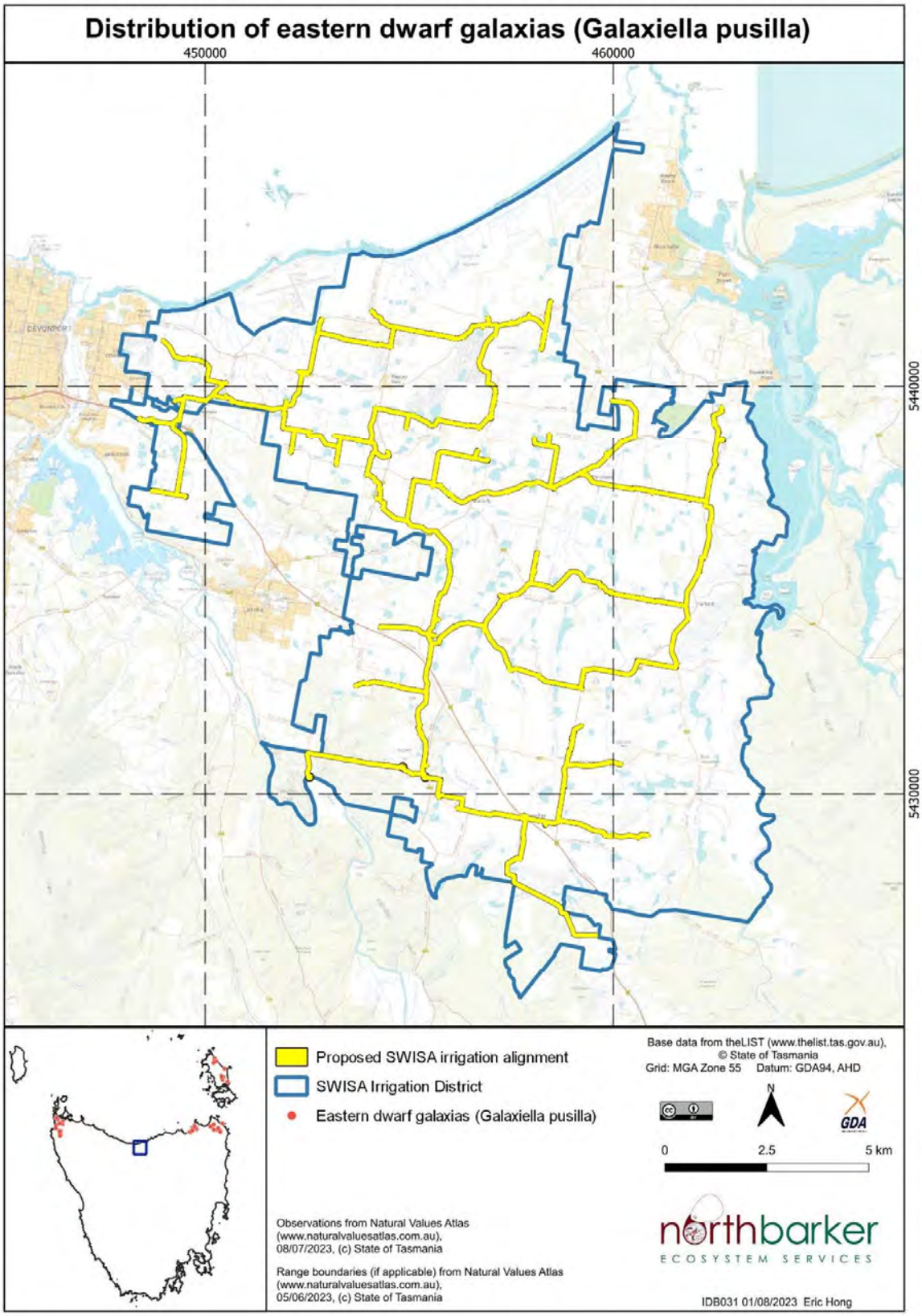
Fish


Distribution of eastern dwarf galaxias (Galaxiella pusilla)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Eastern dwarf galaxias (Galaxiella pusilla)
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0 2.5 5 km
Observations from Natural Values Atlas (www.naturalvaluesatlas.com.au), 08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas (www.naturalvaluesatlas.com.au), 05/06/2023, (c) State of Tasmania
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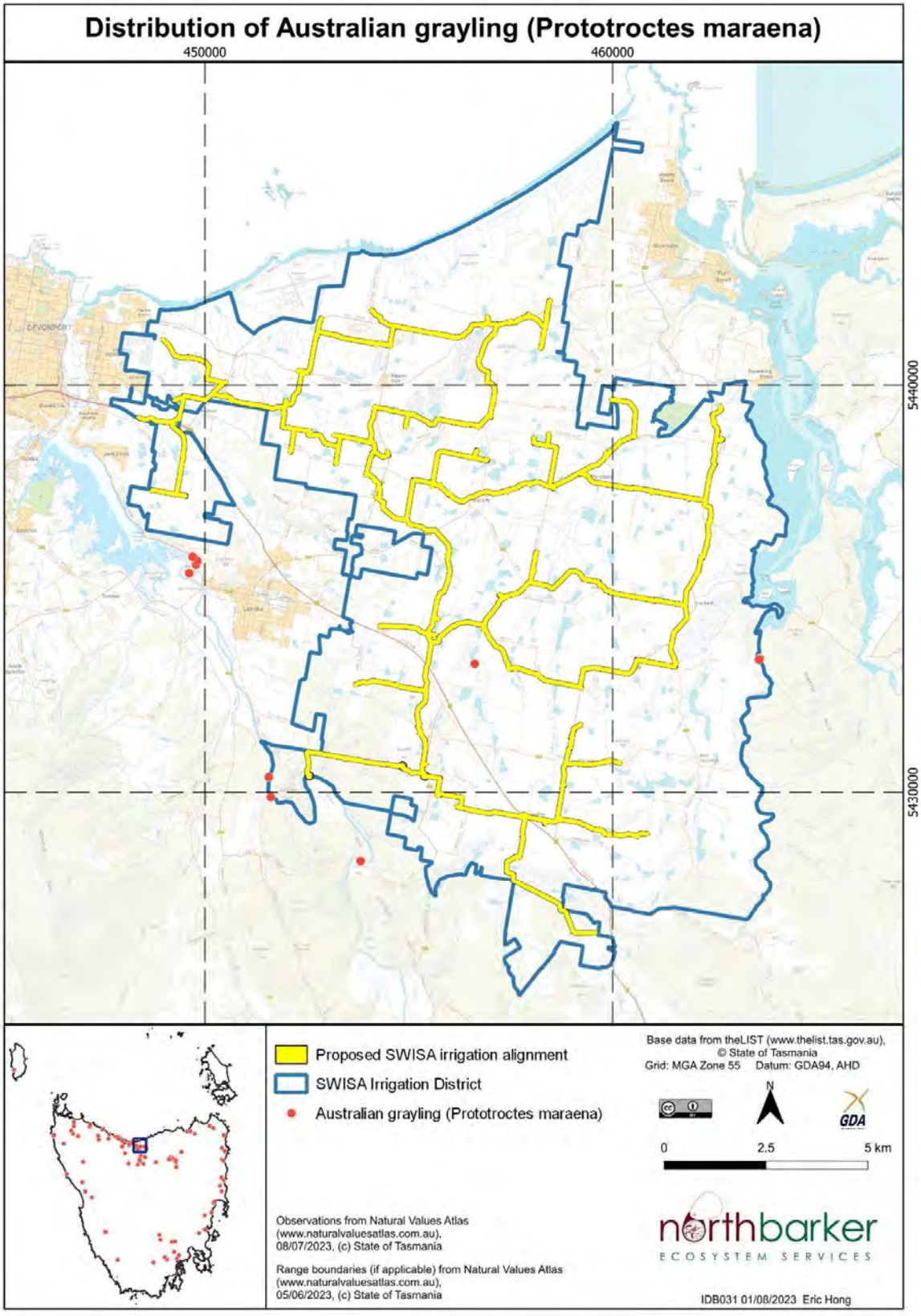
Distribution of Australian grayling (Prototroctes maraena)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Australian grayling (Prototroctes maraena)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
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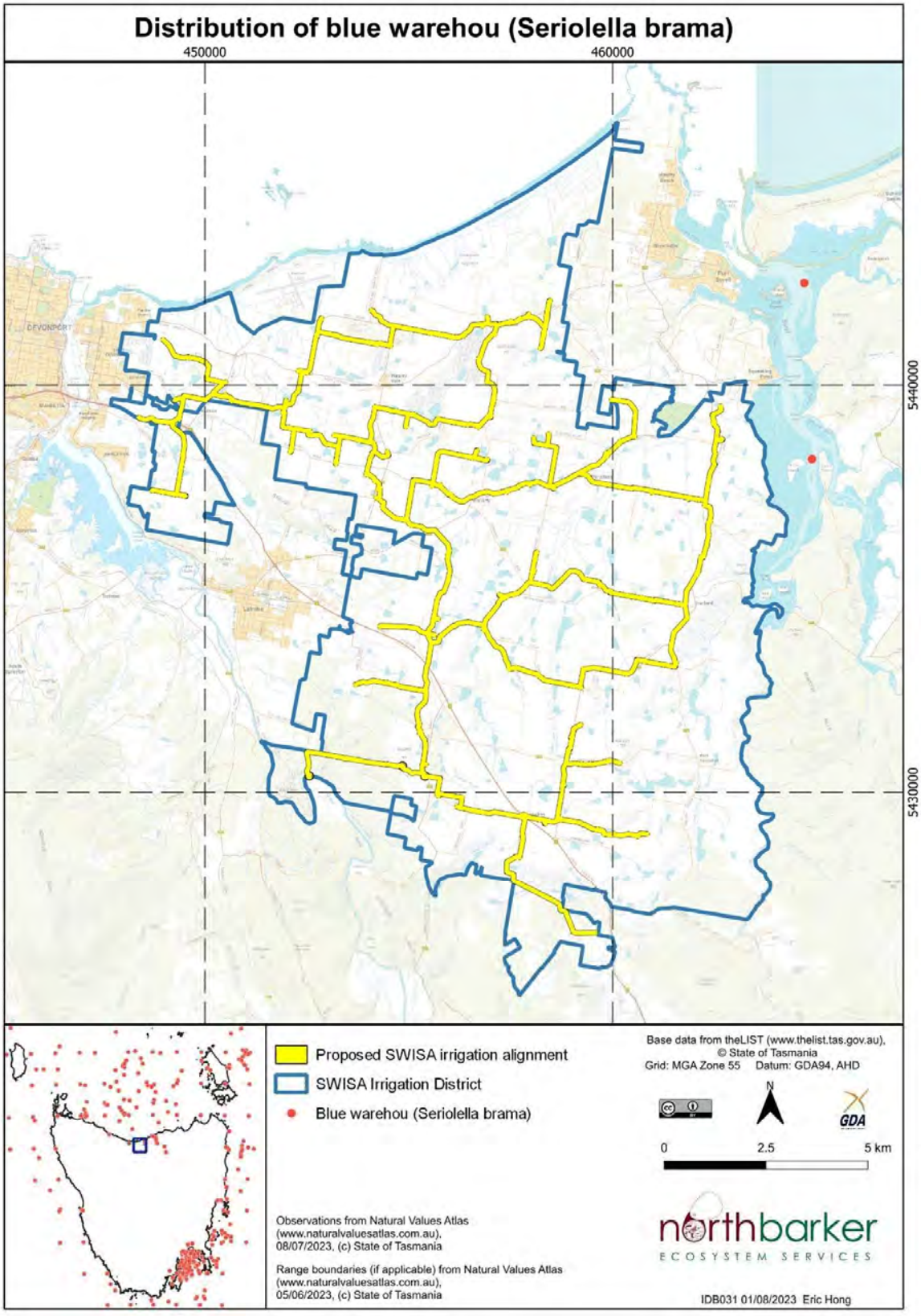
Distribution of blue warehou (Seriolella brama)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Blue warehou (Seriolella brama)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
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ECOSYSTEM SERVICES
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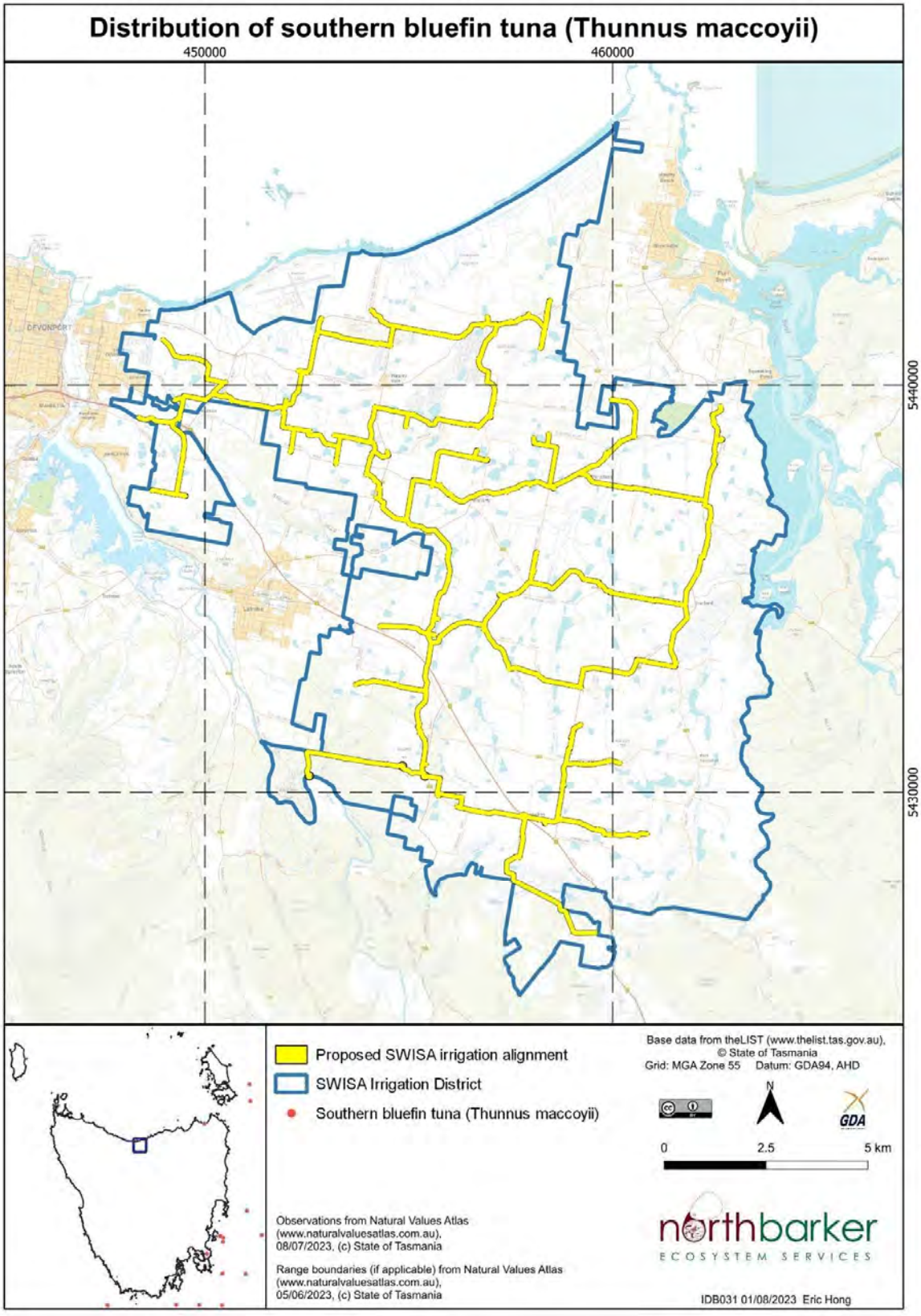
Distribution of southern bluefin tuna (Thunnus maccoyii)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Southern bluefin tuna (Thunnus maccoyii)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
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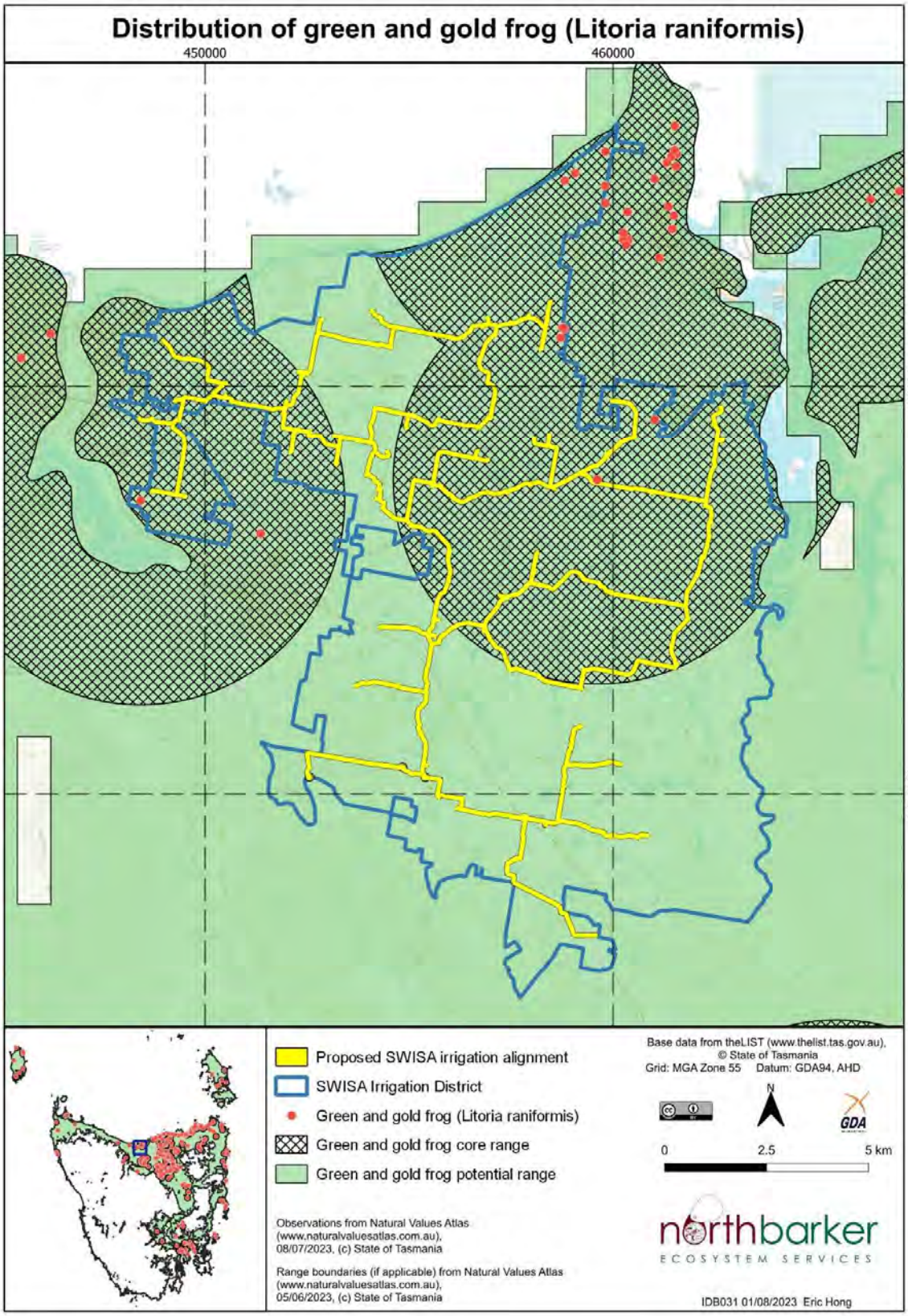
Frogs


Distribution of green and gold frog (Litoria raniformis)
450000
460000
5440000
5430000
Proposed SWISA irrigation alignment
SWISA Irrigation District
Green and gold frog (Litoria raniformis)
Green and gold frog core range
Green and gold frog potential range
Observations from Natural Values Atlas (www.naturalvaluesatlas.com.au), 08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas (www.naturalvaluesatlas.com.au), 05/06/2023, (c) State of Tasmania
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
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2.5
5 km
northbarker
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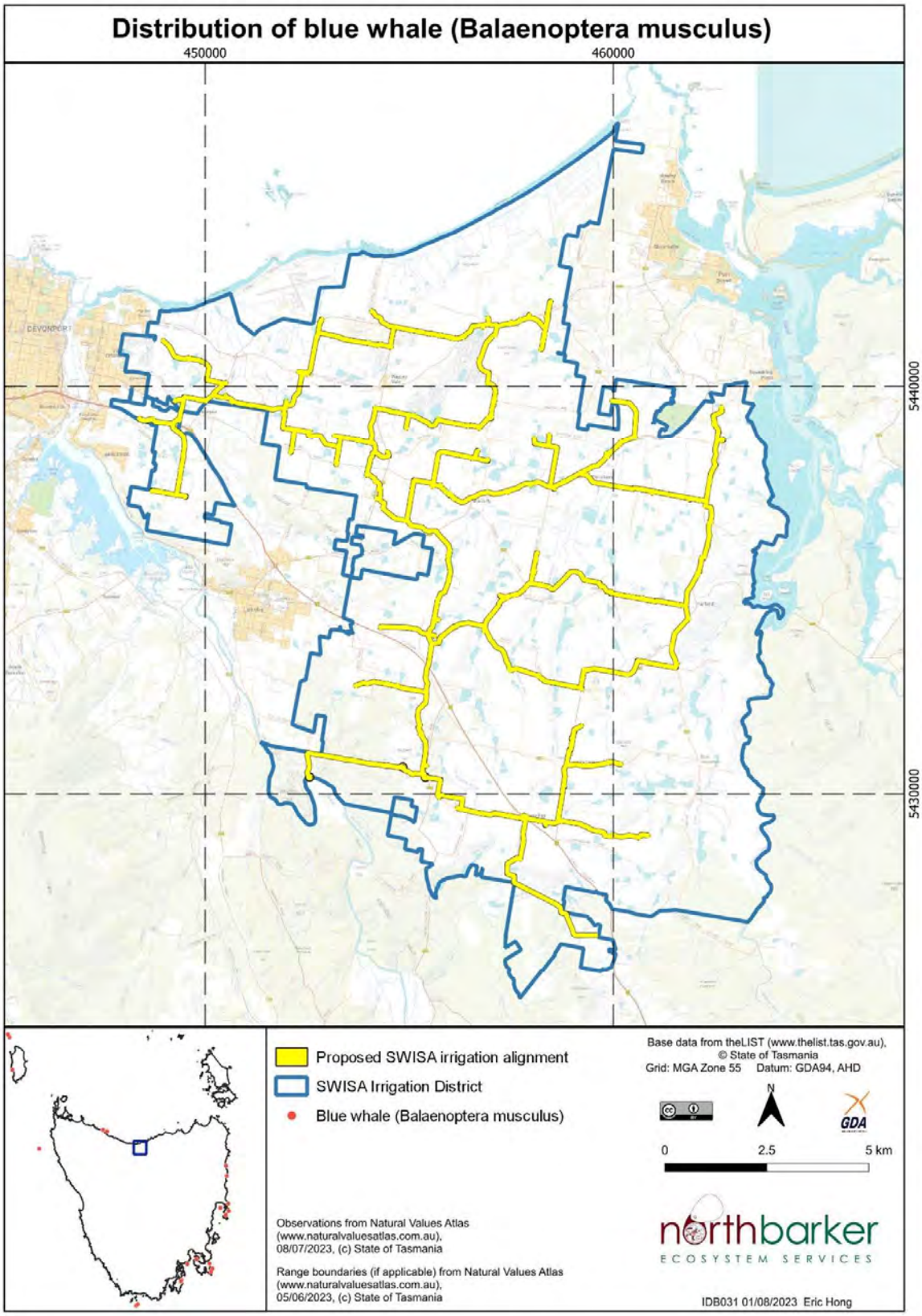
Mammals


Distribution of blue whale (Balaenoptera musculus)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Blue whale (Balaenoptera musculus)
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas (www.naturalvaluesatlas.com.au), 08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas (www.naturalvaluesatlas.com.au), 05/06/2023, (c) State of Tasmania
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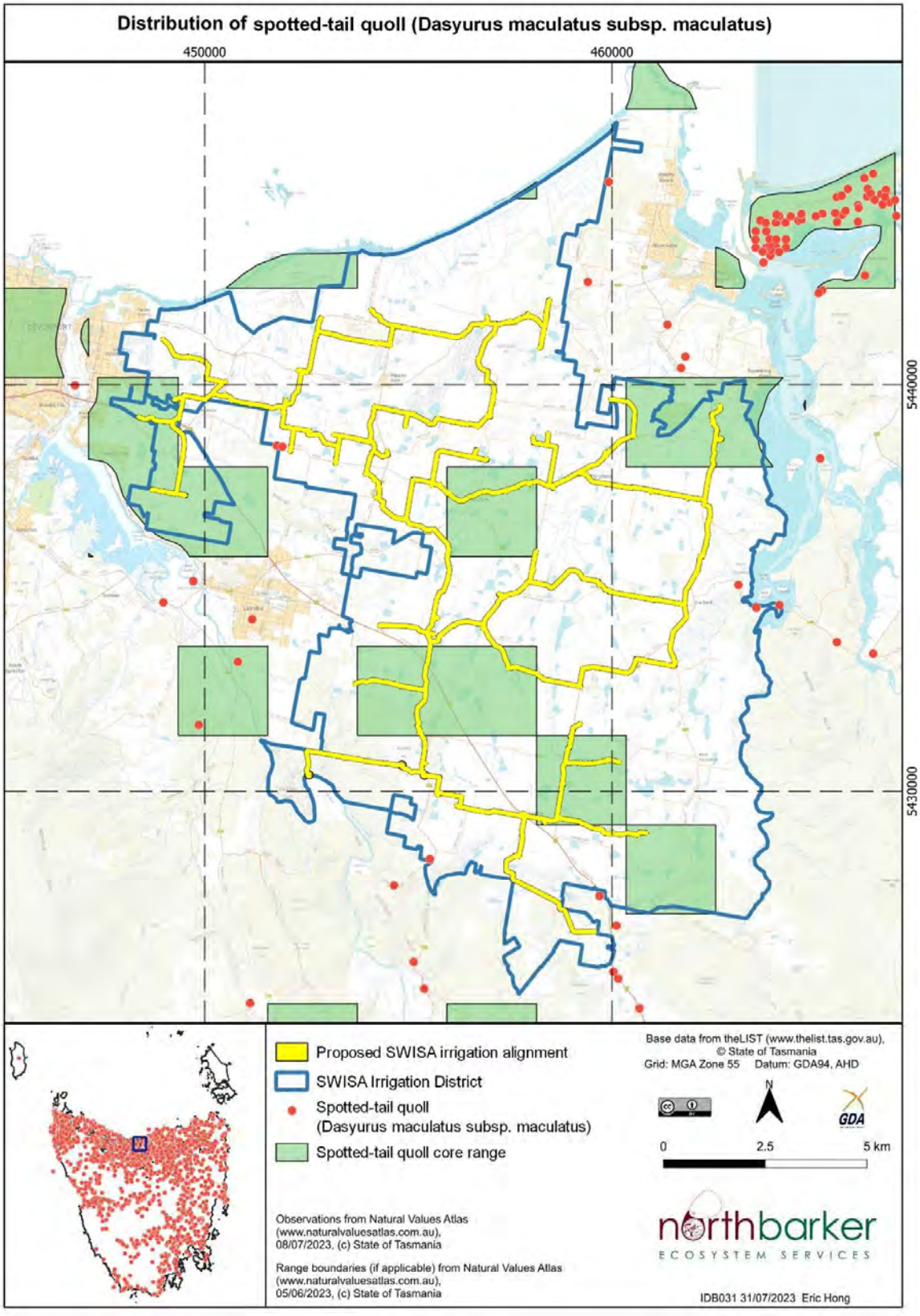
Distribution of spotted-tail quoll (Dasyurus maculatus subsp. maculatus)
450000
460000
5440000
5430000
Proposed SWISA irrigation alignment
SWISA Irrigation District
Spotted-tail quoll
(Dasyurus maculatus subsp. maculatus)
Spotted-tail quoll core range
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
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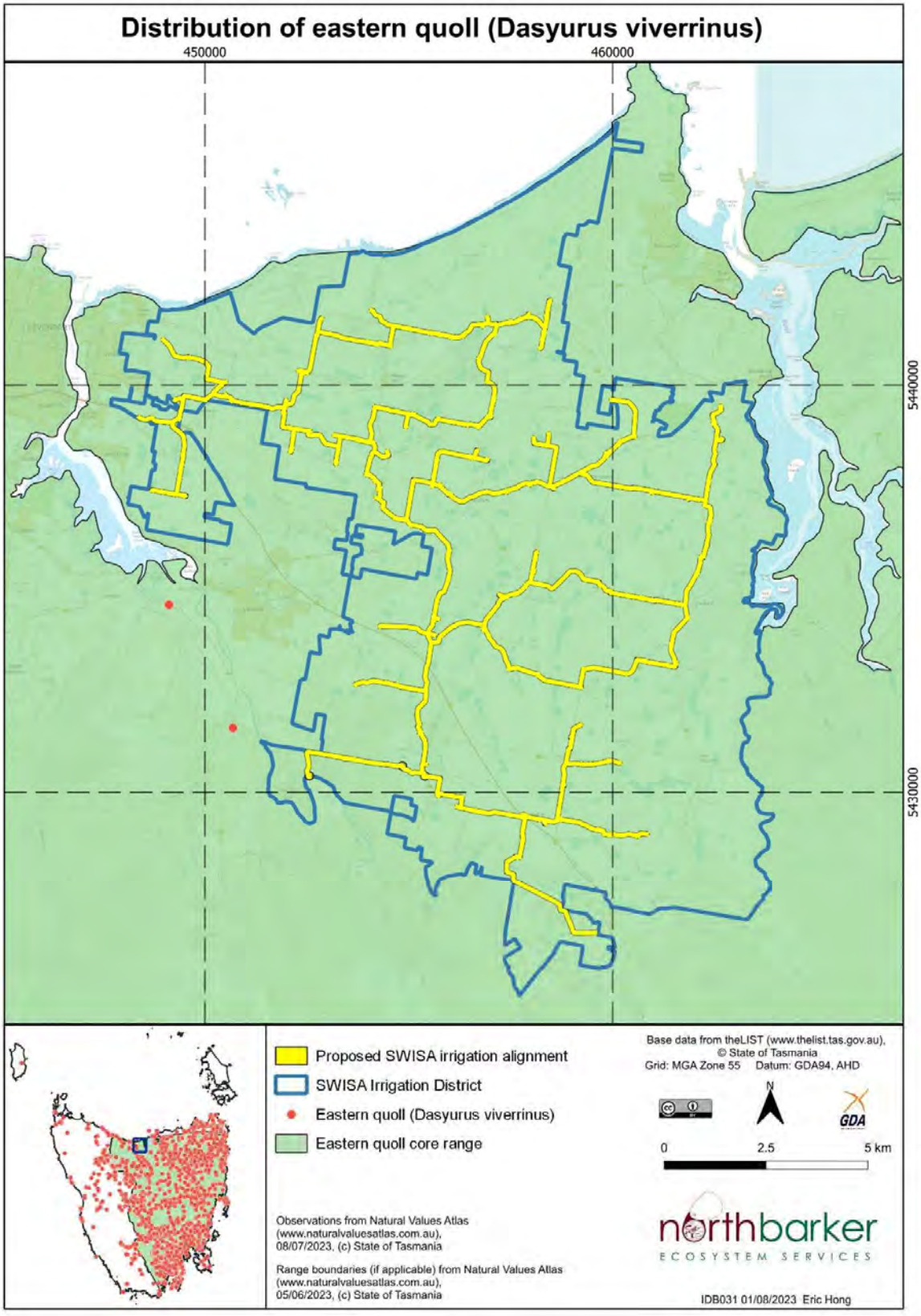
Distribution of eastern quoll (Dasyurus viverrinus)
450000
460000
5440000
5430000
Proposed SWISA irrigation alignment
SWISA Irrigation District
Eastern quoll (Dasyurus viverrinus)
Eastern quoll core range
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas (www.naturalvaluesatlas.com.au), 08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas (www.naturalvaluesatlas.com.au), 05/06/2023, (c) State of Tasmania
northbarker
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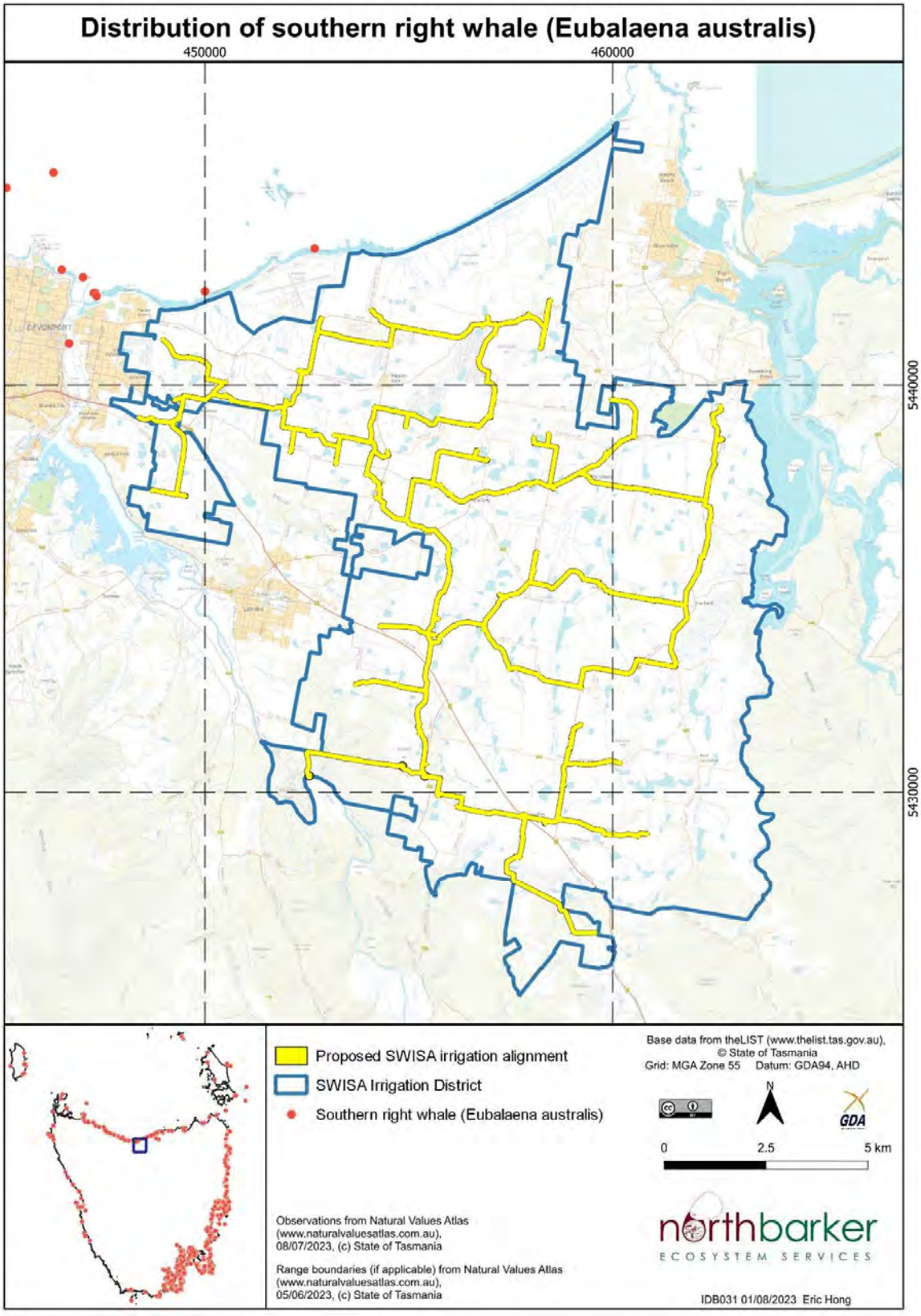
Distribution of southern right whale (Eubalaena australis)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Southern right whale (Eubalaena australis)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
ECOSYSTEM SERVICES
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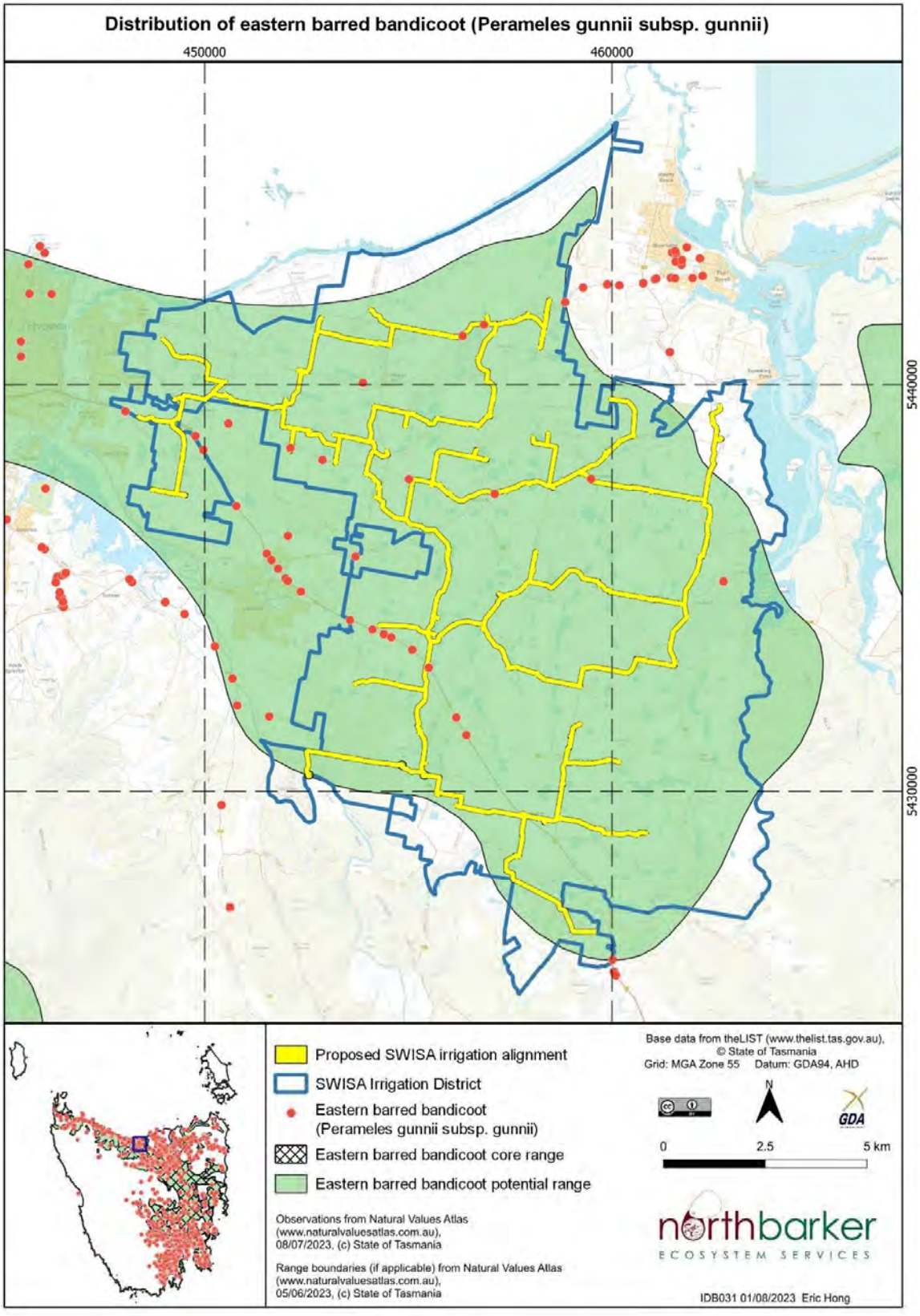
Distribution of eastern barred bandicoot (Perameles gunnii subsp. gunnii)
450000
460000
5440000
5430000
Proposed SWISA irrigation alignment
SWISA Irrigation District
Eastern barred bandicoot
(Perameles gunnii subsp. gunnii)
Eastern barred bandicoot core range
Eastern barred bandicoot potential range
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
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5 km
northbarker
ECOSYSTEM SERVICES
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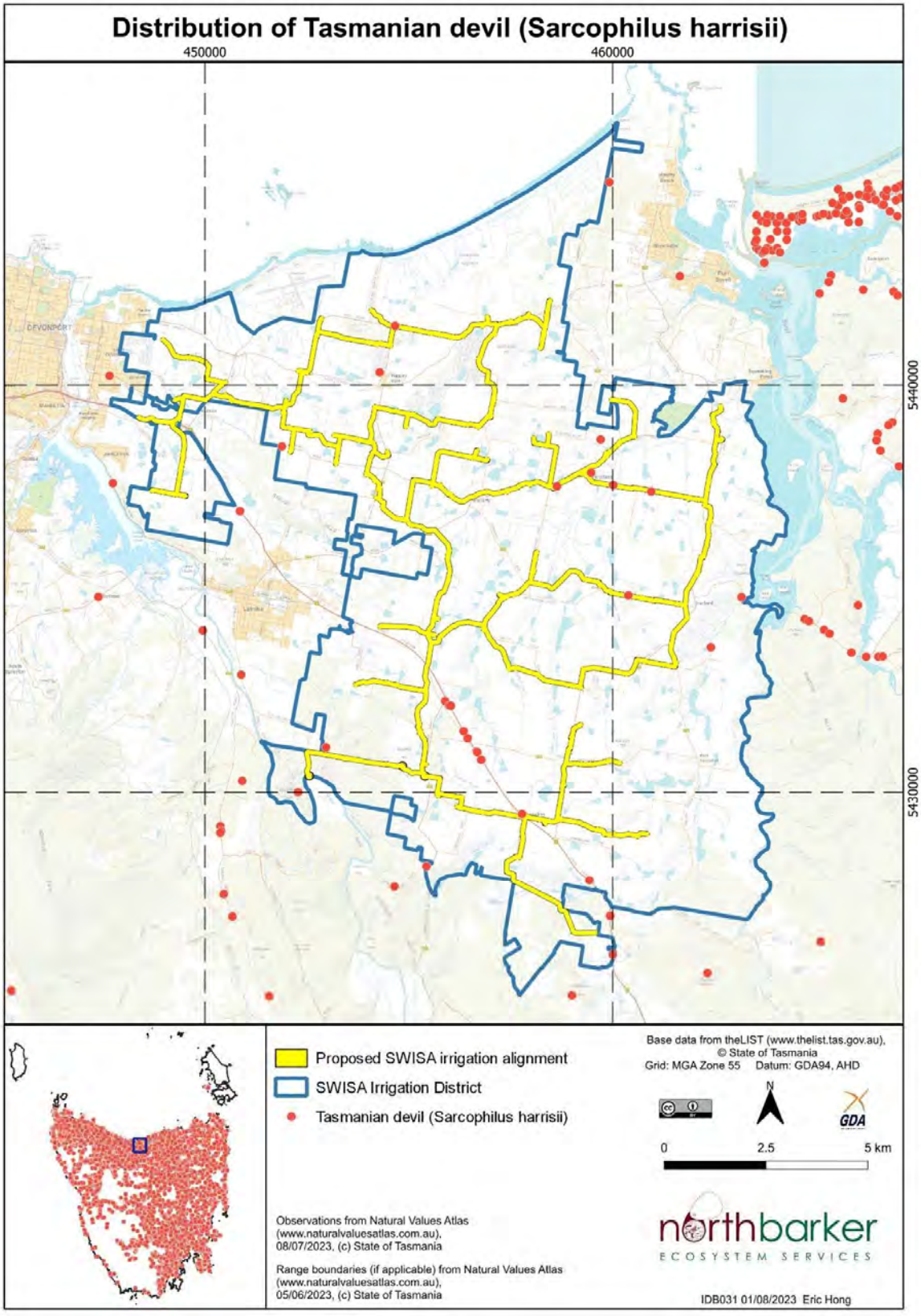
Distribution of Tasmanian devil (Sarcophilus harrisii)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Tasmanian devil (Sarcophilus harrisii)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
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northbarker
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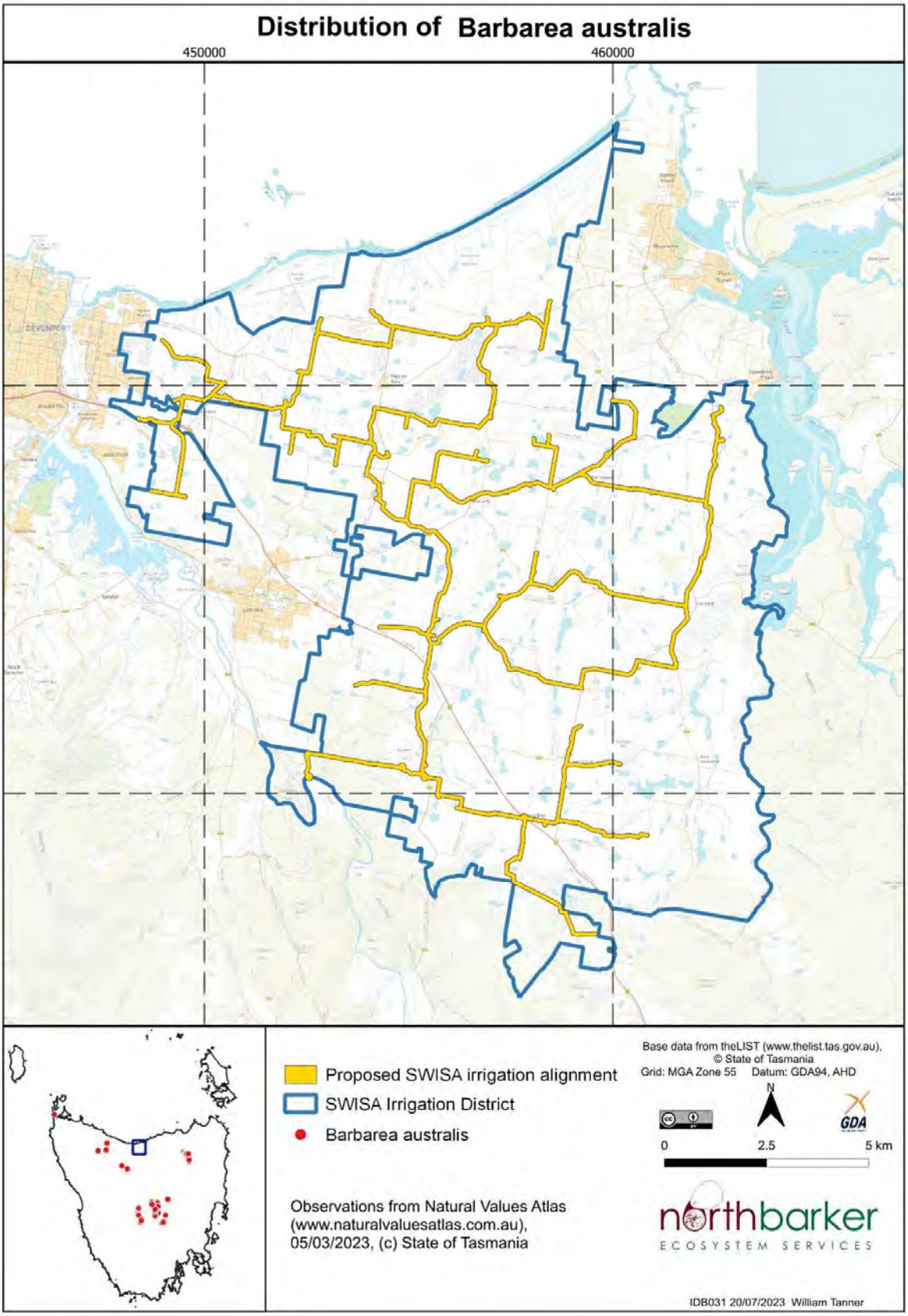
Sassafras – Wesley Vale Irrigation Scheme Augmentation

Appendix K – MNES Threatened Flora Species Distribution Maps

For Tasmanian Irrigation (IDB031)

313 Macquarie Street, Hobart Tasmania, 7000
03 62319788
admin@northbarker.com.au www.northbarker.com.au


Distribution of Barbarea australis
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Barbarea australis
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/03/2023, (c) State of Tasmania
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
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2.5
5 km
northbarker
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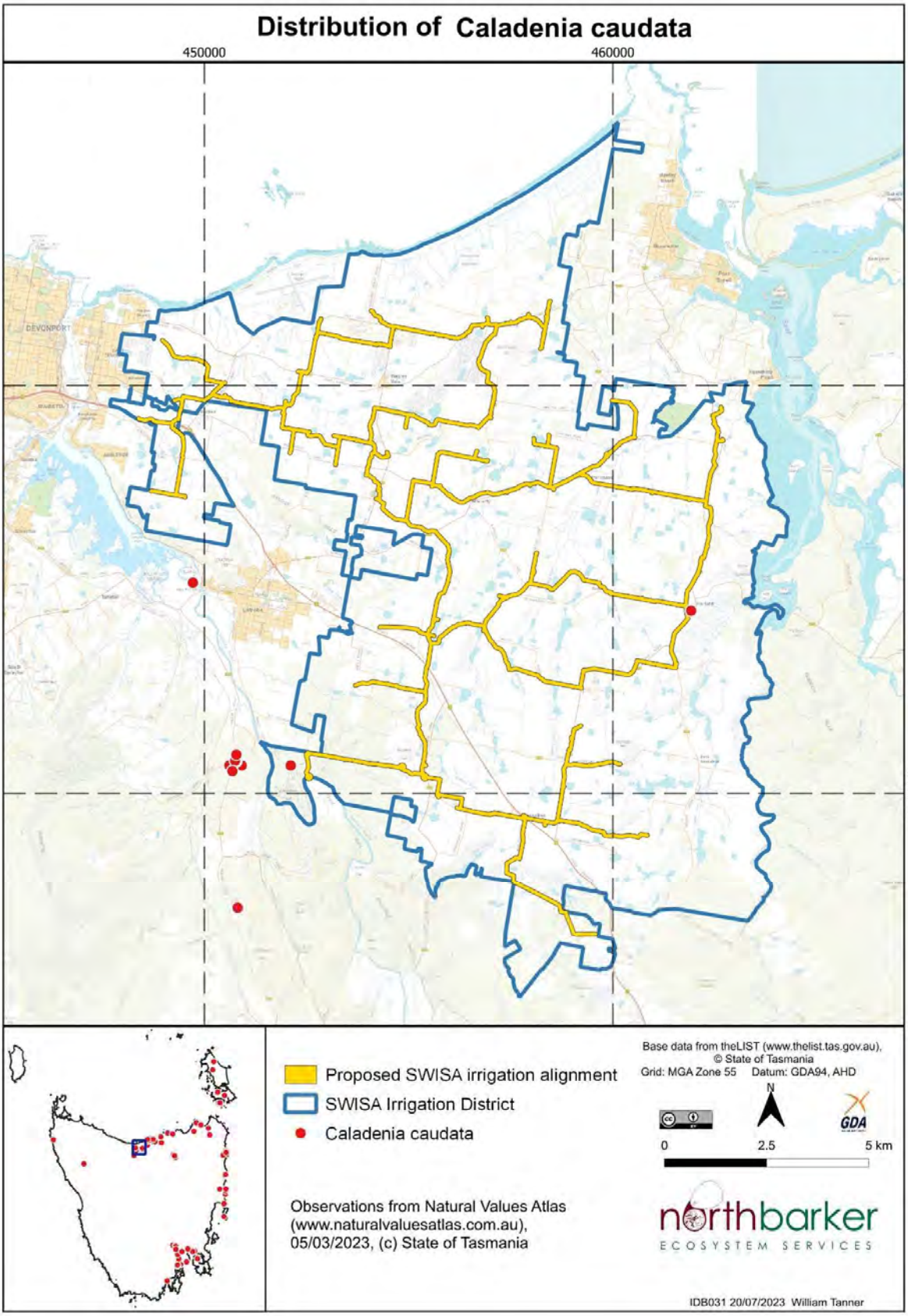
Distribution of Caladenia caudata
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Caladenia caudata
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/03/2023, (c) State of Tasmania
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
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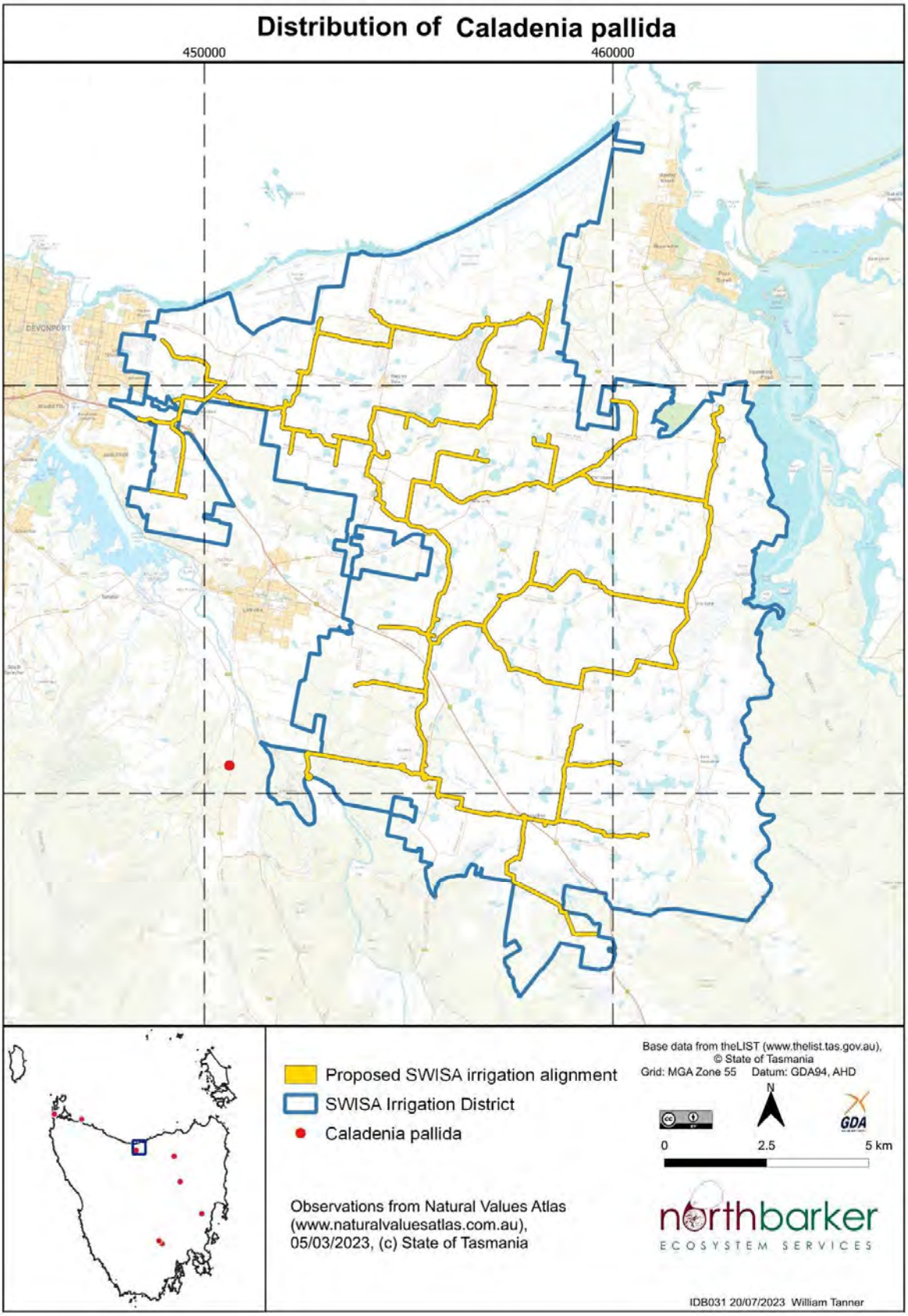
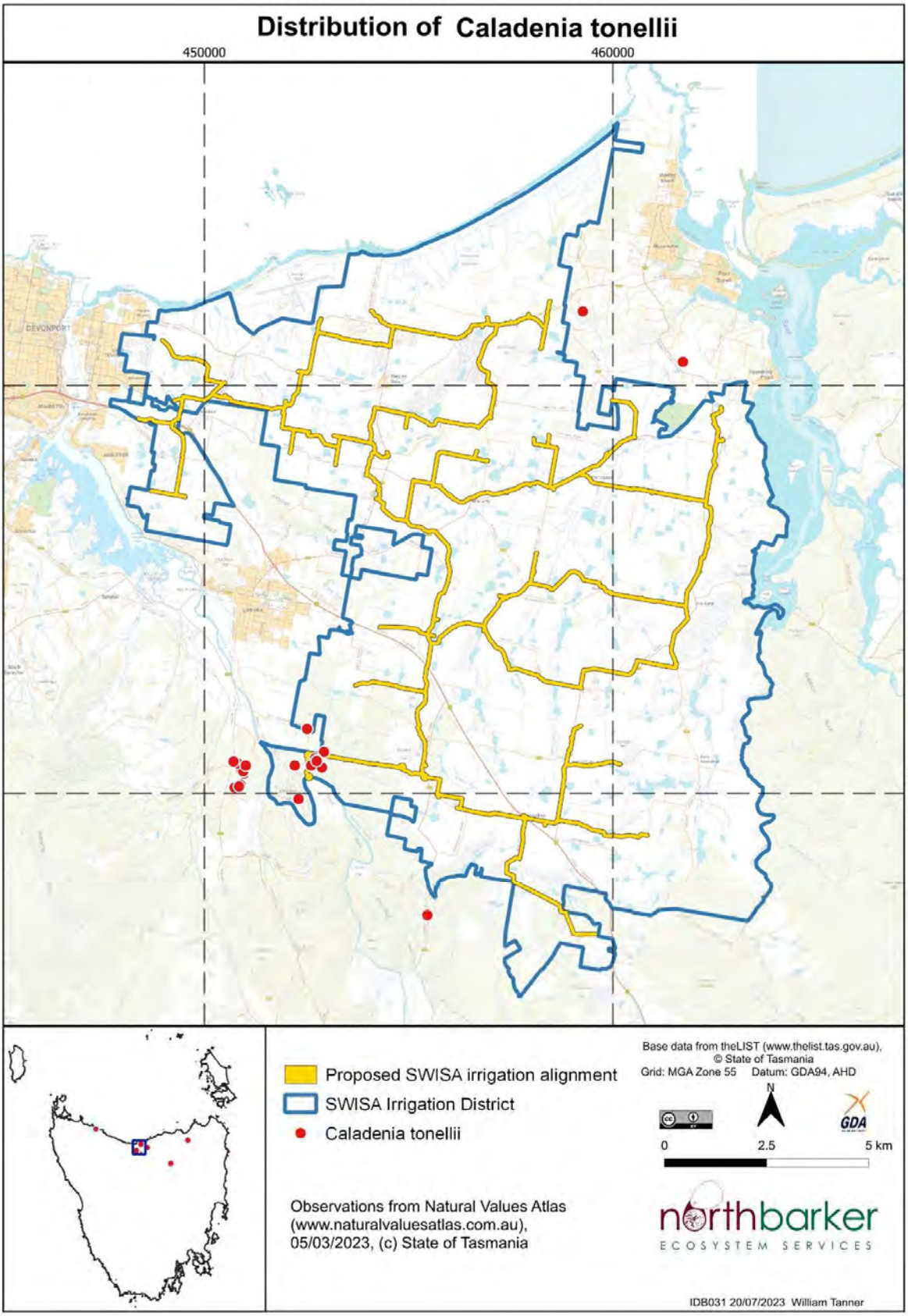
5 km
northbarker
ECOSYSTEM SERVICES
IDB031 20/07/2023 William Tanner


Distribution of Caladenia pallida
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Caladenia pallida
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/03/2023, (c) State of Tasmania
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
northbarker
ECOSYSTEM SERVICES
IDB031 20/07/2023 William Tanner


Distribution of Caladenia tonellii
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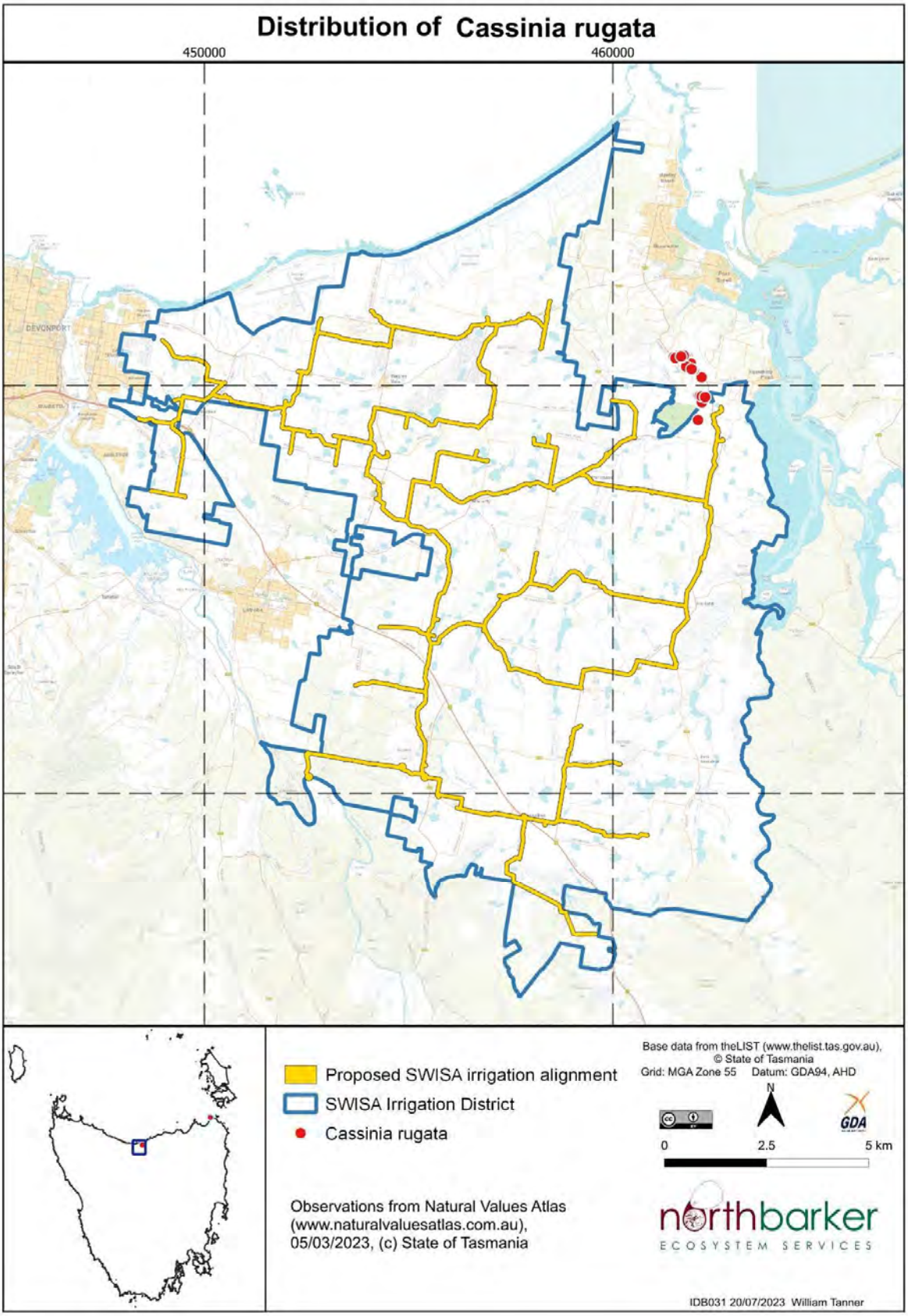
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Caladenia tonellii
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/03/2023, (c) State of Tasmania
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
northbarker
ECOSYSTEM SERVICES
IDB031 20/07/2023 William Tanner


Distribution of Cassinia rugata
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460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Cassinia rugata
Observations from Natural Values Atlas
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Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
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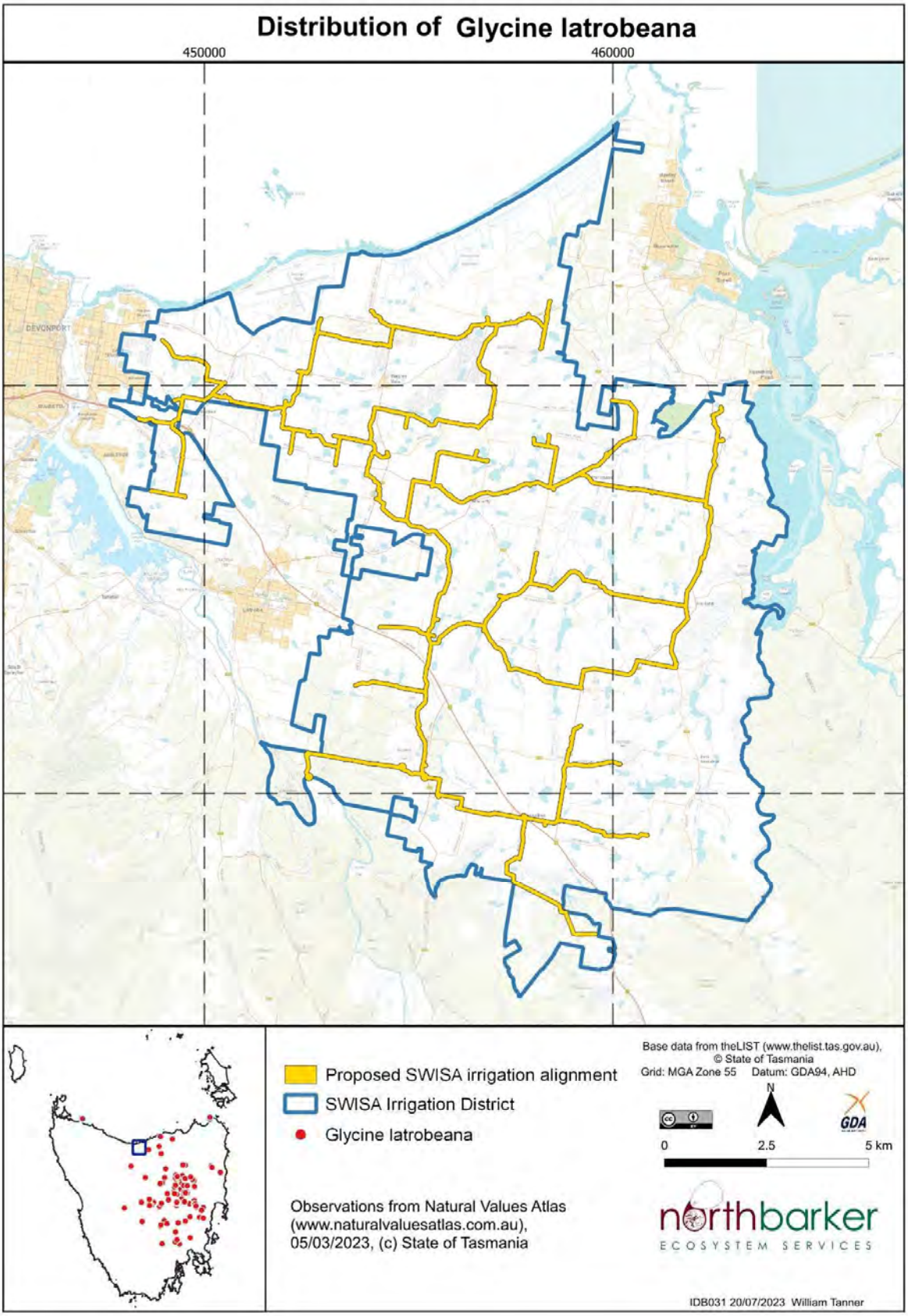
5 km
northbarker
ECOSYSTEM SERVICES
IDB031 20/07/2023 William Tanner


Distribution of Glycine latrobeana
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460000
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5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Glycine latrobeana
Observations from Natural Values Atlas
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05/03/2023, (c) State of Tasmania
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
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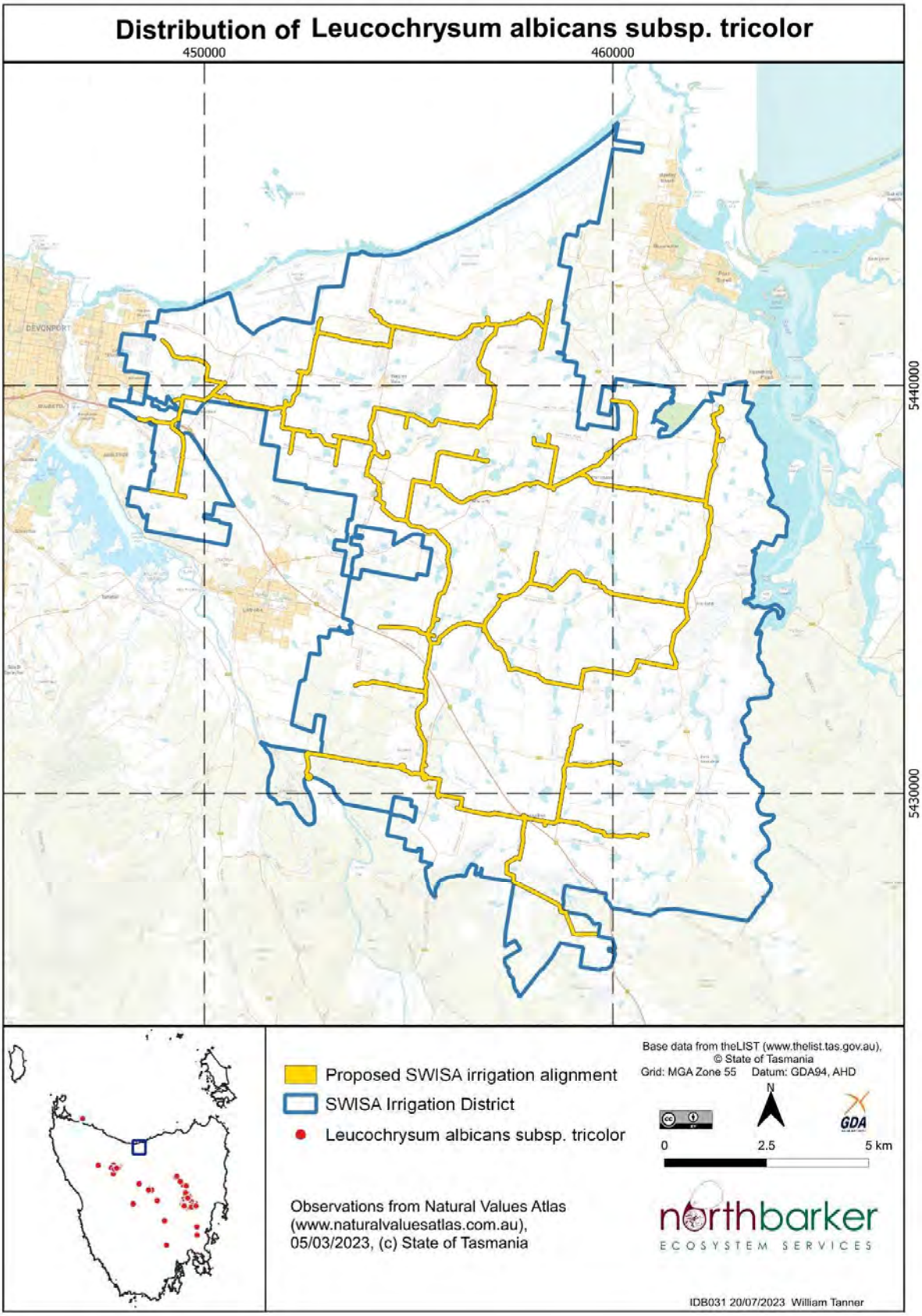
5 km
northbarker
ECOSYSTEM SERVICES
IDB031 20/07/2023 William Tanner


Distribution of Leucochrysum albicans subsp. tricolor
450000
460000
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5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Leucochrysum albicans subsp. tricolor
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/03/2023, (c) State of Tasmania
Base data from theLIST (www.thelist.tas.gov.au),
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Grid: MGA Zone 55 Datum: GDA94, AHD
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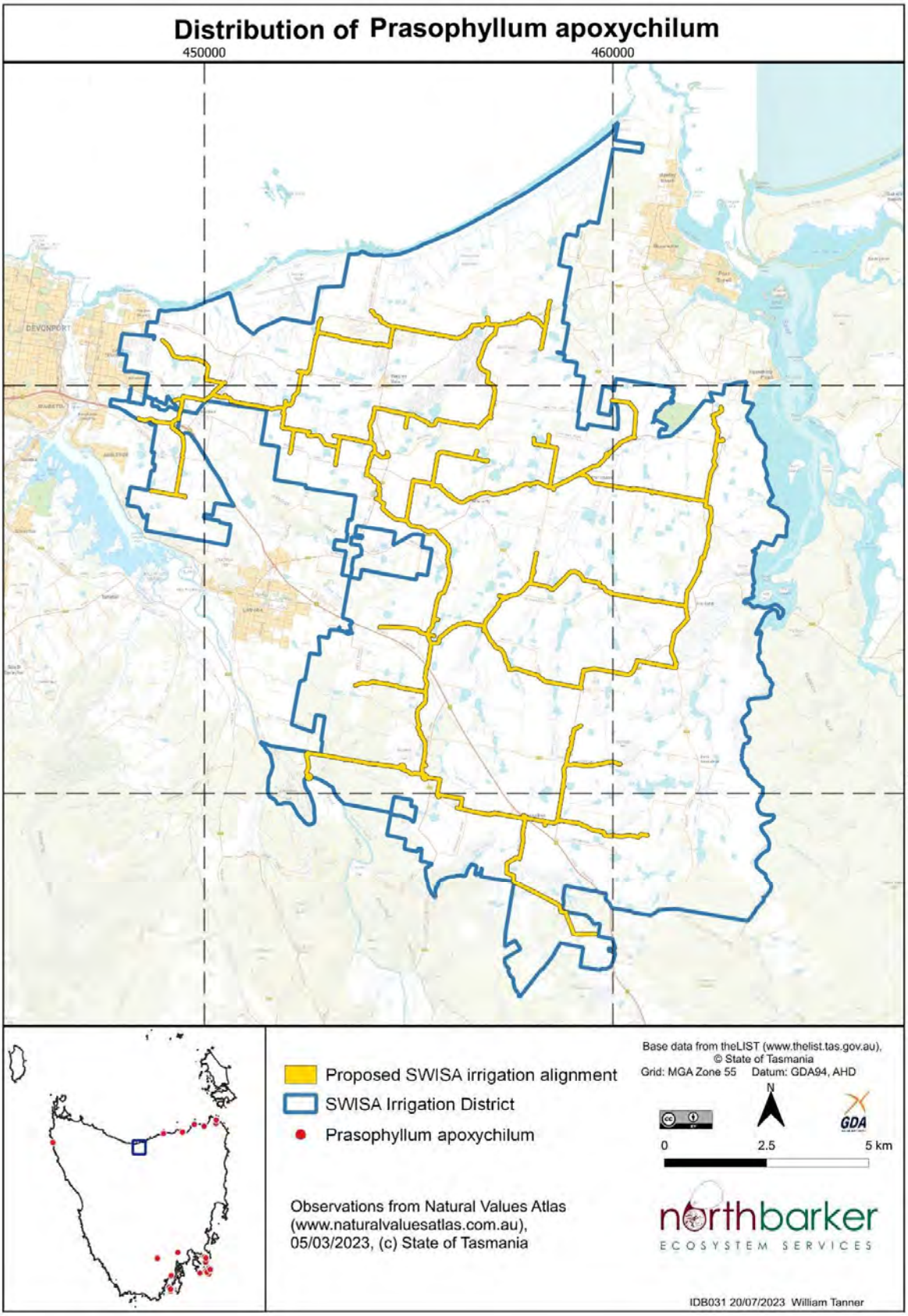
5 km
northbarker
ECOSYSTEM SERVICES
IDB031 20/07/2023 William Tanner


Distribution of Prasophyllum apoxychilum
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5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Prasophyllum apoxychilum
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/03/2023, (c) State of Tasmania
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
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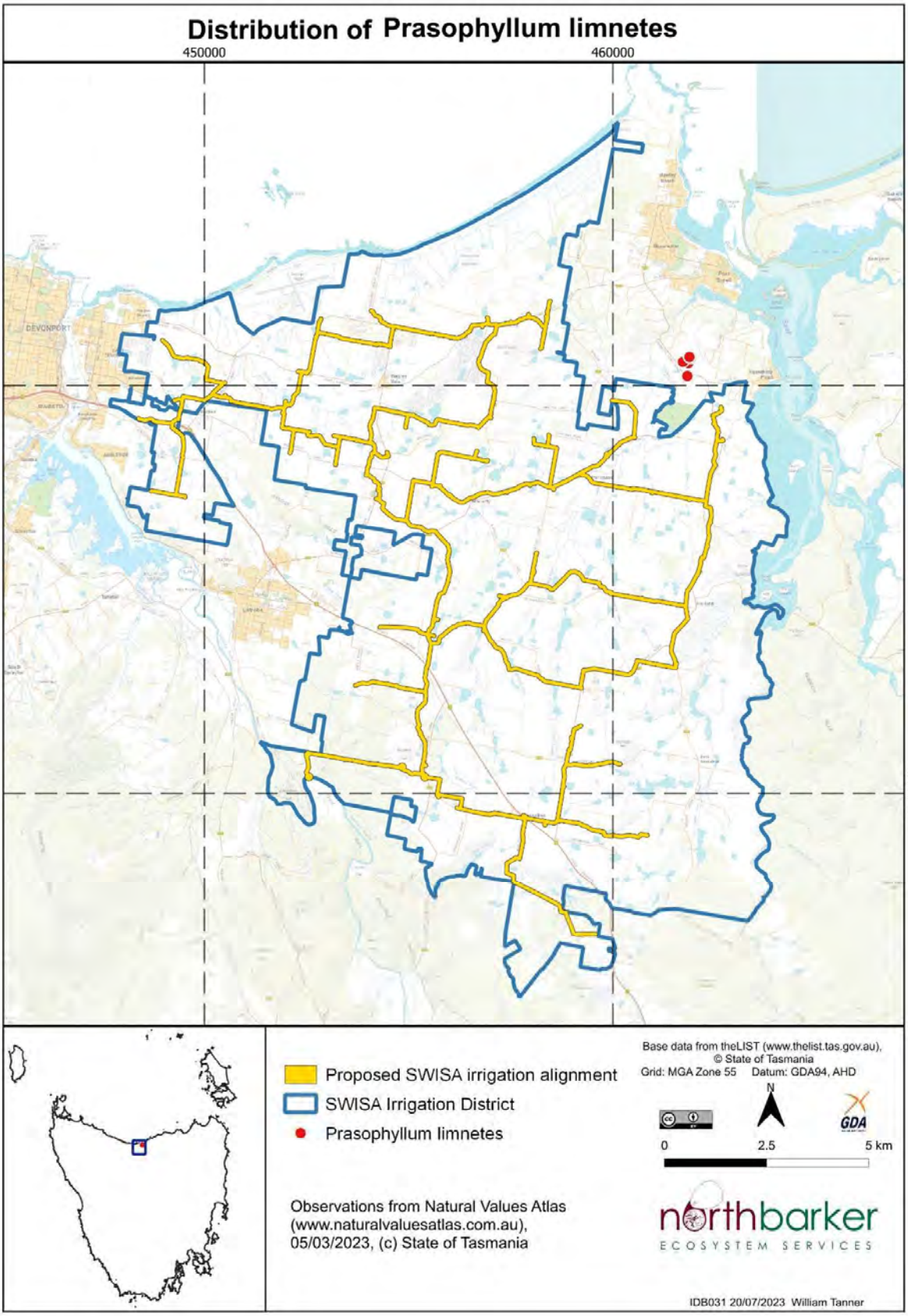
5 km
northbarker
ECOSYSTEM SERVICES
IDB031 20/07/2023 William Tanner


Distribution of Prasophyllum limnetes
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DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Prasophyllum limnetes
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/03/2023, (c) State of Tasmania
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
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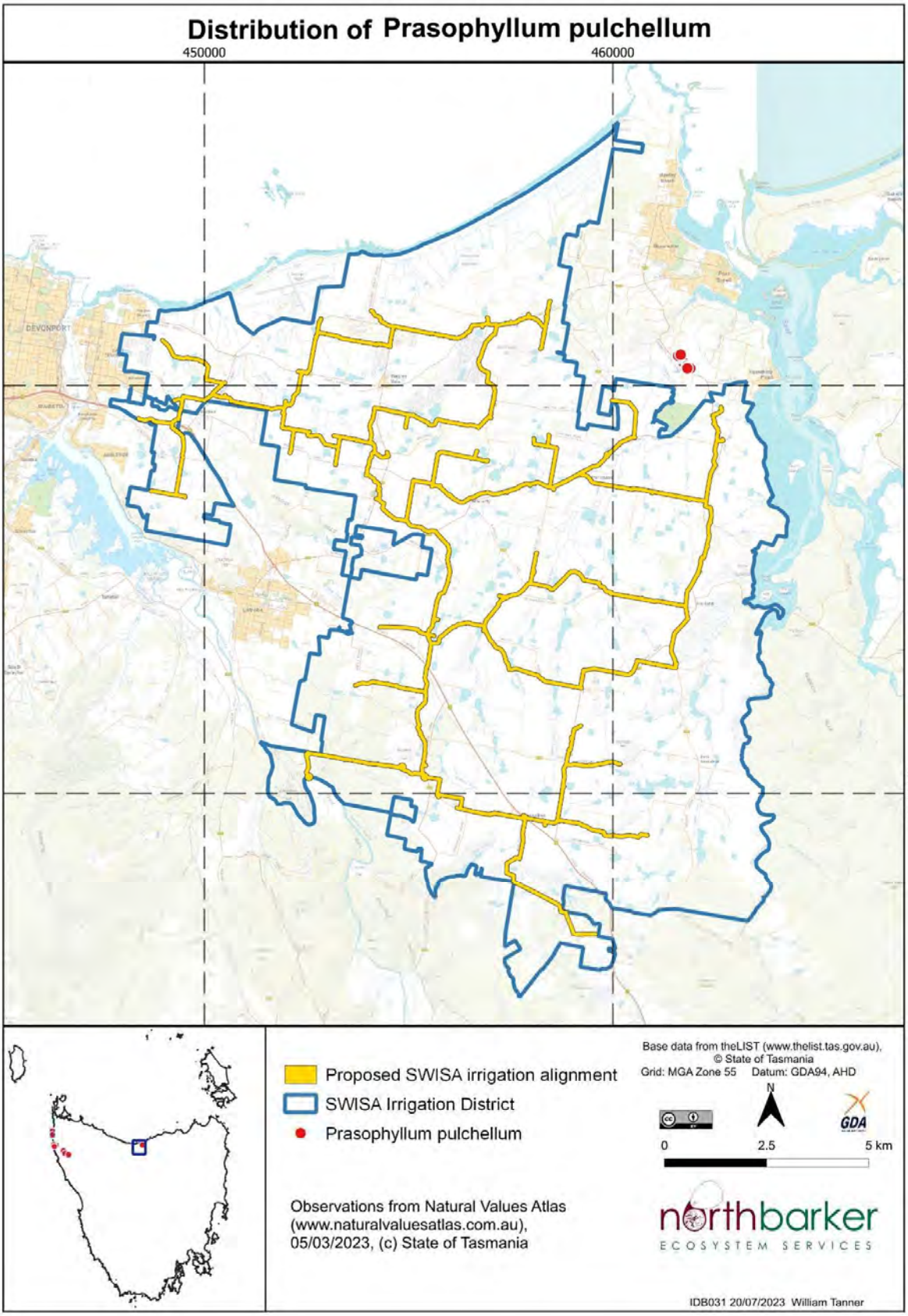
5 km
northbarker
ECOSYSTEM SERVICES
IDB031 20/07/2023 William Tanner


Distribution of Prasophyllum pulchellum
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460000
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5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Prasophyllum pulchellum
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/03/2023, (c) State of Tasmania
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
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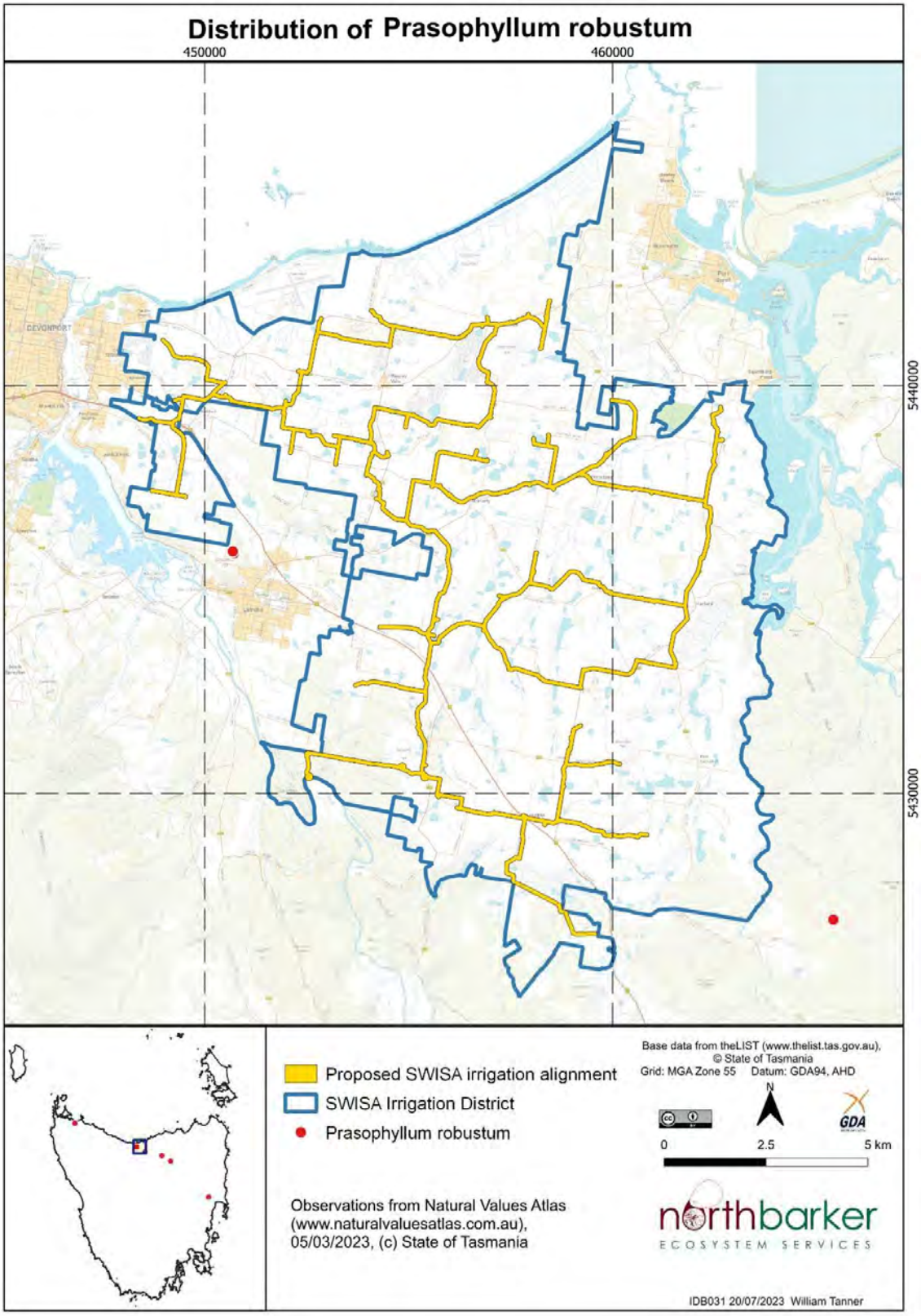
5 km
northbarker
ECOSYSTEM SERVICES
IDB031 20/07/2023 William Tanner


Distribution of Prasophyllum robustum
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460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Prasophyllum robustum
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
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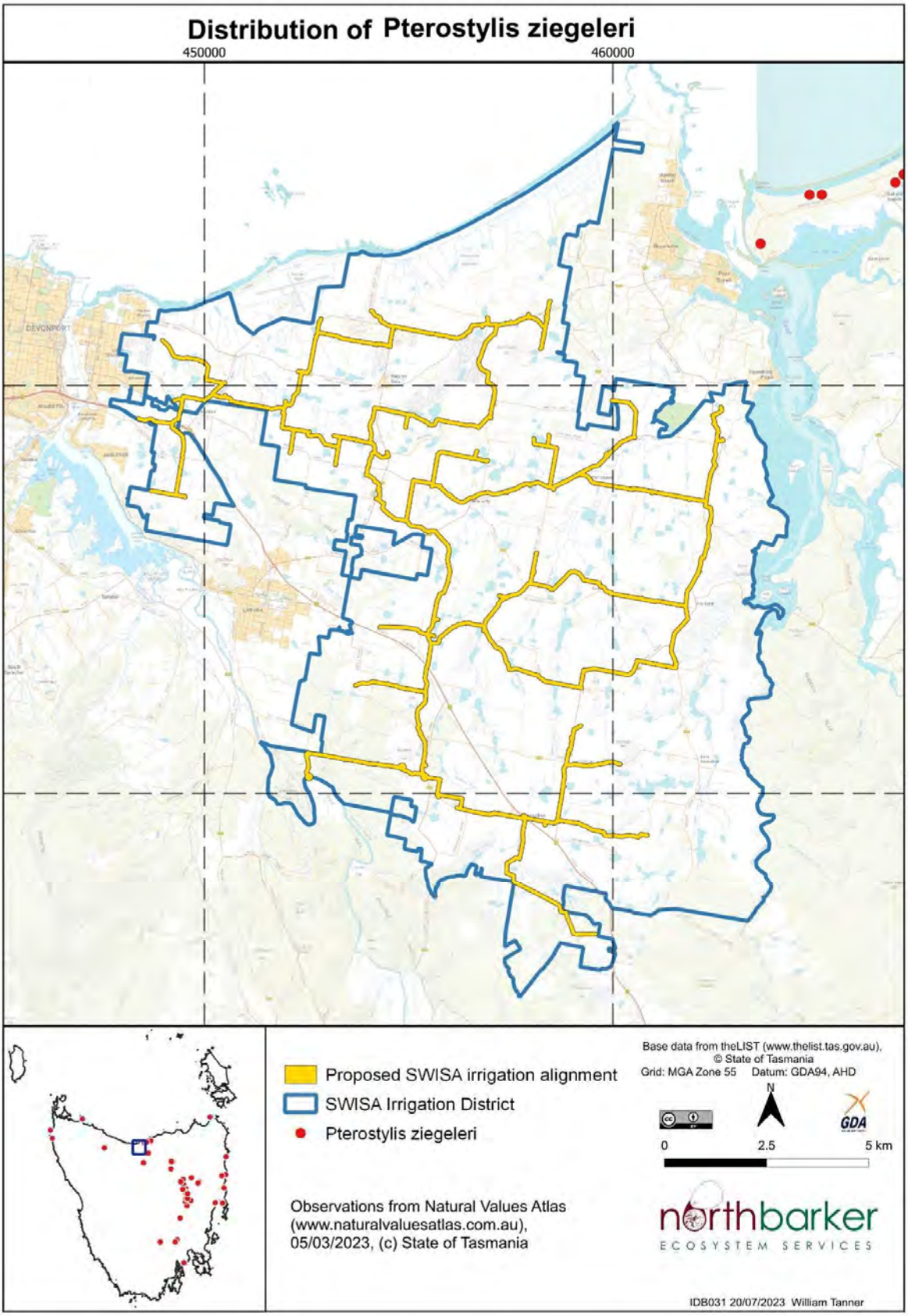
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/03/2023, (c) State of Tasmania
northbarker
ECOSYSTEM SERVICES
IDB031 20/07/2023 William Tanner


Distribution of Pterostylis ziegeleri
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460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Pterostylis ziegeleri
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/03/2023, (c) State of Tasmania
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
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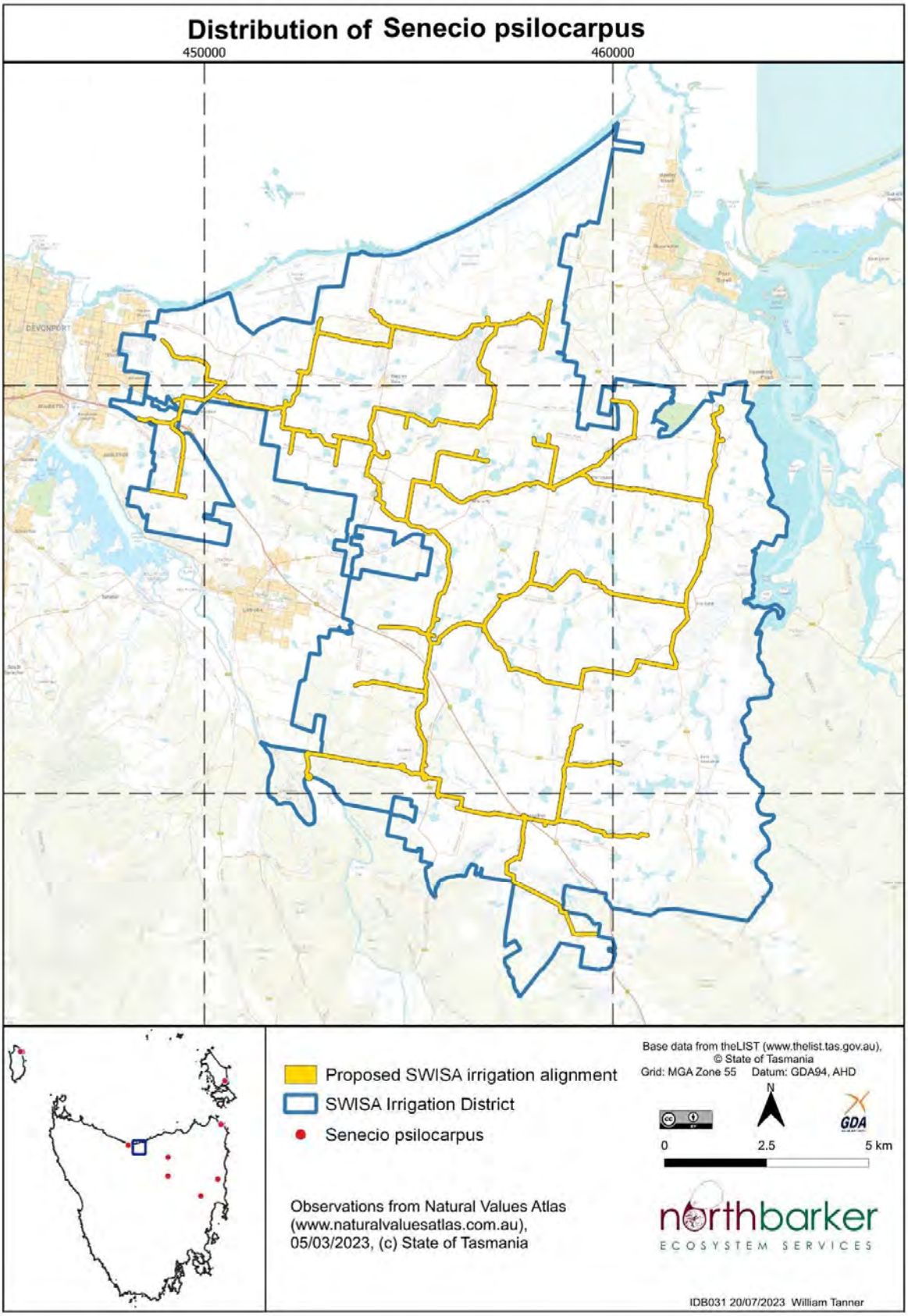
5 km
northbarker
ECOSYSTEM SERVICES
IDB031 20/07/2023 William Tanner


Distribution of Senecio psilocarpus
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460000
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5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Senecio psilocarpus
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/03/2023, (c) State of Tasmania
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
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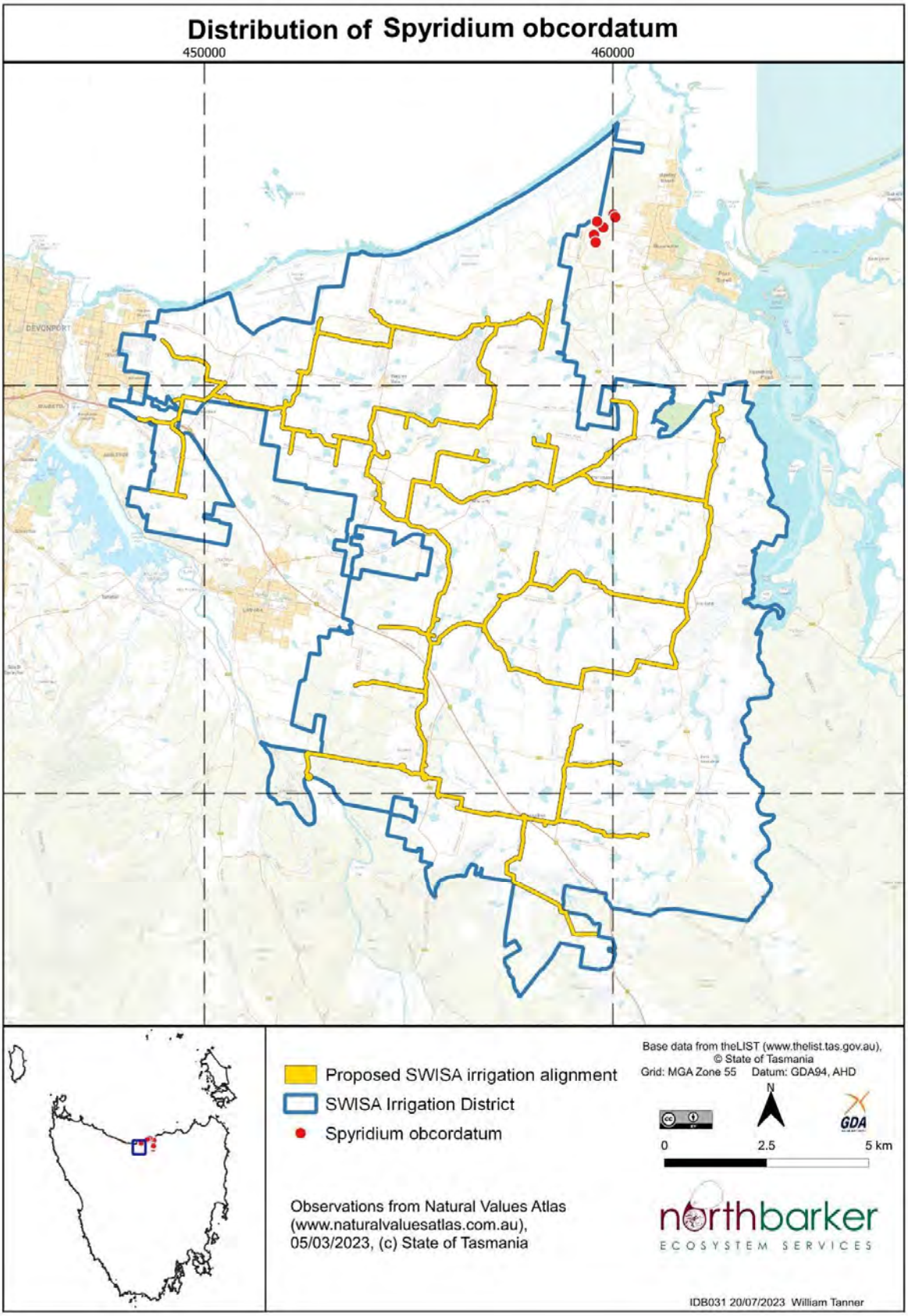
5 km
northbarker
ECOSYSTEM SERVICES
IDB031 20/07/2023 William Tanner


Distribution of Spyridium obcordatum
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5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Spyridium obcordatum
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/03/2023, (c) State of Tasmania
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
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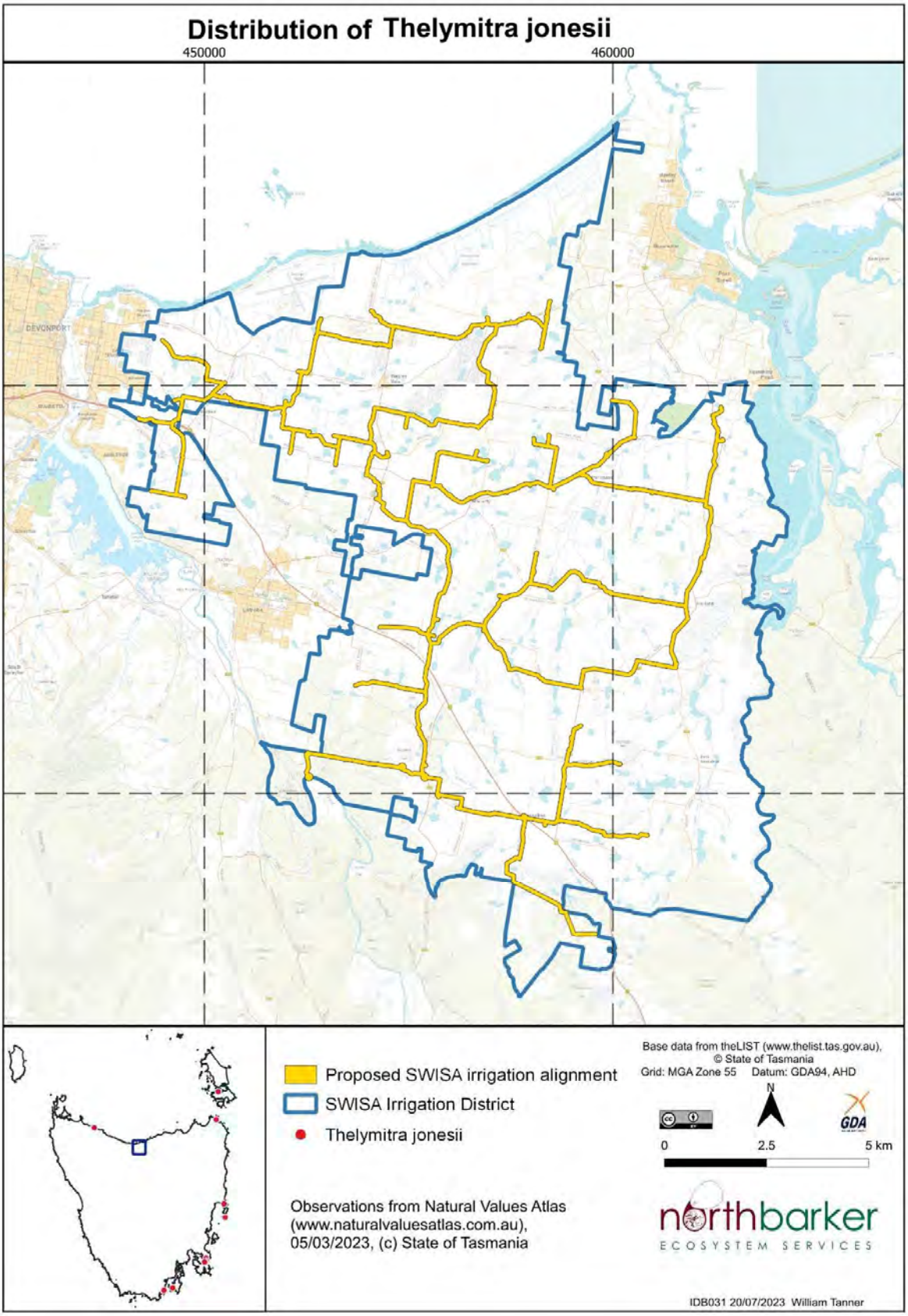
5 km
northbarker
ECOSYSTEM SERVICES
IDB031 20/07/2023 William Tanner


Distribution of Thelymitra jonesii
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460000
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5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Thelymitra jonesii
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/03/2023, (c) State of Tasmania
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
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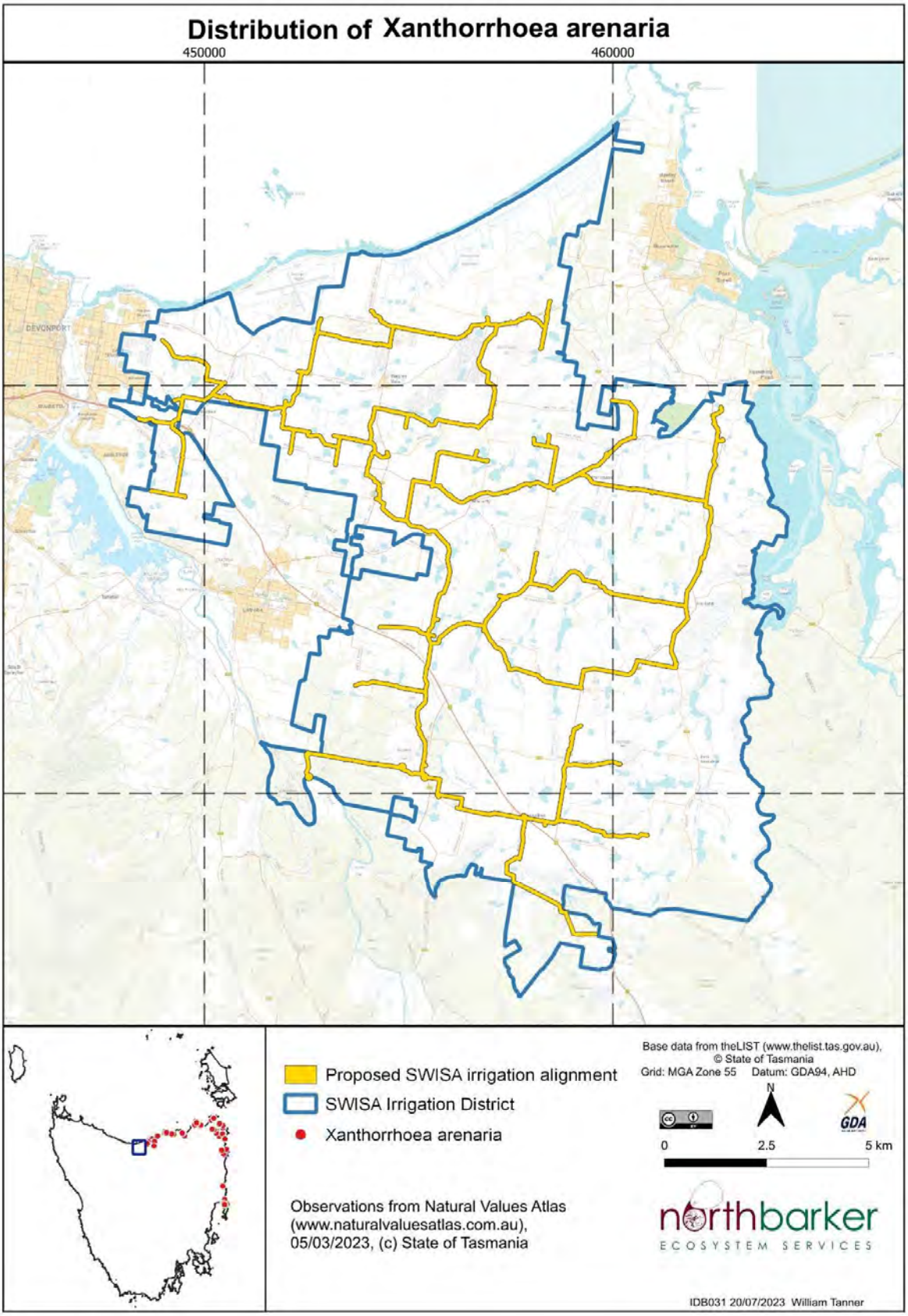
2.5
5 km
northbarker
ECOSYSTEM SERVICES
IDB031 20/07/2023 William Tanner


Distribution of Xanthorrhoea arenaria
450000
460000
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5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Xanthorrhoea arenaria
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/03/2023, (c) State of Tasmania
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
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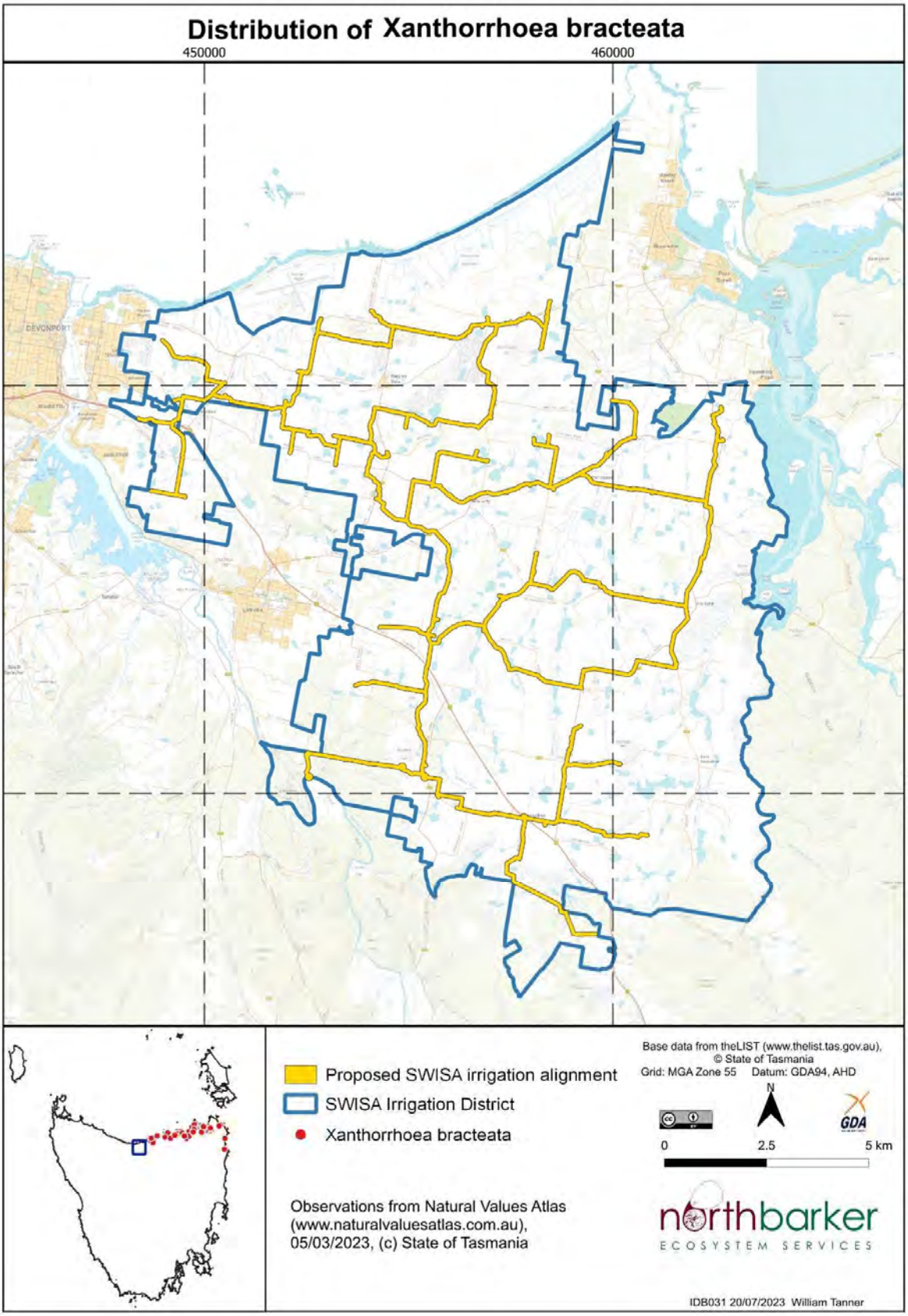
2.5
5 km
northbarker
ECOSYSTEM SERVICES
IDB031 20/07/2023 William Tanner


Distribution of Xanthorrhoea bracteata
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460000
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5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Xanthorrhoea bracteata
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/03/2023, (c) State of Tasmania
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
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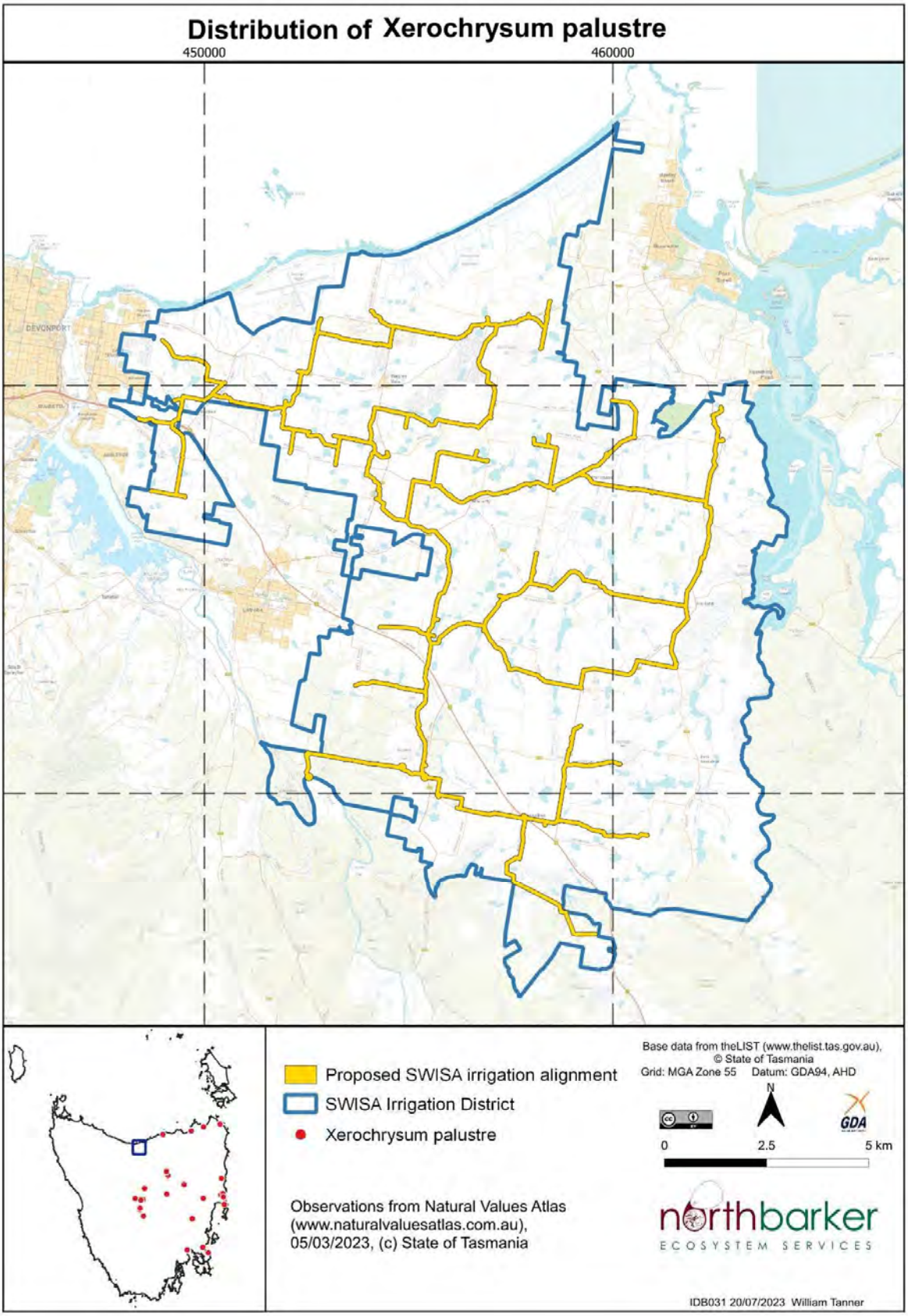
5 km
northbarker
ECOSYSTEM SERVICES
IDB031 20/07/2023 William Tanner


Distribution of Xerochrysum palustre
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Xerochrysum palustre
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/03/2023, (c) State of Tasmania
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
northbarker
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Sassafras – Wesley Vale Irrigation Scheme Augmentation

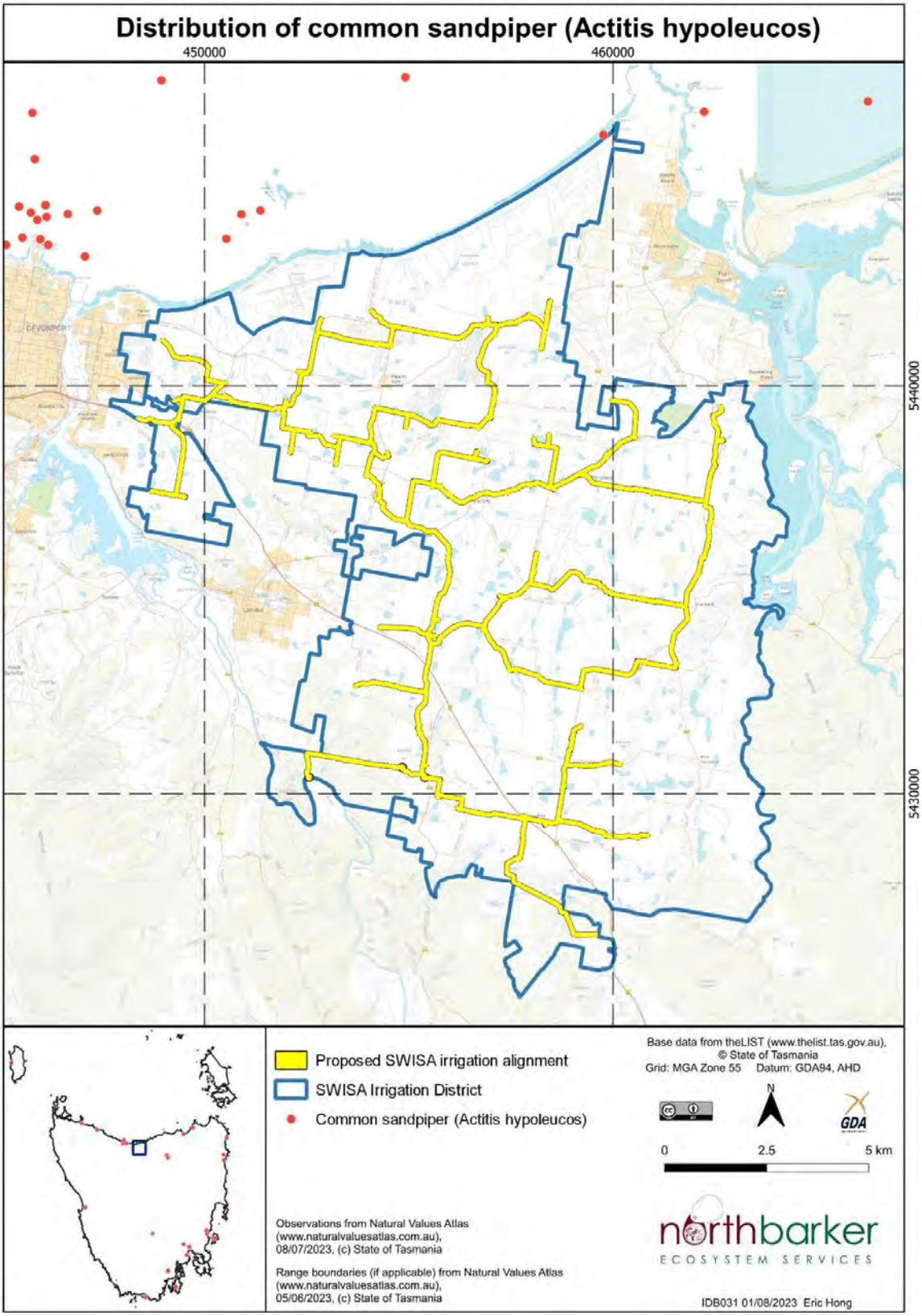
Appendix L - MNES Migratory & Marine Species Distribution

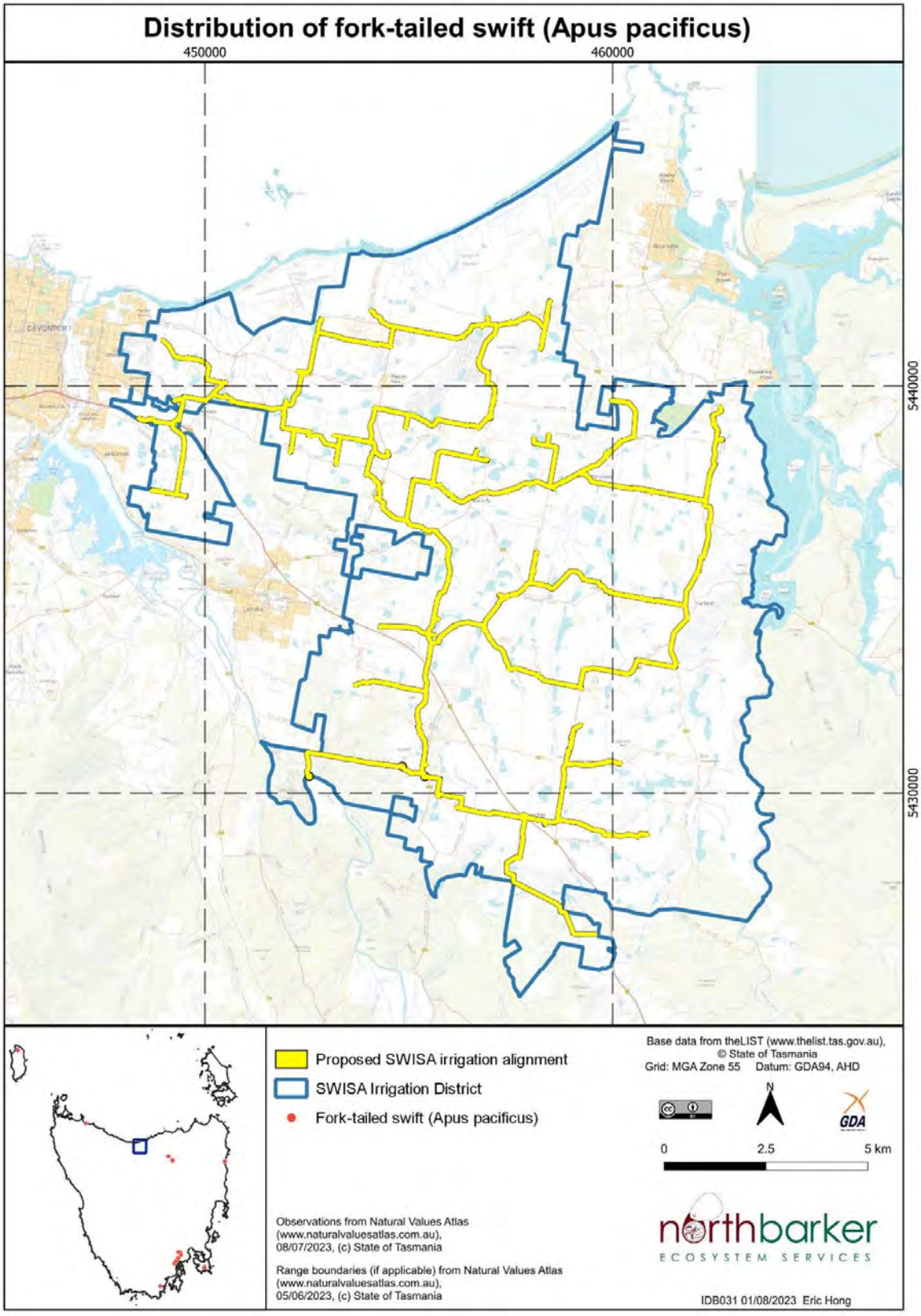
7th August 2023

For Tasmanian Irrigation (IDB031)

313 Macquarie Street, Hobart Tasmania, 7000
03 62319788
admin@northbarker.com.au www.northbarker.com.au

MNES Migratory & Marine Species Distribution




Distribution of fork-tailed swift (Apus pacificus)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Fork-tailed swift (Apus pacificus)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0 2.5 5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
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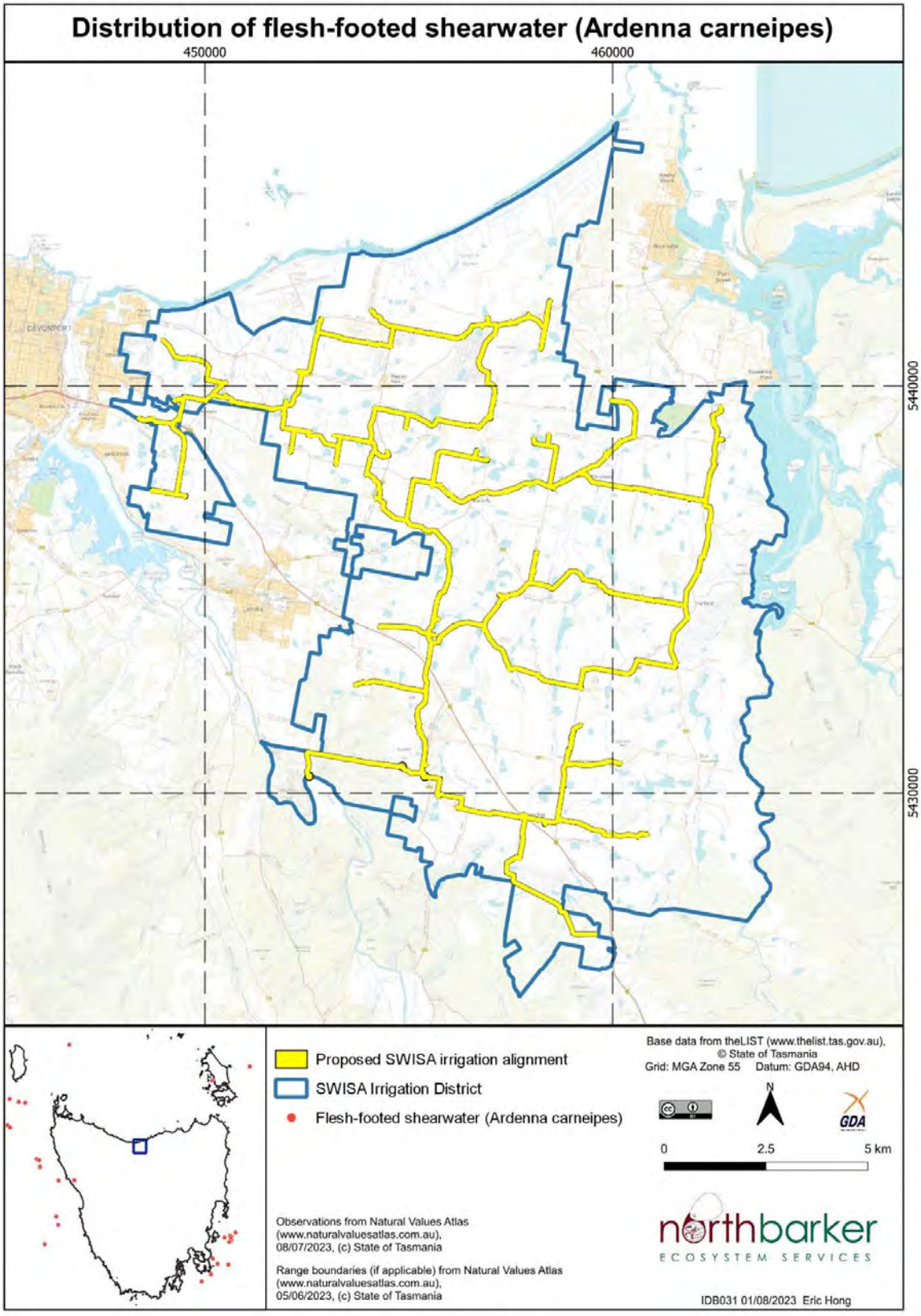
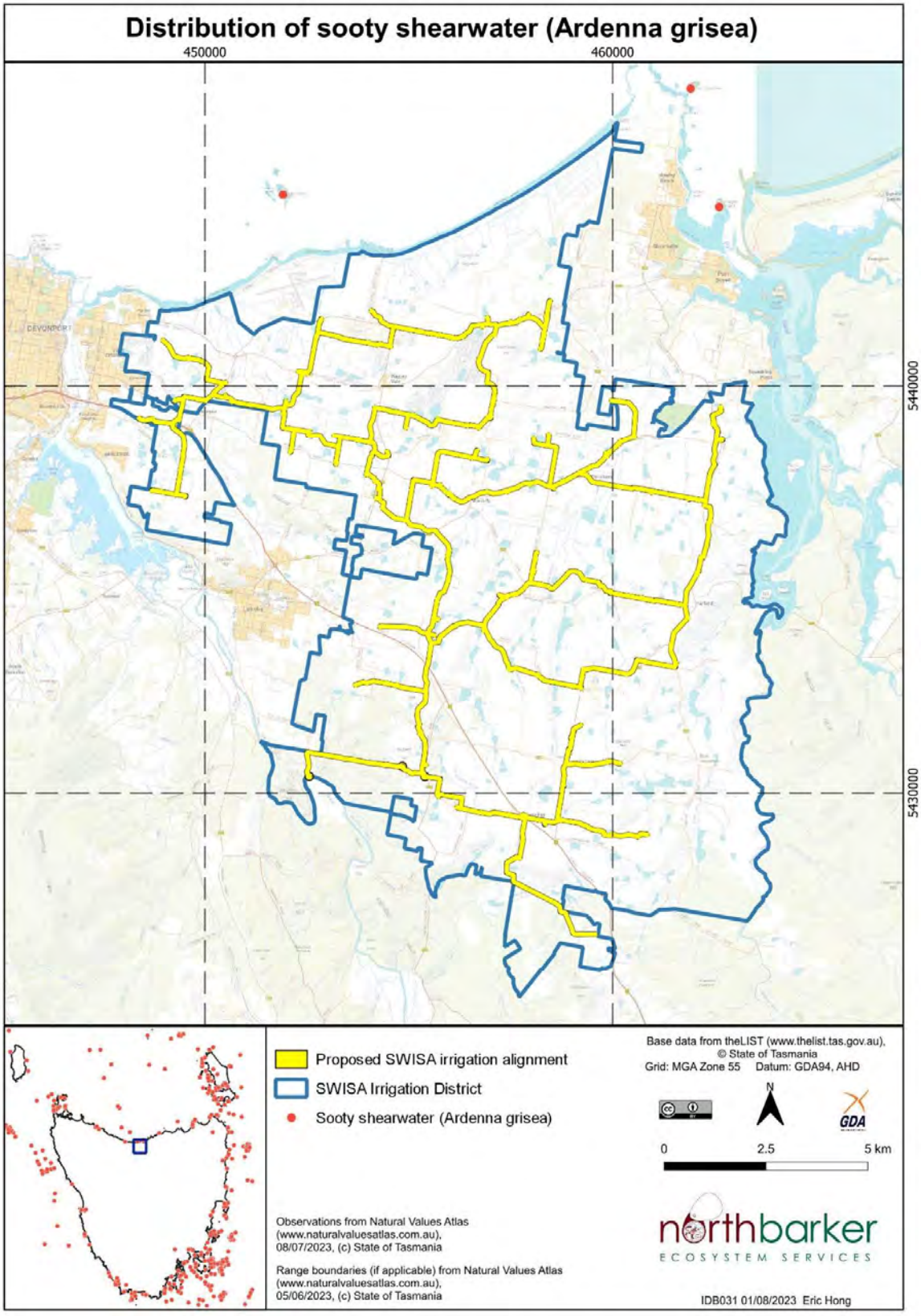

Distribution of flesh-footed shearwater (Ardenna carneipes)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Flesh-footed shearwater (Ardenna carneipes)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0 2.5 5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
ECOSYSTEM SERVICES
IDB031 01/08/2023 Eric Hong


Distribution of sooty shearwater (Ardenna grisea)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Sooty shearwater (Ardenna grisea)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
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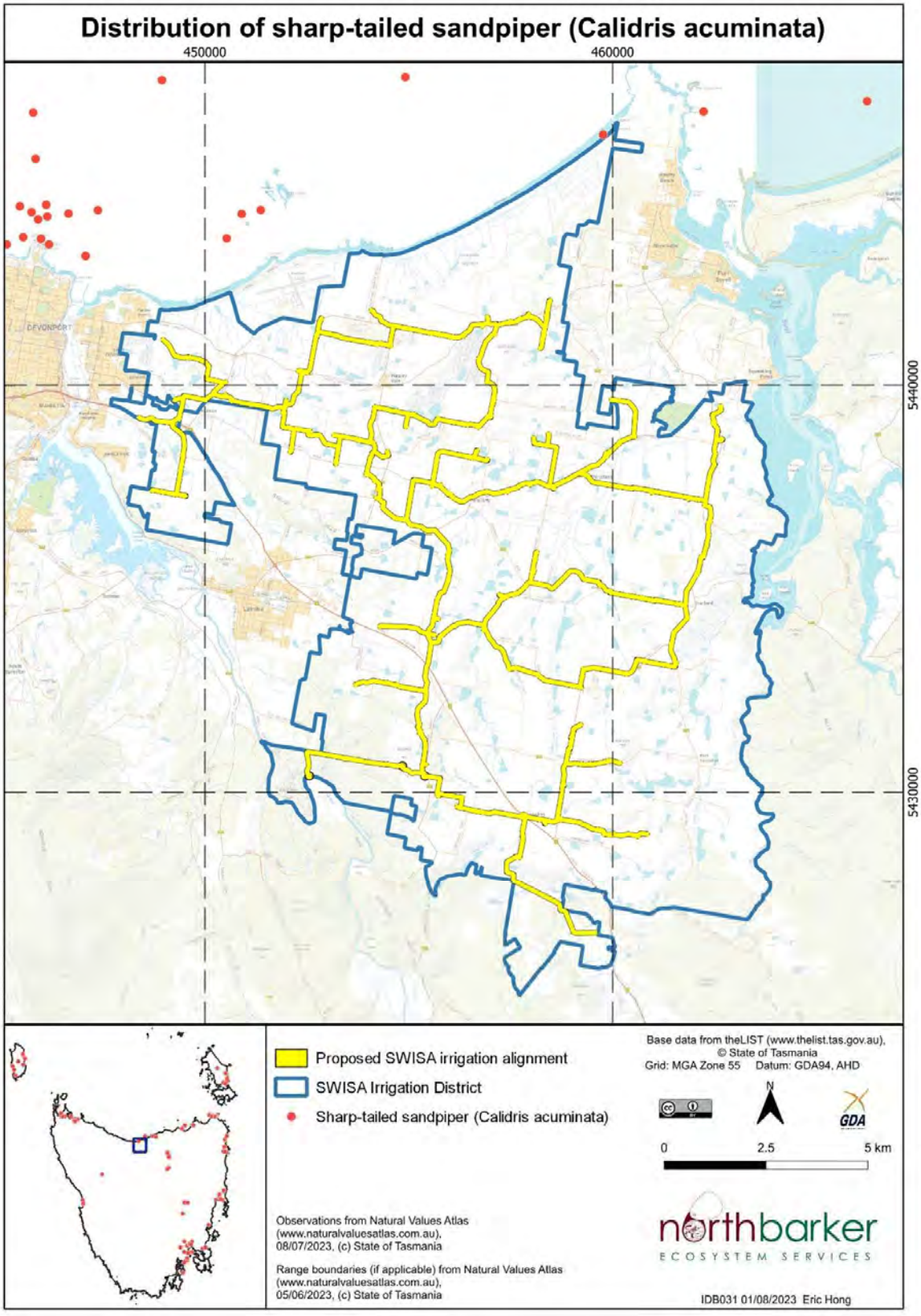
IDB031 01/08/2023 Eric Hong


Distribution of sharp-tailed sandpiper (Calidris acuminata)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Sharp-tailed sandpiper (Calidris acuminata)
Base data from theLIST (www.thelist.tas.gov.au), © State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas (www.naturalvaluesatlas.com.au), 08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas (www.naturalvaluesatlas.com.au), 05/06/2023, (c) State of Tasmania
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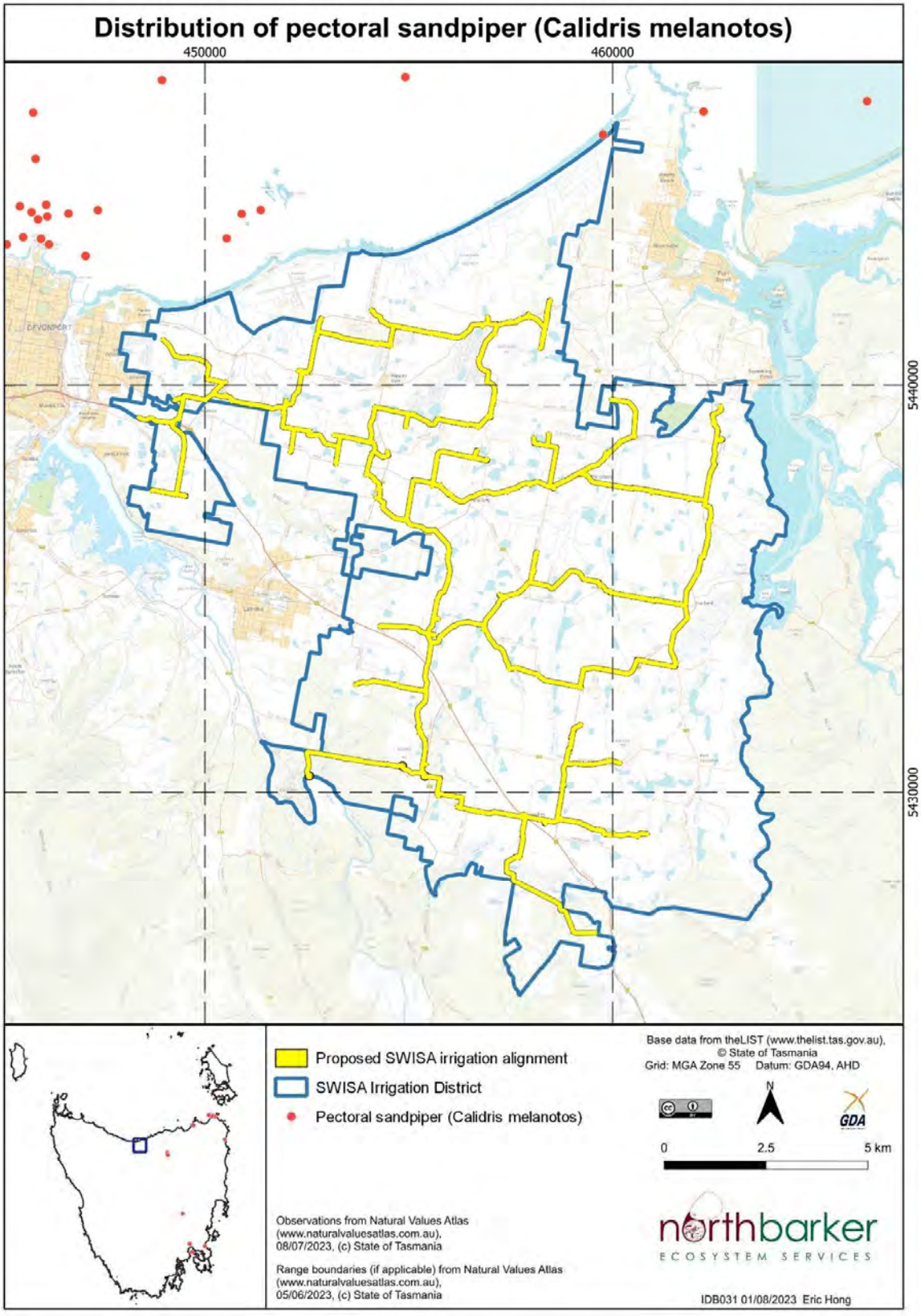
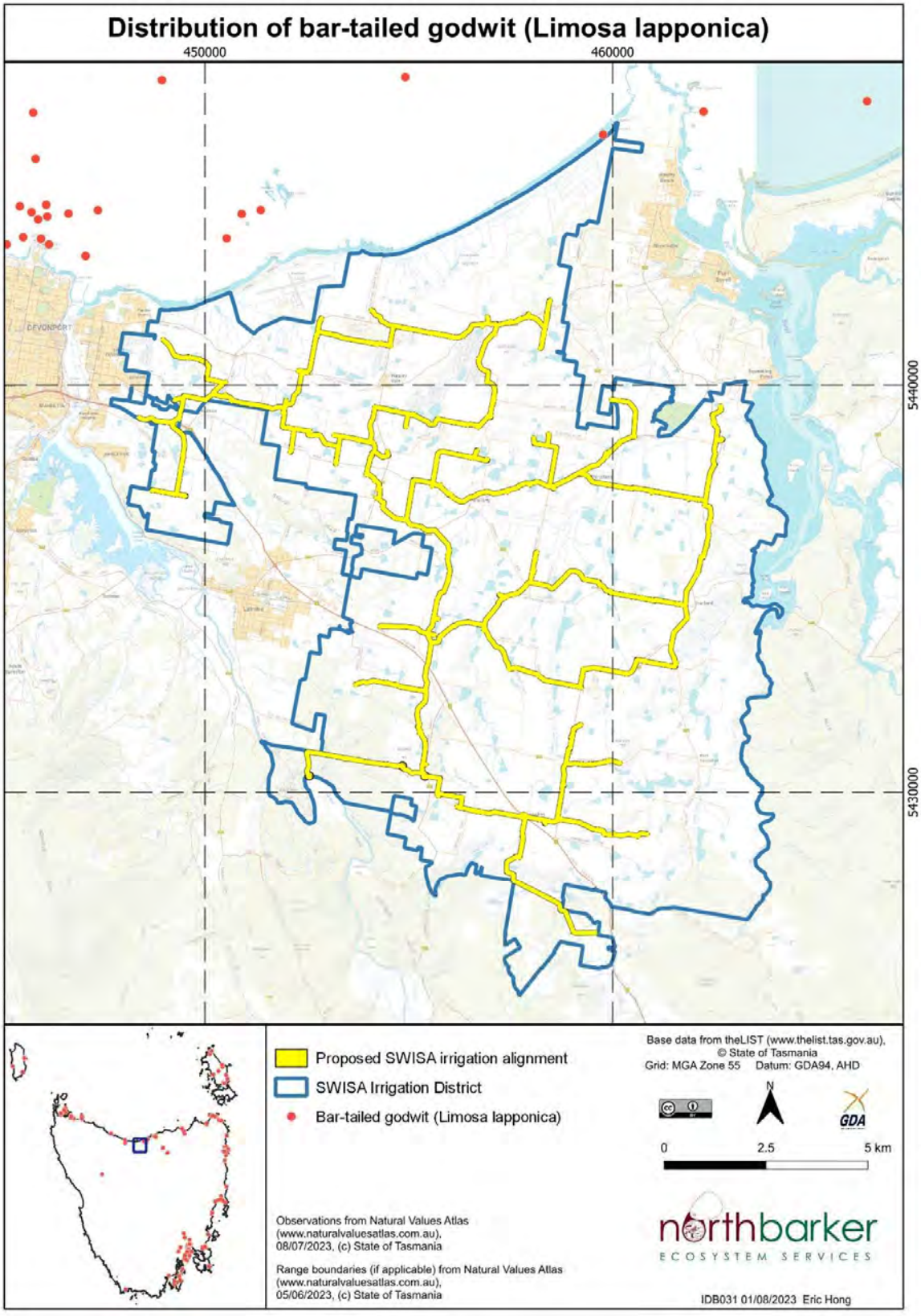
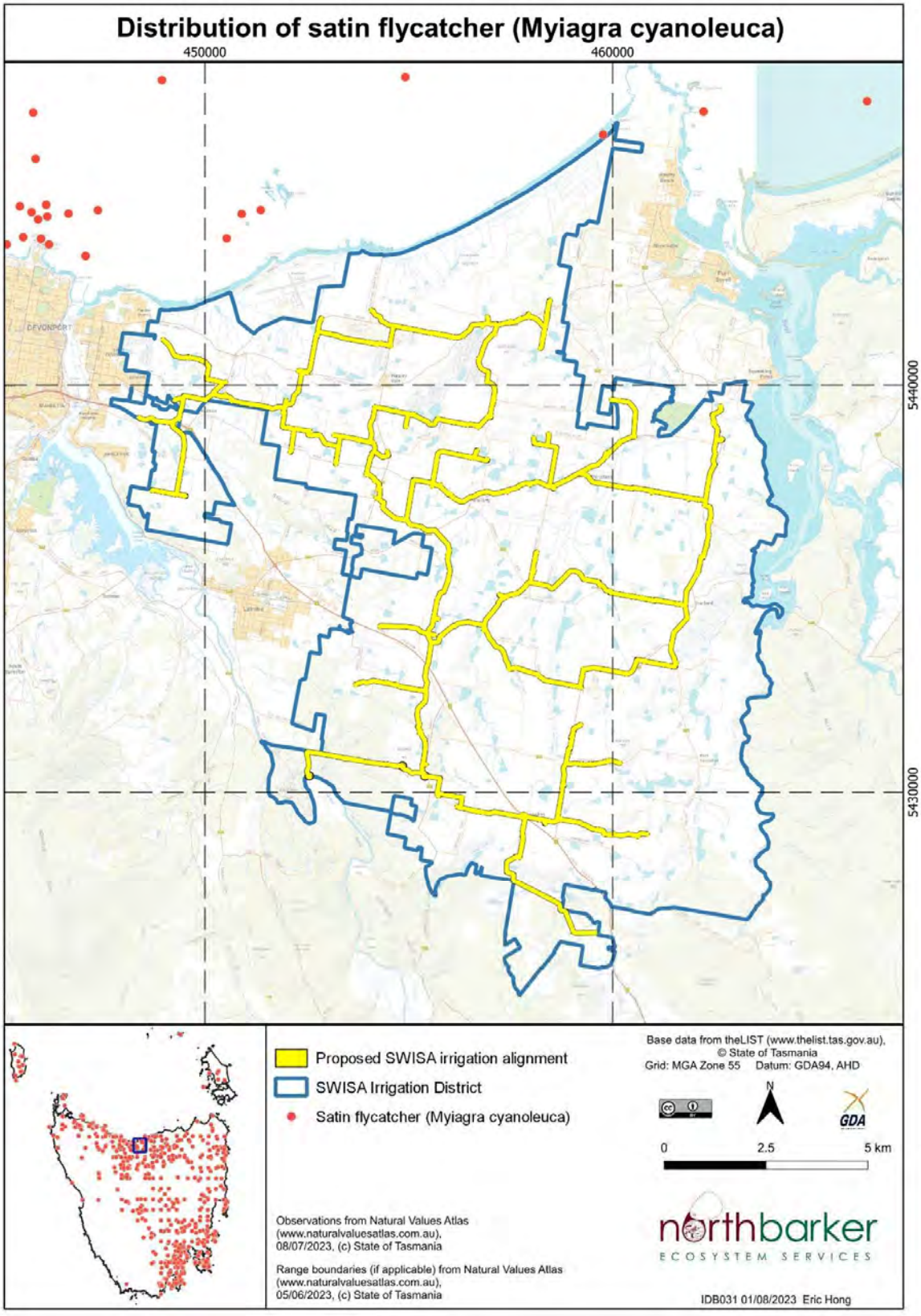

Distribution of pectoral sandpiper (Calidris melanotos)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Pectoral sandpiper (Calidris melanotos)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
ECOSYSTEM SERVICES
IDB031 01/08/2023 Eric Hong


Distribution of bar-tailed godwit (Limosa lapponica)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Bar-tailed godwit (Limosa lapponica)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
0
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
ECOSYSTEM SERVICES
IDB031 01/08/2023 Eric Hong


Distribution of satin flycatcher (Myiagra cyanoleuca)
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460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Satin flycatcher (Myiagra cyanoleuca)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
GDA
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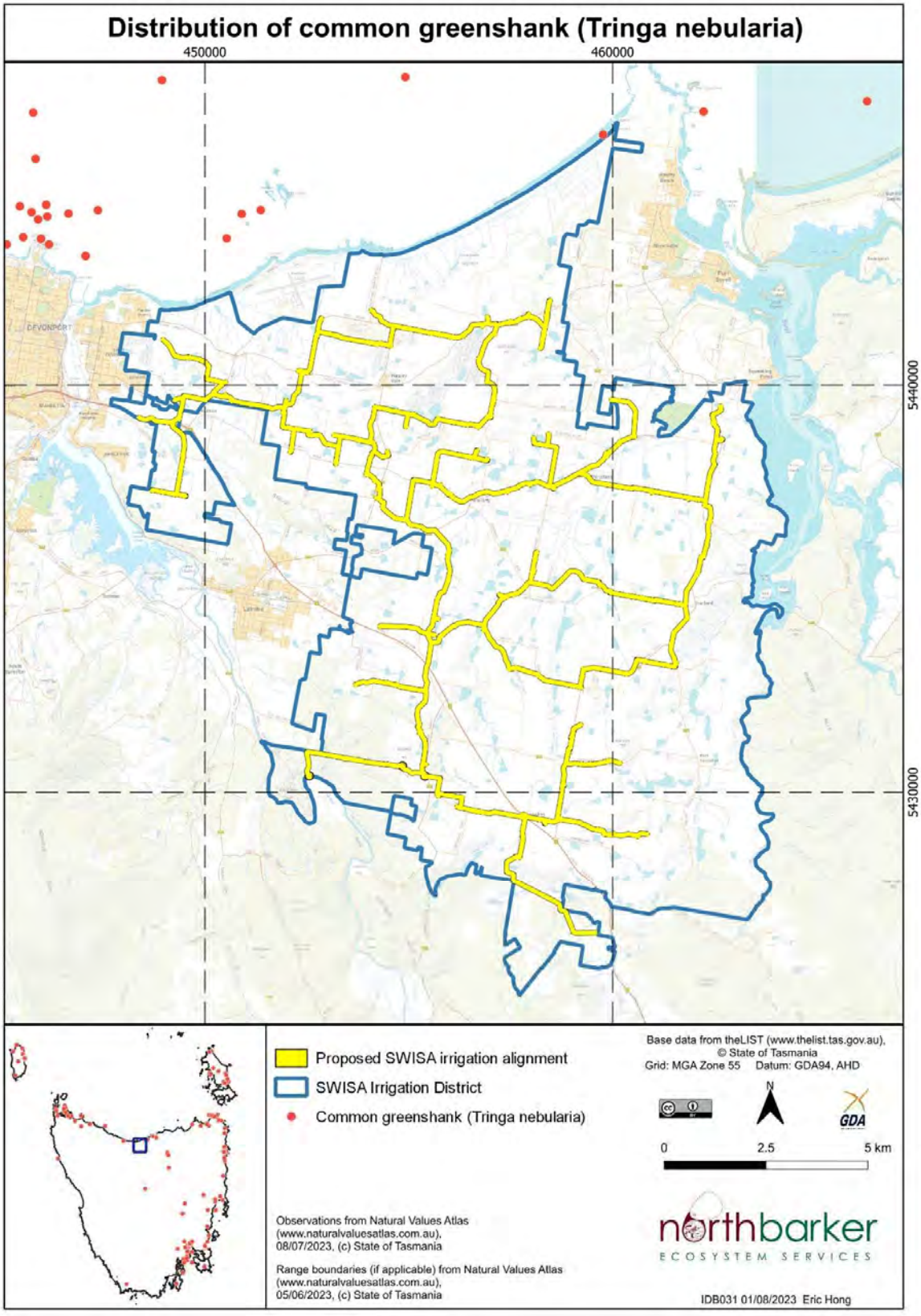
2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
05/06/2023, (c) State of Tasmania
northbarker
ECOSYSTEM SERVICES
IDB031 01/08/2023 Eric Hong


Distribution of common greenshank (Tringa nebularia)
450000
460000
5440000
5430000
DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Common greenshank (Tringa nebularia)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
N
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2.5
5 km
Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
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05/06/2023, (c) State of Tasmania
northbarker
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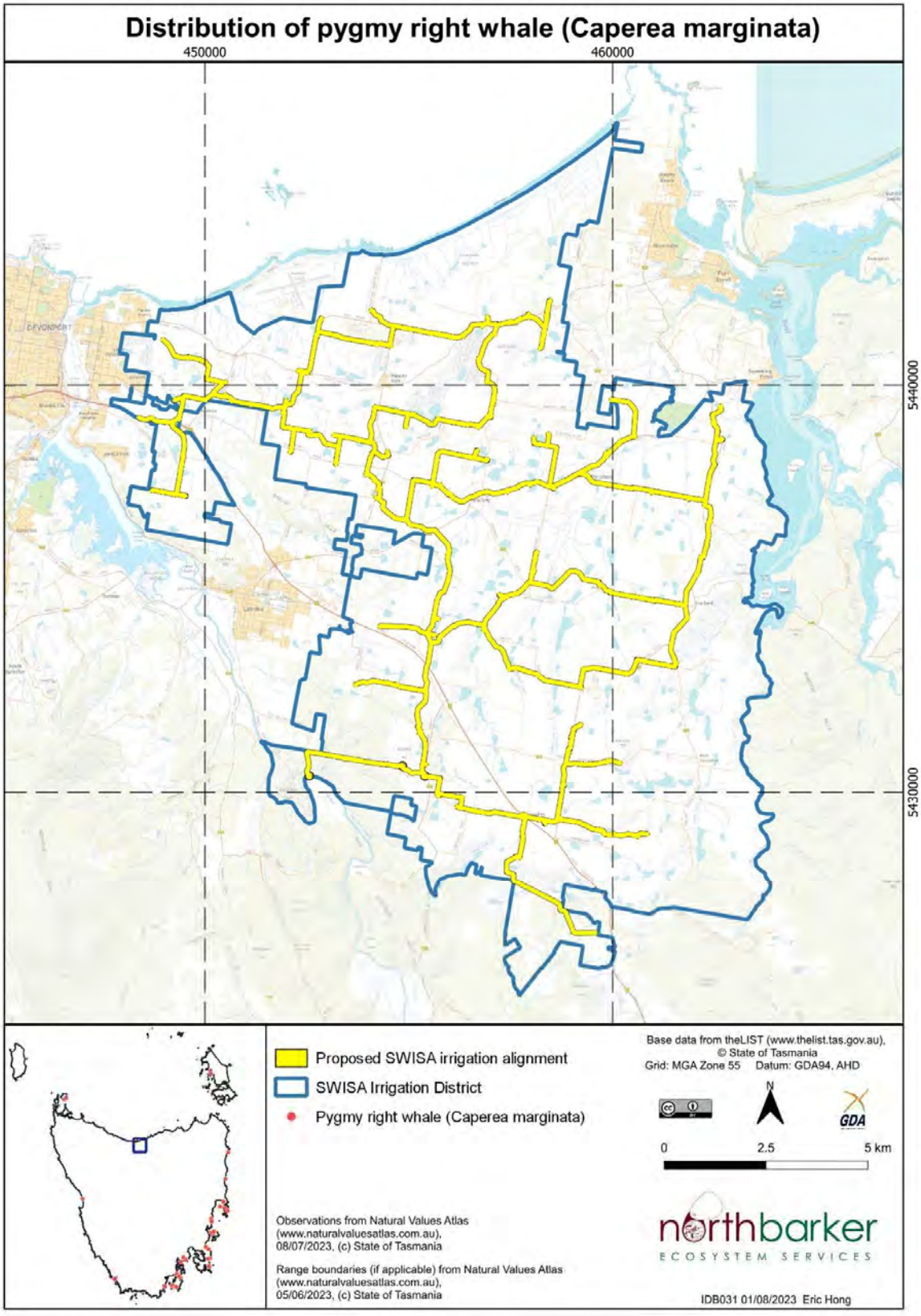
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Proposed SWISA irrigation alignment
SWISA Irrigation District
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Base data from theLIST (www.thelist.tas.gov.au),
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(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
Range boundaries (if applicable) from Natural Values Atlas
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ECOSYSTEM SERVICES
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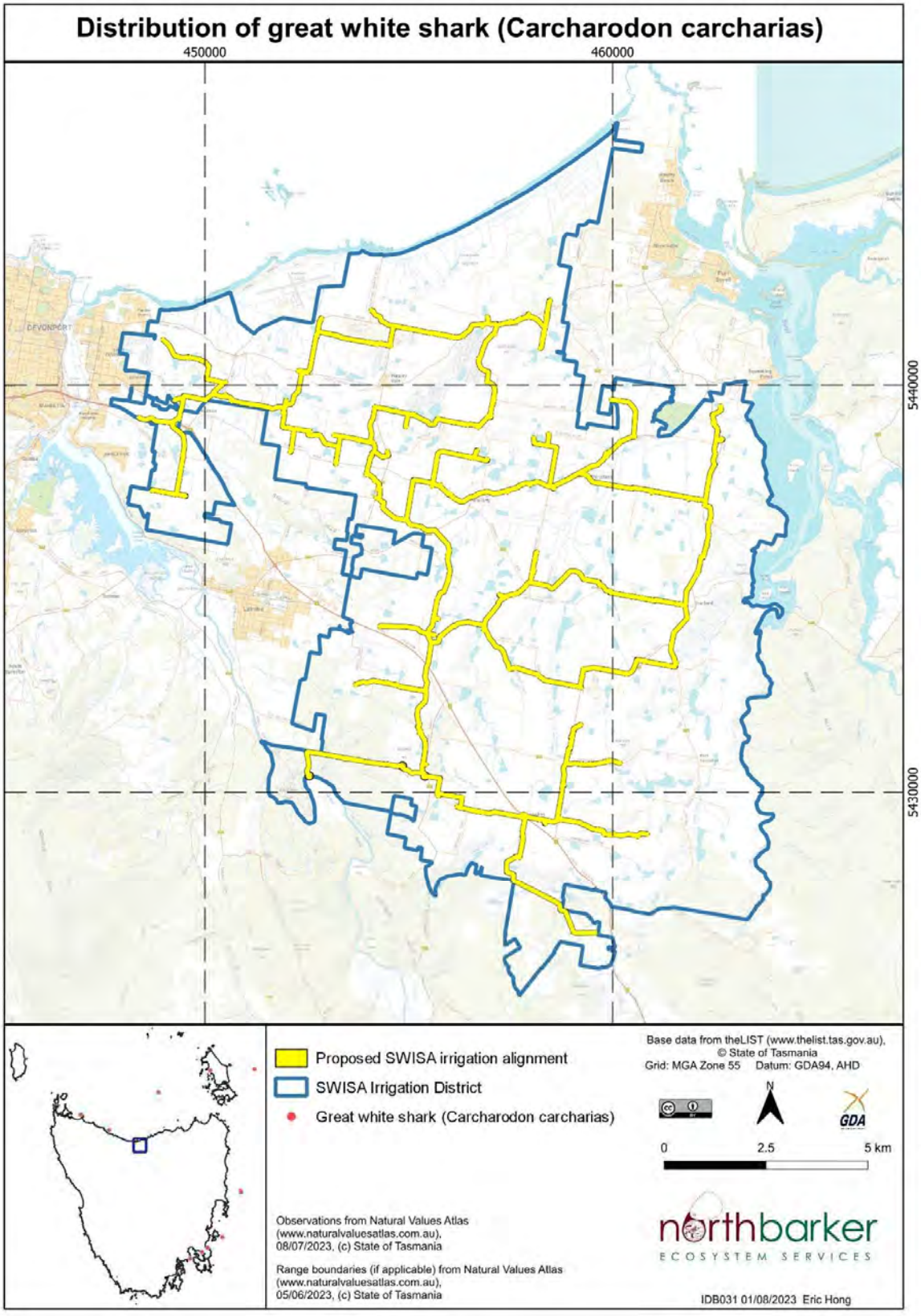
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Proposed SWISA irrigation alignment
SWISA Irrigation District
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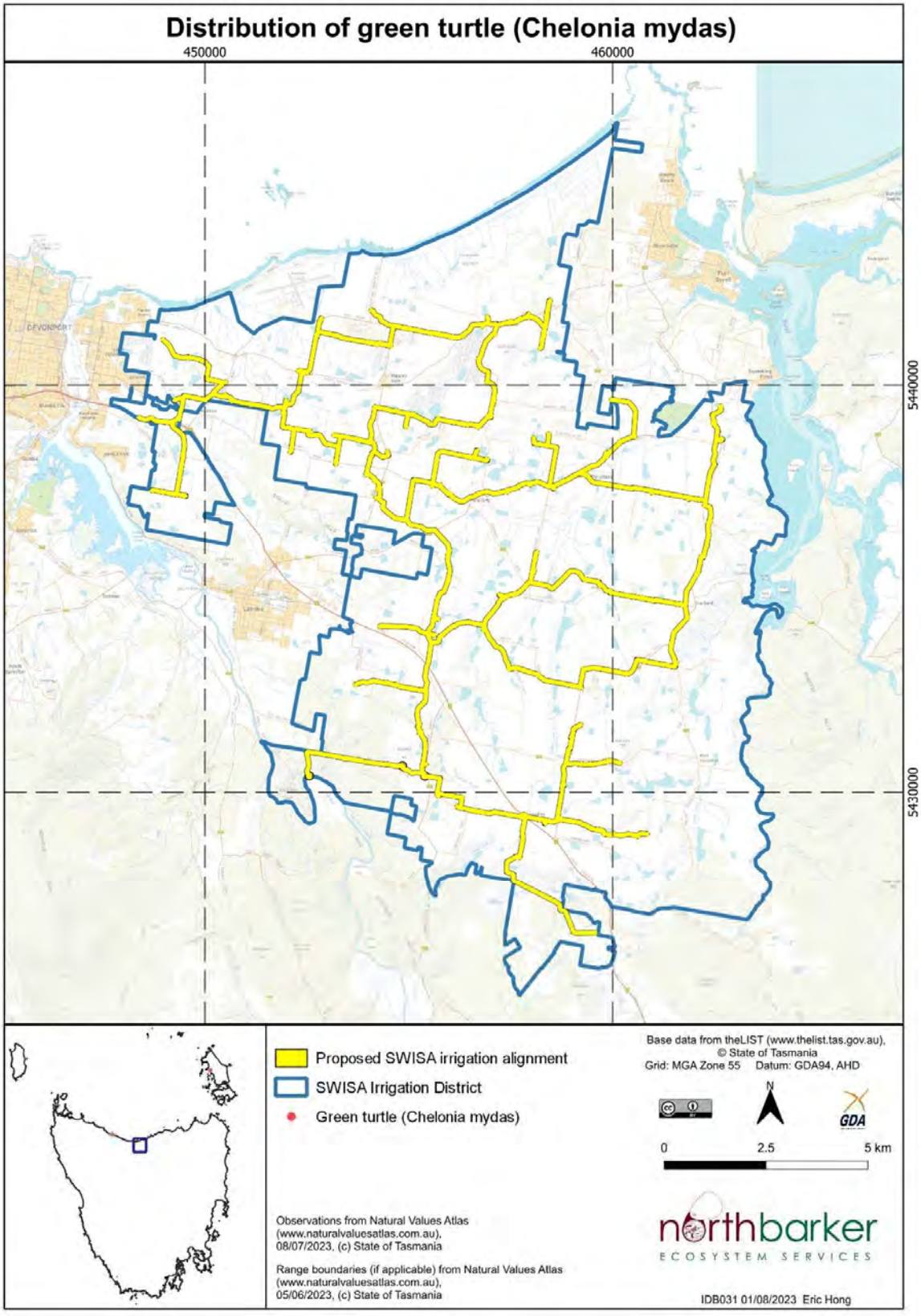
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Proposed SWISA irrigation alignment
SWISA Irrigation District
Green turtle (Chelonia mydas)
Base data from theLIST (www.thelist.tas.gov.au),
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(www.naturalvaluesatlas.com.au),
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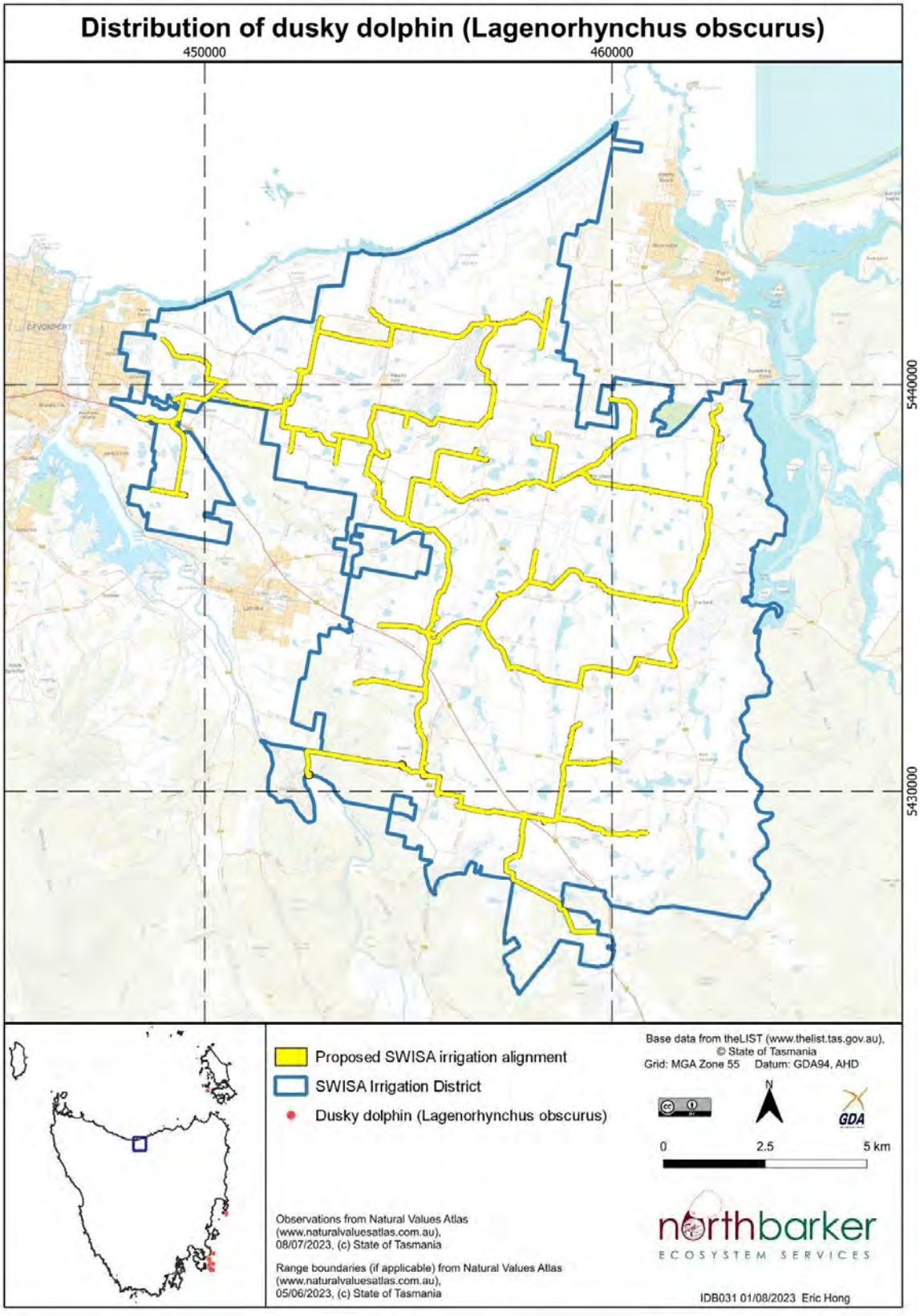
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Proposed SWISA irrigation alignment
SWISA Irrigation District
Dusky dolphin (Lagenorhynchus obscurus)
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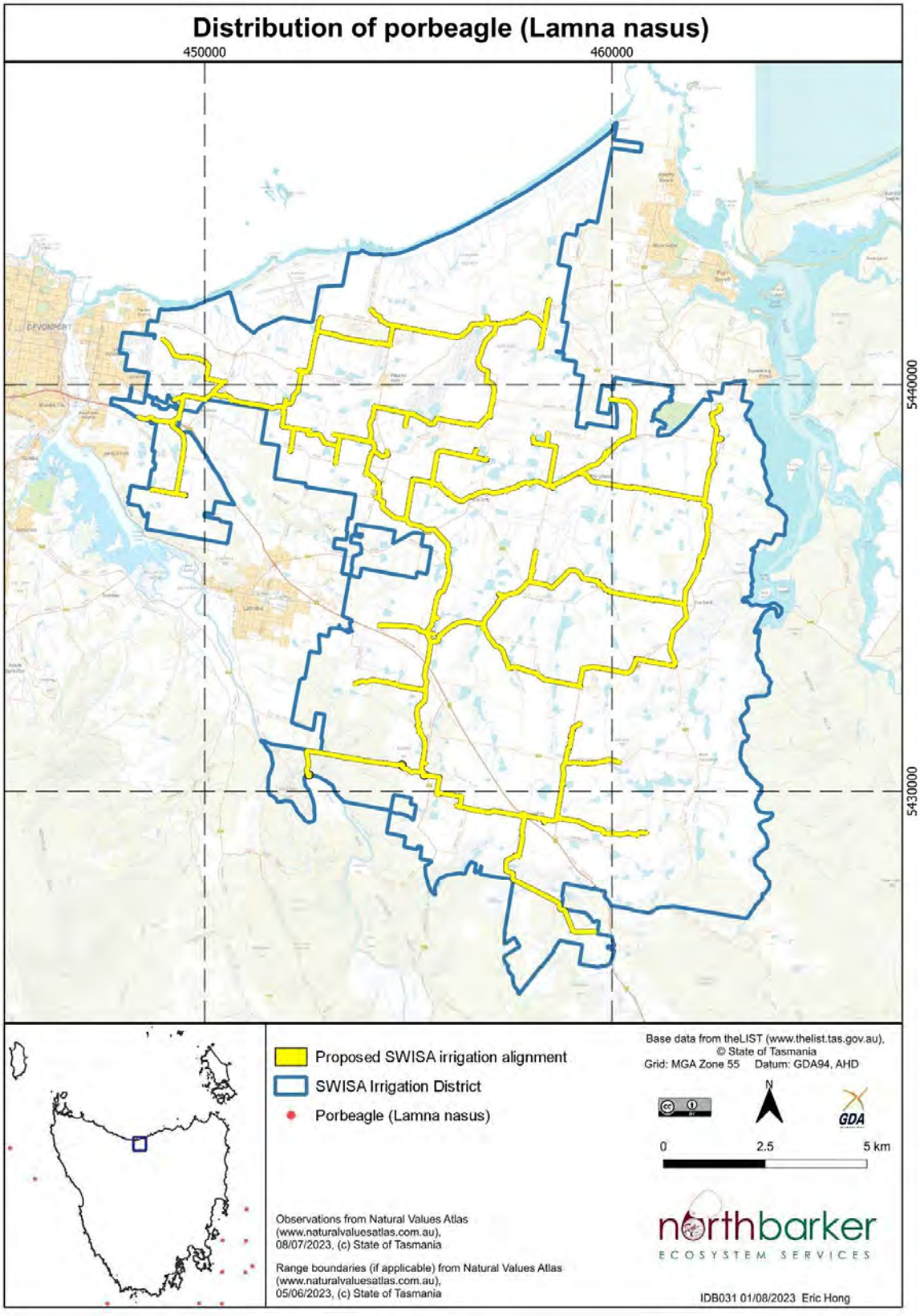
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SWISA Irrigation District
Porbeagle (Lamna nasus)
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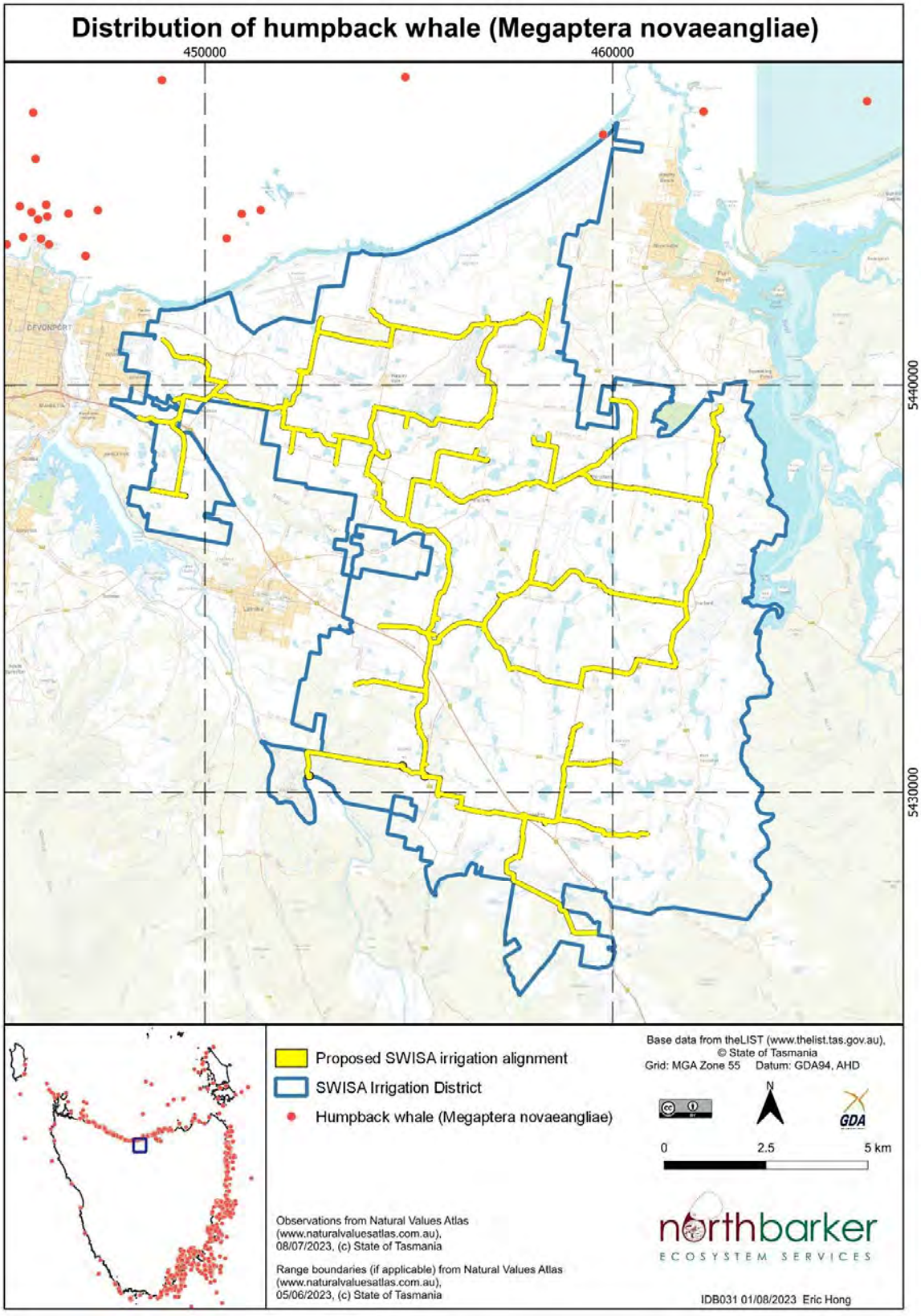
Distribution of humpback whale (Megaptera novaeangliae)
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DEVONPORT
Proposed SWISA irrigation alignment
SWISA Irrigation District
Humpback whale (Megaptera novaeangliae)
Base data from theLIST (www.thelist.tas.gov.au),
© State of Tasmania
Grid: MGA Zone 55 Datum: GDA94, AHD
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Observations from Natural Values Atlas
(www.naturalvaluesatlas.com.au),
08/07/2023, (c) State of Tasmania
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(www.naturalvaluesatlas.com.au),
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Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA) Project

Historic Heritage Assessment Report

AUTHOR: Stuart Huys
27 Apsley St, South Hobart TAS 7004

CLIENT: Tasmanian Irrigation

9.7.2023

CULTURAL HERITAGE MANAGEMENT AUSTRALIA

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Executive Summary

Project Details

The Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA) is a proposed redevelopment of the existing Sassafras Wesley Vale Irrigation Scheme (SWIS). The project includes the upgrade of the existing Great Bend Pump Station, a new Balance Tank located on Saggers Hill along with approximately 100km of new pipeline. The Irrigation district spans from Pardo in the west to Upper Sassafras in the east, including locations such as Latrobe, Moriarty, Harford, Northdown, and Thirlstane. The Augmentation is expected to deliver an additional 9200ML of summer water on top of the existing 5460ML supply under SWIS water entitlements. The project is earmarked to begin construction in late 2023 with an expected completion date of November 2025. This project is a joint venture partnership between the district Landowners along with State and Federal Government. Figure 1 shows the general location of the SWISA project. Figure 2 shows the SWISA project footprint.

CHMA (2009 and 2010) was engaged by Tasmanian Irrigation (TI) to undertake an Aboriginal and Historic heritage assessment for the original corridor alignment for the Sassafras Wesley Vale Irrigation Scheme (SWIS). Numerous sections of the SWIS corridor assessed by CHMA (2009 and 2010) are shared with the current SWISA corridor alignment. Figure 3 shows the SWIS corridor assessed by CHMA (2009 and 2010) overlaid with the current SWISA corridor.

As part of the planning works, CHMA Pty Ltd has been engaged by TI to undertake an historic heritage assessment for the SWISA project. This report presents the findings of the assessment.

Results of the Search of the Heritage Registers

As part of Stage 1 of the desktop assessment a search was carried out of Tasmanian Heritage Register (THR) in order to determine the extent of listed historic sites and places in the vicinity of the SWISA pipeline easement. The search results shows that there are no heritage places located within or in the immediate surrounds of the study area that are no sites or places listed on the THR that are situated in the immediate vicinity of the study area. The investigations undertaken by CHMA (2009 and 2010) for the SWIS pipeline easement also did not identify any THR listed historic sites or features.

The heritage register search results does show that a section of the pipeline easement traverses the boundaries of a property that is listed as a Local Heritage Place under the Tasmanian Planning Scheme. The property (CT144681/1) is located at Northdown, around the north-east end of the SWISA pipeline network (see Figure i). It is situated immediately south of Port Sorell Road and immediately west with the junction of Appleby Road. A 150m section of the pipeline easement traverses along the western boundary of the property (see Figure ii).

Survey Results and Statement of Archaeological Potential

As noted above, a 150m section of the SWISA pipeline easement traverses the boundaries of a property that is listed as a Local Heritage Place under the Tasmanian Planning Scheme. The property (CT144681/1) is located at Northdown, around the north-east end of the SWISA pipeline network (see Figures I and ii).

The proposed scope of works in this area will involve the installation of a new water pipeline along the western edge of the property boundary. The pipeline will be installed via trenching and conducted in accordance with Australian Pipelines and Gas Association Code of Environmental Practice 2017. The trench will be approximately 1.5m in width and to a depth which will allow for a minimum of 700mm soil cover over the top of a pipe to allow for agricultural activities to continue over the alignment. Following installation, the pipeline will be covered and re-vegetated like for-like.

A survey inspection of this section of the pipeline easement was carried out on the 30.5.2023 by Stuart Huys (CHMA archaeologist). The 150m section of the pipeline easement traverses a cleared farm paddocks on the property and runs parallel to and immediately to the east of a graded vehicle track. No historic heritage features were identified through the survey of this section of pipeline easement. The pipeline easement is confirmed as avoiding all built structures on the property, including buildings, stone walls and heritage landscape plantings associated with the property. A review of the available information does not indicate that any dwellings or other structures were ever constructed within or in the immediate vicinity of the pipeline easement and based on the observations made during the survey, the archaeological potential along this section of the pipeline easement is assessed as being very low.

Besides the property described above, no other historic sites or suspected features were identified during the field survey assessment of the SWISA project footprint. As described in section 3 of the report, surface visibility across the SWISA project footprint was variable, ranging between 10% to 40%. Given these constraints, it can't be stated with absolute certainty that there are no undetected historic heritage sites present in the GMIS project footprint. With this acknowledged, the potential for undetected historic sites to be present is assessed as being very low.

Management Recommendations

The heritage management options and recommendations provided in this report are made on the basis of the following criteria.

- Background research into the extant archaeological and historic record for the study area and its surrounding regions, as documented in section 4 of this report.
- The results of the heritage register searches and field investigation as documented in section 4 of this report.
- The results of the field survey assessment, as presented in section 5 of the report.

- The legal and procedural requirements as summarised in section 6 of this report.

Recommendation 1 (Property CT144681/1)

The property at Northdown (CT144681/1) is on the *Latrobe Interim Planning Scheme 2013* (now operating under the *Tasmanian Planning Scheme*), where it is listed within the Local Historic Heritage Code. The listing is a whole of title property listing. A 150m section of the SWISA pipeline easement traverses along the western boundaries of this property. This assessment has confirmed this section of pipeline easement avoids all built structures on the property, including buildings, stone walls and heritage landscape plantings associated with the property. The installation of the pipeline will have no adverse affects on the heritage values of the property, and satisfies the performance criteria outlined in section C6 of the *Tasmanian Planning Scheme.*

Recommendation 2 (Unanticipated Discoveries of historic features)

No other historic sites or suspected features were identified during the field survey assessment of the SWISA project footprint and it is assessed that there is a very low potential for undetected Historic heritage sites to occur within the SWISA project footprint. However, as per the Practice Note No 2 by the Tasmanian Heritage Council, processes must be followed should any unexpected archaeological features and/or deposits be revealed during works. An Unanticipated Discovery Plan for the project is presented in Section 8 of this report.

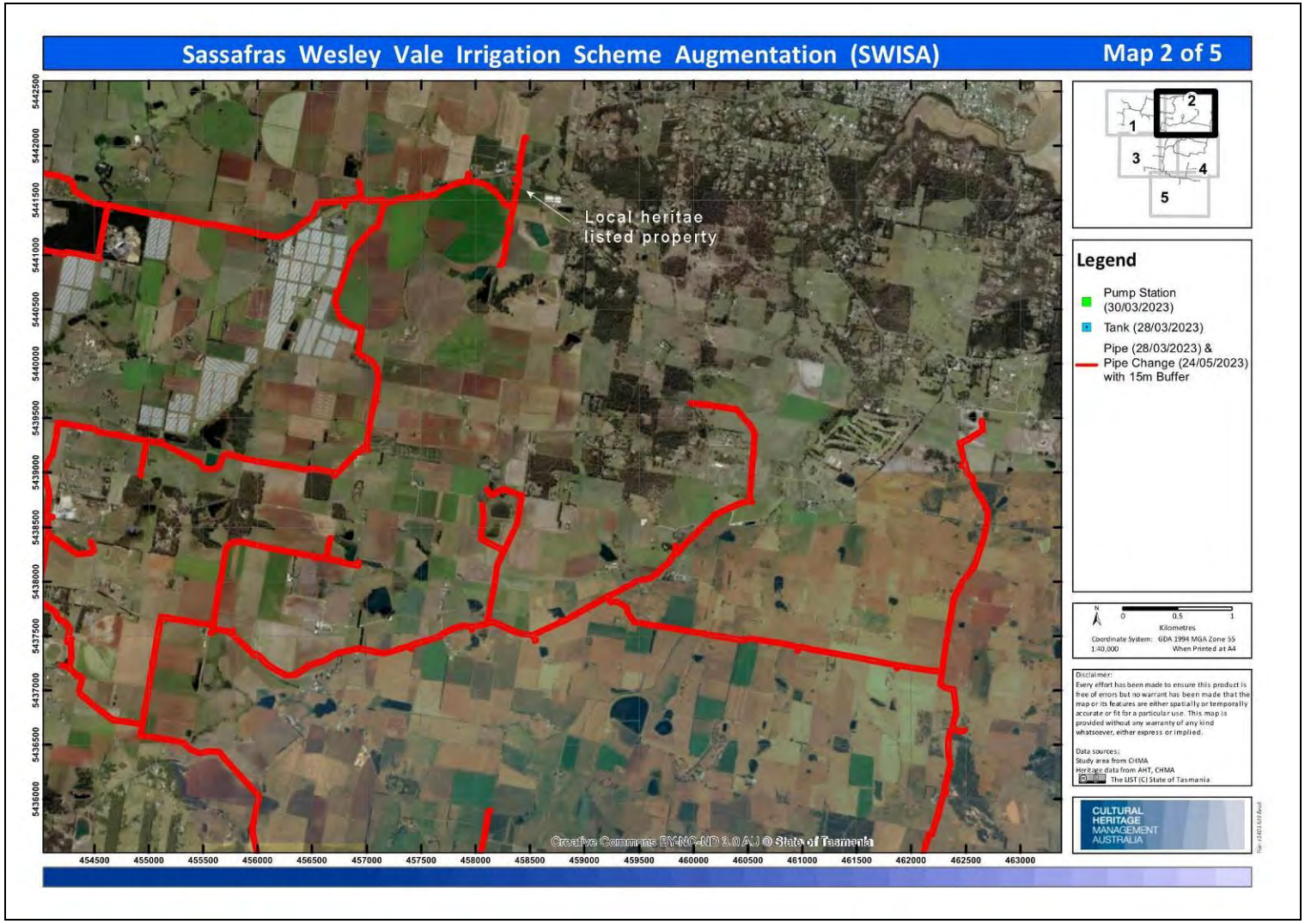


Figure 5: Aerial image showing the location of the heritage listed property CT144681/1 in relation to the project footprint

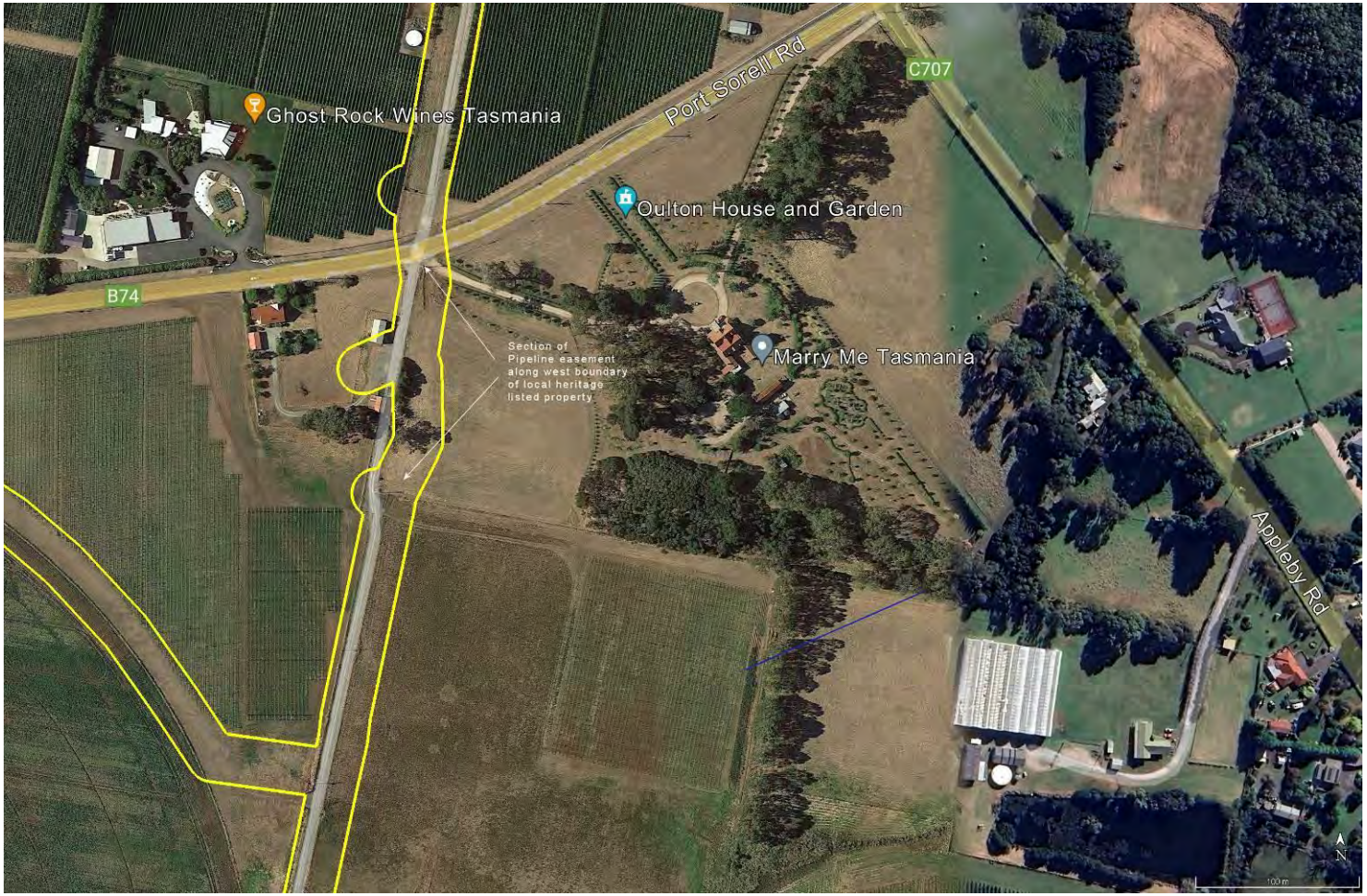


Figure 6: Aerial image showing the section of the pipeline that traverses the heritage listed boundaries of property CT144681/1

1.0 Project Outline

1.1 Project Background

The Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA) is a proposed redevelopment of the existing Sassafras Wesley Vale Irrigation Scheme (SWIS). The project includes the upgrade of the existing Great Bend Pump Station, a new Balance Tank located on Saggers Hill along with approximately 100km of new pipeline. The Irrigation district spans from Pardo in the west to Upper Sassafras in the east, including locations such as Latrobe, Moriarty, Harford, Northdown, and Thirlstane. The Augmentation is expected to deliver an additional 9200ML of summer water on top of the existing 5460ML supply under SWIS water entitlements. The project is earmarked to begin construction in late 2023 with an expected completion date of November 2025. This project is a joint venture partnership between the district Landowners along with State and Federal Government. Figure 1 shows the general location of the SWISA project. Figure 2 shows the SWISA project footprint.

CHMA (2009 and 2010) was engaged by Tasmanian Irrigation (TI) to undertake an Aboriginal and Historic heritage assessment for the original corridor alignment for the Sassafras Wesley Vale Irrigation Scheme (SWIS). Numerous sections of the SWIS corridor assessed by CHMA (2009 and 2010) are shared with the current SWISA corridor alignment. Figure 3 shows the SWIS corridor assessed by CHMA (2009 and 2010) overlaid with the current SWISA corridor.

As part of the planning works, CHMA Pty Ltd has been engaged by TI to undertake an historic heritage assessment for the SWISA project. This report presents the findings of the assessment.

1.2 Aims of the Investigation

The principal aims of the present heritage assessment are as follows.

- Complete an Historic Heritage Assessment for the SWISA Project footprint (the study area as shown in Figures 1 and 2). The assessment is to be compliant with both State and Commonwealth legislative regimes.
- To determine the extent of previously identified Historic heritage sites within and in the immediate vicinity of the study area.
- To locate and document Historic heritage sites that may be present within the identified bounds of the study area.
- To assess the archaeological sensitivity values of the study area.
- To assess the scientific and cultural values of identified Historic heritage sites.
- To advise on the management of Historic heritage in line with best practice archaeological guidelines.
- Prepare a report which documents the findings of the Historic heritage assessment.

1.3 Project Methodology

A four stage project methodology was implemented for this assessment.

Stage 1 (Pre-Fieldwork Background Work)

Prior to field work being undertaken, the following tasks were completed by CHMA.

The collation of relevant documentation for the project

As part of Stage 1 the following research was carried out and background information was collated for this project.

- A review of the relevant heritage registers and the collation of information pertaining to any registered heritage sites located within the general vicinity of the study area.
- Maps of the study area.
- Relevant reports documenting the outcomes of previous heritage studies in the vicinity of the study area.
- Historical literature for the region.
- References to the land use history of the study area.
- GIS Information relating to landscape units present in the study area.
- Geotechnical information for the study area, including soil and geology data.

Stage 2 (Gap Analysis and Desktop report)

The heritage information obtained through the Stage 1 works was reviewed, with the purpose of undertaking a gap analysis of the investigations carried out within the study area and creating an audit of the heritage values present in the study area. A summary desktop report, presenting the findings of the background research and gap analysis was prepared by CHMA (2022). This was an internal report submitted to TI to assist with preliminary planning for the project.

Stage 3 (Field Work)

Stage 3 involved the field work component of the project. The field survey assessment was conducted between the 8.5.2023 and the 31-5-2023) by Stuart Huys and Shay Hannah (CHMA archaeologists), Vernon Graham (AHO) and Kieran Graham (Trainee AHO).

The network of pipeline easements that were the focus of this assessment totals 101km in length, with the nominated width of the pipeline corridor being 15m. The field team walked a series two survey transects along the entire length of the pipeline corridor, with the average width of each transect being 10m. Each transect was conducted by an archaeologist and AHO in tandem, spread 5m apart. In addition, the field team walked a series of survey transects around the existing Big Bend Pump station and the footprint for the new Balance Tank located on Saggers Hill. Section 3 provides further details as to the survey coverage achieved within the study area.

Stage 4 (Reporting)

Stage three of the project involves the production of a Draft and Final Report that includes an analysis of the data obtained from the field survey, an assessment of archaeological sensitivity and management recommendations. The report has been prepared by Stuart Huys from CHMA.

1.4 Project Limitations

All archaeological investigations are subject to limitations that may affect the reliability of the results. The main constraint to the present investigation was restricted surface visibility due primarily to vegetation cover. At the time of the field survey, surface visibility along the nominated pipeline corridors and associated infrastructure was restricted to an estimated average range of between 10% to 40%. These constraints limited to some extent the effectiveness of the survey assessment. The issue of surface visibility is further discussed in Section 3 of this report.

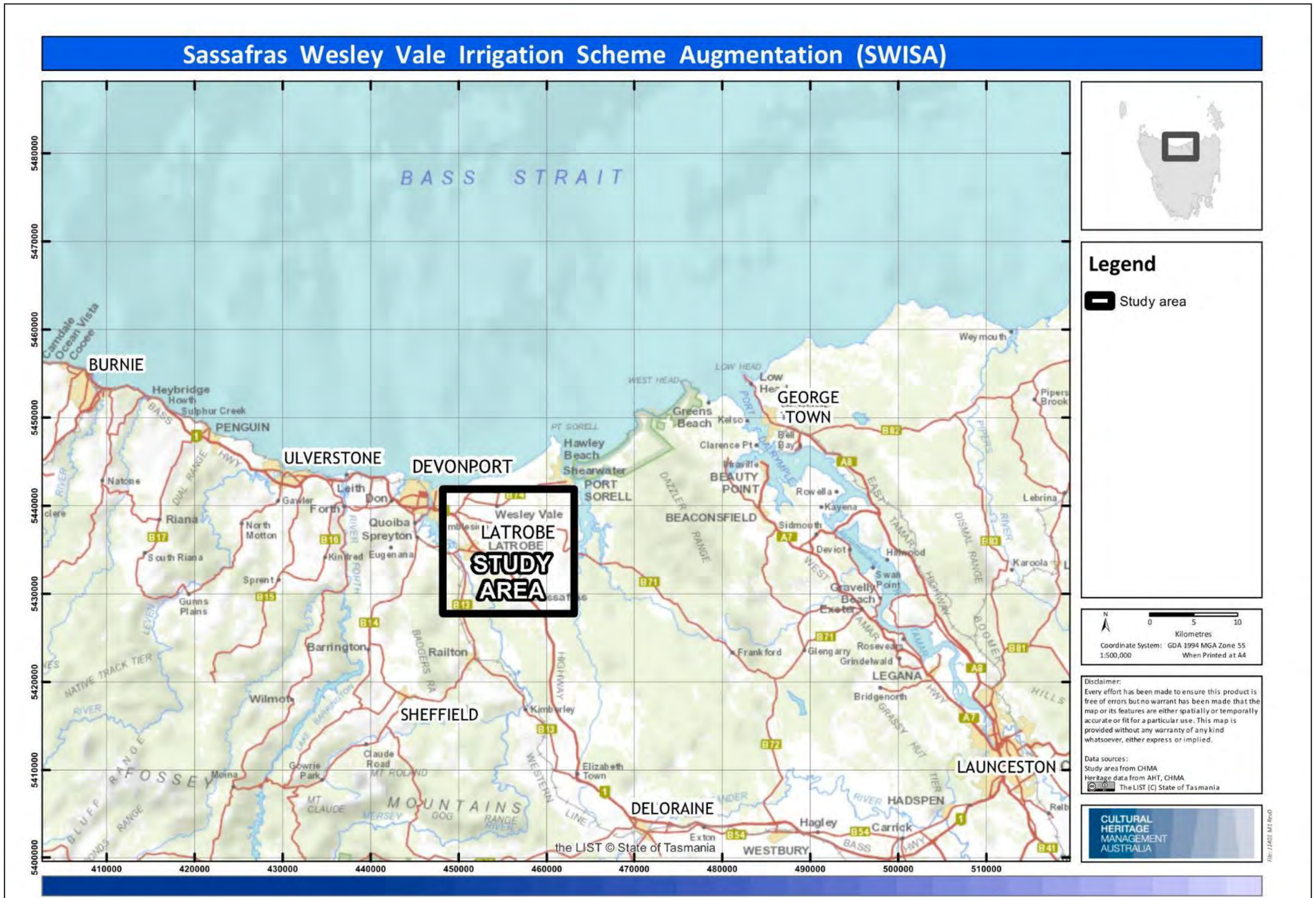


Figure 1: Topographic map showing the general location of the SWISA Project Footprint in the Northern Region of Tasmania

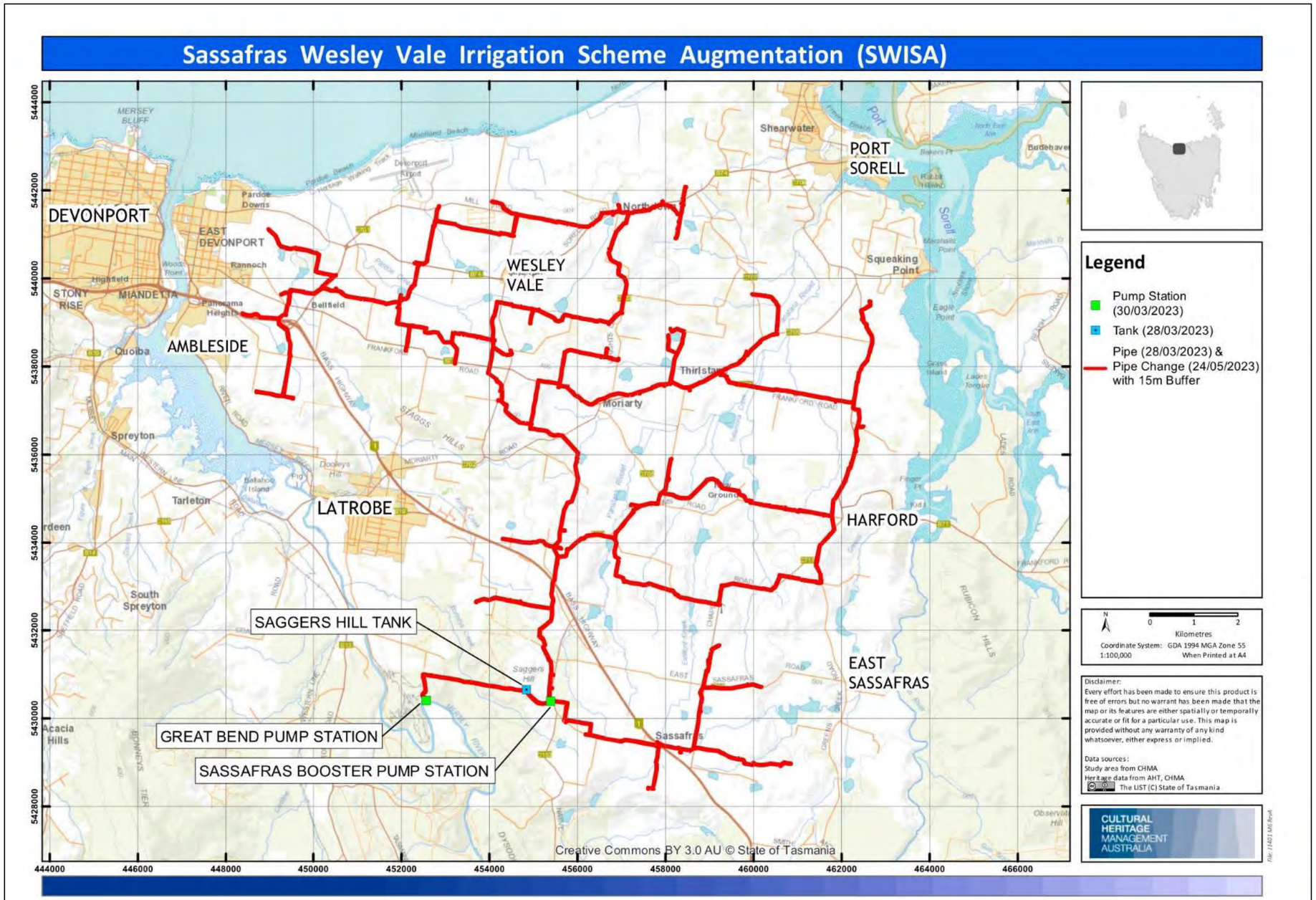


Figure 2: Topographic map showing the SWISA pipeline easements and associated infrastructure that was the focus of this assessment

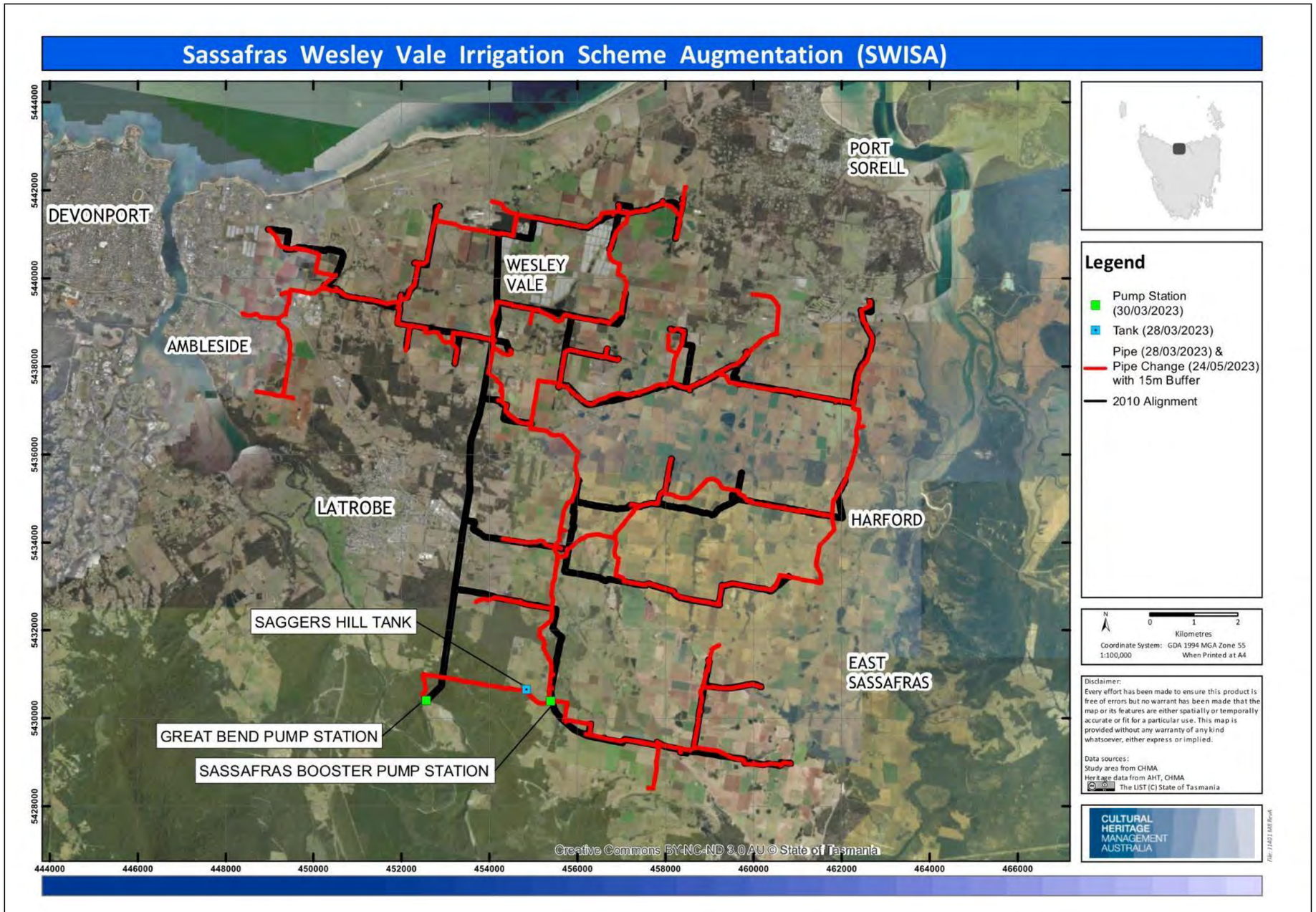


Figure 3: Aerial map showing the SWIS pipeline corridor alignment assessed by CHMA (2009 and 2010) overlaid with the current SWISA pipeline Project footprint

2.0 Environmental Setting of the Study Area

The SWISA project is located within the Sassafras / Wesley Vale area, between Devonport and Port Sorrell, in the Northern Region of Tasmania (See Figures 1 and 2). The pipeline route options are all situated within the hinterland area, between 1km and 16km inland from the coast line.

The study area has a cool, wet climate typical of Northern Tasmania, and receives an average of 1600 mm of rain per annum. The warmest months of the year are January and February, when mean temperatures range from minimums of 10°C to maximums of about 23°C. Winter tends to be cold with mean annual temperatures in the coldest months of June and July ranging from 1.5°C mean minimum to maximum temperatures of about 11°C (BOM 2023).

The Northern Region is characterised by extensive lowland plains and rounded topography which ranges from gently sloping to steep. The terrain traversed by the pipeline route network is characteristically gently to moderately undulating rolling hills. The slope gradients of the hills through this area generally ranges between 3-8º, and vary rarely exceeds 10º. The underlying geology of the project area comprises weathered dolerites which are exposed to the surface mainly on the hill summits and the steeper side slopes of hills.

The underlying geology across the majority of the project footprint is dominated by deeply weathered basalts. In the eastern portion of the study area, around Latrobe, there is a transition to Upper glaciomarine sequences of pebbly mudstone, pebbly sandstone and limestone. Within the lowland areas there are extensive patches of the geology is sand, gravel and mud of alluvial, lacustrine and littoral origin as well as non-marine sequences of gravel, sand, silt, clay and regolith (theList 2023). The soils across the pipeline network to a large extent is reflective of the underlying geology. Soils across the majority of this area comprises deep, red/brown regolith soils that have been formed through the decomposition of the basalt bedrock. These soils transition to dark brown to black clays in the flatter, lower lying areas. There are occasional locations, primarily in the Sassafras areas where soils change to being shallow gravelly sandy loam deposits.

The closest major water courses to the SWISA project area are the Mersey River and the Rubicon River. The project area is situated around the lower reaches of both rivers. The Mersey River is situated to the west of the project area. The river has its headwaters in the Great Western Tiers, around Cathedral Mountain and flows in a northerly direction, eventually emptying into Bass Strait and Devonport. The Great Bend Pump station is located on one of the major bends on the lower reaches of the Meander River, and this is the closest that the project footprint comes to the river (see Plate 4). The Rubicon River has its origins around Red Hills and flows north, past Elizabeth Town and eventually emptying into Port Sorell. The eastern portion of the pipeline network approaches to within 1.4km of the Rubicon River. There are a number of other named water courses traversed by the network of pipeline easements. These include Pardoe Creek, Panatana Rivulet, Westford Creek and

Eastford Creek. There are also a number of smaller ephemeral creek lines crossed by the proposed route alignments.

The vast majority of the SWISA project footprint traverses agricultural land. This land has been cleared of native vegetation, and in many areas have been ploughed and cropped in the past (see Plates 1-2). There is a 2.7km section of the pipeline easement, from the Great Bend Pump Station through to just west of the Saggers Hill balance tank location, that runs through the Warrawee Forest Reserve. The native vegetation in this forest area is comprised of

Eucalyptus obliqua wet forest and Eucalyptus amygdalina sclerophyll forest (see Plate 3). The vegetation structure is reasonably intact, although has been subject to selective logging in the past. There are also surroundings stands of forestry plantations. From an Aboriginal heritage perspective, there is an increased potential for lesser disturbed Aboriginal heritage sites to occur within this forested area. It should be noted that the pipeline easement through this forested area is generally aligned within existing within existing road and track alignments (see Plate 5).

Plate 1: View north-east across the western portion of the SWISA project showing typical undulating topography and cleared agricultural land

Plate 2: View south across the central and southern parts of the SWISA project footprint showing typical topography and cleared farm paddocks

Plate 3: View east along the section of pipeline easement through the Warrawee Forest Reserve

Plate 4: The Great Bend Pump Station on the Mersey River

Plate 5: View north along the pipeline easement running within the road reserve leading to the Great Bend Pump Station

3.0 Survey Coverage of the Study Area

Survey Coverage and Surface Visibility

Survey coverage refers to the estimated portion of a study area that has actually been visually inspected during a field survey. Surface Visibility refers to the extent to which the actual soils of the ground surface are available for inspection. There are a number of factors that can affect surface visibility, including vegetation cover, surface water and the presence introduced gravels or materials. Figure 4 provides a useful guideline for the estimation of surface visibility across a survey area.

The field survey assessment was conducted between the 8.5.2023 and the 31-5-2023) by Stuart Huys and Shay Hannah (CHMA archaeologists), Vernon Graham (AHO) and Kieran Graham (Trainee AHO).

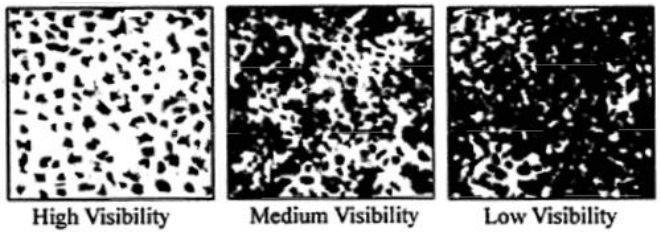
The network of pipeline easements that were the focus of this assessment totals 101km in length, with the nominated width of the pipeline corridor being 15m. The field team (comprising one archaeologist and an one AHO) walked a single survey transect along the entire length of the pipeline corridor, with the average width of the transect being 10m. Each transect was conducted by an archaeologist and AHO in tandem, spread 5m apart.

Surface visibility along the surveyed pipeline corridors was variable. Virtually the entire network of pipeline corridors traverse land that has been cleared of native vegetation as part of past farming activity. In many instances these farm paddocks have been ploughed and cropped. At the time of the survey, there were a number of these ploughed paddocks that had recently been ploughed and vegetation cover was sparse. Surface visibility in these areas was excellent, averaging 90% (see Plate 6). Other paddocks were under crop and surface visibility was reduced to an estimated average of 20%, although in some instances visibility was up around the 40% range (see Plate 7). The remaining sections of the pipeline corridors traversed grassed farm paddocks. Surface visibility along these sections of the pipeline corridor averaged around 20%, with erosion scalds and graded vehicle tracks providing visibility of up around 50% (see Plate 8). There is a 2.7km section of the pipeline easement, from the Great Bend Pump Station through to just west of the Saggers Hill balance tank location, that runs through the Warrawee Forest Reserve. This section of pipeline generally runs along the alignment of existing vehicle tracks, with visibility estimated around 50% (see Plate 9).

In addition, the field team walked a series of survey transects around the existing Big Bend Pump station and the footprint for the new Balance Tank located on Saggers Hill. Surface visibility across the footprints of these infrastructure areas ranged between 10%-40%, with grass cover and introduced gravels being the main impediment to visibility (see Plates 10 and 11).

The map series in Appendix 1 shows the SWISA project footprint that was covered by this assessment.

Visibility



☐Full (100%) ☐High (75%) ☐Medium (50%) ☐Low (24%) ☐None (0%)

Figure 4: Guidelines for the estimation of surface visibility

Effective Coverage

Variations in both survey coverage and surface visibility may have a direct bearing on the ability of a field team to detect historic heritage sites,. The combination of survey coverage and surface visibility is referred to as effective survey coverage. Table 1 presents the estimated effective survey coverage achieved across the SWISA project footprint. The level of effective coverage achieved across all infrastructure areas was assessed as being sufficient to generate a base level impression as to the possible extent and nature of historic heritage sites that may be present across the study area.

Table 1: Effective Survey Coverage achieved across the SWISA project footprint

Infrastructure Area	Total Area Surveyed	Estimated Average Surface Visibility	Effective Survey Coverage
Sections of pipeline corridors traversing ploughed paddocks	28 500m x 10m = 285 000m²	90%	256 500m²
Sections of pipeline corridors traversing cropped paddocks	24 500m x 10m = 245 000m²	20%	49 000 m²
Sections of pipeline corridors traversing grassed paddocks	45 300m x 10m = 453 000m²	20%	90 600m²
Sections of pipeline corridor through forest	2 700m x 10m = 27 000m²	50%	13 500 m²
TOTAL	**187 000m² x 20m = 3 740 000m²**		**409 600m²**
Big Bend Pump Station	110m x 10m = 1 100m²	20%	220m²
Saggers Hill Balance Tank	130m x 10m = 1 300m²	40%	520m²

Plate 6: View south along a section of the pipeline corridor traversing a recently ploughed paddock, with surface visibility averaging 90%

Plate 7: View east along a section of the pipeline corridor traversing a cropped paddock, with surface visibility averaging 40%

Plate 8: View north-west along a section of the pipeline corridor traversing a grassed paddock, with surface visibility averaging 20%

Plate 9: View east along a section of the pipeline corridor through Forest reserve, following a graded vehicle track

Plate 10: View south at the Big Bend pump station, with surface visibility averaging 20%

Plate 11: View south-west at the Saggers Hill Balance Tank location, with surface visibility averaging 80%

4.0 Historic Background

4.1 Settlement of Devonport

The first recorded European settlement prior to 1850 along the banks of the Mersey River is recorded as a property known as Frogmore (near present day Latrobe) owned by a Miss Moriarty, whose brother was a friend of Governor Sir John Franklin (*Advocate* Tuesday 8 November 1938:5). In 1850 a settler named Charles Oldaker took up residence on a block of land in the approximate location of what is now Devonport (*Advocate* Tuesday 8 November 1938:5). Devonport originally consisted of two small townships, Torquay on the east and Formby on the west of the Mersey River, both of which were set aside as reserves in 1850 (Gardam 2006). The Mersey River was named by Edward Curr in 1826 (Gardam 2006). Whilst the population and industry growth lay dormant in both Torquay and Formby, the towns of Don and Forth to the west were occupied by timber getters, shipping was concentrated in Latrobe and farmers were working east of Torquay and as far as Port Sorell (Gardam 2006: *Advocate* Tuesday 8 November 1938:5). The catalyst to growth of population and industry in the two townships was the discovery of coal in Tarleton (south of Devonport), in 1851 which brought in an influx of miners, timbermen, surveyors, prospectors, innkeepers, investors and immigrants (Gardam 2006).

To mitigate the problems that came with the growth in population, the police administrative offices and courthouse were moved from Port Sorell to Torquay (Gardam 2006). Torquay also gained a flour mill, several shipyards and hotels and shopkeepers and farmers setting up business (Gardam 2006; *Advocate* Wednesday 30 March 1938:11). Small sailing vessels began bringing goods and taking produce at high tide to avoid the sandbar and a tramway was built in the 1850s, running eastwards brought timber to the two sawmills (Gardam 2006: *Advocate* Wednesday 30 March 1938:11). Formby however had only one hotel and a few stores, but this would change in 1885 with the arrival of the railway in 1885 which accelerated development, including wharves and the arrival of merchants and banks (Gardam 2006).

In 1890, after years of debate, Formby and Torquay were amalgamated to create the town of Devonport but would not be physically united until the construction of a bridge in 1902 (Gardam 2006). The amalgamation also saw the inclusion of the small settlements of Wivenhoe and Appledore, located on the western side of the Mersey, into the town of Devonport (Gardam 2006). The construction of the Mersey Bluff lighthouse in 1889 and the dredging of the sandbar shortly after amalgamation opened the port to use by larger vessels (Gardam 2006). The steady growth in the maritime industries saw the creation of the first shipping line, the White Star Line by William Holyman and Sons in 1882, whose descendants would later establish the first airline across the Bass Strait (Gardam 2006; *The Examiner* Saturday 6 April 1935:10). After fire destroyed the police offices and the destruction of other important buildings which were all rebuilt in West Devonport, East Devonport saw a decline (Gardam 2006).

Devonport was officially proclaimed a city in 1981 and is sustained by a diverse group of industries including agriculture and tourism, with its strong maritime tradition continued in the form of the Bass Strait Ferry Terminal (Gardam 2006).

4.2 Heritage Register Search Results

As part of Stage 1 of the desktop assessment a search was carried out of Tasmanian Heritage Register (THR) in order to determine the extent of listed historic sites and places in the vicinity of the SWISA pipeline easement. The search results shows that there are no heritage places located within or in the immediate surrounds of the study area that are no sites or places listed on the THR that are situated in the immediate vicinity of the study area. The investigations undertaken by CHMA (2009 and 2010) for the SWIS pipeline easement also did not identify any THR listed historic sites or features.

The heritage register search results does show that a section of the pipeline easement traverses the boundaries of a property that is listed as a Local Heritage Place under the Tasmanian Planning Scheme. The property (CT144681/1) is located at Northdown, around the north-east end of the SWISA pipeline network (see Figure 5). It is situated immediately south of Port Sorell Road and immediately west with the junction of Appleby Road. A 150m section of the pipeline easement traverses along the western boundary of the property (see Figure 6).

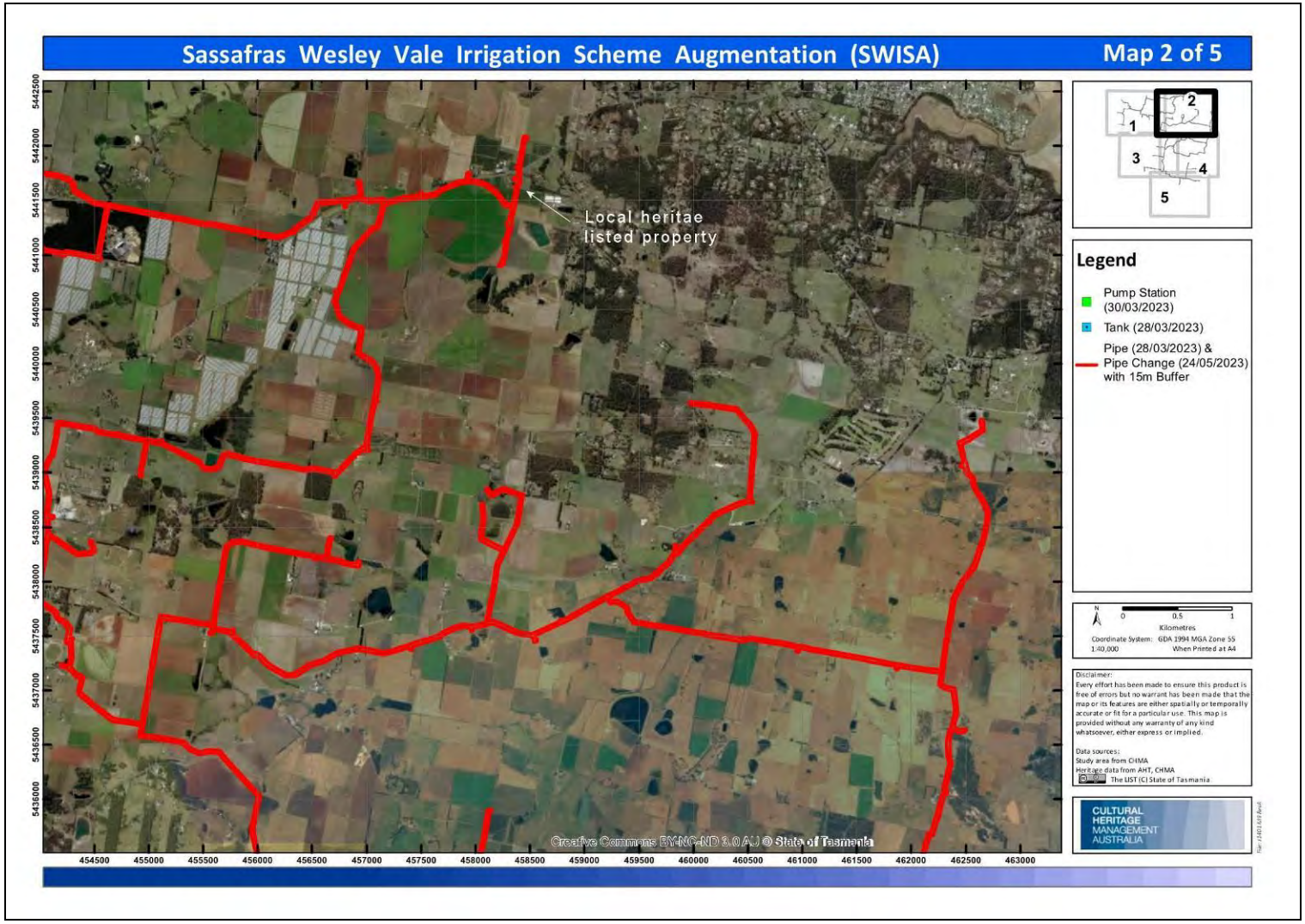


Figure 5: Aerial image showing the location of the heritage listed property CT144681/1 in relation to the project footprint

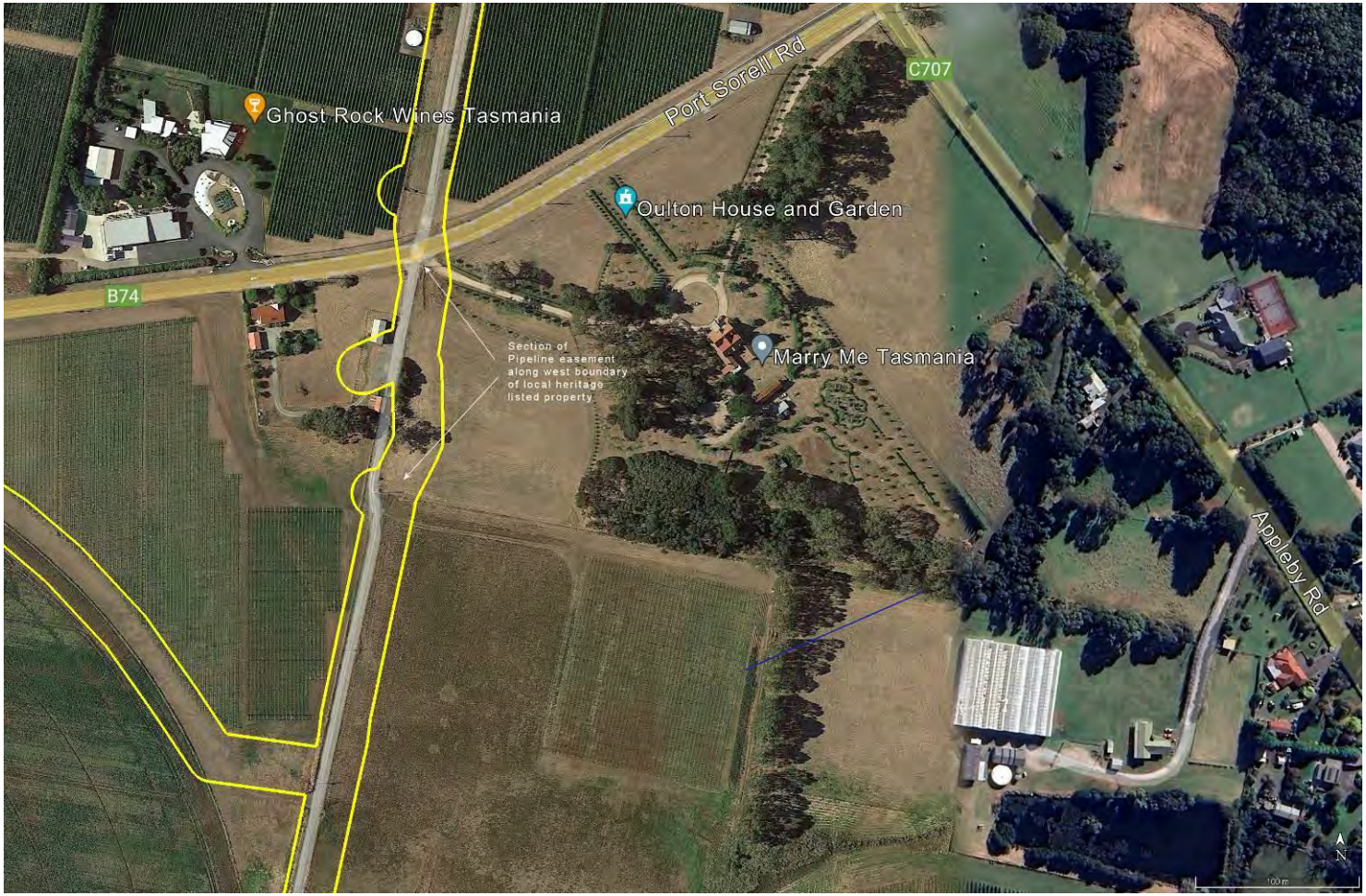


Figure 6: Aerial image showing the section of the pipeline that traverses the heritage listed boundaries of property CT144681/1

5.0 Survey Results, Statement of Heritage Impacts and Statement of Archaeological Potential

As noted in section 4,2 of this report, a 150m section of the SWISA pipeline easement traverses the boundaries of a property that is listed as a Local Heritage Place under the Tasmanian Planning Scheme. The property (CT144681/1) is located at Northdown, around the north-east end of the SWISA pipeline network (see Figures 5 and 6).

The proposed scope of works in this area will involve the installation of a new water pipeline along the western edge of the property boundary. The pipeline will be installed via trenching and conducted in accordance with Australian Pipelines and Gas Association Code of Environmental Practice 2017. The trench will be approximately 1.5m in width and to a depth which will allow for a minimum of 700mm soil cover over the top of a pipe to allow for agricultural activities to continue over the alignment. Following installation, the pipeline will be covered and re-vegetated like for-like.

A survey inspection of this section of the pipeline easement was carried out on the 30.5.2023 by Stuart Huys (CHMA archaeologist). The 150m section of the pipeline easement traverses a cleared farm paddocks on the property and runs parallel to and immediately to the east of a graded vehicle track (see Plate 12). No historic heritage features were identified through the survey of this section of pipeline easement. The pipeline easement is confirmed as avoiding all built structures on the property, including buildings, stone walls and heritage landscape plantings associated with the property (see Plate 13). A review of the available information does not indicate that any dwellings or other structures were ever constructed within or in the immediate vicinity of the pipeline easement and based on the observations made during the survey, the archaeological potential along this section of the pipeline easement is assessed as being very low.

Besides the property described above, no other historic sites or suspected features were identified during the field survey assessment of the SWISA project footprint. As described in section 3 of the report, surface visibility across the SWISA project footprint was variable, ranging between 10% to 40%. Given these constraints, it can’t be stated with absolute certainty that there are no undetected historic heritage sites present in the GMIS project footprint. With this acknowledged, the potential for undetected historic sites to be present is assessed as being very low.

Plate 12: View south along the 150m section of pipeline easement that traverses the west boundary of the heritage listed property at Northdown (CT144681/1)

Plate 13: View west from the pipeline easement towards the landscaped driveway feature of property CT144681/1, which is avoided by the pipeline easement

6.0 Statutory Controls and Legislative Requirements

The following provides a summary overview of the various legislative instruments and statutory requirements relating to historic heritage in Tasmania. The review is presented in order to provide the proponent with a basic understanding of the statutory frameworks and procedures relating to heritage in Tasmania.

6.1 National Conventions

Council of Australian Governments Agreement 1997

In 1997, COAG reached an agreement on Commonwealth, State and local government roles and responsibilities for heritage management. Local government, through the Australian Local Government Association, and the Tasmanian Government were both signatories to this Agreement. The Agreement resulted in the following outcomes:

- Acceptance of a tiered model of heritage management, with the definition of places as being of either, world, national, state or of local heritage significance;
- Nominations of Australian places for the World Heritage List and management of Australia's obligations under the World Heritage Convention would be carried out by the Commonwealth Government;
- A new National Heritage System on one was created in January 2004, comprising the Australian Heritage Council (AHC), National Heritage List (NHL) and Commonwealth Heritage List (CHL);
- The Commonwealth Government, through the Australian Heritage Council would be responsible for listing, protecting and managing heritage places of national significance;
- State and Territory Governments would be responsible for listing, protecting and managing heritage places of state significance; and
- Local government would be responsible for listing, protecting and managing heritage places of local significance.

Environment Protection and Heritage Council of the Australian and State/Territory Governments 1998

In 1998, the National Heritage Convention proposed a set of common criteria to be used in order to better assess, understand and manage the heritage values of places.

The Environment Protection and Heritage Council of the Australian and State/Territory Governments adopted this as a national set of desirable common criteria (known as the HERCON criteria). The adoption of these criteria by Heritage Tasmania has not yet been formalised. These criteria are also based upon the Burra Charter values. The Common Criteria (HERCON Criteria) adopted in April 2008 are summarised below:

a) *Importance to the course or pattern of our cultural or natural history.*
b) *Possession of uncommon, rare or endangered aspects of our cultural or natural history.*

c) *Potential to yield information that will contribute to an understanding of our cultural or natural history.*
d) *Importance in demonstrating the principal characteristics of a class of cultural or natural places or environments.*
e) *Importance in exhibiting particular aesthetic characteristics*
f) *Importance in demonstrating a high degree of creative or technical achievement at a particular period.*
g) *Strong or special association with a particular community or cultural group for social, cultural or spiritual reasons. This includes the significance of a place to Indigenous peoples as part of their continuing and developing cultural traditions.*
h) *Special association with the life or works of a person, or group of persons, of importance in our history.*

These criteria have been endorsed by the Heritage Chairs and Officials of Australia and New Zealand (HCOANZ) in the Supporting Local Government Project document, "Protecting Local Heritage Places: A National Guide for Local Government and Communities" (March 2009).

Burra Charter 1999
Australia ICOMOS (International Council on Monuments and Sites) is the peak body of professionals working in heritage conservation in Australia. The Burra Charter was adopted by Australia ICOMOS in 1979 in Burra, South Australia based on other international conventions. Further revisions were adopted in 1981, 1988 and 1999 to ensure the Charter continues to reflect best practice in heritage and conservation management. The current version of the Australia ICOMOS Burra Charter 1999 is the only version that should be used.

The Burra Charter provides guidance for the conservation and management of places of cultural significance (cultural heritage places), and is based on the knowledge and experience of Australian ICOMOS members. The Charter sets a standard of practice for those who provide advice, make decisions about, or undertake works to places of cultural significance, including owners, managers and custodians.

The Charter recognises the need to involve people in the decision-making process, particularly those that have strong associations with a place. It also advocates a cautious approach to changing heritage places: do as much as necessary to care for the place and to make it useable, but otherwise change it as little as possible so that its cultural significance is retained.

6.2 Commonwealth Legislation

Environment Protection and Biodiversity Conservation Act 1999
The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) provides for the listing of natural, historic or indigenous places that are of outstanding national heritage value to the Australian nation as well as heritage places on Commonwealth lands and waters under Australian Government control.

Once a heritage place is listed under the EPBC Act, special requirements come into force to ensure that the values of the place will be protected and conserved for future generations. The following heritage lists are established through the EPBC Act:

- *National Heritage List* - a list of places of natural, historic and indigenous places that are of outstanding national heritage value to the Australian nation
- *Commonwealth Heritage List* - a list of natural, historic and indigenous places of significance owned or controlled by the Australian Government.
- *List of Overseas Places of Historic Significance to Australia* – this list recognises symbolically sites of outstanding historic significance to Australia but not under Australian jurisdiction.

Australian Heritage Council Act 2003

The Australian Heritage Council is a body of heritage experts that has replaced the Australian Heritage Commission as the Australian Government's independent expert advisory body on heritage matters when the new Commonwealth Heritage System was introduced in 2004 under amendments to the Environment Protection and Biodiversity and Conservation Act 1999.

The Council plays a key role in assessment, advice and policy formulation and support of major heritage programs. Its main responsibilities are to assess and nominate places for the National Heritage List and the Commonwealth Heritage List, promote the identification, assessment, conservation and monitoring of heritage; and advise the Minister on various heritage matters.

Protection of Movable Cultural Heritage Act 1986

The PMCH Act regulates the export of cultural heritage objects from Australia. The purpose of the Act is to protect, for the benefit of the nation, objects which if exported would significantly diminish Australia's cultural heritage. Some Australian protected objects of Aboriginal, military heritage and historical significance cannot be granted a permit for export. Other Australian protected objects may be exported provided a permit or certificate has been obtained.

6.3 State Legislation

Land Use Planning and Approvals Act 1993

This Act (LUPA) is the cornerstone of the State Resource Management and Planning System (RMPS). It establishes the legitimacy of local planning schemes and regulates land use planning and development across Tasmania. With regard to historic heritage, LUPAA requires that planning authorities will work to conserve those buildings, areas or other places which are of scientific, aesthetic, architectural or historical interest, or otherwise of special cultural value" [Schedule 1 Part 2(g)].

Resource Planning and Development Commission Act 1997

The Resource Planning and Development Commission (now referred to as the Tasmanian Planning Commission) is responsible for overseeing Tasmania’s planning system, approving planning schemes and amendments to schemes and assessing Projects of State Significance. In terms of heritage management, the TPC will

consider the establishment of heritage overlays, precincts or areas as part of the creation of planning schemes.

Resource Management and Planning Appeal Tribunal Act 1993
The Resource Management and Planning Appeal Tribunal determine planning appeals and enforce the Acts within the RMPS. The Tribunal plays an important role in the management of heritage places through its determinations on proposed development on, or near to, places of heritage significance.

Historic Cultural Heritage Act 1995
The *Historic Cultural Heritage Act 1995* (HCH Act) is the key piece of Tasmanian legislation for the identification, assessment and management of historic cultural heritage places. The stated purpose of the HCH Act is to promote the identification, assessment, protection and conservation of places having historic cultural heritage significance and to establish the Tasmanian Heritage Council". The HCH Act also includes the requirements to:

- establish and maintain the Tasmanian Heritage Register (THR);
- provide for a system for a system of approvals for work on places on the Register;
- provide for Heritage Agreements and assistance to property owners;
- provide for protection of shipwrecks;
- provide for control mechanisms and penalties for breaches of the Act.

Under the HCH Act, "conservation" in relation to a place is defined as

- the retention of the historic cultural heritage significance of the place; and
- any maintenance, preservation, restoration, reconstruction and adaption of the place.

The definition of "place" under the HCH Act includes:

- a site, precinct or parcel of land;
- any building or part of a building;
- any shipwreck;
- any item in or on, or historically or physically associated or connected with, a site precinct or parcel of land where the primary importance of the item derives in part from its association with that site, precinct or parcel of land; and
- any equipment, furniture, fittings, and articles in or on, or historically or physically associated or connected with any building or item.

The Act created the Tasmanian Heritage Council (THC), which came into existence in 1997 and operates within the State RMPS. The THC is a statutory body, separate from government, which is responsible for the administration of the HCH Act and the establishment of the Tasmanian Heritage Register (THR), which lists all places assessed as having heritage values of state significance. The THC also assesses works that may affect the heritage significance of places and provides advice to state and local government on heritage matters. The primary task of the THC is as a resource management and planning body, which is focused on heritage conservation

issues. Any development on heritage-listed places requires the approval of the THC before works can commence.

Heritage Tasmania (HT), which is part of the Department of Primary Industry, Parks, Water and the Environment, also plays a key role in fulfilling statutory responsibilities under the HCH Act.

HT has three core roles:

- coordinating historic heritage strategy and activity for the State Government;
- supporting the Tasmanian Heritage Council to implement the HCH Act; and
- facilitating the development of the historic heritage register.

In 2013, *Historic Cultural Heritage Act 1995* was amended, with the primary goal of streamlining the approvals process and better align the Heritage Act with the Planning Act. Under the Amendment applicants need only lodge a single Development Application (DA) (as opposed to both a Works Application and DA), which will be referred to the Heritage Council by the local planning authority. Heritage Council then has the opportunity to advise the planning authority whether or not it has an interest in the DA and may request further information under s57 of the LUPAA. If the Heritage Council does not have an interest in the DA, it reverts to the status it has under the Scheme or Planning Act. Where Heritage Council does have an interest in the DA, the Council decision must be incorporated into the final permit (or refusal) issued by the local planning authority.

Also included in the amendments is the incorporation of the HERCON significance criteria for assessing the significance of heritage sites. The Heritage Council may enter a place in the Heritage Register if it satisfied that the place has historic cultural heritage significance by meeting threshold values for one or more of eight individual criteria. Aesthetic characteristics of a place now forms the eighth criterion against which heritage significance may be assessed.

Works to places included in the THR require approval, either through a Certificate of Exemption for works which will have no or negligible impact, or through a discretionary permit for those works which may impact on the significance of the place.

Discretionary permit applications are lodged with the relevant local planning authority. On receipt, the application is sent to the Heritage Council, which will firstly decide whether they have an interest in determining the application. If the Heritage Council has no interest in the matter, the local planning authority will determine the application.

If the Heritage Council has an interest in determining the application, a number of matters may be relevant to its decision. This includes the likely impact of the works on the significance of the place; any representations; and any regulations and works guidelines issued under the HCH Act. The Heritage Council may also consult with the planning authority when making a decision.

In making a decision, the Heritage Council will exercise one of three options: consent to the discretionary permit being granted; consent to the discretionary permit being granted subject to certain conditions; or advise the planning authority that the discretionary permit should be refused. The Heritage Council's decision is then forwarded to the planning authority, which will incorporate the decision into any planning permit

Works Guidelines for Historic Heritage Places
The Tasmanian Heritage Council and Heritage Tasmania have issued Works Guidelines for Historic Heritage Places. The guidelines provide a general reference for the types of works, which may be exempt, or those where a permit will be required. They also define appropriate outcomes for a range of different works and development scenarios. Although specifically designed for places included in the THR, the guidelines provide useful advice for the management of heritage places generally.

6.4 Local Planning Schemes

The *Tasmanian Planning Scheme* came into effect on 22 July 2020, and replaces the former Meander Valley Interim Planning Scheme 2013. The *Tasmanian Planning Scheme* provides a single planning scheme and a consistent set of rules and requirements in relation to the manner in which all land in Tasmania may be used, developed, protected and conserved. It consists of two parts:

1. **State Planning Provisions** contain the mandatory common rules that are to apply in all municipal areas. For consistency in permit and compliance requirements that must be met by a proposed use or development.
2. **Local Provision Schedule** for each municipal area setting out how the State Planning Provisions are to apply.

The planning scheme supports strategic land use planning for residential, business, agriculture, utilities, environmental and recreational zones. The scheme includes considerations such as natural hazards, local heritage values, natural assets, parking requirements and the protection of road, railway and electricity infrastructure.\

Section C6 of the *Tasmanian Planning Scheme* deals specifically with the Local Heritage Code. The stated purpose of the code is to recognise and protect the local historic heritage significance of local places, precincts, landscapes and areas of archaeological potential and significant trees by regulating development that may impact on their values, features and characteristics.

This code applies to:
(a) development on land within any of the following, as defined in this code:
(i) a l ocal heritage place;
(ii) a local heritage precinct;
(iii)a local historic landscape precinct; and
(iv) for excavation only, a place or precinct of archaeological potential;
and
(b) the lopping, pruning, removal or destruction of a significant tree as defined in this code.

If a site is listed as a local heritage place and also within a local heritage precinct or local historic landscape precinct, it is only necessary to demonstrate compliance with the standards for the local heritage place unless demolition, buildings and works are proposed for an area of the site outside the identified specific extent of the local heritage place.

This code does not apply to a registered place entered on the Tasmanian Heritage Register.

The property at Northdown (CT144681/1) is on the *Latrobe Interim Planning Scheme 2013* (now operating under the *Tasmanian Planning Scheme*), where it is listed within the Local Historic Heritage Code. The listing is a whole of title property listing. A 150m section of the SWISA pipeline easement traverses along the western boundaries of this property. The following table provides an assessment of this proposed pipeline easement against section C6 of the *Tasmanian Planning Scheme.*

C6.6.2 Site coverage	
Objective:	
Acceptable Solutions	**Performance Criteria**
A1 No Acceptable Solution.	P1 The site coverage must be compatible with the local historic heritage significance of a local heritage place, having regard to: (a) the topography of the site; and (b) the historic heritage values of the local heritage place as identified in the relevant Local Provisions Schedule, or if there are no historic heritage values identified in the relevant Local Provisions Schedule, the historic heritage values as identified in a report prepared by a suitably qualified person.
Assessment 1. The proposed pipeline easement satisfies P1 for the following reasons: The land traversed by the pipeline easement is relatively flat, so there is no need for excessive cut or fill. The pipeline will be installed via trenching and conducted in accordance with Australian Pipelines and Gas Association Code of Environmental Practice 2017. The trench will be approximately 1.5m in width and to a depth which will allow for a minimum of 700mm soil cover over the top of a pipe to allow for agricultural activities to continue over the alignment. Following installation, the pipeline will be covered and re-vegetated like for-like. 2. The Heritage assessment demonstrates that the installation of the pipeline will have no adverse impacts on the local heritage place. The pipeline easement is	

confirmed as avoiding all built structures on the property, including buildings, stone walls and heritage landscape plantings associated with the property.

C6.6.3 Height and bulk of buildings	
Objective: That the height and bulk of buildings are compatible with the local historic heritage significance of local heritage places.	
Acceptable Solutions	**Performance Criteria**
A1 No Acceptable Solution.	P1 The height and bulk of buildings must be compatible with the local historic heritage significance of a local heritage place, having regard to: (a) the historic heritage values of the local heritage place as identified in the relevant Local Provisions Schedule, or if there are no historic heritage values identified in the relevant Local Provisions Schedule, the historic heritage values as identified in a report prepared by a suitably qualified person; (b) the character and appearance of the existing building or place; (c) the height and bulk of other buildings in the surrounding area; and (d) the setting of the local heritage place.
Assessment The proposed pipeline easement satisfies P1 for the following reasons: (a) No buildings are proposed to be constructed. The pipeline will be installed via trenching to a depth of 1.5m and following the installation, the pipeline will be covered and re-vegetated like for-like. This means that there will be no visual impacts, and the proposal will have no adverse impacts on the character and appearance of the local heritage place; (b) The Heritage assessment identifies the relevant heritage values and demonstrates that the proposed pipeline easement will have no adverse impacts on the setting of local heritage place.	

C6.6.4 Siting of buildings and structures	
Objective: That the siting of buildings is compatible with the local historic heritage significance of local heritage places.	
Acceptable Solutions	**Performance Criteria**

A1 No Acceptable Solution.	P1 The front, side and rear setbacks of a building must be compatible with the local historic heritage significance of the place, having regard to: (a) the historic heritage values of the local heritage place as identified in the relevant Local Provisions Schedule, or if there are no historic heritage values identified in the relevant Local Provisions Schedule, the historic heritage values as identified in a report prepared by a suitably qualified person; (b) the topography of the site; (c) the size, shape, and orientation of the lot; and (d) the setbacks of other buildings in the surrounding area.
Assessment The proposed pipeline easement satisfies P1 for the following reasons: (a) There are no buildings proposed to be constructed in this area. Works are restricted to the installation of an underground pipeline.	

C6.6.5 Fences	
Objective: That fences are compatible with the local historic heritage significance of local heritage places.	
Acceptable Solutions	**Performance Criteria**
A1 No Acceptable Solution.	P1 New fences and gates must be compatible with the local historic heritage significance of a local heritage place, having regard to: (a) the historic heritage values of the local heritage place as identified in the relevant Local Provisions Schedule, or if there are no historic heritage values identified in the relevant Local Provisions Schedule, the historic heritage values as identified in a report prepared by a suitably qualified person; (b) the architectural style of the buildings on the site; (c) the dominant fencing style in the setting;

	(d) the original or previous fences on the site; and (e) the proposed height and location of the fence.

Assessment

The proposed pipeline easement satisfies P1 for the following reasons:

(a) The Heritage assessment identifies the relevant heritage values and demonstrates that the proposed pipeline easement will have no adverse impacts on the local heritage place;

(b) The dominant fencing style in the setting is standard stock fencing;

(c) The original fences are standard stock fencing;

(d) Following installation, the pipeline will be covered and re-vegetated like for-like. Any fencing repairs or replacements will be made like for like.

C6.6.6 Roof form and materials

Objective: That roof form and materials are compatible with the local historic heritage significance of local heritage places.

Acceptable Solutions	Performance Criteria
A1 Replacement roofs on local heritage places which will be visible from any road or public open space adjoining the site, must be of a form and material to match the existing roof being replaced.	P1 Roof form and materials must be compatible with the local historic heritage significance of a local heritage place, having regard to: (a) the historic heritage values of the local heritage place as identified in the relevant Local Provisions Schedule, or if there are no historic heritage values identified in the relevant Local Provisions Schedule, the historic heritage values as identified in a report prepared by a suitably qualified person; (b) the design, period of construction and materials of the building on the site that the roof directly relates to; (c) the dominant roofing style and materials in the setting; and the streetscape.

Assessment

The proposed pipeline easement satisfies P1 for the following reasons:

(a) The Heritage assessment identifies the relevant heritage values and demonstrates that the proposed pipeline easement will have no adverse impacts on the local heritage place.

(b) There are no buildings proposed to be constructed in this area. Works are

restricted to the installation of an underground pipeline.

C6.6.9 Driveways and parking for non-residential purposes	
Objective: That driveways and parking for non-residential purposes are compatible with the local historic heritage significance of local heritage places.	
Acceptable Solutions	**Performance Criteria**
A1 Parking areas for non-residential purposes on local heritage places must be located behind the building line of buildings located or proposed on a site.	P1 Driveways and parking areas for non-residential purposes must be compatible with the local historic heritage significance of a local heritage place, having regard to: (a) the historic heritage values of the local heritage place as identified in the relevant Local Provisions Schedule, or if there are no historic heritage values identified in the relevant Local Provisions Schedule, the historic heritage values as identified in a report prepared by a suitably qualified person; (b) the loss of any building fabric; (c) the removal of gardens or vegetated areas; (d) parking availability in the surrounding area; (e) vehicle and pedestrian traffic safety; and (f) the streetscape.

Assessment

The proposed pipeline easement satisfies P1 for the following reasons:

(a) The Heritage assessment identifies the relevant heritage values and demonstrates that the proposed pipeline easement will have no adverse impacts on the local heritage place.

(b) There are no driveways or parking areas proposed to be constructed in this area. Works are restricted to the installation of an underground pipeline. Access will be via existing roads.

7.0 Heritage Management Plan

The heritage management options and recommendations provided in this report are made on the basis of the following criteria.

- Background research into the extant archaeological and historic record for the study area and its surrounding regions, as documented in section 4 of this report.
- The results of the heritage register searches and field investigation as documented in section 4 of this report.
- The results of the field survey assessment, as presented in section 5 of the report.
- The legal and procedural requirements as summarised in section 6 of this report.

Recommendation 1 (Property CT144681/1)

The property at Northdown (CT144681/1) is on the *Latrobe Interim Planning Scheme 2013* (now operating under the *Tasmanian Planning Scheme*), where it is listed within the Local Historic Heritage Code. The listing is a whole of title property listing. A 150m section of the SWISA pipeline easement traverses along the western boundaries of this property. This assessment has confirmed this section of pipeline easement avoids all built structures on the property, including buildings, stone walls and heritage landscape plantings associated with the property. The installation of the pipeline will have no adverse affects on the heritage values of the property, and satisfies the performance criteria outlined in section C6 of the *Tasmanian Planning Scheme.*

Recommendation 2 (Unanticipated Discoveries of historic features)

No other historic sites or suspected features were identified during the field survey assessment of the SWISA project footprint and it is assessed that there is a very low potential for undetected Historic heritage sites to occur within the SWISA project footprint. However, as per the Practice Note No 2 by the Tasmanian Heritage Council, processes must be followed should any unexpected archaeological features and/or deposits be revealed during works. An Unanticipated Discovery Plan for the project is presented in Section 8 of this report.

8.0 Unanticipated Discovery Plan

The following text describes the proposed method for dealing with unanticipated discoveries of heritage features or objects during the proposed GMIS development works. The plan provides guidance to project personnel so that they may meet their obligations with respect to heritage legislation. Please Note: There are two different processes presented for the mitigation of these unanticipated discoveries. The first process applies for the discovery of all cultural heritage objects or features, with the exception of skeletal remains (burials). The second process applies exclusively to the discovery of skeletal remains (burials).

Discovery of Heritage Objects or Features

Step 1

If any person believes that they have discovered or uncovered a heritage object or feature, the individual should notify any machinery operators that are working in the general vicinity of the area that earth disturbance works should stop immediately.

Step 2

A buffer protection zone of 5m x 5m should be established around the suspected heritage find. No unauthorised entry or earth disturbance will be allowed within this 'archaeological zone' until such time as the suspected heritage find has been assessed, and appropriate mitigation measures have been carried out.

Step 3

A qualified heritage consultant should be engaged to assess the suspected heritage find. As a first step in the process, the heritage consultant should contact Heritage Tasmania, the Heritage Council and the Local Council and notify them of the find. The heritage consultant will ensure that Heritage Tasmania, the Heritage Council and the Local Council are consulted throughout the assessment process.

Step 4

If the heritage find is a movable object, then the find should be recorded, photographed and a decision should be made as to whether the object should be re-located to a designated Keeping Place. If the find is an unmovable heritage object or feature, then the find should be recorded and photographed and a HIA and HMP developed for the feature. This should be then submitted to Heritage Tasmania, the Heritage Council and the Local Council for review and advice.

Possible outcomes may necessitate:

a. An amendment to the design of the development
b. Carrying out of archaeological excavations prior to the re-commencement of works
c. Archaeological monitoring and recording during works
d. Preparation (and implementation) of a strategy to ensure communication of the new information to the community.
e. A combination of the above.

Discovery of Skeletal Material

Step 1:
Call the Police immediately. Under no circumstances should the suspected skeletal material be touched or disturbed. The area should be managed as a crime scene. It is a criminal offence to interfere with a crime scene.

Step 2:
Any person who believes they have uncovered skeletal material should notify all employees or contractors working in the immediate area that all earth disturbance works cease immediately.

Step 3:
A temporary 'no-go' or buffer zone of at least 50m x 50m should be implemented to protect the suspected skeletal material, where practicable. No unauthorised entry or works will be allowed within this 'no-go' zone until the suspected skeletal remains have been assessed by the Police and/or Coroner.

Step 4:
If it is suspected that the skeletal material is Aboriginal, Aboriginal Heritage Tasmania should be notified.

Step 5:
Should the skeletal material be determined to be Aboriginal, the Coroner will contact the Aboriginal organisation approved by the Attorney-General, as per the *Coroners Act 1995*.

References Cited

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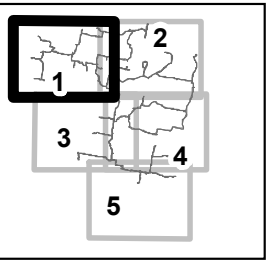
Appendix 1

Detailed Map Series for the SWISA Project Footprint

Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA)

Map 1 of 5



Legend

- Pump Station (30/03/2023)
- Tank (28/03/2023)
- Pipe (28/03/2023) & Pipe Change (24/05/2023) with 15m Buffer

N

0 0.5 1

Kilometres

Coordinate System: GDA 1994 MGA Zone 55

1:40,000 When Printed at A4

Disclaimer:
Every effort has been made to ensure this product is free of errors but no warrant has been made that the map or its features are either spatially or temporally accurate or fit for a particular use. This map is provided without any warranty of any kind whatsoever, either express or implied.

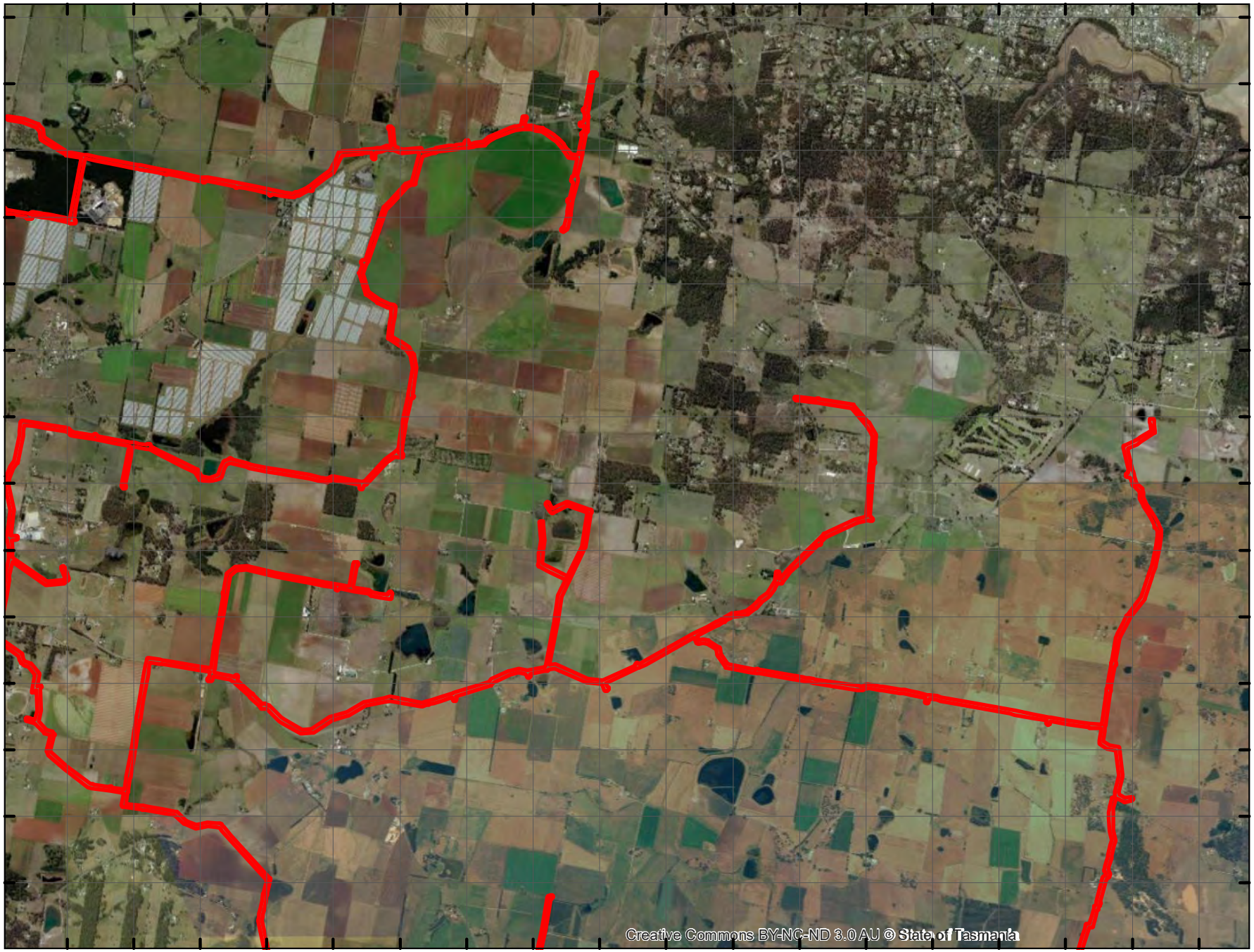
Data sources:
Study area from CHMA
Heritage data from AHT, CHMA
The LIST (C) State of Tasmania

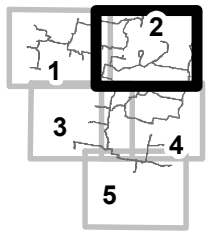
CULTURAL HERITAGE MANAGEMENT AUSTRALIA

File: 11401 M9 RevA

Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA)

Map 2 of 5





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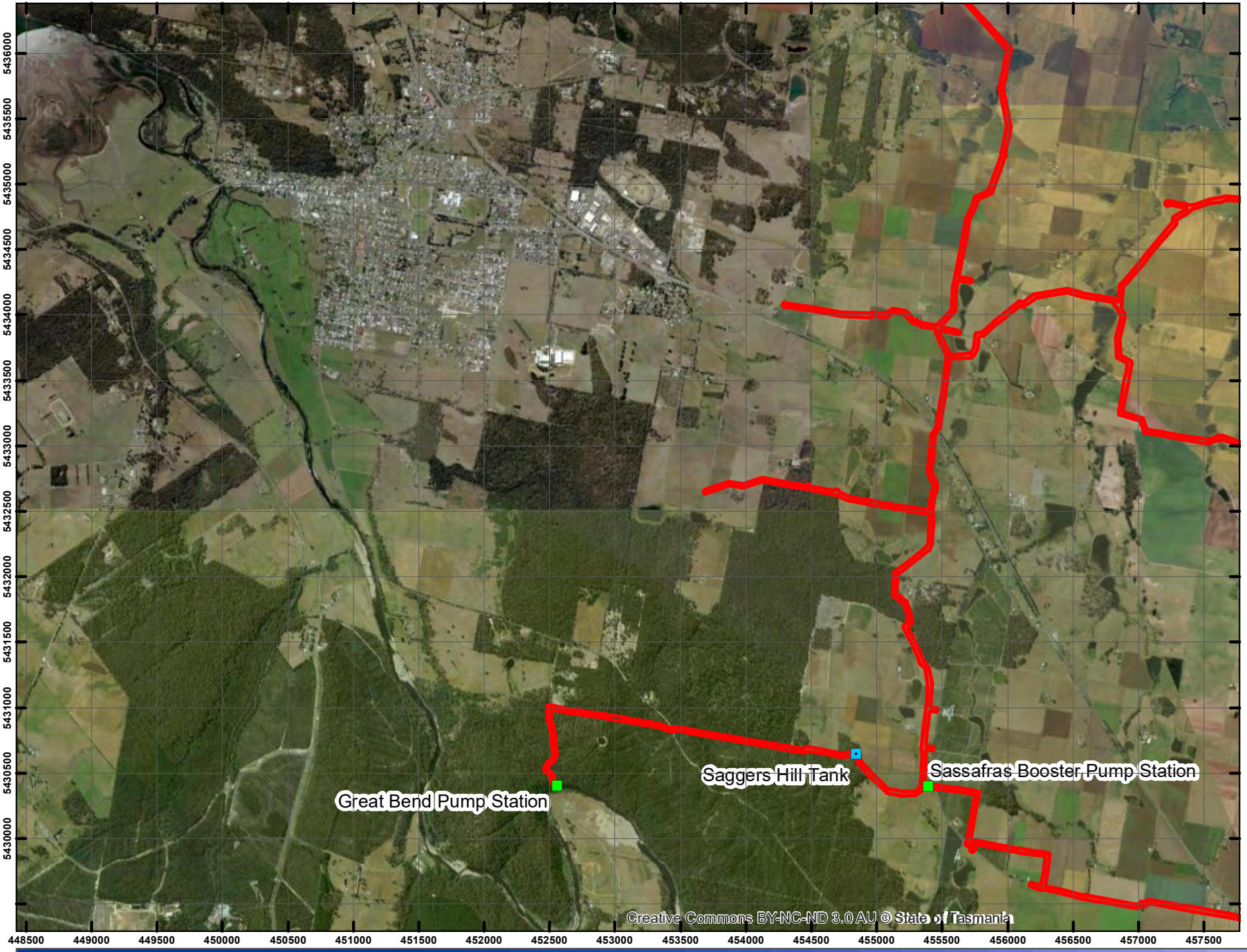
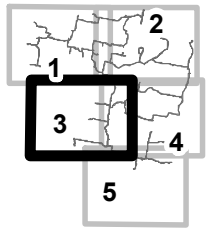
CULTURAL HERITAGE MANAGEMENT AUSTRALIA

File: 11401 M9 RevA

Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA)

Map 3 of 5





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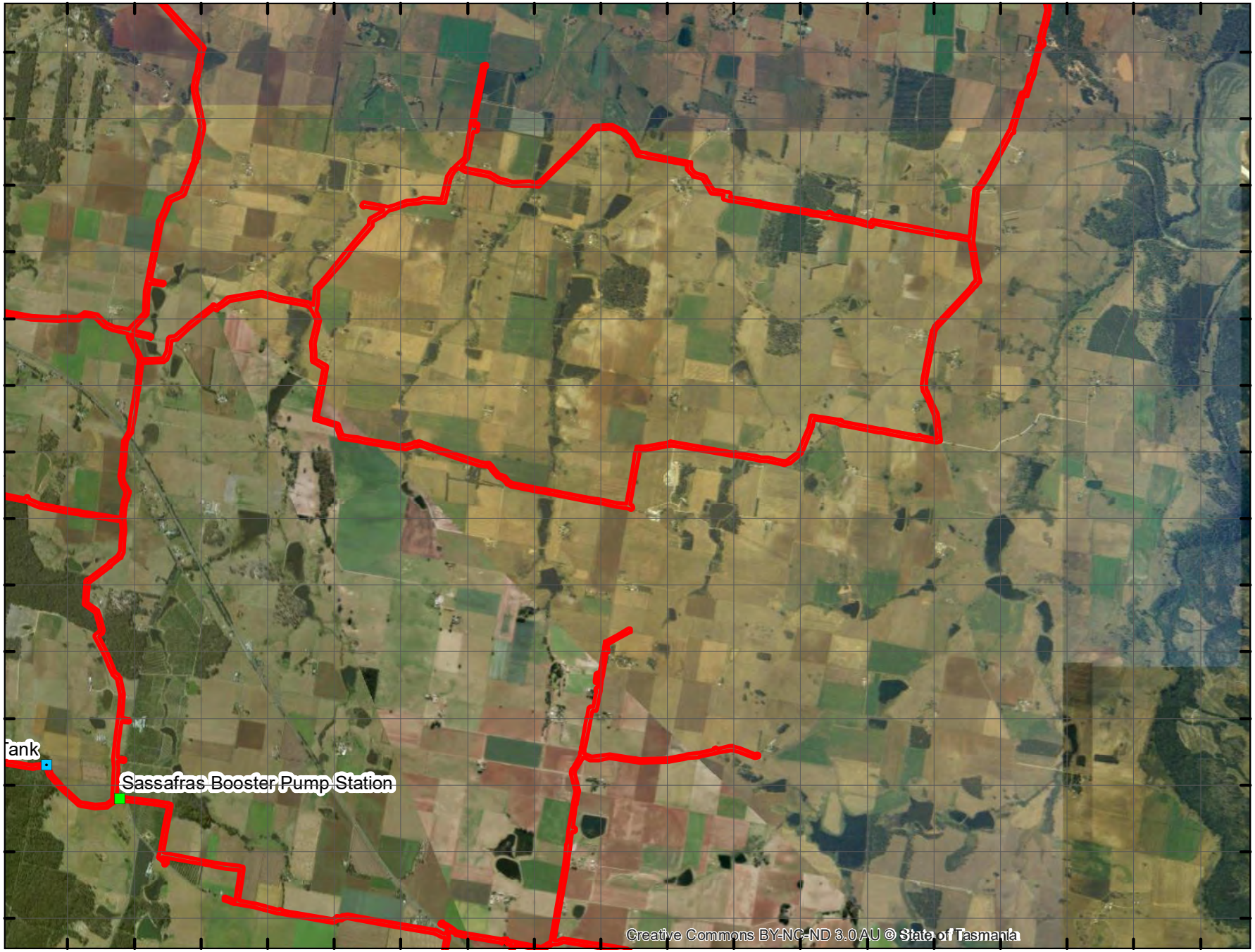
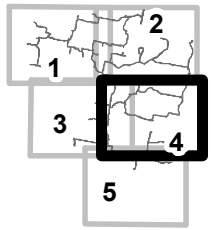
File: J1401 M3 RevA

Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA)

Map 4 of 5





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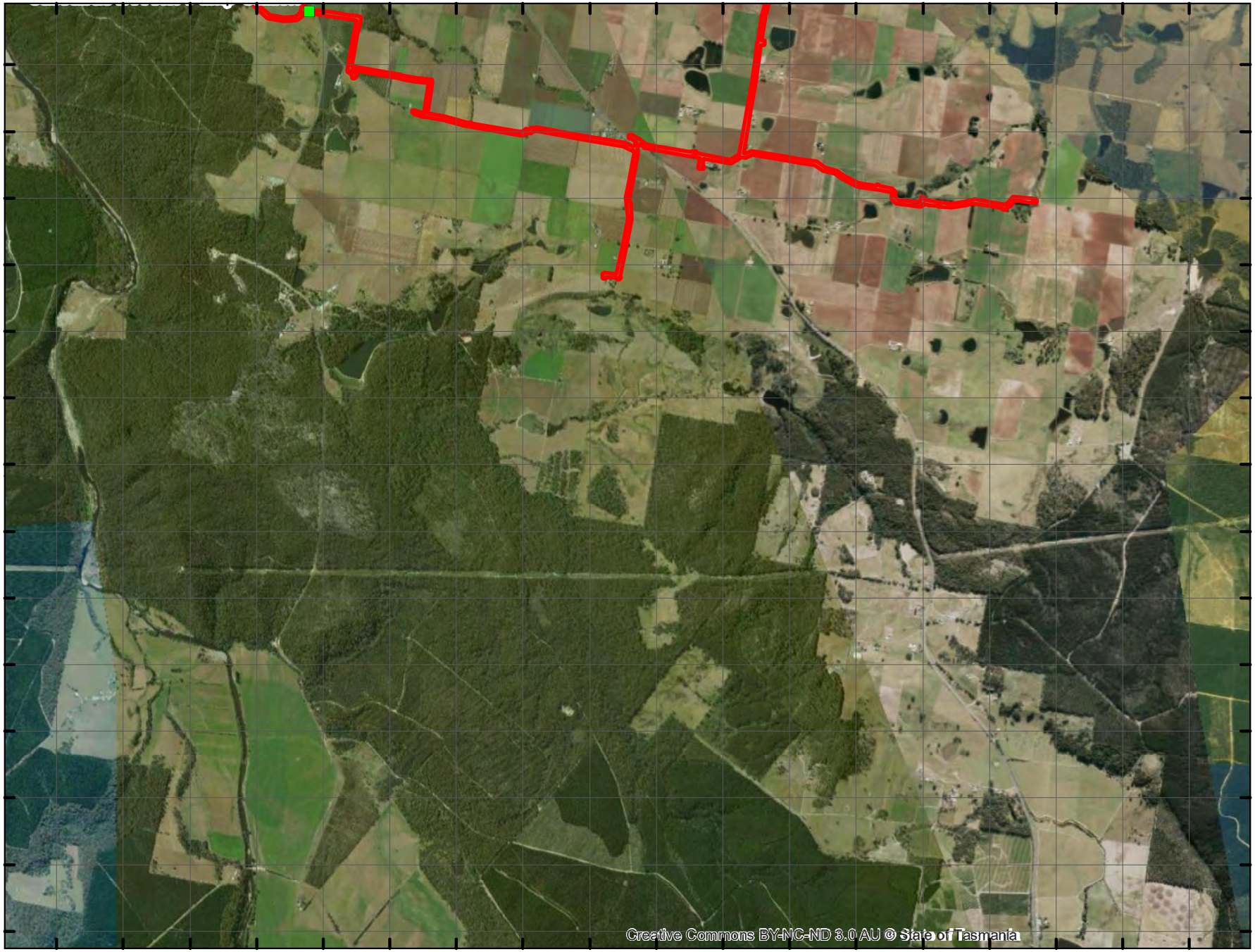
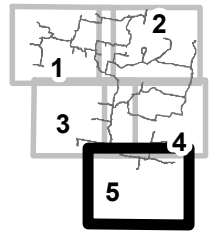
CULTURAL HERITAGE MANAGEMENT AUSTRALIA

File: 11401 M9 RevA

Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA)

Map 5 of 5





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CULTURAL HERITAGE MANAGEMENT AUSTRALIA

File: J1401 M9 RevA

Sassafras Wesley-Vale Irrigation Scheme Augmentation – Pump Stations, Pipelines and Associated Works

Turbidity Management Framework

August 2023

Tasmanian Irrigation

Tasmanian Irrigation Pty Ltd
PO Box 84, Evandale, 7212

Phone: 03 6398 8433| Fax: 03 6398 8441
Email: enquiries@tasmanianirrigation.com.au
Web: www.tasmanianirrigation.com.au

Purpose

Managing sediment inputs into waterways within the construction area for the Sassafras Wesley-Vale Irrigation Scheme Augmentation (SWISA) has been identified as a high priority by Tasmanian Irrigation to ensure that the requirements of all permits and approvals for the project are met.

This framework applies to instream works associated with Great Bend Pump Station, and major waterway crossings as defined in Table 1. This document outlines an adaptive management framework to be applied to turbidity levels within these waterways during the construction phase.

This framework provides guidance for the development of the Contractor's Water Crossing Management Plan (WCMP) as required in the SWISA Environmental Protection Requirements for Construction (EPR) and EPG5 – Watercourse Crossings.

The aim of the framework is to provide guidance to both Tasmanian Irrigation and the Contractor for interpreting water quality results and identifying when mitigative actions may be required to minimize impacts at the site.

The framework ensures that the environmental standards outlined in relevant guidelines and approvals are met during the construction phase of the SWISA.

Background

Tasmanian Irrigation has utilized baseline data from the Department of Natural Resources and Environment (NRE), the Tasmanian Environment Protection Authority (EPA) catchment Default Guideline Values (DGVs) for the Mersey River Catchment, and ANZECC guidelines, to set site specific triggers for the SWISA watercourse crossings.

The ANZECC guidelines state the turbidity trigger values of rivers as:

- Lowland rivers – 6-50 NTU
- Upland rivers – 2-25 NTU

Both these ranges fit with the local trigger values determined by the Tasmanian EPA. We used the more specific values from the Tasmanian EPAs Default Guideline Values for Slightly to Moderately Disturbed (SMD) waterways, cross referencing with available water quality data from NRE. For some of these waterways there is limited baseline data available, particularly for the minor waterways. A trigger value of 5 (NTU) has been predetermined for the Mersey River Catchment as per guidelines by NRE.

The EPA SMD DGVs are listed for the catchments as below.

Mersey River Catchment

Season	Median (NTU)	90th%ile (NTU)
Full Year	**2.4**	**9.9**
Summer	2.0	9.3
Autumn	2.3	9.7
Winter	2.6	10.7
Spring	2.6	9.3

Table 1: Mersey River Catchment median and 90% percentile NTU (turbidity) guidelines.

Great Bend Pump Station

Great Bend Pump Station is located on the banks on the Mersey River, activities to remediate the pump station include External Coating and installation of Mechanical Systems and Walkways, some of this work will likely require the installation of a temporary cofferdam or caisson. Additionally, the installation of barges and pylons may be necessary to install a temporary pumping system for part or all of the project duration.

Monitoring during the Great Bend Pump Station Remediation and Temporary Pumping construction must be completed as detailed for watercourse crossings below.

Watercourse crossings

Watercourse crossings within the Sassafras Wesley Vale construction corridor are outlined in Table 2.
Of the water ways outlined, two are Major Streams with the balance classified as Minor Streams, Tributaries and Minor Tributaries. Most water ways in the district should be considered transient, without consistent flow.

Waterway	**Hydrology Class**	X	**Y**
Panatana Rivulet	Major Stream	456665	5429536
Panatana Rivulet	Major Stream	456816	5434099
Pardoe Creek	Major Stream	456808	5441499
Pardoe Creek	Major Stream	452176	5439690
Panatana Rivulet	Major Stream	459961	5437542
Panatana Rivulet	Major Stream	456665	5429536
Smiths Creek	Tributary	457793	5428948
Westford Creek	Tributary	457607	5433058
Tullamona Creek	Tributary	460451	5432957
Westford Creek	Tributary	458497	5435006
Bishton Creek	Tributary	449430	5438061

Table 2: SWISA pipeline watercourse crossing locations with permanent flows.

Development of a Construction Water Quality Management Program (CWQMP)

As outlined in EPG 5: Watercourse Crossings, the Contractor is to develop and implement prior to construction a CWQMP that incorporates the Great Bend pump station and all watercourse crossings.

The monitoring, reporting, and recording requirements for the CWQMP are specified in EPG 5, with further details of the turbidity triggers and actions below.

Monitoring Locations

All water crossings with running water will require a minimum upstream and downstream monitoring. Appropriate monitoring sites are sites as detailed below:

- Upstream:
    - Located upstream of all water crossing works and potential sedimentation inputs from the site.
    - Downstream of any confluences with significant creeks, streams, or rivers
    - Not to be undertaken less than 10m or further than 200 m upstream from the site.
- Downstream:
    - Located downstream of all construction sediment inputs (from both point and diffuse sources)
    - Upstream of any confluences with significant creeks, streams, or rivers
    - Not be undertaken less than 20m or further than 200m downstream of the construction site.

All water crossing monitoring locations should be at minimum recorded with photo evidence in a Survey123 form that will be provided by Tasmanian Irrigation prior to construction.

Monitoring Requirements

Prior to construction commencing, a Survey 123 form will be created by Tasmanian Irrigation for the monitoring locations and data to be recorded in.

If the watercourse is running:

Monitoring to be undertaken using a turbidity meter and is to be conducted in accordance with the following:

1. Daily reading taken one day prior to construction commencing.
2. Minimum three upstream and downstream readings taken daily once construction has commenced:
    - Prior to the commencement of daily works
    - During daily works
    - At the completion of daily works
    - At any other time that there is a visible change in turbidity downstream resultant from site activities.
3. All readings to be checked against the *SWISA Turbidity Management Framework* and actions taken as necessary.

If the watercourse is NOT running:

Visual monitoring up and downstream prior to, during, and after any construction works adjacent to, or in the bed of, the watercourse is to be undertaken. Appropriate sediment management and erosion control must still be implemented.

Great Bend Pump Station

Great Bend Pump Station is adjacent to the Mersey River watercourse. Due to this, the watercourse must be monitored, and appropriate sediment management mitigations must be implemented.

Monitoring during the Great Bend Pump Station construction must be completed as detailed for watercourse crossings above. The project does not call for the crossing of the Mersey River and works associated in proximity is limited to the installation of temporary pumping, coating work, installation of new screens and the refurbishment of the existing pump station.

Monitoring and Reporting Responsibilities

In accordance with the *SWISA Environmental Protection Requirements for Construction* the Contractor is required to:

1. Complete turbidity monitoring in accordance with the requirements outlined within an approved CWQMP.
2. Provide the results of monitoring to TI weekly.
3. Provide TI with an Environmental Incident Report (EIR) within 24 hrs if monitoring results trigger an environmental incident as defined by this framework.

It should be noted that situations regarding water quality and turbidity may arise on site that are not addressed by the Framework. In these situations, it is important for the Contractor and TI to communicate to quickly identify the cause and to determine the mitigative actions together.

The Contractor must ensure that watercourse crossing controls outlined within the CEMP are complied with, and that compliance is documented.

Compliance will be outlined in:

- Daily Site Diary
- Weekly environmental checklists (provided to TI at the end of the month with the monthly report)

Emergency Response

In the event that a breach of compliance regarding watercourse environmental controls occurs:

- The Contractor will immediately notify the Superintendent and the TI Project Manager; and
- The Contractor will collect evidence at the site and complete an investigation of the incident to the satisfaction of TI.
- The Contractor, on advice from the Superintendent, may be required to engage a suitably qualified person to determine whether the failure constitutes an ongoing threat to the flora and fauna in the vicinity; and
- Tasmanian Irrigation will liaise with the relevant regulatory authorities regarding the incident.

Records

The Contractor will keep written records showing:

- Compliance with environmental controls outlined in the EPRs and CEMP.
- All records of sampling and analysis must be retained for at least two years and copies provided to Tasmanian Irrigation.

Figure 1: Sassafras Wesley-Vale Irrigation Scheme Augmentation – Major watercourse crossings

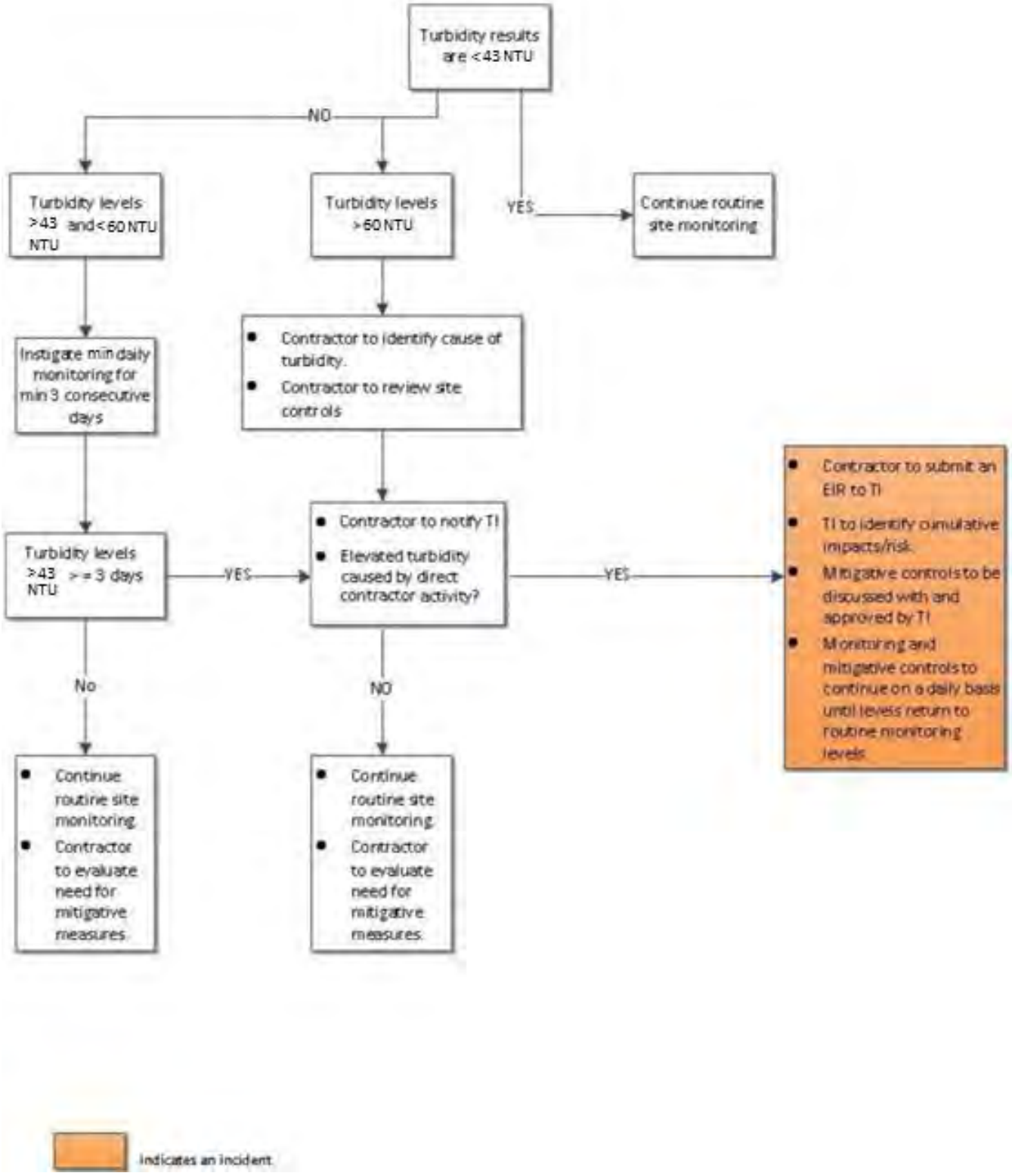

Figure 2: Catchment turbidity management framework

References

Environment Protection Authority (2021) Default Guideline Values (DGVs) for Aquatic Ecosystems of the Mersey Catchment, Environment Protection Authority, Hobart, Tasmania.

PIW (2008). Site-specific trigger values for physico-chemical indicators monitored under the DPIW Baseline Water Quality Monitoring Program. Water Assessment Water Quality Report Series, Report No. WA 08/52. Water Resources Division. Department of Primary Industries and Water, Hobart, Tasmania

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 15-Mar-2023

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	3
Listed Threatened Species:	64
Listed Migratory Species:	37

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	3
Commonwealth Heritage Places:	None
Listed Marine Species:	65
Whales and Other Cetaceans:	10
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	4
Regional Forest Agreements:	1
Nationally Important Wetlands:	None
EPBC Act Referrals:	3
Key Ecological Features (Marine):	None
Biologically Important Areas:	9
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text
Giant Kelp Marine Forests of South East Australia	Endangered	Community may occur within area
Tasmanian Forests and Woodlands dominated by black gum or Brookers gum (Eucalyptus ovata / E. brookeriana)	Critically Endangered	Community likely to occur within area
Tasmanian white gum (Eucalyptus viminalis) wet forest	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Aquila audax fleayi Tasmanian Wedge-tailed Eagle, Wedge-tailed Eagle (Tasmanian) [64435]	Endangered	Breeding likely to occur within area
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat likely to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Ceyx azureus diemenensis Tasmanian Azure Kingfisher [25977]	Endangered	Species or species habitat known to occur within area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Fregetta grallaria grallaria White-bellied Storm-Petrel (Tasman Sea), White-bellied Storm-Petrel (Australasian) [64438]	Vulnerable	Species or species habitat likely to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Breeding known to occur within area
Limosa lapponica baueri Nunivak Bar-tailed Godwit, Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat likely to occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri platei Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini		
Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Thinornis cucullatus cucullatus		
Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area
Tyto novaehollandiae castanops (Tasmanian population)		
Masked Owl (Tasmanian) [67051]	Vulnerable	Breeding known to occur within area
CRUSTACEAN		
Astacopsis gouldi		
Giant Freshwater Crayfish, Tasmanian Giant Freshwater Lobster [64415]	Vulnerable	Species or species habitat likely to occur within area
Engaeus granulatus		
Central North Burrowing Crayfish [78959]	Endangered	Species or species habitat known to occur within area
FISH		
Galaxiella pusilla		
Eastern Dwarf Galaxias, Dwarf Galaxias [56790]	Vulnerable	Species or species habitat may occur within area
Prototroctes maraena		
Australian Grayling [26179]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
[Seriolella brama](#) Blue Warehou [69374]	Conservation Dependent	Species or species habitat known to occur within area
[Thunnus maccoyii](#) Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area
FROG		
[Litoria raniformis](#) Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828]	Vulnerable	Species or species habitat known to occur within area
MAMMAL		
[Balaenoptera musculus](#) Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
[Dasyurus maculatus maculatus (Tasmanian population)](#) Spotted-tail Quoll, Spot-tailed Quoll, Tiger Quoll (Tasmanian population) [75183]	Vulnerable	Species or species habitat known to occur within area
[Dasyurus viverrinus](#) Eastern Quoll, Luaner [333]	Endangered	Species or species habitat may occur within area
[Eubalaena australis](#) Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
[Perameles gunnii gunnii](#) Eastern Barred Bandicoot (Tasmania) [66651]	Vulnerable	Species or species habitat known to occur within area
[Sarcophilus harrisii](#) Tasmanian Devil [299]	Endangered	Species or species habitat likely to occur within area
PLANT		
[Barbarea australis](#) Native Wintercress, Riverbed Wintercress [12540]	Endangered	Species or species habitat likely to occur within area
[Caladenia caudata](#) Tailed Spider-orchid [17067]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Caladenia pallida Rosy Spider Orchid, Pale Spider-orchid, Summer Spider-orchid [9604]	Critically Endangered	Species or species habitat likely to occur within area
Caladenia tonellii Robust Fingers [64861]	Critically Endangered	Species or species habitat known to occur within area
Cassinia rugata Wrinkled Cassinia, Wrinkled Dollybush [21885]	Vulnerable	Species or species habitat known to occur within area
Glycine latrobeana Clover Glycine, Purple Clover [13910]	Vulnerable	Species or species habitat may occur within area
Leucochrysum albicans subsp. tricolor Hoary Sunray, Grassland Paper-daisy [89104]	Endangered	Species or species habitat may occur within area
Prasophyllum apoxychilum Tapered Leek-orchid [64947]	Endangered	Species or species habitat may occur within area
Prasophyllum limnetes Marsh Leek-orchid [82678]	Critically Endangered	Species or species habitat known to occur within area
Prasophyllum pulchellum Pretty Leek-orchid [64953]	Critically Endangered	Species or species habitat likely to occur within area
Prasophyllum robustum Robust Leek-orchid [12499]	Critically Endangered	Species or species habitat likely to occur within area
Pterostylis ziegeleri Grassland Greenhood, Cape Portland Greenhood [64971]	Vulnerable	Species or species habitat may occur within area
Senecio psilocarpus Swamp Fireweed, Smooth-fruited Groundsel [64976]	Vulnerable	Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Spyridium obcordatum		
Creeping Dusty Miller [17447]	Vulnerable	Species or species habitat known to occur within area
Thelymitra jonesii		
Sky-blue Sun-orchid [76352]	Endangered	Species or species habitat may occur within area
Xanthorrhoea arenaria		
Sand Grasstree [21603]	Vulnerable	Species or species habitat may occur within area
Xanthorrhoea bracteata		
Shiny Grasstree [7950]	Endangered	Species or species habitat likely to occur within area
Xerochrysum palustre		
Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat likely to occur within area
REPTILE		
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
SHARK		
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Ardenna grisea		
Sooty Shearwater [82651]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Thalassarche chrysostoma		
Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche salvini		
Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Migratory Marine Species		
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Caperea marginata		
Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area
Eubalaena australis as Balaena glacialis australis		
Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
[Lagenorhynchus obscurus](#) Dusky Dolphin [43]		Species or species habitat may occur within area
[Lamna nasus](#) Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
[Megaptera novaeangliae](#) Humpback Whale [38]		Species or species habitat known to occur within area
Migratory Terrestrial Species		
[Hirundapus caudacutus](#) White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
[Myiagra cyanoleuca](#) Satin Flycatcher [612]		Breeding known to occur within area
Migratory Wetlands Species		
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat may occur within area
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
[Calidris canutus](#) Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area
[Gallinago hardwickii](#) Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Limosa lapponica		
Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State
Unknown	
Commonwealth Land - [60192]	TAS
Commonwealth Land - [60189]	TAS
Commonwealth Land - [60194]	TAS

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Ardenna carneipes as Puffinus carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Ardenna grisea as Puffinus griseus Sooty Shearwater [82651]		Species or species habitat may occur within area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area
Diomedea antipodensis Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea antipodensis gibsoni as Diomedea gibsoni Gibson's Albatross [82270]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Diomedea sanfordi Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat known to occur within area overfly marine area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Breeding known to occur within area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area overfly marine area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Breeding known to occur within area overfly marine area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes halli Northern Giant Petrel [1061]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Breeding known to occur within area overfly marine area
Neophema chrysostoma Blue-winged Parrot [726]		Species or species habitat known to occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat likely to occur within area
Sternula albifrons as Sterna albifrons Little Tern [82849]		Species or species habitat may occur within area
Thalassarche bulleri Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri platei as Thalassarche sp. nov. Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat likely to occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Thalassarche chrysostoma Grey-headed Albatross [66491]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area

Scientific Name	Threatened Category	Presence Text
Thalassarche salvini Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Thinornis cucullatus as Thinornis rubricollis Hooded Plover, Hooded Dotterel [87735]		Species or species habitat known to occur within area overfly marine area
Thinornis cucullatus cucullatus as Thinornis rubricollis rubricollis Eastern Hooded Plover, Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat known to occur within area overfly marine area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area overfly marine area
Fish		
Heraldia nocturna Upside-down Pipefish, Eastern Upside-down Pipefish, Eastern Upside-down Pipefish [66227]		Species or species habitat may occur within area
Hippocampus abdominalis Big-belly Seahorse, Eastern Potbelly Seahorse, New Zealand Potbelly Seahorse [66233]		Species or species habitat may occur within area
Hippocampus breviceps Short-head Seahorse, Short-snouted Seahorse [66235]		Species or species habitat may occur within area
Histiogamphelus briggsii Crested Pipefish, Briggs' Crested Pipefish, Briggs' Pipefish [66242]		Species or species habitat may occur within area
Histiogamphelus cristatus Rhino Pipefish, Macleay's Crested Pipefish, Ring-back Pipefish [66243]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Hypselognathus rostratus Knifesnout Pipefish, Knife-snouted Pipefish [66245]		Species or species habitat may occur within area
Kaupus costatus Deepbody Pipefish, Deep-bodied Pipefish [66246]		Species or species habitat may occur within area
Kimblaeus bassensis Trawl Pipefish, Bass Strait Pipefish [66247]		Species or species habitat may occur within area
Lissocampus caudalis Australian Smooth Pipefish, Smooth Pipefish [66249]		Species or species habitat may occur within area
Lissocampus runa Javelin Pipefish [66251]		Species or species habitat may occur within area
Maroubra perserrata Sawtooth Pipefish [66252]		Species or species habitat may occur within area
Mitotichthys semistriatus Halfbanded Pipefish [66261]		Species or species habitat may occur within area
Mitotichthys tuckeri Tucker's Pipefish [66262]		Species or species habitat may occur within area
Notiocampus ruber Red Pipefish [66265]		Species or species habitat may occur within area
Phyllopteryx taeniolatus Common Seadragon, Weedy Seadragon [66268]		Species or species habitat may occur within area
Pugnaso curtirostris Pugnose Pipefish, Pug-nosed Pipefish [66269]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
[Solegnathus robustus](#) Robust Pipehorse, Robust Spiny Pipehorse [66274]		Species or species habitat may occur within area
[Solegnathus spinosissimus](#) Spiny Pipehorse, Australian Spiny Pipehorse [66275]		Species or species habitat may occur within area
[Stigmatopora argus](#) Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
[Stigmatopora nigra](#) Widebody Pipefish, Wide-bodied Pipefish, Black Pipefish [66277]		Species or species habitat may occur within area
[Stipecampus cristatus](#) Ringback Pipefish, Ring-backed Pipefish [66278]		Species or species habitat may occur within area
[Urocampus carinirostris](#) Hairy Pipefish [66282]		Species or species habitat may occur within area
[Vanacampus phillipi](#) Port Phillip Pipefish [66284]		Species or species habitat may occur within area
[Vanacampus poecilolaemus](#) Longsnout Pipefish, Australian Long-snout Pipefish, Long-snouted Pipefish [66285]		Species or species habitat may occur within area
Mammal		
[Arctocephalus forsteri](#) Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
[Arctocephalus pusillus](#) Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Reptile		
[Chelonia mydas](#) Green Turtle [1765]	Vulnerable	Species or species habitat may occur within area

Whales and Other Cetaceans		[Resource Information]
Current Scientific Name	Status	Type of Presence
Mammal		
[Balaenoptera acutorostrata](#) Minke Whale [33]		Species or species habitat may occur within area
[Balaenoptera musculus](#) Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
[Caperea marginata](#) Pygmy Right Whale [39]		Foraging, feeding or related behaviour may occur within area
[Delphinus delphis](#) Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
[Eubalaena australis](#) Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area
[Globicephala macrorhynchus](#) Short-finned Pilot Whale [62]		Species or species habitat may occur within area
[Grampus griseus](#) Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
[Lagenorhynchus obscurus](#) Dusky Dolphin [43]		Species or species habitat may occur within area
[Megaptera novaeangliae](#) Humpback Whale [38]		Species or species habitat known to occur within area
[Tursiops truncatus s. str.](#) Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

State and Territory Reserves [Resource Information]

Protected Area Name	Reserve Type	State
Pardoe Northdown	Conservation Area	TAS
Port Sorell	Conservation Area	TAS
Rubicon Sanctuary	Conservation Covenant	TAS
Warrawee	Conservation Area	TAS

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

RFA Name	State
Tasmania RFA	Tasmania

EPBC Act Referrals [Resource Information]

Title of referral	Reference	Referral Outcome	Assessment Status
Controlled action			
Tasmania Natural Gas Project - Stage 2	2001/211	Controlled Action	Post-Approval
Water Pipeline	2010/5327	Controlled Action	Post-Approval
Not controlled action			
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed

Biologically Important Areas

Scientific Name	Behaviour	Presence
Seabirds		
Ardenna tenuirostris Short-tailed Shearwater [82652]	Foraging	Known to occur
Eudyptula minor Little Penguin [1085]	Foraging	Known to occur
Pelagodroma marina White-faced Storm-petrel [1016]	Foraging	Known to occur
Pelecanoides urinatrix Common Diving-petrel [1018]	Foraging	Known to occur

Scientific Name	Behaviour	Presence
Phalacrocorax fuscescens Black-faced Cormorant [59660]	Foraging	Known to occur
Thalassarche cauta cauta Shy Albatross [82345]	Foraging likely	Likely to occur
Whales		
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Distribution	Known to occur
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Foraging	Likely to be present
Eubalaena australis Southern Right Whale [40]	Known core range	Known to occur

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact us page.

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Green and Gold Frog Protocol

March 2023

Tasmanian Irrigation

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1. Context

The planning and approvals phase for irrigation schemes developed by Tasmanian Irrigation (TI) contains comprehensive environmental assessments of each proposed project. The environmental assessments include the identification of habitat for green and gold frogs (*Litoria raniformis*) which is listed under the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)* and the *Threatened Species Protection Act 1995 (TSP Act)*.

The protocol has been prepared in accordance with the Threatened Species Section, *Species Management Profile for Green and Gold Frogs,* prepared by the Department of Natural Resources and Environment Tasmania and thedocument *Department of State Growth (2015), Green and Gold Frog (Litoria raniformis) Management Guidelines, report prepared by GHD*. Further details are outlined in this document including information relevant to the project life cycle. This protocol focuses on the construction phase only, and further details can be found in the guidelines.

2. Protocol Objectives

The objectives of the protocol are:

1. To minimise harm to green and gold frogs during construction activities; and
2. To ensure that there is no significant impact on the species.

3. Management of the Protocol

The protocol will be managed by TI's Ecologist with oversight from the General Manager Environment Health and Safety and project teams. The persons who hold these positions must have a working knowledge of the *EPBC Act*, *TSP Act* and the *Nature Conservation Act 2002* (NC Act) and hold current permits for the capture and translocation of the green and gold frog. All personnel involved in the implementation of the Protocol will be suitably qualified and have experience in freshwater ecology and animal handling.

4. Pre-construction Phase

During the pre-construction phase, the contractor must incorporate all biodiversity objectives, including any fauna sensitive design requirements, into their Construction Environmental Management Plan (CEMP), for TI approval. The contractor shall ensure adequate training of staff on the CEMP requirements.

5. Construction Hygiene

The Tasmanian Government has produced a set of guidelines titled "*Keeping it Clean – A Tasmanian Field Hygiene Manual to Prevent the Spread of Freshwater Pests and Pathogens*" (Allan & Gartenstein 2010). This document sets a series of hygiene protocols for individual persons and machinery. This is required to manage the risk associated with transmitting Amphibian Chytrid Fungus (*Batrachochytrium dendrobatidis*). Contractors should implement measures from these guidelines during all construction activities.

6. Transportation away from construction activities

Green and Gold Frog habitat can include both 'known' habitats and potential. Breeding habitat for the Green and Gold Frog can include still or slow-moving water bodies (lagoons, lakes, farm dams, ponds,

irrigation channels, swamps, and slow-moving sections of rivers and streams). In most cases habitat does not necessarily include all roadside ditches or general low-lying areas.

As it may not be possible to avoid all frog habitats as part of the construction activities, a clearance survey should be conducted prior to any works occurring in identified green and gold frog habitat. NRE Tasmania needs to be engaged as a clearance survey may trigger the need for additional threatened species permits.

Once the construction through a waterbody (which includes ephemeral waterbodies in a wet or dry state) has been determined and fenced off appropriately, green and gold frogs that remain within the construction zone will need to be captured and moved out of harm's way using the measures outlined below. This includes both adult frogs and tadpoles.

6.1 Adult frogs and terrestrial metamorphs

Within the week prior to commencement of construction activities through a waterbody, concerted efforts should be made by qualified ecologists to detect, and capture threatened frogs (and other ground-dwelling fauna within the construction area), using active searching techniques.

If construction is to occur through a waterbody during the breeding season for the green and gold frog, and the environmental conditions at the time are conducive to increased frog activity (i.e., warm and wet nights), then nocturnal searches for the species should also be made prior to construction, to maximise the chances of detecting and clearing frogs from the construction zone.

6.2 Tadpoles and aquatic metamorphs - non-linear waterbody (i.e., wetland, pond, dam)

If a non-linear waterbody (i.e., wetland, pond, dam) is intercepted by the construction zone and needs to be drained before construction, then tadpoles and aquatic metamorphs of the green and gold frog will need to be removed from the waterbody and relocated to the nearest available suitable aquatic habitat, according to pre-determined handling protocols and Amphibian Chytrid Fungus protocols (see Section 6.3). Prior to any relocation, testing of both source and receiving populations for Chytrid Fungus is required.

The optimal method for this would be to commence pumping of the surface water to reduce the size and volume of the waterbody, to concentrate tadpoles and other aquatic fauna into a smaller area/volume. This should be done in the presence of a qualified ecologist, so that the pumping process can be slowed or stopped if it is believed to pose a threat to fauna (particularly the green and gold frog and its tadpoles). The intake for water extraction will need to be within 15 cm of the water surface at all times, and pumping will need to be done using a safe and effective filter system to prevent fauna from being sucked into the pump. The filter could be as simple as a fine mesh fenced enclosure that is installed around the water pump inlet, as long as it effectively excludes fauna.

Once the effective size of the waterbody has been reduced to the satisfaction of the supervising ecologist, pumping should be halted and dipnets and/or seine nets used to extract tadpoles from the water. When the waterbody has been cleared of fauna to the satisfaction of the ecologist, then the pumping process should continue until the waterbody is de-watered. If green and gold frog tadpoles (or other hylid tadpoles that could be green and gold frogs – tadpoles can be very difficult to identify in the field) are captured, then they would be moved to a nearby safe location. Collected tadpoles

would be stored temporarily and transported in low densities (no more than 5 large or 20 small tadpoles per litre) in well aerated containers of pond water.

6.3 Tadpoles and aquatic metamorphs – linear waterbody (i.e., stream, channel, drainage line)

If a linear waterbody (i.e., stream, channel, drainage line) is intercepted by the construction zone, and upstream water is to be dammed and then pumped around the construction area to the downstream side of the construction zone, then no collection of tadpoles will be required. In that case, the construction process is expected to create a temporary barrier to tadpoles' dispersal, but the likelihood of significant tadpole mortality or injury is considered to be relatively low. The water-pumping process for a linear waterway would still need to be done within 15 cm of the water's surface and using an effective filter system to prevent fauna from being sucked into the pump.

6.4 Chytrid management during capture and release of frogs

Measures to avoid the spread of the Amphibian Chytrid Fungus must be implemented during the animal-handling process only. Chytrid often occurs in a mosaic pattern within the landscape, with infected and uninfected ponds occurring within close proximity of one another. Given this, a risk assessment needs to be completed to ascertain the potential to distribute Amphibian Chytrid Fungus. For example, if the waterway is downstream, within the same catchment, the risk of spreading Amphibian Chytrid Fungus would be small. However, if the habitat is located in a separate catchment, the risk would be much higher. Where there is a medium to high risk of spreading Amphibian Chytrid Fungus, testing needs to be completed before translocation can occur.

7. References

Allan, K. & Gartenstein, S. (2010) Keeping it Clean - A Tasmanian field hygiene manual to prevent the spread of freshwater pests and pathogens. NRM South. ISBN: 978-1-921082-09-2.

Department of State Growth (2015), Green and Gold Frog (Litoria raniformis) Management Guidelines, report prepared by GHD

Threatened Species Section (2023). Green and Gold Frog (Litoria raniformis): Species Management Profile for Tasmania's Threatened Species Link. https://www.threatenedspecieslink.tas.gov.au/Pages/Green-and-Gold-Frog.aspx Department of Natural Resources and Environment Tasmania. Accessed on 27/2/2023.

Threatened Burrowing Crayfish Management Protocol

April 2023

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1. Context

The planning and approvals phase for irrigation schemes developed by Tasmanian Irrigation (TI) contains comprehensive environmental assessments of each proposed project. The environmental assessments include the identification of potential habitat for the burrowing freshwater crayfish from the *Engaeus* genera. Burrowing freshwater crayfish from the *Engaeus* genera are listed as Threatened under both the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)* and the *Threatened Species Protection Act 1995 (TSP Act).*

Fauna assessments seek to identify potential habitat within the works footprint of proposed Irrigation Schemes. To ensure that the construction of Irrigation Schemes do not have a significant impact on these species, Tasmanian Irrigation has developed the Threatened Burrowing Crayfish Management Protocol.

The protocol has been prepared in consultation with NRE's Policy and Conservation Advice Branch and in accordance with NRE's Survey Guidelines and Management Advice for Development Proposals.

Table 1: Of the 15 confirmed species of burrowing crayfish found in Tasmania, 13 are endemic. The 5 threatened species of burrowing crayfish include: (Source: NRE, Tasmania)

Threatened Freshwater Burrowing Crayfish (Engaeus) found in Tasmania	Conservation Status
Scottsdale burrowing crayfish (E. spinicaudatus)	Endangered
Furneaux burrowing crayfish (E. martiginer)	Endangered
Central North burrowing crayfish (E. granulatus)	Endangered
Mt. Arthur burrowing crayfish (E. orramakunna)	Vulnerable
Burnie burrowing crayfish (E. yabbimunna)	Vulnerable

2. Protocol Objective and Target

The objective of the protocol is:

- To minimise the effects of pipeline installation on populations of threatened burrowing freshwater crayfish from the *Engaeus* genera

The target of the protocol is:

- To have no significant impact on any population of a threatened *Engaeus* species[1], and negligible direct impacts on individuals of threatened *Engaeus* species.

3. Management of the Protocol

Whilst being applied to any relevant Irrigation Schemes, the protocol will be overseen by the TI Ecologist and Manager, Environment, Health & Safety. The person who holds this position must have a working knowledge of the *EPBC Act*, *TSP Act* and the *Nature Conservation Act 2002* (*NC Act*). Suitably qualified consultants or other ecologists may be utilised to undertake components of the assessment.

[1] In accordance with the relevant significant impact guidelines defined under the EPBCA

Tasmanian Irrigation will ensure that the appropriate permits are in place to allow for collecting and handling of the burrowing crayfish, and the necessary permits to take products of wildlife and wildlife under the *NC Act* will be in place.

4 Responsibilities

- Pre-works planning and design, and post-works reporting, are the responsibilities of Tasmanian Irrigation.
- Field methods are the responsibility of the contractor.
- In addition to the requirements of the protocol, both parties have a responsibility to ensure that the conditions outlined in associated Tasmanian Irrigation approvals under the *Threatened Species Protection Act 1995* (TSPA), the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBCA), and/or the *Nature Conservation Act 2002* (NCA) are also met.

5 Methods/ Requirements

5.1 Pre-works planning and design

- Ecological assessment will be undertaken to map the distribution of burrowing crayfish occupancy (as indicated by burrows) in relation to the potential ranges of threatened *Engaeus* species, as defined within the Tasmanian Natural Values Atlas and maintained by NRE[2].
- All areas of burrows within the potential range of threatened species will be avoided to the maximum extent possible by the alignment of impact areas. If patches of burrows are unavoidable, aligning impacts along the margins of the patches will be the preferred option (thus preventing fragmentation).
- In cases of irreversible and permanent habitat change (such as the inundation of habitat), excavation surveys[3] will be undertaken to determine occupancy of burrows by threatened species. This is necessary for the purposes of a permit to take threatened species under the TSPA and also needed to quantify impacts to threatened species more generally. In other cases where habitat change will only be temporary (such as trenching for pipelines), occupancy by threatened species will be assumed in patches of burrows within the potential range of threatened species (with no excavation surveys necessary) – it is within these areas that the protocols will be applied.

5.2 Field methods during works

A suitably qualified ecologist will be present during any aspect of soil disturbance or vegetation removal within areas of burrowing crayfish burrows within the potential range of threatened species (these areas will be clearly identified on contractor's maps as informed by the ecological assessment in the planning phase).

The role of this ecologist is defined as follows, noting that collecting and handling of the burrowing crayfish will be undertaken by the ecologist only.

- Prior to disturbance, all reasonable effort will be made to safely collect all individuals of burrowing crayfish from within the works footprint.

[2] The determination of potential range will also be interpreted by the suitably qualified ecologist undertaking the assessment, and thus may be refined in accordance with the precise location and the quality of the habitat

[3] *i.e.* digging up burrows manually to capture and identify species by hand

- During soil and vegetation disturbance, the ecologist will maintain a safe distance from machinery and collect visible individuals of burrowing crayfish from within disturbed areas as safe and practicable.
- Prior to the removal of any material from the site, all excavated material with the potential to contain burrowing crayfish will be examined and all observed individuals collected.
- Upon collection in any scenario, each individual will be examined to assess their condition. Live and uninjured individuals will be placed singly within a storage jar (of sufficient size to contain the one animal but limit their movement within the jar) containing local, fresh, unchlorinated water. Jars will be placed on ice in a cooler until the individual can be returned/ released within the habitat patch (when the risk of disturbance has passed).
    - Unless it becomes a constraint on handling or captivity time, collected individuals will be identified to the species level using Horwitz 1990[4].

Following works, the soil profile will be restored to its original state with no alterations to hydrology – thus ensuring that habitat change and availability will only be temporary.

- Individuals will be returned to suitable habitat at, or as close as possible to the location from which they were captured, in an area where future disturbance is likely to be minimal. Each individual will be released into its own artificially made burrow (a hole created using a crowbar or similar).
- If individuals are not able to be released on the same day that they were collected, the jars containing the animals will be placed into a refrigerator overnight and returned to the site for release in the manner described above when works are completed and the possibility of disturbance has passed.
- Animals that have injuries from which they are unlikely to recover (e.g. injury to the thorax or head) will be placed in their own individual container with unchlorinated fresh water and then placed on ice in a cooler or refrigerator for 2 hours. Animals will then be euthanised in an ice slurry for 30 minutes.
- Dead animals will be placed into preserving jars containing 90 % ethanol for preservation and lodged with an appropriate institution (such as the Queen Victoria Museum, Launceston) as soon as practicable.

5.3 Post-works reporting

- In accordance with associated permit conditions, the Policy and Conservation Advice Branch of NRE will be notified of the species and the number of individuals collected, released and lodged with institutions (in cases of mortality, through euthanasia or otherwise).
- Location data (include geo-referenced co-ordinates) of threatened species will be lodged with the Tasmanian Natural Values Atlas and where relevant supplied to the institution were collected specimens are lodged.

[4] Horwitz, P.H.J. (1990). A taxonomic revision of species in the freshwater crayfish genus *Engaeus* Erichson (Decapoda: Parastacidae). *Invertebrate Taxonomy* 4: 427–614.

6. Proposal to Apply Protocol during Works for Irrigation Schemes

Ecological assessments undertaken during the planning and design phase of Irrigation Schemes must determine if the proposed impact footprint would overlap with patches of crayfish burrows within the potential range of threatened *Engaeus* species.

Based on this, the protocol will be implemented at all sites in which avoidance is not achievable.

7. Outcomes

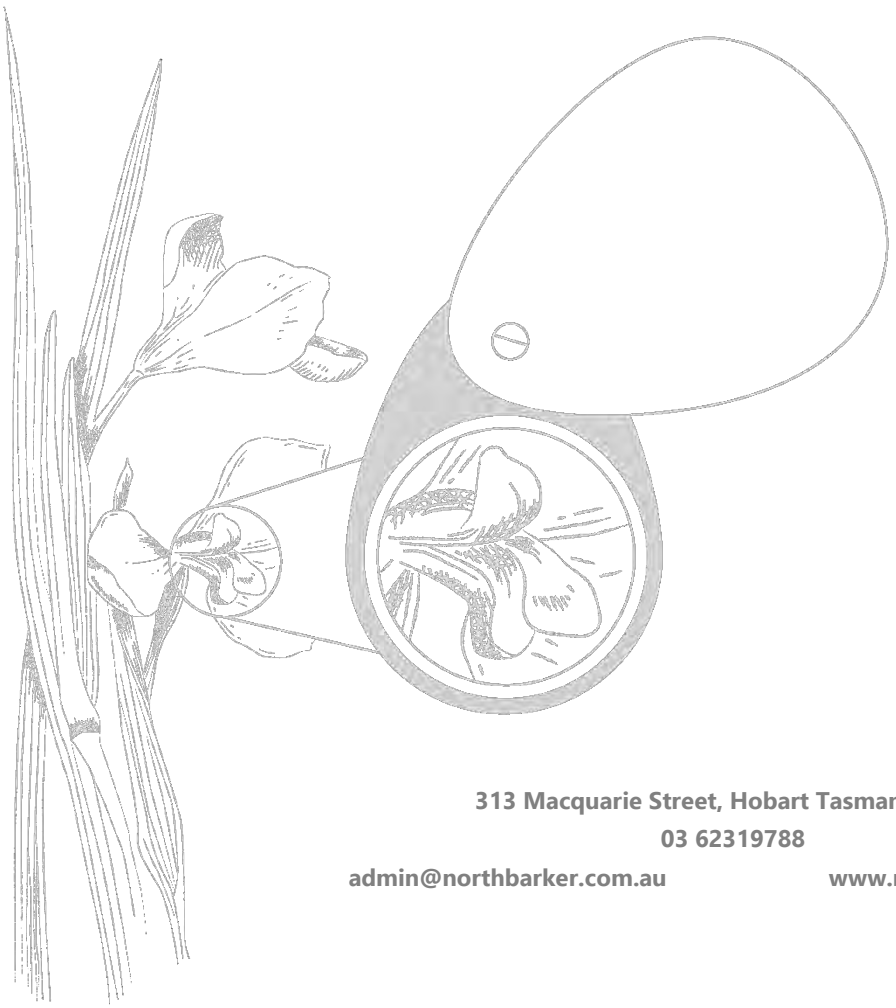
In addition to the avoidance of significant impacts on any population of a threatened species, the application of the protocol can contribute to increased understanding of species distributions, which will improve future conservation efforts and targeted management.

Pre-clearance Check and Unanticipated Den Discovery Protocol
Tasmanian devils, eastern and spotted-tail quolls

Sassafras-Wesley Vale Irrigation Scheme Augmentation

25th July 2023

For Tasmanian Irrigation (IDB031)



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1. Background

The natural values assessment (NVA) undertaken for the Sassafras-Wesley Vale Irrigation Scheme (SWISA) did not record any potential dens within the design corridor for the Tasmanian devil, eastern quoll, or spotted-tail quoll, species variously listed under both the Tasmanian *Threatened Species Protection Act 1995* (TSPA) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBCA). It was subsequently concluded to be a low likelihood that dens would be present within the construction corridor at the point of works. Nonetheless, as a conservative measure of precaution, the NVA recommended:

- A pre-clearance check and unanticipated den discovery protocol (for devils and quolls) must be implemented across the entire construction corridor.

The protocol is subsequently recommended to be undertaken as follows across the entire construction corridor, as well as any associated works areas that will require ground disturbance.

2. Pre-clearance Check and Unanticipated Den Discovery Protocol

Application of this protocol (sections A through D) will require approval to decommission dens under a permit to take products of wildlife, issued under the Tasmanian *Nature Conservation Act 2002* (NCA) by the Department of Natural Resources and Environment Tasmania.

The protocol can largely be undertaken by the civil contractors, with input on specific aspects of the den assessment and management by suitably qualified ecologists (the Ecologist). Some oversight and control of hold-points will be required by either regulators or the proponent and in that case linked to contract requirements for the contractor.

A- Pre-clearance check for potential dens

(i) Approximately two weeks prior to any vegetation clearance and/or ground-breaking works in a particular area, the contractor must undertake a walkover of the impact area (including a 50 m buffer) and systematically search for potential dens.

(ii) Any potential den sites[1] will be investigated and recorded for consulting with the Ecologist. Potential dens are mostly soil burrows/holes in the substrate with an appropriate entrance hole, but also include clusters of boulders with cavities, dense clumps of vegetation with visible animal use, rock outcrops, and dry hollow logs.

(iii) To assist the Ecologist in assessing likelihood of use, the general quality of each potential den will be inspected in relation to factors such as soil warmth (sunlight), proneness to inundation, landscape position, *etc.* Factors including spider webs, delicate fungi, wear marks, hairs, scats, and footprints at potential den entrances will be noted as potential indicators of activity (or non-activity). On receipt of this information and photographs, the Ecologist may advise if the burrow is not being used (*i.e.* definitively inactive and vacant), in which case it can be decommissioned under a permit to destroy a product of wildlife

[1] As devils and quolls are known to opportunistically occupy burrows dug by other species (principally wombats), the protocol manages any burrow as potential habitat for a listed threatened species.

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under the NCA. (Note, if the potential den is not within the necessary clearance area, *i.e.* is within the survey buffer, it should not be decommissioned.)

(iv) If no potential dens are found that require application of Section B, the application of the protocol can proceed to Section C.

(v) Section B, the 'den monitoring assessment' will be applied to any potential den that the Ecologist concludes has evidence of use by a devil or quoll, or evidence of use by a species that cannot be determined, and any den that is considered to be highly suitable for devil or quoll occupation but does not have definitive evidence of being vacant at the time of assessment. An exclusion zone of a 50 m radius will be established around any potential den that warrants application of Section B and will remain in place until the requirements of Section B are completed. Note, if the potential den is not within the necessary clearance area, *i.e.* is within the survey buffer, it will simply be treated as an exclusion zone for the duration of works.

(vi) Clearance will not commence (or any other soil disturbance) in the exclusion zone until that den or burrow is confirmed vacant and the exclusion zone can be lifted as per Section C.

B- Den monitoring assessment

The den monitoring assessment involves the following:

(i) At least two infra-red motion sensor cameras will be installed at each entrance of each burrow. Camera settings will be - sensitivity: high; capture method: video; capture length > 20 sec; capture delay interval: 0 seconds.

(ii) Cameras will remain in place for at least 7 nights.

(iii) After this time, footage will be inspected to identify captures[2], with the following possible outcomes (with input from the Ecologist if devils or quolls are captured).

a. If a pouch-laden devil or quoll, an imp (young devil) or a kitten (young quoll) are recorded using a den, or if an individual devil or quoll is recorded using a den for two or more nights and displaying natal characteristics, then the den will be treated as a likely maternal den.

For a likely maternal den, cameras and the 50 m exclusion zone will remain in place until:

- the den is no longer necessary for the rearing of young and it is confirmed that the mother and young have discontinued use of the den;

[2] If this is done in the field, outcomes a, b, c or d may apply immediately. If memory cards are collected for desktop analysis, cards (and batteries if necessary) will be replaced and camera(s) will remain in place for continued monitoring until action can be informed by the footage. In other words, monitoring will always continue up until the point of decommissioning, which will only be undertaken when an assessment of all footage up until that time has established the den is vacant at the time. A one-way gate may be used in any of the different outcomes to facilitate vacancy (only if the 7 nights of footage has sufficiently informed the action).

- or continued monitoring definitively establishes that the den is in fact not a maternal den (e.g. pouch-laden females may visit multiple dens before dropping their young in one location, and some females may be observed showing natal characteristics [such as lactating and scent marking] around dens in which they have not dropped their young).

Following either of these scenarios the den can be decommissioned while vacant.

b. If any devil or quoll is using a den regularly (*i.e.* almost every night) outcome 'a' will apply. If a den is found to be in regular use to this degree by a species other than a devil or quoll, a one-way gate will be installed, and monitoring will continue until a time when the den is definitively vacant and can be decommissioned.

c. If a den is found to be in opportunistic use only by any species (*i.e.* not occupied for several consecutive nights; in which scenario there are usually several different animals and species frequenting the burrow), the footage from the night and morning immediately prior to the inspection will be used to determine occupancy at that time. If the burrow is conclusively vacant at the time of inspection, it will be decommissioned at that time. If an animal is within the burrow at that time, either a one-way gate will be installed to aid eviction, or the burrow will be revisited the following day and occupancy re-determined based on the footage from the previous night and morning. Monitoring of the burrow (with or without a gate) will continue until a time when it is conclusively vacant at the time of inspection and can be decommissioned.

d. If a den is found to be inactive (no evidence of use), it can be decommissioned.

C- Reporting and regulation

(i) If Section B does not apply, the contractor can advise the proponent (or regulator) of the area searched and seek approved clearance (release of hold point) within the designated area.

(ii) If Section B applies, the area approved for clearance may be conditional upon the maintenance of exclusion zones around active dens or dens still under assessment. Once the monitoring requirements of Section B are completed and dens have been decommissioned, the contractor can request exclusion zones are lifted and un-conditional clearance granted for the designated area.

(iii) Approval to clear in a designated area should only be valid for up to 8 weeks, after which time a new den check and assessment will be required unless an extension to this window is approved by the proponent/regulator (noting an extension may be considered sufficiently low risk in some scenarios, as informed by Section A and B results).

(iv) If the works area is divided into coupes, the process must be repeated until surveying of the entire footprint is complete.

D- Unanticipated discoveries

(i) Notwithstanding Section C (i) and (ii), should a previously unidentified or unanticipated discovery of a potential den be found by the contractor (or other parties) during works, an assessment as per Section A (iii) and (v) is to be undertaken, and, if necessary, the den monitoring assessment as per Section B adopted.

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Sassafras Wesley Vale Irrigation Scheme Augmentation

Environmental Protection Requirements for Construction (Pipelines, pump station, and associated works)

August 2023

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Section 1: Purpose and Scope

Tasmanian Irrigation (TI) is committed to ensuring that all its construction activities adhere to the highest environmental standards and comply with all environmental permits and approvals.

Consequently, contractors and service providers must be able to demonstrate to TI that the execution of works and the provision of services will be undertaken in a manner that has minimal impact on the natural environment and complies with the relevant legislative requirements, regulations, codes of practice and policies.

This document outlines the environmental protection controls that are required for the design and construction of the following components of the Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA):

1. ***Distribution pipeline***: consisting of 102 km of distribution pipeline, 172 property outlets.
2. ***Pump Stations:*** Great Bend and Sassafras Pump Stations. The Two (2) pump stations are to pump the water throughout the distribution pipeline.
3. ***Balance Tanks***: Saggers Hill Balance Tank, integrates into the pipeline network.

The Construction Environmental Management Plans (CEMP) and associated sub-plans for the project, to be prepared by constructing Contractors, will be assessed to ensure that the environmental requirements outlined in this document have been addressed appropriately.

Section 2: Guidelines for Works and Services

Contractors and Service Providers shall, as a minimum, comply with the requirements of relevant Commonwealth and Tasmanian Legislation, Regulations, Codes of Practice and Environment Policies. In addition, Contractors and Service Providers shall abide by all Ordinances, permit requirements and By Laws designated to protect the environment.

To ensure that TI's commitments to environmental outcomes are achieved, environmental management must be monitored, audited, and reported.

Tasmanian Irrigations' Responsibilities

Tasmanian Irrigation is responsible for sound environmental management practices including:

- Ensuring that the Contractor's CEMP and associated sub-plans comply with legislative requirements and TI's Environmental Protection Requirements (EPRs);
- Auditing of Contractor compliance with the EPRs and the CEMP. TI must document compliance to an appropriate level to ensure that an external audit by a regulatory authority can be completed;
- Reporting any breaches to the relevant government agency; and
- Implementing a compliance process to ensure that environmental requirements are upheld throughout the entire construction period.

Contractor's Responsibilities

Contractors and Service Providers are responsible for sound environmental management practices including:

- Understanding environmental permits and legislation as it relates to their activities and the activities of subcontractors and / or consultants working on their behalf;
- Keeping informed about any amendments and changes to environmental legislation;
- Ensuring that managers, supervisors, sub-contractors, employees and visitors within their control or influence comply with the project's environmental controls and TI's environmental objectives;
- Providing support, training and resources to ensure reasonable precautions, due care and diligence are applied to prevent non-compliance;
- Developing and monitoring environmental policies, procedures and work instructions;
- Reporting on environmental performance both internally and to TI;
- Minimising environmental damage in the event of an incident; and
- Developing, implementing and monitoring a Construction Environmental Management Plan (CEMP).

Construction Environmental Management Plan (CEMP)

The Contractor's Construction Environmental Management Plan (CEMP) must:

- Comply with the environmental protection requirements identified within this document;
- Comply with the environmental, cultural and statutory approvals for the project;
- Document the environmental legislative responsibilities relating to the Contractors' and / or Service Providers' activities;
- Identify major activities to be performed under this contract;
- Identify activities that pose significant environmental risks;
- Document how the environmental impacts shall be addressed, managed, avoided or minimised;
- Outline an appropriate environmental management training program;
- Identify the impacts likely to arise from the actions of any subcontractors and consultants; and
- Document auditing and reporting procedures including incident reporting.

There are a number of environmental sub-plans that fit under the CEMP. TI requires the following subplans be developed and implemented by the contractor for the Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA) (location and works as defined in Section 1):

1. Drainage Erosion and Sediment Control Plan;
2. Construction Water Quality Management Program;
3. A Rehabilitation and Reinstatement Plan; and
4. A Weed and Hygiene Management Plan.

Section 3: Protection Aspect Checklist

This section lists environmental aspects applicable to the project. The APGA *Code of Environmental Practice: Onshore Pipelines; Revision 4 September 2017 (APGA Code)* has been used to set the minimum environmental protection standards for the Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA). It is intended by TI that this Code is read and applied.

The checklist also identifies project specific environmental controls required by Tasmanian Irrigation that are additional or different to those outlined within the APGA Code.

The Contractor's Construction Environmental Management Plan (CEMP) must address the issues identified in this checklist.

Protection Aspect Checklist

Sections 1, 3 and 4 of the APGA Code relate to introductions, development and compliance guidelines for environmental management systems and risk evaluation processes. TI requires that these valuable processes be incorporated within the contractor's environmental management system.

Construction Aspect	**Relevant APGA Code Section**	**Relevant TI EPG**	**Additional project specific environmental controls or modifications**
Regulatory context	2.1	_	• Contractors and Service Providers must comply with the requirements of the relevant Commonwealth and Tasmanian Legislation, Permits and Approvals, Regulations and Environment Policies. • Current permits that apply to or are expected for the Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA). (pump stations, pipelines, buffer dam and associated works) are: - EPBC referral prescriptions and approval conditions - Permit to take threatened flora - Permit to take products of wildlife - Permit to take/destroy for Cultural (Aboriginal) or Historic Heritage values - Development Application/Permit - Dam Permit • Any additional permits acquired by the contractor for the project such as waterway, rail and road crossings must be supplied to TI.
Pipeline route selection and design	6.1	1,3,5	• All changes to the design of the pipeline route or design proposed by the contractor must be approved by TI and be consistent with the outcomes of existing environmental approvals.
Stakeholder consultation	5.10, 6.3	-	• Works must not commence until the CEMP and associated sub-plans are approved by TI. • Approval of the CEMP by relevant local governments and Crown Lands may be required. • Contractors must abide by the construction specifications including those for Stakeholder/Landholder Relationship Management.

Construction Aspect	Relevant APGA Code Section	Relevant TI EPG	Additional project specific environmental controls or modifications
			• In periods of wet conditions, the Contractor must liaise with landowners prior to any vehicular movement across paddocks.
Access to site	7.1	_	• Construction of site access points to be restricted to a corridor of no more than 6m, unless otherwise agreed on with Tasmanian Irrigation and in accordance with permits and approvals. • Areas where management prescriptions apply to access tracks are indicated on alignment sheets. • Traffic is to avoid waterways unless approved by TI.
Clearing	7.2	1,2,3,4,5	• Clearance activities are to be conducted in accordance with the approved Forest Clearing Guidelines and any applicable permits, including but not limited to permit/s to take threatened species under the *Threatened Species Protection Act 1995,* and permit/s to take products of wildlife protected under the *Nature Conservation (Wildlife) Regulations 2021* (issued under the *Nature Conservation Act 2002*). • Specific clearance protocols apply in relation to particular habitat values and areas, including for threatened Burrowing Crayfish Habitat Management, Green and Gold Frog Habitat Management and Direct Impact Mitigation Protocol, the Habitat Tree (Hollow-bearing) Management Protocol, and the Pre-clearance Check and Unanticipated Den Discovery Protocol. • Clearing activities within the pipeline construction zone is to be restricted to a corridor of no more than 30m, noting this has been reduced where there are areas of high conservation values • Areas where exclusion zones apply for threatened vegetation, flora and fauna apply are indicated on alignment map sheets. The CEMP must describe the measures to install and monitor exclusion zones. •

Construction Aspect	**Relevant APGA Code Section**	**Relevant TI EPG**	**Additional project specific environmental controls or modifications**
Topsoil removal	7.3	1,2,3,4,5	• The process for determining wet weather non-work periods must be detailed within the CEMP. • Soil that has to be stockpiled must not be transferred across a waterway or placed on the opposite side of a drain or waterway trench by any method that provides potential for the soil to contaminate the drain or waterway. • A rehabilitation and reinstatement plan that minimises the time between topsoil removal and reinstatement must be supplied to TI for approval.
Stringing, coating and jointing	7.4	_	• Pipeline delivery and handling prior to construction shall be restricted to lay-down areas agreed with landholders. • Pipeline stringing to be restricted to within the 30m pipeline construction corridor. • Appropriate methods for gathering and disposing of wastes generated by the project must be included in the CEMP.
Trenching	7.5	1,2,3,4,5	• Acid sulfate soils are to be managed accordance with the *Tasmanian Irrigation Acid Sulfate Soil Management Protocol, Feb 2014.* • Dispersive soils (sodic) are to be managed in accordance with the APGA approved. *Erosion and Sediment Control - A Field Guide for Construction (2010)* and *Erosion & Sediment Control Field Guide for Pipeline Projects.* • The process for determining wet weather non-work periods must be detailed within the CEMP. • In the event that construction intersects shallow groundwater, appropriate control methods are required to ensure environmental disturbance is minimised and that any intersected water is prevented from entering drains or waterways.

Blasting	7.5.1	_	• Blasting will be covered by a Blasting Management Plan The blasting management plan shall take into consideration adjacent conservation values including fauna.

Construction Aspect	**Relevant APGA Code Section**	**Relevant TI EPG**	**Additional project specific environmental controls or modifications**
Trenchless technology	7.5.2	1,2,3,4	• Boring (6.7.2) and/or Directional Drilling (6.7.3) may be required during construction.
Pipelaying and backfilling	7.6	1,2,3,4,5	• Landholder agreements must be upheld regarding backfill and revegetation.
Borrow pits	7.7	1,2,3,4	• Any material required to be sourced from quarries or borrow pits will need to be of weed free status. • Any necessary approvals will be obtained and provided to TI prior work commencing at the site.
Construction camps and worksites	7.8	1,2,3	• All construction camps and works should avoid surface water runoff and erosion where possible and develop access suitable for wet weather access. • Guidelines are set out and should be adhered to in the *Erosion and Sediment Control - A Field Guide for Construction (2010)* and *Erosion & Sediment Control Field Guide for Pipeline Projects*.

Pump stations, weirs and pipeline watercourse crossings	7.9	1,2,3,4,5	• The CEMP is to identify the crossing techniques and potential constraints and mitigative measures for each watercourse crossing. • Before construction at a major watercourse crossing or the construction of the Valleyfield pump station begins, a site layout plan detailing proposed drainage and sediment controls must be approved by TI. Any changes to crossing design is to be approved by TI. • Contractors must develop and implement a Construction Water Quality Management Program (CWQMP) for the Valleyfield pump station and major watercourse crossings. The CWQMP must comply with the *SWISA Turbidity Management Framework*. (*Sassafras Wesley Vale Irrigation Scheme Augmentation – Pump Stations, Pipelines and Associated Works Turbidity Management Framework)* • The CWQMP must be approved by TI. Works at Great Bend Pump Station and major river crossings shall not commence until the CWQMP is approved. • Construction methods must be adopted for crossing flowing watercourses to limit impediment to flow and as a maximum must not impede water flow for more than three
Construction Aspect	**Relevant APGA Code Section**	**Relevant TI EPG**	**Additional project specific environmental controls or modifications**
			days. Methods that do not impede fish movement at all are to be adopted wherever practicable. • Construction methods must be adopted for crossing flowing watercourses that have least impact on dissolved oxygen levels. • Measures must be adopted to mitigate the potential spread of chytrid from machinery arriving within the works area (including being washed down with Phytoclean or Trigene) • Following construction, each major waterway crossing is to be inspected weekly and immediately following any significant storm event until successfully regenerated.
Pipeline testing and commissioning	6.12		• Water sourced for commissioning purposes must be in accordance with relevant water licences.

Reinstatement and rehabilitation	7.12	1,4	• A rehabilitation and reinstatement plan for the construction works must be submitted to TI for approval. • Contractors must develop and implement a Weed and Hygiene Management Plan (WHMP). The WHMP must comply with the APGA Code guideline 5.3, *DPIPWE (2015) Weed and Disease Planning and Hygiene Guidelines - Preventing the spread of weeds and diseases in Tasmania*. Special attention must be given to the control of the spread of gorse. • The WHMP must be approved by TI. Works shall not commence until the WHMP is approved and implemented. • Evidence of compliance with hygiene requirements shall be documented e.g. on a Vehicle Washdown Register. • Disturbance to areas containing identified weed species to be minimised.

Section 4: Environmental Protection Guidelines (EPGs)

This section contains the Environmental Protection Guidelines (EPGs) that specify detailed environmental controls outlined in the previous section. The EPGs incorporate specific environmental protection requirements for this project that have been required to gain approval for the project from regulators. The Contractor's CEMP must address these issues.

The following Environmental Protection Guidelines are included:

Document No.

- **EPG 1**: Disturbance to Terrestrial and Aquatic Flora and Fauna
- **EPG 2**: Erosion, Sedimentation and Surface Run-off
- **EPG 3**: Aboriginal Artefacts – Unanticipated Discovery Plan
- **EPG 4**: Weed and Hygiene Control
- **EPG 5:** Watercourse Crossings

ENVIRONMENTAL PROTECTION GUIDELINE - EPG 1

Disturbance to Terrestrial and Aquatic Flora and Fauna

Objective

To minimise the effects of construction activities on local flora and fauna, particularly threatened and/or protected species, vegetation and ecological communities.

Target

No negative impacts on flora, fauna, vegetation, or ecological communities beyond those outlined within planning approvals.

Responsibilities

The Contractor has a responsibility to ensure that the conditions outlined in Tasmanian Irrigations approvals are met, including but not limited to Tasmania's *Threatened Species Protection Act 1995* (TSPA) and the *Nature Conservation Act 2002* (NCA), and the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC).

Management Methods

1. General

- Areas indicated on alignment sheets as environmentally significant or designated as Exclusion Zones are to be clearly marked in the construction corridor in accordance with the standardised marking system outlined within the CEMP.
- Areas where protected flora or fauna values exist within the corridor will be walked by the Contractor in conjunction with the Superintendent or Principal to ensure that environmental controls are understood.
- Ensure all site workers and machine operators are familiar with the conditions of the permits and environmental aspects of the project at the site induction.
- Prior to the commencement of works, the Contractor will arrange a toolbox meeting to be held with the Principal to outline environmental requirements for the project.
- Machine operators and other workers must be instructed on the standardised marking system, limits of clearing, special fauna and flora in the area and the importance of remnant vegetation patches

2. Protection of Vegetation

- The construction corridor is narrowed in sections to minimise impacts on threatened vegetation communities. These narrowed sections are outlined on the alignment sheet and must be clearly marked within the construction corridor.

- All construction corridors are to be clearly demarcated with the process defined in the CEMP. The Superintendent or Principal will approve pegged areas or marked areas prior to construction activities.
- There will be overlaps with the protection of vegetation and protection of fauna including habitat trees and dens. In this case protection guidelines should be referenced and carried out in accordance with the *Pre-clearance Check and Unanticipated Den Discovery Protocol* and the *Habitat Tree (Hollow bearing) Management Protocol.*

3. Protection of Flora

- The Conditions of "Permit to take threatened flora" must be adhered to.
- All known threatened flora locations outside of, but adjacent to, the permitted works area must be taped or fenced off by a suitably qualified person to prevent incursion by machinery or personnel.
- In areas of identified threatened flora, traffic and cartage routes are to be designated and signed.
- Any felling of trees required must be directional into the construction zone and not onto disturbed vegetation and in accordance with *Forest Clearing Guidelines.*

4. Protection of Fauna

General requirements

- Any wildlife hit by vehicles must be recorded, including details of when, where, and species if identifiable. These records should be reported to TI along with the monthly report. If the wildlife is injured, it must be delt with as per the two points below.
- No animals are to be deliberately killed. If any injured wildlife is found WIRES Wildlife Rescue (1300 094 737) should be contacted immediately and arrangements made for transferring injured wildlife to specialist carers at an animal hospital, vet or refuge.
- If this is not possible animals are to be dealt with humanely in accordance with the *Best Practice Guidelines for Wildlife Rehabilitation* set out by the Department of Natural Resources and Environment Tasmania (2017).
- The maximum distance of an open trench in rural areas will be 1km at any given time and escape ramps suitable for wildlife will be installed. Trenches will be backfilled progressively to cover each day's laid pipe.
- Open trenches must have animal-proof fencing (e.g. barrier mesh) while operations are not in progress.
- The ends of pipe within trenches or on the ground (greater than 1 pipe length) must be closed to ensure that fauna cannot enter the pipe.
- Any previously unidentified habitat elements that support threatened fauna will be subject to the application of the relevant protocol or if no protocol applies in consultation with TI. Works with the potential to disturb the habitat will cease until appropriate protocols or other controls are applied.
- All works in waterways must be managed and monitored to avoid impacts on aquatic fauna.

Tasmanian devil, eastern quoll, and spotted-tailed quoll

- Wombat burrows and other similar holes may be used by Tasmanian devils, eastern quolls or spotted-tail quolls for dens or refuge.
- All aspects of the *Pre-clearance Check* and *Unanticipated Den Discovery Protocol* must be adhered to, in addition to conditions of the associated permit to take products of wildlife listed under the *Nature Conservation (Wildlife) Regulations 2021* (issued under the *Nature Conservation Act 2002*.
- It should be noted that the protocol includes clauses relating to unanticipated discoveries (to apply throughout all works) after the completion of the pre-clearance check.

Wedge-tailed eagle and White-bellied Sea eagle

- All works within 500 m direct distance and/or 1 km line of sight of known nests should be completed outside of the eagle breeding season, which spans from the beginning of July until the end of January and is extended into February in seasons where breeding progress is later than normal, which is determined annually by the Forest Practices Authority around November. Breeding season can be taken to start as early as June 1st for White-bellied Sea eagles, which are not thought to occupy any of the known nests in proximity to the design corridor, but which could nest in the area.

- If works in all these areas cannot be completed outside of the breeding season, the annual activity status of respective nests can be considered, noting that breeding season constraints only need to apply around active nests.

- Activity can only be reliably assessed with an aerial survey and cannot be undertaken until October/November each season – as a result, activity must be assumed, and constraints applied accordingly with no works, from the commencement of the season each year until an activity assessment proves a nest is inactive for that season.

- If a nest is found to be definitively inactive for that season, no constraints will be required on works for the remainder of that breeding season (with constraints to recommence at the beginning of the next season).

- If a nest is found to be active for that season, no works should occur within 500 m and/or 1 km line of sight until the conclusion of that season (either end of January or within February in a late season).

- If the contractor is compelled to undertake works within 500 m direct distance and/or 1 km line of sight of a known eagle nest within the breeding season in a year when the specific nest is active, or assumed to be active due to not having been subject to an activity assessment, it may be possible for works to be completed without causing unacceptable disturbance to the nest – however, this would require a case specific nest disturbance mitigation plan informed by expert advice and with input from relevant authorities, and no such works should be undertaken without such a plan in place.

- If construction is not complete by the non-breeding season of 2023, an aerial resurvey of all habitats within 1 km of the remaining works areas must be done (and this process repeated every two years until completion), noting these must be undertaken outside of the breeding season.
- Furthermore, all the above avoidance recommendations and procedures should apply to any new nest discovered (by any means) within 500 m direct distance and/or 1 km line of sight of the works area until construction is completed.

Eagle management considerations for contractors

To conform to eagle management requirements the contractor will need to be conscious/informed of the following:

- Areas of the works corridor intersecting within 500 m direct distance and/or 1 km line of sight of known eagle nests.
- Procedures around booking aerial nest activity assessments, which typically require booking around 2 months in advance of the survey date.
- Education of staff on how to identify potential new eagle nests, with ground surveys not recommended and being applicable only to nests which adequate vantage points to view into the nest while not risking disturbance

Further eagle management considerations

General measures to minimise disturbance to nests should include:

- Minimising the removal of large trees/shrubs (with no or minimal pruning).
- Screening the infrastructure and its footprint (both visually [including light pollution] and acoustically if relevant), including parking and access routes to and from the parking location.
- Developing a disturbance minimisation procedure for if/when maintenance or emergency works need to be undertaken during the eagle breeding season (either at pump stations or within 500m or 1 km line-of-sight of the nest).

Tasmanian Masked Owl

- The *Habitat Tree (Hollow bearing) Management Protocol* (HTMP) will apply to areas identified as potential Masked Owl habitat.
- If any additional trees are identified and suspected to be Masked Owl habitat, then the HTMP will apply.

Green and Gold Frogs

- The Tasmanian Irrigation Green and Gold Frog (GGF) Protocol will apply for any areas identified as Green and Gold Frog habitats.
- If Green and Gold Frogs are found outside of the identified habitat area, action must also be applied in accordance with the Protocol.

Central North Burrowing Crayfish

- The Tasmanian Irrigation Threatened Burrowing Crayfish Protocol will apply for any areas identified as Burrowing Crayfish Habitat.
- If Burrowing Crayfish or their mud chimneys are found outside of the identified habitat area, action must also be applied in accordance with the Protocol.

Monitoring and Reporting

- The Contractor must ensure that fauna and flora controls outlined within the CEMP are complied with and that compliance is documented. Compliance will be recorded in:
  - Daily Site Diary
  - Weekly environmental checklists (provided to TI)
  - Monthly reports provided to TI compiling the results of the weekly audits.
- Numbers of threatened flora that are disturbed or taken within the construction corridor must be documented and provided to TI in a timely manner to complete permit to take reporting.
- The Site Supervisor will continually monitor application of the CEMP and all controls, rectifying any deficiencies immediately and reporting any breaches to the Superintendent and TI.

Emergency Response

If a breach of compliance regarding flora and fauna environmental controls occurs:

- The Contractor will immediately notify the Superintendent and the TI Project Manager;
- The Contractor will collect evidence at the site and complete an investigation of the incident to the satisfaction of TI;
- The Contractor, on advice from the Superintendent, may be required to engage a suitably qualified person to determine whether the failure constitutes an ongoing threat to the flora and fauna in the vicinity; and
- Tasmanian Irrigation will liaise with the relevant regulatory authorities regarding the incident.

Records

The Contractor will keep written records showing:

- Compliance with environmental controls outlined in the EPRs and CEMP.

All records and compliance documents must be submitted to TI at the completion of the project.

ENVIRONMENTAL PROTECTION GUIDELINE - EPG 2 Erosion, Sedimentation and Surface Run-off

Background Information

The proposed Sassafras Wesley Vale Irrigation Scheme Augmentation sources water from The Mersey River at Great Bend Pump Station on Devil Road directly south of the Latrobe township. Water is pumped to a 2.1ML Balance Tank located on Saggers Hill West of Native Plains Road. Water is then distributed under gravity through the lower portion of the scheme to areas such as, Latrobe, Pardo, Wesley Vale, Thirlstane, Harford, Moriarty and Northdown. Additionally, water is pumped through a boost pump station located at the base of Saggers Hill to a distribution network which supports the Sassafras region.

The MRT mapping indicates that Acid Sulphate soils are mapped along the pipeline route with low susceptibility. Furthermore, the proposal area contains various soils derived from the following geology:

- Dominantly and, clayey sand and sandy clay and subordinate clay and gravel of probable mixed alluvial and aeolian origin. (Geocode TQ)
- Geology not mapped. (Geocode)
- Jurassic Dolerite and related rocks (Geocode Jd)
- Mesoproterozoic Dominantly quartz-mica schist and foliated micaceous metaquartzite. (Geocode Lts)
- Permian Poorly sorted pebbly mudstone, sandstone and minor conglomerate marine fossils present in places (Geocode Pl)
- Permian Quartz sandstone and shale, carbonaceous in places, and minor conglomerate. (Geocode Pf)
- Permian Upper glaciomarine sequences of pebbly mudstone, pebbly sandstone and limestone. (Geocode Pu)
- Quaternary Older stabilised aeolian sand of predominantly coastal plain, with underlying marine sands in places; may show relict landforms including terraces, lunettes, linear or barchan dunes, and beach ridges related to regressive strandlines of Last Interglacial (Geocode Qps)
- Quaternary Stream alluvium, swamp and marsh deposits. (Geocode Qh)
- Quaternary Talus consisting dominantly of dolerite boulders. (Geocode Qpt)
- Tertiary Basalt. (Geocode Tb)
- Tertiary Ferricrete. (Geocode Tf)
- Tertiary Non-vesicular to highly vesicular and amygdaloidal, in places deeply weathered, alkali olivine basalt, with minor volcanic sandstone and breccia, dated at 38.1+- 0.6 Ma (Thirlstane Basalt). (Geocode Tb)
- Tertiary Olivine basalt, deeply weathered in most areas, dated at 25.9+- 0.2 Ma (Moriarty Basalt). (Geocode Tb)

- Tertiary Predominantly deeply weathered basalt. (Geocode Tb)
- Tertiary Sand, quartzite gravel and clay, including interbasalt deposits (Wesley Vale Sand) of Oligocene age. (Geocode Ts)
- Tertiary Undifferentiated Tertiary. (Geocode T)

Watercourse Type

Rivers and creeks within SWISA are generally classified as cobble and gravel-based rivers. They tend to have some locations of bedrock base resulting in shallow river profiles and rocky rapids. The main risk to this watercourse type is coarse sediment and silt entering the watercourse. The result of these incursions would be the smothering of essential bed vegetation, damage to aquatic habitats, causing the conversion of gravel creeks into clay-based creeks and damage to riffle systems.

Objective

To minimise the potential for erosion within the construction corridor and the avoidance of sedimentation in waterways, adjoining properties, dams and drains.

Table 2: Erosion Control

Soil erosion	Impacts of soil erosion and sediment runoff	Risk to the Project – Low, Medium, High	Primary Control Measure
Raindrop	The release of fine sediments and turbid water into waterways can: - adversely affect the health and biodiversity of aquatic life; - adversely affect fish numbers and fish breeding; - increase the concentration of nutrients and metals within permanent waters; - reduce light penetration into pools - increase the frequency, cost and damage of de-silting operations - increase rehabilitation costs	High	Erosion control
Sheet erosion		High	Erosion control
Rill erosion		High	Drainage control
Gully erosion		Low	Permanent stormwater management
Tunnel erosion		High	Erosion Control Soil management
Mass movement		Low	Vegetation and land management
Watercourse erosion		Low	Permanent stormwater management
Coastal erosion		N/A	Land use management
Wind erosion	Dust generation on construction sites can cause significant problems to neighbouring properties	Medium	Erosion control

Responsibilities

- The Contractor is required to submit a Drainage Erosion and Sediment Control Plan (ESCP) for the pump stations and pipeline corridors. The plan must comply with:
    - The APGA Code of Environmental Practice (2017)
    - *Erosion and Sediment Control - A Field Guide for Construction Site Managers* and *Erosion & Sediment Control Field Guide for Pipeline Projects*

- The Contractor is responsible for the construction and maintenance of the erosion and sediment control works.
- The Contractor is required to regularly assess the need for temporary run-off control.
- The contractor must provide individual site layout plans to TI for approval of all pump stations, balance tanks and dams. These must be approved by TI prior to construction. These plans must include:
    - Details of proposed drainages and sediment controls.
    - Measures to ensure that river flows are not impeded during construction.
    - Any changes to the design must be approved by TI.
- The Contractor is responsible for cleaning and repairing erosion and sediment control works and notifying the Principal of any failures.
- The Contractor is required to inspect all erosion controls and sediment control works and keep a written record of all inspections and observations and advise on improvements.
- The Contractor is required to monitor the watercourses during construction in accordance with the *SWISA Turbidity Management Framework* and *Water Crossing Management Plan*.

Management Methods

The environmental management practices are to be in accordance with the APGA Code, relevant approvals and permits and Australian Standards.

Monitoring

- Inspect erosion and sediment control devices a minimum of weekly during dry weather and daily during wet weather to ensure correct functioning and placement and that available capacity is adequate.
- Waterways will be monitored in accordance with the *SWISA Turbidity Management Framework.* Water quality monitoring results are to be provided to TI in the same week that monitoring occurs.
- The Contractor must ensure that the erosion and sediment controls outlined within the CEMP are complied with and that compliance is documented. Compliance will be outlined in:

  - Daily Site Diary

  - Weekly environmental checklists (submitted to TI at the end of the month with the monthly report)

Emergency Response

In the event of any potentially significant failure of the erosion and sediment control devices:

- The Contractor will immediately notify the Superintendent and TI Project Manager.
- The Contractor is to reinstate the erosion and sediment controls as soon as practicable.
- The Contractor is to determine whether the failure constitutes a threat to any adjoining waterway.
    - If it is not considered a threat to waterways, procedures are to be reviewed and the Superintendent to be advised of, and approve, any alterations or installation of additional more effective erosion control devices.

- If the failure constitutes a threat to any adjoining waterway, drainage or dam, the Superintendent is to be notified as soon as practicable and within 24 hours.
  - Additional and more effective erosion control devices to be installed as soon as practicable.
  - Any instructions provided by the Superintendent must be implemented as soon as practicable.

Records

Written records must be kept showing:

- The date and reason for each inspection (eg. Daily/weekly inspection, concerns identified/ raised, etc.).
- Details and the condition of the erosion and sediment control works at each inspection.
- Details of any erosion of sedimentation sighted during each inspection
- The date and time of any notification of any failure of the erosion and sediment control works.

Copies of records are to be provided to TI at the completion of the project.

ENVIRONMENTAL PROTECTION GUIDELINE - EPG 3
Aboriginal Artefacts – Unanticipated Discovery Plan

Objective

To protect Aboriginal cultural heritage values, both artefacts and landscape values, that may be encountered during construction.

Target

Minimal impact on any Aboriginal cultural heritage values along the construction corridors.

Responsibilities

- The *Aboriginal Relics Act 1975* provides the framework for the protection of cultural heritage in Tasmania.
- The Contractor is responsible for the protection (or actioning of permits) of any existing identified Aboriginal cultural heritage values identified along the corridors in accordance with the permit directions. Aboriginal Cultural Heritage Values for which specific management requirements are required and permit conditions apply are identified on the alignment sheets.
- In the event of any unanticipated discovery of Aboriginal cultural heritage material, the Contractor is responsible for undertaking the actions required, as outlined in the Unanticipated Discovery Response below.

Management Methods

The environmental management practices are to be in accordance with the APGA Code Environmental Guideline 5.5 and the Unanticipated Discovery Response within this EPG.

The following control measures are to be established during the whole construction period. They are to be fully operational and provide effective protection prior to disturbing adjacent ground and the commencement of adjacent excavation.

- Unless otherwise specified in an Aboriginal Heritage Permit, all the identified sites are to be protected with appropriate buffer zones and protection fencing, in accordance with the directions of an archaeologist.
- Buffer zones and protection fencing are to remain in place until completion of all construction activities at the site.

Unanticipated Discovery Response

In the event that any unanticipated discoveries of Aboriginal cultural heritage materials are made during the construction period, the following processes are to be followed so that the requirements of the *Aboriginal Relics Act 1975* and the *Coroners Act 1995* are met.

Discovery of Cultural Heritage Items

- If any project personnel, contractors or subcontractors believe that they have discovered or uncovered Aboriginal cultural heritage materials, the individual must notify machinery operators that are working in the general vicinity of the area that earth disturbance works must stop immediately.
- Immediately notify the Superintendent and TI Project Manager.
- A buffer protection zone of 10m is to be established around the suspected cultural heritage site or items.
- No unauthorised entry or earth disturbance must be allowed within this 'archaeological zone' until the suspected cultural heritage items have been assessed, and appropriate mitigation measures carried out.
- Where required, cooperate with management instructions applied relating to site preservation in accordance with the *Aboriginal Relics Act 1975*.

Discovery of Skeletal Material

- Unless obviously the remains of a common animal (e.g. brush tail possum, wallaby, sheep), under no circumstances are the suspected skeletal remains be touched or disturbed. If these are human remains, then this area potentially is a crime scene. Tampering with a crime scene is a criminal offence.
- Any person discovering suspected skeletal remains must notify machinery operators that are working in the general vicinity of the area that earth disturbing works must stop immediately.
- A buffer protection zone of 50m should be established around the suspected skeletal remains and the Superintendent and TI Project Manager is to be notified immediately.
- No unauthorised entry or earth disturbance must be allowed in this buffer zone until such time as the suspected skeletal remains have been assessed.
- If it is suspected that the remains may be human, then the relevant authorities (police) must be contacted immediately and informed of the discovery.
- Where required, cooperate with management instructions applied relating to site preservation in accordance with the *Aboriginal Relics Act 1975.*

Records

Written records are to be kept showing:

- The date of any unanticipated discovery.
- Details of the actions taken.
- The date and details of responses from the relevant authorities regarding any unanticipated discovery.

ENVIRONMENTAL PROTECTION GUIDELINE - EPG 4
Weed and Hygiene Control

Objectives

To minimise the transfer and proliferation of weeds and pathogens within and between sites.

Targets

No spread or proliferation of weeds or pathogens within the site or from one site to another or to adjoining land.

No introduction of weeds or pathogens.

Responsibilities

The Contractor is responsible for:

- Development of a Weed and Hygiene Management Plan (WHMP).
- Identifying legislative weed and pathogen control regulations.
- Inspection of all machines prior to transport on to the site.
- Inspecting the site on a regular basis.
- Undertaking monitoring activities.
- Notification of any breaches.

General Information

The Contractor must provide suitable qualified personnel to assess construction sites for the presence of infectious plants, diseases and weeds.

Although many of the taxa of introduced plants recorded during the ecological assessments for this proposal are widespread species with limited capacity to displace natives, 14 classified as declared weeds under the Tasmanian *Weed Management Act 1999* were observed within the project area. Of these, five species are also listed as Weeds of National Significance.

Declared weeds:

- *Carduus tenuiflorus* (winged thistle) – recorded in one location within a paddock. A large number of plants exists adjacent to the pipeline alignment.
- *Erica lusitanica* (Spanish heath) – small numbers of Spanish heath were recorded at three locations along roadsides and fence liens in the norther part of the survey area.
- *Foeniculum vulgare* (fennel) – occasional patches recorded along Oppenheim Road; on the roadside and in agricultural land.
- *Genista monspessulana* (Montpelier broom) – recorded only around the proposed site of Saggers Hill reservoir. No mature plants were observed but large numbers of seedlings were recorded throughout the pasture grass beneath eucalypt trees.
- *Hypericum perforatum subsp. Veronense* (perforated St Johns-wort) – one patch (8x2 m) was recorded on Beer Street adjacent to a driveway.

- *Ilex aquifolium* (holly) – recorded at three locations within the survey area. The two main populations are on Knights Creek and the gully running into Knights Creek. At both these sites there are numerous mature trees and recruits.
- *Lycium ferocissimum* (African boxthorn) – recorded at one location under native forest at the interface with agricultural land.
- *Rubus fruticosus* (blackberry) – widespread and abundant throughout agricultural zones of the survey area. Particularly prevalent along fence lines, agricultural drains and wet areas, and under damp areas of remnant vegetation such as *Melaleuca ericifolia* swamp forest (NME).
- *Salix X fragilis var. fragilis* (crack willow) – occurs as isolated infestations along creeks and rivers and occasional large individual trees on agricultural land near farm dams and drains. The main infestation is on the Mersey River opposite the Great Bend Pump Station, with smaller infestations on the Eastford, Pardoe, and Tullamona Creeks.
- *Senecio jacobaea* (ragwort) – recorded from a single location within farmland between Cornelius Road and Knights Creek. Scattered individuals occur in remnant vegetation and paddocks in this area.
- *Ulex europaeus* (gorse) – occurs as localised infestations at several locations throughout the design corridor. Was recorded predominantly within the margins of native forest patches at the interface with agricultural land. Where gorse occurs, it typically forms large thickets.

Notable 'environmental' weeds observed throughout the project area:

- *Cirsium vulgare* (spear thistle)
- *Crataegus monogyna* (hawthorn)
- *Rosa canina, Rosa rubiginosa* (dog rose, briar rose)
- *Typha latifolia* (great reedmace)
- *Vinca major* (blue periwinkle)
- *Watsonia meriana var. bulbillifera* (watsonia, in roadside drains)

Potential diseases:

According to the Tasmanian Natural Values Atlas, root rot (*Phytophthora cinnamomi*) is the only known biosecurity risk within the project area. However, no signs of *Phytophthora* have been observed during our field surveys although there are some species present that are highly susceptible.

Chytrid fungus (*Batrachochytrium dendrobatidis*) affects amphibians worldwide, including Tasmania. The spread of the pathogen is likely to be promoted by human activity and has been associated with gravel roads near water bodies. It can be expected to be present within the irrigation district, but no known observations of the pathogen are evident from within five kilometres of the project area.

Management Methods

The Contractor must submit a Weed and Hygiene Management Plan (WHMP) to TI for approval prior to commencing works within the construction corridor. The WHMP must comply with the APGA

Code, *DPIPWE (2015) Weed and Disease Planning and Hygiene Guidelines - Preventing the spread of weeds and diseases in Tasmania and Keeping it Clean (2010)*.

As a minimum the WHMP plan must define:

- Vehicle/machine washdown procedures for and locations along the pipeline routes.
- Vehicle/machine hygiene washdown procedures for arriving at site.
- Practices to be adopted to mitigate the potential spread of chytrid into the catchment including wash down of vehicles with Phytoclean or Trigene.
- Weed species within the construction corridor to be identified and treatment methods outlined. Declared weeds must be treated in accordance with guidelines and regulations.
- The types of cleaning to be used ie. washdown with high-pressure water containing disinfectant or application of other cleaning solutions.
- Stockpile locations for affected soils.
- All imported topsoil, crushed rock or gravel, and organic revegetation matting is certified to be weed and disease free by the supplier prior to being brought to site. Any necessary approvals will be obtained and provided to TI prior work commencing at the site.
- A programme for the primary control of declared weeds that appear in the corridor following rehabilitation and up to the end of the Defect Liability period or 12 months whichever is greater. Treatments will be timed in accordance with species-specific prescriptions. Contractors are required to ensure that the programme is approved by landholders in the Landholder agreement.

Monitoring and Reporting

- Fortnightly monitoring of plant and materials, and location of stockpiles.
- Spot inspection of plant entering and exiting the operation prescription areas to ensure the effectiveness of control measures including wash downs.
- Follow-up monitoring to be undertaken post installation and post rehabilitation for weed identification and appropriate additional control, as disturbance from construction works along the pipeline route is likely to stimulate germination of a range of weed species.
- The Contractor must ensure that the weed and hygiene environmental controls outlined within the CEMP are complied with and that compliance is documented. Compliance will be outlined in:
  - Daily Site Diary
  - Weekly environmental checklist (provided to TI at the end of the month along with the monthly report)

ENVIRONMENTAL PROTECTION GUIDELINE - EPG 5 Watercourse Crossings

Objective

To minimise the potential for environmental impact on waterways and associated aquatic habitat during construction of the Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA).

Target

Minimal environmental impact to water quality and geomorphology within existing waterways, drainages and water bodies.

Responsibilities

- The Contractor is responsible for the construction of appropriate waterway and drainage crossings to ensure minimal impact to existing waterways and drainages. The Contractor is responsible for the construction of crossings, ensuring minimal environmental impacts and notifying the Principal of any failures.
- The Contractor is responsible for monitoring water quality in accordance with the approved Construction Water Quality Management Program (CWQMP) for the project.
- The Contractor is required to inspect crossing constructions, including adjoining waterways, drainages and dams, and keep a written record of all inspections and observations and advise on improvements and provide copies to Tasmanian Irrigation.

General Information

The environmental controls are to be in accordance with the APGA Code and relevant approvals and permits. A Construction Water Quality Management Program (CWQMP) is to be developed to address management of water quality at the water crossings.

The CWQMP must be in accordance and consistent with:

- APGA Code
- EPG 5 - Watercourse Crossings (this EPG)
- EPG2 – Erosion, Sedimentation and Surface Runoff
- SWISA Turbidity Management Framework

Construction activities for crossing flowing watercourses must not impede water flow wherever possible. In situations where this is unavoidable, methods that do not impede fish movement and have minimal impact on dissolved oxygen must be adopted. In any case flows in streams must not be impeded for a maximum of three days.

As detailed in *EPG2 – Erosion, Sedimentation and Surface Runoff*, before construction of the Valleyfield pump station and before construction begins at river crossings, a site layout plan detailing the proposed drainage and sediment controls is to be submitted to TI for approval. The plan is to also include measures to ensure that river flows are not impeded during construction. Any changes to the crossing design must be approved by TI.

Watercourse Crossings

Watercourse crossings within the Sassafras Wesley Vale construction corridor are outlined in Figure 1. Of the water ways outlined, two are Major Streams with the balance classified as Minor Streams, Tributaries and Minor Tributaries. Most water ways in the district should be considered transient, without consistent flow.

Waterway	**Hydrology Class**	X	**Y**
Panatana Rivulet	Major Stream	456665	5429536
Panatana Rivulet	Major Stream	456816	5434099
Pardoe Creek	Major Stream	456808	5441499
Pardoe Creek	Major Stream	452176	5439690
Panatana Rivulet	Major Stream	459961	5437542
Panatana Rivulet	Major Stream	456665	5429536
Smiths Creek	Tributary	457793	5428948
Westford Creek	Tributary	457607	5433058
Tullamona Creek	Tributary	460451	5432957
Westford Creek	Tributary	458497	5435006
Bishton Creek	Tributary	449430	5438061

Table 1 Pipeline watercourse crossing locations with permanent flows

Management Methods

Development of a Construction Water Quality Management Program (CWQMP)

The Contractor is to develop and implement prior to construction a CWQMP that incorporates Great Bend Pump Station and all watercourse crossings.

The monitoring, reporting, and recording requirements for the CWQMP are specified below, and further detailed in the *SWISA Turbidity Management Framework*. The *SWISA Turbidity Management Framework* provides the turbidity framework relevant to the type of infrastructure and watercourse crossing locations.

CWQMP Requirements

The CWQMP to be submitted to TI for approval. Works at Great Bend Pump Station and watercourse crossings must not commence until an approved CWQMP is in place.

Monitoring and reporting requirement details can be found in the Monitoring Requirements, and the Monitoring and Reporting Responsibilities sections further below.

The WCMP must include:

- All sites to be monitored
- Site Specific Plan for Temporary Pumping Construction within Mersey River
- Site specific plans for all river crossings (Pantana Rivulet, Pardo Creek, etc.)
- Details of work to be completed and site sediment management
- Details of monitoring, including
    - Location
    - Frequency
    - Methodology
- Incident response procedure
- Record management
- Reporting requirements

Monitoring Requirements

All water crossings with running water will require at minimum upstream and downstream turbidity monitoring. Appropriate monitoring sites are sites as detailed below:

- Upstream:
    - Located upstream of all water crossing works and potential sedimentation inputs from the site
    - Downstream of any confluences with significant creeks, streams or rivers
    - ○ Not to be undertaken less than 10m or further than 200 m upstream from the site.
- Downstream:
    - Located downstream of all construction sediment inputs (from both point and diffuse sources)
    - Upstream of any confluences with significant creeks, streams or rivers
    - Not be undertaken less than 20m or further than 200m downstream of the construction site.

All water crossing monitoring locations should be at minimum recorded with photo evidence in a Survey123 (or similar program) form that will be provided by Tasmanian Irrigation prior to construction.

Monitoring Methodology

Tasmanian Irrigation will provide the Contractor with a method/system for recording and reporting water quality data, this will likely use the ESRI Survey 123 platform or similar.

If the watercourse is running:

Monitoring to be undertaken using a turbidity meter and is to be conducted in accordance with the following:

1. Daily reading taken one day prior to construction commencing.
2. Minimum three upstream and downstream readings taken daily once construction has commenced:
   - Prior to the commencement of daily works
   - During daily works
   - At the completion of daily works
   - At any other time that there is a visible change in turbidity downstream resultant from site activities.
3. All readings to be checked against the *SWISA Turbidity Management Framework* and actions taken as necessary.

If the watercourse is **NOT** running:

Visual monitoring up and downstream prior to, during, and after any construction works adjacent to, or in the bed of, the watercourse is to be undertaken. Appropriate sediment management and erosion control must still be implemented.

Great Bend Pump Station.

Great Bend Pump Station is located on the banks on the Mersey River, activities to remediate the pump station include External Coating and installation of Mechanical Systems and Walkways, some of this work will likely require the installation of a temporary cofferdam or caisson. Additionally, the installation of barges and pylons may be necessary to install a temporary pumping system for part or all of the project duration.

Monitoring during the Great Bend Pump Station Remediation and Temporary Pumping construction must be completed as detailed for watercourse crossings above.

Monitoring and Reporting Responsibilities

In accordance with the *SWISA Environmental Protection Requirements for Construction* the Contractor is required to:

1. Complete turbidity monitoring in accordance with the requirements outlined within an approved CWQMP.

2. Turbidity monitoring to be conducted with a turbidity meter approved by TI with quality and accuracy to be comparable to a Hach 2100Q Portable Turbidimeter (Calibratable, accuracy of +/-2% of reading, repeatability of +/-1% or reading).
3. Provide the results of monitoring to TI weekly.
4. Provide TI with an Environmental Incident Report (EIR) within 24 hrs if monitoring results (as outlined above and in the *SWISA Turbidity Management Framework*) trigger an environmental incident.

It should be noted that situations regarding water quality and turbidity may arise on site that are not addressed by the Framework. In these situations, it is important for the Contractor and TI to communicate to quickly identify the cause and to determine the mitigative actions together.

The Contractor must ensure that watercourse crossing controls outlined within the CEMP are complied with and that compliance is documented. Compliance will be outlined in:

- Daily Site Diary
- Weekly environmental checklists (provided to TI at the end of the month with the monthly report)

Emergency Response

If a breach of compliance regarding watercourse environmental controls occurs:

- The Contractor will immediately notify the Superintendent and the TI Project Manager; and
- The Contractor will collect evidence at the site and complete an investigation of the incident to the satisfaction of TI;
- The Contractor, on advice from the Superintendent, may be required to engage a suitably qualified person to determine whether the failure constitutes an ongoing threat to the flora and fauna in the vicinity; and
- Tasmanian Irrigation will liaise with the relevant regulatory authorities regarding the incident.

Records

The Contractor will keep written records showing:

- Compliance with environmental controls outlined in the EPRs and CEMP.
- All records of sampling and analysis must be retained for at least two years and copies provided to Tasmanian Irrigation.

Figure 1: Sassafras Wesley Vale Irrigation Scheme – all watercourse crossings

MARSDEN JACOB ASSOCIATES

economics
public policy
markets
strategy

A Marsden Jacob Report

Prepared for Tasmanian Irrigation

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MARSDEN JACOB ASSOCIATES

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Acronyms and abbreviations

ABARES	Australian Bureau of Agricultural Resource Economics and Sciences
BCR	benefit cost ratio
BO	build only
BPS	booster pump station
CAPEX	capital expenditure
D&C	design and construct
DNRET	Department of Natural Resources and Environment Tasmania
EOI	expression of interest
EPBC Act	Environmental Protection and Biodiversity Conservation Act, 1999
FTE	full time equivalent
FY	financial year
Farm WAP	farm water access plans
GM	gross margin
GWh	gigawatt hour
IRR	internal rate of return
kWh	kilowatt hour
MDBA	Murray Darling Basin Authority
MDB	Murray Darling Basin
ML	megalitre
MNES	Matters of National Environmental Significance
MWS	Midlands Water Scheme
NBES	North Barker Ecosystem Services
NCA	Tasmanian Nature Conservation Act
PS	pump station
SWIS	Sassafras Wesley Vale Irrigation Scheme
SWISA	Sassafras Wesley Vale Irrigation Scheme Augmentation
NPV	net present value
NWI	National Water Initiative
NWIDF	National water Industry Development Fund
OPEX	operating expenditure
PVC	present value cost
RWE	responsible water entity
SDLs	sustainable diversion limits
THC	tetrahydrocannabinol

Executive Summary

Regional Benefits

The Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA) will be an important driver of continued economic growth in the northwest coast region of Tasmania, with direct benefits flowing to the larger population centres of Devonport and Latrobe and surrounding towns of Sassafras, Moriarty, Port Sorell, and Hartford. Increased expenditure by irrigators will benefit upstream and downstream participants including contractors, agricultural suppliers, business service providers and retail businesses in the local district.

The reliability of water extracted from Hydro Tasmania's Lake Parangana, which is part of the Mersey-Forth hydro scheme, as the supplementary water source for the scheme ensures that 95% minimum system security requirement set by Tasmanian Irrigation is met. As with all Tasmanian Irrigation's schemes the high reliability of water availability ensures that farmers can confidently expand their businesses.

A key element in delivering SWISA is to ensure that the supply of additional water for the scheme can be accessed in a way ensures that the surety levels specified in the water entitlement contracts do not impact other users holding direct water licences on the Mersey River. This will be achieved through a purchasing agreement with Hydro Tasmania with water being purchased from Hydro Tasmania's entitlement in Lake Parangana during periods when the river is in a 'Cease to Take' event. Appropriate SCADA systems will be implemented to ensure appropriate management of the system.

The enterprises that will utilise water from the SWISA will help enhance Tasmania's increasing international reputation for high quality meat and vegetable production, viticulture, cropping, berry and fruit production, enhancing the State's growing reputation to international and mainland visitors the opportunity to enjoy 'paddock to plate' experiences.

The economic modelling of the $112.90 million (P50 estimate) scheme demonstrates a strong case for public funding with a net present value (NPV) of $113.14 million, a benefit cost ratio of 1.96, internal rate of return (IRR) of 12.6% and the creation of up to 60 positions during the 36-month approvals and construction period, and up to 210 direct and indirect full-time employment positions once fully operational. The private on-farm investment undertaken by farmers taking up entitlements is estimated at around $92.36 million (including the cost of water entitlements), which equates to around 82% of the total capital expenditure required for the scheme.

Agriculture, forestry, and fishing is an important sector in Latrobe region accounting for 9% of total employment making it the fourth highest sector behind healthcare and social assistance, retail trade, and construction.

The SWISA project therefore provides the basis for an ongoing stimulus to the region, building on its diverse agricultural attributes – both physical and human. It provides the foundation for continued development of fresh and processed vegetable production and the expansion of high value horticulture in the region as well as broadacre cropping and intensive livestock enterprises.

Tasmania's northwest coast region has a well-established reputation for irrigated broadacre cropping, vegetable production as well as emerging high value enterprises, including wine grapes, orchards, and berry fruit production.

The main impediments to expansion of the irrigation sector in the region are the constraints of the existing infrastructure and the lack of security associated with on-farm supply. The existing Sassafras Wesley Vale Irrigation Scheme (SWIS) scheme has also suffered from the inability to trade water across the district due to system infrastructure constraints. The district is also unique in that utilisation of land is dispersed with operators leasing land to ensure appropriate cropping rotations are maintained. Constraints on the ability to trade water means that the potential of the district has not been fully realised. Additionally, the area of irrigable land within the project area is estimated at 19,624 ha or 92% of the total land area with approximately 32% of the irrigable area being prime agricultural land (i.e., Classes 1-3). Accordingly, there are extensive areas of irrigable land available which can be used to support further irrigation developments.

Continued development of high value enterprises across the northwest coast region of Tasmania will further underpin the expansion of agri-tourism in the region. Tourism is an increasingly important sector of the state and regional economies. At a state level, tourism is estimated to contribute around $2.18 billion (4.2%) in Gross State Product, accounting for around 15,140 direct jobs or 7.2% of total Tasmanian employment. At a regional level the contribution is similar, with tourism in Northern Tasmania accounting for an estimated 3,650 direct jobs (7.5% of total employment) and $0.52 billion (4.3%) in total regional output. Latest Tourism Tasmania figures indicate that total visitor spending increased by 11% in 2014 to $1.76 billion coupled with a 16% increase in holiday visitors to Tasmania.

Background

Tasmanian Irrigation Pty Ltd (Tasmanian Irrigation) was established by the Tasmanian Government to progress regionally significant irrigation schemes from feasibility assessment through to the construction and operation stages.

A mix of private and Commonwealth and State Government investment in the order of $310 million has seen the successful delivery of ten irrigation schemes under Tranche 1 funding arrangements. Tranche 2 schemes have recently been completed, investing an additional $156 million across a further five irrigation schemes.

The Pipeline to Prosperity Program (renamed from the Tasmanian Future Irrigation Project) has identified ten new irrigation projects for advancing to detailed business case development.

On 14 February 2019 Infrastructure Australia added the Pipeline to Prosperity Program to the "priority initiatives" in the updated Infrastructure Priority List for Australia.

This business case for SWISA is one of five projects being submitted under the Pipeline to Prosperity Program to the Tasmanian State Government to access the National Water Infrastructure Development Fund (NWIDF) commitment.

The core purpose of the business case is to clearly identify and evaluate the key outcomes expected under the 'with-project' and 'no-project' scenarios and make recommendations as to whether there

is likely to be a net public benefit from development of the 9,200 ML of summer water and the improvement in water trading capability provided by the SWISA project.

Post business case approval by the State Government, Tasmanian Irrigation will proceed with detailed design and all environmental, planning and heritage assessments necessary to gain approvals for the project. The approvals are likely to be obtained within the first 8 to 10 months. This will enable the commencement of construction, based on recent experience with similar irrigation schemes in Tasmania.

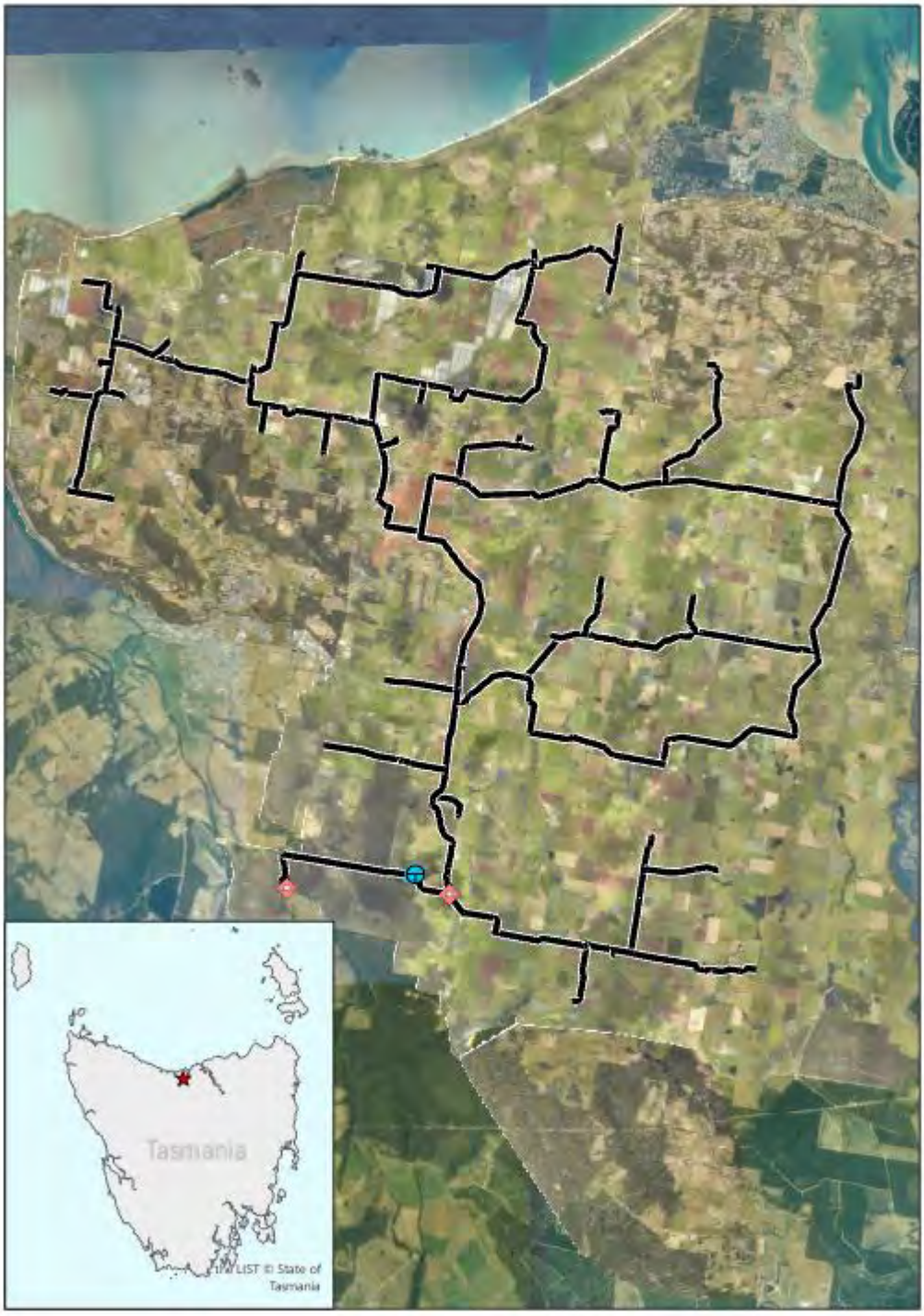
While the Northwest coast region has abundant natural and man-made attributes, underpinning the production of high value agriculture and horticultural production, the relative scarcity of irrigation water given the capacity constraints of the existing irrigation scheme and the associated constraints on water trading are limiting the region attaining its full potential.

The continued reliance on existing allocations and on-farm, in-stream storages means that current supply risks would continue.

Outline of the Sassafras Wesley Vale Irrigation Scheme Augmentation

The preferred option for the SWISA incorporates pumping from the Mersey River via the Great Bend pump station up to a balance tank located on Saggers Hill. From there water will flow via gravity throughout the distribution network apart from the Sassafras zone which will be supplied via booster pump station located on the main trunk main (refer ES Figure 1). Water distributed from the Saggers Hill Balance Tank will be supplied over a 150-day season at a flow rate of 92 ML/day flow rate. The scheme has been designed to maximise the ability for trading to occur throughout the scheme with water released from the balance tank feeding the ring main distribution network. A booster pump station supplies water to the Sassafras zone which accounts for around 10% of the total scheme volume.

ES Figure 1: SWISA distribution network



Details of the preferred option

A full summary of the cost parameters for the SWISA is presented in ES Table 1.

The P50 project outturn cost estimate is $112.90 million, increasing to $124.19 million for the P90 estimate, equating to present value capital costs of $98.47 million and $108.28 million, respectively.

The principal components of the $1,279,877 in annual fixed operating costs include the scheme overheads and monitoring, operations and maintenance, refurbishment costs and other associated

costs. This reflects the total fixed cost for the scheme with incremental fixed costs associated with the augmentation of the scheme estimated at $977,252 or 68% of the total with the balance reflecting the share attributable to existing SWIS customers.

ES Table 1: Cost summary for proposed SWISA

Parameter	Unit	Values adopted in financial & economic models
Capital costs[1]		
P50 estimate	$m	112.90
P90 estimate	$m	124.19
Variable operating costs		
Purchase of water from Hydro Tasmania	$/ML	80.00
Pumping costs		
Great Bend PS	$/ML	55.21
Sassafras Booster PS	$/ML	22.26
Total Variable cost[1]	$/ML	113.30
Fixed operating costs		
Annual operations	$/a	537,112
Maintenance	$/a	59,724
Fixed power	$/a	131,178
Fixed telemetry	$/a	13,479
Asset refurbishment	$/a	607,785
Total Fixed Costs[2]	$/a	1,439,278

Source: Tasmanian Irrigation, 2022.
Notes:

1. *Total variable cost based annual volume of 9,200 ML considering only around 47% of water needs to be purchased from Hydro Tasmania.*
2. *Given that the scheme supplies 5,660 ML to existing customers the incremental fixed cost attributable to the Augmentation is estimated at $977,252 or 68% of the total fixed cost.*

Environmental approvals

Legislative and regulatory approval processes as well as Tasmanian Irrigation's approach to protecting environmental values will ensure that any environmental impacts of the SWISA project are minimised and managed appropriately throughout the entire life cycle of the scheme.

As with all Tasmanian Irrigation schemes, this scheme will be referred for approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Tasmanian Irrigation will also work closely with the relevant Tasmanian Government departments to secure all the necessary state-based approvals for the scheme.

Prior to receiving water from the scheme, irrigators must have an approved Farm Water Access Plan (Farm WAP) in place. Farm WAPs are practical, property specific documents that guide the sustainable application of Tasmanian Irrigation water and assist with the long-term viability of land for agricultural and horticultural production. They also help manage potential risks to natural values, including land and water-based ecology, soil health on the irrigated land and help landowners minimise runoff of irrigated water at their properties to protect water quality in the local catchment. Farm WAPs are mandatory for all new Tasmanian Irrigation schemes and are a condition of Federal and State Government approval for Tasmanian Irrigation built schemes.

As part of business case development, Tasmanian Irrigation commissioned several desktop and preliminary field surveys to understand the nature and extent of environmental impacts likely to be caused through construction of the SWISA. The main environmental impacts are summarised as follows:

***Vegetation communities*:** There is potential for moderate likelihood of disturbance to three communities - *Eucalyptus ovata forest* and woodland (DOV); *Eucalyptus viminalis* wet forest (WVI); and *Melaleuca ericifolia* swamp forest (NME). Each of these vegetation communities are listed under the EPBC Act. However, it is likely the occurrence and potential impact of any of these communities would be highly localised as the current pipeline design route either wholly avoids patches of native vegetation or intersects only marginally into disturbed fringe areas.

Post submission of the business case, further ground-truthing is proposed to be undertaken across the project area to map all vegetation communities. Consistent with all its projects, Tasmanian Irrigation has factored into the schedule for SWISA submitting a referral under the EPBC Act (refer Table 23).

***Threatened flora*:** Desktop and preliminary field assessment identified at least four threatened flora species within proximity of the proposed construction corridor listed under TSPA (1995) with three species also being listed under EPBC Act.

As most of the construction will follow existing pipeline corridors and the new pipelines pass through cleared agricultural land, it is not expected that construction will severely impact listed species. However, more extensive ground truthing will be undertaken to assess flora such as orchids within parts of the pipeline alignment.

Threatened fauna: Preliminary field assessment identified three fauna species of particular concern within the project area – *Aquila audax* (wedge-tailed eagle); *Engaeus granulatus* (Central North burrowing crayfish); and *Litoria raniformis* (Green and gold frog). Targeted surveys and follow-up procedures to identify and manage these species' presence within the alignment corridor are planned to be undertaken post-business case.

Tasmanian Irrigation proposes that the pipeline route be extensively field assessed for natural values present with appropriate 50-meter buffers each side. *Engaeus granulatus* (Central North burrowing crayfish) surveys would be included as part of routine natural values assessments to map evidence of the species, followed by targeted excavations with expert identification if found within the alignment corridor. Similarly, suitable habitat for *Litoria raniformis* (Green and gold frog) would be assessed and mapped across the project alignment area with care taken to avoid these areas.

Weeds: Ten significant weed species have been observed within the irrigation area (Table 27), and therefore it would be expected that these will be encountered during works and appropriate management actions should be implemented after the on-ground survey.

A Weed Management Plan will be implemented as required, based on the findings of on-ground assessments. Only one Weed of National Significance has been observed within the irrigation area. However, it is not expected that any *S. pendulina* (weeping willow) will require management for the proposed works.

Forest Practices Plan: The SWISA will travel through forests on public and private land during its installation. Accordingly, a desktop assessment of the pipeline alignment was undertaken by a Forest Practices Officer (FPO) and the likely actions required to comply with the Forest Practices Act 1985, Forest Practices Regulations 2017 and the Policy for Maintaining a Permanent Native Forest Estate (30 June 2017) were identified. The assessment found that SWISA will potentially impact 27 property owners on separate Property IDs excluding Crown Land Road Reserves and that these impacted properties may require an FFP if the full buffer easement is required. Should the full buffer distance not be required the number of properties impacted and requiring an FFP is likely to reduce.

The need to undertake FFPs will be confirmed as part of the assessments underpinning the EPBC referral process.

Aboriginal and European heritage

Aboriginal heritage: A search of the Aboriginal Heritage Register (AHR) was carried out to determine the extent of registered Aboriginal heritage sites within and in the general vicinity of the study area. The search results showed that there are a total of 59 registered Aboriginal sites situated within an approximate 3km radius of the SWISA corridor. Of these 59 registered Aboriginal sites, 8 are registered sites that are situated within the SWISA pipeline easement. Five of these sites are classified as Isolated artefacts and the other three registered sites are classified as Artefact scatters.

A gap analysis commissioned by Tasmanian Irrigation showed that there is around 39.8 km of the SWISA pipeline easement that was not covered by surveys undertaken as part of the original SWIS project along with the existing Great Bend pump station and the proposed location for the new Balance Tank located on Saggers Hill. These locations will be included in the scope of future Aboriginal heritage assessment works for the SWISA project.

European heritage: A search of the Tasmanian Heritage Register (THR) showed that there are no heritage places located within or in the immediate surrounds of the study area. This finding is consistent with the findings from the surveys undertaken for the original SWIS project.

Financial and economic model results

Marsden Jacob has developed detailed financial and economic models for the proposed SWISA with the results for the preferred 14,860 ML summer irrigation scheme, comprising 5,660 ML of existing scheme water plus a capacity augmentation to deliver an additional 9,200 ML of summer water together with 7,880 ML of winter water summarised in Table ES 2 and Table ES 3 below. Both the financial and economic models utilise the cost estimates presented in Table ES 1.

The revenue estimates in the financial model are based on the requirement set by Tasmanian Irrigation that 25% of the total capital cost (P90 estimate) is funded through the sale of entitlements with the balance being funded through a mix of funding from the Commonwealth and State governments. The Water Sales process run by Tasmanian Irrigation that concluded in August 2022 resulted in water sales of 6,335 ML but this has been reduced by 390 ML due to inability to service the properties due to constraints imposed by the current system design. However, an additional 800 ML has been sold since the conclusion of water sales bringing the water sales volume to 6,745 ML. The expectation is that additional water will be sold prior to the scheme's commissioning which is currently scheduled for September 2026.

Prices of $2,090/ML (December 2022 dollars) for the sale of summer entitlements and $1,500/ML for winter entitlements has been set by Tasmanian Irrigation for Water Sales and these figures have been adopted for the SWISA Business Case.

Financial results

The estimated funding arrangements for the SWISA are set out ES Table 2 with funding of $62.10 million being sought from the NWIDF with $31.05 million from irrigators through purchase on entitlements in the scheme and $31.05 million from the Tasmanian Government.

ES Table 2: Base Case funding arrangements (2022 dollars)

Scenario	Capital Cost $000s
Net Cost for NWIDF Funding	124,194.14
NWIDF component (50%)	62,097.07
Irrigator contribution	31,048.50
Tasmanian Government	31,048.50
Total Project Cost	124,194.14

Source: Tasmanian Irrigation, 2022.

An additional and separate level of funding will be required to cover the financing costs associated with the delay in the sale of water entitlements to irrigators. However, the value of any unsold water entitlements will be indexed annually by the equivalent cost of debt thereby ensuring the long-term recovery of these finance costs.

Tasmanian Irrigation's annual water charges are typically based around a two-part tariff, whereby the fixed charge is levied as a charge per ML of entitlement with the variable charge based on water delivered through the meter under a nodal pricing system. Accordingly, the scheme will have a fixed charge estimated on a levelised cost basis at around $83.63/ML of entitlement with a weighted average variable cost estimated at $93.29/ML.[1] Actual charges to irrigators will depend on their location in the scheme with the total variable charges estimated to range from $91.04 to $113.30/ML. Tasmanian Irrigation also attempts to minimise financial risk by pricing the fixed

[1] Levelised cost takes into account the profile of entitlements over time and is calculated as the present value of fixed costs divided by the present value of entitlements which results in a constant real cost per ML of entitlement.

component in any given year on the known volume of entitlements sold which has the effect of increasing the fixed charge above the levelised cost indicated above.

Economic results

The economic model shows a net economic benefit or net present value (NPV) of $113.14 million, a benefit cost ratio (BCR) of 1.96 and an Internal Rate of Return (IRR) of 12.8%, assuming central case assumptions and P50 estimate (ES Table 1).

The scheme shows a positive net benefit for all 11 scenarios examined using the economic model developed for the proposed SWISA (ES Table 3). This indicates that the project is likely to deliver strong net economic benefits, even if there are unfavourable movements in key parameters impacting the economic viability of the scheme.

Under an 'extreme' scenario – involving a 10% increase in capital and operating costs, a 10% reduction in net farm margins and the slow utilisation of water scenario – a net benefit of $65.77 million, a BCR of 1.51 and an IRR of 10.3% is estimated, demonstrating the resilience of the project to changes in key parameters. A threshold assessment indicated that the enterprise net margins would need to decline to around 52% of the estimates assumed for the central case before the project reached breakeven at a 7% real discount rate, further demonstrating the resilience of the project.

ES Table 3: Outputs from economic modelling – P50 project cost estimate

	PV benefits ($m)	PV lifecycle costs ($m)	Economic NPV ($m)	Benefit Cost Ratio	IRR %
Central case parameters	231.33	118.18	113.14	1.96	12.8%
Discount rate					
4%	466.98	134.97	332.01	3.46	13.2%
10%	139.48	106.64	32.83	1.31	12.6%
Net Margins					
+ 10%	254.81	118.18	136.62	2.16	13.8%
- 10%	207.85	118.18	89.66	1.76	11.8%
Capital cost					
+10%	231.33	128.03	103.30	1.81	12.0%
-10%	231.33	108.34	122.99	2.14	13.8%
Operating cost					
+10%	230.98	120.16	110.82	1.92	12.7%
-10%	231.67	116.21	115.46	1.99	12.9%
Water uptake					
Slow	217.50	117.53	99.96	1.85	12.2%

	PV benefits ($m)	PV lifecycle costs ($m)	Economic NPV ($m)	Benefit Cost Ratio	IRR %
Rapid	250.16	119.03	131.13	2.10	13.7%

Source: Marsden Jacob, 2022.

Key findings from the financial and economic modelling in respect to the proposed SWISA can be summarised as follows:

- at the P50 cost estimate, the SWISA is estimated as producing a strong economic performance, with an expected net economic benefit, or NPV, of $113.14 million, a BCR of 1.96 and an IRR of 12.8% assuming central case parameters
- the SWISA remains economically viable (i.e., economic NPV greater than zero) under all key cost parameters, that is, there could be significant increases in capital costs, operating expenditures or large reductions in farm net margins and the project would remain viable
- the project remains economic under the P90 cost estimate with the net economic benefit estimated at $103.33 million and a BCR of 1.81 and with net benefits also accruing under all sensitivity scenarios.

Funding for the scheme is based on $62.10 million from NWIDF, $31.05million from the sale of entitlements to irrigators and the balance of $31.05 million from the Tasmanian Government.

The government contribution, together with the revenue from the sale of water entitlements ($2,090/ML) for summer water and $1,500/ML for winter water), will meet the capital development costs. All additional costs incurred in operating the SWISA project will be recovered through annual charges. The average levelised annual cost for the SWISA project is estimated at around $179.05/ML of entitlement, which will be recovered through a fixed charge of $83.63 per ML of entitlement held (calculated on a levelised cost basis), and variable charges totalling $93.29/ML, reflecting the cost of pumping and water purchased from Hydro Tasmania.

Regional development benefits

The SWISA project is located almost entirely in the Latrobe City Council with a small portion crossing into Devonport City Council. The direct benefits are expected to flow mainly to the local population centres of Latrobe and surrounding towns of Sassafras, Moriarty, Port Sorell, and Hartford as well as Devonport and the wider Northwest Coast region more generally. Agriculture and horticulture are important economic contributors to the Northwest Coast region accounting for around 8.8% of regional employment and is higher than the 5.3% average for Tasmania.

The project will compliment other schemes in the region, including the Dial Blythe and Kindred North Motton schemes and the Don scheme currently under construction.

The SWISA project has the potential therefore to deliver an important positive stimulus to the regional economy with agribusiness firms, contractors and local businesses benefiting from the increased spend in the regional economy. Overall, the estimated quantitative economic impacts under the base case include:

- an increase in direct farm jobs of up to 140 FTEs
- indirect employment of up to a further 70 FTEs
- total employment of up to 210 FTEs
- an increase in total salaries and wages (direct and indirect) of up to $14.70 million p.a. following full utilisation of the 14,860 ML total volume of summer water (6,660 ML of existing entitlements plus 9,200 ML of new entitlements) and 7,880 ML of winter water able to be provided by the scheme.

The scheme would also provide significant construction benefits to the state economy, not only from the construction period of the project, but also from the on-farm investment undertaken by the local farmers estimated at approximately $61.31 million, increasing to $92.36 million with the cost of water entitlements. During scheme construction, the project would involve up to 60 additional FTEs over the estimated 36-month construction period, providing an important stimulus to the regional economy. Based on experience from other similar schemes being constructed by Tasmanian Irrigation, most of the additional employment would be sourced regionally.

The scheme will also provide improved drought security and so will have an additional social benefit through the reduction in financial pressure placed on farmers during drought. Moreover, the level of expenditure in the local economy by farmers will become less affected by drought (i.e., due to their improved capacity to maintain production levels). Consequently, the regional economy, and employment levels, will become less prone to downturn during periods of prolonged low rainfall.

Securing local water supplies

The Australian and Tasmanian governments have identified that securing water supplies to deliver regional economic development through modern and efficient irrigation as a key deliverable. The proposed SWISA project will contribute to the Australian Government's commitment to build or augment water infrastructure through the NWIDF and provide water security and economic stimulus to regional communities in a sustainable and efficient manner.

At a national level, there is now significant uncertainty about the long-term trends in irrigated agriculture in the Murray Darling Basin (MDB), where 75% of Australia's irrigated agriculture (by area) is located. The response by governments and private enterprise has been to seek to develop irrigation in other regions, with Tasmania, north-west Australia and north Queensland considered the most suitable areas for irrigation expansion.

There is a strong likelihood that securing water supplies will become increasingly important considering ongoing concerns surrounding the frequency and duration of drought and the identified need to deliver regional economic development benefits for Australia.

The SWISA clearly identifies a project which is able, with secure water, to deliver significant growth in a region which has abundant natural resources, proven off-farm infrastructure and logistics support but suffers from a lack of reliable water resources able to be harvested in an efficient manner.

The development of the SWISA is expected to provide a stimulus to the regional economy and further underpin Tasmania's increasing reputation to produce high-quality fresh vegetables, broadacre crops, and other high value horticultural products including berry fruit. Moreover, it will

facilitate the development of new high-value enterprises such as fruit and berries, avocados, and wine grapes.

These factors would help improve the vibrancy of local communities and reduce the vulnerability of the local economy to the effects of extended low rainfall periods.

Approvals processes

This Business Case provides a summary of the approvals processes required. In addition, supplementary reports – covering ecological impacts, Aboriginal and historic cultural heritage assessments – examine all major approvals required for the project.

Legislative and regulatory approvals processes as well as Tasmanian Irrigation's approach to protecting environmental values will ensure that any environmental impacts of the SWISA project are managed appropriately in both the Construction and Operational phases of the scheme.

The nature of the works and the potential environmental impacts identified in the desktop assessments undertaken by Tasmanian Irrigation as part of business case suggest that environmental approvals and permits under the following Acts are likely to be required:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Australian Government). The EPBC Act is triggered by projects that may have a "significant impact on a matter of national environmental significance" which includes national heritage places, wetlands of international importance, threatened species and ecological communities and migratory species. However, as part of its business case process Tasmanian Irrigation has adopted the approach of submitting all projects for assessment under the EPBC Act.
- Tasmanian Government Acts and regulations relevant to environmental aspects of the SWISA project include the *Nature Conservation Act 2002*, *Threatened Species Protection Act 1995* (TSPA), *Forest Practices Act 1995*, *Weed Management Act 1995*, and the *Water Management Act 1999*. These Acts will require consideration and it is likely that permits under one or more of the Acts for specific activities associated with the SWISA project will be required (e.g., 'permits to take' under the *Threatened Species Protection Act 1995*, and a Forest Practices Plan under the *Forest Practices Act 1995*.)

All surveys and related assessments required to obtain the required approvals have been scheduled by Tasmanian Irrigation with a goal of having all approvals in place by November 2023.

Tasmanian Irrigation will make an application in the first half of 2023 for an expansion of the existing irrigation district under the *Water Management Act 1999*. This will provide the statutory powers required for the construction and operation of the scheme. It will also provide the option to utilise acquisition powers to acquire sites for key infrastructure (balance tank and pump station) should private negotiations be unsuccessful under the *Land Acquisition Act 1993* using the authority provided by Section 183 of the *Water Management Act 1999*. However, the need for compulsory acquisition is considered highly unlikely given the extensive consultation undertaken to date with affected landholders.

The proposed infrastructure is located primarily within the Latrobe City Council municipality with a small section crossing into Devonport City Council. Under the current Latrobe Interim Planning

Scheme 2015, a planning permit will be required for all the proposed pipeline infrastructure. Under the Tasmanian Planning Scheme – Devonport a planning permit will also be required for that section of the proposed pipeline where it crosses the Bass Highway but the remainder of the pipeline in the Devonport municipality should be exempt.

While there are no apparent impediments to the project development, Tasmanian Irrigation is focused on ensuring that any impacts are minimised and, where impacts are unavoidable, that appropriate mitigation strategies are in place. To minimise negative impacts and ensure that there are no degenerative issues associated with the use of irrigation water from the SWISA, all irrigators will be required to have an approved Farm Water Access Plan (Farm WAP, refer Section 6.6.1) in place before any water can be utilised from the scheme.

Risk assessment

A comprehensive risk assessment process has been undertaken for this Business Case, in accordance with Treasury and Finance's Draft Business Case Guidelines – Water Infrastructure Fund Applications (see Attachment 4). A risk assessment was undertaken by Tasmanian Irrigation for the purpose of determining appropriate risk ratings. Based on the findings of this assessment and the project impacts included in the environmental and Aboriginal and historic heritage assessments, it can be concluded that there are no unmanageable risks associated with the project. All key risks can be addressed through implementation of the proposed mitigation strategies.

Assessment criteria

Tasmanian Irrigation has completed 10 "Tranche 1" irrigation schemes through $229 million of Australian and Tasmanian government funding. This funding was made available from the Australian Government's Water for the Future Fund ($140 million) and the Tasmanian Jobs and Growth Plan ($9.06 million). In addition, the Tasmanian Government committed $80 million for development of new irrigation schemes in the State.

In February 2015, the Australian Government announced it "…will support productivity and jobs growth in Tasmania by investing $60 million in Tasmanian Irrigation's Tranche 2 schemes", the Tasmanian Government committed $30 million towards the Tranche 2 schemes.

In March 2018, the Australian Government committed a further $25 million to the Scottsdale Irrigation Scheme.

In 2018 The Tasmanian Government committed a further $70 million to a third tranche of irrigation schemes. This commitment was increased to $85 million in 2020 with a further increase of $23.7 million in 2021 taking the total state government commitment to $108.7 million. The SWISA is one of five irrigation schemes included in the first Tranche 3 funding request to the Australian Government through the NWIDF. Additional capital will be invested in on-farm irrigation and related infrastructure within the SWISA region.

The SWISA has been assessed in a manner consistent with the previous 15 Tranche 1 and Tranche 2 schemes and, as demonstrated in Section 7, the project satisfies all the assessment criteria set out under:

- NWIDF – Capital Component criteria

- the Water for the Future Fund (Australian Government's assessment criteria)
- the National Water Initiative (NWI) (Clause 69)
- the Charter for Tasmanian Irrigation (which effectively represents the Tasmanian Government's assessment criteria).

The project also meets the economic assessment criteria set out in the Tasmanian Department of Treasury and Finance's Draft Business Case Guidelines – Water Infrastructure Fund Applications. That is, the economic net present value is positive for the SWISA.

Conclusions and recommendations

Key results from the financial and economic modelling undertaken for the preliminary business case are as follows:

- the economic returns from the proposed SWISA are expected to be positive and the scheme will generate an estimated $113.14 million in direct, net economic benefits (economic NPV) at the P50 estimate and $103.33 at the P90 estimate
- the net government funding required for the SWISA is estimated at around $93.85 million and equates to 75% of the total capital cost (P90 estimate). Funding for $62.10 million is sought from the NWIDF – Capital Component, representing 50% of the capital cost.
- irrigators will fund $31.05 million (25.0%) through the purchase of water entitlements
- the Tasmanian Government will fund $31.05 million (25.0%) representing the balance of the total capital cost.

Sensitivity testing using the economic model of the proposed SWISA shows that the economic NPV (or net economic benefit) of the scheme is positive for all 11 scenarios examined. Moreover, sensitivity testing of a combination of unfavourable assumptions – 10% increase in capital and operating costs, a 10% reduction in net farm margins and Slow Demand Uptake – resulted in a net economic benefit estimated at $65.77 million with a BCR of 1.51 assuming the P50 project cost estimate. The project is also estimated to generate positive economic benefits under all sensitivity scenarios assuming the P90 project cost of $124.19 million.

This shows that the project is likely to remain economically viable even if there are large, unfavourable movements in key parameters (such as capital development costs, operating costs, crop margins, and demand up-take rate) impacting the economic performance of the scheme.

Accordingly, there is a very strong *a priori* basis for development of new water infrastructure to supply an important farming region of Tasmania.

In addition, at a national level, there is growing uncertainty about the impact on the production of a number of tree crops and long-term trends in wine grape production in some of the mainland areas due to increases in temperature. This temperature increase creates a lack of chill hours during the winter months, which is vital to plant growth and fruit development.

In contrast, recent research by the Tasmanian Institute of Agriculture has indicated the impact of climate change on Tasmania is likely to result in warmer atmospheric temperatures, reduced frost

risk and rainfall will remain relatively stable, and is predicted to have a positive impact on increasing the accumulation of growing day degrees and decrease the incidence and severity of frost. Overall, horticulture, cropping and pastoral based industries in Tasmania should see increased productivity provided the right agronomy package is adopted. This includes varietal selection (likely to be longer maturity types with a lower vernalisation requirement), increased nutrient applications to facilitate the higher potential yields. Irrigation will continue to play a critical role such that the ability to access high surety good quality water supply is essential.

Climate change is likely to result in a geographic shift in irrigation in Australia due to declining system yields from the Murray Darling Basin, where 75% of Australia's irrigated agriculture (by area) is located. The response by governments and private enterprise will be to seek to diversify irrigation in other regions, with Tasmania, north-west Australia and north Queensland considered the more suitable areas for expansion of irrigation.

It is noted that, in reviewing the overall performance of the SWISA, the project:

- has a core direct net benefit expected from the use of water for irrigation purposes during business-as-usual (or 'non-drought' periods). This allows for expansion by existing growers as well as the avoidance of a contraction in irrigated agricultural output in dry periods due to a lack of water supply. The economic returns from the scheme are high and will generate direct economic benefits (economic NPV) estimated at $113.14 million with a BCR of 1.96 and an IRR of 12.8% (P50 estimate)
- provides wide-ranging benefits in terms of regional development, water security, and strong stakeholder commitment (see Section 7)
- is designed to facilitate water trading within zones
- is expected to provide a minimum employment stimulus of up to 210 jobs (direct and indirect full-time equivalents) in the local region with additional jobs (60 jobs) created during construction of the scheme not including the additional jobs created through the investment in on-farm infrastructure
- has no fundamental weaknesses in terms of environmental impacts, cultural heritage impacts, impact on Aboriginal relics, or other project risks – technical, environmental, or financial.

Sensitivity testing using the economic model developed shows that there is a net economic benefit of the SWISA under all 11 scenarios modelled, including an "Extreme" case involving a 10% increase in capital and operating costs, a 10% decrease in net margins across all years, and a "Slow" uptake in demand. Even under this case a positive NPV of $65.77 million and a BCR of 1.51 were estimated for the P50 estimate and $54.98 million and a BCR of 1.39 assuming a P90 estimate.

On balance, it is considered that the results of the analyses are conclusive in supporting the case for development of the SWISA. A key factor is that the economic performance of the preferred design option is robust and there are no major obstacles in terms of environmental impacts or technical impediments to the project.

A sum of $62.10 million is sought from the NWIDF-Capital Component with a further $31.05 million in funding from the Tasmanian Government. Irrigators will contribute $31.05 million through the purchase of water entitlements as well as an additional $61.31 million in estimated on-farm works.

Based on the information outlined above, Tasmanian Irrigation is seeking the release of the committed funding from both the Australian and Tasmanian governments for the SWISA, subject to:

- obtaining of all necessary permits and approvals to construct the scheme
- obtaining of firm quotes for construction that are consistent with the estimates contained in the Business Case.

The timings set out in this Business Case, including the planned commencement of construction in July 2024, are dependent entirely on the Australian and Tasmanian governments committing to funding and the approvals process. The timing of any such commitments will determine the actual commencement date of construction.

1. Introduction

1.1 Background

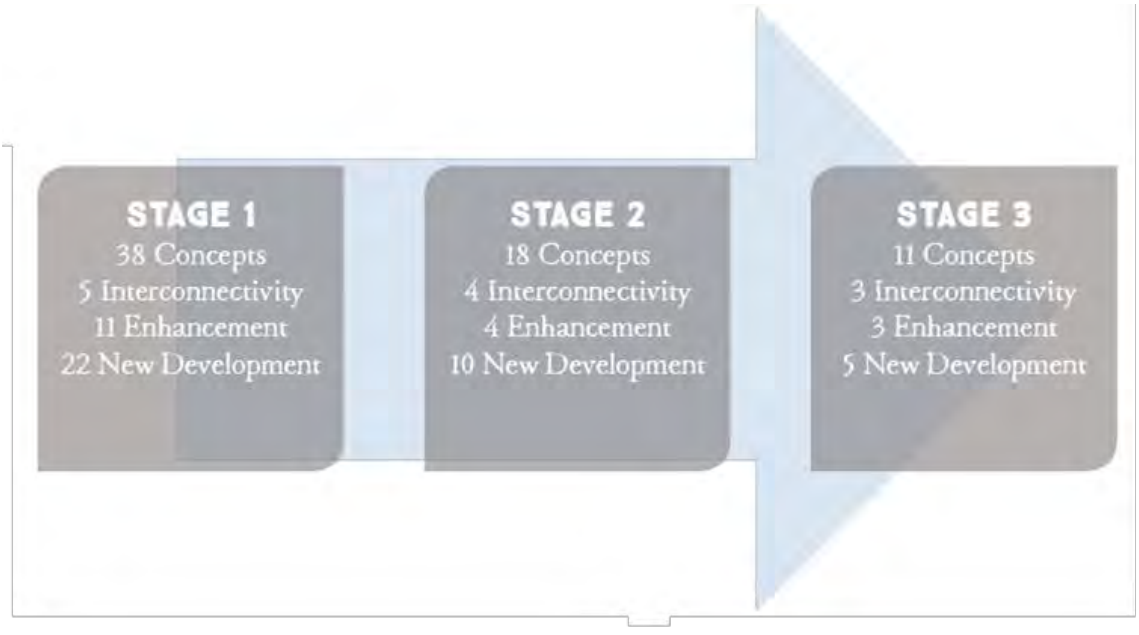
Tasmanian Irrigation Pty Ltd (Tasmanian Irrigation) was established by the Tasmanian Government to progress regionally significant irrigation schemes from feasibility assessment through to the construction and operation stages.

A mix of private and public investment in the order of $310 million has seen the successful delivery of ten irrigation schemes under Tranche 1 funding arrangements. Construction of Tranche 2 has also been completed, investing a further $156 million across an additional five irrigation schemes.

In recognition of the value of irrigation to Tasmania and to build on the investment already made, the Tasmanian Government requested Tasmanian Irrigation to provide advice on:

- Potential opportunities for interconnectivity between existing schemes
- Potential opportunities for enhancement and modernisation of existing schemes throughout Tasmania
- Renewable energy opportunities
- Potential opportunities for the development of new irrigation schemes.

In April 2015, Tasmanian Irrigation implemented a three-stage assessment process to identify feasible concepts for irrigation development under the Tasmanian Future Irrigation Project.



The Pipeline to Prosperity Program (renamed from the Tasmanian Future Irrigation Project) has identified ten new irrigation projects for advancing to detailed business case development.

On 14 February 2019 Infrastructure Australia added the Pipeline to Prosperity Program to the "priority initiatives" in the updated Infrastructure Priority List for Australia.

This business case for the Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA) project is one of five projects being submitted under the Pipeline to Prosperity program to the Tasmanian State Government to access the National Water Infrastructure Development (NWIDF) commitment.

The business case addresses all the criteria required by the NWIDF. It is based on:

- Confirmed demand through Tasmanian Irrigation's proven Water Sales process whereby irrigators pay a binding deposit equivalent to 10% of the agreed final contribution based on the sale of entitlements in the scheme
- Detailed farm surveys of current and future irrigation enterprises, the level of on-farm investment required, the net economic benefits derived, and the additional direct employment generated
- Concept engineering design and cost estimates incorporating independent reviews by cost and P50 and P90 contingency allowances
- Desk-top environmental and heritage assessments
- Assessment of the planning and other approvals required before the project can be taken to tender.

Post business case approval by the State Government, Tasmanian Irrigation will proceed with detailed design including all assessments necessary to gain approvals for the project. Approvals for the project are likely to be obtained within the first 6-9 months. This will enable the project to be put to the market and allow commencement of construction.

The Sassafras Wesley Vale region encompasses the areas of Pardoe, Thirlstane, Harford, Port Sorell, Wesley Vale, and Sassafras. The region has established irrigation practices for a wide range of high value enterprises including dairying, vegetables, berry fruits, broadacre cropping including poppies, cereals and pyrethrum, orchard and red meat production.

A limiting factor for further irrigation expansion within the region is the highly fragmented nature of existing land holdings combined with the restricted capacity of the existing piped delivery system which constrains the ability to trade water efficiently across the district.

1.2 Concept development

The existing Sassafras Wesley Vale Irrigation Scheme (SWIS) was developed by Tasmanian Irrigation and commenced operations in the 2011-12 irrigation season. The scheme was committed to supplying 5,660 ML to 99 irrigators over a 150-day irrigation season i.e., 36.7 ML/day, from November to March.

As one of Tasmanian Irrigation's first projects, the scheme was constructed to meet the actual irrigation demand of the day. Since its completion, demand has grown for greater peak-season flow rates and improved tradability to enhance options for inter-scheme water transfer.

A proposal to augment the existing scheme via the SWIS Augmentation (SWISA) project became one of ten concepts investigated for the Tasmanian State Government in 2016 as part of the Pipeline to Prosperity Program.

Tasmanian Irrigation did not undertake a formal Expression of Interest process for SWISA as part of the Pipeline to Prosperity Program. Instead, it met with irrigators in 2018 to discuss the operation of

the existing scheme and whether there was interest in additional water within the district. The meeting provided Tasmanian Irrigation an opportunity to understand irrigator concerns regarding some of the water trading and delivery restrictions associated with the existing scheme.

Outcomes from the meeting included interest in an additional 1,300 ML of water and a desire to interconnect the existing zones to improve the ability for irrigators to trade entitlements. The Pipeline to Prosperity Program proposed an augmentation of the existing scheme to provide an additional 1,805 ML per season through provision of additional boost pump stations, some pipe network upgrades and a storage dam.

In September 2019, to better inform the Preferred Option design, a formal Expression of Interest (EOI) survey was conducted in which 28 existing and 33 new irrigators expressed interest in an additional 5,745 ML. This formal survey result indicated a significantly higher demand than suggested at the 2018 irrigator meeting.

In October 2020, a phone survey of all irrigators requesting 100 ML or more (i.e., 75% of all EOI's) confirmed that September 2019 EOI was a sound basis for the Preferred Option design. The combined existing scheme requirement of 5,660 ML and the EOI demand of 5,745 ML provided a revised total demand of 11,405 ML (76.0 ML/day).

Acutely aware of the limitations on future agricultural growth resulting from the original scheme being designed to meet only the actual water demand of the day, the Irrigator Representative Committee (IRC) strongly advocated for additional capacity to be incorporated into the augmentation project.

Over the course of 2021 and 2022, the scheme was subjected to numerous design reviews to reach the current design known as the Saggers Hill Loop option. This option effectively replaces the existing SWIS scheme and has the capacity to provide 14,860 ML of summer water over a 150-day season i.e., 99.1 ML/day which is over two and half times the flow capacity of the existing scheme. The scheme has an ultimate capacity to supply an additional 14,860 ML of winter water.

1.3 Purpose

The core purpose of the Business Case is to clearly identify, and evaluate, the key outcomes expected under the 'with-project' and 'no-project' scenarios and make recommendations as to whether there is likely to be a net public benefit from development of the SWISA.

This is to inform Tasmanian Irrigation's, and the Tasmanian and Australian Government's decisions regarding approvals for development of the SWISA project.

More specifically, this Business Case for the SWISA:

- identifies the key financial, economic, and social benefits and costs of the project (Sections 4, 5, 7.2 and 7.3 respectively)
- estimates the project funding requirements under a suite of scenarios for project costs and water demands (Section 4.5)
- outlines Tasmanian Irrigation's planning (including stakeholder consultation), development, and implementation strategies for the SWISA (Section 6.11, 6.12 and Attachment 2)

- considers environmental and cultural impacts of the SWISA and review processes for achieving approvals under all relevant environmental, cultural and planning legislation and regulations (Section 6.3, 6.4, 6.9 and Attachment 3)
- evaluates project risks (Section 7.8 and Attachment 1)
- considers the net public benefits of the project (Section 7)
- assesses performance against (a) Due Diligence Assessment Guidelines of the National Water Infrastructure Development Fund – Capital Component; (b) NWI assessment criteria and (c) Tasmanian Treasury & Finance's Draft Business Case Guidelines - Water Infrastructure Fund Applications (Section 7.9 and Attachment 4)
- evaluates whether the project outcomes align with the key pillars of Tasmanian Irrigation's charter, as espoused by the Government in March 2008 (Section 7.9)
- provides recommendations regarding whether the project should be granted approvals by the Government and Tasmanian Irrigation (Section 8).

1.4 Acknowledgements

This Business Case has been prepared by Marsden Jacob Associates. However, we would like to acknowledge Tasmanian Irrigation has provided much of the intellectual property used in the development of the business case.

2. Project description

This section presents information on the main features of the project design for the preferred supply option, including information on the dam, pipeline route, pump stations and water allocation arrangements. Background information on project costs and energy requirements are also presented.

2.1 Sassafras Wesley Vale Irrigation Scheme Augmentation

The preferred option for SWISA seeks to provide additional water to the Irrigation District enabling an increase in the current area subject to irrigation and to improve the performance of the scheme through improved ability for irrigators to trade flow between zones, plus take higher flow rates to meet changing contemporary irrigation practices not evident at the time the original scheme was developed.

The region serviced by the existing scheme is some of the highest yielding and most fertile agricultural land in Tasmania. Typical land use in the area is for vegetable crops, viticulture, fruit, and seed crops. The augmentation of the existing irrigation scheme will further improve the agricultural potential of the district. This will allow for ongoing changes in agricultural activity to reflect market demand and increase the area of irrigated land in the district.

2.1.1 Scheme overview

Water is pumped out of the Mersey River at Great Bend up to Saggers Hill Reservoir located on a nearby hill. The pump station is controlled by the level in the reservoir.

The scheme includes two looped zones, Moriarty and Wesley Vale, designed to maximise water trading opportunities. The SWIS Harford and Thirlstane branches have been connected on the eastern side of the scheme to create the Moriarty Zone. The Northdown and Pardoe branches have been looped together with a pipeline to the north of the scheme on Mill Road to create the Wesley Vale Zone

As part of the Saggers Hill Loop option development, a detailed engineering condition assessment of the 50-year-old ex-Wesley Vale Paper Mill assets (i.e., Great Bend pump station and reservoir, and the Wesley Vale rising main and main pipeline), which form part of the existing scheme, was undertaken to confirm their suitability for the augmentation i.e., would these older assets be able to reliably deliver more than double the current flow rate.

The assessments found that:

- The Great Bend Reservoir is at the end of its service life and the cost of remedial works would exceed the cost of constructing a new concrete reservoir. As a result, the reservoir will be decommissioned in place and fenced off. The new reservoir will be sited at a higher elevation on Saggers Hill allowing most of the distribution system to be gravity fed.
- The main rising main and gravity main that serviced the former Wesley Vale Papermill was also found to be at the end of its service life. A replacement pipeline was assessed as being

the least cost option compared to repairing the existing pipeline which will be decommissioned in situ and grout filled where it crosses roads, is close to houses and buildings or is under poly growing tunnels.

- The Great Bend pump station will be renewed for use in SWISA. The existing pumps will be decommissioned and replaced with four high pressure variable speed drive 800 kW pumps capable of supplying 24.7 ML/day. The electrical system and switchboard will also be replaced and designed to meet the needs of the new pumping configuration. New screens and penstocks on the inlet and outlet of each of the two screen wells will be replaced. Following a structure and condition assessment, the pump station structure will be refurbished to incorporate safety upgrades to access and improving the stability of the rock wall as well as several maintenance items.

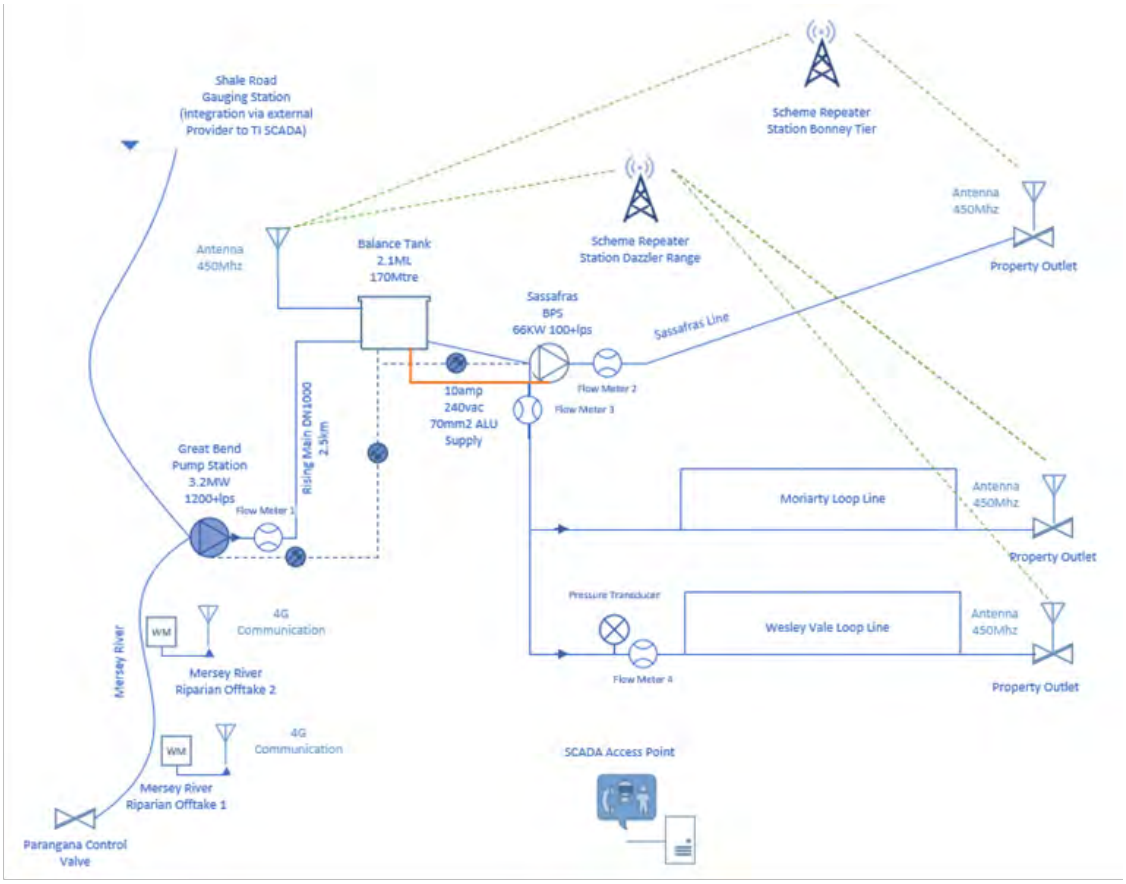
2.2 Saggers Hill Loop

The scheme design has water being pumped out of the Mersey River at Great Bend up to the new Saggers Hill Reservoir, this is then supplied to the majority of the scheme under gravity. The Great Bend Pump Station will be controlled by the level in the reservoir.

The rising main is 2.9 km long and follows the Great Bend Pump Station access road for approximately 500 metres to the existing reservoir site before cutting through bush to the new Saggers Hill Reservoir.

A trunk main from the reservoir runs north to supply the entire scheme via gravity flow except for the Sassafras branch – the first branch in the scheme – where pressure is boosted by the Sassafras pump station. A schematic of the SWISA is provided in Figure 1.

Figure 1: Schematic overview of the SWISA project



The main components of the scheme include:

- The Saggers Hill Reservoir is a 2.1 ML concrete reservoir and will provide approximately 30 minutes of storage at full flow. The reservoir has a wall height of 6 metres with a diameter of 23.5 metres.
- The Sassafras Booster Pump Station is located downstream of the Saggers Hill Reservoir at the offtake from the trunk main. The booster pump station comprises four 30 kW pumps.
- The distribution system for SWISA, comprising a length of 107.4 km, follows much of the existing pipeline alignment and existing outlet points designed to remain in the same location thereby avoiding the need for existing irrigators to alter private irrigation infrastructure. Existing pipes are to be replaced with new larger pipes with the design incorporating a buffer distance of 8 metres between the old and new alignments. This design has the benefit of much of the construction being able to be undertaken without interrupting to existing customers.

  An option to run new pipes in parallel to the existing scheme thereby effectively doubling the capacity of the scheme was considered. However, the option was discounted due to the much of the existing pipe would require replacing due to pressure classes being exceeded. The opportunity to reuse some of the existing pipe was also dismissed due to the cost of reclamation and transport to new sites being prohibitive.

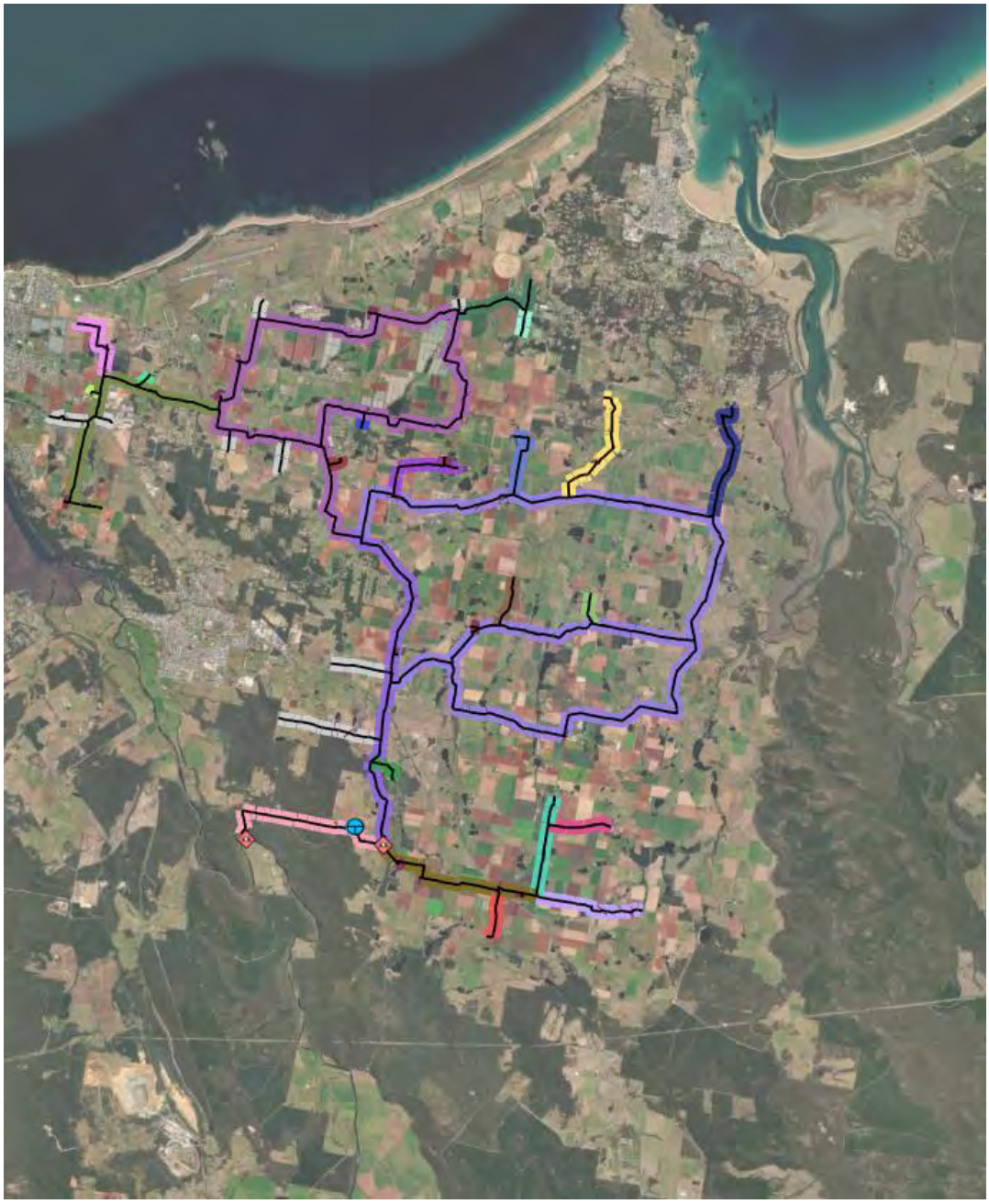
- There will be a total of 172 outlets in the scheme comprising retention of 84 existing outlets, the upsizing of 44 existing outlets and 44 new outlets. Outlet capacities range from 50mm to 300mm.
- An assessment of crossings was undertaken in partnership with a construction management consultant. Generally, major road crossings will be under-bored unless shallow hard material prevents this technique. Most stream crossings will be trenched, especially the ephemeral streams. Most of the pipeline length will be as trench i.e., dig, lay, and backfill.

There will be four new zones with SWISA providing a total of 31 trading zones which will greatly enhance the water trading capability of the scheme facilitating the movement of water to areas where the highest productive use is able to be made. The breakdown of demand by zone is provided in Table 1 with the trading zones illustrated in Figure 2.

Table 1: Summary of SWISA branch summer demand

Zone	Summer Demand (ML/150 days)	Demand (ML/day)
Trunk	1,255	8.37
Moriarty	6,109	40.7
Wesley Vale	5,755	38.4
Sassafras	1,740	11.6
Total	14,860	99.1

Figure 2: SWISA trading zones



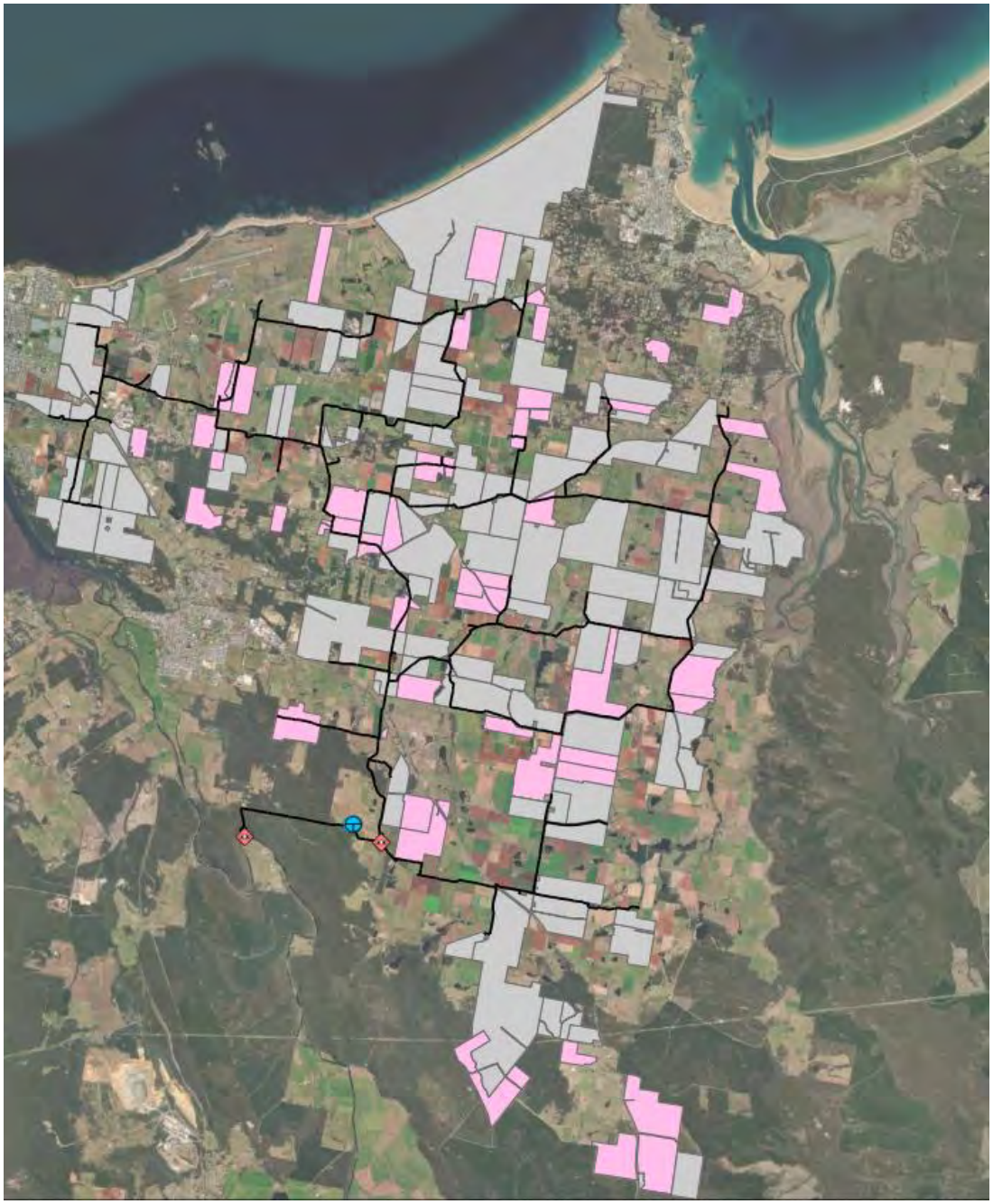
2.3 Water sales

The Water Sales process undertaken by Tasmanian Irrigation concluded in August 2022 and resulted in offers to purchase 6,335 ML in entitlements but this has been reduced by 390 ML due to inability to service the properties due to constraints imposed by the current system design. However, an additional 800 ML has been sold since the conclusion of water sales bringing the water sales volume to 6,745 ML. The expectation is that additional water will be sold prior to the scheme's commissioning which is currently scheduled for September 2026.

This volume is additional to the 5,660 ML of entitlements held within the existing scheme.

Figure 3 illustrates the distribution of EOI and Water Sales entitlement volumes and those entitlements that lie outside the area services by the final scheme design.

Figure 3: Distribution of EOI and Water Sales entitlements and scheme serviced boundary



2.4 Water resource options

2.4.1 Existing scheme entitlements

The existing SWIS scheme has water supply commitments of 5,660 ML or 37.7 ML/d, comprising 5,460 ML of summer water entitlements plus a 200 ML water supply agreement with an irrigator who had a historic supply arrangement regarding use of the ex-Wesley Vale Paper Mill pipeline.,

To meet this demand Tasmanian Irrigation has an annual Department of Natural Resources and Environment Tasmania (DNRET) Water Licence #9204 on the Mersey River totalling 12,410 ML together with an agreement for the transfer of the historic irrigator's summer Water Licence #4063 totalling 338 ML to Tasmanian Irrigation.

The SWIS water supply security is underwritten by a Deed of Water Allocation Transfer[2] through which Hydro Tasmania guarantees up to 34 ML/d when restrictions are applied to Tasmanian Irrigation's DNRET licence, and the river is on cease to take.

While Tasmanian Irrigation's water licence #9204 will contribute to the supply of the additional 61.5 ML/day during summer, it will be insufficient on its own to ensure 95% average reliability. Accordingly, an additional water resource is required.

Tasmanian Irrigation undertook an extensive assessment of alternative water sources, and the outcomes of these assessments are outlined in the following sections.

2.4.2 Additional DNRET water licence allocation

Section 3.2.3.a Water Allocation Limits of the *Mersey Water Management Plan 2005* confirms that there are no new summer Surety 5 allocations available. Accordingly, this option was excluded from further consideration.

2.4.3 Storage dam

This option would involve the construction of a large new storage dam which would be filled during winter using Water Licence #9204, combined with an additional winter allocation if required. Water from the dam would be used during the irrigation season to supplement the direct take from the river using Water Licence #9204.

A Hydrologic Yield Analysis conducted in April 2020[3] found that a 5,500 ML FSL winter-fill storage dam (i.e., 5,200 ML supply plus losses) would be required to achieve 95% average volume reliability for a 76 ML/d scheme (i.e., not including the additional 20% for future growth). The required 42 ML/d would be delivered during summer by an average of 34.6 ML/d released from the dam plus 7.4 ML/d directly pumped from the river under Water Licence #9204.

Two alternative dam sites were assessed (Bonnies Creek dam and Parramatta Creek dam).

An additional new dam site (Franklin Rivulet dam) was also considered, which would be filled in winter using a new Franklin Rivulet DPIPWE Water Licence.

The three dam sites were evaluated in the SWISA Water Supply Cost Benefit Analysis[4] assuming 11,405 ML summer supply (76 ML/d). However, while both capital and operating costs would increase under the preferred Option design of 13,686 ML (91.2 ML/d) the increases would be proportional for all three options and the conclusions reached remain valid. The outcomes from the assessment are summarised in Table 2.

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[2] Hydro Electric Corporation, Deed of Amendment Water Allocation Transfer – Sassafras Wesley Vale Irrigation District
[3] WMA, 2020, Sassafras Wesley Vale Irrigation Scheme Augmentation – Water Availability
[4] Tasmanian Irrigation, 2021 Memo: SWISA Water Supply Cost Benefit Analysis (App 06_SWISA Water Supply Cost Benefit Analysis.pdf)

Table 2: Storage option cost estimates

Item	Unit	Bonney's Creek Dam	Paramatta Creek Dam	Franklin Rivulet Dam
Capital cost	$m	15.95	6.75	11.40
Operating cost	$/a	772,997	668,889	518,109
Operating cost/ML	$/ML	67.51	58.42	45.25

The Parramatta Creek Dam was assessed as having the least whole-of-life cost.

2.4.4 Water purchase from Hydro Tasmania (Lake Parangana)

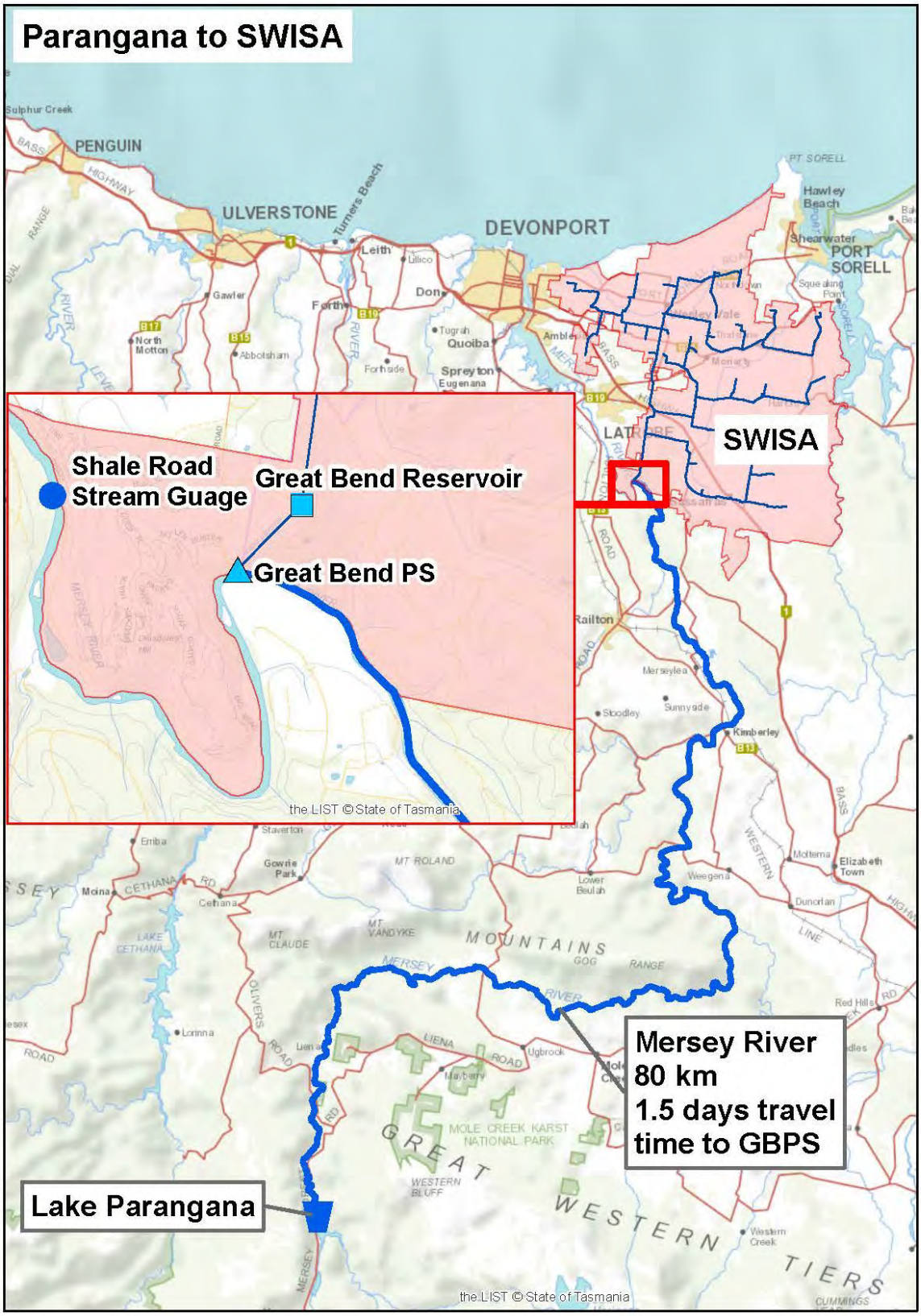
An alternative to constructing a storage was also examined involving purchase of additional water from Hydro Tasmania's Lake Parangana storage.

The capital cost for the Lake Parangana option was estimated at $1.42 million or 18% of the next least cost option – Parramatta Creek Dam (refer Table 2). The operating cost for the Lake Parangana option was estimated at $46.23/ML only slightly higher than the Franklin Rivulet Dam option which had a much higher capital cost ($11.4 million).

Supply from Lake Parangana was therefore selected as the preferred option for supplying the additional water required for SWISA.

Lake Parangana is part of Hydro Tasmania's Mersey-Forth power station network. It is filled by Lake Rowallan, which is the major storage for the network. Water is released from Lake Parangana to the west via tunnels to the Lemonthyme Power Station at Lake Cethana, and to the north down the Mersey River via the Parangana mini hydro for environmental flows and irrigation supply. Great Bend Pump Station is approximately 80 km downstream and 1.5 days water travel time from Lake Parangana, as shown in Figure 4.

Figure 4: Mersey River: Lake Parangana to Great Bend Pump Station



Hydro Tasmania has provided an 'In Principle Letter of Agreement to increase the existing Deed of Amendment from 34 ML/day to 106 ML/day available to Tasmanian Irrigation and to provide this

volume at 95% reliability consistent with Tasmanian Irrigation's stated objective for new irrigation schemes.

For the 'In Principle Agreement' to be finalised there are two areas to be addressed. These are:

- Tasmanian Irrigation undertaking the Design Work required to upgrade the Parangana Bypass Tunnel. Once this work has been completed Hydro Tasmania may bring planned works forward and contribute to the upgrade cost. It is Tasmanian Irrigation's position that Hydro Tasmania will own and operate the asset once installed. Early Design Partner Engagement for the Bypass Valve has commenced establishing the 'Scope of Work' and subsequent cost estimate.

- An ordering process is to be implemented which combines all volumes into one order and presented to Hydro Tasmania at defined intervals. The potential water ordering and billing process is illustrated in Figure 5. The ordering process is well advanced, with a final meeting to be held between Tasmanian Irrigation, Hydro Tasmania and Mersey Irrigation Group scheduled to occur prior to the end of 2022.

Water for the scheme is purchased from Hydro Tasmania at a cost of between $67.00 and $80.00ML (FY24 estimate) depending on its method of delivery (through the Mini-hydro or bypassed). It has been estimated the scheme could use on average around 4,000 ML of Hydro Water in any given season.

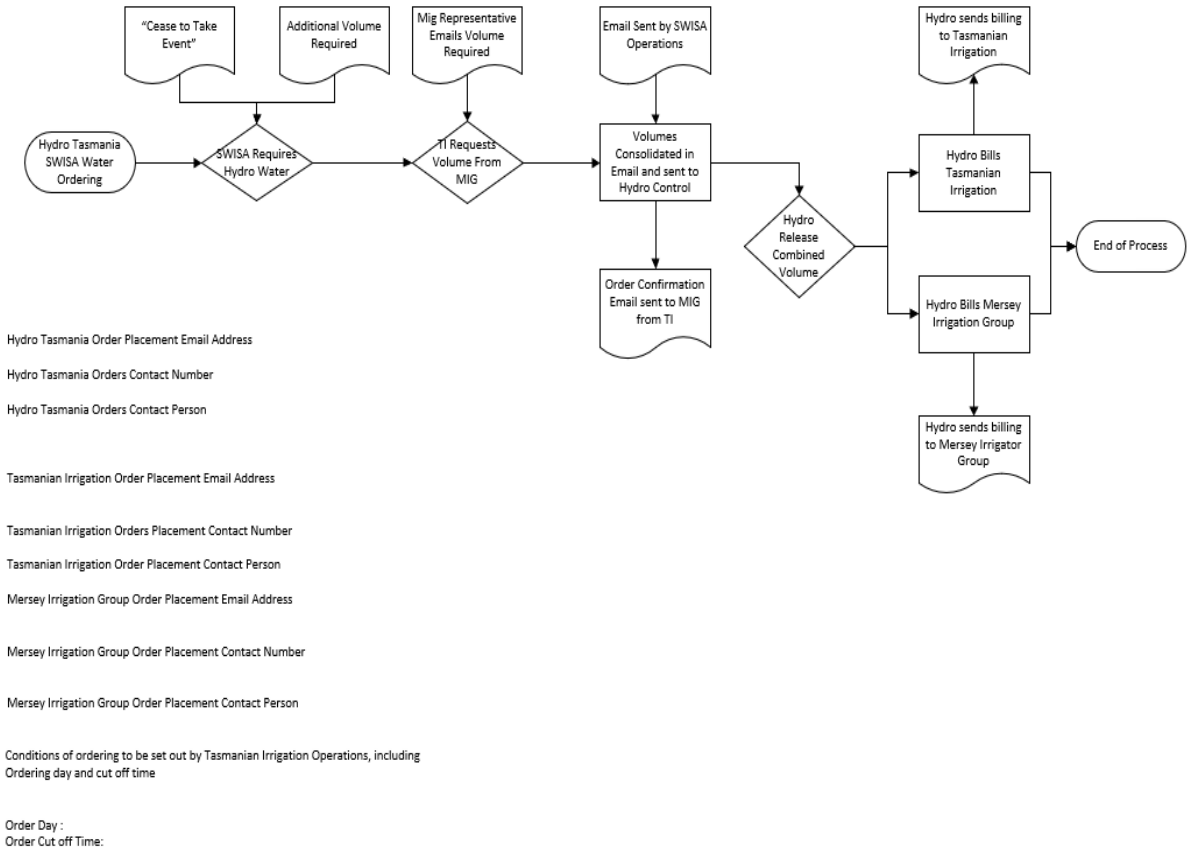
In consultation with Hydro Tasmania, a two-stage approach has been identified for accessing water from the Lake Parangana outlet. The approach is in two stages because Hydro Tasmania has not yet confirmed the timing of its planned major upgrade of the Lake Parangana outlet, which involves extending to main discharge valve past the mini hydro offtake to the end of the outlet tunnel.

In Stage 1 the current 24-inch offtake is extended outside the outlet tunnel and separate new Tasmanian Irrigation and Hydro Tasmania valves installed. The Tasmanian Irrigation valve would be able to independently discharge at a rate of at least 106 ML/day at all dam levels.

In Stage 2, during Hydro Tasmania's planned major upgrade the Stage 1 works would be removed and both valves relocated to the end of the tunnel.

Figure 5 provides a schematic of the likely water ordering process to be implemented.

Figure 5: Schematic of water ordering process



2.5 Energy requirement

As noted, the SWISA requires pumping from the Mersey River to the Saggers Hill Reservoir with a with booster pump station required for the Sassafras Zone. At full capacity for the Augmentation (9,200 ML of summer water per annum), the total energy requirement is estimated at 7,297.99 MWh for the SWISA (Table 3).

Table 3: Energy requirements – SWISA

Parameter	Great Bend PS	Sassafras Booster PS	Total/Average
Pumping days	150	150	
Volume (ML)	9,200	930	
kWh/ML	774.04	190.12	793.26
MWh at full capacity (MWh)	7,121.17	176.82	7,297.99

Source: Marsden Jacob analysis, 2022.

2.6 Project cost estimates

2.6.1 Introduction

This section presents information on project costs for the proposed SWISA, including estimates of capital development costs (CAPEX), fixed operating costs (fixed OPEX) and variable operating costs (variable OPEX).

2.6.2 Capital costs and timing of works

The main components of the capital development cost for SWISA include:

- sourcing and laying the pipelines and fittings
- procuring the pump sets and motors and constructing the pump stations
- balancing storages including the tanks and dam
- procuring and installing the off-take connections to individual irrigators.

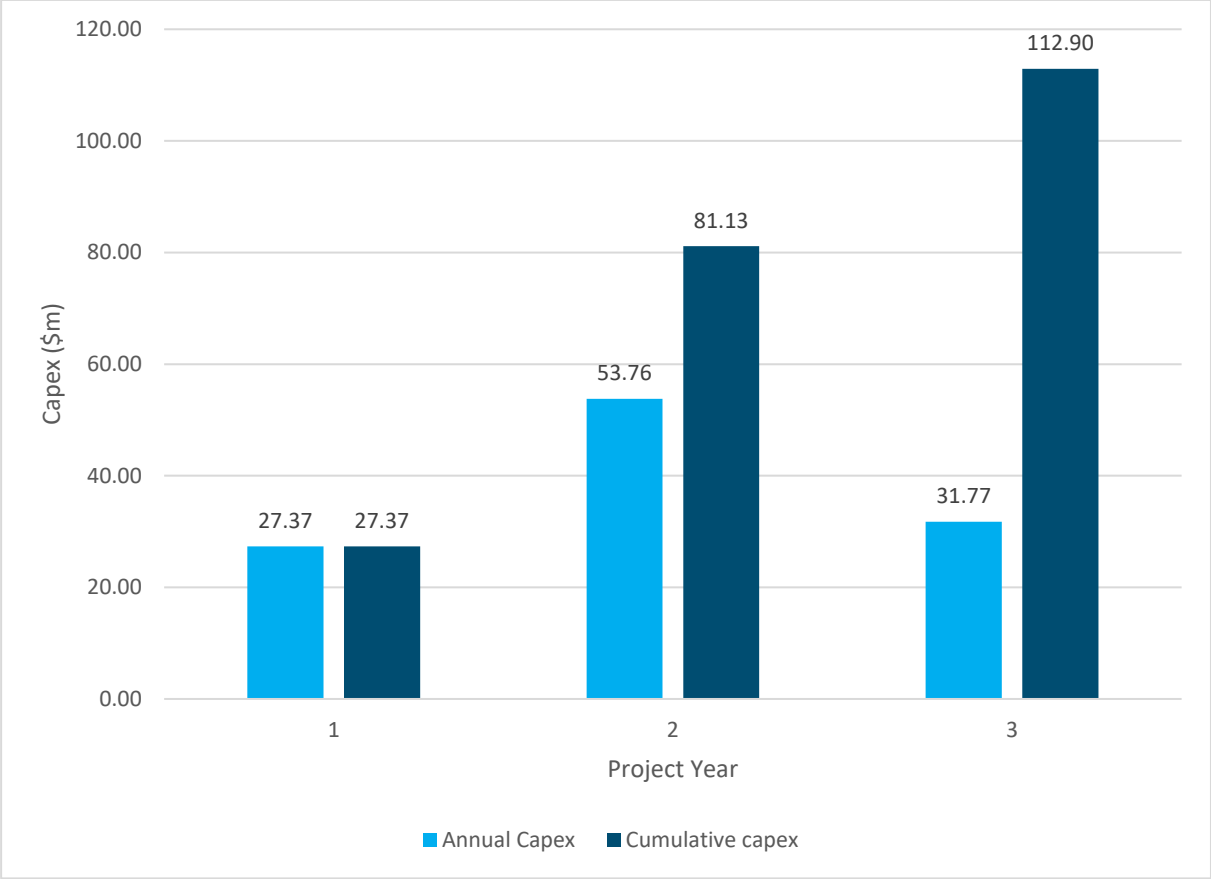
The total capital cost of the scheme is estimated at $112.90 million (P50 estimate) and $124.19 million (P90 estimate), with Table 4 setting out a breakdown of the P50 and P90 cost estimates, including contingency. Figure 6 illustrates the timing of costs showing both the annual and cumulative costs for the project.

Table 4: Total capital cost and timing of SWISA

Items	P50 Cost ($000s)	P90 Cost ($000s)
Preliminaries	7,689.24	7,689.24
Pipe Supply	19,822.77	19,822.77
Pipe Installation	27,819.59	27,819.59
Pump station cost estimate total	11,319.51	11,319.51
Pump Station Power supply total	1,064.01	1,064.01
Valve Station	3,183.84	3,183.84
Reservoir	2,899.92	2,899.92
Dam	596.69	596.69
Property Outlets	8,446.42	8,446.42
Decommission	3,444.79	3,444.79
Other Project Costs	3,413.19	3,413.19
TI Internal Costs	4,367.74	4,367.74
Detailed Design	3,357.62	3,357.62
Commissioning and Defects Liability	926.20	926.20
Base Sub Total	**98,351.54**	**98,351.54**
Inherent and Contingent Risk	14,548.46	25,842.59
Total Project Cost	**112,900.00**	**124,194.14**

Source: Tasmanian Irrigation, 2022.

Figure 6: Annual and cumulative capital cost of SWISA (P50)



Source: Tasmanian Irrigation, 2022.

2.6.3 Fixed operating costs

The principal components of fixed operating costs for the SWISA include scheme operations of $537,112 p.a., maintenance costs are estimated to total around $59,724 p.a. with a further annual allowance of $697,785 in asset refurbishment costs and $131,178 in fixed power and $13,479 in telemetry. This equates to an estimated annual fixed operating cost of $1.28 million.

However, a proportion of these costs will be borne by existing customers with this being estimated at around 32% based on the quantum generated from current fixed charges with 68% of the total fixed costs or $977,252/annum assumed to be the incremental cost attributable to the augmentation of the scheme. This incremental cost is therefore the cost included in the economic cost benefit assessment. This equates to a levelised cost of $85.76/ML of entitlement (summer and winter) or $125.32/ML (summer entitlement only) based on the assumed uptake profile for entitlements (refer section 3).

2.6.4 Variable costs

Pumping costs

The main supply pump station at Great Bend and the Booster Pump Station at Sassafras will both operate in off-peak and peak modes. A weighted average cost of $0.7133/kWh has been adopted for

the Great Bend Pump Station based on a high voltage tariff and $0.1171/kWh for the Sassafras Booster Pump Station based on a low voltage tariff.

Table 5 sets out the volumes, energy requirements (kWh/ML) and resultant cost per ML pumped and total annual costs. Assuming full utilisation of the scheme, the total energy cost is estimated at $0.53 million or a weighted average of $57.46/ML with a total energy requirement estimated at 7,297.99MWh.

Table 5: Cost of water pumped – summer water

Pump Station	Volume	Energy Requirement	Energy Cost	Cost per ML pumped	Annual Cost
	ML	kWh/ML	$/kWh	$/ML	$
Great Bend PS	9,200	774.04	0.7133	55.21	507,955
Sassafras BPS	930	190.12	0.1171	22.26	20,702
Total scheme		792.64	0.7249	57.46	528,657

Source: Marden Jacob analysis based on Tasmanian Irrigation data, 2022.

Cost of purchasing water from Hydro Tasmania

As noted, the price charged by Hydro Tasmania for water from Lake Parangana to support the augmentation is assumed to be current price of $80/ML with a weighted average cost estimated at $35.83/ML considering the volume of water required to be purchased on average under the proposed licence arrangements and the assumed demand profiles (refer section 3).

2.6.5 Cost summary

Table 6 sets out the principal project costs for the SWISA.

Table 6: Cost summary – proposed SWISA

Parameter	Unit	Values adopted in financial & economic models
Capital costs[1]		
P50 estimate	$m	112.90
P90 estimate	$m	124.19
Variable operating costs		
Purchase of water from Hydro Tasmania	$/ML	80.00
Pumping costs		
Great Bend PS	$/ML	55.21
Sassafras Booster PS	$/ML	22.26

Parameter	Unit	Values adopted in financial & economic models
Total Variable cost[1]	$/ML	113.30
Fixed operating costs		
Annual operations	$/a	537,112
Maintenance	$/a	59,724
Fixed power	$/a	131,178
Fixed telemetry	$/a	13,479
Asset refurbishment	$/a	607,785
Total Fixed Costs[2]	$/a	1,439,278

Source: Tasmanian Irrigation, 2022.

Notes:

1. *Total variable cost based annual volume of 9,200 ML taking into account only around 47% of water needs to be purchased from Hydro Tasmania.*
2. *Given that the scheme supplies 5,660 ML to existing customers the incremental fixed cost attributable to the Augmentation is estimated at $977,252 or 68% of the total fixed cost.*

3. Demand for new water in regions supplied by the scheme

3.1 Introduction

Immediate demand for water is likely to come from cropping enterprises looking to enhance the reliability of existing on-farm water supplies and intensify and/or expand their irrigated cropping enterprises, with some changes in enterprise mix. Data shows that vegetable production including potatoes, onions, carrots, brassicas, beans, and peas comprised 48% of current irrigated enterprises with field crops, mostly poppies, accounted for 25% of current irrigation area with the balance being irrigated pastures (refer Section 5). The availability of secure water and a comparatively mild climate has the potential to attract further new investments into high value enterprises, such as berries, viticulture, and orchards.

3.2 Land capability assessment

The indicative upper bound potential demand can be estimated by reviewing potential irrigation demands for all irrigable land in the study region. Accordingly, a brief review is undertaken of the land capability and associated water demands, before reviewing the outcome of both recent demand surveys and Tasmanian Irrigation's recently conducted Water Sales for SWISA.

Class 1, 2 & 3 land is classified as the best cropping land while Class 4 & 5 land is suitable for cropping, but with limitations that restrict the range of crops that can be grown, and the number of years annual crops can occur in a rotation.

The total area of irrigable land within the current irrigation area is around 19,624 ha which comprises a significant portion (92%) of the total land area (refer Table 7). Approximately 32% of the irrigable area comprises prime agricultural land (Classes 1-3).

Table 7: Land capability by land class

Land class	Area ha	Percent of total
Class 1	132	1%
Class 1+2	128	1%
Class 2	1,942	9%
Class 2+3	126	1%
Class 3	4,487	21%
Class 3+4	1,404	7%
Class 4	7,259	34%
Class 4+5	228	1%
Class 5	3,870	18%
Class 5+4	48	0%

Land class	Area ha	Percent of total
Subtotal irrigable	**19,624**	**92%**
Class 6 (including 5+6 & 6+5)	600	3%
Class 7	84	0%
Excluded (including 0)	1,088	5%
Total	**21,396**	**100%**

Source: Source: Pinion Advisory, 2022

3.3 Demand for water

Conducting an expression of interest (EOI) process is often used to gain an informed understanding of the likely demand for irrigation water from a scheme. Such a process was undertaken by Tasmanian Irrigation in September 2019 which identified a potential demand of 5,565 ML. Several survey participants modified their EOI at the time of the survey resulting in a 3% increase in demand compared to initial estimates.

Accordingly, following approval of the Preferred Option report, Tasmanian Irrigation held its Water Sales for scheme over the period May to June 2022 which was subsequently extended by three weeks. The outcome of Water Sales confirmed a strong demand for water with contractual offers to purchase of 6,335 ML (69% of total additional available summer water) being achieved. However, 390 ML is unable to be supplied due to current design constraints, leaving 5,945 ML of summer entitlements purchase offers being accepted with a further 800 ML being sold since the formal conclusion of the water sales process bringing the total volume sold to 6,745 ML or 73% of the additional summer irrigation capacity. The expectation is that additional water will be sold prior to the scheme's commissioning which is currently scheduled for September 2026.

3.4 Uptake rate

The scheme has a total summer capacity of 14,860 ML, 5,660 ML comprises existing demand. Of the 9,200 ML of additional summer water available 6,745 ML has been sold via the Water Sales process conducted by Tasmanian Irrigation. This is viewed as firm demand as irrigators have entered into binding contracts for entitlements and made an initial payment equal to 10% of the total cost of entitlements purchased.

Accordingly, 2,455 ML of summer water and 14,860 ML of winter is available future sale.

3.4.1 Summer water

The uptake rate for the remaining 2,455 ML of summer irrigation water is unknown and is likely to be influenced by seasonal condition (dry hot seasons post commencement of construction is likely to result in heightened demand for water), economic conditions (demand for food and cost of inputs) and the continued interest in Tasmania as an ideal location given its cooler climate and access to secure water.

Accordingly, the uptake scenarios for entitlements and irrigation usage have taken these factors into account with the uptake scenarios developed to underpin the economic and financial assessments. The assumptions underpinning the uptake scenarios for entitlements are set out in Table 8 and for irrigation use in Table 9, with the resultant profiles illustrated in Figure 7 for the central case scenario. Irrigation usage is expected to lag the uptake of irrigation entitlements by one to two years with a one-year lag assumed in the economic and financial assessments.

Table 8: Entitlement uptake scenarios – summer water

Scenario	Initial Demand ML	Final Demand ML	Year final demand achieved[1]
Base Case[2]	6,745	9,200	14
Slow Up-take	6,745	9,200	19
Rapid Up-take	6,745	9,200	12

Source: Tasmanian Irrigation estimates, 2022.

Notes:

1. Year in which 100% of final summer entitlements is assumed to be taken up by irrigators.

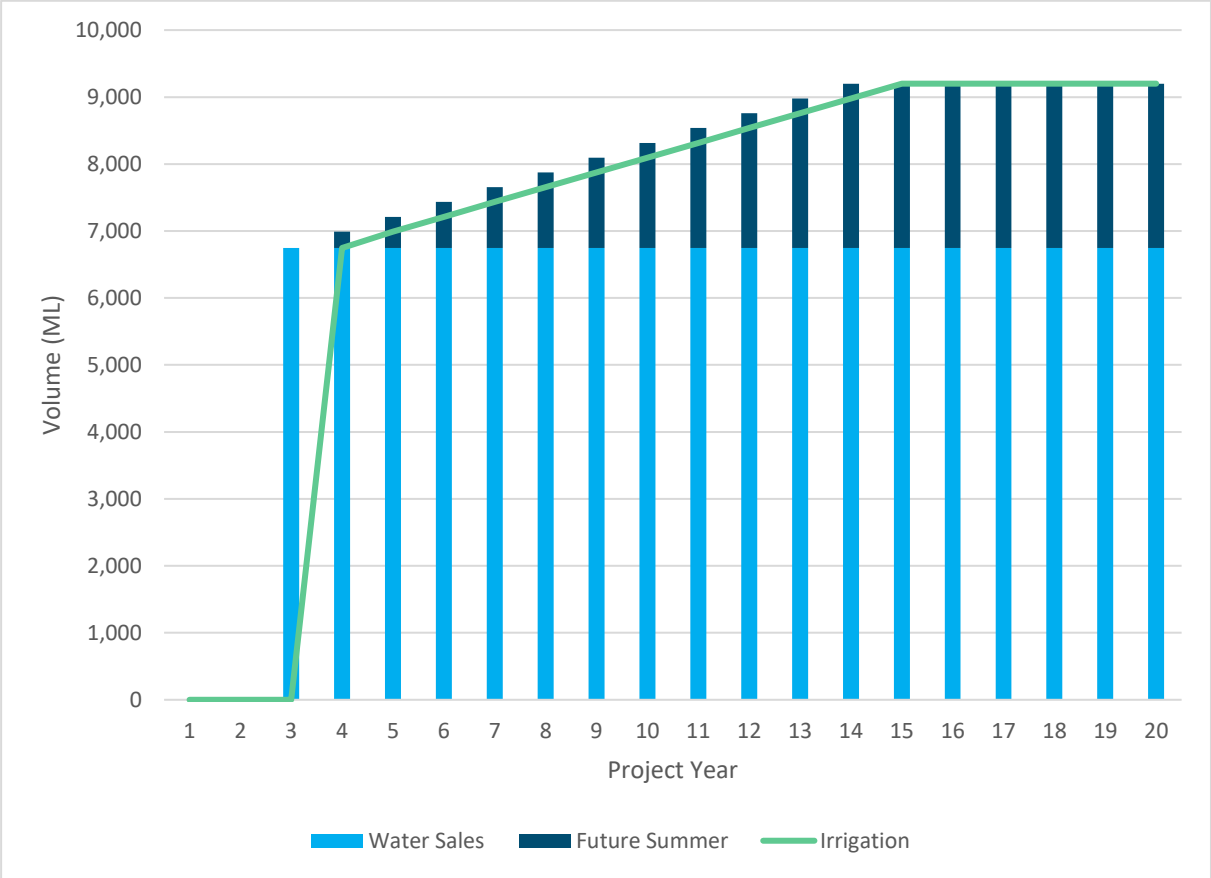
2. Base Case demand is the assumed volume of entitlements sold prior to actual commencement of scheme operations i.e., entitlements held at the beginning of Year 3 with all entitlements sold by Year 14 i.e., 10 years post scheme commissioning.

Table 9: Irrigation usage demand scenarios – summer water

Scenario	Initial Demand ML	Final Demand ML	Year final demand achieved[1]
Base Case	6,745	9,200	15
Slow Up-take	6,745	9,200	20
Rapid Up-take	6,745	9,200	13

Source: Tasmanian Irrigation estimates, 2022.

Figure 7: Entitlement and irrigation use under Central Case conditions



Source: Tasmanian Irrigation, 2022.

3.4.2 Winter water

The uptake of winter water is expected to be much slower than the uptake of summer water. Reasons for this include: the availability of summer entitlements until fully sold; the need for on-farm storage to utilise winter water; the cost of constructing winter storages; and the general intensity of agriculture in the region meaning that there is an opportunity cost of taking land out of production to site a winter storage.

Given these factors the uptake of winter water is likely to occur over a substantially longer period and start from a low base with the assumed uptakes for each of the three scenarios set out in Table 10. It is assumed that there will be no sales of winter water for the first two years post-commissioning of the project reflecting the availability of summer water. However, limited sales of winter water are expected to occur as some irrigators are likely to require small volumes to irrigate during the shoulder periods pre and post the 150-day summer irrigation season.

Table 10: Entitlement uptake scenarios – winter water

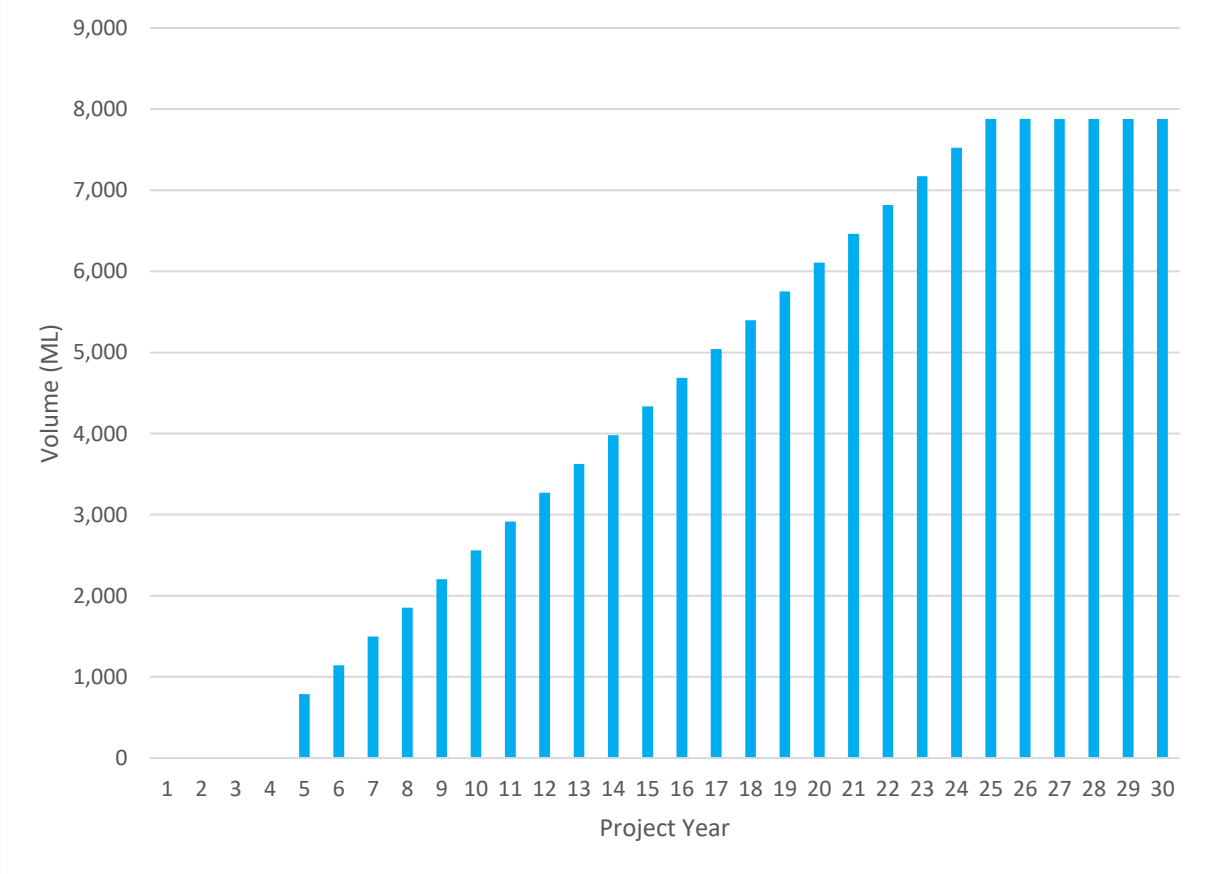
Scenario	Initial Demand ML	Final Demand ML	Year final demand achieved[1]
Base Case	600	7,880	26
Slow Up-take	300	7,880	31
Rapid Up-take[2]	600	7,880	16

Source: Tasmanian Irrigation estimates, 2022.

Irrigation use of winter water is assumed to lag the uptake of winter entitlements by a year. The uptake profiles for winter water are illustrated in Figure 8.

As part of the economic assessment (refer Section 5), an extreme scenario is also modelled where no uptake of winter water is assumed.

Figure 8: Winter water entitlement uptake profile



Source: Tasmanian Irrigation estimates, 2022.

4. Financial assessment

4.1 Introduction

The financial assessment in this section presents details of expected scheme revenues and full lifecycle costs and provides estimates of both the irrigator contributions to capital development costs and the magnitude of subsidy required.

4.2 Key assumptions

Discount rates and assessment period

The economic and financial analyses are undertaken assuming a real discount rate of 7% as required by the Infrastructure Australia Assessment Framework, with sensitivity assessments undertaken assuming 4% and 10%.[5] A 33-year evaluation period is assumed, comprising a three-year construction period followed by a 30-year operations period.

4.3 Present value lifecycle costs

The present value lifecycle costs (PVC) are estimated by discounting all future capital costs, operating costs, and asset refurbishment and maintenance costs using the central case assumption of a 7% real discount rate. Table 11 sets out the present value lifecycle costs by major cost component for the SWISA for the central case demand scenario and the P50 and P90 project cost estimate.

Table 11: Present value lifecycle component costs – central case demand

Component	PV Lifecycle Cost (P50) $m	PV Lifecycle Cost (P90) $m
Capital cost	98.47	108.28
Operating costs		
Fixed	9.90	9.90
Variable	9.82	9.82
Total operating costs	19.72	19.72
Total lifecycle cost	**118.18**	**127.99**

Source: Marsden Jacob analysis, 2022.

Table 12 sets out the estimated lifecycle present value costs for all the scenarios examined for the proposed SWISA. For the SWISA, the PVC is estimated to range from $106.64 million to $134.97 million, with a PVC estimated at $118.18 million using central case parameters.

[5] Infrastructure Australia, 2018 Assessment Framework, March.

Table 12: Lifecycle costs – P50 estimate

Scenario	Capital Cost $m	Fixed Operating Cost $m	Variable Operating Cost $m	Total Operating Cost $m	Total Lifecycle Cost $m
Central case	98.47	9.90	9.82	19.72	118.18
Capital cost					
+10%	108.32	9.90	9.82	19.72	128.03
-10%	88.62	9.90	9.82	19.72	108.34
Operating cost					
+10%	98.47	10.89	10.80	21.69	120.16
-10%	98.47	8.91	8.83	17.74	116.21
Discount rate					
4%	104.26	15.02	15.68	30.71	134.97
10%	93.18	6.92	6.54	13.46	106.64
Demand					
Slow	98.47	9.90	9.17	19.07	117.53
Rapid	98.47	9.90	10.66	20.56	119.03

Source: Marsden Jacob, 2022.

4.4 Projected revenue stream

The financial assessment uses a base-case price for the sale of summer water entitlements of $2,090/ML and $1,500/ML for winter entitlements (2022 dollars). These prices have been selected by Tasmanian Irrigation as balancing the competing elements of:

- high net margins able to be generated from several the selected enterprises, including augmentation of existing irrigated crops and development of orchards
- the high level of on-farm investment required to establish such enterprises
- the need for structural adjustment to occur (i.e., move away from dryland or low intensity irrigation of livestock enterprises to more intensively irrigated enterprises) over time
- Irrigators nominally contributing 25% of the capital cost to construct the scheme
- importantly, it was the price quoted in the contractual documentation for the recent Water Sales.

Based on the application of the chosen prices for summer and winter water entitlements, the present value of revenue from the sale of water entitlements is estimated at $23.01 million (in PVC terms), or around 23% of capital costs (in PVC terms).

4.5 Funding requirements

In nominal dollars the estimated funding arrangements for the SWISA are set out in Table 13 and assume that the NWIDF funding component is based on 50% of the total capital cost (P90 estimate). The estimated funding of $62.10 million represents 50.0% of the total capital cost of the scheme with irrigator contributions comprising $31.05 million (25.0%) with the balance of $31.05million (25.0%) being funded by the Tasmanian Government. Existing irrigators of the SWIS are not required to contribute to the cost of the scheme given that they purchased entitlement at the time the SWIS scheme was constructed.

Table 13: Base Case funding arrangements P90

Scenario	Capital Cost $000s
Capital cost	124,194.14
NWIDF component (50%)	62,097.07
Water sales	31,048.50
Tasmanian Government	31,048.50
Total Project Cost	124,194.14

Source: Tasmanian Irrigation, 2022.

An additional and separate level of funding will be required to cover the financing costs associated with the delay in the sale of summer and winter water entitlements to irrigators. However, the value of any unsold water entitlements will be indexed annually by the equivalent cost of debt thereby ensuring the long-term recovery of these finance charges.

4.6 Pricing

As noted, a price of $2,090/ML has been assumed to be charged for summer water entitlements and $1,500/ML for winter entitlements, with the annual charge being used to recover operating costs and asset maintenance and refurbishment costs. Hence, it is assumed that the funding from the NWIDF and the Tasmanian Government combined with revenues from the sale of water entitlements will meet the capital development costs, and all additional costs incurred in operating the SWISA will be recovered through annual charges.

4.6.1 Estimates of annual charges

Annual charges levied by Tasmanian Irrigation typically are based on a two-part tariff whereby the fixed charge is levied as a charge per ML of entitlement and the variable charge based on a cost per ML of entitlement delivered by the scheme with irrigators bearing the cost of any operational losses. Table 14 sets out the fixed and variable charges for the two delivery zones. It should be noted that the costs presented in Table 14 take account of the demand take-up profiles outlined in Section 3 and are therefore necessarily higher than those that would be obtained from simply dividing the nominal cost by the nominal capacity of the scheme. This reflects the fact that in the years until full

uptake of entitlements has been achieved, applying such nominal charges would result in an under recovery of costs.

Annual charges across the proposed SWISA are estimated at between $174.67/ML and $196.93/ML depending on the location, with an expected weighted average annual charge of $176.92/ML using central case parameters, comprising a fixed charge equivalent to $83.63/ML of entitlement and a weighted average volumetric charge of $93.29/ML covering the variable energy cost of pumping and cost of water from Hydro Tasmania.

Moreover, the pumping costs reflect current energy tariff structures which assume a weighted average of peak and off-peak charges. Opportunity may exist to achieve some reduction in costs by increasing the proportion of water able to be pumped using the off-peak tariff.

Table 14: Annual charges for individual zones

Zone	Fixed Charge $/ML	Scheme Energy $/ML	Spur Energy $/ML	Hydro Tasmania $/ML	Total Variable Charge $/ML	Total Annual Charge $/ML
Main system	83.63	55.21	-	35.83	91.04	174.67
Sassafras	83.63	55.21	22.26	35.83	113.30	196.93
Weighted average	83.63	55.21	2.25	35.83	93.29	176.92

Source: Marsden Jacob, 2022.

5. Economic assessment

5.1 Introduction

In this section we quantify the net economic returns from the project and conduct sensitivity analyses to evaluate the impact of changes in key parameters on the overall economic viability of the SWISA.

The economic assessment focuses on the economic returns from the use of water, whereas the narrower financial assessment adopts the revenue stream as the measure of project benefits. The key economic benefit is represented by the returns to irrigators (i.e., estimated net margins per ML for the principal crop and livestock enterprises).

5.2 Economic model

As noted above, the economic model includes enterprise net margins instead of revenues as the benefit stream.[6]

The economic model also incorporates a residual value representing the economic value of the scheme remaining at the end of the assumed 33-year evaluation period – 3-year construction period followed by 30 years of operations. The residual value is estimated as the present value of the net benefit stream over the remaining economic life of the scheme at the end of the 33-year evaluation period. For the assessment, a 100-year scheme life is assumed which is considered appropriate given that the cost of asset refurbishment/renewal is incorporated in the fixed costs for the scheme via the Asset Renewal Levy.

In all other respects, the economic model is consistent with the financial model.

For this assessment, the project evaluation adopts a real discount rate of 7% real which is subjected to a sensitivity analysis using discount rates of 4% and 10% (real). This is in accordance with the recommended discount rates set out in the Infrastructure Australia's Assessment Framework.

Importantly, the increase in production, hence net returns generated, represents real growth in output from the State's (and national) perspective and is not offset by reductions in output from other areas of the State. In other words, the assumed increase in irrigated output represents a net increase in economic output, contributing to the growth of state and national economies.

As noted, the economic assessment is only concerned with the incremental costs and benefits associated with the proposed project. Key assumptions underpinning the economic assessments therefore include:

[6] The rationale for including margins, and not revenue, in the economic model as the benefit stream is that the margin represents the true economic value to enterprises from using water. It is difficult to set prices equivalent to margins as this would require price differentiation. It is therefore the case that the benefit stream based on margins will typically exceed the revenue stream for the project.
Hence the economic net present value (NPV) for water infrastructure projects is higher than the financial NPV, and the economic NPV may be positive while the financial NPV is negative. (For a more detailed discussion of the difference between economic and financial assessments of new water infrastructure, see: Queensland Treasury, 2000, *'Guidelines for Financial and Economic Assessment of New Water Infrastructure'*, September).

- No account is taken of any benefits that might accrue to existing users (i.e., SWIS customers). This is a conservative assumption in that some incremental benefits are considered likely through the enhanced water trading opportunities provided by the new scheme
- The full capital cost is included as a cost
- Incremental fixed operating costs only are included given that an estimated 32% of costs will be recovered from existing customers
- 100% of water purchased from Hydro Tasmania for water sourced from Lake Parangana are included in the assessments.

5.3 Enterprise mix and farm margins

Net margin assessments used in this proposal are based on "expected average annual" outcomes and are a considered assessment of long-term average annual net margins considering the vagaries of the market and annual crop variations. The net margins are considered prudent in that they incorporate conservative estimates for overhead costs and include full contracting rates for all operations.

The enterprise mix and farm margins applicable to crops grown in the study area are used in estimating the benefits from the use of water in the economic model and are based on data provided in the Enterprise Mix and Margin report prepared by Pinion Advisory[7].

5.3.1 Farm survey

A farmer survey was undertaken by Pinon Advisory in May 2020 and later updated in August 2022 with the inclusion of two additional participants who came forward during the water sales period. The objective of the survey was to determine farmers' plans in relation to additional water required from the scheme.

The 23 farmers contacted, spanning 63 farms or parcels, made up 4,847 ML or 53% of the total 9,200 ML of additional capacity in the scheme. This also represents 81% of the current demand from water sales (Table 15).

Table 15: Farm survey water demand

	Unit	Total	Survey	Survey as % of Total
Extra water available	ML	9,200	4,847	53%
Current water sales	ML	5,945	4,847	82%
EOI participants	No.	60	23	38%
EOI farms	No.	75	63	84%
Average EOI per participant	ML	93	211	
Average EOI per farm	ML	74	77	

Source: Pinion Advisory, 2022.

[7] Pinion Advisory, 2022 SWISA Irrigation Scheme Enterprise Mix and Margin Assessment

Table 16: Current agriculture – survey farms

Farm area	
Participants surveyed (No.)	23
Land Presently Irrigated (ha)	3,423
Land Suitable for Cropping &/or Irrigated pasture (ha)	1,466
Land Suitable for Dryland grazing Only (ha)	531
Total usable area (ha)	**5,420**
Bush/Waste Area (ha)	655
Total (ha)	**5,625**
Current enterprises – proportion of effective area	
Dairy & replacements	5%
Beef/sheep breeding	41%
Beef/sheep finishing	2%
`Agistment	5%
Poppies	8%
Pyrethrum	3%
Other field crops	3%
Fodder crops	1%
Potatoes	7%
Onions	4%
Carrots	3%
Brassicas	4%
Beans	4%
Other vegetable crops	0%
Orchards/vineyards	5%
Total	100%
Current irrigation use	
Average total ML used	9,843
Average total ha irrigated	2,918
Average ML/ha	3.4

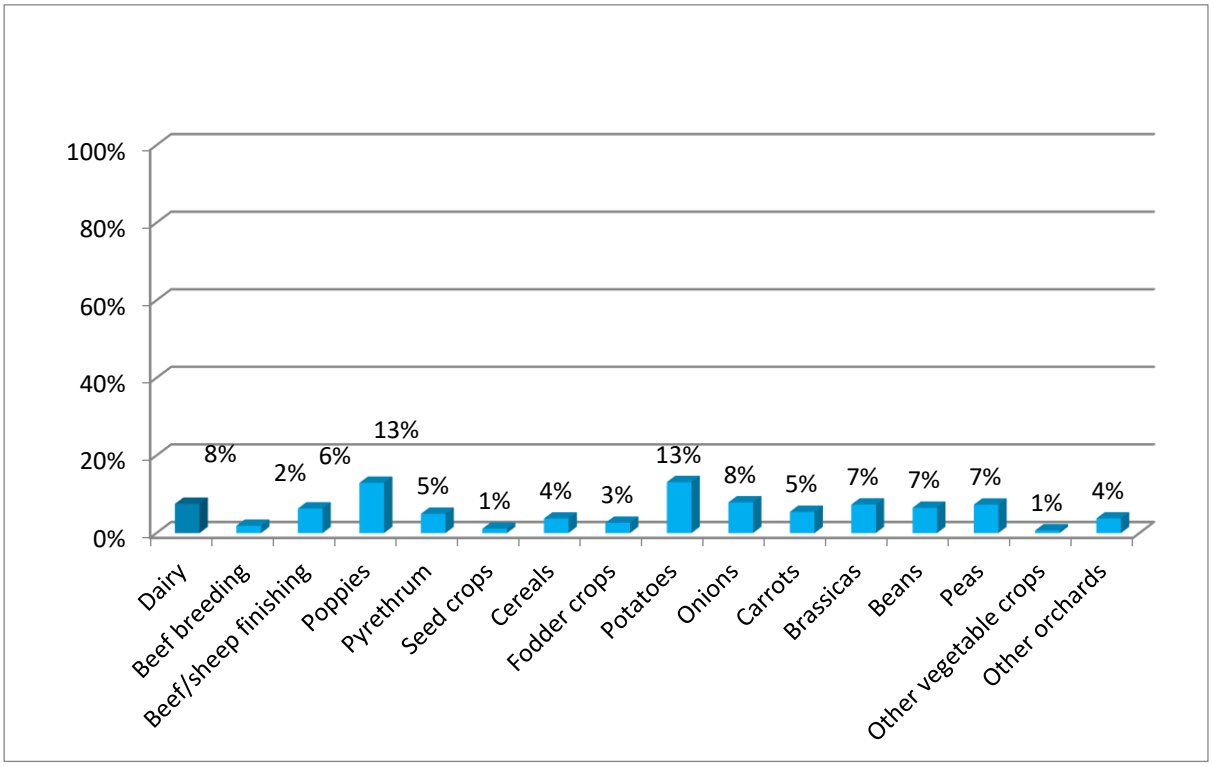
Source: Pinion Advisory, 2022.

Livestock enterprises including dairying (5%), beef/sheep grazing (41%) and finishing (2%) and agistment (5%) account for around 53% of the effective area on the survey farms with a mix of field and vegetable crops comprising the balance of the effective area. Of these cropping enterprises, poppies (8%), potatoes (7%), orchards/vineyards (5%) and a range of other vegetables and field crops providing the balance.

Current irrigated agriculture is estimated to use 9,843 ML across the survey farms and is supplied by a variety of sources including on-farm storages (45%), ground water (21%) and the existing SWIS scheme (31%).

Vegetable crops including potatoes, onions, carrots, brassicas, beans and peas made up 1,394 hectares (48%) of the current irrigated enterprises. This was followed closely by 742 ha (25%) of field crops, mostly poppies, and then grazing activity comprising 460 hectares (16%) of the total 2,918 hectares of currently irrigated area on the survey farms (Figure 9).

Figure 9: Current irrigation enterprises - by proportion of total irrigated area



Source: Pinion Advisory, 2022.

5.3.2 Net margins

The net benefit from the use of the additional water made available by the scheme comprises the enterprise gross margin (enterprise revenue, less variable costs of production) less the cost of capital infrastructure required to utilise the additional water, less any increase in farm overhead costs resulting from the more intensive scale of operations, less the net margin generated from the existing use of the land on which water will be applied.

In its report, Pinion Advisory noted that the estimates are based on average yields and practices for the area using 2021-22 costs. To dampen the influence of recent trade and supply chain disruptions on farmgate prices received and paid have been modified by Pinion Advisory to reflect a more "normal" or trend scenario[8].

The net margins for cash cropping include an allowance for contract cultivation, planting, spraying, harvesting and cartage, and own farm labour is included as a variable cost. Irrigation costs for cash

[8] Disruptive influences include COVID-19 labour shortages, China trade dispute, Russian invasion of Ukraine.

crops assume centre-pivot irrigators reflecting that these are the predominant system used in the region.

Assumptions

In calculating net margins Pinion Advisory made the following assumptions:

- Water for dairying has been split between two separate usage systems being: more water on an existing dairy farm, boosting milk production[9]; versus a straight dairy conversion replacing a dryland beef operation and gross margin of $456/ha.
- Similar to dairy, the beef and lamb finishing activity has been split between two systems: more water on an existing under-irrigated footprint[10]; versus a new irrigated system converted from a dryland beef or sheep breeding enterprise and gross margin of $408/ha.
- The irrigation enterprises for individual vegetable crops, namely potatoes, onions, carrots and brassicas replace small scale dryland sheep breeding enterprises with low pasture utilisation rates and a gross margin of $500/ha.
- Extra farm overheads are associated with the increased farming intensity. This is predominantly additional labour costs, applied on a pro rata basis linked to additional stock numbers or dairy cows, where applicable. In case of irrigated cropping, additional labour is accounted for in contract work in actual crop gross margin calculation.
- Extra capital outlay per hectare for the extra irrigated area ex dryland grazing is as per survey results or an average across the scheme of between $5,000/ha for larger scale areas and $6,000/ha for smaller scale areas – this equates to $554 per hectare when amortised over 20 years and 7% interest.
- For the dairy conversion net margins, a whole farm analysis was undertaken comparing a 200-hectare farm initially being dryland beef breeding, with a 200-hectare dairy milking 530 cows.
- Fodder maize net margin assumes dryland sheep breeding enterprise is replaced with irrigated maize crop sold as silage.
- The grape net margin is based on a new 20-hectare vineyard producing Pinot noir grapes sold off-farm at $3,200/tonne. No winery or cellar door facilities have been included. The vineyard replaces 25 hectares of dryland grazing at $408/ha and assessed over a 20-year investment timeframe.
- The berry-fruit net margin assumes a new 10 ha poly-tunnel development housing raspberry and strawberry plants in equal proportions and replaces vegetable cropping with an average gross margin of $3,425/ha. The berry-fruit net margin is assessed over a 10-year investment timeframe.
- The apple net margin assumes a 10 ha orchard replacing vegetable cropping ground with an average gross margin of $3,425 per hectare and assessed over a 10-year investment timeframe.

[9] Extra water enables expanded irrigation footprint supporting additional milking cows. The net margin reflects the value of additional production less additional capital and overheads.

[10] Extra water enables higher rates of dry matter utilisation using existing infrastructure and overheads. The net margin reflects the value of additional utilisation being achieved.

- Augmented[11] irrigated cash crops assume a 20 ha crop rotation of onions, wheat, carrots and peas, using on average 2.8 ML/ha, is converted to a higher gross margin rotation of irrigated vegetables (broccoli, onions, carrots and potatoes) averaging 4.2 ML/ha.

Pinion Advisory also assessed the benefits of extra water being available to an existing irrigation enterprise. These included:

- it ensures crop establishment and yields are optimised.
- facilitates short-term and out-of-season forage cropping for finishing livestock.
- it enables transition of crop rotations to higher value crops with higher rates of water provided soil and climate factors are conducive to such changes
- minimal capital expenditure is required as the delivery system is already in place provided there is spare capacity within the existing on-farm irrigation system
- with exception of major land-use conversions (such as dairies, vineyards, or orchards), there is minimal requirement for additional overheads.

Enterprise net margins

The individual components of the net margins are set out in Table 17 for each of the enterprises considered likely to utilise the additional water, together with the water use per ha and the percentage of total water utilised at full capacity. The weighted net margin was estimated by Pinion Advisory at $1,777/ML.

A modification was made for the weighted net margin applicable to winter water which was reduced by 26% to $1,310/ML to take account of the assumed cost of constructing on-farm storages to utilise the winter water. Key assumptions included: a dam construction cost of $4,000/ML, an effective economic life of 40 years, a 7% discount rate, and an opportunity cost for land of $500/ha.

[11] Extra water enables a new rotation of higher value crops using existing infrastructure and overheads. The net margin deducts the old crop rotation from the new higher-value crop rotation. The net margin is sensitive to crop selection, as it reflects the change in value generated by the different crop rotations.

Table 17: Derivation of net margins for enterprises in the SWISA

	Allocation	Water Use (extra)	Gross Margin	Forgone GM	Extra Capital	Other Overheads	Net Margin per ha	Net Margin per ML
	% ML	ML/ha	$/ha	$/ha	$/ha	$/ha	$/ha	$/ML
Dairy - ex current	7.6%	0.9	5,418	4,829	120	0	470	545
Dairy - ex dryland l'stock	2.0%	4.5	5,554	456	1,650	1,518	1,930	429
Livestock finishing - ex current	6.5%	3.1	2,666	1,142	177	0	1,347	435
Livestock finishing - ex dryland	24.7%	4.3	2,700	408	558	40	1,694	399
Agistment	2.4%	4.5	3,558	408	475	40	2,635	586
Poppies	3.5%	2.5	3,200	500	554	0	2,146	858
Pyrethrum	0.8%	2.0	3,040	500	554	0	1,986	993
Seed crops	0.2%	4.0	3,975	500	554	0	2,921	730
Cereals	1.2%	2.0	2,538	500	607	0	1,431	715
Lucerne	4.0%	4.5	2,846	500	665	0	1,681	374
Fodder maize	2.5%	2.4	2,990	500	596	0	1,894	789
Potatoes	15.1%	4.3	9,720	500	554	0	8,666	2,015
Onions	0.4%	3.5	5,120	500	554	0	4,066	1,162
Carrots	3.0%	3.5	4,878	500	554	0	3,824	1,093
Brassicas	1.1%	2.5	4,835	500	554	0	3,781	1,512
Peas	1.4%	2.0	1,661	500	554	0	607	303
Grapes	2.8%	3.0	19,326	408	2,540	3,350	13,028	4,343
Berry fruit	3.3%	4.0	171,891	3,425	52,830	38,894	76,743	19,186
Apples	1.2%	2.2	51,253	3,425	20,380	16,023	11,425	5,193
Augmented vegetables	16.1%	1.5	6,309	3,425	18	0	2,866	1,976
Weighted Average	100.0%	3.2	11,403	1,447	2,465	1,619	5,873	**1,777**

Source: Pinion Advisory, 2022.

5.3.3 Prices and terms of trade

The most important drivers of crop net margins are operational efficiency and prices received. Pinion Advisory, in preparing the estimates of enterprise net margins, applied prices, in 2021/22-dollar terms, which reflected the trends in commodity prices for all principal crops grown in the study area considering recent trade and supply chain disruptions resulting from Chinese trade dispute, COVID-19 labour shortages, and the Russian invasion of Ukraine.

Given the period over which the economic evaluation is undertaken (i.e., 33 years), a broad range of potential commodity pricing outcomes are possible. Accordingly, sensitivity analyses are undertaken for the cases whereby the net margins are assumed to be 10% higher (each year) and 10% lower (each year) than the average net margins assumed for the base case economic assessment.

In addition, it is reasonable to utilise constant real net margins in calculating the base-case net margins, given that productivity improvements are likely to offset any potential long-term reduction in terms of trade[12] for agriculture.

This assumption is supported by recent estimates of terms of trade for farmers produced by ABARES in its Agricultural commodities and trade data. The current (2021) data indicated that farmers' terms of trade (Table 18) have been positive, averaging 1.5% growth for the past 12 years (albeit with significant annual volatility) with 8 out of the last 12 years experiencing a positive annual change.

Table 18: Terms of trade

	Terms of trade	Annual change
2009-10	89.0	7.3%
2010-11	93.0	4.5%
2011-12	87.4	-6.0%
2012-13	86.6	-0.9%
2013-14	88.1	1.7%
2014-15	92.0	4.4%
2015-16	98.2	6.8%
2016-17	100.7	2.5%
2017-18	98.4	-2.3%
2018-19	96.9	-1.4%
2019-20	100.0	3.2%
2020-21	105.3	5.3%
Average annual 2009-10 to 2021-21		1.5%

Source: https://daff.ent.sirsidynix.net.au/client/en_AU/search/asset/1031161/2

[12] A standard definition for the terms of trade is the ratio of export prices to import prices. The sector-specific terms of trade will generally differ markedly across irrigation sectors, given marked differences in commodity prices and the mix of inputs utilised in production.

Estimates of productivity growth are extremely volatile (and are revised over time). ABARES prefers to report longer-term trends. Longer-term comparisons suggest that productivity growth has basically offset losses in farmers' terms of trade.

Broadacre and dairy industries, accounting for 65 per cent of agricultural gross value of production, have achieved long-term productivity growth of 1.4 per cent and 0.8 per cent a year for the period 1977-78 to 2007-08, respectively. This growth has helped maintain competitiveness in export markets and offset changes in farmers' terms of trade. The terms of trade, being the ratio of the prices farmers received for outputs to the prices paid for inputs, have declined over this period at an average annual rate of 1.6 per cent a year. Over the past decade the rate of decline has been 0.6 per cent a year.[13]

5.4 Outlook for irrigated enterprises

From a global perspective, Australian agricultural commodities have a positive outlook. Very strong agricultural pricing in 2021 came because of hardship globally. Drought and adverse weather in key cropping regions, strong stockpiling demand in the face of potential food shortages, Covid-induced labour shortages in more intensively produced agri-products, and transport challenges delivered clouds to agriculture sectors in many regions of the world and a silver lining for Australian agriculture.

The demand for water from the proposed scheme will largely depend on the net margins per ML that can be generated from irrigation farming versus the cost of delivering water to the farms (both capital and operating costs).

This section, using information directly extracted from Pinion Advisory's Enterprise Mix and Margins report, provides an overview of market prospects for enterprises expected to use most of the additional water.

An assessment of the prospects for irrigation enterprises in the area found that there are a range of enterprises likely to use the additional water. Based on the results of the farm survey, around 43% of the additional water is earmarked for use by livestock enterprises predominantly for livestock finishing (31.2%) and dairying (9.6%) with the balance for agistment. More water on existing vegetable crop rotations accounted for 16% of the demand for additional water and, when combined with new vegetable cropping areas with 21%, makes up over a third of the expected demand. Higher value enterprises including berry fruit, orchards and vineyards accounted for around 7.3% of the forecast additional water use.

5.4.1 Livestock finishing

Livestock finishing includes the intensive feeding of store lambs and cattle to achieve optimal weight ready for slaughter. While unlikely to be a high returning irrigation enterprise on its own, livestock finishing can be worthwhile as part of a rotation in association with higher gross margin enterprises

[13] Nossal, K and Sheng (2010) "Productivity growth in the broad-acre and dairy industries" in ABARE (2010), *Australian Farm Survey Results: 2007-08 to 2009-10*, April, p.27.

such as poppies, cereals and grass seed. As an enterprise *per se*, the system of lamb finishing on irrigated pasture in Tasmania is in its early stages, however as additional data is acquired over time, a more reliable net margin estimates will be realised.

The three major processing companies in Tasmania (Greenhams, JB Swift and Tasmanian Quality Meats) have indicated that they require further supplies and are also keen to improve meat quality. In Tasmania, due to the prevalence of pasture-based finishing systems, processing plants are over supplied in late-spring and summer, while under supply occurs in winter and early-spring. This creates a seasonality in the processing plants profitability. In Tasmania, three full or partial closures of processing plants has occurred in recent years (since 2008), suggesting facilities will remain vulnerable because of their relatively small economies of scale[3].

Note that significant demand for background feedlot finishing in the state is underpinned by Tasmanian Feedlot Pty Ltd, which has reliably sourced Tasmanian-bred cattle to feed and deliver as branded product to Japanese consumers for the past 40 years. The feedlot relies on local Tasmanian processing to retain the provenance of its branded product.

High rainfall across much of eastern Australia through 2021-22 has led to greater pasture availability and widespread restocking. Graziers, eager to capitalise on pasture availability and facing a low national cattle herd, have broken cattle price records buying scarce cattle. Australian cattle prices are forecast to fall to 711 c/kg in 2022–23. Average (decile 4) rainfall will slow pasture growth, herd rebuilding and demand for younger cattle, compared to that seen in 2021–22. This will erode the 'confidence premium' keeping Australian prices high relative to competitors[14].

The 2021-22 forecast saleyard price for lamb is expected to increase 14% to 893 cents per kg, whilst sheep saleyard prices are expected to rise 7% to 648 cents per kg. These prices have been supported by strong export demand from the United States and China.

The quantity of sheep meat produced in Australia is expected to rise by 5% to around 690,000 tonnes, due to rising numbers of sheep and lambs slaughtered and ongoing flock rebuilding.[15]

Forecasts suggest demand will continue to be steady. Consumer preferences will change from high-quality cuts, preferred by food service and hospitality industries, to accommodate for lower household incomes locally[16].

5.4.2 Dairy

Dairying is the major agricultural enterprise in Tasmania in terms of farm-gate value. In 2019-20, the state's dairy industry posted a record milk production of 950 million litres and farm gate value increased by 10.8% to $506 million[17]. Long-term growth for Tasmanian has increased significantly with 32 per cent growth in the past 10 years and 63 per cent across the last 20 years. Moderate growth of one to two per cent is expected to be maintained in the coming years. (DairyTas Strategic Plan, 2022-27).

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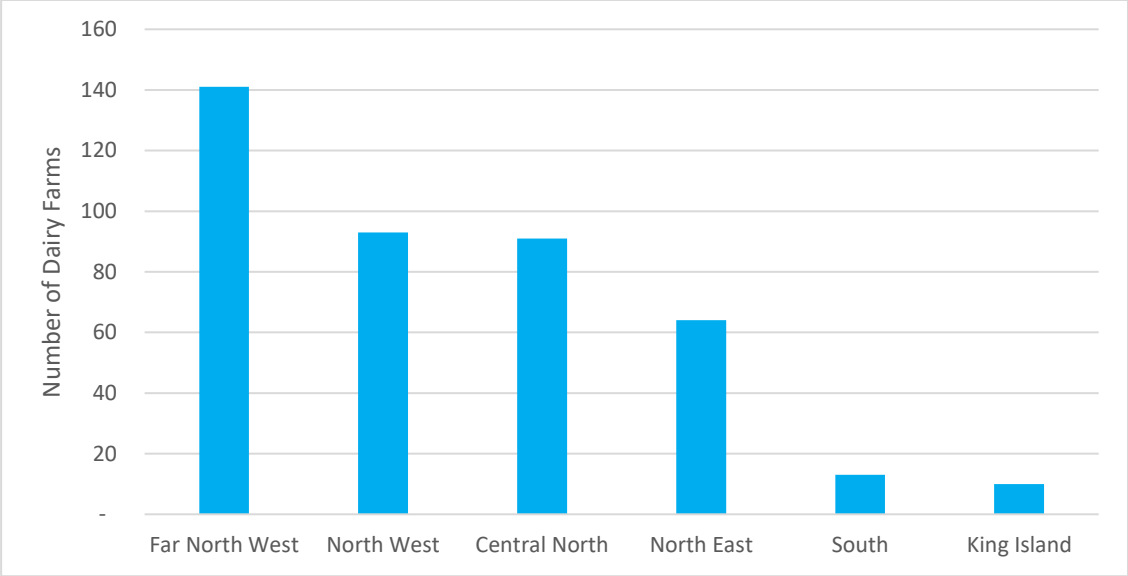
[14] Beef & Veal: March quarter 2022, ABARES
[15] Sheepmeat: March quarter 2022, ABARES
[16] ABARES, Australian Commodity, Sheepmeat, beef & veal: March Quarter 2022
[17] DPIPWE, Tasmanian Agri-Food Scorecard, 2019-20

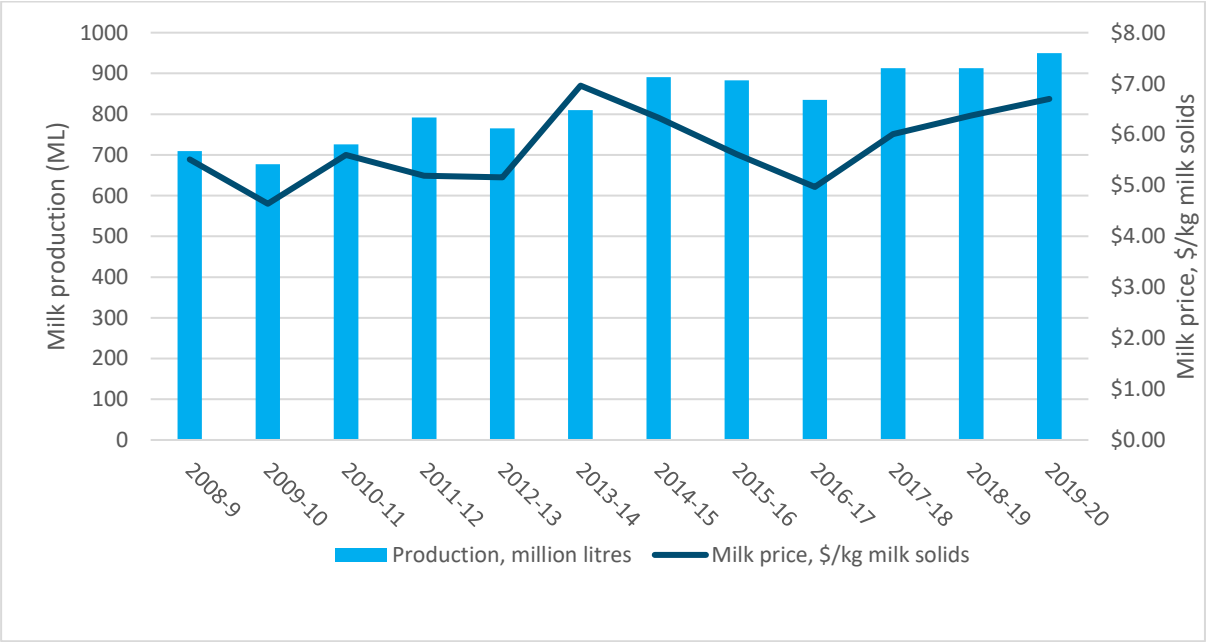
Figure 10: Tasmanian dairy farms by region



Source: DairyTas, The dairy industry in Tasmania, January 2019

Milk production in Tasmania has grown at around 3% per annum over the past 10 years whilst at the same time farm numbers have fallen at around 2% per annum. The expansion of Tasmanian dairy systems has increased in terms of herd size, cow production output, number of staff and supplementary feeding inputs compared to other Australian dairy regions[18].

Figure 11: Tasmanian dairy production and price figures (2008 - 2020)



Source: Dairy Australia, Dairy Situation and Outlook, March 2022

Between 2012 and 2014 processing capacity in Tasmania grew by 300 million litres on the back of investment in new factories by Lion in Burnie and Saputo in Smithton. Fonterra, the state's largest processor, also increased capacity at its Wynyard and Devonport factories. Total processing capacity

[18] Dairy Australia Situation and Outlook, June 2018

for the state is currently around 1,150 million litres which means there is still room for expansion in farm production beyond the record 950 million litres achieved in 2019-20 (Figure 11).

Milk prices over time have been volatile but there has been an overall upward trend (Figure 12).

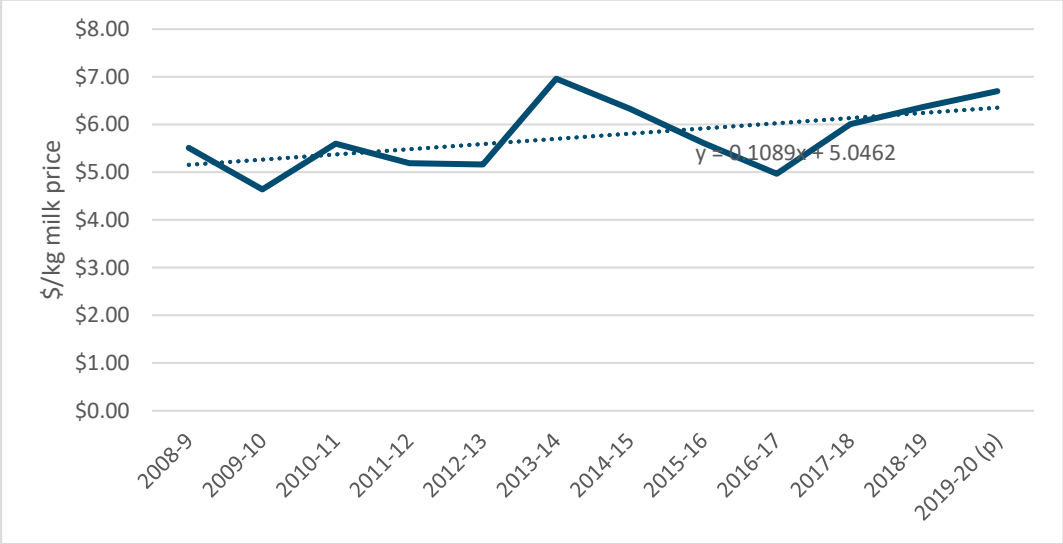
In its recent term projections ABARES forecast farmgate milk prices to have hit record high prices due to strong export demand from China and tight global milk supply. In 2022–23, the value of production in real terms is expected to increase to $5.3 billion because of higher farmgate milk prices. The greatest downside risk factors to this forecast are higher than expected global milk production and lower than expected demand for Australian dairy exports, particularly in our largest export market, China[19].

Turbulence looms large with continuing impacts from seismic global events, which are still expected to play out in dairy markets. Rabobank's initial modelled farmgate milk price for southern Australia in 2022/23 stands at $8.40/kgMS[20].

Tasmanian prices tend to be slightly less than mainland prices due to a higher proportion of manufacturing versus liquid milk.

For the net margin assessment below, we have assumed a base price of $6.50 per kg milk solids with a range of $5.85 to $7.15 per kg milk solid (+/- 10%). This is broadly in line with the longer-term trend shown in (Figure 12).

Figure 12: Tasmanian milk prices



Source: Dairy Australia, Dairy Industry in Focus 2020.
https://www.dairyaustralia.com.au/industry/prices/farmgate-milk-price

5.4.3 Potatoes

The Australian vegetable–growing sector is an important source of food. It supplies most of the fresh vegetables consumed in Australia and provides inputs for the processed vegetable products

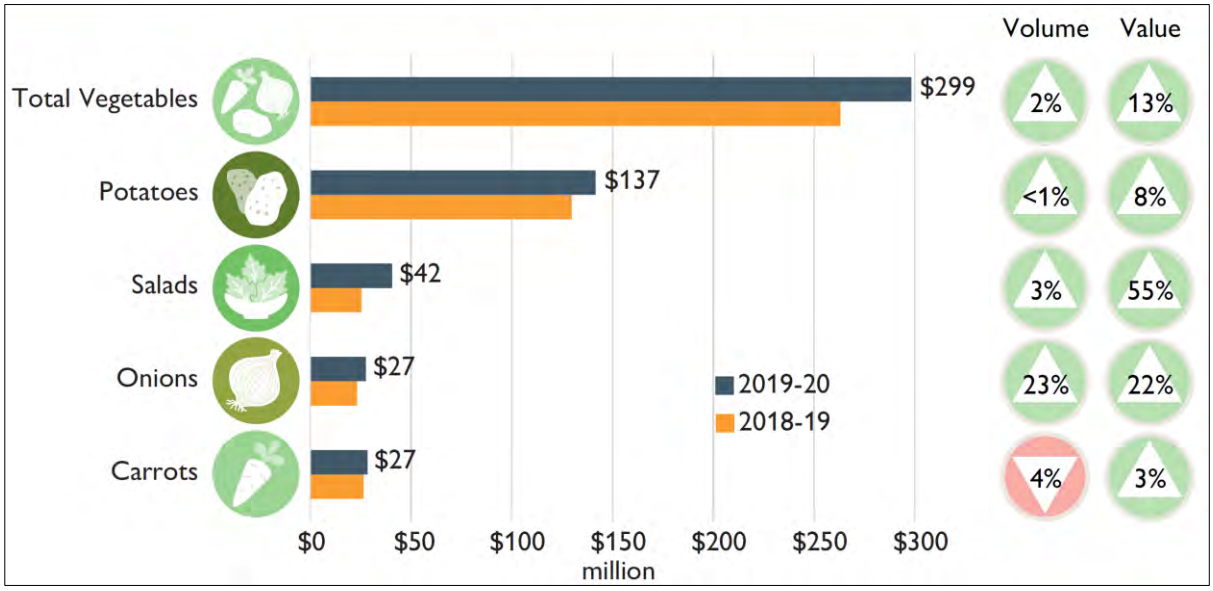
[19] ABARES, Australian Commodities, Dairy: March quarter 2022
[20] Australian Dairy Outlook 2022/23: *Be Confident, But Aware*, Rabobank April 2022

consumed in Australia or exported. The gross value of vegetable production in Australia for 2018-19 was over AU$4 billion, with potatoes contributed 15% of the total gross value[21].

Potatoes are the state's highest value vegetable with Tasmania producing more than any other state.

Figure 13: Vegetable gross farm gate value, Tasmania, 2019-20

in 2019-20 and accounting for 31.5% of national production. Increased prices resulted in the farm gate value rising by 8.4% to $137 million, and processed value rising to $457 million (Figure 13) due to a rise in yields and increased price paid per kilogram[22]. In recent years Simplot Australia at Ulverstone and McCains Foods at Smithton have invested significant capital into state-of-the-art potato processing factories. These facilities are expected to process around 500,000 tonnes of potatoes each year.



Source: DPIPWE (2019-20)

5.4.4 Onions

Tasmania is the second largest producer of onions in Australia. Locally produced onions are distributed into export, processing, and local retail (60%) and food service distribution channels (40%). The state's top international vegetable exports are onions ($14 million), followed by carrots ($5 million). Most onion producers grow under contract as this provides greater certainty and reduces risk levels. The area of onion production has grown in the northern Midlands region of Tasmania due to land availability, along with an increase in reliable irrigation capacity. With historically low exposure to onion production in these areas, less disease pressure has been evident reducing associated costs[23].

The Tasmanian growing season extends from January to October for brown onions and January to August for red onions. In 2018–19, average farm cash income of Australian vegetable-growing farms remained steady at an estimated $253,000 per farm. Average farm cash income is estimated to have

[21] ABARES, Vegetable industry, 2020
[22] ABARES, Farm financial performance- Tasmania, 2020
[23] Onion market profile, Fresh Logic, 2014

declined or remained unchanged in all states except New South Wales and Tasmania[24]. Onions had a gross value of over $27 million in Tasmania for 2019-20 season (Figure 13). With onions being the fourth most purchased vegetable by consumers, production increase is forecast to only be limited by the annual population growth (1.5-2.5% per annum)[23].

5.4.5 Poppies

Poppies are grown under contract for their alkaloid content, which is processed and sold as narcotic raw material or further processed and sold as active pharmaceutical ingredient. The industry is vertically integrated with significant poppy growing and some initial primary extraction undertaken in Tasmania. Currently there are two poppy companies operating in the state: Extractas (formally Tas Alkaloids), and Sun Pharma.

However, recent global oversupply and structural changes to the industry nation-wide have meant that the boom times for local poppy growers appear to be over in the short and medium term. Both growers and processors are feeling the pressure to downsize operations or to consider exiting the industry

The total area of poppies grown increased steadily since production commenced in 1966, reaching a peak of around 30,000 hectares in 2012-13 with a farm gate value of around $100 million. At that time there were concerns about Tasmania being able to fully supply expected market growth[25].

Since then, there has been reduced demand as a direct result of concerns raised in the largest market (USA) regarding overuse of prescription pain management materials. This reduced demand, coupled with a world over supply situation has led to a substantial world-wide reduction in area grown in recent years. Continued improvement in plant breeding has also contributed to the reduction in area grown with average alkaloid content in Tasmania increasing from an average of 25 kg per tonne in 2012-13 to 30 kg per tonne in 2016-17. The best crops have reached 98 kg per tonne[26].

The area of poppies grown in Tasmania peaked in 2013 at 21,000 hectares, fell to around 9,000 hectares in 2015-16 then recovered gradually since then to around 12,000 hectares in 2017-18. In 2018-19, the area of poppies harvested in Tasmania was 9,786 hectares according to the DPIPWE Annual Report (2019). An overall reduction in hectares harvested is a result of balancing global supply and demand, as well as increased yields.

Downward pressure on world production has continued due to a reduced demand for opiate raw materials and tighter international control measures. Cancellation of elective surgeries during COVID-19 and policy decisions in the US to restrict access to opiates, have reduced demand for Tasmania's raw narcotic material in recent years[27].

Overall, as shown in the survey results the proposed scheme is likely to result in some loss of poppies to other enterprises but some gain in new irrigated area.

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[24] Vegetable Industry, ABARES, 2020
[25] Macquarie Franklin, 2013, Factors Influencing Farmer Decisions to Grow Poppies in Tasmania, Devonport TAS
[26] John Rich, Tasmanian Poppy Growers, 2018 pers. comm
[27] DPIPWE Annual Report, 2021

5.4.6 Carrots

Carrots are one of the only two vegetables to be purchased by at least 60 per cent of households on a weekly basis (along with potatoes). This indicates a trend for carrots being a staple vegetable in the average Australian home and demand growth is likely to continue in line with population growth. Vegetable production was the sixth-highest value agricultural industry in Australia, with carrots contributing $247 million gross value to Australia in 2017-18. The gross value of carrots was $27 million for 2019-20 (Figure 13). Tasmania is recorded as the most productive state, with average yields of 73 tonnes/ha.

With high summer temperatures in northern Victoria having a negative impact on carrot quality, Tasmania has a competitive advantage with a temperate climate, long growing season and access to irrigation water. That advantage may continue to increase over time with climate change and Agricultural Commodities, Australia assessing a 13% increase in carrot production for 2020-21[28]. Tasmanian's North-West Coast also presents a great environment for carrot production in the fertile red volcanic soils of the region.

Harvest Moon, based in Forth, produces 20,000 tonnes of carrots each year. Two-thirds are sold within Australia with the remining being exported to Singapore, Hong Kong, Malaysia, and Japan. Selling directly to supermarkets can be an attractive option for growers as value-adding activities (washing, sizing and packing) mean that a higher price is paid for the product. Innovative value adding such as salad mixes and fresh cuts have been largely successful developments in recent years. Further innovations in this area that target time-poor, convenience seeking consumers, with ready to eat products, may increase fresh vegetable revenues in the future[29].

5.4.7 Cereals

To reduce Tasmania's dependence on grain imports, and to create an alternative production option to fill the diminishing poppy industry gap, new cereal lines are being grown by local producers[30]. With a longer growing season in Tasmania, varieties with disease resistance, long phenology and good standing power are required to supply feed grain and malting barley demands. There has been a very gradual increase in the prices trend since 2004-05 at around $180 per tonne, with the 2017-18 price being close to $300 per tonne. In response to the Australian east coast drought the farm gate price for 2020 is currently around $415-425 per tonne in Tasmania[31].

Global wheat prices however are expected to stay low with an abundance of supply worldwide from Argentina, Australia, Canada and Kazakhstan, all having favourable climatic conditions in the major wheat-growing regions for 2020-21. In Australia, wheat production is forecast to produce 30.3 million tonnes in 2022-23. Recent low supply and high domestic prices, as a consequence of drought, have resulted in consumption increasing domestically and export being limited. Export restrictions were

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[28] ABS, Agricultural Commodities, Australia, 2020-21
[29] Enterprise profile – carrots, Macquarie Franklin, 2011
[30] Lyon, N 2018, *Tasmania unlocks potential for feed wheat expansion*, Grain Central

announced by a number of countries due to uncertainty about the effects of COVID-19 and supply has been limited by Russia's invasion of Ukraine. These restrictions are likely to lead to market instability and increased price volatility creating an opportunity for increase demand for Australian exports[31].

The demand for most coarse grains is expected to remain stable in Tasmania as the majority is used for animal feed. Herd numbers are expected to remain stable in anticipation of industry recovery following drought-related depletion of stores and COVID-19 uncertainty.

While animal feed is the dominant use for barley in Tasmania, most growers aim to produce malting barley as this attracts a price premium. Product requirements for malting barley are more specific than for feed barley with a critical factor being even-quality grain to ensure consistency during processing.

5.4.8 Maize/Corn

Maize is a multipurpose, summer, cereal, grain and silage crop that serves as a good rotation crop and livestock feed. The industry is valued at AU$25–35 million annually, depending on prices, area planted and yields[32]. While there is a stable demand for a small volume of maize, inclusion of maize in stockfeed rations appears to be viable when maize is priced at no more than $20-40/t over wheat alternatives[33].

World corn production is expected to increase in 2021–22, but consumption is expected to remain flat. Over the medium term to 2025–26, above average corn prices are expected to be driven by increasing demand for corn as animal feed and as an input to biofuel, combined with ongoing competition from soybeans for arable land. [34].

5.4.9 Apples/Pears

Tasmania is often called the 'Apple Isle' in reference to its history of outstanding apple production. The temperate maritime climate of Tasmania provides the ideal environment for slow maturation and flavour development. Topography and geography allow for niche micro-climates throughout the State and provides a diversity of produce to be harvested from early summer through to late autumn. Ideal areas for apples and pears include the Huon Valley and Tamar Valley [24].

The apple industry in Tasmania has experienced a period of restructuring and diversification due to issues with increasing production costs and labour. This has resulted in some fruit growers including other stone fruit, or berry production, on their farm. Apple and cherry production are often found on the same farm, as it allows for extended use of infrastructure, and producers are able to retain core staff for a greater proportion of the year.

There are approximately 550 commercial apple and/or pear growers in Australia. In Tasmania, these are predominantly located in the Tamar Valley and Huon Valley regions. Recent rapid growth in the

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[31] Grain Report, Dairy Australia, August 2020
[32] GRDC GrowNotes, Maize, 2017
[33] GRDC Market Update – grains, forage and maize, 2020
[34] ABARES, Commodity Report, Coarse grains: March quarter 2021

demand and supply of craft and boutique apple and pear ciders is likely to continue and this will provide additional diversification options for producers. Opportunities also exist in agri-tourism, including cellar doors and cafes, and for diversification into value-added and niche produce[35].

The apple and pear industry produces more fruit for fresh produce consumption than any other fruit industry and in 2020-21 contributed over $594 million to the national economy. Tasmania makes up 15% of the national apple production, and approximately 1% of the pear production[36]. The pome fruit sector provides an important contribution to the Tasmanian economy, with a farm-gate value of $46 million[34].

The Tasmanian fruit industry continues to expand and is focused on providing premium quality fruit to national and overseas markets. Australia's main apple export markets are Europe, Papua New Guinea, Hong Kong and Indonesia. The main pear export markets are New Zealand, Indonesia, Canada and Singapore.

5.4.10 Berry fruit

Production volume of berries in Tasmania has risen by 41%, creating an industry that has the highest gross farm-gate value of over $200 million (2019/20)[37]. The cool temperate climate of Tasmania is beneficial for growing berry fruit. The cooler conditions favour better quality fruit with a longer shelf life. There has been a shift towards more undercover production for berries destined to be sold in a fresh form with rapid growth of production volumes recorded and an extension of seasonal availability.

Tasmania is the second largest producer of raspberries in the domestic market, supplying 31% of national production[38].

Strawberry production has increased to over 68,000 tonnes (2018-19), up by 19%[39] .

Blueberries are a superfood with significant health benefits, which combined with a convenient portion size and price point as well as more consistent supply patterns give the category growth potential.

5.4.11 Grapes

The wine grape growing industry has grown strongly over the past five years. Australia's wine grape production is around 1.75 million tonnes per year, from a vineyard base of 146,000 hectares. The average purchase price per tonne of grapes, in Australia, has increased by 5%, to $694 in 2020. Tasmania contributes 1% of the national crushed grape total with an average yield of 8.5 tonnes/hectare. With a strong focus on Pinot Noir production (42% of total State tonnage), Riesling is paid at the highest price of an average of $3,053/tonne (2020)[40]. Tasmanian grapes attract a price premium in the market, consistently generating a higher average price per tonne compared to other

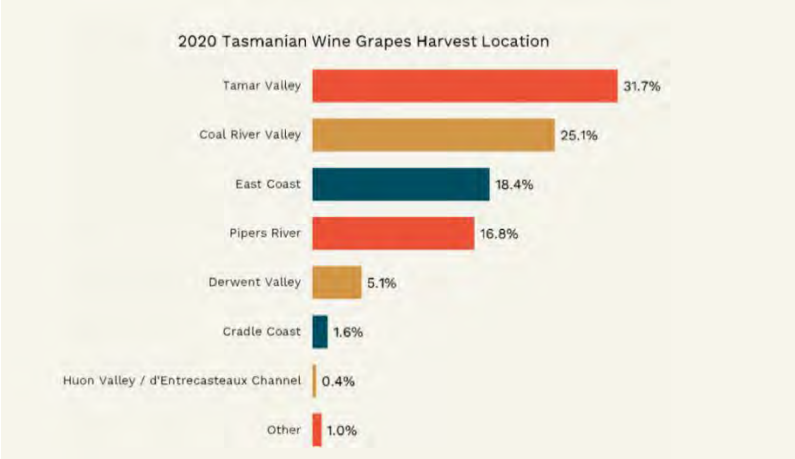
[35] Fruit Growers Tasmania, About Tasmania, 2018
[36] Industry data, APAL, 2019
[37] Pers. Comm., Barnes, J, 2020
[38] Raspberry market profile, Fresh Logic, 2013
[39] Fruit and nuts, ABARES, 2019
[40] 'Wine Australia providing insights to Australian Wine', Wine Australia, 2020

Australian wine producing areas. Wine grape prices are affected by export demand, available supply, and global wine production. Tasmania has a global reputation for outstanding wines, winning high praise from critics around the world thus creating a demand for high-quality Tasmanian wines, that exceeds supply. The average price for a bottle of Tasmanian wine is $22.36, compared to the national average of $10.87[41].

Tasmania is the southernmost wine region in Australia. It has a cool, maritime climate that is the coldest of all Australian regions. The soils are highly variable with low pest and disease risk, altogether creating reasonable interest in grape growing around the State. Tasmania's climate is not predicted to change as rapidly as other Australian regions and the forecasted temperature changes are not likely to impact significantly on the state's suitability for grape growing. Tasmania has an opportunity to build on its reputation as a producer of premium cool-climate wines, and to further develop the wine industry's links with the state's tourism sector and the Tasmanian brand.

The key to sustainable viticulture is the availability of a reliable water supply at key phases in the growing season. Tasmania's most significant natural resource advantage is water, and Tasmania does not have the water-supply issues experienced in other parts of Australia. With the completion of major irrigation schemes, double the amount of irrigated land can be made available to grape growers. This is estimated to generate private sector investment of up to $95 million, and additional on-farm investment of approximately $270 million[42].

Figure 14: Wine grape harvest locations around Tasmania



5.5 Economic results

Results from the economic model for the proposed SWISA are reported in Table 19 assuming the central case assumptions for both the P50 and P90 project estimates. Applying central case parameters, the net economic benefit of the proposed SWISA is estimated at $113.14 million in net present value (NPV) terms with a benefit cost ratio (BCR) of 1.96 and an internal rate of return (IRR)

[41] Wine Industry Tasmania, 2016
[42] The wine industry in Tasmania, investor guide, 2014

of 12.6% assuming the P50 estimate and $103.33million NPV, 1.81 BCR and 12.0% IRR for the P90 estimate.

Table 19: Economic outputs under central case assumptions

Component	Present Values – P50 $m	Present Values – P90 $m
Benefits		
Agricultural benefits	194.37	194.37
Residual value	36.95	36.95
Total benefits	**231.33**	**231.33**
Costs		
Capital	98.47	108.28
Fixed operating	9.90	9.90
Variable	9.82	9.82
Total operating	19.72	19.72
Total costs	**118.18**	**127.99**
Net benefit	**113.14**	**103.33**
Benefit cost ratio (BCR)	1.96	1.81
Internal rate of return (IRR)	12.8%	12.0%

Source: Marsden Jacob, 2022.

Numerous sensitivity tests were conducted by Marsden Jacob (Table 19). These tests indicate that under the P90 estimate the economic NPV from developing the SWISA could range from $23.57 million to $321.60 million, reflecting the outcomes for real discount rates of 10% and 4%, respectively. A 10% real rate is considered high under recent and foreseeable future outlooks for interest rates, where nominal rates have been low (e.g., current 10-year bond yield of around 3.616%) and real rates even lower. Moreover, studies have shown that long term real rates have averaged below 4% historically which means a high-risk premium is attached to the use of a 10% real rate.

It is important to highlight that the economic NPV is positive for all 11 sensitivity scenarios examined using Marsden Jacob's economic model of the proposed SWISA. This indicates that the project is likely to deliver strong net economic benefits, even if there are unfavourable movements in key parameters impacting the economic viability of the scheme.

Table 20: Sensitivity assessment – P90 estimate

	PV benefits ($m)	PV lifecycle costs ($m)	Economic NPV ($m)	Benefit Cost Ratio	IRR %
Central case parameters	231.33	127.99	103.33	1.81	12.0%
Discount rate					
4%	466.98	145.38	321.60	3.21	12.4%
10%	139.48	115.91	23.57	1.20	11.8%
Net Margins					
+ 10%	254.81	127.99	126.81	1.99	12.9%
- 10%	207.85	127.99	79.85	1.62	11.0%
Capital cost					
+10%	231.33	138.82	92.51	1.67	11.2%
-10%	231.33	117.17	114.16	1.97	12.9%
Operating cost					
+10%	230.98	129.97	101.02	1.78	11.9%
-10%	231.67	126.02	105.65	1.84	12.1%
Water uptake					
Slow	217.50	127.34	90.15	1.71	11.4%
Rapid	250.16	128.84	121.32	1.94	12.8%

Source: Marsden Jacob, 2022.

Table 21 provides identical outputs for the sensitivity assessments assuming the lower P50 estimate which results in higher economic benefits under each sensitivity scenario relative to those for the P90 estimate.

Table 21: Sensitivity assessment – P50 estimate

	PV benefits ($m)	PV lifecycle costs ($m)	Economic NPV ($m)	Benefit Cost Ratio	IRR %
Central case parameters	231.33	118.18	113.14	1.96	12.8%
Discount rate					
4%	466.98	134.97	332.01	3.46	13.2%
10%	139.48	106.64	32.83	1.31	12.6%
Net Margins					
+ 10%	254.81	118.18	136.62	2.16	13.8%
- 10%	207.85	118.18	89.66	1.76	11.8%
Capital cost					
+10%	231.33	128.03	103.30	1.81	12.0%
-10%	231.33	108.34	122.99	2.14	13.8%
Operating cost					
+10%	230.98	120.16	110.82	1.92	12.7%
-10%	231.67	116.21	115.46	1.99	12.9%
Water uptake					
Slow	217.50	117.53	99.96	1.85	12.2%
Rapid	250.16	119.03	131.13	2.10	13.7%

Source: Marsden Jacob, 2022.

5.5.1 Additional sensitivity testing

To demonstrate the resilience of the economics of the scheme, further sensitivity testing was undertaken as follows.

A combination of the lower bound estimates for all parameters, i.e., a 10% increase in capital and operating costs, 10% reduction in net margins and Slow demand uptake scenario. Even under this extreme, combined set of assumptions, the project was estimated to deliver a net benefit estimated at $54.98 million at 7% real discount rate and a BCR of 1.39 and an IRR of 9.6% assuming the P90 project cost estimate. Under the P50 estimate the net economic benefit is estimated to increase to $65.77 million with a BCR of 1.51 and an IRR of 10.3%.

A threshold assessment was also undertaken to determine the level of reduction in net margins that could be sustained while ensuring the project remained economic at 7% real discount rate (i.e., where the NPV was reduced to $0 and the BCR equal to 1 and the IRR equal to 7%). This assessment showed that net margins would need to drop to 56% of those assumed in under the central case assessment for the P90 estimate, noting that this reduction in net margins applies to each year of the

assessment. For the P50 estimate the net margins would need to reduce to around 52% of those assumed under the central case.

A further sensitivity was undertaken reflecting the scenario where only summer water was utilised. Under the P90 estimate this reduced the net benefit from $103.33 million to $45.50 million and the BCR to 1.36 and the IRR to 9.7%. Under the P50 estimate the net benefit was reduced from $113.14 million to $55.31 million and BCR to 1.48 and IRR to 10.5%

6. Review of planning, approval & implementation phases for the SWISA

6.1 Introduction

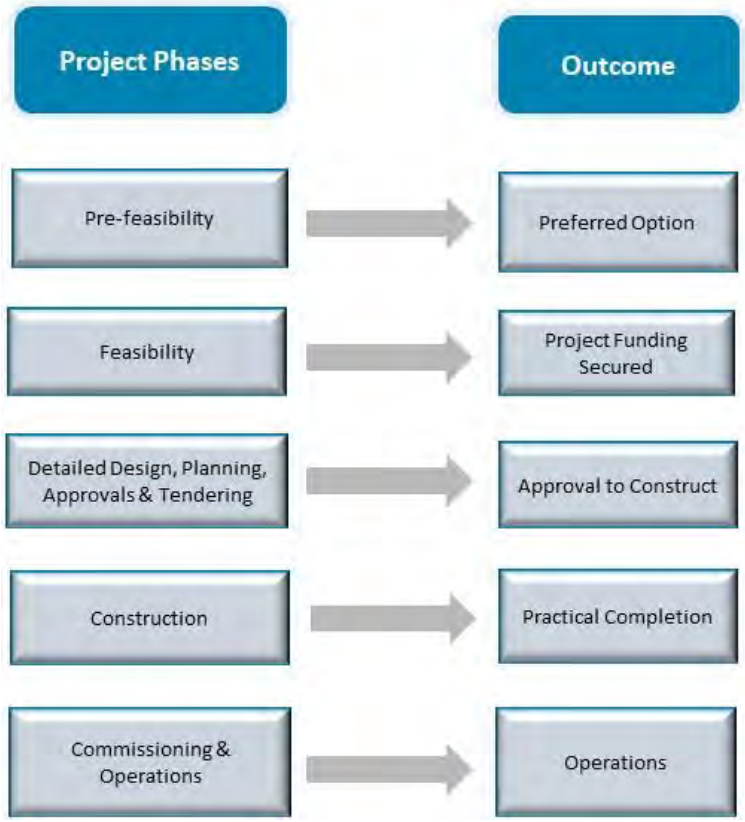
A key issue for the Business Case is to ensure that the project planning and approvals, implementation and operations phases present no potential impediments to development of the SWISA. In this section, we review the key elements of Tasmanian Irrigation's strategy in respect of all principal elements of project development and operations, including the process of gaining all necessary development approvals, and processes used for procurement of design and construction services. Risk management processes are also examined (with more detail in Attachment 1).

6.2 The project planning process

6.2.1 Stages of the project planning process

Tasmanian Irrigation has established five project phases. While essentially the same, there are slight differences between the phases for pipeline and dam projects. The core elements are illustrated in Figure 15 which specifies the project phase and the outcome deliverable for that phase.

Figure 15: Planning phases for infrastructure projects



Tasmanian Irrigation has developed a strategy for the SWISA including target dates for each of the phases above to ensure that the project progresses through each phase and meets target construction and commissioning dates.

The pre-feasibility and feasibility phases have been completed and considered in the development of this Business Case.

Timeframes for the remaining phases are outlined below.

6.2.2 SWISA project phases - timelines

Completion dates for the Business Case are shown in Table 22.

Table 22: Business Case timelines - SWISA

Project phase	Milestone	Target Date
Business Case phase	Submission to Tasmanian Irrigation	December 2022
Approved Business Case	Submission to Tasmanian Government	December 2022

Source: Tasmanian Irrigation, 2022.

The decision to proceed with the SWISA project will be made by Tasmanian Irrigation, and the Tasmanian and Australian Governments following receipt of the Business Case and the subsequent approval of the structure and timing of the release of the funding from the Commonwealth and State Governments.

Subsequently, the planning, detailed design, and approvals phase will ensure that the project passes all relevant legislation and regulations regarding development applications, environmental and cultural heritage (Aboriginal and historical) approvals including EPBC Referral. In addition to the previous EPBC controlled action for the Original SWIS project, updated desktop studies for Vegetation and Fauna Habitat Assessment and the Aboriginal and European Cultural Heritage Assessment indicate that the SWISA does not present any major obstacles that will prevent approvals being gained. All necessary surveys to secure necessary approvals will commence following approval of the Business Case by the Tasmanian Government and a commitment to project funding being provided.

Timelines for the planning, design, and approvals phase for the SWISA are set out Table 23. Application for relevant permits and approvals under the heritage and Aboriginal relics legislation will be sought as appropriate immediately following funding approval for the project.

Table 23: Project schedule – Detailed design and planning & approvals phase

Component	Date
Declaration of Irrigation District	October 2023
Permit and approvals for heritage and Aboriginal relics	October 2023
Bulk water agreement with Hydro Tasmania	October 2023
Development applications	October 2023
Permit for dam works	October 2023
Detailed Design	November 2023
EPBC referrals	October 2023
Land acquisition and easements	October 2023

Source: Tasmanian Irrigation, 2022.

When the SWISA is approved, the construction and commissioning phases of the SWISA commence, with the main phases set out in Table 24.

Table 24: SWISA project schedule – construction & commissioning

Component	Date
Detailed Design, tendering & approvals	November 2023
Award construction tender	February 2024
Construction commences	July 2024
Pipeline and pump station, commissioning	July 2026
Operations commence, delivery of first water	September 2026
First full season commences	November 2026

Source: Tasmanian Irrigation, 2022.

6.3 Planning & approvals - compliance with legislative and regulatory requirements

6.3.1 Approvals processes

Legislative and regulatory approvals processes as well as Tasmanian Irrigation's approach to protecting environmental values will ensure that any environmental impacts of the Sassafras-Wesley Vale Irrigation Scheme Augmentation are managed appropriately. This Business Case provides a summary of the approvals processes required.

All surveys and related assessments required to obtain the required approvals have been scheduled by Tasmanian Irrigation with a goal of having all approvals in place by November 2023.

Tasmanian Irrigation has also initiated steps to extend the irrigation district as the current irrigation district under the *Water Management Act 1999* does not cover the total volume of water sold under

SWISA i.e., there are parcel of entitlements held outside of the current irrigation district. The increase in area is approximately 14%. However, any increase above 10% activates a requirement to submit for a new irrigation district which requires ministerial approval. An option discussed with DNRET is to apply for the district to be amended via the addition of satellite parcels of land.

Declaration of an irrigation district provides the statutory powers required for the construction and operation of the scheme. It also provides the option to utilise acquisition powers to acquire land should private negotiations be unsuccessful under the *Land Acquisition Act 1993* using the authority provided by Section 183 of the *Water Management Act 1999*.

While there are no apparent impediments to the project development, Tasmanian Irrigation is focused on ensuring that any impacts are minimised and, where impacts are unavoidable, that appropriate mitigation strategies are in place. To minimise negative impacts and ensure that there are no degenerative issues associated with the use of irrigation water from the SWISA project, all irrigators will be required to have an approved Farm Water Access Plan (Farm WAP, refer Section 6.6.1) in place before any water can be utilised from the scheme.

This section of the Business Case outlines the SWISA project's compliance with the legislative and regulatory requirements and indicates the next steps that have been identified and will be undertaken in the process of gaining all relevant approvals relevant to the SWISA project. A summary of SWISA compliance with all relevant legislation and regulation is provided in Attachment 3.

6.3.2 Planning & development approvals

Tasmanian Irrigation commissioned Pitt & Sherry to review planning requirements and specify an approvals pathway for the scheme.[43]

The SWISA involves a long, complex network of irrigation pipeline, which covers a large territory in both the Devonport and Latrobe council areas.

Under the Tasmanian Planning Scheme - Devonport, a planning permit will be required for the proposed pipeline where it crosses the Bass Highway. The rest of the pipeline should be exempt. The application requires submission of a Natural Values Assessment. Crown Land Consent will be required from State Growth. The anticipated timeline for Crown Land Consent then determination of the planning permit application is approximately 16 weeks.

Under the current Latrobe Interim Planning Scheme 2015, a planning permit will be required for all of the proposed pipeline. There are no applicable exemptions. The application requires submission of a Natural Values Assessment and a Landslide Hazard Risk Assessment. The anticipated timeline for Crown Land Consent then determination of the planning permit application is approximately 20 weeks.

Latrobe City Council is transitioning to the new Tasmanian Planning Scheme. Council has advised that public exhibition for the Draft Local Provisions has concluded, and all submissions have been

[43] Pitt & Sherry,2022 *Planning Approval Pathway for the Sassafras Wesley Vale Irrigation Scheme, August.*

responded to, and that it is likely the new scheme will be approved and become effective sometime this year.

Once the new Tasmanian Planning Scheme – Latrobe is approved and becomes effective, it is likely that a planning permit will be required for portions of the proposed pipeline. However, Pitt & Sherry recommended that a more detailed planning analysis be carried out when the new planning scheme comes into effect which will help work out exactly which areas require a planning permit and whether Crown Land Consent is required.

The proposed pipeline intersects with several easements on various titles as detailed in the Pitt & Sherry report. The report recommended that Tasmanian Irrigation find out more information about these easements and carry out stakeholder engagement where necessary, before finalising the alignment.

While a planning permit is not required for any places of or precincts of archaeological potential under the applicable planning schemes, a permit may be required under the *Aboriginal Heritage Act 1975*. Therefore, the report recommended that an Aboriginal Heritage Assessment be prepared for the overall project to determine if any such permit is required.

6.3.3 Land acquisition and easements

The preferred method of Tasmanian Irrigation to acquire or secure interest in land is through mutual agreement with landowners under Section 9 of the *Land Acquisition Act 1993*. However, in the event a mutual agreement cannot be reached, Tasmanian Irrigation may undertake the acquisition under a compulsory process in accordance with Division 3 of the *Land Acquisition Act 1993*.

Tasmanian Irrigation can utilise the *Land Acquisition Act 1993* under two methods.

First, where an irrigation district has been declared for the SWISA under the *Water Management Act 1999* with Tasmanian Irrigation being the responsible water entity. Under Section 183 of the *Water Management Act 1999*, the responsible water entity may seek approval from the Minister to acquire or secure interest in land within the irrigation district in accordance with the *Land Acquisition Act 1993*.

Second, if an irrigation district has not been declared, the Minster may provide consent to Tasmanian Irrigation to acquire or secure interest in land under Section 28 of *the Irrigation Company Act 2011* under the *Land Acquisition Act 1993*.

Tasmanian Irrigation has considered the required type of land tenure necessary for the different elements of an irrigation scheme.

The objective has been to ensure secure tenure over land is provided to develop, operate and maintain the irrigation scheme's key infrastructure and provide for ongoing access requirements to:

- withstand change of land ownership
- withstand changes in responsible water entity
- minimise ongoing operational costs
- provide assured access for operations

- to fairly deal with landowners, while minimising compensation payable by Tasmanian Irrigation and any future responsible water entity.

The *Irrigation Clauses Act 1973* provides the ability for a responsible water entity of an irrigation district to install, inspect and repair irrigation scheme infrastructure. While this option would be appropriate when limited ongoing access is required and the likelihood of regular maintenance is minimal (e.g., underground pipelines), a more secure form of land tenure may be required to meet the above objectives.

The four main methods to acquire land or an interest in land are freehold title, lease, licence, and registered easement. Determining the most suitable method to secure land tenure and access to irrigation scheme infrastructure requires consideration of several issues including:

- whether exclusive use of the land is required
- frequency and nature of access requirements
- potential for future landowner compensation claims because of operations and associated access
- operational life of the infrastructure
- costs associated with implementing the abovementioned options.

The option of either a licence or lease will only be considered when only a short-term arrangement is required due to the complexity surrounding their binding nature following a transfer of the land in question. A dam and the associated inundation area is an example of when the acquisition of a freehold title would be suitable.

Following the creation of Tasmanian Irrigation under the *Irrigation Company Act 2011*, Tasmanian Irrigation is enabled to create an 'easement in gross' in favour of Tasmanian Irrigation. If Tasmanian Irrigation were to be substituted as the responsible water entity for an irrigation district, the benefits of the easements are transferable to the new responsible water entity.

If it is determined that it is necessary to acquire private freehold land or an easement for the purposes of the SWISA, initial consultation will occur with the landowner and, upon approval for the development of the SWISA, it is Tasmanian Irrigation's preference for each acquisition to be undertaken through mutual agreement and executed under Section 9 of the *Land Acquisition Act 1993*. If a mutual agreement is unable to be reached, Tasmanian Irrigation may carry out the acquisition under a compulsory acquisition process under Division 3 of the *Land Acquisition Act 1993*.

The *Land Acquisition Act 1993* has provisions for the right of a landowner to be compensated, payment of compensation and, if required, dispute resolution.

6.3.4 Environmental approvals

Tasmanian Irrigation's experience and approach to protecting environmental values will ensure that any environmental impacts of the SWISA project are minimised and managed throughout the entire life cycle of the scheme.

As with all Tasmanian Irrigation schemes, this scheme will be referred for approval under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Tasmanian Irrigation will also work closely with the relevant Tasmanian Government Departments to secure all the necessary state-based approvals for the scheme.

The construction phase will be managed by ensuring Tasmanian Irrigation contractors achieve high standards in environmental performance, in accordance with its environmental protection guidelines and requirements, which have been developed and refined over more than a decade.

In addition, prior to receiving water from the scheme, irrigators must have an approved Farm Water Access Plan (Farm WAP) in place. Farm WAPs are a useful tool which provide irrigators with a guide to the sustainable application of water and ensure the long-term viability of land for agricultural production. They also help manage potential risks to natural values, including land and water-based ecology, soil health on the irrigated land and help landowners minimise runoff of irrigated water at their properties to protect water quality in the local catchment. Farm WAPs are a condition of Federal and State Government approval for all Tasmanian Irrigation built schemes. The proposed scheme includes the requirement to have a Farm WAP covering all land and dams to which scheme water is applied. Tasmanian Irrigation also conducts an approved annual audit program across Farm WAPs state-wide to ensure they are followed and implemented.

Legislative and regulatory approval processes as well as Tasmanian Irrigation's approach to protecting environmental values will ensure that any environmental impacts of the SWISA are managed appropriately.

The nature of the works (for preparation of the business case), and the potential environmental impacts indicated within this document identify environmental approvals and permits under the following Acts are likely to be required:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (Australian Government). The EPBC Act is triggered by projects that may have a "significant impact on a matter of national environmental significance" which includes national heritage places, wetlands of international importance, threatened species and ecological communities and migratory species. As part of its business model process Tasmanian Irrigation has adopted the approach of submitting all projects for assessment under the EPBC Act.
- Tasmanian Government Acts and regulations relevant to environmental aspects of the SWISA include the *Nature Conservation Act 2002, Threatened Species Protection Act 1995 (TSPA), Forest Practices Act 1995*, *Weed Management Act 1995*, and the *Water Management Act 1999*. These Acts will require consideration and it is likely that permits under one or more of the Acts for specific activities associated with SWISA scheme will be required (e.g., 'permits to take' under the *Threatened Species Protection Act 1995*).

6.4 Vegetation and Fauna Habitat Assessment

Based upon a desktop assessment of Flora and Fauna Values and preliminary field surveys carried out for the scheme, significant fauna values have been identified in the survey area, with some possibly requiring assessment of significant impact under an EPBC Act referral.

Once plans and changes are finalised for the SWISA project, detailed on-ground flora, fauna and vegetation surveys will be required prior to finalisation of works alignments. The assessment will

include the identification of vegetation communities, threatened flora and fauna habitat and weeds within a 100-metre-wide corridor along the route of the pipelines, new assets or other works areas.

6.4.1 Vegetation Communities

Vegetation communities were assessed across the proposed new pipeline alignment (including the Great Bend Pumpstation). Several threatened vegetation communities were identified within the scheme area; Eucalyptus ovata forest and woodland (DOV), *Eucalyptus viminalis* wet forest (WVI), *Eucalyptus viminalis* – Eucalyptus globulus coastal forest and woodland/wet forest (DVC), Eucalyptus amygdalina forest and woodland on sandstone (DAS), swamp (NME), riparian scrub (SRE) and wetlands (AWU), however construction is not expected to severely impact these communities as the majority *Melaleuca ericifolia* of works follow existing pipeline corridors.

A field assessment with visiting biological consultant Mark Wapstra (EcoTas, 2022) found there is potential for moderate likelihood of disturbance to the following vegetation communities:

- *Eucalyptus ovata forest* and woodland (DOV)
- *Eucalyptus viminalis* wet forest (WVI)
- *Melaleuca ericifolia* swamp forest (NME)

Each of these vegetation communities are listed under the EPBC Act. However, it is likely the occurrence and potential impact of any of these communities would be highly localised as the current pipeline design route either wholly avoids patches of native vegetation or intersects only marginally into disturbed fringe areas. There is a moderate likelihood that some occurrences of DOV and WVI may equate to the following threatened ecological communities listed on the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999 (EPBCA):

- Tasmanian Forests and Woodlands dominated by Black Gum or Brookers Gum (*Eucalyptus ovata / E. brookeriana)*
- Tasmanian White Gum (*Eucalyptus viminalis*) Wet Forest

Any occurrences of these ecological communities would need to be assessed against critical thresholds, though it is unlikely any ecological communities found would be extensive or impractical to avoid. Outside of a few small areas in the proposed pipeline alignment corridor, the majority of TASVEG mapping units were classified as 'FAG' Cleared Agricultural Land. This area is heavily modified for agriculture and most of the route follows existing corridors, where new pipeline corridors are to be constructed, where possible alignment should be adjusted to avoid disturbance or removal of remnant native vegetation.

Post submission of the business case, further ground-truthing is proposed to be undertaken across the project area to map all vegetation communities. There is no specific season or timing necessary for this type of assessment, though spring-summer would be ideal for maximising recordings of species diversity (refer Table 25). An EPBC Act referral will be required and has been provided for in the project schedule (refer Table 23).

6.4.2 Threatened Flora

Desktop and preliminary field assessment identified at least four threatened flora species within proximity of the proposed construction corridor listed under TSPA (1995). Three species are listed under the EPBC Act.

As most of the construction will follow existing pipeline corridors and the new pipelines pass through cleared agricultural land, it is not expected that construction will severely impact listed species. However, more extensive ground truthing is needed to assess flora such as orchids within parts of the pipeline alignment, namely the Forico property between Great Bend Pumpstation and Saggers Hill rising main. Other listed flora species may be observed during field assessments and may drive additional management strategies.

Further ground-truthing and field surveying is planned to be undertaken across the project area, particularly regarding the presence of threatened orchid species which may be present and are known in adjacent areas of the Henry Somerset Conservation Area on Railton Road. Field surveys of dry sclerophyll forest areas adjacent to Great Bend Pumpstation are best undertaken in mid-October for *Caladenia caudata* (tailed spider-orchid) and early November for *Caladenia tonellii* (robust finger-orchid) to coincide with flowering season for ease of field identification.

6.4.3 Threatened fauna

Eight species listed under TSPA and EPBC Act have been observed or have known habitats within proximity of the proposed pipeline alignment. Generalised mitigation actions to reduce the significance of project impact are provided in Table 26.

Twenty threatened fauna species have ranges which expand into the study area, fifteen of these are listed under the EPBC Act. The suitable habitat is based on the presence of suitable TASVEG mapping units, consideration of the risk/potential for the species to occur across the project area mosaic, the capacity (in terms of significance) of the habitat across the project area. If encountered during on-ground surveys risk mitigation strategies may be required.

Preliminary field assessment identified three fauna species of particular concern within the project area:

- Aquila audax (wedge-tailed eagle)
- Engaeus granulatus (Central North burrowing crayfish)
- Litoria raniformis (Green and gold frog)

Targeted surveys and follow-up procedures to identify and manage these species presence within the alignment corridor is proposed.

Tasmanian Irrigation proposes that the pipeline route be extensively field assessed for natural values present with appropriate 50-meter buffers each side. *Engaeus granulatus* (Central North burrowing crayfish) surveys would be included as part of routine natural values assessments to map evidence of the species, followed by targeted excavations with expert identification if found within the alignment corridor. Similarly, suitable habitat for *Litoria raniformis* (Green and gold frog) would be assessed and mapped across the project alignment area with care taken to avoid these areas. Between February

and June 2023 (inclusive) field surveys would be conducted for *Aquila audax* (wedge-tailed eagle), with a recommendation for helicopter-based surveying of the steep and difficult to access Mersey River and Knights Creek area. Table 25 specifies the field survey activities proposed to be undertaken for all the natural values in more detail.

Table 25: Timeline of proposed field survey activities for all natural values

Timeline	Species	Survey Activity
October 2022	*Caladenia caudata* (tailed spider-orchid)	Surveys of dry sclerophyll forest areas should be conducted in mid-October for *Caladenia caudata.*
November 2022	*Caladenia tonellii* (robust finger-orchid)	Surveys of dry sclerophyll forest areas should be conducted in early November for *Caladenia tonellii*.
October 2022 – February 2023 (spring – summer period)	• *Cassinia rugata* (wrinkled dollybush) *Persicaria decipiens* (slender waterpepper)	Surveys of all other vegetation communities and general flora surveys during spring flowering period.
February – June 2023	*Aquila audax* (wedge-tailed eagle)	Helicopter-based surveys of the Mersey River and Knights Creek area should be conducted outside of breeding season (February – June) inclusive most years.
Time Independent (any season)	• *Engaeus granulatus* (Central North burrowing crayfish) • *Litoria raniformis* (green and gold frog) • General natural values assessment throughout the scheme, including for dens, burrows, and nesting tree species.	Targeted surveys of burrowing crayfish habitats and evidence of burrows can be conducted at any time followed by targeted excavations with expert ID if needed. Mapping of potential habitat, including green and gold frogs, as part of greater natural values assessment across the scheme can be done at any time as well as ground truthing of vegetation and ecological communities present in consultation with TASVeg mapping.

Source: Tasmanian Irrigation, 2022 SWIS Augmentation: Environmental Risk Assessment, July

Table 26: Mitigation actions

Species	Listing (State/Fed)	Legal Implications	Impact/Risk	TI mitigation strategy
Threatened Native Communities				
Eucalyptus amygdalina forest and woodland on sandstone (DAS) *Eucalyptus ovata* forest and woodland (DOV) *Eucalyptus viminalis – Eucalyptus globulus* coastal forest and woodland/wet forest (DVC) *Eucalyptus viminalis* wet forest (WVI) *Melaleuca ericifolia* swamp forest (NME) Riparian scrub (SRE) Wetlands (AWU)	NCA/-	A forest practices plan may be required to clear the vegetation community.	Surveys are required under the Farm WAP process.	Clearing during construction and operational activities will be minimised. The Farm WAP process will ensure that threatened vegetation communities are identified across areas to be irrigated.
Threatened Flora				
Cassinia rugata (wrinkled dolly bush)	e/V	Permits to take will be required under the TSP Act for plants that are located within the construction footprint that cannot be avoided.	Surveys will be required to determine if any of these listed species are within the construction footprint. Surveys are required under the Farm WAP process.	Plants will be avoided where possible by realigning the construction corridor. Where the construction corridor cannot be realigned to avoid all individual plants the impact on the species will be minimised. The Farm WAP process will ensure that threatened flora species are identified across areas to be irrigated.
Persicaria decipiens (slender waterpepper)	v/-			
Caladenia caudata (tailed spider-orchid)	v/V			
Caladenia tonellii (robust finger-orchid)	e/CR			

Species	Listing (State/Fed)	Legal Implications	Impact/Risk	TI mitigation strategy
Threatened Fauna Observations				
Dasyurus maculatus maculatus (spotted-tailed quoll)	r/VU	Any significant impacts on the species would be considered under the EPBC referral. Permits to take under the TSP Act may be required to decommission any identified dens within the construction corridor.	The operation of scheme is not expected to alter land use (with operational management) and hence will not have an impact on foraging habitat. Any minor disturbance to hunting habitat will not have a significant impact on this species.	Any dens identified for the species will need to be monitored for occupation by the species. A permit to take may be required to destroy the den sites. If significant habitat (including high-value breeding den) is found during surveys of pipeline routes impacts will be mitigated by retaining habitat with exclusion zones during construction. The Farm WAP process will ensure that any risks to denning habitat for the spotted-tail quoll are identified and managed to support the species.
Sarcophilus harrisii (Tasmanian devil)	e/EN	Any significant impacts on the species would be considered under the EPBC referral. Permits to take under the TSP Act may be required to decommission any identified dens within the construction corridor.	The operation of scheme is not expected to alter land use (with operational management) and hence will not have an impact on foraging habitat. Any minor disturbance to hunting habitat will not have a significant impact on this species.	Any dens identified for the species will need to be monitored for occupation by the species. A permit to take may be required to destroy the den sites. If significant habitat (including high-value breeding den) is found during surveys of pipeline routes impacts will be mitigated by retaining habitat with exclusion zones during construction. The Farm WAP process will ensure that any risks to denning habitat for the Tasmanian devil are identified and managed to support the species.

Species	Listing (State/Fed)	Legal Implications	Impact/Risk	TI mitigation strategy
Perameles gunnii (Eastern-barred bandicoot)	-/VU	Any significant impacts on the species would be considered under the EPBC referral.	The operation of scheme is not expected to alter land use (with operational management) and hence will not have an impact on foraging habitat. No significant impact is anticipated on this species	Key breeding sites for the species that are identified by the Farm WAP ecological surveys will be protected from disturbance by limiting any encroachment of land clearance to 30 m of the nest habitat.
Tyto novaehollandiae (masked owl)	pe/PVU	Any significant impacts on the species would be considered under the EPBC referral. Permits to take under the TSP Act may be required to take nesting habitat.	The entire project area would be considered potential foraging habitat for these species. The operation of scheme will not alter land use and hence will not have an impact on foraging habitat. Any minor disturbance to hunting habitat will not have a significant impact on the species. No significant impact is anticipated on this species.	The proposed pipeline alignment will avoid significant areas of remnant native vegetation and potential nesting habitat for the masked owl. Potential large habitat trees will be marked and avoided during construction. The Farm WAP process will ensure that any risks to nesting habitat for the masked owl are identified and managed to support the species.
Aquila audax (wedge-tailed eagle) *Haliaeetus leucogaster* (white-bellied sea-eagle)	pe/PEN v/-	Any significant impacts on the species would be considered under the EPBC referral. This Irrigation Scheme must conform to existing distance and seasonal activity constraints in nest management protocols for eagles as described in *FPA - Fauna Technical Note No. 1.*	The entire project area would be considered potential foraging habitat for these species. The operation of the scheme is not expected to alter land use (with operational management) and hence will not have an impact on foraging habitat The proposed scheme is not anticipated to have a significant impact on the wedge-tailed eagle or the white-bellied sea-eagle.	If previously undiscovered nests are identified during further surveys the appropriate management protocols for the species outlined in the *FPA - Fauna Technical Note No. 1: Eagle nest searching, nest activity checking, and nest management* will be implemented. The Farm WAP process will ensure that any risks to nesting habitat are identified and managed to support the species.

Species	Listing (State/Fed)	Legal Implications	Impact/Risk	TI mitigation strategy
Engaeus granulatus (Central North burrowing crayfish)	e/EN	Any significant impacts on the species would be considered under the EPBC referral. Permits to take under the TSP Act may be required to disturb habitat.	Comprehensive surveys for this species may need to be conducted in order to assess significance of impact under the EPBC referral. The potential impact of the construction and operation of the scheme will be determined at the conclusion of the field surveys.	Construction could degrade potential habitat if sediment was released during construction into watercourses that were inhabited by this species. Appropriate controls will be implemented to ensure that sediment inputs across the construction zone are minimised. If required, specific management may be undertaken to reduce impact from works. The Farm WAP process will ensure that any risks to aquatic habitat for this species are identified and managed to support the species.
Litoria raniformis (green and gold frog)	v/VU	Any significant impacts on the species would be considered under the EPBC referral. Permits to take under the TSP Act may be required to disturb habitat.	Comprehensive surveys for this species may need to be conducted in order to assess significance of impact under the EPBC referral. The potential impact of the construction and operation of the scheme will be determined at the conclusion of the field surveys.	If significant habitat is found during surveys, mitigative measures may be required such as realignment to avoid significant habitat for the species. The Farm WAP process will ensure that any risks to aquatic habitat for the green and gold frog are identified and managed to support the species.

Source: Tasmanian Irrigation, 2022 SWIS Augmentation: Environmental Risk Assessment, July

6.4.4 Weeds

Weed species are almost certain to be encountered in the construction corridor. The *Tasmanian Weed Management Act 1999* provides for the control and eradication of weeds with the need to minimise negative effects of weeds on the sustainability of Tasmania's productive capacity and natural ecosystems. Ten significant weed species have been observed within the irrigation area (Table 27), it would be expected that these will be encountered during works and appropriate management actions should be implemented after the on-ground survey.

A Weed Management Plan will be implemented as required, based on the findings of on-ground assessments. Only one Weed of National Significance has been observed within the irrigation area and as such a weed and hygiene management will likely require implementation during works and ongoing operations. However, it is not expected that any *S. pendulina* (weeping willow) will require management for the proposed works.

Table 27: Significant weed species observed within proximity of the proposed pipeline alignment

Species	Common name
Cirsium arvense var. arvense	creeping thistle
Cortaderia sp.	pampas grass
Erica lusitanica	Spanish heath
Foeniculum vulgare	fennel
Nassella neesiana	Chilean needlegrass
Rubus fruticosus	blackberry
Salix x fragilis nothovar. fragilis	crack willow
Senecio jacobaea	ragwort
Ulex europaeus	gorse
Weeds of National Significance	
Salix x pendulina var. pendulina	weeping willow

Source: Tasmanian Irrigation, 2022 SWIS Augmentation: Environmental Risk Assessment, July

6.4.5 Potential Acid Sulphate Soils

As the majority of proposed are within existing areas where works have already occurred it is not expected that acid-sulphate soils will be disturbed during construction. Within the project area, most high-risk PASS areas are limited to the coastal areas to the north of the irrigation area and not expected to be impacted by works.

6.4.6 Reserves

Only a few small reserve areas occur within the irrigation area, no works are anticipated to occur in these areas, therefore no management will need to be in place. If proposed works change and impact these areas, management plans may need to be implemented.

6.5 Aquatic Impacts and Water Quality

6.5.1 Construction Impacts

There is potential for construction to reduce habitat quality for aquatic species occurring within watercourses that will be crossed via pipeline. Noting this, most of the project area has been heavily modified with limited areas of native vegetation and unmodified watercourses.

All watercourses associated with the works area are listed at a Medium or Low integrated conservation value, indicating limited naturalness and conservation management policy scores. As such, significant risk is associated with works immediately proximal to the River Forth, with low risk associated with other watercourses throughout the project area.

6.5.2 Operational Impacts

Changed hydrology

While Tasmania Irrigation has not implemented any hydrological studies at this juncture, it would be expected that limited changes to hydrology would occur with the current proposed infrastructure and volumes to be delivered by the scheme.

Water Quality

The typical land use across the proposed area of interest is broadacre crops, specialty crops, vegetable, and seed crops. Tasmanian Irrigation's policy that all new schemes implement Farm WAPs and given the current large-scale modification of the area of interest, it could be expected that minimal impact on current water quality would occur. This contention is supported by evidence from other schemes managed by Tasmanian Irrigation where there has been limited impact on water quality throughout each of the districts.

Transfer of pests and pathogens

Batrachochytrium dendrobatidis (chytrid fungus) has been detected upstream of the intake for the Great Bend Pump Station. However, none has been detected within the irrigation district at this stage. As such, high risk applies to build activities, but significant mitigation is likely achievable with appropriate weed and hygiene management. Considering that an irrigation scheme is already in operation and has been for a period of 8 years indicates that it is not expected that this will be of concern for the proposed works. Usual works hygiene procedures should mitigate any transfer risk of this pathogen.

Phytophthora cinnamomi has not been detected within this scheme. However, given that observations have been recorded within proximity of the irrigation district, *P. cinnamomi* should always be considered a high hygiene risk during the works period and usual works hygiene measures should be adhered to. Within operational periods, it is not expected that *P. cinnamomi* will be a high risk with water delivery.

The risk of pathogen spread via the proposed augmentation works and operations is considered low, especially if appropriate control mechanisms are implemented.

6.6 Forest Practices Plan

The SWISA project infrastructure will traverse forests on public and private land during its installation, as such it is deemed necessary to have a desktop assessment of the pipeline alignment undertaken by a Forest Practices Officer (FPO) of the area and the likely actions required to comply with the Forest Practices Act 1985, Forest Practices Regulations 2017 and the Policy for Maintaining a Permanent Native Forest Estate (30 June 2017). Accordingly, Tasmanian Irrigation engaged Sustainable Forestry Solutions to undertake a Forest Practices Plan (FPP) desktop assessment report on SWISA.[44]

Land clearing controls apply to all land in Tasmania, both public and private. They apply to native forest through the Tasmanian Government Policy for Maintaining a Permanent Native Forest Estate (30 June 2017) (the Policy) which is implemented through the *Forest Practices Act 1985*. There are also controls on clearance and conversion of threatened native vegetation communities through the *Forest Practices Act 1985*.

All clearing and conversion operations will be done under an FPP that has been certified by the Forest Practices Authority (FPA) according to the *Forest Practices Act 1985*.

The assessment undertaken by Sustainable Forestry Solutions found that SWISA will significantly impact 27 property owners on separate Property IDs excluding Crown Land Road Reserves. These impacted properties are likely to require an FFP if the full buffer easement is required. Should the full buffer distance not be required the number of properties impacted and requiring an FFP is likely to reduce.

Six properties are impacted by known Wedge-tailed Eagles nests and will therefore need to be the subject of an aerial search for Raptor nests.

Prior to commencing an FFP an ecological report consistent with the requirements set out in the "Guidelines for ecological surveys and reports for areas proposed for a forest practice plan" is required to be completed.

It normally takes 12 to 16 weeks to prepare and certify a FFP depending on the complexity, timing of the required surveys including raptor searches and the availability of landowners. Accordingly, given that FFPs cannot all be prepared at once, substantial lead time will be required, and this has been factored into the project schedule developed by Tasmanian Irrigation.

6.7 Legislative requirements

Provides a summary of the likely legislative requirements for the SWISA.

[44] Sustainability Forestry Solutions, 2022 Sassafras-Wesley Vale Irrigation Scheme Augmentation, Forest Practice Plan Desktop Assessment Report, October

Table 28: Possible legislative requirements for SWISA

Legislation	Approval/Comment	Assement Agency	Assessment Time
Commonwealth			
Environment Protection and Biodiversity Conservation Act 1999	Protected Matters Determination	Department of the Environment	Up to 6 months
State			
Threatened Species Protection Act 1995	For the removal of any vegetation protected under the Act	Department of Natural Resources and Environment Tasmania (DNRET)	Up to 6 months
Nature Conservation Act 2002	Permit to take flora	DNRET	Up to 6 months
Nature Conservation Act 2002	Permit to take fauna	DNRET	Up to 6 months
Forestry Act 1920	Forestry Practices Plan (FPP)	DNRET	Up to 6 months
Water Management Act 1999	Water Licence	DNRET	Up to 6 months
Land Use Planning and Approvals Act 1993	Planning permit	Local Council	Up to 6 months
Crown Lands Act 1976	Owners consent to undertake works and development within areas such as informal reserves and riverbeds. A licence or lease will be required to develop infrastructure on crown land.	DNRET	Up to 6 months

Source: Tasmanian Irrigation, 2022 SWIS Augmentation: Environmental Risk Assessment, July

6.8 Critical constraints review

Tasmanian Irrigation engaged Environmental Consulting Options Tasmania (ECOtas) to undertake a critical constraints review of natural values associated with proposed SWISA project.[45] A primary purpose of the review was to highlight critical matters likely to influence the business case and design of the scheme. The review was undertaken with reference to issues such as threatened vegetation

[45] Environmental Consulting Options Tasmania (ECOtas), 2022 Critical Constraints Review of Natural Values Associated with Proposed Sassafras Wesley Vale Irrigation Scheme Augmentation Project, September

types, flora and fauna, and likely approval pathways under Commonwealth, State and local government assessment and approval frameworks.

Key recommendations contained in the review include:

- **Vegetation types:** Undertake ground-truthing of project area to map all vegetation communities. While there are no specific constraints in terms of timing, spring-summer is considered ideal to maximise recording species diversity.
- **Threatened flora:** Undertake mid-October surveys of dry sclerophyll forest for *Caladenia caudata* and early November surveys of dry sclerophyll forest for *Caladenia tonellii*. For other species surveys can be undertaken at any time of the year.
- **Threatened fauna:** Undertake a helicopter-based survey of the Mersey River and Knights Creek area between February and June for known and potential nesting habitat for the *Aquila audax* subsp. *fleayi* (wedge-tailed eagle) which is listed as endangered under the TSPA and EPBCA. Map evidence of Central North burrowing crayfish *Engaeus granulatus* as part of routine natural values assessments followed by targeted excavations. Map potential habitat of the Growling grass frog *Litoria raniformis* as part of routine natural values assessments.

6.9 Aboriginal and European heritage

6.9.1 Aboriginal heritage values

The *Aboriginal Relics Act 1975* protects all Aboriginal relics by requiring that permits be obtained for any works or excavation that impact such relics. Permits are issued by the Minister, through consultation with the Tasmanian Aboriginal Land and Sea Council (TALSC). The permit application must include details of why impact is unavoidable, what has been done to examine other options, a full assessment of the site, and the results of consultation with the Aboriginal community.

Tasmanian Irrigation commissioned Cultural Heritage Management Australia (CHMA) to undertake a preliminary desktop Aboriginal and historic heritage assessment for the SWISA project.[46]

A search of the Aboriginal Heritage Register (AHR) was carried out to determine the extent of registered Aboriginal heritage sites within and in the general vicinity of the study area. The search results showed that there are a total of 59 registered Aboriginal sites situated within an approximate 3km radius of the SWISA corridor.

Of these 59 registered Aboriginal sites, there are 8 registered sites that are situated within the SWISA pipeline easement. Five of these sites are classified as Isolated artefacts and were all recorded by CHMA as part of the assessment of the original SWIS pipeline easement. The other three registered sites are classified as Artefact scatters.

In addition, there are another three registered Aboriginal sites that are situated within a 100m radius of the SWISA pipeline easement. Two of these sites are classified as Isolated, both of which were previously recorded by CHMA. The other site is classified as an Artefact scatter.

[46] CHMA, 2022 Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA) Project Desktop Aboriginal and Historic Heritage Report. September.

AHT has advised that a permit to interfere and destroy 6 sites had previously been issued as part of the original SWIS project. However, it is unknown if these sites had been destroyed or if they remain present. If present, the sites retain protection under the *Aboriginal Heritage Act 1975* and will need to be managed appropriately.

Tasmanian Irrigation will need to clarify whether these sites were impacted by any works associated with the original SWIS project. For those sites that have been impacted, Tasmanian Irrigation will need to seek confirmation from AHT whether there are any further requirements for these sites.

For those sites that have not be impacted, CHMA recommended that as part of the scope of future Aboriginal heritage assessment works for the SWISA project, these sites should be relocated, recorded and their current condition status assessed, and appropriate management/mitigation strategies should be developed based on the findings of the assessment.

A gap analysis completed by CHMA showed that there is around 39.8 km of the SWISA pipeline easement that was not covered by surveys undertaken for the original SWIS project along with the existing Great Bend pump station and the proposed location for the new Balance Tank located on Saggers Hill. CHMA therefore recommended that these locations should be included in the scope of future Aboriginal heritage assessment works for the SWISA project.

Additionally, around 55.2 km of the SWISA pipeline easement network overlaps the original SWIS pipeline easement that was assessed as part of the original scheme. CHMA therefore recommended that Tasmanian Irrigation should seek clarification from AHT and HT whether there are any further requirements for these sections of the SWISA pipeline easement.

Accordingly, Tasmanian Irrigation propose to commission the necessary Aboriginal investigations which will be conducted jointly by a consulting archaeologist and Aboriginal heritage officer as part of the detailed design phase. Appropriate management strategies will be developed and implemented to minimise (or eliminate) the disturbance of Aboriginal heritage sites.

6.9.2 European cultural values

Tasmanian Irrigation commissioned Cultural Heritage Management Australia (CHMA) to complete a search of historic heritage values.[47] A search of the Tasmanian Heritage Register (THR) showed that there are no heritage places located within or in the immediate surrounds of the study area. This is consistent with the findings from the surveys undertaken for the original SWIS project.

6.10 Water supply and use

Water entitlements within the SWISA have been offered by direct sales. Farmers have entered into purchase contracts to obtain rights to a water entitlement. Water entitlements contain two components: an Irrigation Right; and a Zoned Flow Delivery Right.

After commissioning of the scheme, irrigators may trade (temporarily or permanently) the component rights individually or jointly or in part. To source water at a particular connection point,

[47] CHMA, 2022 Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA) Project Desktop Aboriginal and Historic Heritage Report. September.

an Irrigation Right (water), a Zoned Flow Delivery Right (the capacity to draw water in a specified zone), and a Connection Agreement (the right to receive water at a connection point) will be needed.

6.10.1 Farm Water Access Plans

Prior to the receipt of any water from the scheme, all irrigators must have an approved Farm Water Access Plan (Farm WAP) in place. Farm WAPs are practical, property specific documents that guide the sustainable application of Tasmanian Irrigation water and assist with the long-term viability of land for agricultural production. They are a requirement for all new Tasmanian Irrigation schemes. Farm WAPs identify where water can be applied and actions to manage potential risks from applying it. The area assessed and incorporated in the Farm WAP includes all land (including dams) to which Tasmanian Irrigation water will be applied, both now and in the future.

Farm WAPs include information on:

- soil, biodiversity, and water resources
- current and proposed future water use
- potential irrigable land (based on land capability and divided into land use categories such as root cropping, surface cropping, irrigated pasture, dryland pasture, horticulture, forestry)
- actions required to manage risks including monitoring schedules.
- best management practices and other relevant regulations.

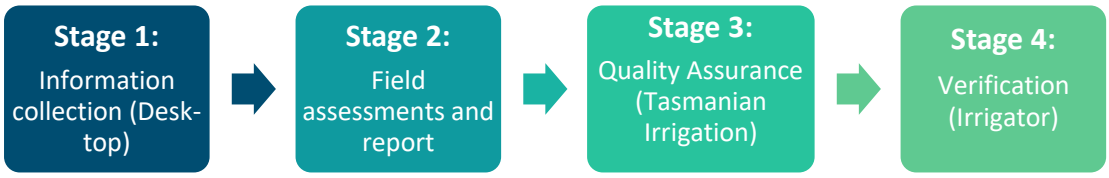
They also outline practices which can provide for higher productivity and improved quality while minimising water resource use and environmental impacts.

The Farm WAP Planning Framework was developed in consultation with the Tasmanian Farmers and Graziers Association, Tasmanian Natural Resource Management organisations and the Tasmanian Government. The Farm WAP Planning Framework includes three natural asset modules (soil, water, and biodiversity) that form the basis for all Farm WAPs.

Farm WAPs will be required to demonstrate that, prior to being supplied with irrigation water, each irrigator has:

- identified the core natural assets of the land directly affected by the proposed irrigation.
- developed or confirmed farm management options/actions according to current best practice.
- undertaken a comprehensive risk management process determining any impacts on natural assets that may result from application from the irrigation water.
- instigated any recommended monitoring programs required to demonstrate sustainable irrigation practices.
- identified legislative or regulatory processes relevant to the application of irrigation water.

There are four main stages in preparing a Farm WAP.



Tasmanian Irrigation facilitates the Farm WAP development process. Field assessments and preparation of the reports are completed by prequalified consultants approved by the state minister for Primary Industries and Water and are prepared in accordance with Government approved soil, water, and biodiversity modules. Tasmanian Irrigation completes the final quality assurance process to ensure they are consistent and compliant with all relevant regulations.

Farm WAPs for schemes under construction are prepared in batches which provide cost efficiencies and time savings for each irrigator.

Each Farm WAP has three key components reflecting the three modules.

Water component

The Farm WAP requires water information to be provided in accordance with the guidelines. For the area of land directly affected by the proposed irrigation, a Farm WAP will:

- summarise current water assets and resources.
- identify additional irrigation water requirements, including information on the suitability of such water for use in sustainable irrigation.
- identify risks (e.g., salinity, effluent management, sediment transport) associated with irrigation activities.
- incorporate appropriate management actions and monitoring recommendations to appropriately manage these risks.

Soil component

The Farm WAP requires soil information to be provided in accordance with the guidelines. For the area of land directly affected by the proposed irrigation, a Farm WAP will:

- describe the soil characteristics.
- comprehensively describe and assess the land-use potential and capability of each soil type including the potential for use as irrigated farmland.
- identify the risks (e.g., erosion, waterlogging, salinity, sodicity) associated with current land use and potential changes in land use.
- incorporate appropriate management actions and monitoring recommendations to appropriately manage these risks.

Biodiversity component

The Farm WAP requires biodiversity information to be provided in accordance with the guidelines. For the area of land directly affected by the proposed irrigation, a Farm WAP will:

- collate information relating to the features of biodiversity and ecological sensitivity including Matters of National Environmental Significance (MNES);
- identify risks to biodiversity (e.g., impacts on threatened species or communities);
- determine appropriate strategies for the sustainable management of biodiversity; and
- incorporate appropriate management actions and monitoring recommendations to appropriately manage these risks.

Conditions of approval for the establishment of Tasmanian Irrigation schemes under the *Tasmanian Water Management Act 1999* (WMA) include the requirement for the development of Farm WAPs and the implementation of a Farm WAP auditing program. The audit program includes annual audits of randomly selected Farm WAPs, provisions for properties that contain MNES, and triggered audits where non-compliances are identified or monitoring results indicating a decline in scheme water quality. Results of the annual Farm WAP auditing program are provided to the state minister under the WMA to ensure that water is only being used in accordance with the plans.

Ultimately the development of, and compliance with, Farm WAPs however is the responsibility of the irrigator.

6.11 Project implementation & operation

Project implementation for the SWISA Project has been divided into two broad phases:

- development and construction
- operational.

In each phase, different sections of Tasmanian Irrigation have been allocated responsibilities to ensure that the project is managed and resourced by those with the most appropriate experience and expertise in that area. The roles and responsibilities are explained below.

6.11.1 Development and construction phase

Role of Tasmanian Irrigation

Tasmanian Irrigation will be responsible for development and construction, and management of contractors most likely via a Build Only (BO) engineering contract or contracts covering the total project.

Tasmanian Irrigation was established in March 2008 to develop and construct irrigation schemes in Tasmania. Its formation was designed to bring private sector expertise to the development of irrigation schemes across Tasmania, including the SWISA, and it consists of engineers with over 100 years' experience collectively, greatly enhancing the project management process.

In more detail, Tasmanian Irrigation's responsibilities are as follows:

- selection of pipeline routes (via walk through and/or seasonal surveys)
- detailed design of infrastructure
- functional specifications to meet the requirements of a D&C or BO contract

- hydraulic design (establishing diameters of pipelines, strength and appropriate materials for terrain and distances involved) to the level required for either a D&C or BO contract
- establishment of the D&C or BO construction contract.

In addition, Tasmanian Irrigation may consider direct purchase of pipes and fittings. Tasmanian Irrigation's purchasing power, given it is a proponent of multiple schemes across the State, will be relatively high, likely enabling it to purchase pipelines at a lower price than most contractors. Major items to procure include pipes and fittings, pump station and telemetry components.

Contractors' role

Contractors, selected through a competitive tender process, will be responsible for other aspects of the SWISA project through the contract, subject to meeting the design specifications outlined by Tasmanian Irrigation. The contracts will cover:

- construction of the Great Bend pump and installation of the Sassafras Booster pump station
- laying of pipelines
- drilling
- hydraulic pressure testing
- construction of the balancing storage.

As noted above, Tasmanian Irrigation aims to award the construction contract for SWISA by February 2024. Early contractor involvement/scheduling will help avoid paying peak contractor prices by enabling the contractor to plan for the scheduled works and ensure sufficient skilled labour and technical experts are available.

Tasmanian Irrigation has considerable expertise in procurement of contracting services for infrastructure projects and experience gained from the construction of 15 Tranche 1 and Tranche 2 schemes. A series of steps will be implemented to ensure that installation costs are not inflated, including:

- the use of detailed functional specifications and design documentation
- Tasmanian Irrigation will carry the risks of landowner access and identification of infrastructure crossing (avoids large risk premiums)
- procurement of pipe in stages to ensure efficient expenditure and integration with construction program and procurement of other infrastructure components including pipe fittings and irrigator offtakes.

6.11.2 Operations phase

Tasmanian Irrigation will apply for an extension to the Sassafras Wesley Vale Irrigation District and to appoint Tasmanian Irrigation as the responsible water entity (RWE).

During and post-commissioning of the new scheme, the operations group of Tasmanian Irrigation will be responsible for managing the scheme. Tasmanian Irrigation will consult on operational matters from the SWISA irrigator representative group established during the project development phase.

A communications strategy (refer Section 6.8) has been developed to provide a framework for communication and stakeholder management for the project.

The two key functions – scheme administration and scheme operations – during the operations phase for Tasmanian Irrigation are set out below.

Scheme administration

Key functions and activities associated with the management of the scheme include:

- maintain a central registry of irrigation and zone flow delivery rights including any trading of these rights
- set by-laws for the district and scheme
- provide annual information on the financial performance of the scheme
- deliver the statutory requirements as RWE for the district
- schedule the opening and closing of the season
- day-to-day operation of the scheme
- asset management and maintenance planning and delivery
- set annual water charges.

Scheme operations

Day-to-day operations of the scheme will be undertaken with specific reference to the following:

Scheme Operator

- Tasmanian Irrigation will appoint a suitably qualified person to fulfil the role of Scheme Operator for the SWISA. This appointment will be programmed such that the appointee is involved during the latter stages of construction and commissioning.

Off-take Operations

- Supply from the Great Bend pump station into the Saggers Hill Balance Tank and pumping from the buffer dam to the Poatina Balance Tank during the 180-day irrigation season between October and March each year. Instigation for commencement and cessation will be organised via remote telemetry, under the control of the scheme operator.
- The scheme operator will need to co-ordinate closely with Hydro Tasmania to co-ordinate the appropriate water source timing (opportunistic or purchase) and release from Lake Parangana to match pumping requirements and to ensure no breaches of 'Cease to Take' or restriction rules.

Water management

- Water released from the Great Bend pump station, Saggers Hill Balance Tank and the Sassafras pump station will be metered and recorded at the outlet.
- Each irrigator outlet will be metered.
- The scheme operator will be required to read and monitor meter readings during periods of delivery.

Monitoring

- Water deliveries will be monitored by reading of bulk meters at the inlet and outlet of the pump station, the farm meters or on-farm inspections.
- Trading, either permanent or temporary, is to be managed by the responsible water entity and recorded into the central registry.

Compliance, monitoring, maintenance & reporting

- Tasmanian Irrigation, as the RWE will be responsible for:
  - compliance and monitoring to the conditions and approvals associated with the SWISA
  - maintenance of the scheme assets
  - reporting requirements.

6.12 Stakeholder management and consultation process

A key component of the development of the SWISA Project is stakeholder consultation. Tasmanian Irrigation has identified and consulted with relevant stakeholders, including government departments, other levels of government and clients who are the intended end users of the services. The strategy incorporates objectives and principles of communication along with tactics for engaging identified stakeholders. The stakeholder management strategy is outlined in detail in Attachment 2 with key components outlined in the following sections.

6.12.1 Objectives

Key communications objectives for this project are to:

- engage local communities in the development and water entitlement up-take of the SWISA
- identify and, where possible, resolve local community issues relating to the project
- maintain open communication with the local communities
- keep the Tasmanian and Australian governments and their respective agencies informed and abreast of the progress of the projects
- ensure that other stakeholders are engaged or informed as appropriate
- identify and classify all stakeholders to manage risk
- identify and clarify project risks from external project entities early
- promote participation by stakeholders using planned and targeted communication
- ensure that synergies in communication strategies with related projects and with mutual stakeholders can be achieved.

6.12.2 Key messages

Key messages that should be incorporated consistently into stakeholder communications for this project are the:

- SWISA project is being delivered under a robust governance framework. Tasmanian Irrigation schemes are done 'by the book'
- SWISA is developed in collaboration with farmers and based on community demand
- project is for sustainable development, not development at any cost
- SWISA will enable primary producers to pursue opportunities for greater security, diversification, or expansion
- Tasmanian Irrigation schemes are built as public-private partnerships. They will not be built without sufficient contribution from both parties. The project will meet statutory planning and approval conditions, NWI requirements and will need to be shown to be sustainable in the long term through the CSIRO Sustainable Yields Project
- project is a partnership between the local community, and the Tasmanian and the Australian governments.

6.12.3 Identification of relevant stakeholders

Key stakeholders identified by Tasmanian Irrigation's SWISA Communications Strategy include:

- Government agencies and other levels of government: Office of Minister for Primary Industries and Water; Department of Sustainability, Environment, Water, Population and Communities (formerly DEWHA); Department of Treasury and Finance; Department of Economic Development and Tourism; Department of Infrastructure, Energy and Resources; Department of Natural Resources, Environment Tasmania; Department of Premier and Cabinet; Inland Fisheries Service; Tasmanian Heritage Council; Aboriginal Heritage Office; Local Government Association of Tasmania; Local Government – Devonport City Council and Latrobe City Council, LGAT; Tasmanian Public Finance Corporation, Hydro Tasmania and Tas Networks.
- Community/Social Groups: Tasmanian Aboriginal Land and Sea Council, Tasmanian Aboriginal Centre, Tasmanian Farmers and Graziers Association, Tasmanian Conservation Trust, and Waterwatch Tasmania, Mersey Mountain Bike Club via Latrobe Council, Tasmanian Construction Industry and key contractors, and Mersey Irrigator Group.

6.12.4 Critical issues

Several critical issues have been identified in developing the communications strategy, with the more important being summarised in Table 29, together with the communications actions designed to mitigate the impacts.

Table 29: Critical stakeholder issues and mitigation actions

Potential issue	Impact	Likelihood	Communication Actions to Mitigate
Potential irrigators financially challenged to enter the scheme	High	Moderate	Ensure communications provide the maximum timeframe and information to facilitate landholder's ability to arrange finance facilities to enter the scheme. Provide information to finance

Potential issue	Impact	Likelihood	Communication Actions to Mitigate
			institutions relating to the value and investment potential associated with irrigation projects.
Age demographic of community reducing participation/investment	High	Moderate	Positive communication of the scheme benefits for the future generation. Value enhancement of the property with surety of water supply for future use.
Application of water licence especially during 'Cease to Take' and restriction events	High	Moderate	Liaise closely with DNRET and Hydro Tasmania and develop robust SCADA systems and management protocols to facilitate water purchases from Lake Parangana during periods when licenced take from the river is restricted.
Irrigators see the projects as providing water that is too costly	High	Moderate	Stress 95% reliability, 100-year lifespan, bias towards higher capital costs to lower operating costs. Water Sales provided indication of likely prices with strong uptake of entitlements. Provide ongoing communication of pricing outcomes.
Stakeholder backlash due to perceived insufficient consultation	High	Moderate	Consult extensively with stakeholders.
Insufficient understanding of customer's needs	High	Moderate	Consult extensively with stakeholders.
Public announcements by politicians raise expectations that will not be able to be met	High	Moderate	Provide regular briefings for politicians.
Scheme does not comply with NWI rules	High	Low	Liaise closely with DNRET Water Management Branch to ensure compliance.
Future market opportunities affecting up-take	High	Medium	Work with TFGA and Government to promote action being undertaken to address market concerns.

Source: Tasmanian Irrigation, 2022 SWISA Communication Strategy.

6.12.5 Consultation process

Major project milestones incorporated in the consultation process, conducted by Tasmanian Irrigation's project manager, are outlined in Table 30. Stakeholder input has been ensured through the public launch of the SWISA, stakeholder submissions, Water Sales, and other feedback to

Tasmanian Irrigation, ongoing meetings and consultation with irrigator groups and other stakeholders, website updates and regular newsletters.

Table 30: Stakeholder consultation – major project milestones

Major event	Date
Presentation of final Business Case decision to relevant stakeholders	December 2022
Development of funding Submission	December 2022
Landholder Engagement	December 2022 (ongoing)
Construction and supplier market consultation	June 2023
Commencement of construction	July 2024
Conclusion of construction	July 2026 (including decommissioning)
Scheme commissioning	September 2026

Source: Tasmanian Irrigation, 2022, SWISA Communications Strategy.

6.13 Summary

This section has outlined and examined:

- the project planning process in terms of gaining planning, environmental, cultural heritage, and Aboriginal relics approvals necessary for project development
- structures for project implementation – the entities responsible for the design and construction of the SWISA and the operations phase
- the SWISA stakeholder management strategy.

The development of the SWISA has involved comprehensive and detailed analyses of:

- relevant planning legislation and regulations that impact on project development and construction
- impacts in terms of environment issues, cultural heritage and Aboriginal relics related to the SWISA and the associated legislative and regulatory guidelines and approvals.

Legislation and regulations at local, Tasmanian and Australian government levels establish clear guidelines and approvals processes to ensure that the project is planned and managed appropriately. Desk-top flora and fauna, and cultural and heritage assessments commissioned by Tasmanian Irrigation have indicated that the SWISA does not present any fatal flaws that would prevent the appropriate approvals being gained in terms of development applications, environmental approvals, and heritage (cultural, historical, and Aboriginal) values.

In addition, consideration has been given to appropriate structures for project development and operation of the SWISA. The proposed structure will ensure that the most suitable and experienced entities have responsibility for project development and construction and subsequently operations management.

Finally, in developing the SWISA, a wide range of stakeholders has been consulted to ensure support and input to the project from irrigators and impacted communities, as well as government agencies and relevant peak body groups. Moreover, a comprehensive stakeholder consultation strategy has been developed by Tasmanian Irrigation.

7. Public benefit assessment

7.1 Introduction

The purpose of this section is to outline the key aspects of the 'With Project' and 'No-Project' cases, to underpin Tasmanian Irrigation and the Tasmanian Government's assessments of the project.

7.2 Financial & economic performance

Marsden Jacob has developed detailed financial and economic models of the proposed SWISA as part of the socio-economic assessment and these are described in detail in Sections 4 and Section 5 of this Business Case. Key results from our financial and economic models are as follows:

- the economic returns from the proposed SWISA project are expected to be positive and the scheme is estimated to generate an estimated $113.14 million in direct economic benefits (economic NPV) assuming the P50 estimate and $103.33 million assuming the P90 estimate
- funding for $62.10 million is sought from the NWIDF – Capital Component, representing 50% of the capital cost
- irrigators will fund $31.05 million (25%) through the sale of water entitlements
- the Tasmanian Government will fund the balance of $31.05 million (25%) representing the balance of the total capital cost including land and project feasibility costs.

Sensitivity testing using the economic model of the proposed SWISA project shows that the economic NPV (or net economic benefit) of the scheme is positive for all 11 scenarios examined for both the P50 and P90 project cost estimates. Moreover, sensitivity testing of a combination of unfavourable assumptions – 10% increase in capital and operating costs, a 10% reduction in net farm margins and Slow Demand Uptake – resulted in a net economic benefit estimated at $54.98 million with a BCR of 1.39 assuming the P90 estimate and $65.77 million and a BCR of 1.51 with the P50 estimate.

This shows that the project is likely to remain economically viable even if there is a large unfavourable movement in key parameters (such as capital development costs, operating costs, crop margins, and demand up-take rate) impacting the economic performance of the scheme.

7.3 Economic benefits

7.3.1 Sassafras Wesley Vale Irrigation Scheme Augmentation

The economic benefits of the SWISA are significant and represent a strong rationale for government support of the project.

The details of the economic benefits are presented in Section 5.

In summary, we note that:

- under central case assumptions, the SWISA project generates an expected benefit to the community of

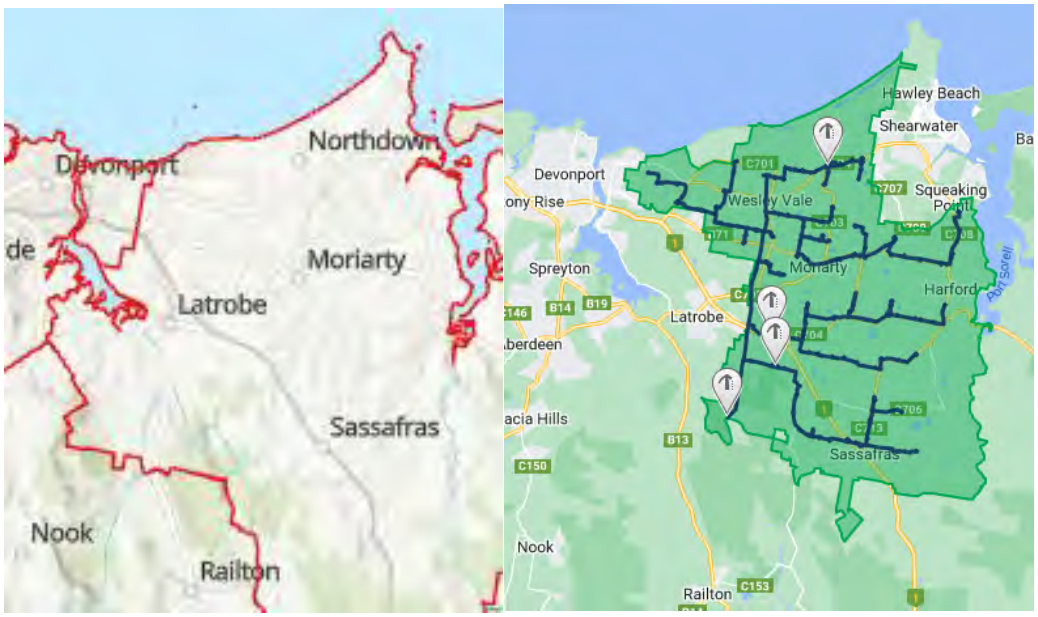
$113.14 million (economic NPV) and a benefit cost ratio (BCR) of 1.96 under the P50 estimate and $103.33 million and a BCR of 1.81 for the P90 estimate

- the expected economic benefit remains high ($89.66 million with a BCR of 1.76 under the P50 estimate) even if the net margins are reduced to 90% of the values assumed under the central case conditions
- slower than expected up-take by growers is estimated to have only a small impact on the level of economic benefits generated, reducing the net benefit to $99.96 million under the Slow Demand Up-take scenario.

7.4 Regional development / social impacts

The SWISA is situated across the Devonport and Latrobe City Councils (refer Figure 16).

Figure 16: Scheme and Council boundaries



Under the proposal, additional water will be supplied to agricultural land in the two municipalities. The direct benefits are expected to flow mainly to the local population centres of Devonport, Latrobe, Moriarty, Sassafras, Wesley Vale, Port Sorell, and the Northwest Coast region more generally. Primary production is an important economic driver for the wider Northwest region.

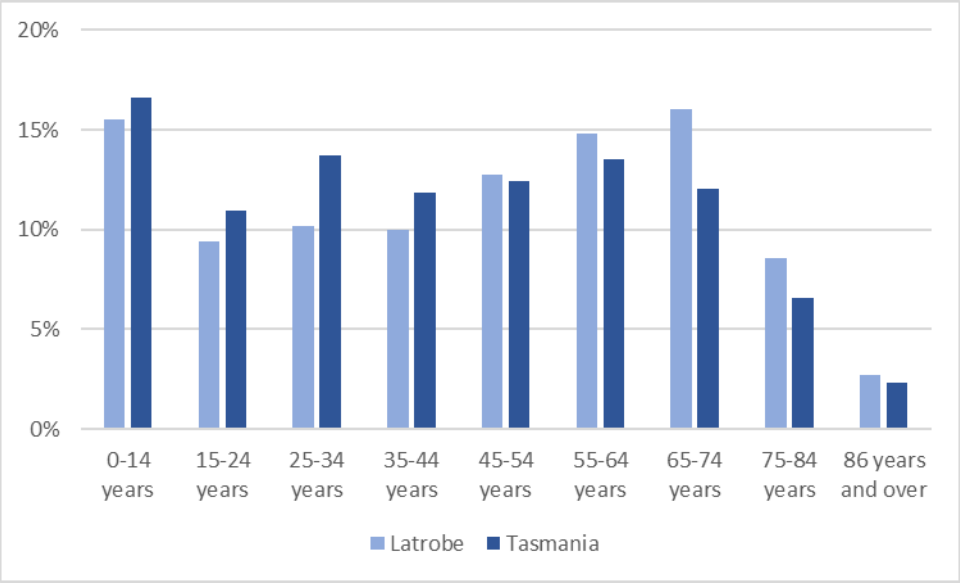
The project will complement other existing schemes in the region, including the Don scheme currently under construction, the Dial Blythe, and the Kindred North Motton Schemes.

The opportunity to provide a significant project providing employment through the creation of up to 210 new jobs (direct and indirect) once fully operational and growth opportunities for the expansion and diversification of local enterprises is also highlighted as key social benefits from investment in the scheme.

7.4.1 Demographic profile

The 2021 census indicated the population of the Latrobe LGA was 12,420, or 2.2% of the Tasmanian population. Figure 17 indicates the age distribution profile for the scheme area[48] compared to Tasmania as a whole. The region has a higher proportion of people aged over 65, with 27% of the population aged 65 and over, compared with 21% for Tasmania. This is also reflected with a lower proportion of working age peoples, with 32.9% of the population in prime working age (24-54), compared with 38.0% for Tasmania.

Figure 17: Population distribution



Source: *Marsden Jacob analysis of Census 2021.*

Note: scheme area refers to census area Latrobe LGA.

Broad demographic profile

The demographic profile for the scheme area's regional economy is set out in Table 31. The area is characterised by a low population density, and long-term trends for younger people to move out of the region to find employment. The median age of residents is 49, significantly higher than the median age of 42 for Tasmanian residents. Labour force participation (54.5%) is lower than for the State as a whole (58.2%). However, the unemployment rate (4.2%) is lower than the unemployment rate for the State overall (5.9%) which is similar above that for Australia (5.1%). Median weekly household income ($1,256) in the study region is lower than for the State as a whole ($1,358).

[48] Scheme area defined as ABS boundary Latrobe LGA

Table 31: Demographic profile – Scheme area regional economy

	Scheme area	Tasmania
Population	12,420	557,571
Median age of persons (years)	49	42
Labour force participation (% of population over 15)	54.5%	58.2%
Unemployment rate	4.2%	5.9%
Median individual income (weekly)	$645	$701
Median household income (weekly)	$1,256	$1,358
Highest year of education Year 12 or below	47.9%	43.6%

Source: *ABS Census of Population and Housing, 2021.*

Economic profile

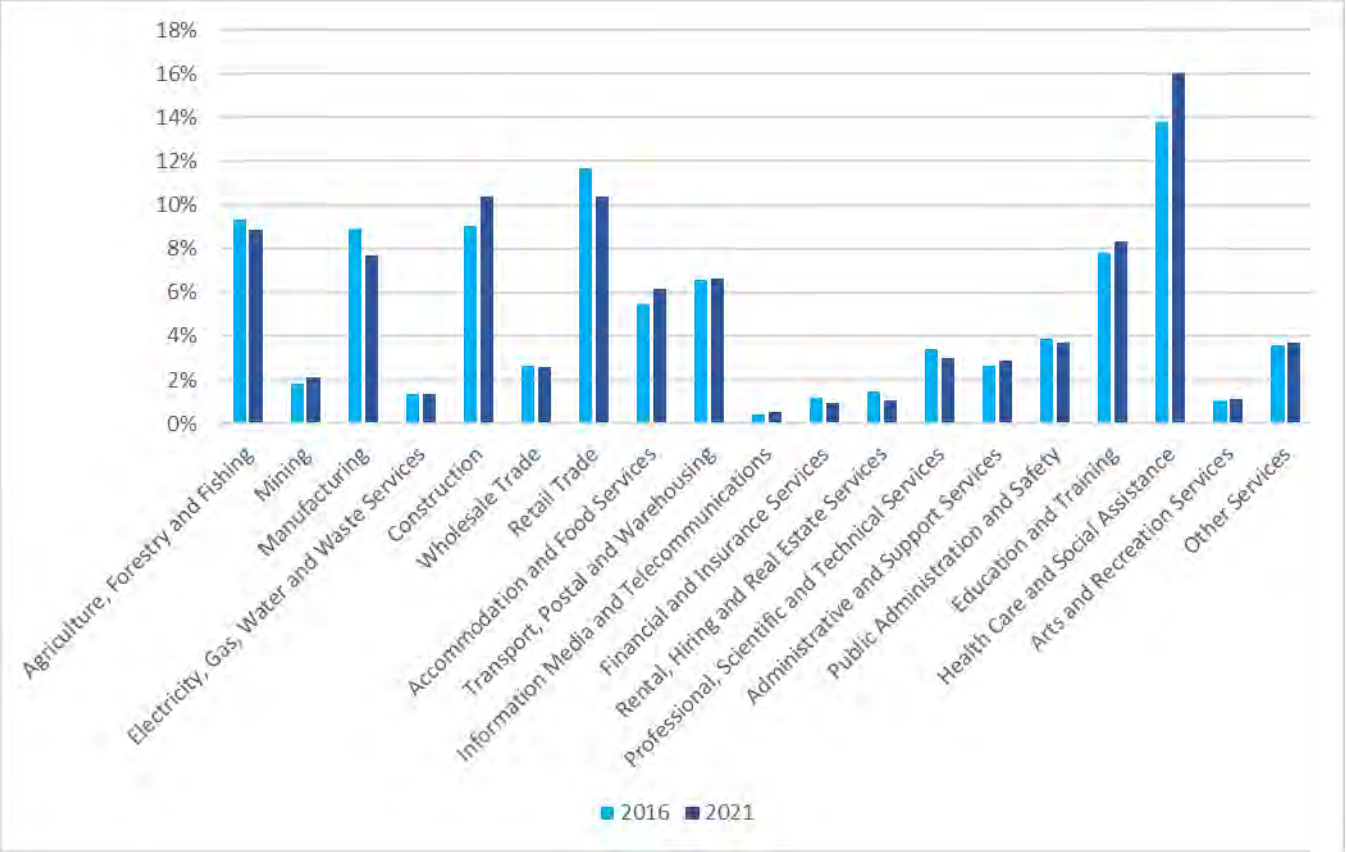
Table 32 shows that 484 of the region's population were employed in the agriculture, forestry, and fishing sector at the time of the 2021 census. This represents 8.8% of regional employment, which is higher than the 5.3% for Tasmania as a whole.

Most sectors reported higher (and in many cases) significantly higher employment levels compared with the 2016 Census figures. Overall, employment was 22.2% higher in the LGA than in 2016. Large increases were reported for the health care and social assistance sector, the mining sector, and the construction sector since the 2016 Census (refer Figure 18). Health care and social assistance (16.0%) is the major employer in Latrobe, with retail trade and construction also major employers (both 10.4%). As employment in agriculture, forestry and fishing increased by less than the LGA's average, the proportion employed in the sector declined slightly.

Table 32: Employment in agriculture, forestry, and fisheries

	Scheme area	Tasmania	Scheme area as % of Tasmania
Population	12,420	557,571	2.23%
Total employment	5,479	254,722	2.15%
Employment in agriculture, forestry and fishing	484	13,422	3.61%

Figure 18: Employment by industry – Scheme area regional economy



Source: *Marsden Jacob analysis of ABS Data by Region.*

7.5 Regional development and social benefits

7.5.1 Stimulus to the regional economy

A key strength of the proposed SWISA will be the social benefits and improvements in community morale because of the stimulus to the regional economy directly attributed to the scheme.

Based on the crop mix and water use assumptions outlined previously, the 9,200 ML of additional summer water from the proposed SWISA would facilitate an additional 2,400 ha of irrigated cropping and pasture and provide augmented irrigation to a further 1,000 ha of existing vegetable production.

Based on the farm surveys undertaken by Pinion Advisory, the direct on-farm employment impacts are estimated at up to 46 additional full-time positions being created once the SWISA is fully developed.

However, evidence from surveys commissioned by Tasmanian Irrigation in 2020 undertaken for five Tranche 1 schemes indicate that this estimate is likely to be on the low side. Survey outcomes for the five schemes indicated that introduction of the secure irrigation water has led to an average increase in direct employment of around 1 FTE for every 65 ML of entitlement. Based on this estimate of 65 ML/EFT and applying this to the 9,200 ML of additional summer water available from

SWISA results in an estimate for direct employment of 140 FTEs for the SWISA operating at full capacity. Given the intensive nature of SWISA compared to some of the schemes covered by the survey (e.g., Midlands Water Scheme and South Esk and Upper Ringarooma Irrigation Schemes) which have more extensive, pasture-based enterprises, the employment impacts could be considered conservative.

These estimates do not take account of the increase in employment by firms providing contracting services to farms involved or to those involved in packing and processing additional farm output. Much of this work has a relatively high labour requirement.

Based on an employment multiplier of 1.5 the total additional employment generated by the scheme could be in the order of 210 FTEs (140 direct and 70 indirect). This equates to an increase in annual wages and salaries of around $14.70 million for workers in the study region (based on an assumed average of $70,000 per employee).

Table 33: Direct and indirect employment impacts – operational phase

	Demand (ML)	Incremental irrigation area (ha)	Direct employment (FTE)	Indirect employment [1] (FTE)	Total employment (FTE)
SWISA (Summer water)	9,200	2,400 ha new 1,000 ha augmented	140	70	210

Source: Marsden Jacob estimate.

Notes:

1. *Based on an employment multiplier of 1.5.*

The scheme would also provide significant construction benefits to the regional economy, not only during the construction period of the project, but also from the on-farm investment. During construction, the project would involve up to 60 additional FTEs over the 36-month planning, design, approvals, and construction period, providing an important stimulus to the regional economy. Based on experience from other similar schemes constructed by Tasmanian Irrigation, most of the additional employment would be sourced regionally.

The additional on-farm investment is estimated by Pinion Advisory at around $61.31 million with a further $19.23 million in the purchase of summer water entitlements and $11.82 million in winter entitlements. Total farm expenditure including entitlements is therefore estimated at $92.36 million which is equivalent to around 82% of the actual P50 construction cost of the scheme (74% of the P90 cost) and would involve an employment stimulus during the on-farm development period additional to the numbers outlined previously.

A recent survey of five Tranche 1 schemes undertaken by Marsden Jacob for Tasmanian Irrigation found significant economic returns to local communities at all stages of the schemes. The total on-farm investment amounted to $204 million across all five schemes, nearly double the value estimated in the business cases of $127 million. Among the 219 respondents, 379 FTE positions have been created following development of the irrigation schemes. Adjusting this figure to the five schemes for full scheme development gives a total of 842 FTE jobs. The Business Cases for the five

schemes predicted 325 jobs. These results highlight the major economic advantage of providing water security to the region and that the economic benefit will likely be considerably greater than the conservative estimates used in the business case (refer Box 1).

These findings support an earlier independent review undertaken by Aither of the Midlands, Whitemore, and Sassafras Wesley Vale Schemes. Aither concluded that there were significant economic returns to local communities at all stages of the schemes in an independent review of three Tranche 1 schemes (refer Box 2).

Box 1: Irrigator survey – review of regional impacts of five Tranche 1 schemes

Marsden Jacob completed a subsequent survey of 219 irrigators across five Tranche One schemes to further investigate the actual benefits and economic impacts of the schemes and compare these findings with the returns forecast in the respective Business Cases.

The initial schemes studied include Upper Ringarooma and Kindred North Motton followed by South Esk, Midlands and South-East Stage 3 in the second round of surveys. These schemes had been operational for between six and eight years. The survey was completed by 219 participants with a 71% response rate covering 50% of entitlements as a percentage of entitlements sold.

The survey found over 80% of irrigators found the scheme beneficial to farming operations. Around 90% of respondents stated the scheme was beneficial to improving water security, reducing farming risk and increasing the ability to diversify enterprises.

From a regional benefit perspective, most respondents stated the improvement to water security (96%) was the most important benefit brought to the region by the scheme. Other important regional benefits include:

- Increased ability for enterprise diversification (88%);
- Improved farm profitability (84%);
- Assisted in retaining populations in the regions (60%);
- Assisted in retaining community and rural services (59%);
- Improved access to services (50%); and
- Improved a sense of community well-being (55%)

The review found significant economic returns to local communities at all stages of the schemes. Average additional on-farm expenditure for respondents of five schemes of Tranche One was estimated to be $4,272/ML. The investment was predominantly spent on irrigation infrastructure (39%) followed by plant and buildings (24% and farm equipment (17%). The total on-farm investment amounted to $204 million across all five schemes, nearly double the value estimated in the business case of $127 million.

The development of the irrigation schemes can be demonstrated to have directly led to a significant increase in the number of Full Time Equivalent (FTE) jobs on-farm. It was determined that best estimates suggest that the observed direct and indirect jobs created by the five schemes investigated have been 59% percent higher than forecast in individual business cases.

In total, across the 219 respondents, 379 FTE positions have been created on-farm following the development of the irrigation schemes. Adjusting this figure to the five schemes for full scheme development gives a total of 842 FTE jobs. The Business Cases for the five schemes predicted 325 jobs.

Each of these projects constitutes a significant investment in the surrounding areas serviced by the schemes and within the context of the Tasmanian economy more broadly. These results highlight the major economic advantage of providing water security to the region and that the economic benefit will likely be considerably greater than the conservative estimates used in the business case.

Source: Marsden Jacob, 2020

Box 2: Independent review of regional impacts of three Tranche 1 schemes

The precedent of the outcomes of Tranche One have been documented in an independent review by Aither commissioned by Tasmanian Irrigation to investigate the actual benefits and economic impacts of three irrigation schemes developed under Tranche One and compare these findings with the returns forecast in the respective Business Cases.

The schemes studied include Midlands, Whitemore, and Sassafras Wesley Vale. These schemes had been operational for between two and four years. The review entailed 66 surveys and nine detailed interviews.

The review found significant economic returns to local communities at all stages of the schemes. Average additional on-farm expenditure for respondents of three schemes of Tranche One was estimated to be $110,000. These expenses included new machinery, new irrigation infrastructure and land development costs. Extrapolated up to the total number of water entitlement holders in the three schemes would mean the additional on-farm expenditure was in the order of $30 million.

The development of the irrigation schemes can be demonstrated to have directly led to a significant increase in the number of Full Time Equivalent (FTE) jobs on-farm. It was determined that best estimates suggest that the observed direct and indirect jobs created by the three schemes investigated have been 86 percent higher than forecast in individual business cases.

In total, across the 66 respondents, an additional 31.7 FTE positions have been created on-farm following development of the irrigation schemes. Extrapolating this figure to the three schemes in their entirety gives a total of 183 additional direct jobs. The Business Cases for the three schemes predicted 73 direct jobs. Additionally, indirect jobs observed for the respondents alone were 42.35 FTE compared with the predicted 36.5 FTE for the schemes in their entirety.

Each of these projects constitutes a significant investment in the surrounding areas serviced by the schemes and within the context of the Tasmanian economy more broadly.

Source: Aither 2016, Review of Tasmanian Irrigation Schemes

In summary, the social benefits from the project are likely to be significant, with the development expected to provide a strong stimulus to the economy of the smaller centres Latrobe, Moriarty, Sassafras, Wesley vale, and Port Sorell and to the larger centre of Devonport through increased demand for agricultural inputs and downstream packing and processing.

These factors will help improve the vibrancy of the local communities. In addition, the project would help realise the full potential of the region and reduce the vulnerability of the local economy to the effects of low rainfall periods.

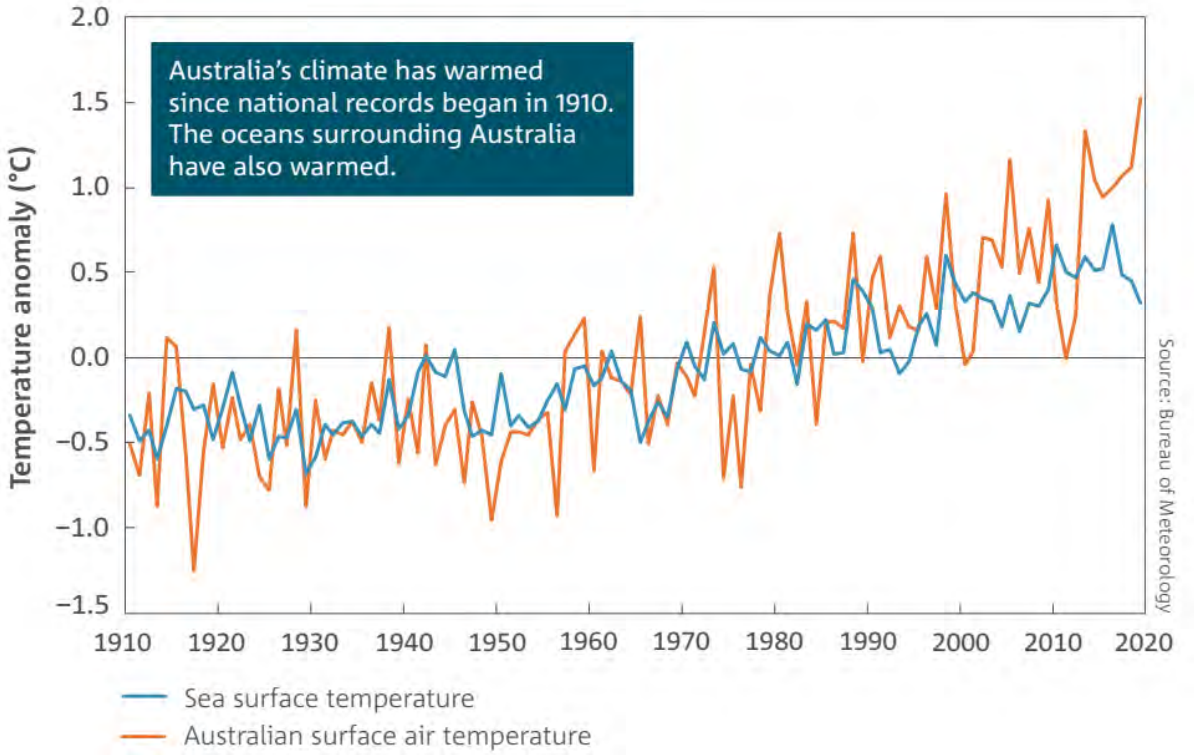
7.5.2 Drought security

The proposed SWISA will result in a substantial improvement in the underlying security of the available water resource in the region and therefore provide additional social benefits related to the reduction in financial pressure placed on farmers during periods of low water availability. Importantly, the level of expenditure in the local economy by farmers will become less affected by shortfalls (i.e., due to their improved capacity to maintain production levels). Consequently, the regional economy, and employment levels, will become less prone to downturn during periods when irrigation water is not normally available.

7.5.3 Climate change adaptation

Australia has always had a variable climate – it is a land of droughts and flooding rain. There is now overwhelming scientific agreement that climate change is occurring. Australia's climate has warmed on average by 1.44 ± 0.24 °C since national records began in 1910, leading to an increase in the frequency of extreme heat events.

Figure 19: Australia's climate has warmed



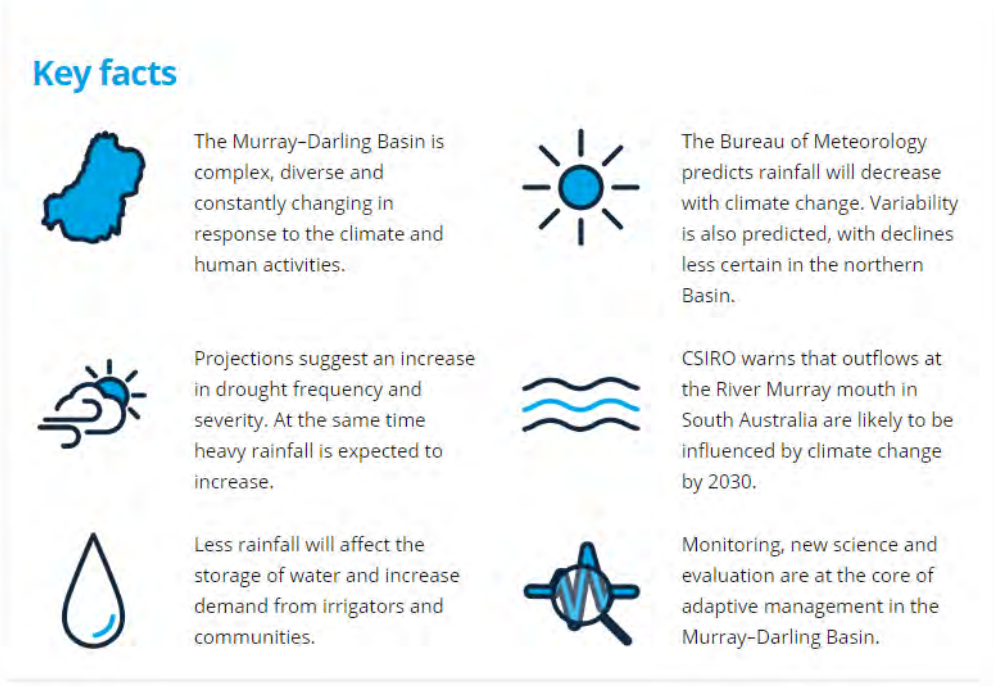
Source: *http://www.bom.gov.au/state-of-the-climate/documents/State-of-the-Climate-2020.pdf*

These changes in global and regional climate patterns will have significant impacts on both temperature (see Figure 21) and water availability for both communities and the environment across the Murray–Darling Basin and across Australia more broadly and while many of its effects are uncertain and the timeframes are unclear some are already starting to present.

For instance, where the Murray-Darling Basin is concerned the MDBA has identified that climate change will affect economic, social, and environmental outcomes. The MDBA based on research by CSIRO has identified that climate change is going to drive a geographic shift in sectors such as irrigation and agriculture across Australia, because:

- climate change will significantly impact both rainfall and yields from river system and dams.
- climate change will increase temperatures affecting the viability of different some crops that are can be particularly temperature sensitive.

Figure 20: Key facts on the impact of climate change, MDBA



Source: *Murray-Darling Basin Authority https://www.mdba.gov.au/basin-plan-roll-out/climate-change*

Figure 21: Annual mean temperature anomaly for the Murray-Darling Basin (1910 to 2018)

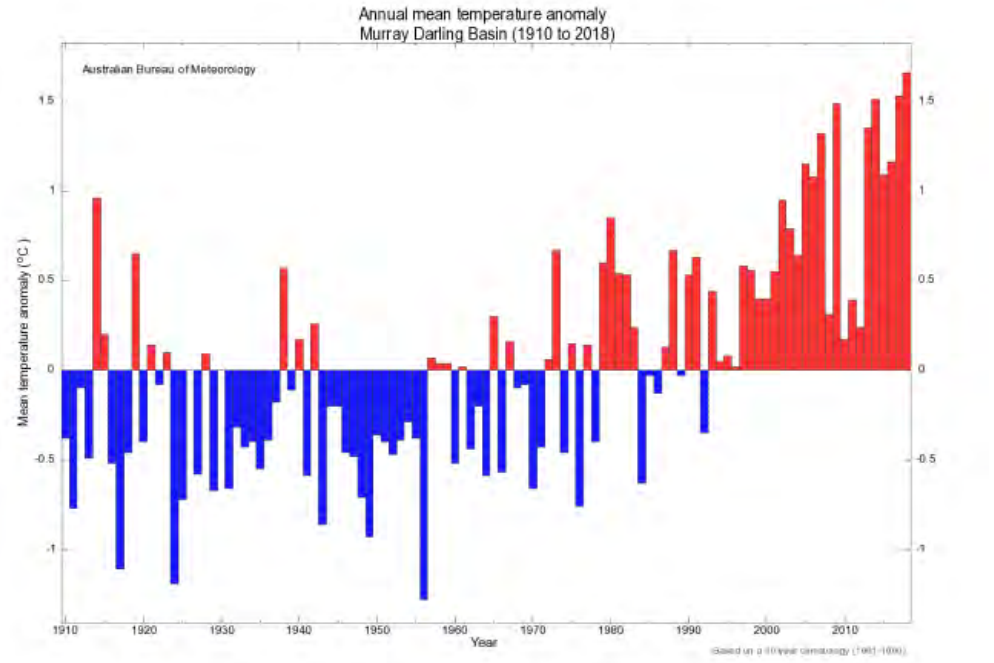


Figure 2: Annual mean temperature anomaly for the Murray–Darling Basin (1910 to 2018) (BOM, 2018)

Source: *Bureau of Meteorology, 2018*

The MDBA further states that climate change is expected to increase production risks to agriculture, through reduced water availability, higher evapotranspiration, and higher temperatures. Agricultural industries have been adapting to these risks through changes in business and operating models. Highly water-dependent industries (e.g., irrigation industries) are also adapting to the reality of less water and will continue to do so.

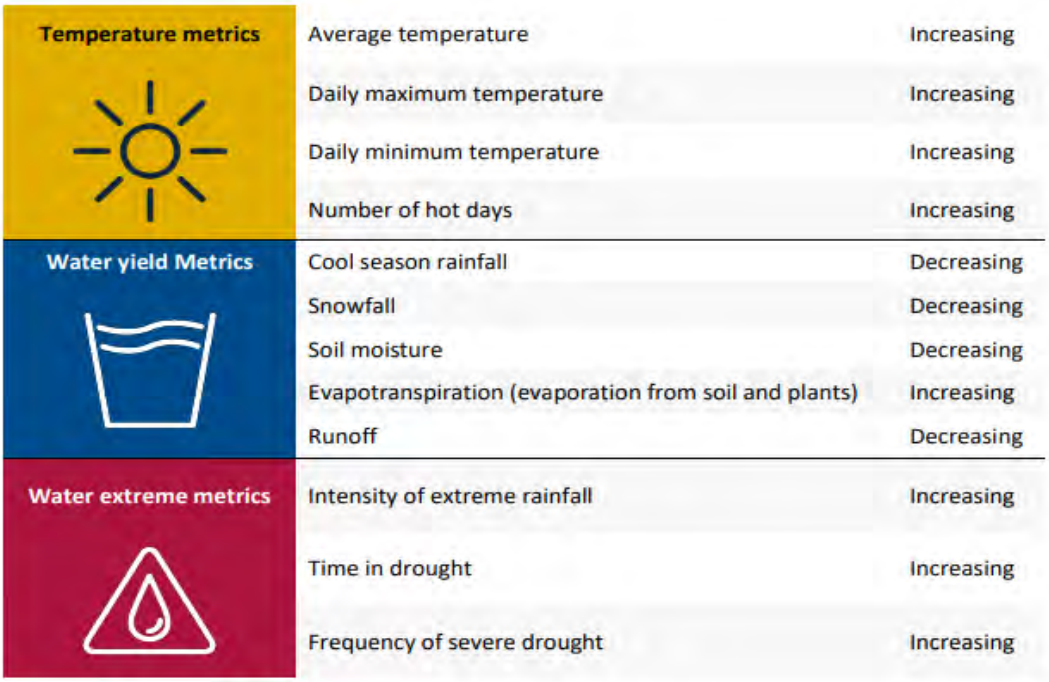
The MDBA comments that responses by irrigators to future climate changes include:

- change of crop types such as a:
  - shift to more drought tolerant or water efficient varieties,
  - spatial shift in where crops are grown, and
  - reduction in total permanent plantings and an increase in annual crops under a future of reduced water availability. Annual crops allow for greater inter-annual flexibility in water use because perennial plantings require water every year. The shift to annual crops could be substantially more if the current irrigation footprint is maintained.
- possible shift in the irrigation season from summer to autumn/spring – such changes have already been observed in the southern basin dairy industry; and
- reduction in both annual and permanent crop types under the more severe climate change scenarios that see substantial reductions in water availability (MDBA, 2019, page 10).

Over the past decade, several studies have applied global climate models to identify potential changes in the Basin's climate and estimate the scale of potential impacts on water availability. Two such investigations, the Murray–Darling Basin Sustainable Yields (MDBSY) project and the South Eastern Australian Climate Initiative (SEACI), both found a greater likelihood of declining rainfall at the basin-scale, and that water availability in the southern basin would continue to decline.

The MDBSY study projected the average volume of available surface water could decline 11% by 2030 under the median climate scenario. Subsequent projections by SEACI found a 1°C increase in the mean global temperature (by 2030) could lead to changes in mean annual runoff by between –2 and –22% in the southern Basin, and –29 and +12% in the northern Basin (CSIRO, 2010, 2012).

Figure 22: Synthesis of trends associated with climate change impacts in the Murray-Darling Basin (MDBA 2019)



Work under the Climate Change in Australia initiative indicates the Australian climate will experience longer dry periods and more severe droughts (comprising more frequent and intense heat waves) in the future.

7.5.4 Impacts on irrigated agriculture are already emerging

Recent evidence is that climate change is affect both horticultural and viticultural crops across southern and western Australia.[49]

In the Murray–Darling Basin, more than three quarters of the long-term streamflow gauges show a declining trend since records began in 1970. This is more severe in the northern Basin where 94 per cent of the gauges show a declining trend in streamflow. In the northern Basin catchments, where these trends are strongly evident, there are statistically significant declining trends in the headwaters, including the Namoi, Condamine–Culgoa and Gwydir River catchments. In the Murrumbidgee, Lachlan, Goulburn, and Loddon River catchments of the southern Basin, more than three quarters of the streamflow gauges show declining trends; these trends are statistically significant in one third of these gauging stations. In the Darling River region, declining trends were observed in all 19 streamflow gauges, of which half show a statistically significant declining trend.

In Western Australia, cherry growers are needing to both change farming practices and are trialing both low-chill varieties and chemical stimulants that emulate the effects of a chill to help the trees break dormancy.

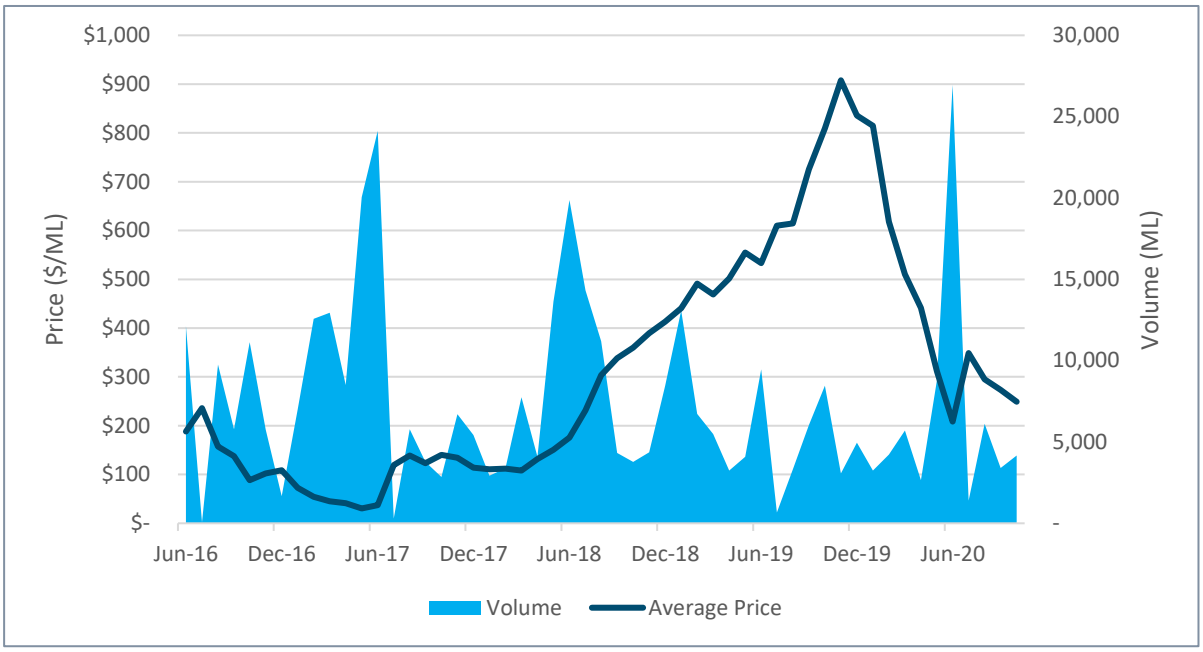
In South Australia, winemakers are finding that hotter and drier summers mean that they must harvest grapes considerably earlier resulting in riper wines with higher alcohol content. Producers are concerned that this compression of the vintage is going to affect both the taste and style of wines.

To adapt to climate change, growers are implementing several different strategies, including:

- trialing approaches to manage the higher alcohol content in the winemaking process
- using water to cool the plant during heatwaves, but this is expensive particularly when water is scarce, and the spot price of water is typically higher (often over $400 per ML) during dry periods (see Figure 23)
- switching to grape varieties or crop types that are better able to tolerate the heat.

[49] http://www.bom.gov.au/state-of-the-climate/documents/State-of-the-Climate-2020.pdf

Figure 23: Temporary water price, SA Murray



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It is not possible to quantify the impact that this will have on commodity prices, but the reduced supply from the MDB will have a long-term impact on crop production, improving the viability of irrigation in other parts of Australia. Expansion of irrigation in north Queensland, north-west Australia (Ord irrigation region) and Tasmania may occur in response to the contraction of irrigation in the MDB.

There is no firm framework for building this type of adaptation to climate change into the assessment of the SWISA scheme. Moreover, the uncertainty regarding the extent of the reduction in agricultural output from the MDB complicates the analysis of the appropriate strategic response by government. In practical terms, there is scope for greater demand capacity to be met in the future, from new water infrastructure in Tasmania, given that the impact of climate change could enhance the viability of irrigation in the State.

Lessons can be learnt from the Basin Plan process which is currently being implemented. The Basin Plan has been developed to ensure climate variability and climate change is considered in real-time, and climate change patterns, measured over decades, are considered through regular reviews. To specifically address climate change, regular (10-yearly reviews) of the Basin Plan are undertaken, which allow for emerging climate change patterns to be considered.[50]

Given the need for water supply infrastructure to support this shift in the location of irrigated agriculture, there is a direct role for government in facilitating economically viable water infrastructure developments.

[50] https://www.mdba.gov.au/basin-plan-roll-out/climate-change

7.6 Securing water supply for economic development

The Murray-Darling Basin is already changing because of climate change. The MDBA released a discussion paper on this very issue *Climate change and the Murray–Darling Basin Plan* (February 2019), which identifies that:

- temperatures are increasing
- droughts are occurring more often; and
- the volume of inflows into the Murray-Darling Basin have decreased over the last 20 years.

The Australian Government has attached a very high priority to climate change adaptation, particularly in sectors such as irrigation and agriculture, which could be significantly impacted by the effects of climate change on rainfall and yields from river systems and dams.

Climate change is likely to result in a geographic shift in irrigation in Australia due to the declining system yields from the MDB, where most of Australia's irrigated crops are grown. Moreover, any reduction in sustainable diversion limits (SDLs) designed to improve environmental values within the basin because of the Murray Darling Basin Plan will reinforce such geographic shifts in irrigation.

It is not possible to quantify the impact that this will have on commodity prices, but the reduced supply from the MDB will have a long-term impact on horticultural prices, improving the viability of irrigation in other parts of Australia. Expansion of irrigation in north Queensland, north-west Australia (Ord irrigation region) and Tasmania may occur in response to the contraction of irrigation in the MDB.

There is no firm framework for building this type of adaptation to climate change into the assessment of the SWISA scheme. Moreover, the uncertainty regarding the extent of the reduction in agricultural output from the MDB complicates the analysis of the appropriate strategic response by government.

In practical terms, there are strong grounds for being optimistic about future demands for water from new water infrastructure in Tasmania, given that the impact of climate change could enhance the viability of irrigation in the State.

Recent research by the Tasmanian Institute of Agriculture indicated the impact of climate change is likely to result in warmer atmospheric temperatures, reduced frost risk and rainfall will remain relatively stable, and is predicted to have a positive impact on increasing the accumulation of growing day degrees and decrease the incidence and severity of frost. Overall, horticulture, cropping and pastoral based industries should see increased productivity provided the right agronomy package is adopted and this includes varietal selection (likely to be longer maturity types with a lower vernalisation requirement), increased nutrient applications to facilitate the higher potential yields. Irrigation will continue to play a critical role such that the ability to access high surety good quality water supply is essential.

Given the need for water supply infrastructure to support this shift in the location of irrigated agriculture, there is a direct role for government in facilitating economically viable water infrastructure developments.

7.7 Project Impacts

The project will have several minor impacts, including social and environmental impacts, and potential impacts on cultural heritage and Aboriginal relics. The mitigation strategies and stakeholder consultation processes developed by Tasmanian Irrigation are suitable for the purpose of avoiding the impacts where possible and mitigating the impacts in areas where they cannot be avoided.

7.8 Project risks

Project risks have been documented in detail for this report. Risks are presented in sub-categories under each of the major categories, which comprise: Occupational Health & Safety, Environment & Heritage Compliance, Financial & Economic Viability, Social Licence, Project Implementation, and Scheme Operations.

Tasmanian Irrigation is expected to be able to obtain all environmental and planning approvals. At this juncture, there are no major unmanageable financial and economic risks remaining after mitigation strategies have been applied.

Table 34 provides a summary of the major risks identified, where major is defined as being those risks where the Net Risk rating remains High or Extreme post-mitigation actions proposed. Attachment 1 contains the Risk Assessment for the SWISA.

Table 34: Risk Assessment Summary

Risk Category / Detailed Risk	Gross Risk Profile (Consequence/ Likelihood/ Rating)	Mitigation Action	Net Risk Profile (Consequence/ Likelihood/ Rating)
Occupational Health & Safety			
1.3 Commissioning and Initial Operations: Major injury or death	Catastrophic / Possible / High	Observing TI's OH&S Guidelines Ensuring adequate measures are adopted during tender selection process & ensuring that contractor's OH&S procedures are in place as part of the tender process Tenderers are required to have Federal Safety Accreditation Appointment of OH&S Manager for TI and maintenance of certified management system including KPIs Review, reporting & auditing of OH&S practices	Catastrophic / unlikely / High
Financial & Economic Viability			
3.7 Capital expenditure exceeds budget (post commercial close)	Major / Likely / High	Sensitivity testing in Business Case demonstrates that project remains economic at higher CAPEX but increases risk of not receiving full Government funding post-business case External Independent review of Capital estimates and constructability issues at Concept, business case and detailed design. This is to specifically ensure Construction Tenders are received under budget. Detailed estimates included in Concept Design Risk based approach to setting contingency. TI has historic experience in delivering similar projects. Early negotiation with landowners, pipe, and other major component suppliers	Major / Possible / High

Risk Category / Detailed Risk	Gross Risk Profile (Consequence/ Likelihood/ Rating)	Mitigation Action	Net Risk Profile (Consequence/ Likelihood/ Rating)
		TI's contract selection and management including de risking project from Construction contractor's perspective. A risk & opportunities assessment to establish contingency	
3. 4 Change in catchment operating conditions/structures by Hydro Tasmania that reduce supply reliability during potential dam safety upgrade works	Major / Likely / High	Implementation and management of contractual operating arrangements with Hydro Tasmania and DNRET Maintain communication pathways with all levels of government to ensure they understand the value of irrigation water	Major / Possible / High
3.10 Significant increase in energy costs	Significant / Possible / High	Sensitivity testing as part of economic assessment demonstrates that project can withstand significant increase in real energy prices, even from outset of the scheme's operations Ensure alternative energy supplies are investigated Examining economic merits of installing renewable energy for the Sassafras Booster PS Opportunities to optimise pumping reducing costs to irrigators	Significant / Possible / High

Risk Category / Detailed Risk	Gross Risk Profile (Consequence/ Likelihood/ Rating)	Mitigation Action	Net Risk Profile (Consequence/ Likelihood/ Rating)
Project Implementation			
5.1 Inability to attract competitive bids due to heated market conditions	Major / Possible / High	Engagement with contracting community to properly manage risks within the project Enhance/maintain position of contracting entity of choice within the Tasmanian market	Major / Possible / High

Risk Category / Detailed Risk	Gross Risk Profile (Consequence/ Likelihood/ Rating)	Mitigation Action	Net Risk Profile (Consequence/ Likelihood/ Rating)
		Early engagement with the contractor market	
5.3 EPBC referral: Delays in government approval	Major / Likely / Extreme	Detailed surveying using appropriately qualified consultants Good stakeholder & regulator communication EPBC referral mandatory under TI procedures Early advice sought regarding the overlap with the Midlands Water Scheme Strategic Assessment area. This advice has been shared and discussed with relevant State and Federal Government departments Plan for approval timelines and processes and previous mitigation strategies	Major / Possible / High
5.11 Availability of supply of large diameter HDPE pipe causing schedule delays due to Tasmanian company only having one production line to manufacture most of the pipe for the scheme	Major / Likely / High	Early engagement with a preferred pool of suppliers Maintain awareness within supplier market of both impending scheme and timing Early ordering of pipe within the design period to allow pipe to be manufactured prior to construction commencing Engage several suppliers to ensure supply is spread and delays are mitigated	Major / Possible / High

Source: Tasmanian Irrigation, November 2022, Risk Assessment.

7.9 Assessment against funding priorities and policy initiatives

The key assessment criteria in respect of funding priorities are those specified under the Australian Government's National Water Infrastructure Development Fund – Capital Component, Water for the Future Fund, and the broad criteria under Clause 69 of the National Water Initiative (NWI). The performance of the project is assessed against these criteria in Table 35. In addition, it is very important that the project aligns with the overall charter for Tasmanian Irrigation; Table 35 therefore also documents performance of the project against the key pillars of Tasmanian Irrigation's Charter. A detailed assessment against the criteria incorporated in the National Partnership Agreement on Water for the future is provided in Attachment 4.

Table 35: Performance of the SWISA against governmental priorities (Water for the Future Fund, NWI criteria, and Tasmanian Irrigation Charter)

Assessment criteria	Project performance against criterion	Business Case Reference
NWIDF Criteria		
1) Proposed project involves construction of permanent water infrastructure that will increase supply and access to water	The preferred option for the SWISA incorporates pumping from the Mersey River via the Great Bend pump station up to a balance tank located on Saggers Hill. From there water will flow via gravity throughout the distribution network apart from the Sassafras zone which will be supplied via booster pump station located on the main trunk main. Water distributed from the Saggers Hill Balance Tank will be supplied over a 150-day season at a flow rate of 92 ML/day flow rate. The scheme has been designed to maximise the ability for trading to occur throughout the scheme with water released from balance tank feeding the ring main distribution network. A booster pump station supplies water to the Sassafras zone which accounts for around 10% of the total scheme volume. The total P90 value of the works is estimated at $124.19 million ($112.90 million P50) and will be delivered within a three-year planning, approvals and construction period, with the first full operation season commencing October 2026. Demand for the scheme is coming off the back of the existing SWIS scheme constructed in 2010 with demand being confirmed through Tasmanian Irrigation conducting a formal EoI process in September 2019 with Water Sales being completed by August 2022. Both processes indicated strong demand and likelihood of rapid uptake of summer water once the scheme was commissioned. The results of the Water Sales process conducted by Tasmanian Irrigation confirmed the very strong demand with around 65% of the total scheme entitlements being contractually committed to prior to commencement of the business case. This reflects the limited water supply alternatives in the region, the lack of security associated with those supplies, infrastructure constraints with the existing system that impact on the ability to trade water across the scheme, and the extensive areas of irrigable soils that are suitable for irrigation of high value vegetables, prime lambs, stone fruit and other horticultural and broadacre crops.	Sections 1 and 2
2) Proposed project will be compliant with the National Water Initiative	**Effective water planning:** Water entitlements based on sustainable yields and water extraction models over 100 years with 95% reliability set for scheme source water. Dependent ecosystems have been identified and e-flows set that inform cease to take volumes for future licences issued in Tasmanian Irrigation catchments.	Section 6

Assessment criteria	Project performance against criterion	Business Case Reference
	Secure water entitlements: Secure and permanent and transferable water rights are established under the Tasmanian Irrigation framework supported by publicly available registers and annual reporting and accounting of water use to government. **Future water availability:** sustainable yield modelling ensures that future allocations will be available allowing for environmental allocations. **Open markets:** Trading rules and trading zones are established at the outset of the scheme allowing temporary and permanent trades to occur within physical constraints of the system. Tasmanian Irrigation's established management practices ensure that trades can occur with minimal transactions costs and time. Environmental water and existing licences are recognised and protected. **Effective water resource accounting:** Definitive volumes achieved through the water sales process instigated by Tasmanian Irrigation informs and ensures a efficient scheme design and allows real-time data regarding extraction and delivery volumes meaning that all water is metered. Tasmanian Irrigation has well established water entitlement and trade registers in place. Cooperative management with regulators in shared waterways enables effective accounting of environmental water including water licences, watercourse authorities and estimation of transmission losses. **Policy setting facilitating efficiency and innovation:** Farm Water Access Plans monitor and guide application of irrigation water with farmers adopting latest irrigation technologies including centre pivots, drip and tape depending on the enterprise being irrigated. Tasmanian Irrigation cooperates with regulators to ensure efficient and effective management of the water resource. **Best practice water pricing and institutional arrangements:** Water pricing is based on two-part tariff principles which identify the value of water delivered with no averaging of short run costs between users. Auctions are held for unallocated water post-scheme commissioning and trading of water is encouraged with efficient registers and systems in place to facilitate an open water market. The future refurbishment of scheme assets is incorporated in the derivation of fixed charge to ensure that the scheme is financially sustainable long term.	
3) Proposed project will be of public benefit	The economic modelling of the $112.90 million scheme (P50 estimate) demonstrates a strong case for public funding with a net present value (NPV) of $113.14 million, a benefit cost ratio of 1.96, internal rate of return (IRR) of 12.8% ($103.33 million NPV, 1.81 BCR and 12.0% IRR for the P90 estimate) and the creation of up to 60	Sections 5, 7 and 8

Assessment criteria	Project performance against criterion	Business Case Reference
	positions during the 24-month construction period, and up to 140 direct and 70 indirect full-time employment positions once fully operational. The private on-farm investment undertaken by farmers taking up entitlements is estimated at around $61.31 million, excluding the cost of water entitlements which is equivalent to around 54% of the total capital expenditure required for the scheme. Including the cost of entitlements increases the percentage to around 82% of the P50 cost of the scheme. The SWISA provides the basis for an ongoing stimulus to the region, building on its diverse agricultural attributes – both physical and human. It provides the foundation for continued development of high value viticulture and horticulture in the region as well as broadacre cropping, dairying and other intensive livestock enterprises. Continued development of high value enterprises in the region will further underpin the expansion of tourism in the region. Tourism is an increasingly important sector of the state and regional economies. At a state level, tourism is estimated to contribute around $2.18 billion (4.2%) in Gross State Product, accounting for around 15,140 direct jobs or 7.2% of total Tasmanian employment. At a regional level the contribution is similar with tourism in Northern Tasmania accounting for an estimated 3,650 direct jobs (7.5% of total employment) and $0.52 billion (4.3%) in total regional output. Latest Tourism Tasmania figures indicate that total visitor spending increased by 11% in 2014 to $1.76 billion coupled with a 16% increase in holiday visitors to Tasmania.	
4) Proposed project has received required Commonwealth and state statutory approvals required to proceed to construction	Desktop assessments have been undertaken and indicate no fatal flaws regarding the ability to gain the necessary approvals to proceed to detailed design and tender phases. Over the past 10 years Tasmanian Irrigation has developed 15 schemes at a similar scale and in similar terrain. Tasmanian Irrigation will leverage this project experience to expediate the planning and approval process.	Section 6
5) Business case and demand for the project	**Economic viability:** The project is economically viable with estimated net economic benefits of $113.14 million, a BCR of 1.96 and an IRR of 12.8% under central case assumptions and assuming the P50 estimate ($103.33 million and a BCR od 1.81 and an IRR of 12.0% for the P90 estimate). Extensive sensitivity analyses demonstrated that the scheme remains viable across all 11 scenarios evaluated for both the P50 and P90 project cost estimates, including an extreme scenario where capital and operating costs are increased by 10%, net margins reduced by 10% and a	Sections 2, 3, 5, 7 and 8

Assessment criteria	Project performance against criterion	Business Case Reference
	Slow Demand uptake assumed. Under this scenario the project is estimated to generate an NPV of $65.77 million with a BCR of 1.51 ($54.98 million and a BCR of 1.39 for the P90 estimate). However, growers are not able to fund the full cost of the scheme as well as the associated on-farm development required for irrigation. Moreover, enterprises have differing levels of return and it is not practicable to price differentiate between low and high returning enterprises with the fixed entitlement fee set by the Board of Tasmanian Irrigation. Accordingly, funding of $62.10 million from the NWIDF and $31.05 million from the Tasmanian Government is necessary for the economically viable scheme to be delivered and the benefits realised. **Demand forecasting:** Conservative estimates have been adopted for the economic and financial assessments based on: i) results of the EoI process implemented by Tasmanian Irrigation; ii) a threshold set by Tasmanian Irrigation at 60% of scheme capacity (yield at 95% sustainable reliability) was exceeded with Water Sales achieving contractual commitments to 6,745 ML (73%); and iii) 10 years before the full uptake of entitlements is achieved; and iv) conservative estimate of irrigation usage which lags the uptake of entitlements. **Water availability and security:** The scheme will source water from the Lake Parangana operated by Hydro Tasmania as part of the Mersey-Forth hydro scheme. This will mean that Tasmanian Irrigation, in combination with the proposed storage, can achieve its expected reliability target of greater than 95% under current and future (2030) climate scenarios, subject to the proposed licences and water purchase agreements being obtained. **Project design and delivery:** The project will most likely be delivered through either a single, competitive D&C contract or construct to design contract, utilising Tasmanian Irrigation's proven project management and delivery systems and protocols that have seen the Tranche 1 and 2 schemes being delivered on time and within the budgets included in the business cases for the schemes. Tasmanian Irrigation maintains a comprehensive project and corporate risk register. **Whole-of-life operation and maintenance:** The economic and financial assessments and pricing established for the scheme incorporates costs estimates operation and maintenance of the scheme as well as asset refurbishment costs for individual project components based on industry guidelines and Tasmanian Irrigation's developed understanding of asset performance gained from its extensive portfolio of schemes which is responsible for operating across Tasmania. **Project benefits realisation:** Project benefits are expected to be:	

Assessment criteria	Project performance against criterion	Business Case Reference
	• net economic benefits estimated at $113.14 million on present value terms based on the P50 project cost estimate and $103.33 million at the P90 estimate. • 2,400 ha converted to irrigated agriculture within 10 years of the scheme commencing operations • approximately 172 outlet connections accessing the scheme by 2036 • ongoing employment of up to 140 direct on-farm FTEs by 2036 matched by a further 70 FTEs in downstream and upstream sectors, with a further 60 FTEs on average engaged over the 36-month planning, approvals, and construction period.	

Source: Marsden Jacob, 2022.

7.10 The 'No-Project' case

In assessing potential investment in the SWISA, Tasmanian Irrigation and the Tasmanian Government need to give due consideration to the 'No-Project' case. The 'No Project' case presents a strong contrast to the 'With Project' case as the SWISA is expected to have a significant impact on the agriculture sector in the Northern Midlands region as well as the regional economy.

Under the 'No Project' case, the status quo regional profile is likely to decline over the medium to longer term resulting from outages and potential failure of the existing SWIS infrastructure. The profile of cropping would change periodically in response to changes in commodity prices, and water availability (from existing allocations). However, while the area has abundant natural and man-made attributes underpinning the production of high value agriculture and horticultural production, the relative scarcity of irrigation water and constraints associated with service levels inherent in the existing SWIS infrastructure is limiting the region attaining its full potential from access to water and the ability to flexibly trade water.

The continued reliance on existing allocations and constraints of existing infrastructure in conjunction with on-farm, in-stream storages means that current supply risks would continue and most likely increase as supply issues associated with the existing scheme accelerate. In summary, under the 'No Project' case, we would expect to see:

- continued exposure of farmers in the region to climate risks – both climate change and rainfall variability – which impact on the viability of both grazing and irrigation enterprises
- limited scope for expansion into high value enterprises including horticulture and berry fruits and orchards, and other cropping enterprises due to the lack of viable and secure additional water sources and limitations on the ability to trade across the district
- financial vulnerability of some operators, due to the impacts of periods of low rainfall
- limited potential for expansion of agribusiness in the region, due to direct reliance on business from the farming and irrigation sectors
- limited potential for expansion of farm contracting, again due to direct reliance on business from the farming and irrigation sector
- failure to take advantage of market opportunities for alternative enterprises.

There are no viable alternative supply options for the SWISA. Tasmanian Irrigation has undertaken a comprehensive review and assessment of supply options (refer Section 1.2) and through this testing process has concluded that the chosen option is the most efficient option for supplying water to the Sassafras-Wesley Vale region.

7.11 Overall assessment of net public benefits

In evaluating the net public benefit of the project, Marsden Jacob has considered each of the key outcomes outlined above, in the context of the overall subsidy required for the project.

The project will deliver:

- an economic NPV of $113.14 million, a BCR of 1.96 and IRR of 12.8% (under central case assumptions and P50 project cost estimate) for the SWISA
- stimulus to the regional economy including:
  - an increase in direct farm jobs of up to 140 FTEs for the SWISA
  - indirect employment of around 70 FTEs
  - total employment of 210 FTEs
- with a further 60 FTEs over the 3-year approvals, planning and construction period
- greater regional water supply security than could be achieved without the scheme
- substantial improvement in the ability to trade water across the district facilitating the continued development of high value vegetable enterprises
- adaptation to climate change – the SWISA would help facilitate a geographic shift in food production which may be important for Australia given uncertainty about the future yields from the Murray Darling Basin
- high reliability water which is required to attract the large capital investments required to develop the region to its full potential, especially in relation to the continued diversification into high value enterprises including stone fruit.

The following section provides a summary of the net economic benefits of the project, proposed funding requirements together with the key conclusions and recommendations of this Business Case.

8. Conclusions and recommendations

Tasmania's northwest region has proven to be suitable for irrigation with extensive areas of vegetables, poppies, cereals and pasture and fodder crops grown and extensive high-quality meat produced throughout the region. Moreover, in recent years it has seen the emergence of significant investments in high value berry fruit production and more recently orchards and viticulture.

The main impediment to expansion of the irrigation sector in the region is the limited supply of water and the inability to flexibly trade water due to constraints associated with the existing SWIS infrastructure. There are extensive areas of irrigable land that can be used to support new irrigated areas as well as water being made available to augment existing less-secure supplies to existing vegetable enterprises.

Accordingly, there is a very strong *a priori* basis for development of new water infrastructure to support an important farming region in Tasmania.

Moreover, at a national level, there is now large uncertainty about the long-term trends in irrigated agriculture in the MDB, where 75% of Australia's irrigated agriculture (by area) is located. The response by governments and private enterprise will be to seek to develop irrigation in other regions, with Tasmania and north Queensland considered the more suitable areas for expansion of irrigation.

8.1 Government funding commitments

In 2007, the Australian Government committed $140 million under the Water for the Future Fund for development of new irrigation schemes in Tasmania. In addition, the Tasmanian Government, building on the success of the Meander Dam project, committed $80 million for development of new irrigation schemes in the State. Since that date, Tasmanian Irrigation, through a mix of private and public investment in the order of $310 million, has seen the successful delivery of ten irrigation schemes under Tranche 1 funding arrangements. Tranche 2 being practically complete, investing a further $156 million across a further five irrigation schemes.

The Pipeline to Prosperity project (renamed from the Tasmanian Future Irrigation Project) has identified ten new irrigation projects for advancing detailed business case development.

On 14 February 2019 Infrastructure Australia added the Pipeline to Prosperity project to the "priority initiatives" in the updated Infrastructure Priority List for Australia.

This business case for the Sassafras-Wesley Vale Scheme Augmentation, is one of five projects being submitted for funding under the NWIDF – Capital Funding component.

As demonstrated in Section 7, the project satisfies all the assessment criteria set out under:

- the NWIDF - Capital Component
- the Water for the Future Fund (Australian Government's assessment criteria)

- the NWI (Clause 69)
- the Charter for Tasmanian Irrigation (which effectively represents the Tasmanian Government's assessment criteria).

The project also meets the economic assessment criteria set out in the Department of Treasury and Finance's Draft Business Case Guidelines – Water Infrastructure Fund Applications. That is, the economic NPVs are positive for the SWISA project under all modelled scenarios.

8.2 Net public benefits of the project

In reviewing the overall performance of the SWISA, we note that:

- the core benefit of the project is the direct net benefits expected from the use of water for irrigation purposes during business-as-usual (or 'non-drought' periods), allowing expansion by existing growers as well as providing additional capacity for an expansion of irrigated higher value enterprises on land currently utilised by dryland grazing. The economic returns from the project are high. The SWISA will generate direct economic benefits (economic NPV) of an estimated $113.14 million assuming the P50 project cost and $103.33 million at the P90 estimate
- the project has wide ranging benefits in terms of regional development, drought security, and climate change adaptation benefits (see Section 7)
- the project is expected to provide a direct employment stimulus of 140 jobs (full-time equivalents) and an additional 70 indirect positions with a further 60 positions during approvals and construction
- the project has no fundamental weaknesses in terms of environmental impacts, cultural heritage impacts, impact on Aboriginal relics, or other project risks (technical, environmental, or financial).

Sensitivity testing using the economic model developed by Marsden Jacob shows that the economic NPV (or net economic benefit) of the SWISA is positive under all 11 scenarios modelled and is positive even under an extreme scenario involving a 10% increase in capital and operating costs, a 10% reduction in net farming margins and the slow uptake in irrigation demand scenario. This finding applies for both the P50 and P90 project estimates.

On balance, we consider that the results of our analysis are very conclusive in supporting the case for the development of SWISA. A key factor is that the economic performance of the preferred design option is robust and there are no major obstacles in terms of environmental impacts or technical impediments to the development.

An investment of around $62.10 million from the NWIDF – Capital Component fund is required for the development of SWISA with additional funding of $31.05 million from the Tasmanian Government. Irrigators will contribute $31.05 million through the sale of water entitlements as well as additional on-farm investment estimated at around $61.31 million in irrigation infrastructure, land development and associated enterprise infrastructure.

8.3 Recommendation

Based on the arguments outlined above, Marsden Jacob therefore recommends that Tasmanian Irrigation and the Tasmanian Government approve the business case to allow the SWISA to progress to the next project phase comprising:

- obtaining all necessary permits and approvals to construct the scheme.
- obtaining firm tender prices for construction that are consistent with the estimates contained in this Business Case.

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Name	Comment
1	Moved due to landwoner objection, environmental impact assesment completed and considered
2	Moved due to landwoner opposition
3	Alignment to supply water sales, minimising environmental impact and avoiding properties not connected to the scheme
4	Moved due to environmental and constructability constraints
5	Alignment moved away from existing dam
6	Changed alignment as to meet water sales interest
7	Moved due to landwoner opposition
8	Environmental and construction constraints
9	Moved to minimise landowner impact
10	Constructibility
11	Extensive environmental, drainage and existing underground infrastructure challenges
12	Alignment altered to reflect water purchased
13	Alignement moved to work in with landowners
14	Alignement moved to work in with landowners
15	Alignement moved to work in with landowners
16	Alignment moved to due to environmental constraints
17	Construction and landowner constraints
18	Altered due to location of water sales and constructability
19	Minimise impact on landowners due to topography
20	Avoid orchid habitat and construction constraints
21	located tank to minimise visual impact and with landowners expectations
22	Construcatbility constraints
23	Construcatbility constraints
24	Constructability constraints due to orchard
25	Environemtal, constructability and landowner challenges
26	Constructability and loandowner considerations
27	Landowner opposition
28	Avoid construction near unmarked cemetary
29	Moved pipe aligment out of road corridor
30	Construction and landowner considerations
31	Construction and environmental constraints
32	Prefered Highway crossing location and to minimise impact on landowners
33	Construction, existing infrastructure, landowner and environmental challenges

SWISA Pre Water Sales vs Detailed Design

Legend

Pipeline Pre Water Sales

Pipeline Post Water Sales

Alignment Change Area

Scale: 1:27,400 A1 Portrait

1 0.5 0 1

Kilometers

N

ID: SWISA
Date: 12/09/2023
Author: C Reid
Tasmanian Irrigation

Credits: DPIPWE, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS; TASMAP © State of Tasmania; the LIST © State of Tasmania
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Tasmanian Irrigation

Sophie Grace

Subject: FW: [External]CAS Comments: Tas Irrigation - Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA) - Natural Values Assessments

From: ConservationAssessments@nre.tas.gov.au
Sent: Wednesday, September 20, 2023 10:02 AM
To: Sophie Grace <sophie.grace@tasirrigation.com.au>
Cc:
Subject: [External]CAS Comments: Tas Irrigation - Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA) - Natural Values Assessments

Dear Sophie,

Thank you for your email and the opportunity to comment on the natural values assessment reports for Tasmanian Irrigation's Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA). Conservation Assessments (CAS) has reviewed the information provided and can make the following comments.

General Comments
It can be noted that the natural values assessments for SWISA have so far been thorough and have addressed the potential impacts to a range of threatened species and habitat recorded within or close to the irrigation design corridor. It is likely that, based on the results of the surveys, a number of management plans will need to be developed for the irrigation scheme augmentation in order to manage impacts to threatened species (including Green Gold Frog, Tasmanian devil and Spotted-tailed Quoll dens, Wedge-tailed Eagle nests, etc.). It is recommended that these plans are also provided CAS for review and input as they are developed.

Threatened Flora
***Persicaria decipiens* (slender waterpepper, listed as vulnerable under the TSPA)**
The natural values assessment recorded this species at 30 locations, covering a total of 1,490 m² within the design corridor along the northern half of the project area, through agricultural land. Given this species occurs in large clumps in some locations, making it difficult to determine how many individual plants there are, it is reasonable to present abundance as an area instead of number of plants.

CAS supports the recommendation in the natural values assessment to exclude as many of the known locations of *Persicaria decipiens* as possible from the impact footprint. These areas should be designated as exclusion zones and buffered by at least 10 m. CAS supports the use of physical barriers or cordons as necessary to enforce the exclusion requirements.

***Caladenia tonellii* (robust fingers, listed as endangered under the TSPA) and *Caladenia caudata* (tailed spider-orchid, listed as vulnerable under the TSPA)**
A targeted search for *Caladenia tonellii* and *C. caudata* was undertaken at peak flowering time for these species in November 2022. No evidence of *C. caudata* was detected from any of the targeted areas, however several *C. tonellii* plants were recorded around the existing SWIS pipeline. CAS supports the proposed SWISA pipeline alignment being sited away from the *C. tonellii* population (and thus the existing SWIS pipeline), to be adjacent to Devil Road near the Great Bend pump station on the Mersey River (within the Warrawee Conservation Area). A pre-clearance spring survey for *C. tonellii* within potential habitat at Warrawee Conservation Area is also supported.

CAS can advise that if the pre-clearance surveys record any threatened flora species that cannot be avoided by the final pipeline route, a permit to take threatened flora under the TSPA will be required. The processing of permit applications may take up to four weeks. Information on applying for a permit, including application forms, can be found on the NRE Tas website: Permit to Take Threatened Species (for Consultants & Development-related Activities) | Department of Natural Resources and Environment Tasmania (nre.tas.gov.au).

Threatened Fauna

Green and Gold Frog (*Litoria raniformis*, listed as vulnerable under the TSPA)

The irrigation scheme, particularly the northern half of the irrigation scheme, is within the habitat range of the Green and Gold Frog. During the natural values survey, there were four sightings of Green and Gold Frogs recorded at three locations within the design corridor.

CAS supports modification of the pipeline design corridor to reduce potential impacts on Green and Gold Frog breeding habitat and acknowledges that it may be difficult to avoid impacts to all frog habitat for the proposal, given the prevalence of Green and Gold Frog habitat throughout the design corridor. The development and implementation of a Green and Gold Frog management protocol to reduce overall impacts to frogs and habitat based on the proposed inclusions in the natural values assessment report (page 50) is supported. Adherence to strict hygiene protocols to manage the risk of introducing chytrid fungus to the region and impacting the population of green and gold frog within the design corridor is also supported. As discussed above, it is recommended that the Green and Gold Frog management protocol is referred to CAS once it has been developed, to review and provide feedback.

Central North Burrowing Crayfish (*Engaeus granulatus,* listed as endangered under the TSPA)

The entirety of the SWISA project area is within the core range of the Central North Burrowing Crayfish. No direct observations of burrowing crayfish were recorded during the natural values surveys, however 15 burrowing crayfish colonies were recorded within the survey area, 13 of which are within the current design corridor.

The proposal is likely to reduce the area of occupancy for the species through impacts to habitat within the construction corridor. The total area of crayfish habitat to be impacted will be understood once the final alignment is determined. CAS supports the recommendation in the natural values survey report to avoid impacts to burrowing crayfish colonies and optimal habitat as much as possible. Impact mitigation and the development and implementation of habitat management protocols to limit the likelihood of mortalities and long-term impacts on habitat condition are also supported. CAS can also advise that if burrowing crayfish habitat containing crayfish chimneys is proposed to be taken within the core range of the Central North Burrowing Crayfish, it can be assumed that the Central North Burrowing Crayfish are occupying the burrows and as such, a permit to take the species under the TSPA will be required.

Tasmanian Wedge-tailed Eagle (*Aquila audax* subsp. *fleayi*, listed as endangered under the TSPA)

There are 11 eagle nests located within 1.5 km of the original SWIS pipeline route. Three of the nests are within 500 m of the proposed new pipeline construction corridor. An additional four nests are within 1 km from the construction corridor of which one nest is within line-of-sight of the construction corridor. CAS supports construction of the pipeline being undertaken outside the eagle breeding constraint period (July to January inclusive) for the eagle nests within 1 km of the pipeline route. The recommendation in the natural values survey report that if works cannot be completed outside of the breeding season, to realign the route of the construction corridor to avoid areas within 500 m direct distance and/or within 1 km line of sight of eagle nests is also supported.

Tasmanian devil (*Sarcophilus harrisii*, listed as endangered under the TSPA) and Spotted-tailed Quoll (*Dasyurus maculatus*, listed as rare under the TSPA)

The natural values survey did not record any Tasmanian devil or Spotted-tailed Quoll dens within the irrigation pipeline design corridor, however there is potentially suitable denning habitat present within the design corridor for both species. It is recommended that impacts to all suitable Tasmanian devil and Spotted-tailed Quoll denning habitat is avoided as much as possible by the construction corridor. Suitable denning habitat that cannot be avoided by the pipeline construction will need to be monitored and subject to pre-clearance surveys prior to the commencement of construction.

CAS supports the development and implementation of a den management and decommissioning protocol for Tasmanian devil and Spotted-tailed Quoll dens, in order to provide a clear process for monitoring and undertaking pre-clearance surveys and to reduce impacts to breeding animals. It is recommended that the protocol is referred to CAS for review and feedback once it has been developed. It should also be noted that if any dens and/or burrows need to be decommissioned for the pipeline construction, a permit to take products of wildlife under the *Nature Conservation Act 2002* (NCA) will be required.

The natural values report states that the increased hours of operation of the roads during the pipeline construction period will increase the threat of roadkill and represent a significant risk for the Tasmanian devil and Spotted-tailed Quoll. CAS supports the development and implementation of a traffic management protocol as a mitigation strategy to manage the risk of increased devil and quoll mortality associated with increased traffic (particularly night time, including one hour before sunrise and one hour after sunset) during the construction phase.

Swift Parrot (*Lathamus discolor*, listed as endangered under the TSPA)
Approximately 185 ha of the irrigation pipeline design corridor falls within the northwest breeding range for Swift Parrot. No naturally occurring *E. globulus* trees or *E. globulus* vegetation communities were recorded within the survey area, though there are a number of areas of *E. globulus* plantation which Swift Parrot will utilise for foraging. *E. ovata* trees were recorded throughout the survey area within *E. ovata* forest and woodland vegetation community (DOV), within mixed eucalypt communities (such as DSC), and as individual trees in remanent vegetation or paddock trees. A number of large (dbh >70 cm) potential hollow bearing trees were also recorded during the survey, both within forest block and remnant vegetation, and in paddocks in agricultural land. These trees provide potential nesting habitat for Swift Parrots. In total 8.1 ha of suitable Swift Parrot foraging habitat and an additional 20 individual foraging habitat trees were recorded within the design corridor. A total of 7.8 ha of forest potentially supporting Swift Parrot breeding habitat and 58 individual breeding habitat trees were recorded within the design corridor. CAS supports the proposal to design the pipeline corridor in order to reduce the potential impact to foraging and breeding habitat for Swift Parrot as far as practicable, and for a habitat tree protocol to be developed and implemented for trees that are proposed to be cleared for the construction of the pipeline.

Tasmanian Masked Owl (*Tyto novaehollandiae* subsp. *castanops*, listed as endangered under the TSPA)
The SWISA project area is within the core range for the Masked Owl and although there is no old growth forest within the survey area, 62 large eucalypt trees (DBH >100 cm) were recorded in remanent vegetation in agricultural land and previously logged areas. Although isolated, these trees are potentially viable breeding and/or roosting habitat for masked owl. In addition, although not examined closely as yet, 2.6 ha was determined to potentially support masked owl nesting habitat trees. The irrigation pipeline design corridor has been modified to reduce potential impacts to habitat trees. CAS supports the priority mitigation strategy to avoid the removal of large trees with the potential to support hollows as much as possible. The development of a habitat tree protocol that covers Masked Owl habitat is also supported. It should also be noted that Masked Owl nests are a product of wildlife under the *Nature Conservation Act 2002* (NCA), however, CAS has never issued a permit to remove a confirmed Masked Owl nest and any proposal to do so would be considered significant and an offset would likely be required. It is recommended that if impacts to a nest cannot be avoided then discussions with CAS occur as early in the planning stage as possible.

Weeds and Diseases
A number of introduced plants listed as 'declared weeds' under the Tasmanian *Biosecurity Act 2019* were observed during the natural values survey. Two of these are listed as Zone A (isolated infestations) species within the Latrobe Council. CAS supports the recommendation in the natural values survey report to develop and implement a Weed and Hygiene Management Plan to guide weed control and facilitate containment of weed species during construction works. Further information on preparing weed and disease management plans can be found in the DPIPWE (2015) *Weed and Disease Planning and Hygiene Guidelines - Preventing the spread of weeds and diseases in Tasmania*.

Frog chytrid fungus has resulted in frog extinctions on the Australian mainland and has the potential to devastate Tasmanian frog populations. CAS recommends that the manual *Keeping it Clean - A Tasmanian Field Hygiene Manual to Prevent the Spread of Freshwater Pests and Pathogens* be adhered to clean equipment prior to its use on wetlands and waterbodies: *Keeping it clean - A Tasmanian field hygiene manual to prevent the spread of freshwater pests and pathogens*.

Tasmanian Government

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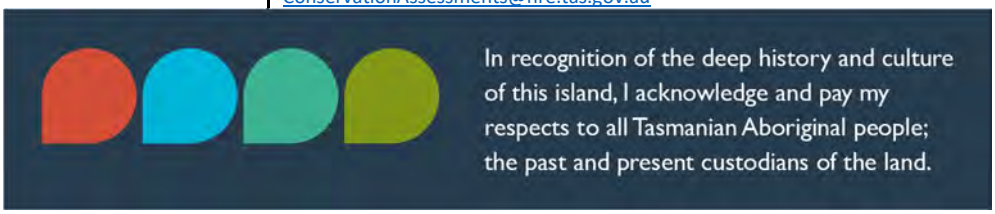
ConservationAssessments@nre.tas.gov.au



SWISA Planning Scheme Zones

Legend

SWISA Pipeline

Tasmanian Planning Scheme Zones

- Rural Living
- General Indusrtrial
- Rural
- Agriculture
- Environmental Management
- Utilities
- Recreation

Scale: 1:55,029 A3 Portrait

1.5 0.75 0 1.5

Kilometers

N

ID: NA
Date: 8/11/2023
Author: CR
Tasmanian Irrigation

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Tasmanian Irrigation

OPERATIONAL ENVIRONMENTAL MANAGEMENT PLAN HANDBOOK

UNCONTROLLED document when printed

Reviewed – 8 November 2023

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Purpose

The purpose of this Operational Environmental Management Handbook (OEMP) is to provide details of the environmental compliance obligations for Tasmanian Irrigation's (TI) operational schemes and how these are to be applied. It acts as a single repository for information and has been designed to be a helpful reference guide to assist scheme operators in meeting TI's environmental commitments, standards and expectations.

The OEMP details the environmental aspects, requirements and scheme operator responsibilities, and includes references to relevant procedures, forms and external codes of practice. Where further information is required, the user should consult other references, guidance or standards and discuss with their manager.

Each scheme has its own unique environmental aspects and requirements; the key aspects relating to each scheme are contained in scheme OEMP coversheets and tables in the Appendices.

The OEMP focuses on managing risks to the environment. Please see TI's latest Work Health and Safety Manual for more detail on managing risks to people.

Context

TI develops, owns and operates irrigation schemes in Tasmania as public-private partnerships; and is the responsible water entity for twenty operational irrigation schemes (see map). Approval for the construction and operation of the irrigation schemes has been granted under a range of federal, state and local government environmental statutes. Numerous laws, licences, permits, regulations, conditions, authorities, codes of practice, planning documents and other instruments apply to the ongoing management and operation of our irrigation schemes.

TI is proactive in ensuring that we meet our responsibilities and commitment to protecting the environment and maintaining our exemplary environmental compliance record. Promoting environmental sustainability is a core organisational goal and is reflected in TI's Environmental Policy (see page 8).

The mitigation actions contained in the OEMP form part of the controls that address and therefore reduce risk ratings for; non-compliance with environmental legislation, decline in environmental values, biosecurity incident exacerbated by TI, blue-green algae outbreak and reduction in water availability.

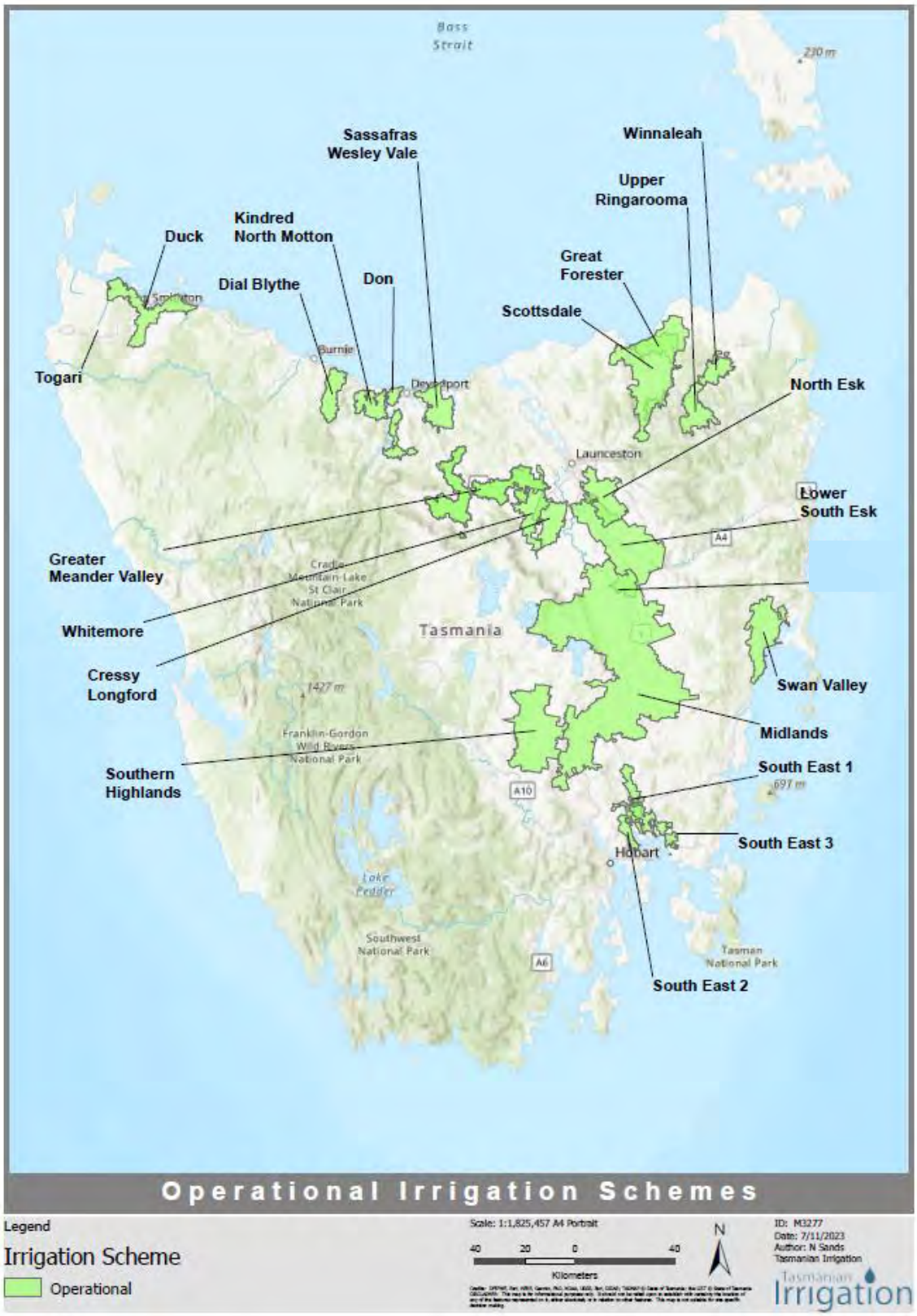
TI's operational employees are responsible for being aware of and familiar with the environmental obligations relevant to operational schemes. Furthermore, operational employees are expected to ensure all actions are undertaken to avoid environmental harm including the reporting of environmental incidents. The OEMP forms part of the induction process for all of TI's operational schemes.

For more information on the content of this document, please contact a member of TI's Environment Team directly, or through 03 6398 8433 or EHSTeam@tasirrigation.com.au.

Document revision

This document is reviewed every two years, or as changes in best practice, legislation or other requirements occur. Hard copies are not guaranteed to be up to date, electronic copies should be referred to, and are found on SharePoint in OEMP (Environment > Documents > OEMP).

Tasmanian Irrigation Operational Scheme Map



Tasmanian Irrigation Environment Policy

Environmental Policy

Policy Number – ENV-P-001

1. Our Vision and Values

Our Vision

"Tasmanian Irrigation is seen an essential and valued partner in sustainably growing Tasmania's agricultural sector and overall prosperity".

Our Values

- Integrity
- Collaboration and Communication
- Safety and Wellbeing
- Innovation and Optimisation
- Sustainability

2. Policy Purpose

The purpose of this Environmental Policy is to outline Tasmanian Irrigation's commitment to developing and operating irrigation infrastructure in Tasmania in a sustainable and environmentally responsible manner, demonstrating our precautionary approach. We recognise the importance of supporting and aligning with government policies and programs designed to protect and enhance environmental values and promoting environmental stewardship to Tasmanian Irrigation employees and stakeholders.

3. Scope

This Policy encompasses the organisation's commitment to environmentally responsible practices and sustainability across all its operations and activities. Our overarching strategic goal is to exceed expectations in environmental and socio-economic performance.

4. Policy Statement

It is Tasmanian Irrigation's objective to minimise our impact upon and, where possible, positively contribute to the natural, human and built environment by continuously improving our environmental performance. To achieve this, we will:

- As a minimum, comply with all legislation, regulation, codes of practice and other environmental obligations relevant to our business.

Approval Date: 3 October 2023
Review Date: September 2026
Endorsed By: Chief Executive Officer
ENV-POL-001- Environmental Policy
Version 2.0

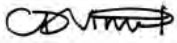
- Establish measurable objectives and targets to track progress toward environmental performance improvement and transparently report on our environmental performance.
- Actively engage in open communication with members of the community on the particular and significant environmental aspects of our business.
- Proactively evaluate the environmental risks and benefits linked to our activities, using these assessments to inform our decision-making processes.
- Proactively address climate-related risks and opportunities and integrate climate resilience into our environmental management practices and infrastructure and use energy from renewable sources.
- Embrace sustainable design, asset management, and project delivery to mitigate potential adverse impacts, and actively explore opportunities to offset any negative effects on the environment.
- Actively engage in the preservation and promotion of Aboriginal and historic heritage in all our activities.
- Safeguard and enhance natural values that may be impacted by our operations, including upholding government priorities to conserve threatened flora, fauna and habitats across Tasmania by operating in a manner that prevents pollution and minimises impacts.
- Continuously reduce our direct and indirect carbon footprint across our operations by embracing the circular economy, looking for opportunities to reduce emissions in our supply chain and minimising our high-emissions activities where possible.
- Seek continuous improvement in our Environmental Management System including providing training, education, and guidance to employees, contractors and irrigators.
- Actively encourage our stakeholders and suppliers to elevate the sustainability of their organisations and products, fostering a broader commitment to environmental responsibility.

In every aspect of our business, environmental management is integral. Together the Tasmanian Irrigation Management Team and our employees commit to these principles.

5. Policy Review Date

This policy should be reviewed **every three years**, or sooner where there is a material change to the organisation, relevant regulations, or standards.

Policy Approved

Date: 8/11/2023	Chair of the Board Signature	

Approval Date: 3 October 2023
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Environmental Legislation

There are three key pieces of Federal and State Legislation that govern the operation of TI's irrigation schemes that Scheme Operators should be aware of:

Environmental Protection and Biodiversity Conservation Act 1999 (Federal)

The *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) is the Australian Government's central piece of environmental legislation. The EPBC Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places—defined in the EPBC Act as matters of national environmental significance (MNES). There are nine MNES to which the EPBC Act applies and include wetlands of international importance (often called 'Ramsar' wetlands after the international treaty under which such wetlands are listed) and nationally threatened species and ecological communities.

Significance impact tests are conducted on all TI irrigation schemes prior to their construction to determine potential impacts on MNES. TI has a general policy to refer all applications for new irrigation schemes under the EPBC Act to the Federal Government irrespective of whether the significance impact triggers have been met. This process provides certainty to all stakeholders that a thorough assessment of potential environmental impacts during construction and operation have been considered and allows any interested persons to make representations at this stage. Appendix A provides a list of EPBC Act referral decisions relevant to each scheme.

Water Management Act 1999 (State)

The *Water Management Act 1999* (WMA) provides for the management of Tasmania's freshwater resources. The Department of Natural Resources and Environment Tasmania (NRE Tas) administers the WMA which provides for the establishment of irrigation districts and administering water entities and the issuing of water licences, water allocations, dam permits and watercourse authorities. NRE Tas are responsible for compliance and enforcement activities related to the instruments they issue. Appendix A and Section 10 of Appendix B provide a list of the WMA instruments relevant to each scheme.

Irrigation Clauses Act 1973 (State)

The *Irrigation Clauses Act 1973* (ICA) provides the statutory basis for the construction, operation and funding of TI's irrigation schemes. The ICA provides for the supply of water for irrigation under the system of irrigation rights or general availability, and for the transfer of irrigation rights. The ICA is incorporated with the WMA, for the purposes of the application of the WMA to irrigation districts. The ICA provides TI with the power to make by-laws which address such issues as meters, rates, charges and the requirement for Farm Water Access Plans. Appendix A provides a list of the ICA instruments relevant to each scheme.

1 INCIDENT MANAGEMENT

1.1 Aim

To manage the initial response to environmental incidents quickly and effectively, preventing or reducing harm to the environment.

1.2 Background and Management Practices

An environmental incident is an occurrence or activity that causes or may cause environmental nuisance, or harm, including contamination with dangerous substances. Examples of environmental incidents are provided in the table below, for further information read the relevant sections of this document or contact the Environment Team.

Environmental Incident	Incident Notification type
Failure to obtain permit/approval or breach of permit/approval	General Manager EHS
Water licence breach	Environment/Ops Manager
Farm WAP breach	Farm WAP team: farmwap@tasirrigation.com.au
Leaks/spills of chemicals or hazardous materials	General Manager EHS
Contamination of land or soils	General Manager EHS
Erosion and sedimentation	General Manager EHS
Water quality – algal bloom, pollution	Environmental Advisor – Compliance
Damage/removal of vegetation	General Manager EHS
Incidents impacting threatened species	General Manager EHS
Weeds, pests, disease	General Manager EHS
Dead Animals	Environmental Specialist – Ecology & Sustainability
Waste Disposal	General Manager EHS
Disturbance of heritage values	General Manager EHS

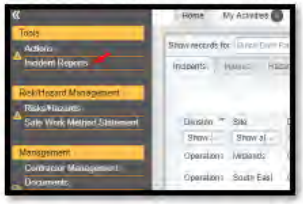
Incident Reporting

Environmental incidents should be reported to the General Manager EHS (or other as listed above) as soon as possible and through MyOSH as soon as practicable, within 24 hours.

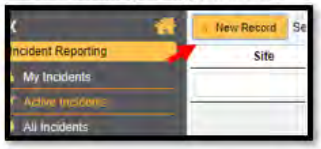
Incident reporting process diagram and MyOSH report process

All environmental incidents must be entered into MyOsh.

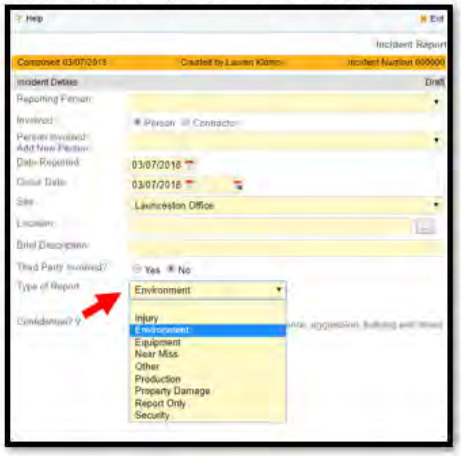
a) Environmental incidents can be entered into Incident Reports from the side menu. (see diagram below).



b) Add New Record. (see diagram below).



c) Follow prompts, making sure Environment is highlighted in the dropdown menu. (see diagram below).



Blue Green Algae

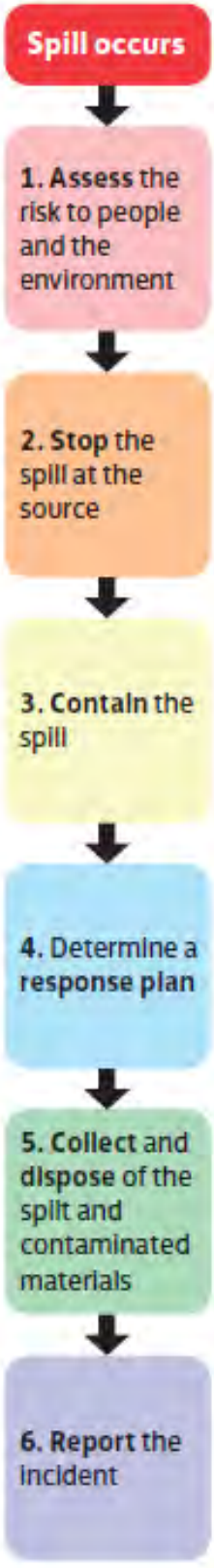
Report the presence of blue green algae in any of TI's storages or waterways to the General Manager EHS or Environmental Advisor – Compliance as soon as possible and take a sample as per their instructions. There is a specific brown glass bottle required to collect the blue-green algae sample. *Do not touch* algae. On positive confirmation of blue green algae, follow the *TI Blue-Green Algae Monitoring Procedure*.

Chemical Spills

Report any uncontrolled spills or accidents involving solid or liquid contaminants to the General Manager EHS as soon as possible (within 24 hours). Immediate action to be taken: Stop the spill and spread, identify the chemical, use appropriate spill kit and disposal (if safe), contact General Manager EHS.

Do not hose down spills.

Replenish spill kits after use and notify the General Manager EHS as per the incident response procedure (*Environmental Incident and Reporting Procedure*).



1. Identify any immediate risks to people and the environment from the spill. Take any necessary precautions and, if safe to do so, manage the spill.

a. Check for safety issues; activate the evacuation alarm if necessary.
b. Check the MSDS.
c. Notify General Manager EHS)

Call for assistance if needed (internal/external and/or emergency services – 000)

2. Take steps to stop the spill at the source (e.g. closing values, shutting off equipment, covering or blocking drains). Once the spill source is stopped, get help if needed and clean up the spill if it is safe to do so. Make sure you are wearing required Personal Protective Equipment (PPE).

3. Take steps to stop the spilt substance from spreading.
a. Prioritise preventing spills from entering waterways.
b. Use spill kits (e.g. booms, pillows) to contain the spill.
c. Set up bunds to contain liquid spills.
d. Shut off any drains or equipment that could spread the spill.

4. Identify and put in place any further requirements to manage the spill and clean-up.
a. Is specialised equipment required?
b. Does work/water delivery need to be halted?
c. Are there any external notification or reporting requirements?
d. What are the waste disposal requirements?
e. Do any control measures need to be maintained?

5. Recover as much of the spilt material as possible. Manage and dispose of any waste and contaminated materials as **controlled wastes** (Section 13 – Air, Noise & Waste Management)
a. Use absorbents to soak up liquid spills.
b. Remove any contaminated soil, gravel or other solid materials.
c. Place used absorbents and other contaminated materials in suitable, labelled containers for safe storage until disposal can be arranged.

6. Submit an Environmental Incident via MyOSH, providing as much information as possible about the spill incident and your response. Think about why the incident happened and how a repeat or similar incident could be prevented.
a. Call General Manager EHS to report an environmental incident by phone.
b. Submit an environmental incident via MyOSH

Water Pollution

If water pollution (e.g. oils, rubbish, high turbidity) is noticed in any TI storage or waterway in TI Scheme area, report to the Environment Team immediately, regardless of the source of the pollution.

Water Licence Breach

If it is believed that water may have been pumped outside of the conditions and requirements of a water licence notify General Manager EHS immediately and provide the water take data as soon as possible. An investigation will be undertaken to determine if a breach has occurred.

Farm Water Access Plan Breach

If an irrigator has expanded their area under irrigation, or someone new has started accessing TI water, check on Field Maps to confirm if the area is within a Farm WAP boundary – if it is not immediately contact the Environment Team. An investigation will be undertaken to determine whether environmental harm has been caused and whether the Farm WAP should be amended. Farm WAP breaches will trigger an audit of the Farm WAP during the next audit season.

1.3 Your Responsibilities

- Report all environmental incidents to General Manager EHS and through MyOSH
- Complete the quarterly OEMP Checklist regarding Incident Management

1.4 Further Info

- Environmental Incident Procedure (reporting levels, external notifications, incident report and detailed investigation report)
- Incident Report (opens MyOsh)
- Emergency Response – Spills Procedure (report through MyOsh)
- TI Blue-Green Algae Monitoring Procedure V3
- Spill Response Equipment Selection Guide

2 CHEMICAL AND OTHER HAZARDOUS MATERIALS MANAGEMENT

2.1 Aim

To ensure the safe and legal storage, handling and disposal of chemicals, fuels, oils and other hazardous materials and to minimise risks to people and the environment.

2.2 Background and Management Practices

Chemicals, fuels, oils and other hazardous materials are used regularly as part of TI's activities. These substances may harm both people and the environment and there are legal requirements around the way they are stored, handled, transported and disposed.

Always be alert when working with chemicals and other hazardous materials, remembering that some harmful substances have no odour, colour or taste.

Register and Storage of Chemical and Fuels

All chemicals and fuels must be entered into MyOsh, and the Safety Data Sheet (SDS) must always be with the substance (storage and transport). Hazardous goods (including chemicals and fuels) are to be stored in accordance with the requirements of their SDS. Chemicals must be stored in an appropriate area based on the class of chemical and volume and are not to be stored with incompatible substances. Chemical liquids must be stored over a bund or in a bunded, labelled area able to contain the volume of stored liquid in case of spill or leak. All chemicals and fuels are to be clearly labelled with the full name of the contents, the dangerous goods class of the contents (if applicable) and their hazards, and should generally kept clean and locked.

Working with Chemicals

All chemicals are to be used and applied according to the label. Always wear appropriate personal protection equipment (as specified on label) when handling and applying chemicals and never spray on very hot or windy days. Ensure an appropriate spill kit is on hand, during the servicing of pumps and when refilling and using TI's large spray units, particularly around waterways.

Refer to the relevant chemical labels and supporting documentation for further detailed information, in particular *Guidelines for Safe and Effective Herbicide Use Near Waterways* and the *Code of Practice for Ground Spraying*.

Chemical Disposal

Aim to mix only the quantity of chemical required for the task. Where leftover chemical mix occurs, quantities over 20 L should be diluted and stored in a holding tank in a bunded area for future use or in the case of smaller quantities (<20 L), the chemical may be diluted and stored for next use or applied over the previously sprayed area if necessary.

Equipment (including spray trailer) should be washed down at appropriate washdown sites. Chemical pumps should be washed into a tank to create a diluted rinsate which may be used for future chemical mixes. Make sure all tanks are labelled with the appropriate chemical label (and dilution if relevant).

TI's spray trailers are to be left washed out and empty after use.

Empty chemical containers should be triple or preferably pressure washed and disposed of per the label instructions, with preference given to recycling disposal. If possible, containers should be taken to the local drumMuster disposal centre (see Appendix C). Eligible containers will have the logo shown right on the chemical label or drum, e.g. Lontrel, Grazon Extra and Roundup.

Refer to the *Guidelines for Managing Leftover Chemicals* for further information.

Refuelling and Vehicle/Plant Servicing

Equipment and machinery are to be refuelled and/or serviced in designated, well ventilated areas away from waterways. During servicing, an appropriate oil spill kit is to be kept on hand and used (as required).

Spills and Spill Kits

If a chemical or fuel spill occurs, see page 7.

When using a ***TI spray trailer***, the associated spill kit must accompany the trailer while it is under use.

When using other ***TI spray units*** an appropriately sized spill kit or kitty litter kit must accompany the unit.

An oil spill kit should be located at each ***pumpstation*** for use if required during plant/pump servicing and in the case of a plant/pump failure.

TI has a number of hydrocarbon boom/silt curtains, contact the Chief Operating Officer or Environment Team if undertaking work that might require these.

Before starting a task involving chemical use:

1. Check that the up-to-date SDS is available and use it to help you complete your risk assessment – make sure you attach a copy.
2. Make sure you understand and follow the necessary precautions given in the SDS (e.g. potential hazards, PPE required and spill response) before working with that chemical.
3. Make sure any bunding or **spill control** is in place and working, and that you know what to do in the case of a spill or chemical emergency.
4. Know how to collect, store and dispose of any chemical wastes (see Section 13 – Air, Noise and Waste Management).

2.3 Your Responsibilities

- Ensure all chemicals, oils, fuels and other hazardous substances are listed on MyOSH and all relevant SDS sheets are stored on site, annually or when acquiring a new chemical.
- Check that all containers holding chemicals, oils, fuels and other hazardous substances are in good condition and clearly labelled before using them, report damaged containers, unclear labels or unsafe storage when using or annually if not used.
- Ensure all chemicals, oils, fuels and other hazardous materials are stored appropriately between uses, and when transporting in accordance with SDS requirements.
- Ensure the correct PPE is worn, and that correct handling, mixing and application procedures are followed when using and applying chemicals and fuels.
- Follow the *Guidelines for Safe and Effective Herbicide Use Near Waterways* and the *Code of Practice for Ground Spraying*
- Ensure all chemicals, oils, fuels and hazardous materials are disposed of appropriately.
- Know where to find relevant spill kits and how to use them.
- In the case of a spill, follow the incident procedure and report to General Manager EHS.
- Ensure spill kits are replenished as required.
- Complete the quarterly OEMP Checklist regarding chemical and fuel management.

2.4 Further Info

- Chemical Register
- Incident Report (opens MyOsh)
- Guidelines for Safe and Effective Herbicide Use Near Waterways
- Code of Practice for Ground Spraying
- Guidelines for Managing Leftover Chemicals
- Information on storage and transporting chemicals
- Spill Response Equipment Selection Guide (information on spill kit selection)

3 VEGETATION MANAGEMENT

3.1 Aim

To ensure vegetation management work including any clearing and removal of trees complies with legal requirements and that environmental disturbance is minimised.

3.2 Background and Management Practices

As part of our work activities we manage vegetation, controlling weeds and trimming plants. Native vegetation provides habitat for animals, protects rare and threatened species and provides support for riverbanks. Vegetation management activities aim to protect these values while enabling us to do our work.

Legal restrictions apply to some of our vegetation management activities, with permits and approvals required to clear or prune some types of plants or work in protected areas including streamside reserves. Some vegetation is also protected due to its social or cultural values, including trees listed on the National Trust Significant Tree Register.

Assessments are required before carrying out new vegetation management work and permits or approvals obtained (as required) before work starts. The risk of spreading weeds and plant diseases must be minimised while undertaking any vegetation management activities (e.g. phytophthora) (Section 7).

Where dead trees require removal, in the first instance they are to be assessed for hollows that may be providing native fauna habitat, and where suitable hollowed trees are found, nest boxes or log hollows may need to be erected in their place.

Grasses

Grass around dams and infrastructure where it impacts safety or access may be controlled. This should be determined on a site-by-site basis but may include controlled grazing of livestock, slashing or spraying.

Eucalypt control – DICL pipeline

Trees need to be removed along pipeline easements to protect DICL pipeline from root intrusion. Removal can become a very expensive and labour-intensive activity if not undertaken in a planned (regular) and coordinated manner. A management plan should be developed and implemented annually to ensure TI infrastructure is not compromised and the activity remains within budget.

Bushfire Management

Vegetation and other fire risks need to be assessed and managed around our infrastructure. An annual fuel reduction program may need to be implemented to reduce the impacts of bushfires.

Rehabilitation and revegetation

TI is committed to rehabilitating and revegetating areas cleared during TI activities in line with approval requirements. Areas of rehabilitation or revegetation are mapped in the scheme specific documents. Any weeds are to be managed per Section 4. Surveys may be required periodically until the revegetation requirements are met. Scheme operator assistance may be required to facilitate access to these areas, undertake the activities or engage necessary contractors.

Quarry Permits

Rehabilitation and revegetation required under quarry permits should be documented to ensure monitoring requirements are met.

3.3 Your Responsibilities

- Ensure no native vegetation (including individual trees) are cleared before the approval of General Manager EHS and any appropriate approvals are received.
- Assist in regeneration/revegetation requirements for the scheme.
- Complete the quarterly OEMP Checklist regarding vegetation management.

3.4 Further Info

- Map/list of Regeneration/Revegetation Sites (see scheme specific cover sheet)

4 WEED MANAGEMENT

4.1 Aim

To prevent the introduction and spread of weeds through our work activities.

4.2 Background and Management Practices

Weeds can reduce biodiversity and agricultural productivity, replacing native plants and destroying habitats and foods sources for native animals. Controlling established weeds can be very expensive; it is far better to prevent their spread through following good hygiene practices.

4.2.1 Declared Weeds

We are legally required to manage declared weeds on TI owned and managed lands, including pipeline easements. Declared weeds and their treatment methods are identified in the NRE Tas *'Weeds Index'* web site. Control methods used will be dependent on the scale of the weed infestation and site access. There are very specific requirements for the disposal of declared weeds. Some of the more common of the 115 declared weeds that are found on TI land are detailed below.

Woody weeds

Blackberry and gorse are to be managed using herbicide either as a foliar spray for large areas or by the cut and paint method. Large areas of gorse may be controlled using gorse mulching undertaken by an approved contractor with follow up management as necessary. It is highly recommended that a weed management plan be prepared when undertaking the removal of gorse from large areas.

Agricultural/common weeds

Common weeds that are found (e.g. Californian thistles, horehound, marshmallow) are to be managed by spot spraying with herbicide using recommended application rates, or non-chemical alternatives including hand pulling, chipping, slashing or mowing where applicable.

Trees

Hawthorn and crack willow are to be managed with herbicide using either the cut and paint or stem injection methods or foliar spray (to a height of 2m). Wattles growing on dam walls are to be managed with waterway safe herbicide or through physical removal with chainsaw by approved operator.

Crack willow along banks of watercourses which are impeding flow or causing large trans-evaporation losses should only be removed under an approved weed management plan.

Submerged and partially submerged plants/ aquatic weeds

Weeds found instream (e.g. *Elodea canadensis* (Canadian pondweed) and the non-declared introduced cumbungi) that are preventing the delivery of water are to be managed preferably using non-chemical alternatives (e.g. mechanical or hand removal) or if not practical using aquatic/waterway safe herbicide. For large areas of a weed, subject to the relevant approvals being obtained a backhoe and/or bulldozer may be required to remove debris from waterways.

Note: Some of our storages and waterways contain a protected native cumbungi which looks similar to the introduced cumbungi. Please see factsheet or contact Environment Team to assist in identification.

Chilean Needle Grass

A Weed of National Significance (WONS), Chilean needle grass is a perennial grass which can grow to 1 m in height with no grazing pressure. The leaves of the tussock forming grass are 1 to 5 mm wide, flat and strongly ribbed on their upper surface, with leaf edges that are rough to touch. It has a distinctive purple flowering seed head predominately from September to December although it can be year-round. It is mainly found in both urban and rural areas in the south of the state. Chilean needle grass reduces pasture productivity, contaminates crops, and seeds can injure livestock, particularly sheep. If you find a plant or think a grass *may* be Chilean needle grass *immediately* report it to Environment Team. Several properties are known in the South East Irrigation Schemes, please contact Scheme Operator or Environment Team before accessing farm properties.

Didymo

Not yet present in Australia, didymo is a freshwater alga that has invaded New Zealand and Chile and is considered a high risk in Tasmania. Didymo forms large mats of thick, cottony growth, clogging waterways and blocking drains, pipelines and intakes. The introduction of Didymo is a significant threat to the water industry in Tasmania. If you think you see Didymo report it immediately to the Environment Team.

Algal growth in dam

TI's 'Management Procedure for Managing the Risk of Algal Blooms in Storages' is to be used to monitor for the presence of blue green algae. Report any suspected blue green algae as soon as possible to the Environment Team. A sample may be required to be taken to the laboratory straight away. For blue green algae identification help, please contact the Environment Team or use the Algal Resource Kit app.

4.2.2 Management Actions

Herbicide/Pesticide Use

Any herbicide or pesticide used must follow the recommended application rates and the SDS to minimise risks. Wear appropriate personal protection equipment and never spray on very hot or windy days. For further information on chemical use see Section 2.

TI only uses glyphosate that has been registered for aquatic use within 20 meters of waterways or in riparian areas. Please refer to the *Guidelines for Safe and Effective Herbicide Use Near Waterways* for any further information or for guidance contact the Environment Team.

Burning

Where no other weed management options are feasible, weed control via burning may be discussed with Environment Team. Any burning that is undertaken must be done so with the approval of the General Manager EHS and only when permitted by the Tasmanian Fire Service.

Weed management plans

TI's Operational Weed Management Plan outlines the main control methods for a range of weeds. Where there are large infestations of weeds and/or the removal of the weed will require ongoing management, a scheme specific Weed Management Plan should be developed. Implementation of the plan will prove much more effective in the long run for the removal of the weed and save time, effort and money. The NRE Tas Weed Management and Hygiene Guidelines contain a template.

Problematic weeds for TI

Gorse

Thistle

Wattle

Sagg/Lomandra

Blackberry

Willow

Blue Green Algae

Chilean Needle Grass

Cumbungi

Elodea canadensis

Washdown

See Section 7 for Plant and Animal Disease Management

4.3 Your Responsibilities

- Check with your Manager, Environment Team or scheme specific Weed Management Plan if there are any weed, pest or disease management requirements that apply to your work and ensure you comply with them.
- Assess the risk of spreading weeds, pests or diseases before starting field work: think about where you've been, where you're going and what you might encounter.
- Plan field trips to work from the least-disturbed to the most-disturbed site to reduce the risk of spreading weeds, pests or diseases.
- Follow check-clean-(disinfect)-dry hygiene protocols - washdown vehicles, shoes and equipment, particularly after visiting sites with weed infestations or signs of diseases and/or before working in any conservation areas. Note if any landholders have specific requirements.
- Avoid moving water, soil, gravel or plants from one area to another.
- Be aware of signs of infections/infestations; contact the Environment Team for further information, advice or to organise field hygiene training.
- Note any potentially problematic plants, aquatic weeds and algae during VIR inspections.
- Undertake weed control as necessary.
- Use chemicals appropriately and according to the label, SDS and Section 2, including only using waterway safe chemicals within 20m of waterways.
- Report any declared weeds, in particular Chilean needle grass to the Environment Team.
- Complete the quarterly OEMP Checklist regarding weed management.

4.4 Further Info

- Code of Practice for ground spraying
- Guidelines for Safe and Effective Herbicide Use Near Waterways
- Blue-green Algae Monitoring Procedure (V3)
- Operational Weed and Hygiene Management Plan (Draft)
- Weed Management and Hygiene Guidelines
- Chilean Needle Grass

5 NATIVE FAUNA MANAGEMENT

5.1 Aim

To minimise and manage the effects of our work activities on native fauna and fauna habitat.

5.2 Background and Management Practices

All native Tasmanian animals are protected by law and we are legally required to manage the effects of our activities on local wildlife. Permits are required for some activities, including any work impacting on threatened species. Where possible, mitigation measures should be put in place to reduce risks to wildlife.

Some protected species have additional specific regulatory requirements, including the Tasmanian wedge-tailed eagle *(Aquila audax fleayi)*, white-bellied sea eagle *(Haliaeetus leucogaster)* and Tasmanian devils *(Sarcophilus harrisii)*. Contact the Environment Team if undertaking works that could disturb these.

Native fauna habitat trees

If there is any planned removal of trees or limbs with hollows or greater than 70cm at chest height (dbh), contact the environment team for a fauna habitat assessment. The works may be able to be redesigned or alternative habitat (e.g. nest boxes or log hollows) may be erected in their place, and compliance reporting may be required.

Wallabies

If wallabies are found to be creating bare ground on dam walls and embankments through tracks or overgrazing, management options should be discussed with Environment Team.

Wombats

Wombats have been known to burrow into TI infrastructure, particularly in dam walls and embankments. These are a dam safety concern and if found should be decommissioned using the *Tasmanian Irrigation Burrow Monitoring and Decommissioning Protocol* after contacting the Environment Team.

Tasmanian Devils and Quolls

Tasmanian devils and quolls (especially the spotted-tail quoll) often take advantage of existing wombat burrows, particularly during breeding season. Where burrows are known and not compromising TI infrastructure, they should be left alone and disturbance to the surrounding area minimised during the devil and quoll breeding seasons (usually early winter to December). Report any active devil dens to Environment Team.

Green and Gold Frogs / Fish Sampling

See Section 9 – Water Quality and Aquatic Biota Management.

Birds – Swift Parrots, Masked Owl, Wedge-tailed Eagle, Goshawks

Disturbance to older/dead trees (particularly eucalypts) should be avoided particularly in the common breeding season of July to late summer. They often provide hollows or other nesting opportunities for threatened bird species including Tasmanian wedge-tailed eagles, white-bellied sea eagles, swift parrots and Tasmanian masked owls. Please report any new nests/nesting eagle sightings and during the eagle breeding season of July – January, please consult Environment Team if undertaking any maintenance works near known eagle nests and habitat.

Invasive fauna (pest management)

See Section 6 for Pest Management.

Injured wildlife

Report injured fauna to Bonorong Wildlife Sanctuary on 0447 264 625 (all hours – volunteer run Tasmania wide).

Remove injured wildlife from danger and leave in a warm, quiet and dark place until they can be collected, or transport to an animal hospital, vet or refuge and General Manager EHS notified. Refer to TI's *Emergency response – Discovery of Injured Fauna* for more details.

5.3 Your Responsibilities

- Minimise disturbance to threatened fauna habitat where possible and check with Environment Team before removing trees or undertaking vegetation management works.
- Do not undertake any major activities (e.g. pipe laying, dam maintenance, road construction works) within 500m or 1km line of sight of an active eagle's nest during July to February without approval from Environment Team.
- Drive carefully to avoid hitting wildlife: watch for animals on or near the roads, pay attention to wildlife warning signs and slow down at dusk and dawn.
- Report any active devil dens and new eagle nest/nesting eagle sightings.
- Where appropriate, if you encounter sick or injured wildlife, contact Bonorong Wildlife Sanctuary rescue service (Tasmania wide) or a local wildlife rescue service, particularly if threatened species.
- Complete the quarterly OEMP Checklist regarding fauna management.

5.4 Further Info

- Emergency Response - Discovery of Injured Fauna
- Burrow Monitoring and Decommissioning Protocol

6 PEST MANAGEMENT

6.1 Aim

To prevent the incursion and damage of TI infrastructure from pests.

6.2 Background and Management Practices

Rabbits

If rabbit burrows are detected in a dam wall or other infrastructure, discuss suitable eradication measures with the Environment Team.

Rats and mice

Where possible, prevent rats and mice from entering infrastructure (e.g. pumpstations) by blocking access points. Where necessary they can be trapped or poisoned using appropriate procedures. Poison/baits must be placed inside a bait station to avoid bait being eaten by other animals, and storage of excess chemicals must be in accordance with label, SDS and Section 2.

Snakes

Snakes should be prevented from entering pump stations by blocking access points. If materials are stored on site, they should be stacked off the ground to prevent snakes from hibernating under it. If you encounter a snake do not approach it or attempt to remove yourself. It may move itself, or call a snake removalist and log the sighting in MyOsh. All snakes in Tasmania are protected and it is offence to kill or take them.

Areas around TI assets including hydrometric monitoring facilities and irrigation outlets should be maintained in a clear state.

Birds

Birds should be prevented where possible from entering pump stations by blocking access points. Birds and nests should be dislodged humanely from inside site property as they are a fire hazard. If there is potential for the bird to be a threatened species, contact Environment Team.

Ants

Ants found in site office are to be poisoned using appropriate procedures.

Deer

Deer found to be causing damage to scheme infrastructure should fenced out where possible.

Wasps

Wasp nests should be treated with caution and where wasps are aggressive and interfering with operations, a registered pest controller should be called in to remove the nest. If found to affecting access to environmental monitoring sites, contact the Environment Team to discuss.

Aquatic pests

Red fin perch is to be prevented from spreading from its current range. Screens that are fitted to prevent the passage of fish eggs are to be maintained and any instances of fish being found outside of the expected range is to be reported.

European carp and eastern gambusia have localised populations in Tasmania. European carp can be found in Lake Crescent and Lake Sorell, while eastern gambusia can be found in the Tamar estuary. If found outside these areas notify Inland Fisheries Service.

Screens have been installed in some schemes to inhibit the passage of pest fish. The filters and screens require cleaning according to how fine the grate is. The finer screens to prevent fish egg passage (~1mm) typically require weekly cleaning, while some of the larger debris screens require less frequent cleaning. Refer to the scheme specific coversheet regarding the screens in each scheme.

The debris screens at the dam offtakes should be checked periodically, or when there seems to be an issue. Dirt box screens on outlets should be checked when meter readings are undertaken.

Snail

Snails may occur in some schemes (e.g. Whitemore) and may require cleaning of the filters/screens. If a significant problem is identified, please contact the Environment Team.

Eels

Short finned eels are wide-spread and native to Tasmania and can be found in most TI catchments. They can pose a problem with infrastructure if in large numbers. These snake-like fish spawn thousands of kilometres north of Tasmania in the warm waters of the Coral Sea. The tiny eels are carried by currents down the east coast of Australia till they reach Tasmania where they follow the freshwater as far as they can upstream to mature.

TI has an access arrangement with Tasmanian Eel Exporters Pty Ltd to stock and harvest short finned eels in some of TI storages. Determinations on whether the eels can be stocked, harvested or both in each of TI's dams have been based on environmental values and access provisions. The arrangement includes conditions relating to access, hygiene and licensing requirements. Discuss with the Environment Team or Chief Operating Officer for further information.

Freshwater turtles

Freshwater turtles are not native to Tasmania, please report all sightings to the Wildlife Management Branch of NRE Tas (see Contacts - Section 14).

6.3 Your Responsibilities

- Undertake pest control as necessary using appropriate measures.
- Complete the quarterly OEMP Checklist regarding pest management.

6.4 Further Info

- Reptile Rescue – Snake Removal
- Pest Ants
- European and English Wasps

7 PLANT AND ANIMAL PATHOGEN/DISEASE MANAGEMENT

7.1 Aim

To prevent the introduction and spread of plant and animal disease through our work activities.

7.2 Background and Management Practices

Plant and animal diseases can have significant impacts on the land and waterways we own and manage and potentially large impacts on TI and associated businesses.

TI is a signatory to the State '*Charter for Working on Private Farm Land*' which addresses biosecurity risks through the protection of properties from the entry of the spread of pests, diseases and weeds.

7.2.1 Biosecurity

Farm biosecurity is a crucial set of measures designed to protect properties from the entry and spread of pest, diseases and weeds. Farm biosecurity is the responsibility of farmers and every person visiting or working on a farm. Farmers have obligations to ensure that signage regarding biosecurity on their property is current and visible at the point of entry and scheme operators must observe signage.

The '*Check, Clean, (Disinfect) and Dry*' hygiene protocol is to be applied as detailed in the diagram below.

NRE Tas Keeping It Clean

7.2.2 Plant and Animal Diseases

Phytophthora

Phytophthora refers to *Phytophthora cinnamomi*, a waterborne, root rot pathogen that can cause disease and death in native Tasmanian plants.

Chytrid

Chytrid is a fungal pathogen that affects frogs and causes them to get chytridiomycosis, a disease that impacts their skin structure and function, leaving them prone to other diseases and death. It particularly impacts threatened frogs, including the threatened green and gold frog which is found across many of TI's schemes.

In particular, Lower South Esk, Midlands, Upper Ringarooma, Scottsdale and Duck do **not** have known chytrid fungus. Equipment (particularly if used in waterways) and vehicles **must** be thoroughly washed down before entering waterways or muddy areas from other schemes. Additional care should be taken when visiting Duck as chytrid has been found in the adjacent Montagu and Togari catchments. Whitemore has been confirmed to contain chytrid fungus. Meander and Southern Highlands contain areas of confirmed chytrid fungus, however it is not widespread, so aim to washdown vehicles (particularly tyres) between properties if entering waterways or muddy areas.

Foot rot

Foot rot is a serious and highly contagious disease, to prevent the spread of foot rot, which is mainly found on farming properties, ensure that hygiene protocols are followed, after visiting affected farms.

To prevent the spread of phytophthora, chytrid fungus and foot rot become familiar with and follow TI's washdown procedure and hygiene protocols, including washdowns with Trigene or phytoclean and '*Check, Clean, (Disinfect), Dry'* in the following procedures linked below;

- '*Keeping It Clean – Tasmanian field hygiene manual to prevent the spread of freshwater pests and pathogens, 2010*', and
- '*Operational Weed and Hygiene Management Plan including Vehicle Cleaning Protocols'.*

Notifiable pests and diseases

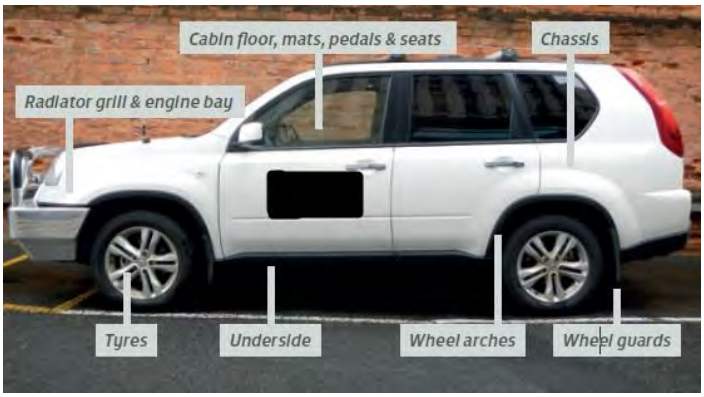
Where properties have been impacted by a notifiable pest or disease (e.g. foot and mouth, blueberry rust), extra biosecurity measures must be undertaken. The primary response should be to avoid the property or area until such a time that the disease or pest has been controlled and/or eliminated. If this is not possible, or the pest or disease causes an ongoing issue, the vehicle and equipment (including footwear) should be washed down with the specified disease or pest's recommended washdown procedure and product on entry and exit of property. A list of notifiable pests and diseases can be found on NRE Tas's website, separated into animal and plant.

7.2.3 Washdown procedure

TI vehicles and machinery need to be washed in accordance with the *Tasmanian Washdown Guidelines for Weed and Disease Control 2004* and recorded on an appropriate washdown register. Where appropriate, washdowns should occur before travelling between schemes, especially where there are known diseases in one of the schemes or driving through water/mud.

Specifically, all vehicles (TI and contractor) involved in operations will:

- Complete regular vehicle washdowns, covering the labelled areas below with appropriate cleaning products.
- Complete a vehicle wash if requested by a property owner or TI has been notified of a property requirement.
- Follow all requested biosecurity protocols (including washdowns) on properties with biosecurity signage or when notification of a biosecurity incident occurs.



7.3 Your Responsibilities

- Undertake regular vehicle washdowns and record on washdown register.
- Comply with the *Charter for Working on Private Land.*
- Complete the quarterly OEMP Checklist regarding hygiene/biosecurity management.

7.4 Further Info

- Weed Management and Hygiene Guidelines
- Keeping it Clean - Field Hygiene Manual - 2010
- Tasmanian Washdown Guidelines for Weed and Disease Control 2004
- *Charter for Working on Private Farm Land*
- Vehicle Weed and Hygiene Washdown Register
- Vehicle Washdown Site Location List
- Phytophthora Flora Technical Note. 8 FPA 2012
- Chytrid Tasmanian Frog Management Plan 2010
- Footrot Manual
- Notifiable Animal Diseases
- Notifiable Plant Diseases

8 CULTURAL HERITAGE

8.1 Aim

To ensure that that our work activities respect cultural significance and that we manage Aboriginal heritage items and values in compliance with all indigenous and heritage legislation.

8.2 Background and Management Practices

TI is committed to preserving Tasmania's Aboriginal and Cultural Heritage. Any areas of indigenous and cultural significance located on TI property must be managed to preserve its historical value.

8.2.1 Aboriginal sites and artefacts

If undertaking any soil disturbance works, follow the flow chart below or visit the AHT Website for instructions on how to undertake the Aboriginal Heritage Assessment Process. First and foremost a Dial Before You Dig or an Aboriginal Heritage Property Search must be undertaken prior to works.

At any point during works if a suspected new artefact is discovered, works are to cease immediately, do not move, collect or otherwise disturb the object, follow the Unanticipated Discovery Plan, and fill out an Aboriginal Heritage Site Reporting Form.

Legislation in Tasmania is clear that **ignorance is not a defence**. You **must** follow these basic steps to check for Aboriginal Heritage artefacts or sites.

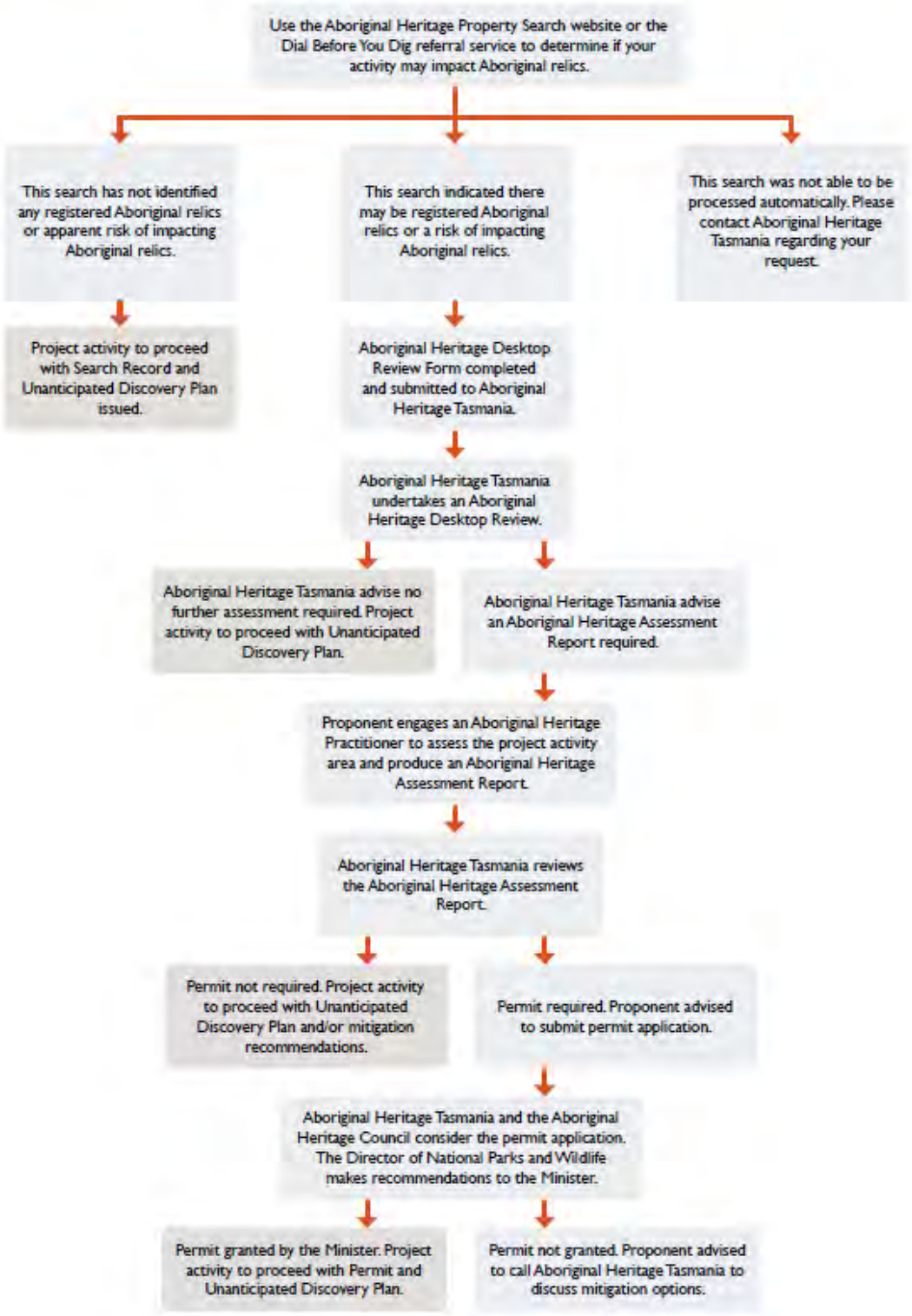
8.2.2 Heritage listed buildings and equipment

Any heritage listed buildings and artefacts located on TI land listed under the Tasmanian Heritage Register will be preserved. It is unlikely that you will have to manage heritage listed items through works on TI land. If you come across an item with suspected heritage values, stop work immediately and contact the Environment Team.

8.2.3 Culturally significant location or matter

Culturally significant locations or matters including World Heritage Areas, Ramsar Wetlands and Matters of National Significance are also protected under heritage legislation. The Farm WAP process is the primary procedure that manages any potential impacts from the application of TI water on these matters. Additionally, the Sorell Irrigation Scheme has a Groundwater Monitoring Program to monitor potential changes to the water that feeds into the Pitt Water - Orielton Lagoon Ramsar Site.

Aboriginal Heritage Assessment Procedure



8.3 Your Responsibilities

- Conduct a Dial Before You Dig and follow the Aboriginal Heritage Assessment Procedure prior to any undertaking any soil disturbance works.
- Stop work immediately if you find a suspected Aboriginal site or artefact and follow the Unanticipated Discovery Plan.
- Stop work immediately if you find an item or site with suspected heritage values and contact the Environment Team.
- Complete the quarterly OEMP Checklist regarding cultural management.

8.4 Further Info

- Aboriginal Heritage Assessment Process
- Unanticipated Discovery Plan - Aboriginal relics
- Aboriginal Heritage Act 1975
- Historical Cultural Heritage Act 1995

9 WATER QUALITY AND AQUATIC BIOTA MANAGEMENT

9.1 Aim

To identify and respond to potential changes in waterway condition and health and to minimise any impacts on water quality or aquatic biota due to TI's operational activities.

9.2 Background and Management Practices

TI is committed to managing water quality in our storages and associated waterways. Our waterways are valued by the community and stakeholders for their agricultural, ecological and recreational values. It is important that we maintain healthy waterways and quickly respond to any potential environmental issues or concerns. Water quality and health is assessed through the water quality monitoring programs and various aquatic biota monitoring programs.

9.2.1 Surface Water Quality Monitoring

Most schemes have a surface water quality monitoring program in place to assist detect any impacts of TI operations on water quality. Water quality monitoring sites are tested monthly and results are sent to the Environment Team through Survey123. Lab samples are generally collected every 3 months unless specified otherwise and transported to the appropriate collection point as per the Water Quality Monitoring Program (Appendix D).

Monthly samples are tested in field for pH, turbidity, conductivity, dissolved oxygen and temperature. Laboratory samples are tested for total nitrogen and total phosphorus as well as total suspended solids (TSS) and a further breakdown of nutrients at particular sites. These results give an indication of whether there is fertiliser and effluent contaminated runoff entering the waterways. The water quality data is reviewed upon submission through Survey123 for any threshold exceedances and trends are analysed monthly and annually to identify creep and potential impacts of TI operations on water quality in the catchments.

The water quality monitoring equipment (DO, pH and EC probes and turbidity meter) should be serviced (including part replacement) and calibrated according to the equipment's manual. Please contact the Environment Team to organise a time to service your equipment and if you would like assistance to calibrate any meters.

*Inform the Environment Team if you suspect a meter is faulty **within** the month of sampling.*

Please also notify Environment Team if any of the monitoring sites are unsafe to access or do not meet WHS requirements.

9.2.2 Groundwater Monitoring

TI undertakes groundwater quality monitoring and uses groundwater monitoring data to assess the potential impacts of the application of TI water on Pitt Water - Orielton Lagoon in the Sorell Irrigation Scheme. Groundwater monitoring data is used to detect the movement of nutrients, salinity and the water table. Farm risk profiles using Farm WAP data have been developed to assist with interpreting findings and to allow for adaptive management responses to be implemented upon changes and any threshold exceedances being identified.

9.2.3 Blue Green Algae

Blue green algae is a type of bacteria, naturally found in freshwater in low quantities. A combination of high water temperature, sunlight and nutrients can cause blue green algae blooms. These algae blooms are toxic to humans and animals and can cause fish kills and bad odours. Please report any suspected blue green algae blooms *immediately* to the Environment Team and *DO NOT* touch the algae.

TI's 'Management Procedure for Managing the Risk of Algal Blooms in Storages' is to be used to monitor for the presence of blue green algae. Report suspected blue green algae as soon as possible to the Environment Team. A sample may be required to be taken to the laboratory straight away. For blue green algae identification help, please contact the Environment Team or use the Algal Resource Kit app.

9.2.4 Aquatic Biota

TI undertakes a variety of surveys to ensure that there is no adverse impact on the aquatic biota of streams due to the application of TI water. This may include AusRIVAS surveys, fish surveys and aquatic flora and weed surveys.

AusRIVAS

AusRIVAS surveys (Australian River Assessment System) assesses the biological health of waterways through the assessment of macroinvertebrates. TI undertakes these surveys as part of our legislative requirements under particular schemes. The assessments are undertaken by the Environmental Specialist – Ecology & Sustainability, although they may ask for your presence while they are in the water at some sites.

Green and Gold Frogs

Green and gold frogs are found predominately in the north-east and south-east of the state. They are listed as vulnerable on both the state and federal threatened species lists and TI undertakes monitoring where required to ensure they are not adversely impacted by the application of TI water. These surveys are conducted by the Environment Team, with assistance by scheme operators.

Fish Surveys

Native and pest fish surveys are undertaken to determine the impact of TI infrastructure and operations on fish community composition, relative abundance and recruitment, abundance and diversity of fish species in comparison to pre dam fish numbers. Inland Fisheries undertake these surveys through electrofishing. Your assistance may be required to provide access to enable these surveys.

Aquatic Weed Surveys

Aquatic weed surveys are undertaken to determine presence or absence of aquatic weed species. The surveys are undertaken via visual assessments of the water body by driving around the edge, and on ground visual assessments at sites determined to be at higher risk of aquatic weed establishment. Annual aquatic weed surveys are undertaken by the Environmental Specialist – Ecology & Sustainability in certain schemes, with more general monthly Operator surveys undertaken monthly.

9.2.5 Fish stocking – Inland Fisheries

Some schemes have dams and waterways stocked by Inland Fisheries. Each of these has a set of access agreements, hygiene and licensing requirements, supplied with relevant scheme OEMP coversheets. While public fishing is allowed at some of our sites, there are regions that are unsafe for public to enter. Ensure these are marked and/or fenced off.

9.2.6 Pump Station Maintenance

Activities associated with the maintenance of TI pumpstations can have adverse impacts on water quality and aquatic flora and fauna if not managed correctly. Prior to undertaking any maintenance on pumpstation wet wells, an environmental management plan is to be prepared. The EMP is to identify the activities to be undertaken, the environmental aspects, possible environmental impacts and management actions including controls that are to be implemented.

9.3 Your Responsibilities

- Complete monthly water quality monitoring of all sites and ensure results are sent in via Survey123 by the end of the 3rd week of the month.
- Collect laboratory samples at the designated frequency and transported to the appropriate office/laboratory by the end of the 3rd week of the month.
- Report any faulty water quality equipment.
- Assist in aquatic biota surveys as required.
- Report suspected blue green algae blooms immediately.
- Be aware of Inland Fisheries stocking plans and access requirements.
- Complete the quarterly OEMP Checklist regarding water management.

9.4 Further Info

- Water Quality Monitoring Programs
- Blue-green Algae Monitoring Procedure (V3)
- Algal Resource Kit
- *Inland Fisheries Act 1995*

10 WATER RESOURCE MANAGEMENT

10.1 Aim

To ensure the water taken from watercourses and released by TI for our irrigators complies with legal requirements and does not have any impact on the environment or other water users.

10.2 Background and Management Practices

TI is committed to ensuring that all water taken for our activities is done so in accordance with licensed approvals. We are also committed to ensuring that all water released and conveyed using watercourses for our irrigators is done so in a manner that will not impact on the environment or other water users.

10.2.1 Water Licences

Water licences are issued to TI by NRE Tas to enable taking of water, to fill dams, for environmental flow provisions and occasional flood takes (apart from SWIS where there is a year-round take). Water licences come with particular conditions that must be followed. Most water licence conditions include ensuring that the amount of the water taken does not exceed the period amount and ensuring that the water taken is recorded on an appropriate meter. Records of water taken under the water licences must be maintained and reported on (water entity reports).

10.2.2 Watercourse Authorities

Watercourse Authorities are approvals from NRE Tas to convey water along watercourses (typically taken at one time, stored, then released later). All schemes with riparian delivery must have a watercourse authority in place. Watercourse authorities also have conditions attached to them, usually outlining the required transmission losses for conveying water down the watercourse.

10.2.3 Water Transfer Agreements

In a number of schemes, TI has a Water Transfer Agreement (WTA) which facilitates the transfer of water from Hydro Tasmania (or another party) to TI. The agreement differs between each of the schemes and in some cases is only in place for when there are water restrictions in place for NRE Tas licences (i.e. SWIS). Records of water taken under WTA must be maintained and reported on.

10.2.4 Water Infrastructure

Weirs

Weirs are installed to measure flow entering storages and/or to measure riparian delivery. TI weirs are telemetered into SCADA and the NRE Tasmania Water Information Web Portal. Maintenance of the weirs and associated equipment is currently undertaken by Pinion Advisory.

Weather Stations including rain gauges and evaporation pans.

Where rain gauges and evaporation pans are installed, they should be cleaned out periodically. Weather station telemetry should be maintained and where it is malfunctioning, should be reported to the Asset Manager.

10.3 Your Responsibilities

- Make yourself familiar with the requirements of the water licence(s) for your scheme. If you are unsure contact Environment Team.
- Ensure you are familiar with the requirements of and are following the conditions of the relevant watercourse authority for your scheme.
- Maintain rain gauges, evaporation pans, filters and screens as necessary.
- Complete the quarterly OEMP Checklist regarding water resource management.

10.4 Further Info

- NRE Tasmania Water Information Web Portal
- How to access Water Licence information on the LIST
- Water Licences
- Watercourse Authorities

11 SOIL MANAGEMENT

11.1 Aim

To prevent erosion, soil loss and sediment pollution of waterways by managing site works and activities and minimise the disturbance of acid sulfate soils and potential impacts of acid sulfate soil disturbance.

11.2 Background and Management Practices

Soils may become damaged or lost during or a result of TI work activities, or from wind and water; creating erosion and dust problems and waterway pollution. Sediments in waterways can impact our infrastructure and harm the environment. TI aims to minimise soil impacts, sediment entering infrastructure, storage facilities and waterways, and to comply with soil management requirements and recommendations.

11.2.1 Sediment and runoff control

Before undertaking works, consider sediment and erosion controls and regeneration plan (if relevant). This may include sediment traps, silt booms, spreading grass seed, hydromulch or covering bare areas with rock or mulch to reduce or eliminate sediment entering any storages and waterways. Any uncontrolled sediment laden runoff will be documented in MyOSH and reported to the General Manager EHS as an environmental incident.

11.2.2 Erosion

Any erosion found on TI land will be controlled using the *Best Practice Erosion and Sediment Handbook.* Rock shall be placed over the bare ground to prevent erosion while ground cover regenerates. Some cases may require for grass seed or hydromulch to be spread.

11.2.3 Acid Sulfate Soil Management

Acid sulfate soil (ASS) is the common term for soil which contains chemical compounds known as metal sulfides. These soils are not a concern when remaining undisturbed or covered by water, but when exposed to air they pose risk to water and soil quality. Heavy metals and other toxicants can also be released and dissolved oxygen concentration in water is likely to be low in affected areas.

Where maintenance activities require soil disturbance, the soil should be assessed for potential ASS through a desktop assessment (refer to Tasmanian Irrigation Acid Sulfate Soil Management Protocol). If suspected ASS are found during works, cease works and contact General Manager EHS immediately for further advice.

11.2.4 Sodic Soil Management

Sodic soils are generally characterised as containing a high concentration of sodium that causes the soils to be highly dispersive with a significant risk of erosion. They are common in duplex or gradational soils, with sodic duplex soils particularly susceptible to waterlogging. Like ASS, these soils mostly pose a risk when exposed. Management measures are focused on not exposing sodic soils where possible or applying lime or gypsum if appropriate. Contact environment team for further information.

11.3 Your Responsibilities

- Assess potential for ASS and sodic soils when planning works that will disturb the ground, and know the signs of ASS and sodicity if undertaking soil disturbance works.
- Ensure any significant bare ground is covered with rock and/or grass seed is spread at completion of works.
- Report any significant sediment runoff or erosion to General Manager EHS and through MyOSH as an environmental incident.
- Complete the quarterly OEMP Checklist regarding soil management.

11.4 Further Info

- Best Practice Erosion and Sediment Handbook (2008)
- Erosion and Sediment Control Plan
- Erosion and Sediment Control Plan Procedure
- Tasmanian Irrigation Acid Sulfate Soil Management Protocol

12 FARM WATER ACCESS PLANS

12.1 Aim

To address the risk from application and storage of TI water, and to minimise potential impacts to biodiversity, soil and water, Farm Water Access Plans (Farm WAPs) have been developed for all TI-built schemes.

12.2 Background and Management Practices

12.2.1 Farm WAP

TI is committed to preventing adverse impacts on the biodiversity, soil and water on farms using TI water. Farm WAPs must cover all land and dams where TI water may be applied or stored, which must be in place before TI water can be delivered to the property.

Farm WAP areas can be found on Field Maps, and on printed/pdf maps provided for each scheme. Please check the Farm WAP area on Field Maps and contact Environment Team if irrigators are expanding their area under irrigation. Farm WAPs can be amended to include new areas or split where properties have been sold separately (charges apply). Please contact the Environment Team if you identify a potential Farm WAP breach, are alerted to one, or know of someone planning to expand/sell/buy significantly more water.

It is the responsibility of the scheme operator to inform the Environment Team when a new outlet is being installed or an irrigator is planning on using water for the first time. Some irrigators delay arranging their Farm WAP at the time of scheme construction, but have an outlet, irrigation right and allocation. Additionally, when irrigators transfer water, a check needs to be undertaken to ensure their Farm WAP allows them to apply as much water to their property. The Water Trading and Document Administrator will typically commence this check.

12.2.2 Farm WAP Audits

TI has an Annual Farm WAP Audit process in place which, dependent on scheme approval conditions, requires 10 or 15% of Farm WAPs for properties that have taken over 5 ML. If compliant that Farm WAP is typically exempt from audit selection the following year.

Irrigators with identified non-compliance are audited/re-audited, and in some schemes, Farm WAPs that contain Matters of National Significance are audited annually. The audits are conducted in compliance with an annually approved Farm WAP Audit Protocol.

12.3 Your Responsibilities

- Identify increases in irrigation area, check Farm WAP area on Field Maps and if a breach is identified, or you are unsure, report to the Environment Team.
- Review any transfers and sales of water for Farm WAP requirements to assist admin processes.
- Where suitable assist Environment Team with compliance activities/Farm WAP audits if required.
- Provide water meter readings when requested to enable Farm WAP audits.
- Complete quarterly OEMP Checklist regarding Farm Water Access Plans.

12.4 Further Info

- Farm WAP Planning Framework 2013
- Scheme specific maps attached to scheme coversheet

13 AIR, NOISE AND WASTE MANAGEMENT

13.1 Aim

To minimise impacts of TI activities on air quality including dust, fumes and noise on neighbours, the community and the environment and to ensure waste generated by TI is identified, stored, collected and disposed of correctly.

13.2 Background and Management Practices

Dust

All vehicle movement will be undertaken to minimise dust and other air pollutants where possible. Where suitable, TI will revegetate, sow to grass or place gravel in bare areas to minimise dust and erosion.

Noise

Noise on site will be managed to minimise disturbance to neighbours and the community by remaining within approved hours where possible. Any activities or equipment that has the potential to impact other parties will be undertaken and managed appropriately.

Fumes

Fumes will be managed as per SDS for individual chemical found on site. A physical copy of each SDS must be kept on site. Appropriate PPE must be worn when fumes are suspected.

Identification of Waste

Waste will be identified as either controlled waste or common waste, with a high priority to reduce waste and recycle where appropriate. Controlled waste includes tyres, chemicals, unlabelled/unwashed/old chemical containers, oils and some paints (due to the presence of heavy metals).

Storage of Waste

Waste will be identified and stored in appropriate waste containers/receptacles.

Collection and disposal of waste

Controlled waste must be transported by a licensed controlled waste transporter at a licensed waste disposal centre. Controlled waste certificates will be filled out and kept by TI. Common waste will be disposed of at local waste facilities. Tyres should be returned to appropriate facilities, ideally when purchasing new tyres. Where appropriate, waste that can be recycled will be returned to recycling facilities.

13.3 Your Responsibilities

- Where possible minimise or control air, dust, fume and noise pollution.
- Identify and store waste in an appropriate manner.
- Complete quarterly OEMP Checklist regarding waste management, air quality & noise compliance.

13.4 Further Info

- Operational Waste Management Procedure
- Waste Management Procedure
- OHS Noise Management Procedure
- Information on storage and transporting chemicals

14 CONTACTS

14.1 Emergency Contacts

Police, Fire Brigade, Ambulance	000
Poisons Information Centre	131 126
Search and Rescue (Aviation)	1800 815 257

14.2 Tasmanian Irrigation Contacts

Head Office

Evandale	03 6398 8433		enquiries@tasirrigation.com.au
Chief Operating Officer	David Skipper	0417 279 062	david.skipper@tasirrigation.com.au

Environment Team

General Manager – Environment, Health and Safety	Sophie Grace	0460 884 468	sophie.grace@tasirrigation.com.au
Environmental Specialist – Ecology & Sustainability	Jesse Lewis	0472 535 639	Jesse.Lewis@tasirrigation.com.au
Senior Environmental Advisor – Compliance	Geoff Jones	0447 066 959	Geoff.Jones@tasirrigation.com.au
Environmental Officer – Compliance	Amy Madsen	0439 856 122	amy.madsen@tasirrigation.com.au
Environment Advisor – Projects & Approvals	Cassie Tickner-Smith	0438 994 149	cassie.tickner-smith@tasirrigation.com.au
Farm WAP enquiries	Amy & Geoff		farmwap@tasirrigation.com.au

14.3 Other Key Contacts

Alistair Brooks – Pinion Advisory (Hydrography)	0438 476 215
Department of Natural Resources Tasmania (NRE Tas)	1300 368 550
Bonorong Wildlife Sanctuary	0447 264 625
Inland Fisheries Service	03 6165 3808
Reptile Rescue - Snake removal	0499 116 690

Appendix A Table of Key Environmental Approvals relevant to each Scheme

Scheme	**Environmental Approvals**						
	Environment Protection and Biodiversity Conservation Act 1999			***Water Management Act 1999***		***Irrigation Clauses Act 1973***	
	Approval Type[1]	***Independent Audit of Conditions***	***Conditioned Contingency Plan***	***Irrigation District Approval conditions***	***Water Entity Report***	***By-Laws***	***Farm WAPs***
Coal River (SEIS1)	N/A				✓	✓	-
Dial Blythe	NCA			✓	✓	✓	✓
Don	N/A			IP	✓	IP	✓
Duck	NCA			✓	✓	✓	✓
Great Forester	NCA			✓	✓	✓	✓
Greater Meander	CA	✓		✓	✓	✓	-
KNMIS	NCA-PM		✓	✓	✓	✓	✓
Lower South Esk	SA	✓		✓	✓	✓	✓
Midlands	SA	✓		✓	✓	✓	✓
North Esk	NCA			✓	✓	✓	✓
Sassafras Wesley Vale	CA			✓	✓	✓	✓
Scottsdale	NCA-PM			✓	✓	IP	✓
Sorell (SEIS3)	NCA-PM		✓	✓	✓	✓	✓
South East (SEIS2)	N/A				✓	✓	-
Southern Highlands	NCA			✓	✓	✓	✓
Swan	NCA			✓	✓	✓	✓
Upper Ringarooma	NCA-PM		✓	✓	✓	✓	✓
Whitemore	NCA-PM			✓	✓	✓	✓
Winnaleah	NCA-PM		✓	✓	✓	✓	✓

[1] NCA – Not Controlled Action, NCA(PM) – Not a Controlled Action if undertaken in a particular manner, CA – Controlled Action, PM – Prescribed Manner, SA – Strategic Assessment, IP – In Progress

Appendix B Table of Key Environmental Aspects relevant to each Scheme

Scheme	Section 2 – Chemical and Other Hazardous Material Management				Section 3 – Vegetation Management		Section 4 – Weed Management			
	Chemical storage facility	***Spray Trailer - stored***	***Spill Kit***	***Boom/ silt curtain - stored***	***Rehabilitation commitment (incl quarry)***	***Eucalypt control (DICL pipeline)***	***Willow***	***Cumbungi***	***Gorse***	***Other/ prescribed***
Coal River (SEIS1)	*y*	y	y		y		y	y	p	Chilean needle grass
Dial Blythe			y			y	p			
Don			y				p			
Duck			y	y	✓					
Great Forester			y					p	n	
Greater Meander	Y	y	y	y	✓		p	p	p	
Kindred North Motton			y			y	p	p		
Lower South Esk			y				p	p	P	
Midlands	Y		y		✓	y	p	y	y	
North Esk		y	y				p	p	y	
Sassafras Wesley Vale			y				p	p		
Scottsdale	y	y	y	y	✓	y	p		y	
Sorell (SEIS3)	*y*	y	y		y		p	p		Chilean needle grass
South East (SEIS2)	*y*	y	y		y		p	p		
Southern Highlands	y		y		y					
Swan	y		y				p	p	P	
Upper Ringarooma			y						N	
Whitemore			y				p		p	
Winnaleah	y		y							

✓ - legal requirement, y - yes/need exists, p - present but no action required, n - not present + have to maintain this status

Scheme	Section 6 – Pest Management			Section 7 - Plant and Animal Disease Management		Section 8 – Cultural Heritage Management	
	Fish	***Snail***	***Eel***	***Chytrid***	***Biosecurity***	***Aboriginal heritage***	***European heritage***
Coal River (SEIS1)	p		p		y	y	p
Dial Blythe					y		p
Don					y		
Duck				Montagu catchment	y	y	p
Great Forester				n	y	y	
Greater Meander			p		y	y	p
Kindred North Motton	p	y			y	y	p
Lower South Esk			p		y	y	
Midlands				n	y	y	p
North Esk					y	y	p
Sassafras Wesley Vale	y	y			y		
Scottsdale				n	y	y	p
Sorell (SEIS3)	p				y	y	p
South East (SEIS2)	p				y	y	p
Southern Highlands	y				y	y	p
Swan				n	y	y	p
Upper Ringarooma				n	y	y	p
Whitemore				y	y		p
Winnaleah					y		p

✓ - legal requirement, y - yes/need exists, p - present but no action required, n - not present + have to maintain this status

Scheme	Section 9 - Water Quality and Aquatic Habitat Management									
	Surface WQMP	***Ground WQMP***	***Blue Green Algae***	***AusRivas***	***Frog surveys***	***Native Fish Surveys***	***Pest Fish Surveys***	***Aquatic Weed Surveys***	***Blue-Green Algae outbreak***	***Pump Station Maintenance***
Coal River (SEIS1)	✓		y						High	
Dial Blythe	✓		y						Medium	
Don	✓								Low	
Duck	✓								Low	
Great Forester	✓								Medium	
Greater Meander	✓			✓		✓			Medium	
Kindred North Motton	✓								Low	y
Lower South Esk	✓		y						High	
Midlands	✓	✓		✓			✓	✓	Medium	
North Esk	y						✓		Low	
Sassafras Wesley Vale	y								Low	
Scottsdale	✓								Low	y
Sorell (SEIS3)	✓	✓							Low	
South East (SEIS2)	✓								Low	
Southern Highlands	✓								Low	
Swan	✓								Medium	
Upper Ringarooma	✓								Low	
Whitemore	✓								Low	
Winnaleah	✓								Low	

✓ - legal requirement, y - yes/need exists, p - present but no action required, n - not present + have to maintain this status

Scheme	Section 10 - Water Resource Management						
	Water Licence	***Watercourse Authority***	***Water Transfer Agreement***	***Transmission Losses***	***TI Gauging Station***	***Rain Gauge***	***Evaporation Pan***
Coal River (SEIS1)	✓	✓		✓	y		
Dial Blythe	✓				y		
Don	✓	✓					
Duck	✓	✓		✓	y	y	y
Great Forester	✓	✓		✓			
Greater Meander	✓	✓	✓	✓		y	y
Kindred North Motton	✓	✓					
Lower South Esk	✓	✓		✓			
Midlands		✓	✓	✓	y		
North Esk	✓				y		
Sassafras Wesley Vale	✓	✓	✓				
Scottsdale	✓	✓			y		
Sorell (SEIS3)	✓						
South East (SEIS2)					y		
Southern Highlands	✓	✓	✓				
Swan	✓				y		
Upper Ringarooma	✓	✓			y		
Whitemore	✓	✓			y	y	
Winnaleah	✓						

✓ - legal requirement, y - yes/need exists, p - present but no action required, n - not present + have to maintain this status

Scheme	Section 11 – Soil Management		Section 12 - Farm Water Access Plans		Section 13 - Waste Management
	Acid Sulfate Soils	***Erosion***	***Farm WAP***	***Landscape Monitoring Program***	***Controlled Waste***
Coal River (SEIS1)	y				As required
Dial Blythe		y	✓	✓	As required
Don		y	✓	✓	As required
Duck	y	y	✓	✓	As required
Great Forester	y		✓	✓	As required
Greater Meander	y				As required
Kindred North Motton	p	y	✓	✓	As required
Lower South Esk	y		✓	✓	As required
Midlands	y	✓	✓	✓	As required
North Esk	y	y	✓	✓	As required
Sassafras Wesley Vale	p	y	✓		As required
Scottsdale	y		✓	✓	As required
Sorell (SEIS3)	y		✓	✓	As required
South East (SEIS2)	y	y			As required
Southern Highlands	p	y	✓	✓	As required
Swan	y		✓	✓	As required
Upper Ringarooma	p	y	✓	✓	As required
Whitemore	y	y	✓	✓	As required
Winnaleah	p		✓		As required

✓ - legal requirement, y - yes/need exists, p - present but no action required, n - not present + have to maintain this status

Appendix C DrumMuster Collection Points

Location	Address	Opening Days	Opening Hours	Bookings	Contact Details
South Riana Transfer Station	*South Riana Road 3km south of Loyetea Rd junction, South Riana*	Thursday	12pm – 3.30 pm	No	
		Sunday	9am – 12.30pm		
Sprent/Castra Transfer Station	*Castra Rd 3.5km south of Sprent, Sprent*	Friday	1pm – 4:30om	No	
		Saturday	8:30am – 12pm		
Preston Transfer Station	*Preston Rd 3km north of Preston, Preston*	Friday	8.30am – 12pm	No	
		Saturday	1pm – 4.30pm		
Ulverstone Resource Recovery Centre	*Lobster Creek Rd, West Ulverstone*	Tues, Wed, Fri	9am – 5pm	No	
		Sat	10am – 5pm		
Spreyton Waste Transfer Station	*Mersey Rd, Spreyton*	Tuesday, Thursday	9am – 3pm	Yes	(03) 6427 3351
Burnie Waste Management Centre	*289 Mooreville Rd, Mooreville*	First Monday of every month		No	
Wynyard Transfer Station	*170 Goldie St, Wynyard*	7 days	9am – 5pm	Yes	Vincent Industries – (03) 6442 3538
Deloraine Landfill & Recycling Centre	*Tip Rd, Deloraine*	First Monday of every month	9am – 5pm	Yes	(03) 6362 3700
Beaconsfield Transfer Station	*Bowens Jetty Rd, Beaconsfield*	On request		Yes – at least 24 hrs notice	0417 055 823
George Town Refuse Site	*Mount George Rd, George Town*	7 days	12pm – 4pm	No	
White Hills Transfer Station	*Bass Hwy, Smithton*	7 days	10am – 4pm	Yes	(03) 6452 4896
Longford Waste Transfer Station	*Marlborough St, Longford*	Wednesday	1pm – 5pm	Yes	(03) 6391 3032 or 0439 648 684
Scottsdale Waste Transfer Station	*Bridport Rd, Scottsdale*	Monday	10am – 2pm	No	
		Wednesday, Friday, Saturday, Sunday	9am – 5pm		
Bothwell Waste Disposal Site	*1755 Highland Lakes Rd, Bothwell*	On request		Yes	(03) 6259 5503
Campbell Town Waste Transfer Station	*Lake Leake Hwy, Campbell Town*	Tuesday	9.30am – 4.30pm	Yes	(03) 6391 3032
Hamilton Waste Management Centre	*Mount Rd, Hamilton*	Monday, Friday, Saturday, Sunday	2pm – 4pm	Yes	Council – (03) 6259 5503
Avoca Transfer Station	*Esk Main Rd, Avoca*	Saturday	10am – 4pm	Yes	0417 311 033
Branxholm Waste Transfer Station	*Ruby Flats Rd, Branxholm*	Wednesday	1pm – 5pm	No	

		Saturday	9am – 5pm		
		Sunday	1pm – 5pm		
Oatlands Waste Management Centre	*Inglewood Rd, Oatlands*	Tuesday	8am – 12pm	No	Council – (03) 6254 5016
		Friday	11am – 3pm		
		Saturday	8am – 12pm		
		Sunday	1pm – 5pm		
Peppermint Hill Landfill	*Dean Rd, New Norfolk*	7 days	10am – 4.30pm	Yes	0477 803 236
Bridgewater Transfer Station	*Cove Hill Rd, Bridgewater*	By request		Yes	Cathy Harper – (03) 6268 7030
Gladstone Waste Transfer Station	*Cape Portland Rd, Gladstone*	Monday	9am – 3pm	No	(03) 6357 2182
		Wednesday	1pm – 5pm		
		Saturday	9am – 4pm		
		Sunday	10am – 5pm		
Campania Waste Management Centre	*Brown Mountain Rd, Campania*	Tuesday, Thursday, Saturday	1pm – 5pm	Yes	Council – (03) 6259 3011
		Sunday	8am – 12pm		
Swansea Waste Transfer Station	*Bottom end of Maira St, Swansea*	By request		Yes	0417 534 018 or (03) 6256 5053
Scamander Refuse Disposal Site	*Coach St, Scamander*	Tuesday, Thursday	10am – 4pm	Yes	Peter Lefevre – 0427 360 252
		Sunday	2pm – 5pm		
Mornington Park Waste Transfer Station	*126 Mornington Rd, Mornington*	Monday – Friday	7.30am – 5pm	Yes	(03) 6245 9330
Southbridge Waste Transfer Station	*3km south of the Huonville Bridge, Huon Hwy, Huonville*	Tuesday, Thursday	10am – 4pm	No	(03) 6264 8459
Barretta Waste Management Facility	*1922 Channel Hwy, Margate*	Monday – Friday	7am – 4pm	Yes	(03) 6267 2337
		Weekends/Public Holidays	9am – 4pm		
Flinders Council Depot	*Patrick St, Whitemark*	Annual			(03) 6359 2131
Nubeena Waste Transfer Station	*60 Tip Rd, Nubeena*	Quarterly			(03) 6250 9200
Charles Street Waste Transfer Station	*Charles St, Currie*	Tuesday, Thursday	8am – 12pm	No	
		Sunday	10am – 2pm		

Appendix D Water Quality Monitoring Program

Sites are field sampled (pH, electrical conductivity (µs/cm), turbidity (NTU), dissolved oxygen (mg/L), temperature (°C)) monthly, and lab samples are collected as following:

Scheme	Site number	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Parameters
Dial Blythe	DBIS_1, DBIS_2, DBIS_3, DBIS_4, DBIS_5, DBIS_6, DBIS_7			Y			Y			Y			Y	TN, TP
Don	DN_1, DN_2, DN_3, DN_4													TN, TP
Duck	DUCK_1, DUCK_2, DUCK_3, DUCK_4, DUCK_5	Y			Y			Y			Y			TN, TP
Great Forester	No lab samples (1-6 field sampled)		Y			Y			Y			Y		
Greater Meander	MDAM_1, MDAM_3 (2 is field sampled)													TN, TP, PO_4, ammonia
Kindred North Motton	KNMIS_1, KNMIS_2, KNMIS_3, KNMIS_5, KNMIS_6, KNMIS_7, KNMIS_8, KNMIS_9													TN, TP
Lower South Esk	No lab samples (4, 7, 8 & 9 field sampled)													
Midlands	MWS_1_US, MWS_1_DS, MWS_2_US, MWS_2_DS, MWS_3_US, MWS_3_DS, MWS_4_DS, MWS_5 (7 is field sampled)	Y			Y			Y			Y			TN, TP
	MWS_4_DS, MWS_5	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	TSS
	MWS_6	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	TN, TP, nitrate, nitrite, PO_4, ammonia
North Esk	NEIS_1	Y	Y										Y	TN, TP
	NEIS_2, NEIS_3	Y	Y											TN, TP
Sassafras Wesley Vale	SWIS_WQ1, SWIS_WQ2, SWIS_WQ3, SWIS_WQ4, SWIS_WQ5, SWIS_WQ6			Y			Y			Y			Y	TN, TP

Scottsdale	SIS_1, SIS_2, SIS_3, SIS_4 U/S, SIS_5 U/S, SIS_6, SIS_7, SIS_8	Y			Y			Y			Y			TN, TP
Sorell (SEIS3)	SEIS_WKR, SEIS_OR1, SEIS_OR2, SEIS_SR1, SEIS_SR2, SEIS_IC, SEIS_FR, all groundwater sites	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	TN, TP
South East (SEIS 1 & 2)	SEIS_BD, SEIS_CD, SEIS_BMR, SEIS_FRB, SEIS_GW, SEIS_DBD (RD is field sampled)		Y			Y			Y			Y		TN, TP
Southern Highlands	SHIS_1, SHIS_2, SHIS_3, SHIS_4, SHIS_5, SHIS_6, SHIS_7	Y			Y			Y			Y			TN, TP
Swan	SWAN_5, SWAN_6, SWAN_7, SWAN_8, SWAN_9, SWAN_10, SWAN_11, SWAN_12, SWAN_13, SWAN_14, SWAN_15			Y			Y			Y			Y	TN, TP
Upper Ringarooma	URIS_1, URIS_2, URIS_3, URIS_4, URIS_5, URIS_6, URIS_7, URIS_8	Y			Y			Y			Y			TN, TP
Whitemore	WHS_1, WHS_2, WHS_4, WHS_5, WHS_6			Y			Y			Y			Y	TN, TP
Winnaleah	WISA_1, WISA_2, WISA_3, WISA_4, WISA_5, WISA_6, WISA_7,	Y			Y			Y			Y			TN, TP

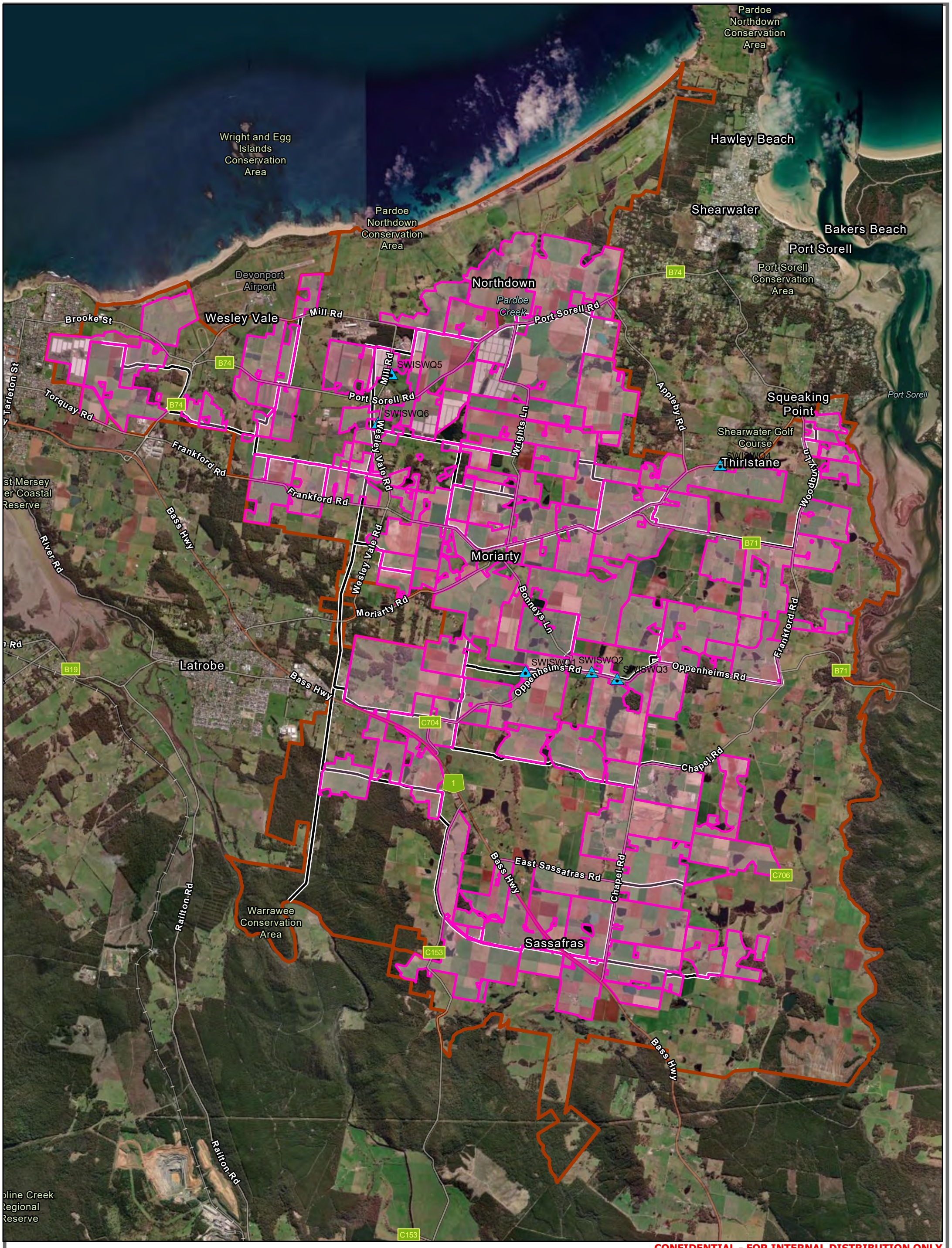
Operational Environment Management Plan Coversheet – Sassafras Wesley Vale Irrigation Scheme

Updated 8/11/2023

OEMP Issue:	Scheme Specific Details:
Incident Management	
If incidents occur contact the Manager Environment and follow the MyOsh incident reporting procedure	e.g. Blue Green Algae, chemical spills, water pollution, Farm WAP breach.
Chemical & Hazardous Materials	
Chemicals are to be stored in a locked chemical storage facility.	Chemical storage facility located at the Deloraine office. Ensure chemicals are kept sealed, in bunded areas. Ensure up to date SDS are kept in the office, in the shed, on you during transit and on MyOsh.
Spill kits must be present in chemical storage and transport.	A spill kit is located at the chemical storage facility. A spill kit is to be kept in the vehicle transporting chemicals.
Ensure appropriate training, PPE and documentation (e.g. JHA)	Scheme Operator should have current ChemCert. Ensure adequate PPE before undertaken any chemical application or chemical decanting/ mixing.
Washdown and disposal	Chemical washdown facility location TBC. DrumMuster collection centre for empty chemical drums located at Spreyton Waste Transfer Station (see App. C of OEMP).
Vegetation Management	
Grasses	Requires control via whippersnipper, lawn mowing or spraying around outlets periodically.
Rehabilitation and revegetation	N/A
Bushfire Management	Ensure fuel has not built up around TI infrastructure (annual).
Eucalypt Control DICL pipeline	N/A
Quarry	N/A
Weed Management	
Blue Green Algae	N/A
Other aquatic weeds	Willows and cumbungi in waterways but no known issues as scheme delivers via pipeline. Manage if it becomes necessary.
Significant weeds	Blackberries around outlets require control periodically. Serrated tussock exists in the scheme, but is not known at TI infrastructure.
Around infrastructure	General agricultural weeds and grass around infrastructure.
Weed hygiene	Washdown between sites with significant weed infestations.
Native Fauna Management	
If undertaking works that will remove trees	Consult with Environment Team and receive approval from General Manager EHS and other relevant approvals before clearing trees (including individual trees).
Impacting infrastructure	No known issues.
Protected	If undertaking works that could disturb eagle nests or other protected species contact the Environment Team.
Injured	Keep the animal warm, dark and quiet, do not feed it and minimise handling. Contact the RSPCA on 6332 8282 or Bonorong Wildlife Rescue on 0447 264 625.

Pest Management	
Offices and buildings	Use appropriate rodent bait in sealed containers.
Aquatic	Red fin perch in Mersey. Screens prevent transfer to farm dams.
Screens	Require cleaning periodically to remove build up of debris.
Plant and Animal Disease Management	
Biosecurity	Chytrid has been observed in the vicinity of the scheme. Care should be taken to washdown and/or disinfect vehicle between sites if entering waterways/muddy areas and before visiting schemes with no observed chytrid cases.
Notifiable pest/disease	Chytrid.
Washdown locations	Latrobe Car Wash, Trigene bottle provided.
Cultural Heritage	
Aboriginal	None known. Complete Dial Before You Dig before undertaking any soil disturbance works.
European	None known. Complete Dial Before You Dig before undertaking any soil disturbance works.
Water Quality & Aquatic Biota Management	
Undertake surface water sampling	Complete water quality monitoring by the 14th of each month and use Survey123 to submit the results by the 21st of each month. Take water samples at sites and provide these samples to the Environment Team by the 21st of every third month.
Undertake ground water sampling	N/A
Where required assist Ecologist with surveying	Provide access to sites as necessary.
Infrastructure	Screens (Offtake and dirt box on outlets) – keep clear of debris Water quality monitoring kit – Use Meander kit, calibrate regularly and report any faults to Environment Team
Water Resource Management	
Water Licence Conditions	Maintain records of water taken and ensure water is taken through an appropriate meter.
Watercourse Authorities	Convey water as per Water Transfer Agreement with Hydro Tasmania.
Water Transfer Agreements	Prior to water restrictions being put in place by NRE Tas, contact Hydro Tasmania to organise release of water from storage and meet with Mersey Irrigators so that one consolidated order is provided to Hydro. Water takes approx. 2 days to reach the pump offtake after release from Hydro storage. Record water taken and provide to Commercial Manager at end of financial year.
Transmission losses	As per agreement with Hydro Tasmania.
Weather monitoring	No rain gauge or evaporation pan exists in the scheme.
Meter readings	Inform annual Farm WAP audits.
Soil Management	
Sediment and runoff control	If undertaking maintenance works, refer to OEMP.
Erosion	At some outlets, the concrete has been breaking away from the base of the outlet. Observe and report if situation worsens.
Geomorphology	N/A

Sodic	Nil Risk.
Acid Sulfate Soils (ASS)	Nil to low risk, consider minimising exposed soils when undertaking work that disturbs ground at depth and follow TI's Acid Sulfate Soil Management Framework.
Farm Water Access Plans (Farm WAPs)	
Farm WAPs are required to cover all land and dams where TI water is applied.	Across the scheme, ensure new landholders have a copy of the Farm WAP. If they need a new Farm WAP notify Environment Team and do not deliver water. Where irrigation expansion is known, ensure the area is covered by the Farm WAP mapping (see Field Maps). Notify Environment Team if breach is found.
Farm WAP audits are required for 10% of water users >5ML and Farm WAP areas with MNES.	Provide assistance to Environment Team if requested. Meter readings are required for auditing purposes.
Air, Noise and Waste Management	
Dust	Minimise where possible.
Fume	Ensure chemicals are stored, used and disposed of correctly.
Noise	No known issues.
Waste	Spreyton Waste Transfer Station.
Irrigation District	
Establishment Conditions	Ensure all those provided with water have a Farm WAP. Ensure all meters are compliant with the relevant standards in the National Framework for Non-urban Water Metering. Maintain records of any works undertaken for reporting in the annual report. Maintain records of the total volume of water used by irrigators inside the Sassafras Wesley Vale Irrigation District for reporting in the annual report.
By-Laws	Undertake meter reads as soon as practicable - Before the commencement date of an irrigation season - After the closing date of an irrigation season
Water Entity Reports compiled at the end of each financial year	Provide records of • Water ordered from Hydro • Water taken • Irrigator usage/billing information
Other key notes	
None at this time.	
Key Contacts	
NRE Tas	1300 368 550
Bonorong Wildlife Sanctuary	0447 264 625
Inland Fisheries Service	03 6165 3808
Reptile Rescue - Snake removal	0499 116 690
General Manager – Environment Health and Safety	0460 884 468



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OEMP SWIS Map

Legend

- Water Quality Monitor Site (Active)
- FWAP Area
- Pipeline
- Irrigation District

Scale: A3 Portrait

40 20 0 40

Kilometers

N

ID: [Layout -> Edit Metadata -> Summary]
Date: 14/11/2023
Author: CTS
Tasmanian Irrigation

Credits: DPIPWE, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS, Maxar; TASMAP © State of Tasmania; the LIST © State of Tasmania
DISCLAIMER: This map is for informational purposes only. It should not be relied upon to establish with certainty the location of any of the features represented on it, either absolutely or in relation to other features. This map is not suitable for site specific decision making.

Tasmanian Irrigation

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Project Note/Report

To	Tasmanian Irrigation, Cassie Tickner-Smith, Sophie Grace
From	Chris Thompson, Global Water Lead, Pinion Advisory
RE :	Hydrological Comments SWISA scheme
Date	22nd November 2023, Version 2

Background

I am providing this information as a professional with 49 years experience in water management in Tasmania, spanning field hydrological assessment through to on farm irrigation system / planning and regional water infrastructure development.

Summary Comments

As a general comment, I can safely state that the hydrological outcomes for this scheme are a function of the planning process undertaken by Tasmanian Irrigation and that is to develop irrigation schemes with minimum disruption to the associated environment. In this case it has been achieved by the following simple processes.

- The scheme is an augmentation/update of an existing scheme, to improve and augment water surety to an area that has established and developed practices.
- The scheme is utilising existing key infrastructure:
    - The water supply being underpinned by an allocation from an existing Hydro Tasmania storage.
    - The main river extraction point being the existing pump station at the Great Bend location.

General information

The key points for consideration/understanding in respect to the overall hydrological outcomes for this project are as follows:

1. The Sassafras Wesley Vale Irrigation Scheme Augmentation (SWISA) is an augmentation and upgrade of the existing Sassafras Wesley Vale Irrigation Scheme (SWIS). The catchment area covered by the SWISA scheme is a significant area of irrigated agriculture with a long history of intensive agricultural production. In general, with the introduction of irrigation supply water from Tasmanian Irrigation that has a relatively high cost attached to it by historical standards, as industry professionals we have seen an ongoing improvement in water use efficiency over the past 15 years.

2. There is no increase on the existing NRE summer water licence of 12,410ML. An application has been submitted for a winter licence of 7800 ML. By way of explanation, the SWISA project provides significant pipeline infrastructure which is only utilised in the summer season. The application for the winter licence is to allow the utilisation of this infrastructure to those with the land suitable for on farm storage, allowing them to take water during the winter period and utilise in the summer period. This is expected to develop quite slowly over a number of years in a controlled and incremental manner. The water will be inherently expensive to develop for the farm proponents and thus management of this water is expected to be highly efficient and thus as per the

information in point 6 of this document, the regional hydrological effects will be indiscernible. The availability of this winter licence will also provide some security and opportunity in relation to changing climate outcomes.

3. The operation of the SWISA scheme is covered by the NRE water licence and is supported by an allocation of 9200ML of currently stored water from The Hydro Tasmania Parangana dam. This water is part of the Mersey Forth Hydro system and would not form part of normal release to the Mersey River. In general, this would manifest as follows:
    a. When the NRE system flow triggers require augmentation of the river to meet current stakeholder uses inclusive of environmental flows, fully controlled releases into the river based on a defined ordering system between Tasmanian Irrigation and Hydro Tasmania, metered in and metered out through a Water Transfer Agreement.
    b. Marginally more base flow in the river during the irrigation season, approved by NRE Tas under a Water Course Authority. One element being addressed through that process is ensuring there will not be an impact on existing water users or the environment.
    c. Releases will not occur during periods of flood within the Mersey system and thus have indiscernible effects to flood flow hydrology and geomorphology.

4. Tasmanian Irrigation's established Farm Water Access Plan system and ongoing compliance framework manages irrigation application and risks to natural values, including the risk of runoff to waterways and deep percolation to groundwater by:
    a. Presenting a maximum irrigation rate,
    b. Requiring the use of irrigation scheduling to avoid irrigation runoff and infiltration,
    c. Enforcing buffers to waterways where habitat exists for threatened species,
    d. Mapping and management of soil types in accordance with the land capability system,
    e. An Annual Audit Program approved by the State Minister to ensure compliance is maintained during the life of the irrigation scheme, and to encourage opportunities for improvement. To date no major non-compliance (impact on environment) has been identified in the SWIS audits, while extension opportunities have been implemented.

5. There are no Ramsar wetlands within the proposed SWISA irrigation district.

6. Rainfall in the catchment is nominally 250mm during the irrigation season. This would manifest as 45,000 ML of uncontrolled water across the proposed scheme area of 18,000 ha. The system augmentation of an additional 9,200 ML is all highly controlled, high-cost water targeted at plant water use. The practices utilised generally result in a well less than 10% of un-utilised (uncontrolled) water, i.e. water that is not evaporated or transpired through the plant water use process. This water, at 920 ML, is a 2% change in the uncontrolled water within the scheme area. It should be noted that this taking place in a drying climate where traditional water resources availability to the agricultural community are under likely reductions in surety, thus the outcome is much more likely to be a status quo scenario.

7. Water Quality Monitoring;
    a. Existing water monitoring in area – existing water quality monitoring has not shown any significant impact from the operation of SWIS.

b. Will be continued with opportunity to review and add sites with SWISA.
c. Significant 'baseline' data pre-SWISA exists providing sound background for management and proactive identification of issues through ongoing water quality monitoring.

8. The scheme is utilising existing water storage infrastructure and thus the localised effects from developing on and off stream dams are not experienced.

9. There is no material land clearing for construction or operations that could impact local and regional hydrology.

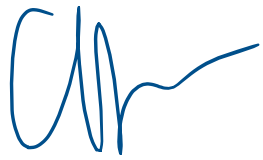
10. There will be 65 water crossings, mostly minor and all undertaken within strict guidelines to minimise local environmental/hydrological disruption. The following table lists the water crossings under the current alignment.

Table 1: Proposed SWISA Water Crossings

		PROJECT:	TI Sassafras Wesley-Vale Irrigation Scheme Augmentation				
		DOC No.:	12585497-SCH-000009				
		TITLE:	WATER CROSSING SCHEDULE				
		A	85% Design Issue	20.10.2023	DL	SG	CP
		REV	DESCRIPTION	DATE	BY	CHECKED	APPROVED
Water Crossing Identifier	Pipeline Designation	Pipe Size (DN)	PN	Waterway Name (if any)	Location X	Location Y	Waterway Classification
WC-022	D1	900	25	Bonneys Creek	453633.6	5430808.6	Minor Stream
WC-044	L1	355	12.5		451143.7	5439527.2	Tributary
WC-045	L1	355	16		450168.1	5439777.9	Minor Tributary
WC-046	L1	355	16		449490.3	5439731.3	Stream
WC-047	L1	355	16		449457.7	5439624.5	Minor Tributary
WC-048	L1	355	16		449208.0	5439018.6	Minor Tributary
WC-049	L1	355	16		449447.7	5438165.1	Minor Tributary
WC-050	L1	355	16	Bishton Creek	449429.7	5438061.3	Tributary
WC-051	L1	355	12.5		449419.6	5438003.0	Minor Tributary
WC-052	L1	355	12.5		451331.6	5439499.4	Tributary
WC-058	L1	355	16		451776.6	5439457.8	Tributary
WC-062	L1	355	16		450467.5	5439845.3	Tributary
WC-053	LA	225	16		449808.8	5440642.2	Minor Tributary
WC-064	LA	225	16		449636.8	5440669.8	Stream
WC-002	M1	450	10		461075.1	5434719.6	Minor Tributary
WC-005	M1	450	16		461003.1	5437392.5	Minor Stream
WC-011	M1	450	12.5	Tullamona Creek	459969.9	5434896.5	Minor Stream
WC-014	M1	450	12.5		462241.3	5435833.6	Minor Tributary
WC-016	M1	450	16	Tullamona Creek	460114.8	5437514.1	Minor Stream
WC-018	M1	450	12.5		455949.0	5437335.0	Tributary
WC-020	M1	450	16	Eastford Creek	459258.7	5435277.3	Minor Stream
WC-026	M1	630	8		455716.7	5433687.9	Tributary
WC-027	M1	630	12.5	Panatana Rivulet	456816.4	5434099.1	Major Stream
WC-028	M1	630	12.5		456786.5	5434113.3	Minor Tributary
WC-034	M1	450	10		461193.8	5434698.4	Minor Stream
WC-035	M1	450	12.5		460624.0	5434783.5	Minor Tributary
WC-036	M1	450	12.5	Westford Creek	458497.5	5435006.2	Tributary
WC-037	M1	450	16		459680.5	5437588.5	Minor Tributary
WC-038	M1	450	16		460759.0	5437439.3	Minor Tributary
WC-057	M1	450	16	Panatana Rivulet	459961.0	5437542.2	Major Stream
WC-059	M1	630	12.5		456664.0	5434134.0	Tributary
WC-015	M1x	500	10		460077.3	5432967.0	Minor Stream
WC-029	M1x	560	10	Westford Creek	457606.8	5433057.7	Tributary
WC-030	M1x	560	10	Eastford Creek	458587.8	5432703.5	Minor Stream
WC-031	M1x	500	10		460241.8	5432931.4	Minor Tributary
WC-032	M1x	500	10	Tullamona Creek	460451.3	5432957.5	Tributary
WC-033	M1x	500	10		461529.5	5433170.9	Tributary
WC-063	MC	280	16		462887.2	5438901.4	Tributary
WC-066	MC (EO)	110	16		462703	5438632	Minor Tributary
WC-017	MD	315	16		460560.9	5439357.2	Minor Stream
WC-019	MD	315	16		459979.2	5438397.0	Minor Tributary
WC-039	MD	315	16		459384.9	5437947.5	Minor Stream
WC-060	ME	250	16		458532.4	5438078.8	Minor Tributary

Given the above, we have determined that the proposed SWISA will not have a significant impact on the hydrology of the area.

Kind Regards,



Chris Thompson
Global Water Leader
PINION ADVISORY