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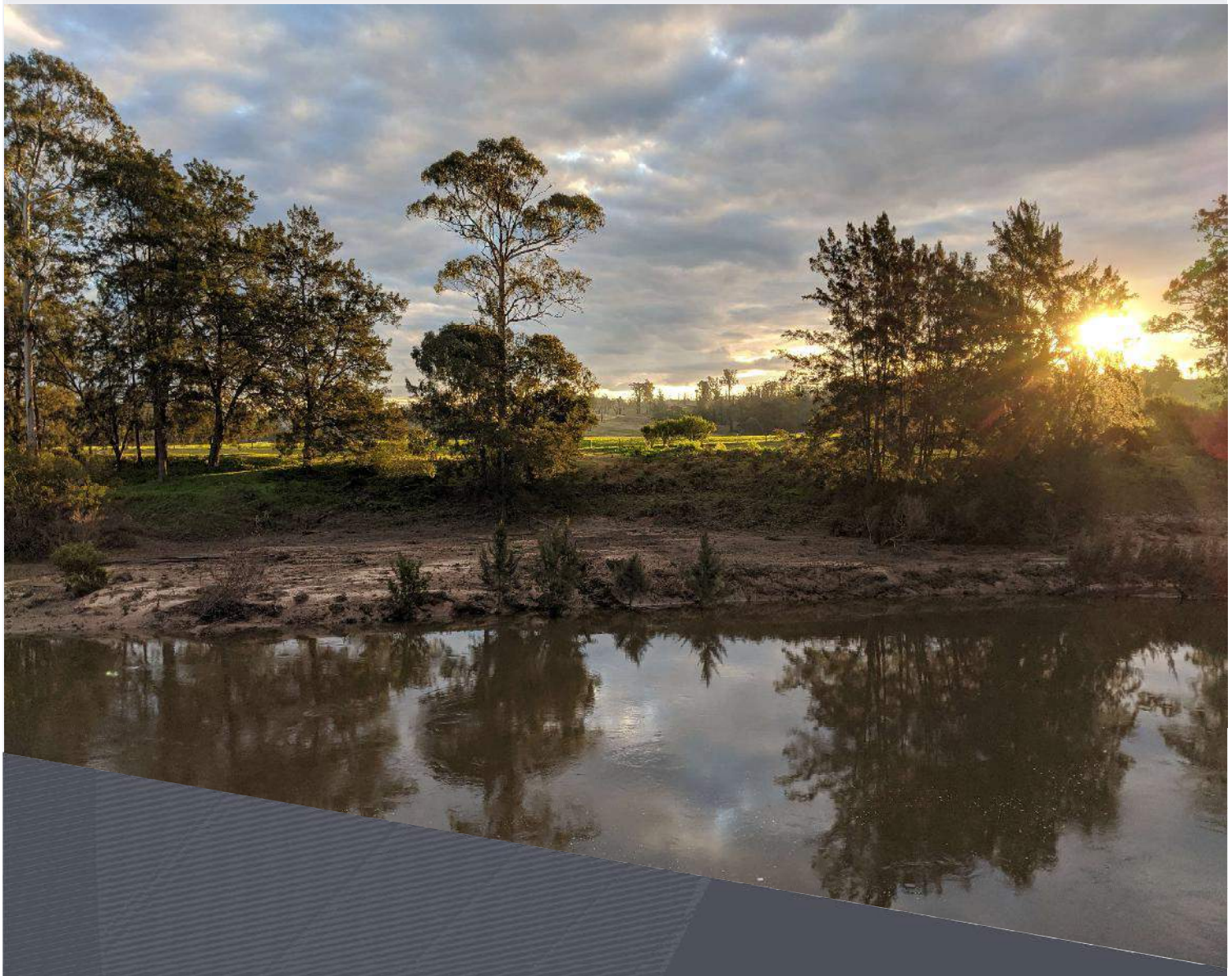

Construction Environmental Management Plan

Eurobodalla Southern Water Supply Storage Project: Tuross River Intake Pump Station (TRIPS)

Prepared for Quay Civil Pty Ltd
21 October 2020

SMEC INTERNAL REF. 30012985

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SMEC Company Details

Approved by:	Mark Davey		
Address:	Level 5, 20 Berry Street, North Sydney		
Signature:	M.DAVEY		
Tel:	+61 2 9925 5515	Fax:	
Email:	mark.davey@smec.com	Website:	www.smec.com

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Glossary/Abbreviations

Abbreviation	Detail
CFFMP	Construction Flora and Fauna Management Plan
CEMP	Construction Environmental Management Plan
CSWMP	Construction Soil and Water Management Plan
DOI	Department of Industry
DPI	Department of Primary Industries
DPIE	Department of Planning, Industry and Environment
DPIE - EES	Department of Planning, Industry and Environment – Environment, Energy and Science
EIS	An Environmental Impact Statement
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPA	Environment Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
POEO Act	*Protection of the Environment Operations Act 1997*
SRD SEPP	*State Environmental Planning Policy (State and Regional Development) 2011*
SSD	State Significant Development
TRIPS	Tuross River Intake Pump Station
WQO	NSW Water Quality Objectives
WTP	Water treatment plant

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1 Introduction

1.1 Purpose

This Construction Environmental Management Plan (CEMP) has been prepared to outline and describe how Quay Civil Pty Ltd (Quay Civil) will be responsible for the construction of Stage 2 – Tuross River Intake Pump Station (TRIPS) as part of the Eurobodalla Southern Water Supply Storage Project, and will comply with State Significant Development (SSD) 7089 Development Consent, the Environmental Impact Statement (EIS), Addendum Submissions Report and all associated licences, permits and approvals required for the Eurobodalla Southern Water Supply Project.

The CEMP specifically outlines how Quay Civil is to minimise environmental risks and achieve environmental outcomes for the Eurobodalla Southern Water Supply Project by providing a structured approach to ensure appropriate mitigation measures and controls are implemented.

The CEMP has been prepared in accordance with the *Guideline for the Preparation of Environmental Management Plans* (DIPNR, 2004) and:

- Describes the Stage 2 – TRIPS construction activities to be undertaken and their timing
- Identifies the planning approval requirements, legal obligations, permits, licences, standards and guidelines that construction works are to adhere to
- Provides specific mitigation measures and controls to be implemented on-site to avoid or minimise negative environmental impacts
- Describes the environmental management related roles and responsibilities including competence, training and awareness, effective communication and consultation processes
- Outlines a monitoring, auditing and reporting regime to ensure compliance with the requirements including incident investigation and action response.

The requirements of Development Consent SSD-7089, including agency consultation requirements, their relevance and where they are covered in this CEMP are provided in Section 2.

This CEMP is applicable to all staff and sub-contractors associated with the Stage 2 – TRIPS construction work.

1.2 Objective

The objective of the Stage 2 – TRIPS CEMP is to ensure all mitigation measures and licence/permit requirements relevant to environmental management are described, scheduled and assigned responsibility as outlined in:

- The EIS for the Eurobodalla Southern Water Supply Storage Project
- Addendum Submissions Report for the Eurobodalla Southern Water Supply Storage Project
- Development Consent SSD-7089 for the Eurobodalla Southern Water Supply Storage Project.

It also addresses Condition C2 of Development Consent SSD-7089 which requires the preparation of a CEMP prior to undertaking construction works for the Eurobodalla Southern Water Supply Project

Condition C3 of Development Consent SSD-7089 requires the CEMP to contain the following:

- A Construction Flora and Fauna Management Plan (CFFMP - as specified within Condition B3 and provided in Appendix B)
- A Construction Soil and Water Management Plan (CSWMP - as specified within Condition B13 and provided in Appendix A)
- Emergency Response Procedures in the event of flooding or bushfire (as specified within Condition B20 and provided in Appendix F)
- A Construction Traffic Management Plan (as specified within Condition B28 and provided in Appendix C)
- A Construction Noise and Vibration Management Plan (as specified within Condition B34 and provided in Appendix D).

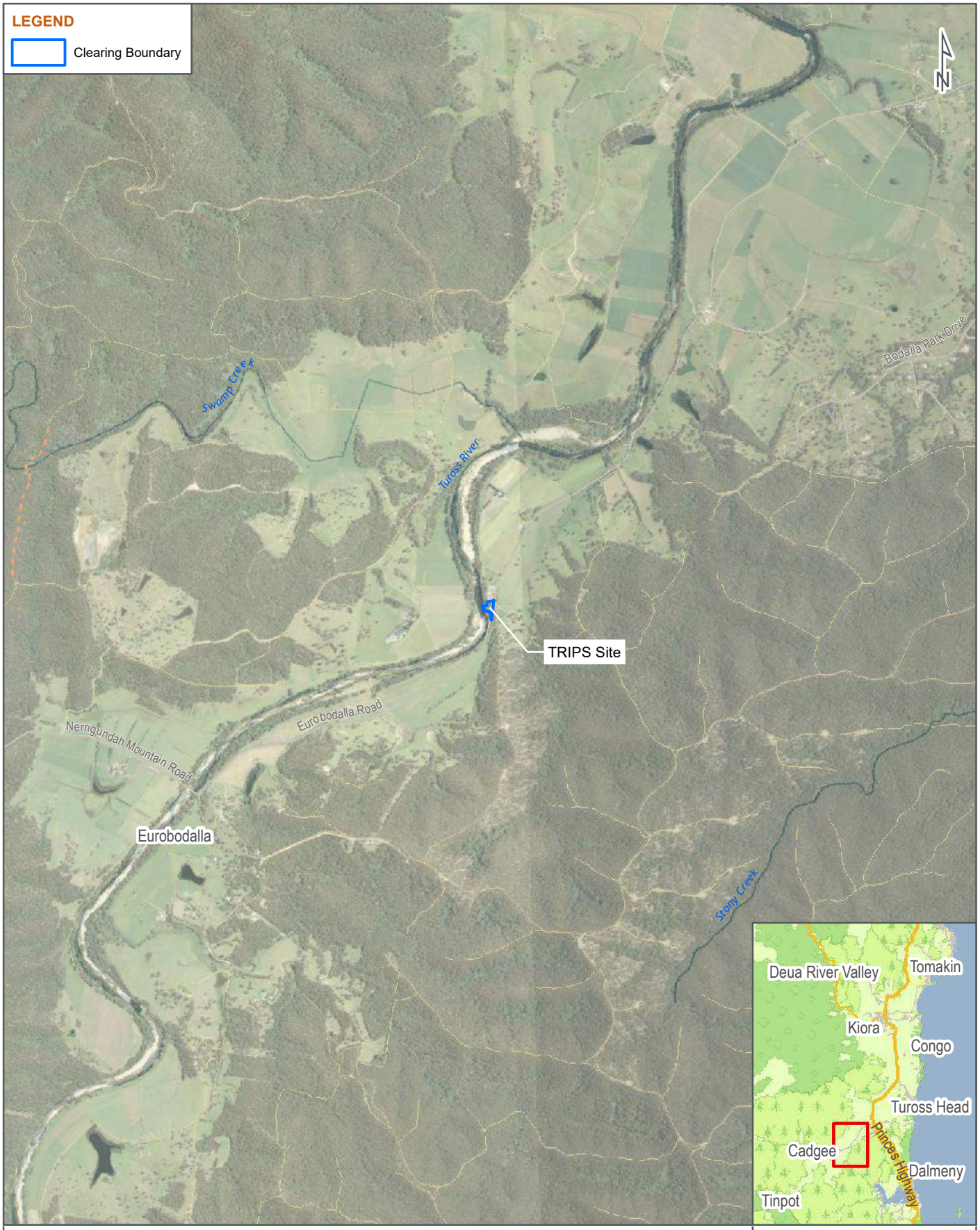
Item 1.2 of the Statement of Commitments contained within Development Consent SSD-7089 requires the CEMP to include the following additional matters:

- A Construction Erosion and Sediment Control Plan (as specified within Items 9.1 and 9.2 of the Statement of Commitments and provided as Appendix A of Appendix A)
- A Dust Management Plan (as specified within Item 12.2 of the Statement of Commitments and provided in Appendix E)

Condition A13 of Development Consent SSD-7089 allows any strategy, plan or program for the Eurobodalla Southern Water Supply Project to be prepared and submitted to DPIE on a staged basis. This CEMP and its related sub-plans as listed above within this Section 1.2 have been prepared for the Stage 2 – TRIPS construction of the Eurobodalla Southern Water Supply Project only, which scope is defined within Sections 1.3 and 1.4.

1.3 Project background

The TRIPS will abstract river flow and direct flow to the Eurobodalla Southern Storage facility (refer to Figure 1-1 below). It will consist of a 4.5 m diameter, 18 m deep concrete wet well with three submersible Flygt pumps receiving water from an inlet screen installed in the flowing river. This screen will be protected by marine piles. Associated ancillary infrastructure will include concrete structures used in the operation and maintenance of the pump station, flow control and sampling instrumentation and all associated electrical works. Power will be fed by a new transformer, and power and water flow will be provided by new in ground services. Control of the new infrastructure will take place remotely, with a SCADA system being developed to monitor, control and report fault status of the new infrastructure.



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COORDINATE SYSTEM GDA 1994 MGA Zone 56

FIG NO. 1-1

FIGURE TITLE TRIPS Site Location

PROJECT NO. 30012985

PROJECT TITLE TRIPS Site CEMP

CREATED BY FA13847

SOURCES : Roadnet MDS 2019, public_NSW_Imagery: © Department of Customer Service 2020

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1.4 Stage 2 - TRIPS construction activities

Activities associated with Stage 2 – TRIPS construction include:

- Site mobilisation and preparation of the work area, including:
  - Installation of erosion and sediment control as outlined in the CSWMP (refer to Appendix A).

Plant, equipment and site facilities which would be brought to site in order to support the Stage 2 -TRIPS construction includes the following: Figure 1-2 below shows the location of the construction compound which would be used to support the Stage 2 – TRIPS construction

- Initial set up:
- Earthworks:
- Piling and barge piling works:
- Formwork, reinforcing steel placement and pouring of concrete works:
- Mechanical works:
- Electrical/Supervisory control and data acquisition:

Stage 2 - TRIPS construction activities are to be conducted during the following hours, as per Condition B31 of Development Consent SSD-7089:

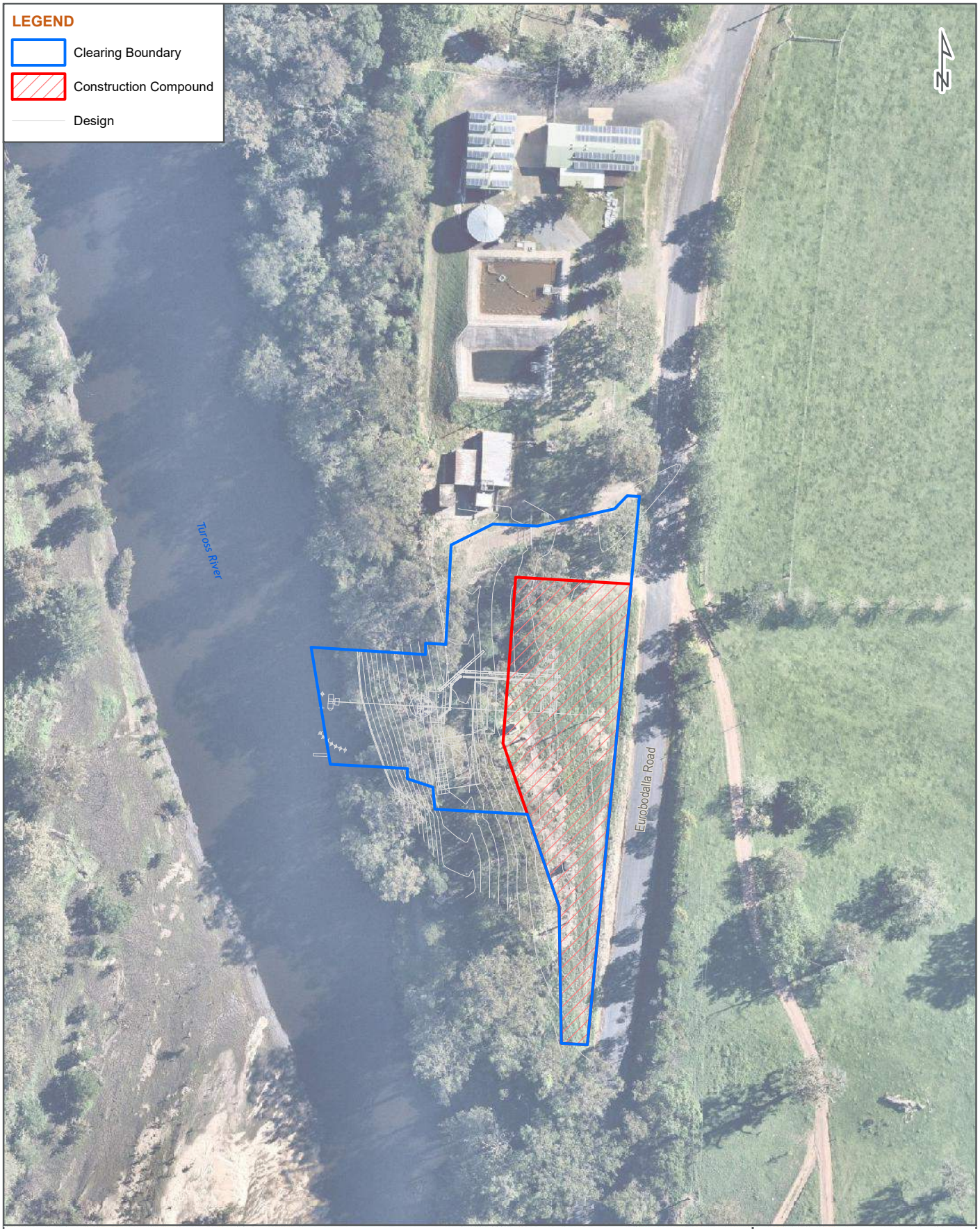
- 7:00 a.m. to 6:00 p.m. Monday to Friday
- 8:00 a.m. to 1:00 p.m. Saturday
- At no time on Sunday or public holidays.

Stage 2 - TRIPS construction works outside the hours outlined above may be undertaken under the following circumstances, as per Condition B32 of Development Consent SSD-7089:

- Works that are inaudible at the nearest sensitive receivers, *or*
- For the delivery of materials required outside these hours by the NSW Police Force or other authorities for safety reasons, *or*
- Where it is required in an emergency to avoid the loss of life, property or to prevent environmental harm, *or*
- Where a variation is approved in advance in writing by the Secretary of the Department of Planning, Industry and Environment (DPIE) or their nominee if appropriate justification is provided for the works.

Whilst the first three circumstances listed above do not require the prior written approval of the Secretary of DPIE, Quay Civil and Eurobodella Shire Council (ESC) would endeavour to consult with the DPIE about any out-of-hours Stage 2 – TRIPS construction activities where it is reasonable and feasible to do so.

In all instances, Quay Civil would endeavour to comply with the construction noise limits for SSD-7089 as referred to within Condition B33 and B34 of Development Consent SSD-7089.



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COORDINATE SYSTEM GDA 1994 MGA Zone 56

FIG NO. 1-2

FIGURE TITLE TRIPS Site Location

PROJECT NO. 30012985

PROJECT TITLE TRIPS Site CEMP

CREATED BY FA13847

SOURCES : Roadnet MDS 2019, Nearmap 20200312

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Location: \\AUSYFSV003\Group\projects\30012985 - TRIPS - D&C Environmental Compliance\140 Deliverables\GIS\Maps\30012985_CEMP_F002_TRIPS_Site.mxd

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2 Legislation and approvals

2.1 Legal requirements

Table 2-1 below sets out the environment and planning law requirements of the Stage 2 - TRIPS construction.

Table 2-1 Register of legal requirements

Legislation	Requirement	Authority
Environment Protection and Biodiversity Conservation Act 1999 (EPBA Act)	The Eurobodalla Southern Water Supply Storage Project was not considered to be a controlled activity under the EPBC Act	Department of Agriculture, Water and the Environment
Environmental Planning and Assessment Act 1979	Modification to the approved scope of SSD-7089 requiring modification to the project approval under the *Environmental Planning and Assessment Act 1979* (EP&A Act).	DPIE
Protection of the Environment Operations Act 1997	Any unauthorised pollution of waters is considered an offence under section 120 of the *Protection of the Environment Operations Act 1997* (POEO Act). Section 148 of the POEO Act requires that the Environment Protection Authority (EPA), the Minister of Health, SafeWork NSW, Fire and Rescue NSW and Eurobodalla Shire Council be notified immediately if a pollution incident occurs so that material harm to the environment is caused or threatened (being environmental harm that is not trivial or would cost more than $10,000 to rectify). Note that the EPA is required to be notified verbally immediately in these circumstances, prior to written notification being provided to DPIE (as per Condition C9 of Development Consent SSD-7089). Sections 139 and 140 of the POEO Act set out offences relating to noise pollution.	EPA
Biodiversity Conservation Act 2016	Part 1, Divisions 1 and 2 set out requirements with respect to threatened flora and fauna species and communities within NSW, as well as protected species more generally (i.e. any native flora or fauna species regardless of its threatened status). Duty to notify DPIE – Environment, Energy and Science (EES) in the event that unexpected threatened species are impacted or injured during works.	DPIE - EES
National Parks and Wildlife Act 1974	Protection of Aboriginal Objects and Places. Duty to notify Heritage NSW in the event that an Aboriginal object is uncovered during the works.	Heritage NSW
Biosecurity Act 2015	Priority weeds are regulated under the *Biosecurity Act 2015* with a general biosecurity duty to prevent, eliminate or minimize any biosecurity risk they may pose. Some priority weeds have additional management obligations which may apply generally, or under specific circumstances. Any person who deals with any plant, who knows (or ought to know) of any biosecurity risk, has a duty to ensure the risk is prevented, eliminated or minimised as far as is reasonably practicable.	Department of Primary Industries (DPI)

Legislation	Requirement	Authority
Rural Fires Act 1997	Sections 63(1) and 63(2) of the *Rural Fires Act 1997* require public authorities and owners/occupiers of land to take all practicable steps to prevent the occurrence of bushfires on, and to minimise the danger of the spread of bushfires on or from, that land.	Rural Fire Service
Contaminated Land Management Act 2017	As per Section 6 of the *Contaminated Land Management Act 2017*, ensure only EPA-approved VENM and ENM are brought to site, keep records of the same and provide copies to DPIE if requested.	EPA
Fisheries Management Act 1994	Section 37 of the *Fisheries Management Act 1994* requires a permit be obtained from DPI – Fisheries where fish are to be relocated during in-stream works. The EIS and Statement of Commitments for SSD-7089 also refer to the need to obtain a Section 219 permit for blocking fish passage during construction works where fish passage would become blocked. However, Section 4.41 of the EP&A Act provides a blanket exemption for all SSD projects to obtain such a permit under Section 219 of the *Fisheries Management Act 1994*. This matter is to be resolved with DPI – Fisheries in the event that fish passage is to be blocked.	DPI - Fisheries
Water Sharing Plan for the Tuross River Unregulated and Alluvial Water Sources 2016.	Water extracted from the Tuross River for use as construction process water during the Stage 2 – TRIPS construction is to be in accordance with Water Access Licences held by Eurobodalla Shire Council under the *Water Sharing Plan for the Tuross River Unregulated and Alluvial Water Sources 2016.*.	DPIE - Water

2.2 Environmental Planning and Assessment Act 1979

The EP&A Act establishes the framework for environmental planning and assessment in NSW.

Part 4 of the EP&A Act provides for development that requires consent under an Environmental Planning Instrument. Division 4.7 (previously Part 4, Division 4.1) of Part 4 deals with SSD which due to the size, economic value or potential impacts of the development, is deemed to have State significance. Section 4.36 provides for certain types of development or development on specified land to be declared SSD by means of a State Environmental Planning Policy or by a Ministerial Order. The full list of SSD development types and identified sites is provided in Schedules 1 and 2 of *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP).

Section 4.38 of the EP&A Act provides for the Minister for Planning to be the consent authority for SSD. However, Section 2.4 provides for the Minister to delegate the consent authority function to the Planning Assessment Commission, the Secretary of DPIE or to any other public authority.

An EIS was prepared on behalf of the Applicant, ESC, under Part 4, Division 4.7 of the EP&A Act as SSD-7089. The EIS went on public exhibition in September 2018 and a Submissions Report was subsequently prepared to outline the responses to submissions received. The Eurobodalla Southern Water Supply Project was approved by DPIE as the determining authority, on 17 October 2019, and Development Consent SSD-7089 issued.

All personnel associated with the Stage 2 – TRPS construction works for the Eurobodalla Southern Water Supply Storage Project must comply with all environmental requirements for the Project, including Development Consent SSD-7089, legal and statutory requirements, permits, licences, standards and guidelines. The Conditions of Development Consent SSD-7089 relating to the Eurobodalla Southern Water Supply Storage Project and their applicability to the Stage 2 – TRIPS construction are outlined in Table 2-2.

As the Eurobodalla Southern Water Supply Storage Project was determined to be SSD, it must also comply with the relevant guidelines for SSD under the EP&A Act. Section 4.41 of the EP&A Act specifies the approvals and legislation etc. that do not apply to an approved SSD project, and those that must be applied consistently along with Development Consent SSD-7089.

Table 2-2 Conditions of Development Consent SSD-7089

Condition reference	Condition Requirement	Condition Delivery
B2	No more than 54.61 of native vegetation is to be cleared	Not applicable to this CEMP.
B3	Prior to clearing of native vegetation, the Applicant must prepare a Construction Flora and Fauna Management Plan (CFFMP) in consultation with DPIE Fisheries and to the satisfaction of the Planning Secretary.	Not applicable to this CEMP.
B4	The CFFMP must form part of the CEMP required by Condition C2 and, in addition to the general management plan requirements listed in Condition C1, the CFFMP must include the following: (a) measures to ensure biodiversity values not intended to be impacted are delineated by mapping of 'no-go areas' and the installation of on-site measures such as temporary exclusion fencing prior to clearing; (b) measures to minimise the risk of introducing weed species via construction vehicles, plant and equipment and control of pest and weed species existing at the site; (c) method of vegetation removal and measures to minimise impacts outside the water storage facility construction boundary and within the perimeter road construction boundary as a result of the equipment used for clearing and general access for heavy vehicles and construction plant and equipment; (d) options to reuse cleared vegetation, in preference to burning, such as relocation of hollow logs for habitat and mulch for use in areas to be revegetated within the site and use elsewhere within the local area; (e) measures to minimise the impacts on fauna within the site including the installation of nest boxes prior to clearing, relocation of fauna to adjacent habitat (including any fish during dewatering of the cofferdam), staged clearing and timing of clearing outside breeding seasons; and (f) details on rehabilitation and revegetation including: (i) use of locally indigenous plant species including collection of seed prior to clearing for this purpose;	Stage 1 Construction Flora and Fauna Management Plan and Stage 2 CFFMP where applicable (refer to Appendix B). Given that the clearing works to support the Stage 2 – TRIPS construction activities have already been undertaken, requirements within this Condition which relate to clearing are not required to be addressed in detail within the Stage 2 CFFMP. The requirement for new storage access road batters is also not relevant to this stage of works. A cofferdam would also not be required and no river bed exposure would occur during this stage of works.

Condition reference	Condition Requirement	Condition Delivery
	(ii) for construction areas outside the full supply level including the construction compounds, on-site quarry areas and the new storage access road batters; (iii) for the construction area at the existing water treatment plant (WTP) including for the bed and banks of the Tuross River affected by the temporary cofferdam.	
B5	Prior to removing/clearing any vegetation or any demolition, pre-clearing surveys and inspections for threatened species must be undertaken. The surveys and inspections, and any subsequent relocation of species and associated management measures, must be undertaken under the guidance of a suitably qualified and experienced ecologist.	Given that the clearing works to support the Stage 2 – TRIPS construction activities have already been undertaken, requirements within this Condition which relate to clearing are not required to be addressed in detail within the Stage 2 CFFMP (refer to Appendix B).
B6	The Applicant must: (a) not commence any clearing work until the CFFMP is approved by the Planning Secretary; and (b) implement the most recent version of the CFFMP approved by the Planning Secretary for the duration of works.	Given that the clearing works to support the Stage 2 – TRIPS construction activities have already been undertaken, requirements within this Condition which relate to clearing are not required to be addressed in detail within the Stage 2 CFFMP (refer to Appendix B).
B13	Prior to commencement of any surface disturbance the Applicant must prepare a Construction Soil and Water Management Plan as part of the CEMP required by Condition C2. The Construction Soil and Water Management Plan must be prepared by a suitable qualified person(s) in consultation with the EPA and include: (a) guidelines and procedures to reuse dirty water collected in sediment basins with reuse prioritised over discharge to receiving waters; (b) an assessment of cumulative risks associated with sediment pond settling agents; (c) discharge criteria based on an assessment of potential impacts against the NSW Water Quality Objectives (WQO) for receiving waters; (d) identification and implementation of mitigation measures to avoid pollution including, but not limited to, dosing procedures, discharge procedures, direct ecotoxicology testing;	Refer to the CSWMP in Appendix A.

Condition reference	Condition Requirement	Condition Delivery
	(e) a detailed Erosion and Sediment Control Plan prepared in consultation with DPIE Fisheries and Water (in addition to the EPA); and (f) (evidence of consultation with the EPA and DPIE Fisheries and Water.	
B14	Erosion and sediment control measures must: (a) be in accordance with the relevant requirements of Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004) and mitigation measures outlined in the Policy and guidelines for fish habitat conservation and management (DPI 2013); and (b) have sediment basins sized to a 90th or 95th percentile 5-day rainfall depth or as otherwise agreed with the EPA during the preparation of the Erosion and Sediment Control Plan referred to in Condition B13(e).	Detailed within Appendix A of the CSWMP (refer to Appendix A).
B15	The development must comply with section 120 of the POEO Act, which prohibits the pollution of waters, except as expressly provided for in an EPL	Detailed within the CSWMP (refer to Appendix A).
B16	The Applicant must store all chemicals, fuels and oils used on-site in accordance with: (a) the requirements of all relevant Australian Standards; and (b) the NSW EPA's Storing and Handling of Liquids: Environmental Protection – Participants Manual' if the chemicals are liquids.	Refer to Section 3.6.
B17	In the event of an inconsistency between the requirements Conditions B16(a) and B16(b), the most stringent requirement must prevail to the extent of the inconsistency.	Refer to Section 3.6.
B20	The CEMP required by Condition C2 and OEMP required by Condition C5 must include emergency response procedures in the event of flooding or bushfire.	Refer to Quay Civil Emergency Response Plan provided in Appendix F.
B25	The Applicant must take all reasonable steps to minimise dust generated during all works authorised by this consent	Refer to Section 3.5 and the CSWMP provided in Appendix A and Quay Civil Dust Management Plan provided in Appendix E.
B26	During construction, the Applicant must ensure that:	Refer to Section 3.5, the CSWMP provided in Appendix A and the Dust Management Plan in Appendix E.

Condition reference	Condition Requirement	Condition Delivery
	(a) unsealed roads used for truck access and exposed surfaces and stockpiles within the construction area are regularly watered to suppress dust; (b) all trucks entering or leaving the site with loads have their loads covered; (c) trucks associated with the development do not track dirt onto the public road network; (d) public roads used by these trucks are kept clean; and (e) measures are implemented to minimise dust from exposed surfaces following vegetation clearing and until transfer of storage water to the WTP.	

2.3 Protection of the Environment Operations Act 1997

The POEO Act regulates certain activities with respect to air, water and noise pollution and waste. Schedule 1 of the POEO Act identifies activities and thresholds related to activity types and volume(s) of emissions that require an Environment Protection Licence to be issued by the EPA. Water storages and related infrastructure are not included in Schedule 1.

The activities to be carried out for the Stage 2 – TRIPS construction do not meet the criteria specified in Schedule 1 of the POEO Act. Therefore, no Environment Protection Licence is required to be issued by the EPA.

The POEO Act also identifies a number of pollution offences, including offences relating to:

- The wilful or negligent disposal of waste in a manner that harms or is likely to harm the environment
- The wilful or negligent causing of a substance to leak, spill or otherwise escape (whether or not from a container) in a manner that harms or is likely to harm the environment
- The wilful or negligent causing of any controlled substance to be emitted into the atmosphere in contravention of the regulations under the Ozone Protection Act 1989 and in a manner that harms or is likely to harm the environment
- Water pollution
- Air pollution
- Noise pollution
- Land pollution and waste.

Part 5.7 of the POEO Act specifies a general duty to notify the relevant authority (defined in Subsection 148(8)) of a pollution incident where there is actual or potential material harm to the environment. The activities associated with the Stage 2 – TRIPS construction are to be managed to ensure pollution risks are minimised. Measures were incorporated in the EIS to ensure risks to soils, waterways and air quality are avoided or minimised. The EPA is to be notified if a 'pollution incident' occurs that causes or threatens 'material harm' to the environment, along with Minister of Health, SafeWork NSW, Fire and Rescue NSW and Eurobodalla Shire Council.

Legal requirements for the management of waste are also established under the POEO Act and the *Protection of the Environment Operations (Waste) Regulation 2005*. Unlawful transportation and deposition of waste is an offence under Section 143 of the POEO Act.

Schedule of 8 of the Protection of the *Environment Operations (Clean Air) Regulation 2010*, identifies Eurobodalla Local Government Area as an area in which all burning (including vegetation and domestic waste) is prohibited except with approval.

2.4 Permits and licensing requirements

Environmental objectives and targets outlined in Table 2-3 have been developed to evaluate environmental performance during the Stage 2 – TRIPS construction activities and guide the implementation of the development of any management measures required.

Table 2-3 Project environmental objectives

Objective	Target	Measurement/Tool
Compliance with the Conditions of Development Consent SSD-7089	All relevant Conditions of Development Consent SSD-7089 implemented throughout the construction of Stage 2 – TRIPS in accordance with requirements and within designated time frames. No non-conformances identified during self-regulation through monitoring and auditing.	Site inspections Auditing Review
Compliance with all legal requirements	No breaches or environmental infringement notices.	Site inspections Auditing Review

3 Implementation

3.1 Construction Environmental Management Plan and Sub Plans

The CEMP is the primary environmental management document in relation to the environmental performance during the Stage 2 - TRIPS construction. The CEMP is supported by several aspect-specific sub plans which provide additional environmental management requirements. The sub plans prepared as part of the CEMP include:

- CSWMP – refer to Appendix A
- CFFMP – refer to Appendix B
- Construction Traffic Management Plan – refer to Appendix C
- Construction Noise and Vibration Management Plan – refer to Appendix D
- Dust Management Plan – refer to Appendix E
- Emergency Response Plan – refer to Appendix F
- Construction Erosion and Sediment Control Plan refer to Appendix A of Appendix A.

In addition to the sub-plans, the Unexpected Finds Procedure provided in Appendix G is also to be complied with during the Stage 2 – TRIPS construction.

3.2 Waste Management

A Waste Management Register will be maintained until the completion of the works and will include:

- The classification according to the EPA's Waste Classification Guidelines Part 1: Classifying Waste (EPA, 2014)
- Volume of waste
- Evidence of disposal to a facility that may lawfully accept the waste or reuse location.

3.3 Air quality

The Stage 2 – TRIPS construction will involve the use of plant and machinery. This has the potential to generate emissions of particulate matter, and combustion by-products. Mitigation measures are to be implemented on site to manage and minimise emissions that may impact local air quality. These include:

- Maintaining equipment to ensure it is operating efficiently
- Use of plant, materials and equipment sourced locally to minimise fuel consumption associated with plant, equipment and material transportation
- Implementation of on-site strategies to minimise dust generation during construction works.

3.4 Heritage

If any item or object of Aboriginal heritage significance is identified on site during the Stage 2 – TRIPS construction works, the following actions would be taken:

- All work within a 10 m area surrounding the suspected Aboriginal item or object is to cease immediately
- A 10 m buffer area around the suspected item or object is to be cordoned off and Heritage NSW is to be notified immediately
- Work within a 10 m area surrounding the Aboriginal item or object may only recommence in accordance with the provisions of Part 6 of the *National Parks and Wildlife Act 1974*.

If any unexpected archaeological relics are uncovered during the Stage 2 – TRIPS:

- All work within a 10 m area surrounding the find is to cease immediately
- Heritage NSW is to be notified
- A suitably qualified and experienced archaeologist is to be engaged to record and assess the significance of the find and the results are to be reported to the Secretary of DPIE and the Heritage Division DPC

- Where required by Heritage NSW, a Management Strategy is to be developed and implemented in consultation with the Heritage NSW
- Work within a 10 m area surrounding the find may only recommence on the advice of the archaeologist.

3.5 Site management

General site management procedures that are to be implemented during the Stage 2 – TRIPS construction works include:

- The work site is to be maintained in an orderly manner to reduce the potential visual impact
- Surveys are to be undertaken to identify any damage to local roads caused by movement of plant and machinery into and out of the site. Any damage to local roads is to be repaired by the party responsible for the damage as soon as practical
- Mud tracking off the site and onto the local roads is to be monitored, and local roads are to be cleared of mud should this occur
- All plant and equipment are to be maintained to minimise the risk of pollution to the environment.

3.6 Contamination, spill prevention and response

The following controls are to be implemented to minimise the risk of site contamination during the Stage 2 – TRIPS construction works:

- Vehicles and machinery are to be maintained to minimise the risk of fuel/oil leaks. Routine inspections for evidence of fuel/oil leaks are to be carried out on all vehicles and machinery
- All fuels, chemicals and hazardous liquids are to be stored within an impervious bunded area in accordance with Australian standards and the EPA's Storing and Handling of Liquids: Environmental Protection – Participants Manual
- Refuelling will only occur close to the laydown areas
- In the event of an inconsistency between the requirements of Conditions B16(a) and B16(b), the most stringent requirement is to prevail to the extent of the inconsistency
- A spill kit is to be located at the site compound. If a spill occurs, it is to be managed using the following Spill Response Procedure:
  - Check for any hazards to the responder or other personnel
  - Control the source of the spill, following the Safety Data Sheet instructions for Personal Protective Equipment and handling
  - Contain the spread of the spill, if safe to do so
  - Clean up the spill
  - Document the spill in the Incident Management Procedure
  - Some spills may require external reporting (refer to Section 6).

4 Accountability, competence and communications

4.1 Responsibilities and accountabilities

Table 4-1 below outlines the roles and responsibilities of personnel for carrying out the requirements outlined in this CEMP.

Table 4-1 Stage 2 – TRIPS construction roles and responsibilities

Role	Responsibility
Project Manager	• Include the environment into all aspects of project planning • Allocate project resources to handle environmental issues • Ensure suppliers and contractors comply with environmental requirements • Investigate and ensure that environmental incidents are reported and recorded • Review the performance of environmental management • Ensure environmental inspections are conducted.
Site Engineer and/or Project Engineer	• Assist and guide the respective workers to meet their environmental responsibilities • Check the implementation of the environmental requirements as per this CEMP • Report to the Project Manager on environmental issues • Monitor the rectification of incidents • Provide technical advice to personnel and management in the review of environmental management method • Carry out environmental inductions, environmental toolbox talks and discuss environmental matters during the daily pre-start meetings where required • Implement appropriate action to address any environmental incidents • Development, implementation, monitoring and updating of the CEMP and sub-plans • Ensure environmental risks of the Project are identified and appropriate mitigation measures implemented • Manage environmental document control, reporting, inductions and training • Oversee site monitoring, inspections and audits • Manage all subcontractors and consultants with regards to environmental matters, including assessing their environmental capabilities and overseeing the submission of their environmental documents • Respond to stakeholder enquires/complaints within required timeframes • Ensure suppliers and contractors comply with environmental requirements.
Site supervisor	• Communicating with all personnel and sub-contractors regarding compliance with the CEMP and site specific environmental issues • Notification of environmental incidents • Coordinating the implementation of the CEMP • Undertaking site inspections • Co-ordinating the implementation and maintenance of pollution control measures

Role	Responsibility
	• Identifying resources required for implementation of the CEMP • Coordinating action in emergency situations and allocating required resources in accordance with the Incident Response Plan • Notify the Project Manager of any environmental harm or potential environmental harm, or if authorised by the Project Manager notify the Client Ensuring that instructions are issued, and adequate information is provided to site resources which relate to environmental risks on site.
Contractors	• Contribute to effective environmental management at the site for the life of the project, by implementing this CEMP within their area of responsibility • Comply with the relevant Act(s), Regulations, Specifications and Standards • Promptly report to management any environmental non-conformances, incidents and/or breaches • Participate in environmental awareness training as directed.

4.2 Competence, training and awareness

Onsite environment training will be coordinated and recorded by the Site Engineer/Project Engineer. Records include details of topics, attendees, and duration will be stored in the training register, signed attendance sheets will be filed.

4.2.1 Induction

All contractors at site are required to attend a health and safety, quality and environment induction prior to commencing work. The induction is to cover core issues including (but not limited to):

- Purpose and objectives of the CEMP
- Requirements of due diligence and duty of care
- Conditions of environmental permits and approvals
- Potential environmental emergencies and emergency response procedures
- Reporting and notification requirements for pollution and other environmental incidents
- High-risk activities and associated environmental safeguards, e.g. working near waterways
- Working in or near environmentally sensitive areas
- Traffic management, including clear instructions to all contractors with regards to speed limits, approved access tracks, approved working hours and delivery times
- Unexpected Finds Procedure (refer to Appendix G)
- All relevant noise and vibration management measures including:
  - Avoiding use of radio during work outside normal hours
  - Avoiding shouting and slamming doors
  - Operating machines at low speed or power and switching off when not being used rather than left idling for prolonged periods, where practical
  - Minimising reversing
  - Avoid metal to metal contact.

4.2.2 Daily pre-start meetings

Daily pre-start meetings are to be undertaken by the Site Supervisor or delegated representative. All contractors for the Stage 2 – TRIPS construction works that are present are required to attend.

Pre-start are to include information about health and safety, environmental aspects, impacts and risks relevant to the proposed work activities and location. Attendance, meeting content and issues raised is to be recorded.

Specific environmental toolbox meetings may be developed and implemented as required at the discretion of the site team. Relevant environmental issues for discussion may include (but are not limited to):

- Waste management
- Erosion and sediment control
- Noise and vibration control
- Environmental monitoring
- Emergency response procedures
- Environmental reporting
- Traffic and transport
- Flora and fauna management
- Relevant licences and approval conditions
- Permissible hours of work
- Location of nearest sensitive receivers
- Construction employee parking areas
- Designated loading/unloading areas and procedures
- Site opening/closing times.

A register of lesson learnt is to be maintained by the Site Engineer/Project Engineer for the Stage 2 – TRIPS construction works.

4.3 Emergency contacts, general communication and consultation

4.3.1 Emergency contacts

Emergency contact details relevant to the Stage 2 – TRIPS construction works are provided in Table 4 2. Quay Civil would establish a protocol with Eurobodalla Shire Council to clarify who is responsible for providing external incident notification in the event of a material harm incident occurring (refer to Section below), and what steps should be undertaken where an incident occurs out of hours and Eurobodalla Shire Council staff may be unavailable to prepare the 'immediate' email notification to DPIE.

Table 4-2 Emergency contact details relevant to the Stage 2 – TRIPS construction works

Organisation / Project Position	Responsible representative	Contact details
EPA pollution hotline	-	131 555
DPI - Fisheries	Carla Ganassin	Carla.ganassin@dpi.nsw.gov.au
Fire and Rescue NSW	-	000 (for incidents that present an immediate threat to human health or property) or 1300 729 579 (for incidents that do not present an immediate threat to human health or property)

Organisation / Project Position	Responsible representative	Contact details
Southern NSW Local Health District	-	1300 066 055
SafeWork NSW	-	131 050
Eurobodalla Shire Council	Harvey Lane - Engineer	harvey.lane@esc.nsw.gov.au 02 4474 1342
Public Works Representative	Ross Bailey Public Works Advisory	02 4474 7556 0412 320 064
Project Manager	Stuart Wing Project Manager	s.wing@quaycivil.com 0417 042 365
Project Engineer	Nima Yekta Project Engineer	n.yekta@quaycivil.com 0405 274 957

4.3.2 Internal communication

Regular internal communications are to be carried out between the project team, including sub-contractors. Internal lines of communication are to include:

- Meetings
- Phone calls
- Written correspondence, including:
  - Management reports
  - Site inspection reports
  - Audit reports
  - Incident reports
- Employee induction, toolbox talks, daily pre-start meetings
- Notice boards, alerts and notifications.

4.3.3 External communication

Quay Civil will be responsible for consultation with government authorities (if required), key stakeholders and the community. Government agencies, including the NSW EPA, DPI – Fisheries, DPIE - Water and DPIE have been consulted during preparation of the EIS and this CEMP and sub plans. A summary of relevant discussions is included in the CSWMP.

Table 4-3 below summarises the relevant consultation triggers from Development Consent SSD-7089 which apply to the Stage 2 – TRIPS construction. Table 4-3 also shows the responsible party for engaging this trigger.

Table 4-3 Quay Civil consultation triggers for the Stage 2 – TRIPS construction works

Consultation trigger	Timing	Development Consent reference	Related Permit/Approval Required	Management Plan Approval Required	Legislative Reference
DPIE/ General Stakeholders					
Retain evidence of consultation with DPIE regarding the staging or updating of a strategy, plan or program without consultation being undertaken with all parties required to be consulted in the relevant condition in this consent. This may also be relevant to Conditions A12, A13, A14, A15, B13, B14, B42, C7 and C8.	Ongoing, during the preparation and revision of plans, strategies and programs.	A14	NA	NA	NA
DPIE					
Comply with noise hours provided in Table 3 of the Development Consent unless DPIE has provided written approval.	During construction.	B31 and B32	Written approval from DPIE for out of hours works regarding construction noise.	NA	Sections 139 and 140 of the POEO Act - offences related to noise pollution.
Comply with approved hours of work unless approval is obtained from DPIE in the relevant circumstances.	Throughout TRIPS construction.	Management and Mitigation Measures 8.2.	Yes - out of hours work hours require approval.	NA	Sections 139 and 140 of the POEO Act - offences related to noise pollution.
DPIE/DPI Fisheries					
Temporary in-stream structures erected according to DPI Guidelines, and DPIE is notified seven days prior to any dewatering activities so that fish rescue can be organised. A Section 37 permit may be required to relocate fish.	Throughout TRIPS construction.	Management and Mitigation Measures 3.12.	Unanticipated	NA	Section 37 of the Fisheries Management Act 1994.
DPI-Fisheries					

Consultation trigger	Timing	Development Consent reference	Related Permit/Approval Required	Management Plan Approval Required	Legislative Reference
Provide the CEMP, Erosion and Sediment Control Plan and Flora and Fauna Management Plan to DPI - Fisheries for review.	Prepare prior to construction and implement during construction.	Management and Mitigation Measures 1.3.	NA	Yes - wording of consent says 'review' is required rather than approval. However, this is similar to approval.	Section 120 of the POEO Act and various Sections of the Fisheries Management Act 1994.
Instream structures to be undertaken as per these relevant standards, and DPIE is notified seven days prior to any unanticipated dewatering activities so that fish rescue can be organised. A Section 37 permit may be required to relocate fish in the event that this is required	Prior to undertaking instream works.	Management and Mitigation Measures 2.24.	None anticipated	NA	Section 37 of the Fisheries Management Act 1994.
Consult with DPI - Fisheries regarding the need to obtain a fisheries permit if fish passage is to be blocked (note that State Significant Development projects are ordinarily exempt from this requirement, however the Statement of Commitments says that a Section 219 Permit would be obtained).	Throughout TRIPS construction.	Management and Mitigation Measures 3.10	Unanticipated	NA	Section 219 of the Fisheries Management Act 1994.
Undertake monitoring if required and as approved by DPI - Fisheries	Throughout TRIPS construction.	Management and Mitigation Measures 3.11.	NA	NA	Section 120 of the POEO Act and various Sections of the Fisheries Management Act 1994.
DPI Fisheries/DPIE Water					
Follow relevant guidelines when undertaken in-stream works and works on waterfront land. Consult with DPI - Fishing and DPIE - Water.	Throughout TRIPS construction.	Management and Mitigation Measures 9.3.	NA	NA	Section 120 of the POEO Act and various Sections of the Fisheries Management Act 1994.

Consultation trigger	Timing	Development Consent reference	Related Permit/Approval Required	Management Plan Approval Required	Legislative Reference
Heritage Division, DPIE					
Follow unexpected finds protocol in the event that potential Aboriginal heritage items are discovered.	Throughout TRIPS construction.	Management and Mitigation Measures 6.1.	NA	NA	Sections 86 and 87 of the National Parks and Wildlife Act 1974.
EPA					
Ensure only EPA-approved VENM and ENM are brought to site, keep records of the same and provide copies to DPIE if requested.	Before bringing fill to site during construction.	B12	Yes - written approval from EPA.	NA	Section 6 of the Contaminated Land Management Act 2017.
Ensure erosion and sediment control measures are undertaken as per the relevant standards and as agreed to by the EPA where required.	Prior to undertaking any surface disturbance.	B14	NA	Yes - erosion and sediment control plans agreed to by the EPA.	Section 120 of the Protection of the Environment Operations Act 1997 and various Sections of the Fisheries Management Act 1994.
Engaged Archaeologist/Heritage NSW					
Ensure works cease immediately in the vicinity of a potential unexpected Aboriginal heritage item. Only recommence works on the advice of an archaeologist.	During construction.	B43	Written confirmation from engaged archaeologist that works can proceed.	NA	Sections 86 and 87 of the National Parks and Wildlife Act 1974.
Eurobodalla Shire Council					
Undertake water quality monitoring during construction and apply corrective measures in consultation with Council.	During construction.	Management and Mitigation Measures 3.5.	NA	NA	Section 120 of the POEO Act and various Sections of the Fisheries Management Act 1994.

Consultation trigger	Timing	Development Consent reference	Related Permit/Approval Required	Management Plan Approval Required	Legislative Reference
Liaise with Council over the establishment of a communications protocol and implement the protocol.	Throughout TRIPS construction.	Management and Mitigation Measures 4.3.	NA	NA	NA
Liaise with Council regarding ongoing surveying and management of impacts to local road system.	Prior to commencing construction and during construction.	Management and Mitigation Measures 7.2.	NA	NA	Roads Act 1993.
Heritage NSW					
Ensure works cease immediately in the vicinity of a potential unexpected Aboriginal heritage item. And immediately notify Heritage NSW.	During construction.	B40	NA	NA	Sections 86 and 87 of the National Parks and Wildlife Act 1974.
Ensure works cease immediately in the vicinity of a potential unexpected archaeological relic, notify the Heritage Division, obtain advice from an archaeologist and prepare a Management Strategy if directed to.	During construction.	B42	NA	Management Strategy may be required.	Sections 86 and 87 of the National Parks and Wildlife Act 1974.
Local residents/local community					
At least five days prior to works commencing and regularly during construction, consult with local residents.	Prior to commencing construction.	Management and Mitigation Measures 4.5.	NA	NA	NA
Consult with community regarding noise mitigation measures for construction.	Prior to commencing construction.	Management and Mitigation Measures 4.6.	NA	NA	NA
Managers of nearby developments with potential for overlapping construction					

Consultation trigger	Timing	Development Consent reference	Related Permit/Approval Required	Management Plan Approval Required	Legislative Reference
The Construction Traffic Management Plan will consider the potential for cumulative impacts.	Prior to commencing construction.	Management and Mitigation Measures 13.4.	NA	NA	Roads Act 1993.
Rural Fire Service					
Include Hazard and Risk Management Plan in the CEMP in consultation with the RFS.	Prior to commencing construction.	Management and Mitigation Measures 10.1.	NA	Approval not required but consultation is required.	Rural Fires Act 1997.
Service and utility providers					
Quay Civil must consult with the relevant owner and provider of services that are likely to be affected by the development to make suitable arrangements for access to, diversion, protection and support of the affected infrastructure.	Prior to commencement of TRIPS construction.	A16	Yes - may be required in consultation with utility and service providers.	NA	Various Act and Regulations regulating the provision of utility and service infrastructure within NSW.

4.3.3.1 Public information

In addition to government agency consultation, at the commencement of Stage 2 – TRIPS construction works until the completion of all Stage 2 – TRIPS construction works, the following information and documents will be publicly available:

- Development Consent SSD-7089
- Eurobodalla Southern Water Supply Storage Project EIS
- Eurobodalla Southern Water Supply Storage Project EIS Response to Submissions
- Site layout
- Management and mitigation measures
- All current statutory approvals for Eurobodalla Southern Water Supply Storage Project Stage 2 – TRIPS construction works
- All strategies, plans and programs required under Development Consent SSD-7089
- Reporting on environmental performance in accordance with the reporting requirements in any plans or programs approved under Development Consent SSD-7089.

4.3.4 Community and stakeholder communication

Community and stakeholder engagement for the Stage 2 – TRIPS construction works will include:

- Provision of notice to local residents of planned Stage 2 – TRIPS construction works at least five days prior to commencement of activities
- As required, local residents are also to be informed of any changes to Stage 2 – TRIPS construction works
- Where works are determined to have a noise impact to sensitive receivers, the affected community will be consulted regarding the proposed noise mitigation measures for activities
- Where dust and air quality complaints are made, the cause will be identified, and appropriate measures made to reduce emissions in a timely manner. Details of the complaint and rectification actions will be recorded.

Due to the location of the TRIPS site, there is expected to be no impact to local business owners or local residents. The nearest sensitive receiver is located about 500 m to the north-east of the site.

Due to the limited anticipated impact of the Stage 2 - TRIPS construction works, a project hotline will not be established.

5 Auditing and reporting

5.1 Environmental inspections

The Project Engineer/Site Engineer is responsible for ensuring effective environmental inspections are carried out and appropriately documented. This is to comprise:

- Informal daily inspection
- Regular environmental inspections, with ad hoc inspections after a storm, documented in a format that enables capture of all information such as environmental status, action and close out
- Inspections carried out after heavy rainfall to ensure environmental controls are effective
- Inspections of plant and equipment maintenance records to ensure all plant and equipment is being maintained to ensure optimum running conditions.

5.2 Environmental monitoring

Any required environmental monitoring will be detailed within the relevant sub-plans.

5.3 Reporting

ESC is responsible for all relevant reporting requirements specified in Development Consent SSD-7089. Construction compliance reports and a pre-operational compliance reporting for the Eurobodalla Southern Water Supply Storage Project must be carried out in accordance with the *Compliance Reporting Post Approval Requirements* (2018) or any revision in force from this time.

Quay Civil will inform ESC of reportable outcomes as they occur, with a summary report every month for incorporation into ESC's reporting every six months.

Reviews of the CEMP and associated environmental management plans are to be undertaken by the Project Manager or Project Engineer, where required, as part of a continual improvement process.

The review is to consider:

- Additional processes or management that would improve the environmental performance of the Stage 2 – TRIPS activities
- Compliance with a direction, strategy, plans and/or program required under the Conditions of Development Consent SSD-7089, to the satisfaction of DPIE.

Where revisions are required, the revised document must be submitted to the Secretary of DPIE for approval within six weeks of the review. In addition, the strategies, plans and programs required as a part of the conditions of approval for Stage 2 – TRIPS construction, must be reviewed and submitted to the Secretary of DPIE within three months of:

- The submission of an incident report
- The Approval of any modification to Development Consent SSD-7089
- The issue of a direction of the Secretary of DPIE which outlines the requirement for a review.

The continuous improvement process is to be designed to:

- Identify areas of opportunity for improvement of environmental management and performance
- Determine the cause or causes of non-conformances and deficiencies
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies
- Verify the effectiveness of the corrective and preventative actions
- Document any changes in procedures resulting from process improvement
- Make comparisons with objectives and targets.

6 Incidents and emergencies

An Emergency Response Plan is provided in Appendix F. This Section 6 sets out the key requirements of Quay Civil with respect to emergency response management during the Stage 2 – TRIPS construction.

6.1 Incident notification and reporting

Incident notification is the responsibility of a person undertaking an activity, and the occupier of a premises. In the case of the Stage 2 – TRIPS construction, this would include Quay Civil. Quay Civil would therefore be required to *immediately* notify the EPA in the event of a Material Harm incident occurring. This is despite the fact that Quay Civil is not the Applicant or the owner of the site.

Section 147 of the POEO Act defines 'material harm' as follows:

> ***147 Meaning of material harm to the environment***
>
> *(1) For the purposes of this Part—*
>
> *(a)harm to the environment is material if—*
>
> *(i)it involves actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial, or*
>
> *(ii)it results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding $10,000 (or such other amount as is prescribed by the regulations), and*
>
> *(b)loss includes the reasonable costs and expenses that would be incurred in taking all reasonable and practicable measures to prevent, mitigate or make good harm to the environment.*
>
> *(2) For the purposes of this Part, it does not matter that harm to the environment is caused only in the premises where the pollution incident occurs*.

It is generally recommended that, where a potential material harm incident occurs, the EPA be immediately notified by verbal means (by calling 131 555). This should be immediately followed with verbal notification to Minister of Health, SafeWork NSW, Fire and Rescue NSW and Eurobodalla Shire Council.

There is a separate requirement to undertake incident reporting and notification to DPIE under Condition C9 Development Consent SSD-7089, which is the responsibility of the Applicant – in this case Eurobodalla Shire Council. Quay Civil would be required to provide information to Eurobodalla Shire Council to inform written notification and subsequent requirements detailed in Sections 6.1.1 and 6.1.2 below. This written notification is required to be emailed to DPIE immediately in the event of a potential material harm incident occurring.

It is recommended that the parties listed above (EPA, Minister of Health, SafeWork NSW, Fire and Rescue NSW and Eurobodalla Shire Council) be verbally notified prior to DPIE being provided with 'immediate' written notification via email: compliance@planning.nsw.gov.au).

Quay Civil would establish a protocol with Eurobodalla Shire Council to clarify who is responsible for providing these notifications, and what steps should be undertaken where an incident occurs out of hours and Eurobodalla Shire Council staff may be unavailable to prepare the 'immediate' email notification to DPIE.

6.1.1 Written material harm notification

In addition to the requirements specified in the Emergency Response Plan (refer to Appendix F), DPIE must be notified in writing to compliance@planning.nsw.gov.au immediately after the potential material harm incident has become known.

The notification will include the following information:

- Development application number SSD-7089
- Name of the development – Eurobodalla Southern Water Supply Storage Project
- Details of the incident (date, time, location, a brief description of what occurred and why it is classified as an incident)
- Identify how the incident was detected

- Identify when the incidents became known
- Identify any actual or potential non-compliance with Development Consent SSD-7089
- Describe what immediate steps were taken in relation to the incident
- Identify further action(s) that will be taken in relation to the incident
- Identify a project contact for further communication regarding the incident.

6.1.2 Notification of Non-Compliance with Development Consent SSD-7089

Following a non-conformance incident (not constituting material harm), DPIE must be notified in writing to compliance@planning.nsw.gov.au within seven days after the non-compliance has become known.

In reporting the non-compliance, the notification must identify the following:

- Development application number SSD-7089
- Name of the development – Eurobodalla Southern Water Supply Storage Project
- The Condition of Development Consent SSD-7089 that has been breached
- Outline how condition has not been met and the reasons for the non-compliance (if known)
- What actions have been, or will be, undertaken to address the non-compliance.

A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance.

Appendix A Construction Soil and Water Management Plan

Appendix B Construction Flora and Fauna Management Plan

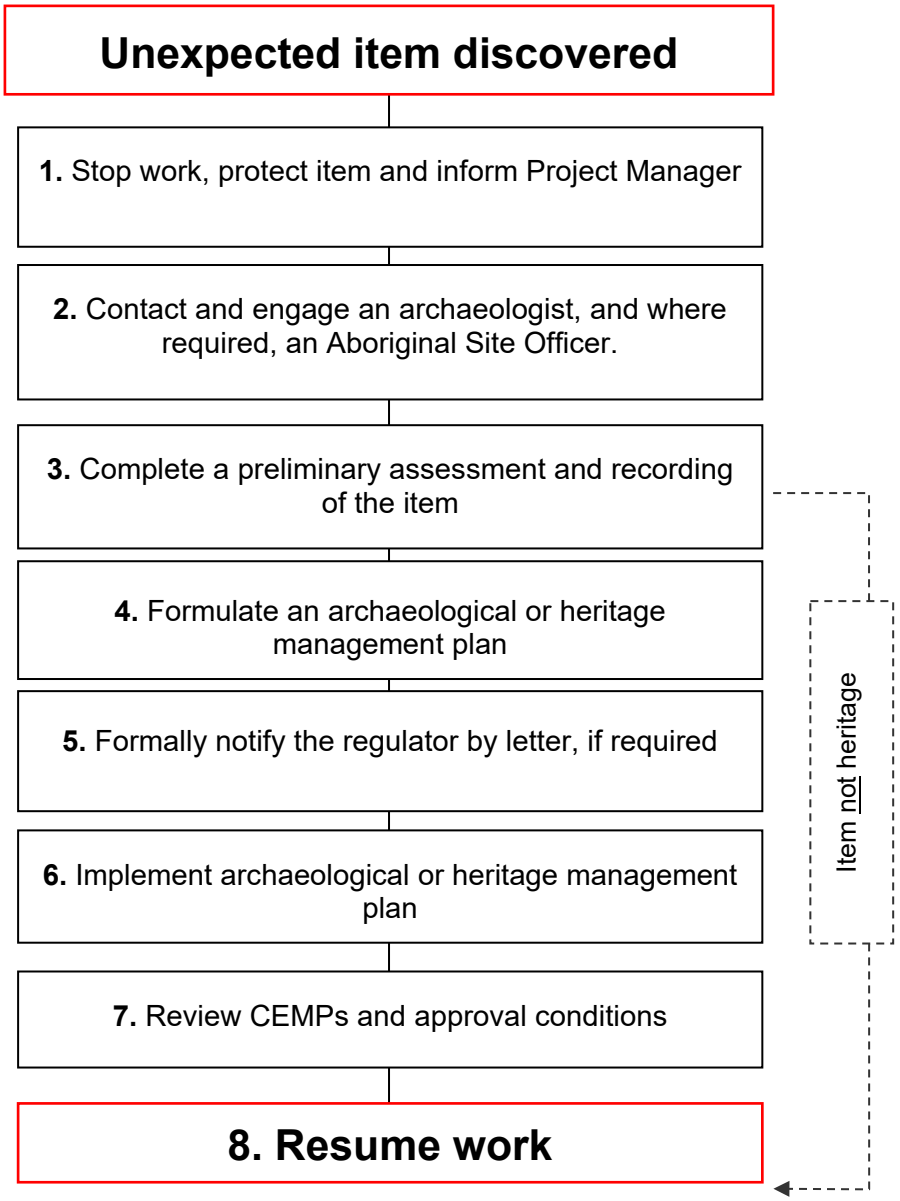
Appendix C Construction Traffic Management Plan

Appendix D Construction Noise and Vibration Management Plan

Appendix E Dust Management Plan

Appendix F Emergency Response Procedures

Appendix G Unexpected Finds Procedure


Unexpected item discovered
1. Stop work, protect item and inform Project Manager
2. Contact and engage an archaeologist, and where required, an Aboriginal Site Officer.
3. Complete a preliminary assessment and recording of the item
4. Formulate an archaeological or heritage management plan
5. Formally notify the regulator by letter, if required
6. Implement archaeological or heritage management plan
7. Review CEMPs and approval conditions
8. Resume work
Item not heritage

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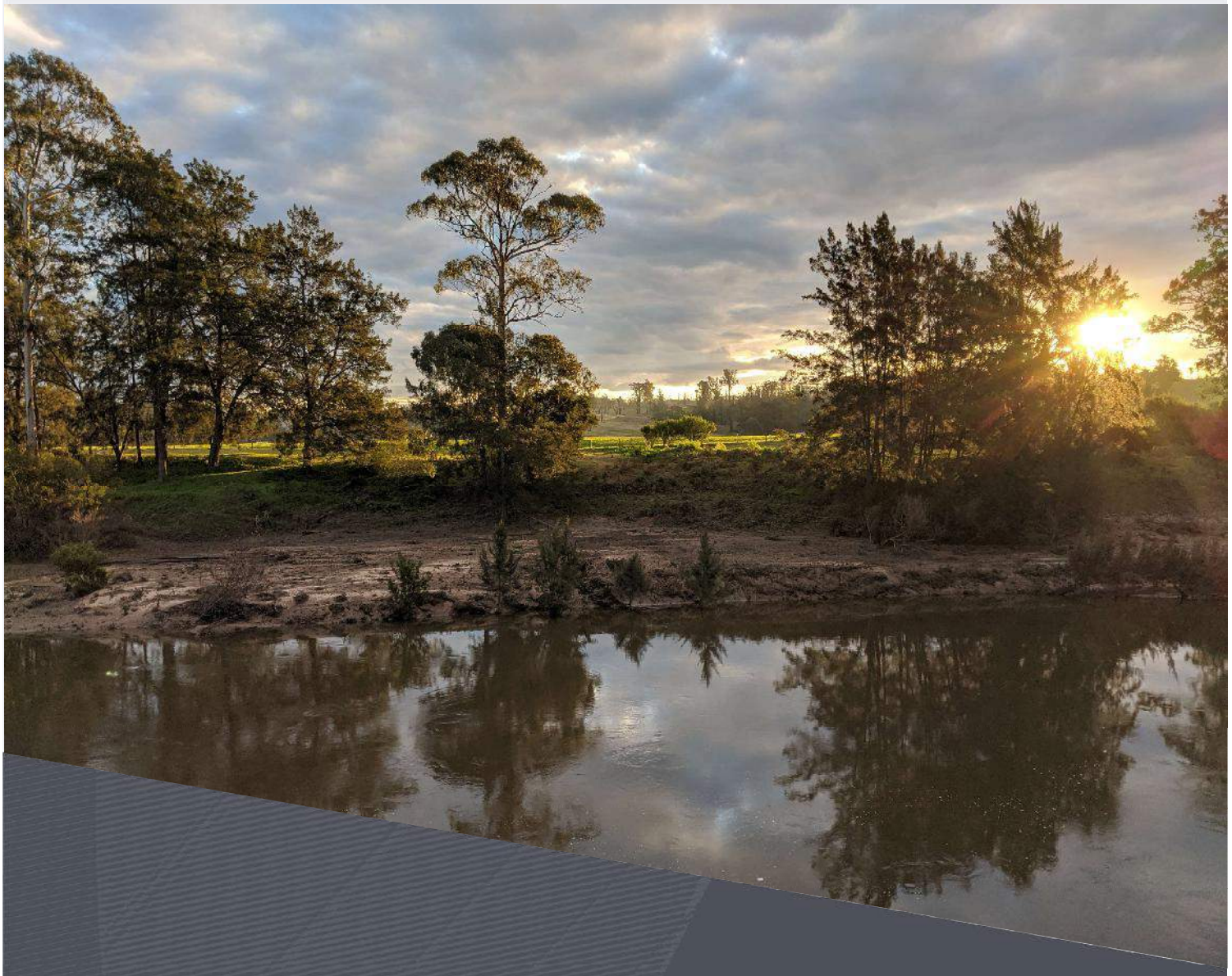

Construction Soil and Water Management Plan

CSWMP - Eurobodalla Southern Water Supply Storage Project: Tuross River Intake Pump Station (TRIPS) – Stage 2

Reference No. 30012985
Prepared for Quay Civil Pty Ltd
15 January 2021

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SMEC Company Details

Approved by:	M. Davey		
Address:	Level 5, 20 Berry Street, North Sydney		
Signature:	MARK DAVEY		
Tel:	+61 2 9925 5515		
Email:	mark.davey@smec.com	Website:	www.smec.com

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1 Introduction

1.1 Context

This Construction Soil and Water Management Plan (CSWMP) has been prepared to outline and describe how the contractor responsible for the construction of Stage 2 – Tuross River Intake Pump Station (TRIPS) as part of the Eurobodalla Southern Water Supply Storage Project (the Project) will comply with State Significant Development (SSD) 7089 Development Consent, the Environmental Impact Statement (EIS), Addendum Submissions Report and all associated licences, permits and approvals required for the Eurobodalla Southern Water Supply Project with respect to soil and water management.

This CSWMP forms part of the Construction Environmental Management Plan (CEMP) for the Stage 2 – TRIPS construction component of the Project.

This CSWMP has been prepared specifically for the TRIPS Stage 2 package of works.

This CSWMP has been prepared to address the requirements of the Project Environmental Impact Statement (EIS), Addendum Submissions Report, Conditions of Consent and all applicable legislation. The Conditions of Consent, under Section 4.38 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for the Project were assigned on 17 October 2019. Figure 1-1 in the CEMP outlines the Eurobodalla TRIPS site location.

1.2 Background and project description

The EIS assessed the impacts of construction and operation of the Project regarding soil and water within Chapter 7 (Water resources and geomorphology) and Chapter 14 (Soils etc.). A Response to Submissions was subsequently prepared, which included additional information and safeguards pertaining to water quality within the Appendix D Water Quality Addendum Assessment.

As part of the EIS development, a Conceptual Erosion and Sediment Control Plan (Ref: 30012127_R10) was developed for the Project, informing the EIS and Submissions Report. This plan provided concept level recommendations on erosion and sediment control measures and other considerations for the Project. This included, but was not limited to, the requirement for Progressive (or detailed) Erosion and Sediment Control Plans prepared by the Contractor.

The Project location is approximately 30 kilometres south of Moruya within the Eurobodalla Local Government Area. The TRIPS site is located along the eastern bank of the Tuross River, just south of the existing water treatment facility on Eurobodalla Road within Lot 1 DP 1168581. The TRIPS site will be located on a section of the Tuross River that runs in a north-easterly direction through the valley on the western side of Bodalla State Forest.

The TRIPS will abstract river flow and direct this to the Eurobodalla Southern Storage facility. It will consist of a 4.5 m diameter, 18 m deep concrete wet well with 3 submersible flight pumps receiving water from an inlet screen installed in the flowing river. This screen will be protected by marine piles. Associated ancillary infrastructure will include concrete structures used in the operation and maintenance of the pump station, flow control and sampling instrumentation and all associated electrical works. Power will be fed by a new transformer, and power and water flow will be provided by new in ground services. Control of the new infrastructure will take place remotely, with a Supervisory Control and Data Acquisition (SCADA) system being developed to monitor, control and report fault status of the new infrastructure.

The Project is currently divided into three stages, specifically:

- Stage 1 – Clearing of the Tuross River Intake Pump Station (TRIPS) site. This stage of the Project has since been completed.
- Stage 2 – Construction of the river intake pump station component of the works (covered by this CEMP and Sub-plans)
- Stage 3 - Clearing and construction of the remaining components of the Eurobodalla Southern Water Supply Storage (which will be covered by a separate CEMP and Sub-plans).

The Stage 2 - TRIPS construction works would include:

- Site mobilisation and preparation of work area including:
  - Traffic control and erection of site fencing

  - Installation of erosion and sediment control as outlined in this CSWMP
  - Floating of plant and equipment
- In-river works, likely involving:
  - Crane and barge mobilisation/demobilisation
  - Drilling of intake pile and fender piles
- Bulk excavation to platform level, likely involving:
  - Excavation of access track cut into river bank face
  - Batter stabilisation and anchoring
- Intake Pipe Installation, likely involving:
  - Staged excavation of intake trench
  - Assembly, installation of intake pipe
  - Concrete encasement and backfill of intake pipe
- Wet well construction and commissioning, likely involving:
  - Completion of wet well excavation
  - Construction of wet well
  - Backfilling and installation of retaining wall
  - Installation of in-ground services such as wet well valve chamber pipework, drainage, electrical
  - Roadworks and finishing.

The EIS identified the potential for direct and indirect impacts on water quality but concluded that provided the proposed mitigation and management measures are implemented, no significant long-term impacts would be expected.

2 Purpose and objectives

2.1 Purpose

The purpose of this CSWMP is to describe how the contractor, Quay Civil, is required to manage and protect water quality during the Stage 2 – TRIPS construction.

Development Consent SSD-7089, provided by the Minister for Planning, states that the relevant Conditions are required to:

- Prevent, minimise, or offset adverse environmental impacts
- Set standards and performance measures for acceptable environmental performance
- Require regular monitoring and reporting
- Provide for the ongoing environmental management of the development.

The CSWMP-specific conditions are provided in Table 2-1.

Table 2-1 Soil and Water Management Conditions of Development Consent SSD-7089

Condition	Section where condition addressed in CSWMP
B13. Prior to commencement of any surface disturbance the Applicant must prepare a Construction Soil and Water Management Plan to the satisfaction of the Planning Secretary as part of the CEMP required by Condition C2. The Construction Soil and Water Management Plan must be prepared by a suitable qualified person(s) in consultation with the EPA and include:	This document
(a) guidelines and procedures to reuse dirty water collected in sediment basins with reuse prioritised over discharge to receiving waters;	Section 6.3.8
(b) an assessment of cumulative risks associated with sediment pond settling agents;	Not applicable to Stage 2 – TRIPS construction
(c) discharge criteria based on an assessment of potential impacts against the NSW Water Quality Objectives (WQO) for receiving waters;	Refer to Appendix E
(d) identification and implementation of mitigation measures to avoid pollution including, but not limited to, dosing procedures, discharge procedures, direct ecotoxicology testing; and	Refer to Appendix E
(e) a detailed Erosion and Sediment Control Plan prepared in consultation DPI Fisheries and DPIE Water in addition to the EPA.	Section 6.3 and Appendix A
(f) evidence of consultation with the EPA and DPIE Fisheries and Water	Section 6.3
B14 Erosion and sediment control measures must: (a) be in accordance with the relevant requirements of Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004) and mitigation measures outlined in the Policy and guidelines for fish habitat conservation and management (DPI 2013); and	Sections 3.3 and 6.1
(b) have sediment basins sized to a 90th or 95th percentile 5-day rainfall depth where possible.	Not applicable to Stage 2 – TRIPS construction

Condition	Section where condition addressed in CSWMP
B15 Compliance with section 120 of the POEO Act, which prohibits the pollution of waters, except as expressly provided for in an EPL	Section 7.3.1 and Appendix E
B16 The Applicant must store all chemicals, fuels and oils used on-site in accordance with: (a) the requirements of all relevant Australian Standards; and (b) the NSW EPA's Storing and Handling of Liquids: Environmental Protection – Participants Manual if the chemicals are liquids.	Section 6.4.3
B18 The Applicant must: (a) design and manage stormwater runoff from access roads so that it does not result in erosion and pollution of receiving waters;	Section 6.3.8
(b) maintain erosion control measures downstream of the spillway, storage outlet works and at the river intake; and	Section 6.3 Appendix A
(c) use natural materials, such as rock rip rap, for erosion and river bank protection	Section 6.3.4
B30 The Applicant must ensure that public access is managed to prevent erosion or damage to native vegetation by restricting access through site fencing to pedestrians	Not applicable to Stage 2 – TRIPS construction

2.2 Objectives

The key objective of this CSWMP is to ensure all mitigation measures and licence/permit requirements relevant to soil and water management are described, scheduled and assigned responsibility as outlined in:

- The EIS
- Addendum Submissions Report
- Development Consent SSD-7089.

2.3 Targets

The following targets have been established for the management of soil and water impacts during the Stage 2 – TRIPS construction:

- Full compliance with the relevant legislative requirements, EIS, Addendum Submissions Report, and Development Consent SSD-7089
- Manage downstream water quality impacts attributable to the Project (i.e., maintain water waterway health by avoiding the introduction of nutrients, sediment and chemicals outside of that permitted by the Environment Protection Licence and/or ANZECC guidelines)
- Training on best practice soil and water management is provided to all construction personnel through site inductions.

3 Environmental requirements

3.1 Legislation

All legislation relevant to Stage 2 - TRIPS construction is included in Section 2 of the CEMP, including the following relevant to this CSWMP:

- *Environmental Planning and Assessment Act 1979* (EP&A Act)
- *Protection of the Environment Operations Act 1997* (POEO Act)
- *Fisheries Management Act 1994* (FM Act)
- *Contaminated Land Management Act 2017* (CLM Act).

3.2 Additional approvals, licences, permits and requirements

As part of the EP&A Act, there are Conditions of Development Consent SSD-7089 that have been specified by the Minister for Planning that the Project must comply with. These conditions are stated in Section 2.1.

The Project has been determined to be SSD, and as such must comply with the relevant guidelines for SSD under the EP&A Act.

An Environment Protection Licence does not apply to this Stage 2 of the construction works.

3.3 Guidelines

The main guidelines, specifications and policy documents relevant to this CSWMP include:

- Managing urban stormwater: soils and construction Volume 1, Landcom, 2004 (referred to herein as the 'Blue Book')
- Managing urban stormwater: soils and construction Volume 2D, Main road construction, Department of Environment and Climate Change, NSW, 2008
- NSW Office of Environment and Heritage (NSW OEH, 2012), Erosion and Sediment Control on Unsealed Roads, Sydney
- *Policy and guidelines for fish habitat conservation and management* (DPI, 2013)
- *Storing and Handling of Liquids: Environmental Protection - Participants Manual* (EPA, 2007).

4 Existing environment

4.1 Topography and drainage

The TRIPS site elevation ranges from 0 to 23mAHD and is located on the eastern embankment of the Tuross River adjacent to Eurobodalla Road. An environmental engineer from SMEC carried out a site inspection on 13 November 2019 to make observations and take photographs of the site and surrounding topography features which are described below. Quay Civil also provided site photos of the TRIPS site post Stage 1 vegetation clearing works. Figure 4-1 in Section 4.1.2 below provides an overhead view of the TRIPS site and surrounding areas post vegetation clearing.

4.1.1 Surrounding areas

To the east, Eurobodalla Road is approximately level with the TRIPS site at the driveway, before it descends to the south at a gentle to moderate gradient within a road 'cutting' (Figure 4-2). Potential surface water run-on to the TRIPS site is currently intercepted and diverted along the western edge of the road via an existing PVC pipe culvert at the TRIPS site driveway entrance (refer to Figure 4-3 in Section 4.1.2 below).

To the north of the site, the existing Southern Water Treatment Plant is upslope of the TRIPS site. Surface runoff from the existing southern water treatment plant is expected to drain south-east towards Eurobodalla Road or south towards the TRIPS site. An existing stormwater pit is located at the hydraulic low point, intercepting surface water runoff from the facility before discharging via pipe to the Tuross River (refer to Figure 4-4 in Section 4.1.2 below).

To the south, surface runoff is expected to discharge towards the south-west and west towards the Tuross River. To the west and downslope of the site is the Tuross River which runs in a northerly direction past the site.

4.1.2 TRIPS site areas

The north eastern portion of the TRIPS site comprises a levelled area near the driveway (refer to Figure 4-5 below). The site descends to the west at gentle to moderate slope gradients (up to 15%).

An existing vehicle access track is formed within a 'cutting' into the river embankment at gradient of approximately 8-10% (refer to Figure 4-6 below). The access track is treated with site won mulch covering, bordered by a dirty water drain on eastern side and silt fencing on western side closest to riverbank face. A sump is installed at hydraulic low point (fed by the dirty water drain) and permits discharge to vegetated areas.

Between the access track and the Tuross River, steep to very steep slope gradients are noted ranging from 50% to 85% in upper to mid-embankment slopes (refer to Figure 4-7 below), before dropping off steeply to greater than 100% (>45 degrees) on lower embankment slopes (refer to Figure 4-8 below). Some rock outcropping and vertical cliff edge is noted along the lower embankment slopes and along the edge of the river (refer to Figure 4-9 below). This section of the riverbank extends between 0 and 18m AHD, includes areas of semi-permanent water and inundation due to flooding. The soils along the slope are stabilised by existing native vegetation including mature trees and undergrowth plants and shrubs. Post TRIPS Stage 1 vegetation clearing works, the soils within the Stage 2 - TRIPS construction site have been stabilised by the maintenance of tree stumps and installation of geofabric over the embankment slope (refer to Figure 4-1 below).

Figure 4-1 Overhead photo (looking down slope) of the TRIPS site post Stage 1 Vegetation Clearing works including indicative project boundary. The Tuross River borders the top of the photo and Eurobodalla Road borders the bottom of the photo. Clearance of vegetation on the riverbank face evident. Along riverbank slope, geotextile visibly installed on upper part of slope, with tree stumps remaining in place.

Figure 4-2 Eurobodalla Road within cutting. TRIPS site to left of photo

Figure 4-3 Driveway entrance to TRIPs site. Existing PVC pipe culvert (blocked)

Figure 4-4 Existing stormwater pit immediately south of the Southern Water Treatment Plant, adjacent to the TRIPs site

Figure 4-5 Levelled area at access driveway to TRIPs site

Figure 4-6 Vehicle access track. Sump installed at hydraulic low point. Sediment fence erected on western edge and dirty water drain runs along eastern edge.

Figure 4-7 Steep slope gradients, approximately 50% to 85% on upper to mid-embankment slopes (photo taken prior to TRIPS Stage 1 Vegetation Clearing)

Figure 4-8 Very steep slopes gradients, estimated greater than 100% (greater than 45 degrees) on lower embankment. Photo taken prior to TRIPS Stage 1 Vegetation clearing.

Figure 4-9 Rock outcropping near Tuross River water edge

4.2 Soil landscape and geology

The site lies over Ordovician sediments and metamorphic rocks, which produce steep hilly to mountainous terrain. Under natural conditions, soils over Ordovician rock types in the region are generally stable, with a gravelly surface lag inhibiting ongoing sheet erosion on slopes.

Soil landscapes have been identified from the Soil Landscapes of the Narooma 1:100 000 Sheet (Tulau, 2002) within the study area. The TRIPS site construction catchment is within the riparian zone of the Tuross River. Soils within this catchment are within the Tuross River (ts) soil landscape and are considered to have a low erosion potential. Soils are described as quaternary alluvium comprising coarse sand and sandy loams, to sandy clay loams, with gravel and cobble layers common.

Previous geotechnical investigations undertaken at the TRIPS site included near surface mapping, subsurface investigation test pits and boreholes, and groundwater level monitoring. The site subsurface conditions consisted of surficial silty topsoil and residual clayey silt soils (mostly relatively shallow), overlying interbedded and foliated laminated siltstones and sandstones (depths greater than 1.4m depth). The strength and weathering profile of the rock at the TRIPS location are generally related, with rock strength increasing as the degree of weathering reduces. Groundwater beneath the TRIPs site is expected to remain relatively consistent at elevation of 6.5m AHD. Alluvial deposits comprising sands, silts and gravels are expected in the river bed, although these were not encountered within geotechnical test locations located near the river embankment.

Further details are presented within the *Geotechnical Investigations Factual Report* (SMEC, 2018a) and *Geotechnical Investigations Interpretive Report* (SMEC, 2018b).

4.3 Erosion hazard

A preliminary assessment of existing erosion impacts was undertaken based on visual observations made during a site visit by a SMEC senior environmental engineer on 13 November 2019. Table 4-1 below provides a summary of the relevant observations.

Table 4-1 Identified Erosion hazards

Observations	Photograph
Existing minor gully erosion was observed within drainage line alongside the vehicle access track. Eroded soils appeared to have scoured to top of underlying shallow rock. Surface water runoff is expected to flow towards Tuross River via this drainage line.	 Photo 4-1 Minor gully erosion in site drainage line

Observations	Photograph
Difficult foot access was noted on the steep embankment slopes. An existing 'goats trail' was observed to be present with apparent minor erosion impacts to downslope topsoil and leaf litter. Photo 4-2 was taken prior to the completion of Stage 1 vegetation clearing.	 Photo 4-2 'Goats' trail evidence on steep embankment
Existing temporary steps, constructed with star pickets and timber, appeared to be formed at a single location. The steps appeared to provide stabilised foot access up/down the site slopes (east of access track). Minimal erosion was noted in the near vicinity of the steps.	 Photo 4-3 Temporary steps (star pickets and timber) provided safe and stabilised up/down slope foot access

Observations	Photograph
The existing low lift pump station (offsite to the south) was noted to be constructed with a concrete stabilised wall on lower embankment slopes, preventing erosion in this area of prior disturbance.	 Photo 4-4 Existing low lift pump station (offsite to south) included concrete stabilised wall

4.4 Receiving water quality

Maintaining the surface water quality in the Tuross River has been identified as being a primary water quality objective. Existing water quality conditions, and potential risks to water quality posed by the Eurobodalla Southern Water Supply Storage are discussed in Appendix D of the Addendum Submissions Report.

Water Quality Objectives (WQO) for this section of the Tuross River relate to the protection of:

- Aquatic ecosystems
- Visual amenity
- Primary contact recreation
- Secondary contact recreation
- Livestock water supply
- Irrigation water supply
- Homestead water supply
- Drinking water at point of supply (disinfection only, clarification and disinfection, groundwater)
- Aquatic foods (cooked).

A Water Quality Monitoring and Sampling Plan (WQMSP, SMEC 2017) was developed and has been implemented for the Eurobodalla Southern Water Supply Storage . Baseline water quality monitoring included scheduled (monthly) and event based (e.g. immediately after rainfall) sampling carried out within several locations along this section of the Tuross River for various water quality parameters including total dissolved solids (TDS), total suspended solids (TSS), turbidity, pH, nutrients, heavy metals, various organic pollutants and microbial parameters. Baseline water quality data indicated that the Tuross River is characterised by:

- Elevated turbidity, nutrients and chlorophyll and selected heavy metals (aluminium and zinc), following wet weather events
- Other pollutants such as heavy metals (excluding aluminium and zinc), petroleum hydrocarbons, pesticides and other contaminants were below adopted assessment criteria (SMEC, 2017).

Construction water quality monitoring will be carried out throughout the construction of the Project, including the Stage 2 – TRIPS construction. This will enable a comparison of water quality during Stage 2 – TRIPS construction to the pre-construction baseline water quality. The baseline monitoring program methodology and findings are provided in Appendix C. Appendix C also include site specific trigger values for comparison during construction water quality monitoring, in accordance with *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG 2018).

A *Site Water Management Strategy* (refer to Appendix E) has been prepared by Quay Civil Pty Ltd specifically for implementation during the Stage 2 – TRIPS construction and provides an outline of the methods by which water quality will be monitored.

4.5 Climate and river flows

Climate and river monitoring data for the proposal were sourced from the two nearby available weather and river monitoring stations:

- Source 1: Daily river flows and rainfall monitoring data at 'Tuross River @ Eurobodalla (Station ID 218008)', located immediately adjacent to the proposal within the existing southern water treatment plant sourced from the Department of Primary Industries, Office of Water website (DPI, 2017)
- Source 2: Rainfall monitoring data only at 'Bodalla Post Office (Station ID 069036)' located approximately six kilometres north-east of the proposal sourced from the Bureau of Meteorology website (BOM, 2017).

Moderate to high rainfall typically occurs throughout the year (871 millimetres annual average), with a slight summer dominance (118 millimetres on average in February). The lowest rainfall occurs in spring (41 millimetres average in September). SMEC considers that rainfall data at Source 1 is typically less than Source 2 and may provide a better estimate of actual rainfall expected at the proposal site.

Similarly, mean monthly flow within the Tuross River was 23309 Megalitres (all months), with highest flows observed in March (42007 Megalitres) or June (44433 Megalitres) and the lowest flow in September (9721 Megalitres). Seasonal monthly runoff figures show the Tuross River experiences its highest flows in autumn, possibly resulting from dominant summer rainfall.

Historically, water levels within the Tuross River ranged between -1 metre AHD (dry) and 13 metres AHD (highest recorded flow). Within 2016, at least two events were recorded where river flows exceeded 10 metres AHD.

5 Environmental impacts

5.1 Construction activities

The construction methodology is outlined in the *Quay Civil Construction Methodology* (Quay Civil 2020). Table 5-1 below provides an indicative overview of construction methodology and program.

Key activities of the TRIPS Stage 2 that could result in adverse impacts to soils and water include:

- Installation of erosion and sediment controls (on land and in river)
- Site establishment and mobilisation of plant and equipment
- Construction of access road
- Site access by plant and foot traffic (steep embankment slopes)
- Barge mobilisation/demobilisation and operation within river
- Piling activities
- Excavation of intake pipe trench and treatment of water ingress
- Operation of plant and equipment on barge or platform adjacent to the river
- Bulk excavation to platform level and detailed excavations for subsequent construction elements, including wet well, manifold slab excavations and in-ground services
- Backfilling activities
- Transport and stockpiling of excavated material within the TRIPS site
- Removal of vegetation, tree stumps and roots during excavation
- Compounds operation including fuel and chemical storage, refuelling and chemical handling
- Vegetation clearing
- Batching/pouring of concrete
- Noxious weed treatment including herbicide application and bleach wash-down treatment of vehicles.

Table 5-1 Indicative construction methodology and timing

Work Phase	Activities	Indicative Timing
Site Establishment	• Installation of Traffic Control • Temporary Fence Erection • Float of Plant and Equipment • Erosion and Sediment Controls • Power Connection • Provision of Water.	4 days
In River Works	• Crane and Barge Mobilisation/Demobilisation.	4 days
	• Drilling of Intake Pile and Fender Piles.	10 days
Bulk Excavation to Platform Level	• Bulk excavate MSB (Main Switch Board) slab area.	2 days
	• Access track cut into Riverbank Face • Batter and Anchors to Excavation.	15 days
Intake Pipe Installation	• Excavate Intake Trench	14 days
	• Assemble intake pipe, steel cage, ancillary lines.	5 days
	• Drop pipe assembly into intake trench and concrete encase.	5 days

Work Phase	Activities	Indicative Timing
Backfill above Intake Pipe	• Staged Trench Backfill.	5 days
Completion of Wet Well Excavation	• Excavation of shaft to RL-2.5 AHD • Temporary shoring of shaft • Uncovering of sand filled valve pocket • Provision of shaft drainage lines and sump.	8 days
Wet Well Construction	• Concrete pours for base construction, wall lifts • Well fit out • Precast roof and baffle wall installation • Backfill to Pump Station.	114.5 days
	• Construction of Manifold Slab, MSB Slab.	38 days
	• Gabion Basket Retaining Wall and Crane Pad Construction.	21 days
In Ground Services	• Trench excavations for wet well-valve chamber pipework, Trench excavations for drainage, inground electrical and borefield diversion • Backfill with site won material.	133.5 days (concurrent with other activities)
Electrical and Control Works	• Fit out of cabinets or wiring of panels • Rough in of cables through installed conduits, installation of above ground cable containment and bracketry • Finalisation of functional description.	20 days
Road Works and Finishing	• Installation of permanent fencing, guard rail • Gravel road, topsoil and spray-seed.	13 days
Commissioning	• As per commissioning plan (to be prepared by Quay Civil Pty Ltd.)	TBC

5.2 Impacts

The potential for impacts on soil and water will depend on several factors. Primarily impacts will be dependent on the nature, extent, magnitude and management of construction activities and the associated interaction with the natural environment. Construction activities could impact water quality.

Potential sources of water quality impacts include:

- Increased sediment loads due to:
  - erosion, spills or dust generation during piling and excavation in the river and riverbank slope
  - reduced slope stability induced by access of plant and foot traffic, excavation and removal of vegetation which could result in soil being lost to the water course
  - exposed or stockpiled soil transported during rain events discharging to Tuross River
- Increased concentrations of nutrients, metals, and other pollutants, transported via sediment-laden (i.e. dirty water) discharge to Tuross River.
- Chemicals, oils, grease and petroleum hydrocarbon spills or leaks from storage containers or directly from construction machinery entering and polluting Tuross River.
- Gross pollutants (e.g. litter) from construction activities entering and polluting Tuross River.
- Stockpiles of cleared vegetation (including mulch) could leach or be washed directly in the Tuross River.

Impacts to water quality that may result from these activities include:

- Smothering of aquatic life and/or inhibiting critical processes (e.g. photosynthesis) of aquatic and riparian flora
- Reduction of fish passage area from instream activities and erosion and sediment controls
- Impacts to breeding and spawning conditions of aquatic fauna
- Changes to water temperature due to reduced light penetration, or from discharge of water that is not at ambient temperature
- Impacts to downstream ecosystems such as wetlands, floodplains and coastal estuaries
- Increased turbidity and nutrient concentrations leading to a proliferation of nuisance aquatic flora
- Pollutant runoff in surface water from herbicide application
- Runoff high in tannins can increase the biological oxygen demand (BOD) of the receiving environment, which in turn would decrease the availability of dissolved oxygen. Tannins may also reduce light penetration and alter the pH of receiving waters. These impacts may affect aquatic ecosystems in receiving environments.

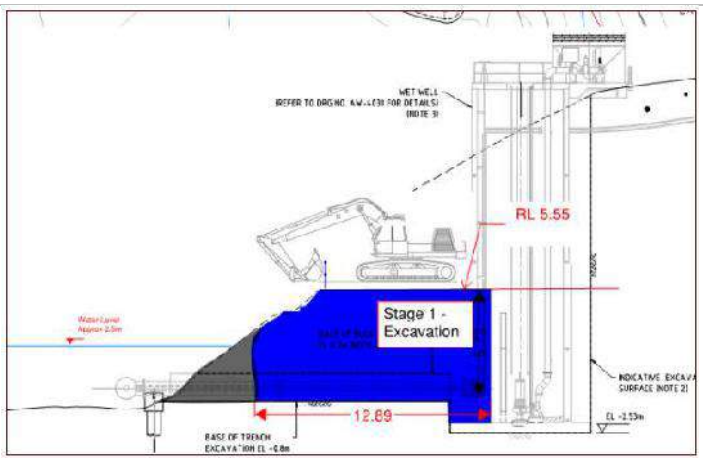
Some impacts on soil and water attributable to the Stage 2 – TRIPS construction is anticipated. Chapter 6 provides a suite of mitigation measures that will be required to be implemented to reduce the likelihood and severity of impacts.

6 Mitigation and management measures

6.1 Key management strategies

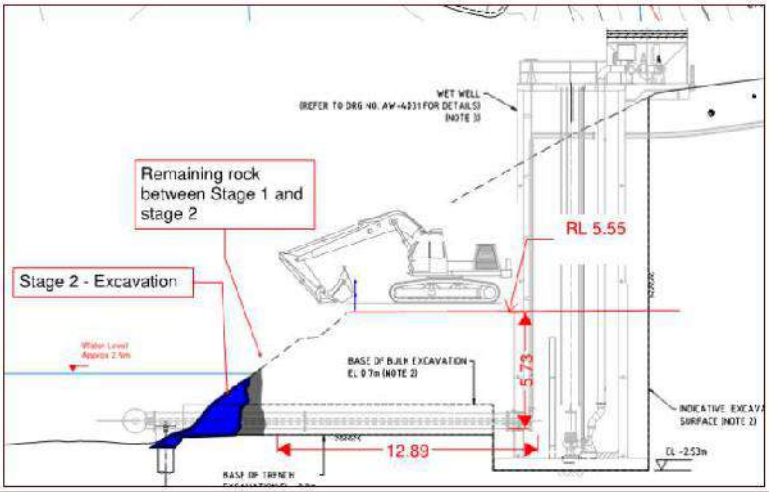
Key management strategies which underpin this CSWMP and apply generally across the Stage 2 - TRIPS construction works have been developed from the Blue Book principles and include:

- Specific controls for higher erosion and sediment risk activities:
  - In-river works (Section 6.3.3)
  - Riverbank face works (Section 6.3.4)
- Minimising extent and duration of disturbance, particularly steep slope and in-stream activities.
- Standard controls, including stockpile management to be implemented
- Where possible, maintaining existing tree stumps, roots and ground level vegetation (i.e., grass, shrubs and undergrowth), particularly on steep slopes where possible
- Works carried out Environmental Work Method Statements (EWMS) prepared by the Contractor, Quay Civil, including effective consultation and implemented by construction personnel.
- Early clean water diversions around the site (i.e., minimising run-on)
- Control stormwater flows onto, through and from the site.
- Use erosion control measures to prevent onsite damage
- Use sediment control measures to prevent off site damage
- Stabilise disturbed areas quickly and progressively throughout construction stage
- Regular inspection and maintaining controls measures
- Water ingress from river would be pumped and treated for re-use on site. Surplus treated water would be returned to the construction swale drains. This process would be managed as per the *Site Water Management Strategy* provided in Appendix E, and includes the following practices:
  - To avoid potential pollution offences under Section 120 of the POEO Act, any water discharged from site must be of the same quality, or better, than the quality of the receiving waters (at the time of discharge) (refer to Section 7.3.1 below for further details)
  - Regular visual monitoring will commence following site mobilisation for the Stage 2 - TRIPS construction works for any potential or observable impacts to the Tuross River during construction activities (refer to Section 7.3.2 below)
  - Weather and flood monitoring will be carried out by the Site Supervisor/Project Manage/Project Engineer during the construction activities to ensure that scheduled works do not occur during or shorter before heavy rainfall periods (refer to Section 7.3.3 below)
  - Water quality monitoring is to be undertaken as per the locations, parameters and requirements set out in Table 7-3 within Section 7.3.4
  - Water treatment would be undertaken prior to discharge (as per Section 7.3.5 and Appendix E), if the following water quality parameters are triggered:
    - Visible oil and grease
    - pH levels outside the range of 6-8
    - TSS greater than 50mg/L
  - Water may be reused onsite for uses such as dust suppression, compaction and irrigation, so long as it meets the relevant criteria (refer to Section 7.3.6 and Appendix E
- Scheduling construction activities outside of inclement heavy rainfall periods or high river flows.



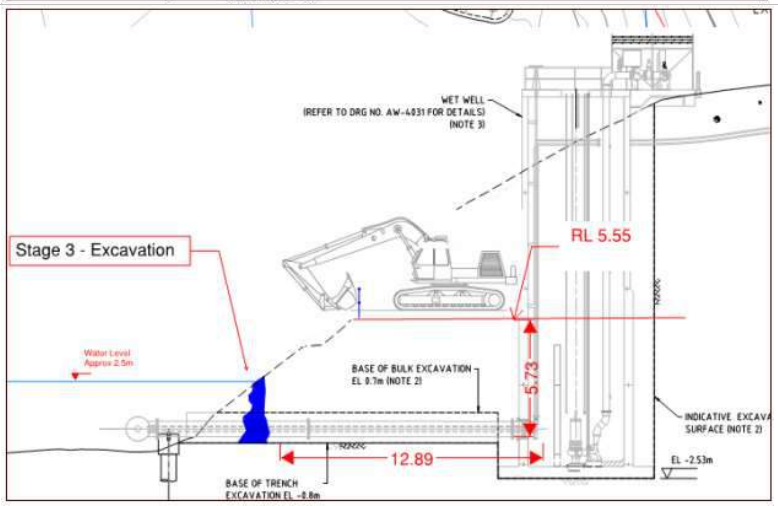
Stage 1

- Excavation of the main section of the trench to full depth
- Over-Excavation of the area beneath and surrounding valve location
- Following Excavation to base, locally place concrete pads at base of trench with laser to create accurate intake pipe base level
- Continually dewatering to take place from sump location
- Remove rubble and debris with second excavator (long-reach).



Stage 2

- Excavation of trench within river to end of bank profile
- Leave section of "rock wall" between Stage 1 and Stage 2 to create "dam" and reduce water ingress from river
- Ingress water to be pumped out of Stage 1 trench, pending quantity of ingress.



Stage 3

- Clear Stage 1 area from debris
- Excavation of remaining section of rock to complete trench excavation.

Figure 6-1 Intake Pipe Trench construction staging

6.2 Environmental Work Method Statements (EWMS)

The Contractor, Quay Civil, will prepare a detailed EWMS for construction activities outlined in Section 5.1 to comply with the requirements of this CSWMP. The EWMS should detail the:

- Proposed activities to be undertaken
- Identify environmental hazards and assess initial risk ranking
- Nominated proposed control measures with reference to this CSWMP
- Assess residual risk ranking and responsible personnel to implement controls.

Prior to works, the EWMS will require review and approval by the Project Manager/Project Engineer and consultation / induction with all construction personnel involved in the activity.

6.3 Erosion and sediment control plan

Appendix A (Drawing no. 30012985_CEMP_F003_ESCP) includes the detailed Erosion and Sediment Control Plan for the works. The plans include the minimum requirements to be progressively installed by the Contractor, Quay Civil during the works. Standard controls are identified where relevant to the Stage 2 - TRIPS construction works in the following sections. In summary, these include:

- Up-gradient clean water diversions to be installed around the site
- Install silt fencing along perimeter to prevent clean water run-on and divert dirty water flows away from steep embankment area
- Install a sump area at low point with level spreader or equivalent to permit discharge to vegetated area. No site water runoff permitted to enter Tuross River
- Install coir logs and temporary steps (timber and star picket) to provide stabilised and safe downslope access by foot along contour slopes
- Install geotextile (Bidim or equivalent) cover layer over the surface of exposed soil in areas excavated during works for Stage 2, to prevent erosion from raindrop impact. At a minimum, geotextile would be installed from the toe of the embankment near the water edge to 5m AHD. Additional areas would be covered with geotextile subject to wherever there was ground disturbance during vegetation removal. The geotextile would be secured to the slope by fixing with soil pins and/or tree stumps remaining.

6.3.1 Consultation with agencies

SMEC undertook initial discussions with the NSW EPA via a teleconference on 30 September 2020. The purpose was to enable development of suitable and effective control measures to be incorporated within this CSWMP and detailed Erosion and Sediment Control Plans. NSW EPA comments were considered and adopted within this plan. Evidence of correspondence is included in Appendix B.

During development of the ESCP consultation with DPI Fisheries and Water was attempted; however, this was not achieved in prior to finalising the draft ESCP. DPI Fisheries and Water will be consulted prior to finalisation of the ESCP as required under Condition B13(e) of the Conditions of Consent. Review comments received by DPI Fisheries and Water would be considered and addressed as required in the final CSWMP and ESCPs.

6.3.2 Standard controls

The following standard erosion and sediment controls are indicative of controls that may be used to manage soil and water impacts during construction. Table 6-1 details the relevant section from the following guidelines where the drawings (or requirements) are detailed. Controls should be implemented where appropriate and maintained to ensure proper function:

- *Volume 1 Soils and Construction – Managing Urban Stormwater* (Landcom, 2004) ('the Blue Book')
- *Volume 2D Soils and Construction – Main Road Construction* (DECC, 2008)
- *Erosion and sediment control on unsealed roads* (NSW OEH, 2012).

Where the drawings are detailed, controls should be implemented where appropriate and maintained to ensure proper function.

Selection of control measures requires the following:

- Identifying the problem – erosion or sedimentation to be managed
- Where the problem is erosion, identifying whether it is caused by raindrop impact or concentrated flow
- Where the problem is sedimentation, identifying if sediment is conveyed by sheet or concentrated flow
- Selecting the appropriate techniques depending on the identified specific nature of the problem.

Table 6-1 Standard erosion and sediment controls for Stage 2 - TRIPS construction

Control	Drawing Reference	Source Page Reference	Recommended standard erosion and sediment controls: Y (yes recommended) NR (not recommended) TBA (to be assessed by Quay Civil)
Stockpiles	SD 4-1	4-5 Blue Book	Y – where applicable
Replacing topsoil	SD4-2	4-6 Blue Book	NR
Temporary waterway crossing	SD5-1	5-14 Blue Book	NR
Rock check dams	SD 5-4	5-22 Blue Book	NR
Earth Bank (low flow)	SD 5-5	5-25, Blue Book	Y – Clean water diversions
Earth Bank (high flow)	SD 5-6	5-26 Blue Book	Y – Sump area
Concentrated Flow (Batter Chute)	SD 5-7	5-28 Blue Book	NR
Energy dissipater	SD 5-8	5-34 Blue Book	Y – at discharge outlet or where scour potential
Sediment Fence	SD 6-8	6-36 Blue Book	Y – North and western perimeter (minimum)
Rock sediment basin	SD 6-1	6-16 Blue Book	NR
Gabion sediment basin	SD 6-1	6-17 Blue Book	NR
Earth basin - wet	SD6-4	6-19 Blue Book	NR
Turbidity barrier	SD6-10	6-39 Blue Book	Y – containing any in-river, bank works

Control	Drawing Reference	Source Page Reference	Recommended standard erosion and sediment controls: Y (yes recommended) NR (not recommended) TBA (to be assessed by Quay Civil)
Mesh and Gravel Inlet Filter	SD 6-11	6-40 Blue Book	Y – Existing stormwater pit
Geotextile Inlet Filter	SD 6-12	6-41 Blue Book	Y – Existing stormwater pit
Stabilised Site Access	SD 6-14	6-48 Blue Book	Y – Driveway entrance
Control of wind erosion	SD6-15	6-49 Blue Book	NR
Temporary batter drains – typical arrangement	C2	Vol 2D Appendix C, p57	NR
Check dams in drains and gullies	C3 Figure 32	Vol 2D Appendix C, p58 NSW OEH (2012), p41	Y – If concentrated flows develop (i.e. drainage pathways)
Sediment Traps at drop inlets	C5	Vol 2D Appendix C, p60	Y – Existing stormwater pit
Sediment fence – typical arrangement	C6	Vol 2D Appendix C, p61	Y – North and western perimeter (minimum)
Crowning and in fall drainage	Figure 5 & 7 (example photo)	NSW OEH (2012)	NR
Typical road drainage features (incl. Catch drain, table drain, mitre drain)	Figure 8	NSW OEH (2012)	NR
Rollovers	Figure 13 (example photo)	NSW OEH (2012)	NR
Catch drains	Figure 16	NSW OEH (2012)	NR

Control	Drawing Reference	Source Page Reference	Recommended standard erosion and sediment controls: Y (yes recommended) NR (not recommended) TBA (to be assessed by Quay Civil)
Temporary cross drain	Figure 14	NSW OEH (2012)	Y – Driveway entrance
Temporary crossing (Culvert)	Figure 27	NSW OEH (2012)	NR
Batter slope stabilisation (various)	Table D1 Group 1	Vol 2D Appendix C, p61	Y – Steep embankment area
Erosion control blankets	Section 6.1.3, Figure 30 and Figure 31	NSW OEH, p38-40	Y – Steep embankment area
Sediment fences	Figures 33, 34 and 35	NSW OEH (2012), p43-44	Y – North and western perimeter (minimum)
Spoon drains on batters	Figures 40 and 41	NSW OEH (2012), p54	NR
Soil surface Mulching	Section 6.1.2 and 7.1.3	NSW OEH (2012), p38	TBA

6.3.3 In-river activities and intake pipe trench controls and management

Key management strategies would include:

- Implementation of erosion and sediment controls as detailed in the ESCP (see Section 6.3 and Appendix A), particularly:
  - the implementation of sediment booms and silt fence within the Tuross River to contain turbidity plumes. These will be weighted silt curtains, extending to the bottom of the riverbed. The corners of the silt curtain would be anchored to the riverbed and shoreline as necessary. Quay Civil may investigate options for placement and configuration of these silt curtains so as to reduce the potential for fish passage to be blocked
  - Sediment fence to be installed along and offset from the water line
- Maintenance of fish passage by ensuring in-river structures do not span entire width of river
- Monitoring of wet weather and river flood potential (as outlined in Section 6.4) to plan works during. Critical aspects of in-river works should be scheduled for forecasted dry weather periods
- Construction staging to minimise time that embankments or creek bed are exposed. Refer to Figure 6-1 in Section 6.1 above as to the proposed staged excavation of the Intake Pipe Trench
- Geotechnical advice to inform the dimensions of the “rock wall” dam that separates the Stage 1 and Stage 2 excavations to minimise the risk of collapse and minimise ingress into the trench prior to completion of Stage 2 excavation (refer Figure 6-1 in Section 6.1 above)
- Disturbance of riverbed sediments to be minimised during installations where practicable
- In-river activities to be conducted in a controlled manner to minimise the disturbance and mobilisation of sediments within the river. This includes:
  - Stage 2 and Stage 3 excavation (refer to Figure 6-1 in Section 6.1 above)
  - Pile installation
  - Barge mobilisation, demobilisation and operation
  - Installation of erosion and sediment controls (as detailed in Section 6.3)
- Regular visual and water quality monitoring to be carried out during construction period, and corrective measures taken as outlined in the WQSMP (refer to Section 7.3.4 below).

6.3.4 Excavation and batter stabilisation

Work activities on the riverbank face introduce higher erosion and sediment risks due to the steep slope, potentially lower slope stability from vegetation removal and plant and foot traffic and exposed soils from excavation and stockpiling activities.

Impacts include higher sediments loads entering the river and potential for subsidence/landslides.

Key management strategies would include:

- Excavation parameters and temporary shoring requirements will be informed by geotechnical advice and reviewed and approved by a Geotechnical Engineer progressively as excavation activities.
- Geotechnical engineer will confirm proposed batters to excavation during construction. Below image for batter of excavation based on geotechnical analysis of foundations.
- Minimising the duration of work activities and duration of exposed excavations as far as possible
- Maintenance of sediment fencing as per Erosion Sediment Control plan (detailed in Section 6.3)
- Install coir logs at regular intervals to stabilise slopes following vegetation clearing. These would be positioned at regular intervals, including downslope of any ground disturbance or destabilised topsoil areas and where concentrated flows have potential to form
- Install geotextile (Bidim or equivalent) cover layer over the surface of exposed soil in areas excavated during works for Stage 2, to prevent erosion from raindrop impact. At a minimum, geotextile would be installed from the toe of the embankment near the water edge to 5m AHD. Additional areas would be covered with geotextile subject to wherever there was ground disturbance during vegetation removal. The geotextile would be secured to the slope by fixing with soil pins and/or tree stumps remaining.
- Maintain vegetation where possible (Section 6.3.9).

Where the riverbank is backfilled, clean fill is to be used. Backfill materials will not constitute highly erosive elements (e.g. yellow pinch soils would not be used).

Appendix A, Drawing 30012985_CEMP_F003_ESCP shows an indicative batter stabilisation measures.

6.3.5 Stockpile management

Standard controls for stockpiles will be implemented as outlined in SD 4-1 of the Blue Book (Landcom, 2004) and would include the following measures:

- Stockpiles to be treated with dust suppression, soil binder or equivalent. Where practical and safe to do so, stockpiles are to be covered.
- Stockpiles to be placed away from the Tuross River, core riparian zone, concentrated water flow and roads
- Stabilised Bunding/silt traps/hay bales to be established around stockpile area boundary
- Surface water flows are diverted away from stockpiles
- Stockpiles are to be kept to manageable sizes

6.3.6 Weed control and management

Weed control will be carried out prior to vegetation clearing for construction works. Specific weed control measures are contained within Section 6.1.4 of the Construction Flora and Fauna Management Plan. Mitigation measures will be employed to prevent soil land water impacts include:

- Herbicide application (if required):
  - The handling and use of herbicides on the site will be in accordance with labelling instructions and Safety Data Sheets and comply with the Pesticides Act 1999. Herbicides should generally be applied when wind speeds are generally low.
  - Herbicide application will take place after two consecutive days with no rain and prior to at least five consecutive days with no predicted rain. Herbicide application should be delayed if rain is forecasted
- Vehicle washdown (as required):
  - Vehicle washdown to occur within designated hygiene control points established at site access points
  - Vehicle washdown would be required for any vehicle entering site that has come from an areas of known weed infestation
  - All tracked plant will require washdown
  - All plant and equipment to be placed in river will first require washdown
  - Minimisation of water volume will be achieved through high pressure
  - Runoff from vehicle washdown will be contained within suitable earth bunded areas and standard controls used to prevent runoff entering site drains and pits.

6.3.7 Clean water diversions

The Contractor will install and maintain upgradient clean water diversions around the site (i.e. minimising run-on) including:

- Silt fencing will be installed along existing fence line to the north of the TRIPS site to separate clean and dirty water flows.
- Installing a mesh and gravel filter inlet (or equivalent geotextile filter) will be placed over the existing stormwater pit downslope of the Southern Water Treatment Plant
- Installing perimeter silt fencing and mulch bunds at the crest of the steep embankment to divert dirty water and prevent from entering the Tuross River.

Appendix A, Drawing 30012985_CEMP_F003_ESCP shows clean water diversions.

6.3.8 Sediment treatment and sump

The Stage 2 - TRIPS construction will involve earthworks, with significant ground disturbance proposed. The following sediment controls will be installed, using precautionary principle, to reduce site runoff velocity, prevent erosion and treat dirty water flows (if applicable) prior to leaving the site:

- Sediment fencing along the crest of steep embankment to divert dirty water flows away from steep embankments (applicable to cleared portion only)
- Install geotextile or jute mesh lined catch drain to divert site water from steep embankment across the contours of the access track
- Remove existing earth berms where these are likely to divert dirty water towards the steep embankment
- Exposed soil areas (i.e. unsealed access track to be stabilised with mulch cover (site won) or suitable imported washed gravel road base to prevent scour
- A sump area was installed at the hydraulic low point to permit discharge of site water into the downslope vegetated area. The sump outlet would discharge runoff at low velocities with level spreader or equivalent to prevent scour. The sump area is expected to intercept possible dirty water runoff from site or contain accidental spills (Refer to contingency measures Section 6.4.3).

6.3.9 Maintaining vegetation

Vegetation clearing, including tree felling, stump grinding and slashing within the clearance boundary has been completed. The Contractor will adopt and maintain the following control measures when undertaking vegetation clearing activities to maintain the existing ground cover and prevent topsoil destabilisation, along steep embankment slopes:

- Light vegetation (shrubs, herb, forbs and grasses) should be cut down to ground level. This could be achieved with either a slasher of flail mower
- Grubbing and soil disturbance should be avoided in areas where clearing is not required. Retained roots can assist in soil stabilisation and some regrowth and coppicing can assist in the rehabilitation stage post construction
- Weed and exotic vegetation in seed should be removed and disposed of appropriately in order to prevent spread as required under the Biosecurity Act 2015. This would namely include the Honeysuckle and Blackberry vines
- Trunks and roots are to be left in situ where possible to minimise soil erosion.

6.3.10 Temporary access path

Prior to excavations as part of providing access to the river, the Contractor, Quay Civil, will provide a suitable temporary access path to provide stabilised and safe downslope access by foot along slope contours. The temporary access path is required to reduce the likelihood of destabilisation using the following:

- Install coir logs or temporary steps (timber and star picket) on downslope side of path
- Maintain low lying and ground vegetation outside of path areas
- Foot traffic to keep to the designated temporary access path to maintain low lying vegetation in remaining areas.

Appendix A, Drawing 30012985_CEMP_F003_ESCP shows an indicative temporary access path.

6.4 Contingency measures

6.4.1 Wet weather (heavy rainfall)

The following additional contingency measures will be carried out to mitigate risks of inclement wet weather (heavy rainfall) during the works:

- Weather and flood monitoring will be carried out daily as outlined in Section 7.3.3
- Works will be scheduled not to occur prior to or during heavy rainfall. Works will be postponed until after predicted heavy rain events
- Progressive erosion and sediment controls (i.e. batter stabilisation measures) would be installed and maintenance inspections/repairs undertaken prior to days off (i.e. weekends) or periods of predicted heavy rainfall
- Additional visual monitoring inspections to be undertaken during wet weather (heavy rainfall) as outlined in Section 7.3.2.

6.4.2 River flood potential

The following additional contingency measures will be carried out to mitigate risks of impacts to water during river flood events:

- Weather and flood monitoring will be carried out daily as outlined in Section 7.3.3
- Works will be scheduled to not occur prior to or during heavy rainfall. Works will be postponed until after predicted heavy rain events
- Erosion and sediment controls will be progressively installed during works installed and inspected prior to weekends and predicted heavy rainfall events
- Progressive batter stabilisation measures will be installed during works on steep embankment slopes. A geotextile cover will be employed over fluctuating water level zone
- Where possible, batter stabilisation measures are to be located above 2-year ARI flood to prevent impacts from concentrated water flows
- During construction activities, stockpile or store materials away from the core riparian zone (i.e. 20 metre zone).

6.4.3 Environmental spills

The following additional contingency measures apply for environmental spills:

- All liquid chemical handling/storage, refuelling and vehicle washdown activities will be located at a designated bunded area near the driveway entrance, away from stormwater drains and at least 50m away from the Tuross River
- A sediment sump located at the hydraulic low point at the site will be used a contingency pollution sump to capture and treat contaminated runoff
- An environmental spill kit will be readily available
- Where practicable, refuelling should not occur on the steep embankment slopes or within the Tuross River. Should refuelling activities be required on the flat platform to be located at RL 5.5, or on the barge mounted piling rig, these activities must be undertaken within an appropriately bunded area to avoid spills to Tuross River
- All powered plant will be inspected and checked for evidence of leaks prior to use.

7 Compliance management

7.1 Roles and responsibilities

The roles and responsibilities of all project staff of relevance to the CSWMP are listed in the CEMP. Specific roles and responsibilities for this CSWMP are outlined within Table 7-1. Quay Civil Pty Ltd will be primarily responsible for the implementation, monitoring and auditing of the CSWMP.

Table 7-1 Project staff roles and responsibilities – specific to CSWMP

Role	Responsibility	Timing
Project Manager / Project Engineer / Site Engineer	• Develop/review EWMS for compliance with this CSWMP • Review and update of Progressive Erosion and Sediment Control Plans • Monitoring compliance with and inspections of items detailed in this CSWMP	Detailed in Section 7.3.
Soil conservation consultant	• Support the preparation of the ESCP in accordance with the principles and practices detailed in Managing Urban Stormwater Soils and Construction (the Bluebook) (Landcom, 2004), Volume 2D: Main Road construction (DECC 2008).	During preparation of ESCP
Geotechnical engineer/consultant	• Provide advice, review and approve excavation/shoring parameters and designs.	During detailed design and as needed during progression of construction

7.2 Training

Training of all contractors and management staff will be conducted prior to construction works. Training will be conducted through a series of inductions, tool box talks, daily pre-start meetings and the formulation of a lessons learnt register. A detailed description of the training methodology is outlined in Section 4.2 of the CEMP.

7.3 Monitoring and inspection

A program of monitoring and inspection will be carried out by the Project Manager / Project Engineer / Site Engineer. Monitoring of the erosion and sediment management controls is required to ensure the measures outlined in this CSWMP are implemented. The monitoring program will commence at the establishment of construction works.

The monitoring program will involve:

- Assessment of erosion and sediment control measures
- Compiling evidence of erosion and sedimentation and the correct function of erosion control devices
- Forming recommendations for corrective measures and/or additional management measures
- All maintenance must be recorded to ensure compliance with the specification.

The monitoring program timings will be comprised of:

- Informal daily inspection
- Site environmental inspections, documented in a format that enables capture of all information such as environmental status, action and close out
- Inspections carried out after heavy rainfall to ensure environmental controls are effective (Section 7.3.3)
- Inspections of plant and equipment maintenance records to ensure all plant and equipment is being maintained to ensure optimum running conditions.

7.3.1 Potential water pollution offences

To avoid potential pollution offences under Section 120 of the POEO Act, water discharged from site must be of the same quality, or better, than the quality of the receiving waters (at the time of discharge). Water quality criteria referenced in the *Site Water Management Strategy* (refer to Appendix E), such as that for TSS, 50mg/L, as well as testing and treatment techniques, are based on the Blue Book and the trigger values. However, compliance with these does not, of itself, provide any defence to an alleged breach of Section 120 of the POEO Act. This could include situations where:

- Water discharged with TSS below 50mg/L may still cause pollution, if the receiving waters have a TSS less than 50mg/L at the time the discharge occurs
- Appropriate erosion and sediment controls are in place, but a rainfall event occurs beyond the design capacity of those controls.

Table 7-2 below sets out the risks associated with different types of water discharge from the TRIPS site. Impacts are based on rain water run-off, whether collected in excavations or passing through site. Seepage will occur into the excavations which occur beneath the water table; with the proximity to the river, this seepage is anticipated to be of near river water quality.

Dust suppression and hydrotesting will occur with water of a near potable standard. During dust suppression processes, the runoff water generated will present a risk much like rain fall run off. However, for hydrotesting of pipelines and structures, the water will be contained in a clean environment and as such the risks are minimal.

Table 7-2 Discharge types and associated risks

Discharge Type	Potential Effect	Characteristics	Risks
Rain water collected in excavation and rain surface run off	Large, depending on the rain event	High turbidity Wash out of surface contamination if present	Moderate if untreated
Dewatering of excavations (seepage)	Small; large only after a rain event requiring dewatering	Potential higher salinity Potential low pH Potential for higher heavy metals	Moderate if untreated
In river excavations	Large	High turbidity due to grinding or scraping of submerged rock	Large if untreated
Excavation dust suppression water from Southern WTP	Moderate	Higher turbidity after run off Wash out of surface contamination	Moderate if untreated
Hydrotesting water from Southern WTP	Small	Very close to potable quality Wash out of items inside pipework	Negligible with good construction practice

7.3.2 Visual monitoring

Regular visual monitoring will commence following site mobilisation for the Stage 2 - TRIPS construction works for any potential or observable impacts to the Tuross River during construction activities. Visual monitoring will be carried out on a minimum daily basis (or more frequently if required) by the Site Supervisor/Project Manage/Project Engineer during construction activities, and during and after wet weather (heavy rain) events. Visual monitoring will include:

- Making observations and photographic evidence for signs of:
  - Damaged or ineffective erosion and sediment control measures
  - Dirty water runoff from construction site directed towards Tuross river
  - Tannin impacted runoff from use of mulch windrows or stockpiles
  - Evidence of turbid plumes forming within the river
  - Loose leaves or vegetation debris fallen into the river
  - Deteriorating slope stability or subsidence
- Employing appropriate corrective measures will be taken as required including:
  - Temporarily stopping works (where appropriate)
  - Review and amend EWMS
  - Review and amendment to Geotechnical advice and investigations
  - Inspecting and maintaining erosion and sediment control measures
  - Incident investigations and reporting of notifiable incidents (where appropriate)
- Documentation of visual monitoring and corrective actions undertaken during the construction period will be recorded.

7.3.3 Weather and flood monitoring

Weather and flood monitoring will be carried out by the Site Supervisor/Project Manage/Project Engineer during the construction activities to ensure that scheduled works do not occur during or shorter before heavy rainfall periods (including subsequent high river flows).

- Daily monitoring data will be obtained online from the following data sources:
  - Source 1: Daily river flows and rainfall monitoring data at 'Tuross River @ Eurobodalla (Station ID 218008)', located immediately adjacent to the proposal within the existing southern water treatment plant sourced from the Department of Primary Industries, Office of Water website (DPI, 2017).
  - Source 2: Rainfall monitoring data only at 'Bodalla Post Office (Station ID 069036)' located approximately six kilometres north-east of the proposal sourced from the Bureau of Meteorology website (BOM, 2017)
- Predicted rainfall forecasts over the next 24-48 hours (or next 72 hours prior to weekends) will be notified to construction personnel during Daily Pre-start/toolbox discussions prior to undertaking works. Works will be stopped and rescheduled to avoid predicted heavy rainfall and high river flows
- Documentation of actual daily rainfall and river flows during construction will be recorded.

7.3.4 Water quality monitoring

Quay Civil Pty Ltd will be responsible for undertaking construction water quality monitoring during the construction of the Project as in accordance with the *Site Water Management Strategy* (refer to Appendix E).

The *Site Water Management Strategy* has been prepared by Quay Civil Pty Ltd specifically for implementation during the Stage 2 – TRIPS construction and provides an outline of the methods by which water quality will be monitored. The strategy is informed by the Baseline Water Quality Assessment, which is provided in Appendix C.

Table 7-3 below sets out the locations, parameters and requirements of this monitoring as per the *Site Water Management Strategy* (refer to Appendix E).

Table 7-3 Monitoring locations, parameters and requirements

Location	Monitored Parameters	Trigger Values	Comments
Monitoring Locations and Parameters			
SW4 Upstream Location	pH	6 < pH < 8	SW4 is upstream of Quay Civil's impact, and thus can be used as an upstream baseline
	Turbidity	> 50 NTU	

Location	Monitored Parameters	Trigger Values	Comments
SW5 Downstream Location	pH	6 < pH < 8	Upstream impact point consistent with Baseline Water Quality Monitoring
	Turbidity	> 50 NTU	
Discharge Monitoring Requirements			
QC1 On site location	pH	6 < pH < 8	Sampled from clear water discharge after on-site treatment
	Turbidity	> 50 NTU	

Table 7-4 below sets out an indicative schedule for the Tuross River water monitoring frequency, as per the *Site Water Management Strategy* (refer to Appendix E). This monitoring schedule is subject to change.

Table 7-4 Tuross River sampling frequency

Stage of Works	Expected Discharge	Frequency of Sampling
Site set up/barge piling works	In river due to barge activities within silt boom	Daily
Earthworks	In river excavation, dust suppression and wetting, dewatering (frequent), increased run off	Daily
Backfill operations	Wetting run off, dewatering (rain only)	Twice/week
Concrete Works	Curing run off, dewatering (rain only)	Twice/week
Mechanical Works	Hydrotest water, dewatering (rain only)	Weekly
Completion	Commissioning water, dewatering (rain only)	Weekly
Water Discharge at QC1	Discharge of dewatering or site water	Prior to discharge

Figure 7-1 below summarises the onsite testing procedure which is detailed in full within Appendix E. If testing indicates that one or both of the parameters is out of specification, a risk assessment for discharge must be undertaken prior to discharging this water into the Tuross River. This risk assessment must consider:

- The volume of the out of specification discharge: very small volumes are unlikely to affect water way health
- The reason for the out of specification discharge. These may not be treatable or may not require treatment depending on the situation in the water way e.g. heavy rain event through well maintained sediment controls
- Mitigation strategies

If water treatment is required, this is assessed on a case by case basis, with common treatments available securely storage on site.

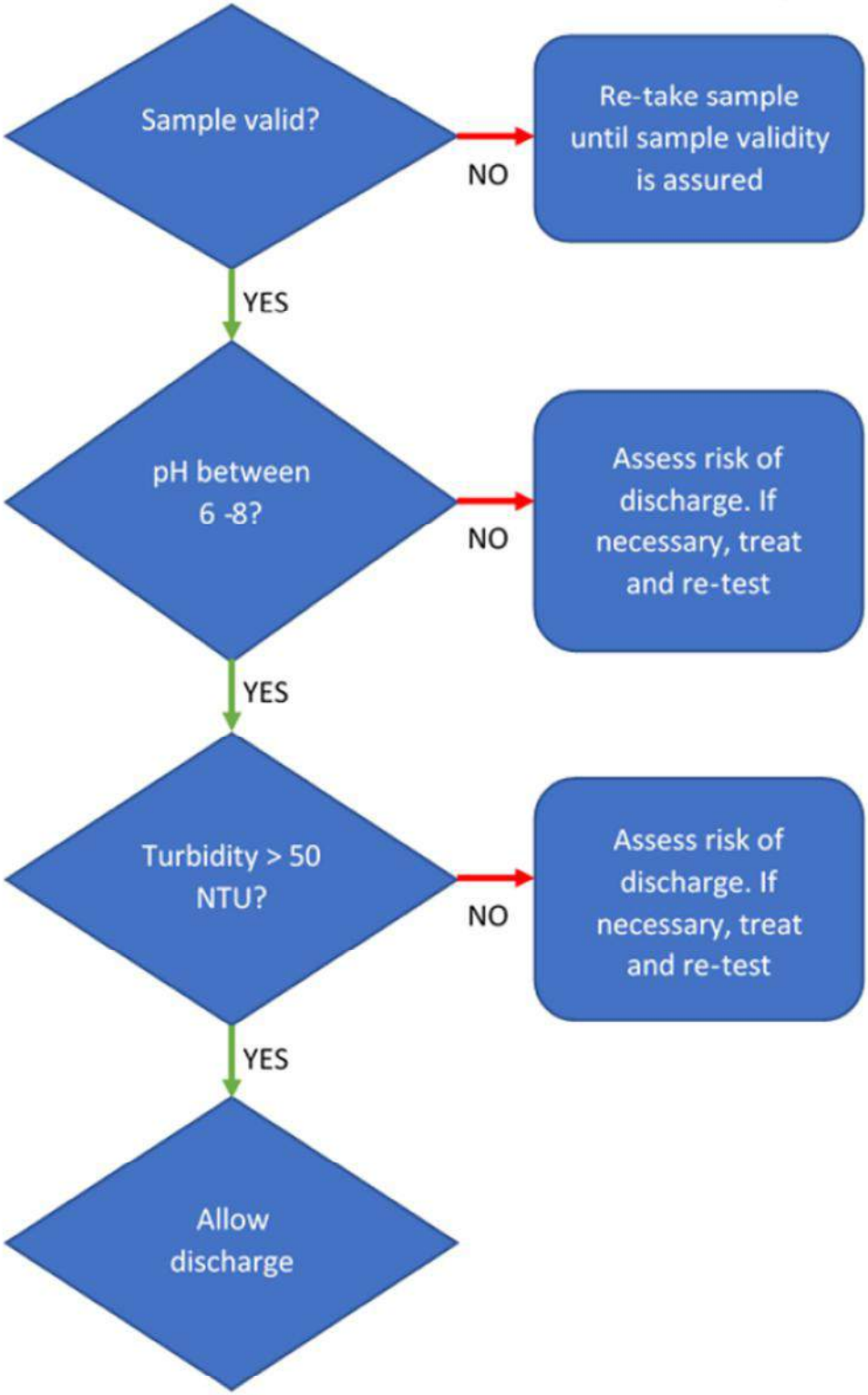


Figure 7-1 Flow chart for onsite discharge testing

7.3.5 Treatment prior to discharge

The *Site Water Management Strategy* provided in Appendix E sets out the following requirements for water treatment prior to discharge.

Any visible oil and grease will be treated as follows:

- Examine surface of water immediately prior to discharge for evidence of oil and grease (e.g. sheen, discolouration)
- No action is required if there is no visual contamination
- If there is contamination, the contaminated water must either be disposed of at a licenced disposal facility, or treated using appropriate absorbent materials, which must be spread on the surface
- Any used absorbent materials are to be disposed of appropriately.

For pH levels outside the range:

- If pH is outside the range 6–8 the water will need to be neutralised. This may be achieved via three methods which are dependent on site and time constraints:
  - Natural – allowing the water to sit for a period of time and naturally neutralise
  - Mixing – by mixing with other site water of a higher or lower pH (i.e. other water has also been tested), to achieve compliance
- Acid/base addition – if the water is above 8.5, acid is used to lower the pH; if the water is below 6.5 a base is used to raise the pH. To treat water with acid or base, safety requirements must be followed as outlined in the relevant material safety data sheet (MSDS)
- Re-test the water pH following treatment – repeat as necessary, until the acceptable pH range is reached.(c) Total suspended solids.

If TSS are greater than 50mg/L, the sediments need to settle to the bottom or be removed. This can be achieved via the following methods:

- Natural settlement
- Flocculation – chemical treatment with a flocculent (e.g. gypsum). If the flocculant is being applied manually, an even application over the surface of the water is essential. Only environmentally safe flocculants are to be used
- Filtration – pumping or gravity feeding the water through a filter medium (e.g. geofabric) to another storage area (e.g. container or sediment basin) to remove sediment
- Re-testing of water is required once treatment has been undertaken to ensure criterion for TSS is met.

7.3.6 Requirements for discharge to land

Discharging water to land (within the site boundary) allows water to infiltrate into the ground, thus avoiding direct discharge to, or pollution of, waters as suspended solids within the water are deposited either on the surface or retained in underlying soil layers. As such, the TSS criterion does not apply. pH testing and a visual inspection for oil or grease must nevertheless be undertaken.

Discharge locations should consider the following:

- Groundwater flow direction
- The receiving area should have complete groundcover vegetation to minimise erosion
- Water must not be discharged to areas where there is potential to have an adverse effect on any flora or fauna
- The receiving area must have sufficient infiltration capacity without causing flooding or significantly increasing the risk of flooding should rainfall occur.

Discharge to land within the site boundary shall only occur if:

- There is no visible oil or grease (otherwise treat in accordance with Appendix E)
- The pH levels are in range 6-8 (otherwise treat in accordance with Appendix E)

- No surface runoff will be generated and discharged water will not reach any onsite or offsite watercourse
- No erosion is caused from the discharge and appropriate erosion and sediment control are installed in accordance with the Blue Book
- All discharge water can be wholly contained within the site boundary.

Water may be reused on site, for example, for dust suppression, compaction or watering landscape/revegetation. As with discharges to land, the TSS criterion does not apply. pH testing and a visual inspection for oil or grease must nevertheless be undertaken. Onsite reuse shall only occur if:

- There is no visible oil or grease (otherwise treat in accordance with Appendix E)
- The pH levels are in range 6-8 (otherwise treat in accordance with Appendix E)
- No erosion is caused from the discharge
- Any runoff generated by the reuse is controlled entirely within the site boundary and appropriate sediment controls are installed and maintained in accordance with the Blue Book.

Further details on this process are provided in Appendix E.

7.4 Safeguards and management measures

7.4.1 EIS compliance

Table 7-5 outlines the EIS safeguards and mitigation measures that will be adopted to address potential impacts on hydrology and water quality.

Table 7-5 Safeguards and management measures – EIS (those not relevant to the TRIPS site construction are highlighted)

Impact	Environmental safeguards	Responsibility	Timing
Flooding	A Hydrology and Consequence Assessment would be carried out to inform the detailed design. Consideration of mitigation measures would be carried out in consultation with the relevant local authorities (e.g. NSW State Emergency Service) to ensure that flood related outcomes are consistent with floodplain risk management. This would be detailed in the Dam Safety Emergency Plan. *This does not relate to the Stage 2 – TRIPS construction works.*	Council	Detailed design
Flooding	Construction planning would consider flood risk for all compounds and work sites. The site layout and staging of construction activities would avoid or minimise obstruction of overland flow paths and limit the extent of flow diversion required.	Construction contractor	Pre-construction Construction
Hydrology	Measures to further avoid and minimise the construction footprint will be investigated during detailed design and implemented where practicable and feasible. *Note that the design has been revised since the EIS was submitted to further avoid and minimise environmental impacts.*	Council	Detailed design
Hydrology	Additional assessment of scour potential would be undertaken as necessary during the detailed design. This would include the development of appropriate mitigation	Council	Detailed design

Impact	Environmental safeguards	Responsibility	Timing
	measures. *Note that the design has been revised since the EIS was submitted. The current design would prevent scour.*		
Hydrology	Works within or near watercourses would be undertaken with consideration given to the DPI Water's guidelines for controlled activities.	Construction contractor	Pre-construction Construction
Water quality	Water quality control systems would be incorporated into the detailed design to ensure that relevant WQOs can be met during water discharge. *This does not relate to the Stage 2 – TRIPS construction works.*	Council	Detailed design
Water quality	The current WQMSP will be revised (as necessary) and implemented during construction and operation of the proposal. The plan will specify: • Sampling locations relevant to assessing potential impacts and / or the effectiveness of control measures • The frequency of monitoring and sampling and the triggers for event-based monitoring / sampling • The monitoring and sampling methodology in accordance with relevant guidelines, and the parameters to be monitored and sampled • General and reactive management and mitigation processes • Procedures addressing relevant matters specified in relevant legislation and guidelines.	Construction Contractor Council	Pre-construction Construction Operation
Water quality	Erosion and sediment mitigation measures would be installed and maintained for the duration of the construction period.	Construction contractor	Pre-construction Construction
Water quality	Discharges would be monitored to ensure compliance with WQOs and discharge criteria in the Environment Protection Licence. *Note that a baseline water quality assessment has been undertaken by Council, and site-specific trigger values have been developed (refer to Appendix C). Quay Civil will undertake monitoring as per the requirements of the baseline water quality assessment and Site Water Management Strategy (refer to Appendix E). As such an EPL is not required.*	Construction Contractor Council	Pre-construction Construction Operation
Water flows	Water extraction will be in accordance with the Tuross River WSP	Council	Operation
Temporary structures	Temporary in stream structures will be constructed in accordance with the NSW DPI policy guideline and will: • Avoid spanning the full width of the waterway channel	Construction contractor	Pre-construction of storage site and in-stream works for TRIPS site.

Impact	Environmental safeguards	Responsibility	Timing
	• Be inserted during low-flow periods with management plans being submitted to NSW DPI detailing how high flow events will be managed. • If require, dewatering of temporary in-stream structure should follow the following guidelines: – NSW DPI is to be notified 7 days prior to any dewatering activities to organise potential fish rescue activities. A separate s.37 permit may be required from NSW DPI to relocate fish – water is to be pumped a minimum of 30 m away from the waterway and should preferentially not re-enter the waterway. If water is to re-enter the waterway, ANZECC water quality guidelines need to be adhered to with the proponent being required to submit a detailed water quality monitoring program. *This does not relate to the Stage 2 – TRIPS construction works.*		Construction

7.4.2 Submissions Report compliance

Table 7-6 outlines the additional safeguards and mitigation measures that have been proposed to address potential impacts on hydrology and water quality.

Table 7-6 Additional water quality safeguards – Submissions report

Impact	Environmental safeguards	Responsibility	Timing
Water quality	The water quality of 'clean water' would be maintained through implementation of appropriate erosion and sediment controls and staged vegetation clearing in upslope areas. The coffer dam outlet will connect to the diversion pipe constructed through the base of the embankment, diverting 'clean' flow through the site to the outlet works. *This does not relate to the Stage 2 – TRIPS construction works.*	Construction Contractor	Construction
Water quality	Discharges would not occur during the construction of in-stream features within the Tuross River (i.e. intake pump structures). Temporary in stream structures (i.e. silt boom) would be constructed in accordance with the NSW DPI Policy and Guidelines (see requirements in Appendix D) and dewatering activities designed to avoid re-enter the waterway.	Construction Contractor	Construction
Water quality monitoring	A revised Water Quality Monitoring and Sampling Plan (WQMSP) would be prepared during pre-construction and implemented during construction and operation of the proposal. This would outline the ongoing additional water quality monitoring to assess and demonstrate compliance with NSW WQOs during construction phase of the project.	Construction Contractor Council	Pre-construction Construction Operation

Impact	Environmental safeguards	Responsibility	Timing
	Note that a baseline water quality assessment has been undertaken by Council, and site-specific trigger values have been developed (refer to Appendix C). Quay Civil will undertake monitoring as per the requirements of the baseline water quality assessment and Site Water Management Strategy (refer to Appendix E).		

8 References

écologique 2017, *Eurobodalla Southern Storage Water Supply – aquatic ecological assessment*, écologique, Balgowlah.

Fairfull and Witheridge 2003 *Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings*

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SMEC 2018b, *Eurobodalla Southern Storage Ancillary Works Geotechnical Investigation – Interpretive Report, SMEC* Australia, North Sydney. Ref: 30012127_R13, Revision 02

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SMEC 2018d, *Eurobodalla Southern Water Supply Storage, Environmental Impact Statement,* SMEC Australia, North Sydney, Ref: 30012127_R16_V01 dated 27 August 2018

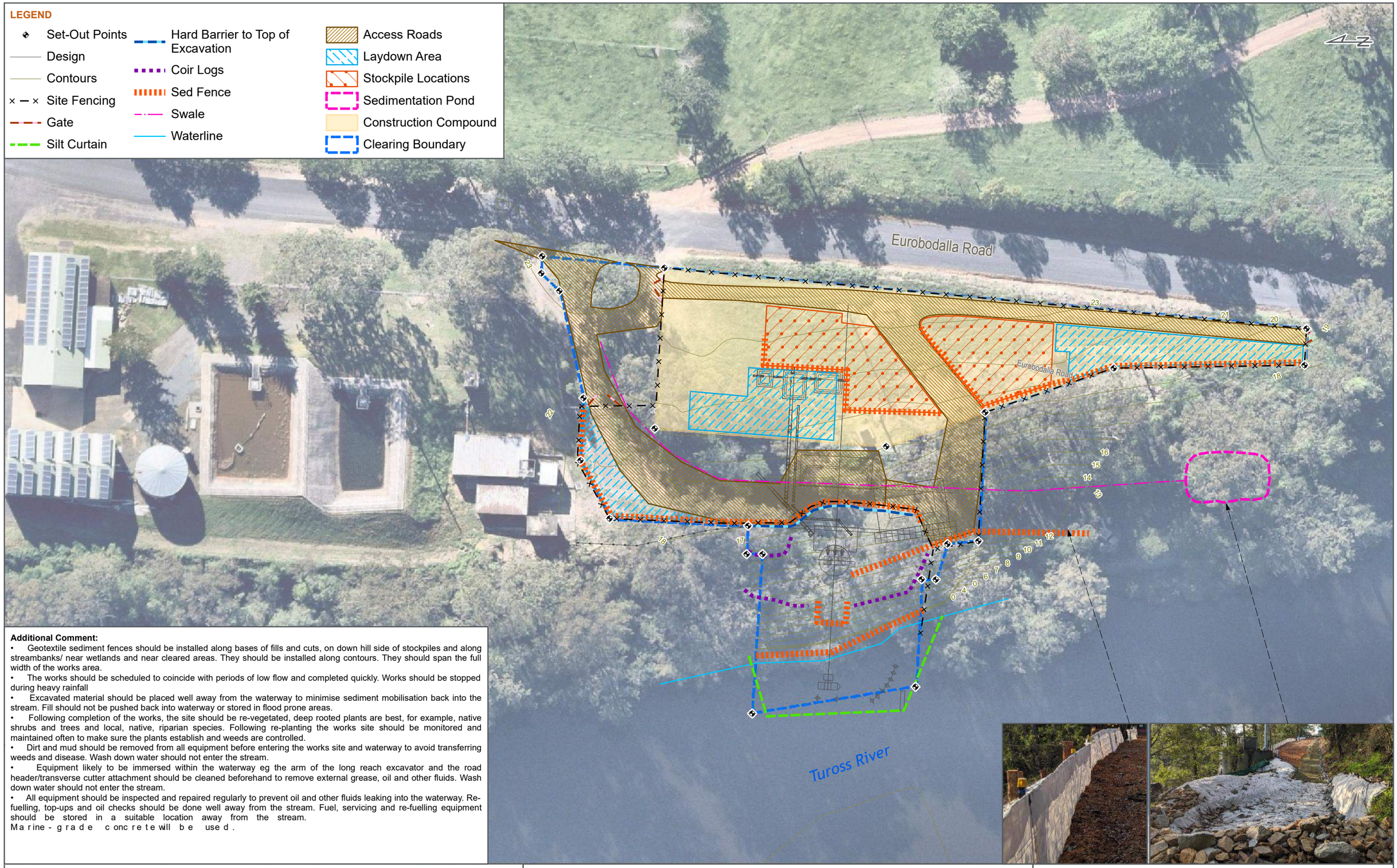
SMEC 2019a, *Eurobodalla Southern Storage Tuross River Intake Pump Station Design Report*, SMEC Australia, North Sydney, Ref: 30012127_R24, Revision 01, dated 24 January 2019

SMEC 2019b, *Eurobodalla Southern Storage, Addendum Submissions Report*, SMEC Australia, North Sydney, Ref: 30012127_SR dated 24 May 2019

Appendix A Erosion and Sediment Control Plan

LEGEND

- Set-Out Points
- Design
- Contours
- Site Fencing
- Gate
- Silt Curtain
- Hard Barrier to Top of Excavation
- Coir Logs
- Sed Fence
- Swale
- Waterline
- Access Roads
- Laydown Area
- Stockpile Locations
- Sedimentation Pond
- Construction Compound
- Clearing Boundary



Additional Comment:

- Geotextile sediment fences should be installed along bases of fills and cuts, on down hill side of stockpiles and along streambanks/ near wetlands and near cleared areas. They should be installed along contours. They should span the full width of the works area.
- The works should be scheduled to coincide with periods of low flow and completed quickly. Works should be stopped during heavy rainfall
- Excavated material should be placed well away from the waterway to minimise sediment mobilisation back into the stream. Fill should not be pushed back into waterway or stored in flood prone areas.
- Following completion of the works, the site should be re-vegetated, deep rooted plants are best, for example, native shrubs and trees and local, native, riparian species. Following re-planting the works site should be monitored and maintained often to make sure the plants establish and weeds are controlled.
- Dirt and mud should be removed from all equipment before entering the works site and waterway to avoid transferring weeds and disease. Wash down water should not enter the stream.
- Equipment likely to be immersed within the waterway eg the arm of the long reach excavator and the road header/transverse cutter attachment should be cleaned beforehand to remove external grease, oil and other fluids. Wash down water should not enter the stream.
- All equipment should be inspected and repaired regularly to prevent oil and other fluids leaking into the waterway. Re-fuelling, top-ups and oil checks should be done well away from the stream. Fuel, servicing and re-fuelling equipment should be stored in a suitable location away from the stream.

Marine-grade concrete will be used.

FIG NO. 1 **FIGURE TITLE** Eurobodalla ESCP

DATE 02/10/2020

0 5 10 20
1:600 Metres

PAGE SIZE A3

COORDINATE SYSTEM GDA 1994 MGA Zone 56

PROJECT NO. 30012985

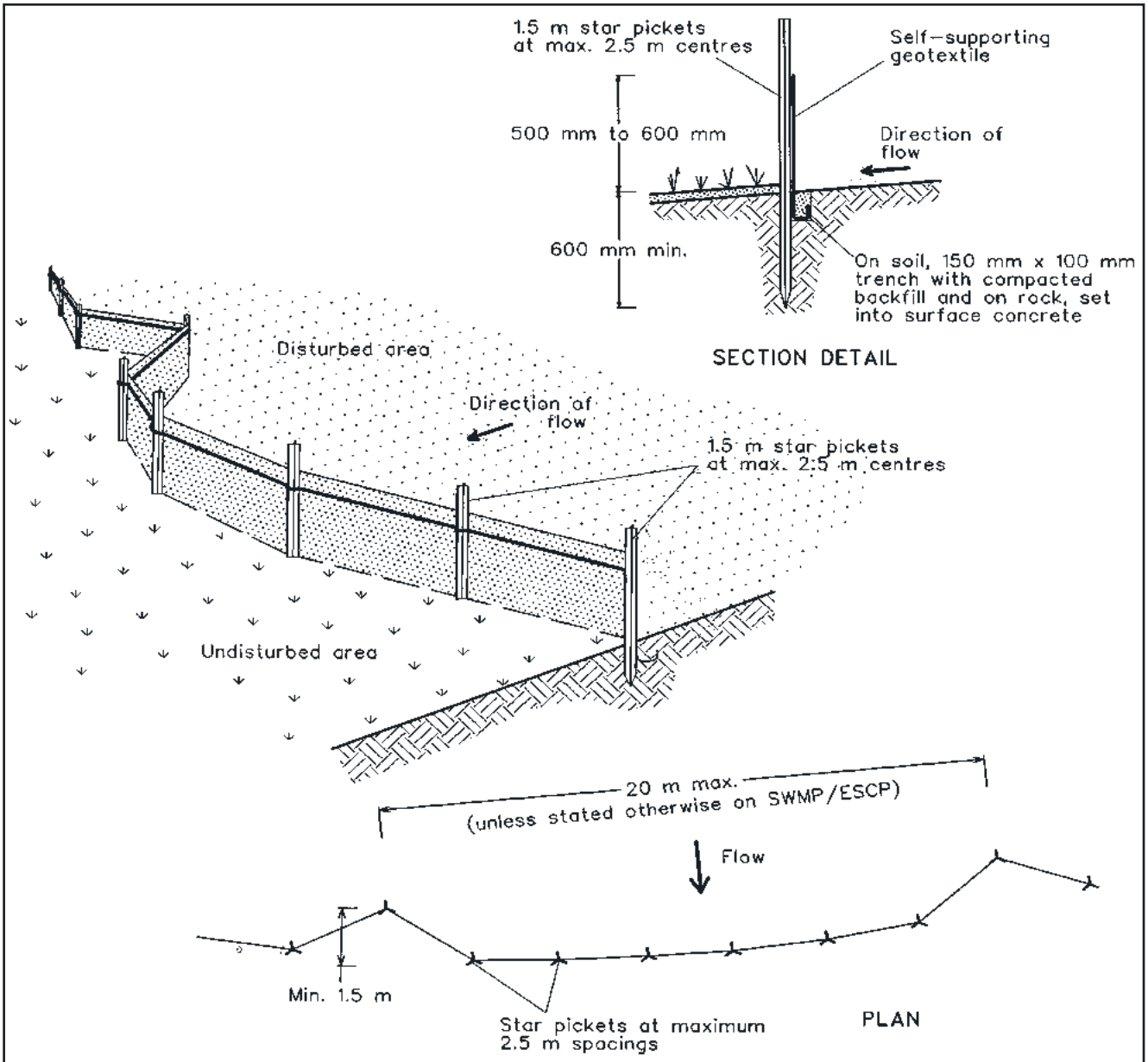
CREATED BY FA13847

SOURCES Roadnet MDS 2019, Nearmap 20200312
Site information provided by client

SMEC
Member of the Surbana Jurong Group

Location: \\AUSYFSV003\Group\projects\30012985 - TRIPS - D&C Environmental Compliance\140 Deliverables\GIS\Maps\30012985_CEMP_F003_ESCP.mxd

Last updated by: FA13847 on 2/10/2020 at 14:06



Construction Notes

1. Construct sediment fences as close as possible to being parallel to the contours of the site, but with small returns as shown in the drawing to limit the catchment area of any one section. The catchment area should be small enough to limit water flow if concentrated at one point to 50 litres per second in the design storm event, usually the 10-year event.
2. Cut a 150-mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.
3. Drive 1.5 metre long star pickets into ground at 2.5 metre intervals (max) at the downslope edge of the trench. Ensure any star pickets are fitted with safety caps.
4. Fix self-supporting geotextile to the upslope side of the posts ensuring it goes to the base of the trench. Fix the geotextile with wire ties or as recommended by the manufacturer. Only use geotextile specifically produced for sediment fencing. The use of shade cloth for this purpose is not satisfactory.
5. Join sections of fabric at a support post with a 150-mm overlap.
6. Backfill the trench over the base of the fabric and compact it thoroughly over the geotextile.

SEDIMENT FENCE — SD 6-8

Appendix B Correspondence

Member of the Surbana Jurong Group

T-PM10004	MEETING AGENDA AND MINUTES (DRAFT)		
Meeting Title	Eurobodalla Southern Storage TRIPS Stage 2 - CSWMP & ESCP Discussion		
Meeting Date	30 September 2020	Start Time	02:30 ☐ a.m. ☒ p.m.
Venue	Vid/Teleconference	Finish Time	3:30 ☐ a.m. ☒ p.m.
Minutes By	Anthony Moll	Checked By	

RECORD OF DISCUSSION	
ITEM	ITEM DETAILS
1.0	**WELCOME, INTRODUCTION OF ATTENDEES, APOLOGIES & MEETING AGENDA**
ATTENDANCE	Anthony Moll (AM) (SMEC) (Minute Taker) Sam Vaughan (SV) (SMEC) Matthew Rizzuto (MR) (EPA) Claudine Jeffery (CJ) (EPA)
APOLOGIES	Alex Williams (SMEC)
MEETING AGENDA	Discuss concept/control measures to be implemented for the Eurobodalla TRIPS Stage 2 works (construction of pump station) as part of the Construction Soil and Water Management Plan and Erosion Sediment Control Plan.
2.0	**DISCUSSION ITEMS**

Background, existing environment and controls (post TRIPS Stage 1 vegetation clearing works)

Refer Figure 1.

- CSWMP and ESCP required under Development Consent SSD 7089 Condition B13, B14.
- Previous vegetation clearing works completed, ERSED controls implemented (Figure 1)

Proposed Construction Methodology

Refer Figure 2, 3 & 4.

AM:

- In-river works (pile installation, indicative timing 10 days) and works on riverbank face (intake pipe trench – indicative timing of 14 days + 5 days for concrete encasement), then remainder of works including wet well construction.
- No in river pouring of concrete, stop end used on pre-fab intake pipe when lowered into trench and encased in concrete.

Proposed Erosion and Sediment Controls

Refer Figure 5.

SV & AM: Discussion of standard controls (Blue Book), sediment boom, “rock wall”. Primary control of sediment fence near water line, sediment boom in river, coir logs on slope. Expected volume of in-river excavation small, majority of excavation involved in “Stage 1”.

MR:

- Prefer sediment boom to be anchored to riverbed
- Quantify turbidity impacts of construction methodology
- What is justification for moving away from the use of coffer dam?
- How is water ingress that is pumped treated? Can this water be re-used?

AM: Expected volume of pumped for treatment is small. We note that original cofferdam had large abstraction volume under Water Access License (current RFI to confirm that this council license still current).

3.0	**OTHER BUSINESS**

Next steps:

- Draft CSWMP and ESCP to be sent to client, circulated to DPIE Fisheries and EPA for consultation and comment

4.0	**NEXT MEETING**

No meeting planned, expected that CSWMP and ESCP will be distributed for comment.

5.0	**CLOSE MEETING**

Meeting closed at 3:10pm.

ACTION LIST

NAME OF PERSON(S)	DETAILS OF ACTION	TIMING
Anthony Moll	Circulate and finalise minutes	Post Meeting
Anthony Moll	RFI: - Justification for moving away from the use of a coffer dam from proposed construction activities and controls - What is proposed treatment of pumped water from ingress into trench	RFI

SUPPORTING INFORMATION AND FIGURES

Figure 1.

Post TRIPS Stage 1 vegetation clearing and ERSED controls

SUPPORTING INFORMATION AND FIGURES

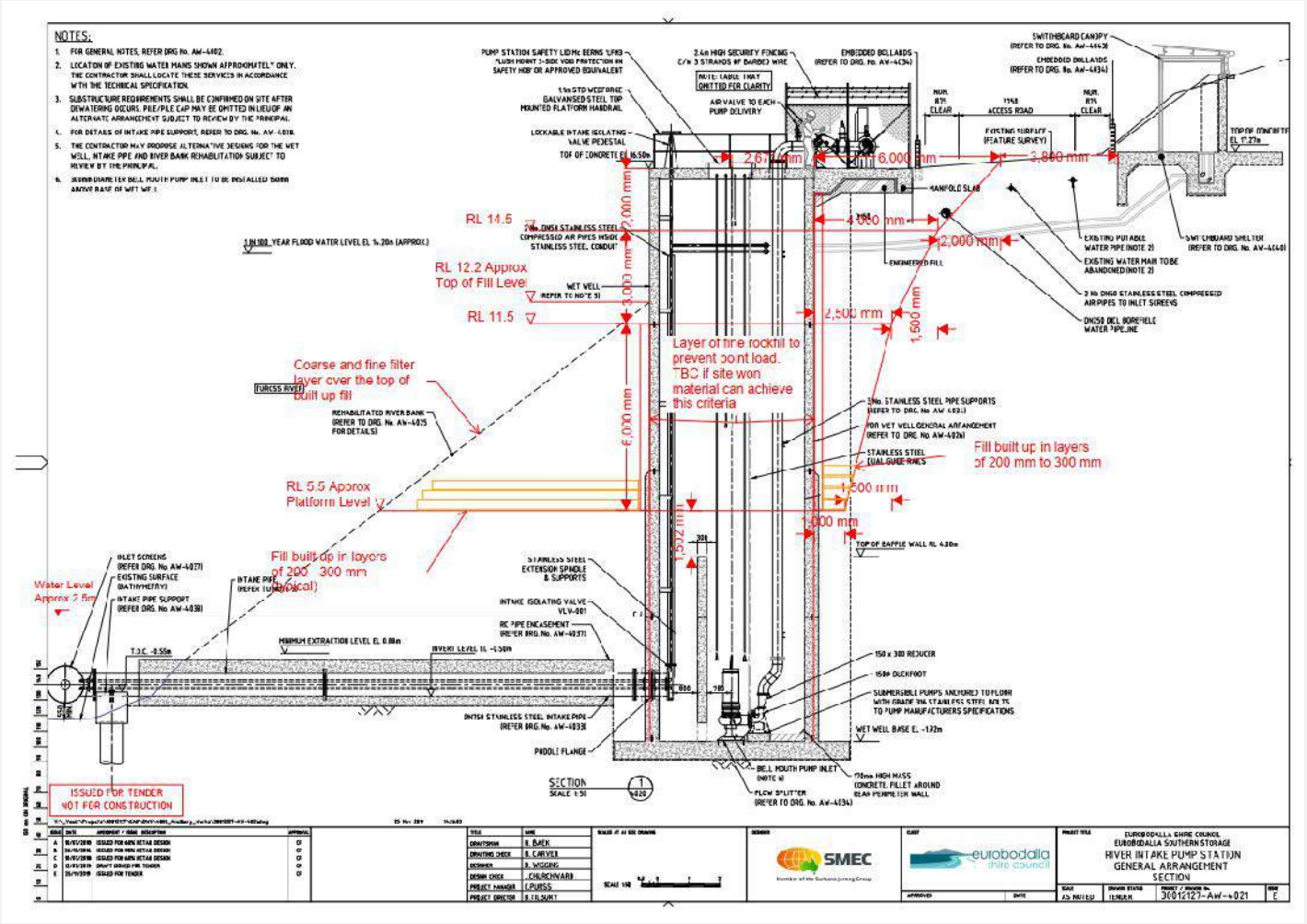
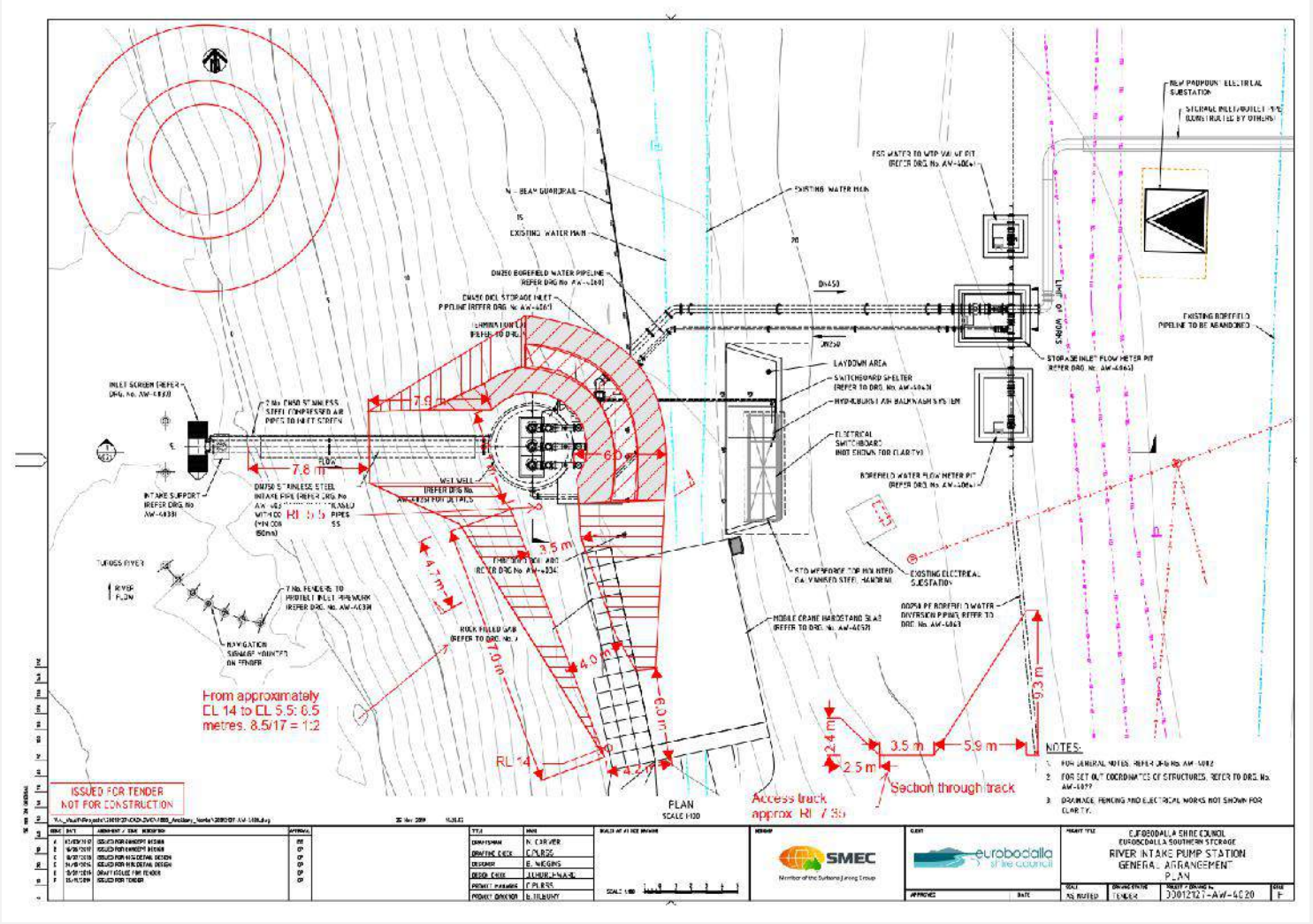


Figure 2.

Construction Methodology – Excavation and Access Ramp

SUPPORTING INFORMATION AND FIGURES



SUPPORTING INFORMATION AND FIGURES

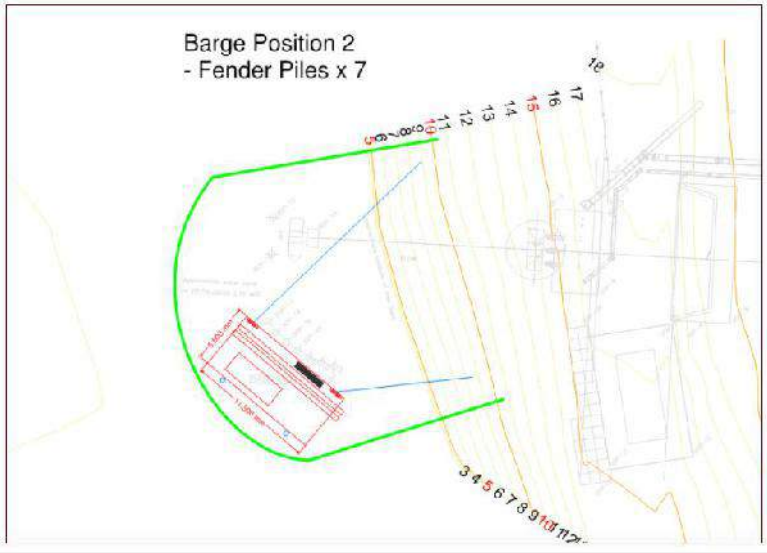


Figure 3. Construction Methodology – Pile installation

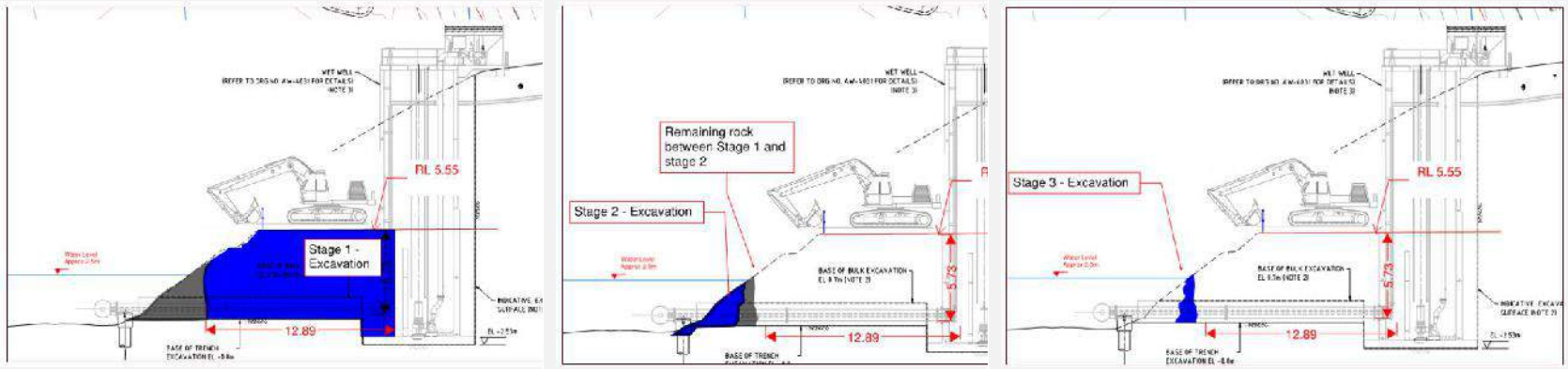


Figure 4. Construction Methodology – Staged intake pipe trench excavation

SUPPORTING INFORMATION AND FIGURES

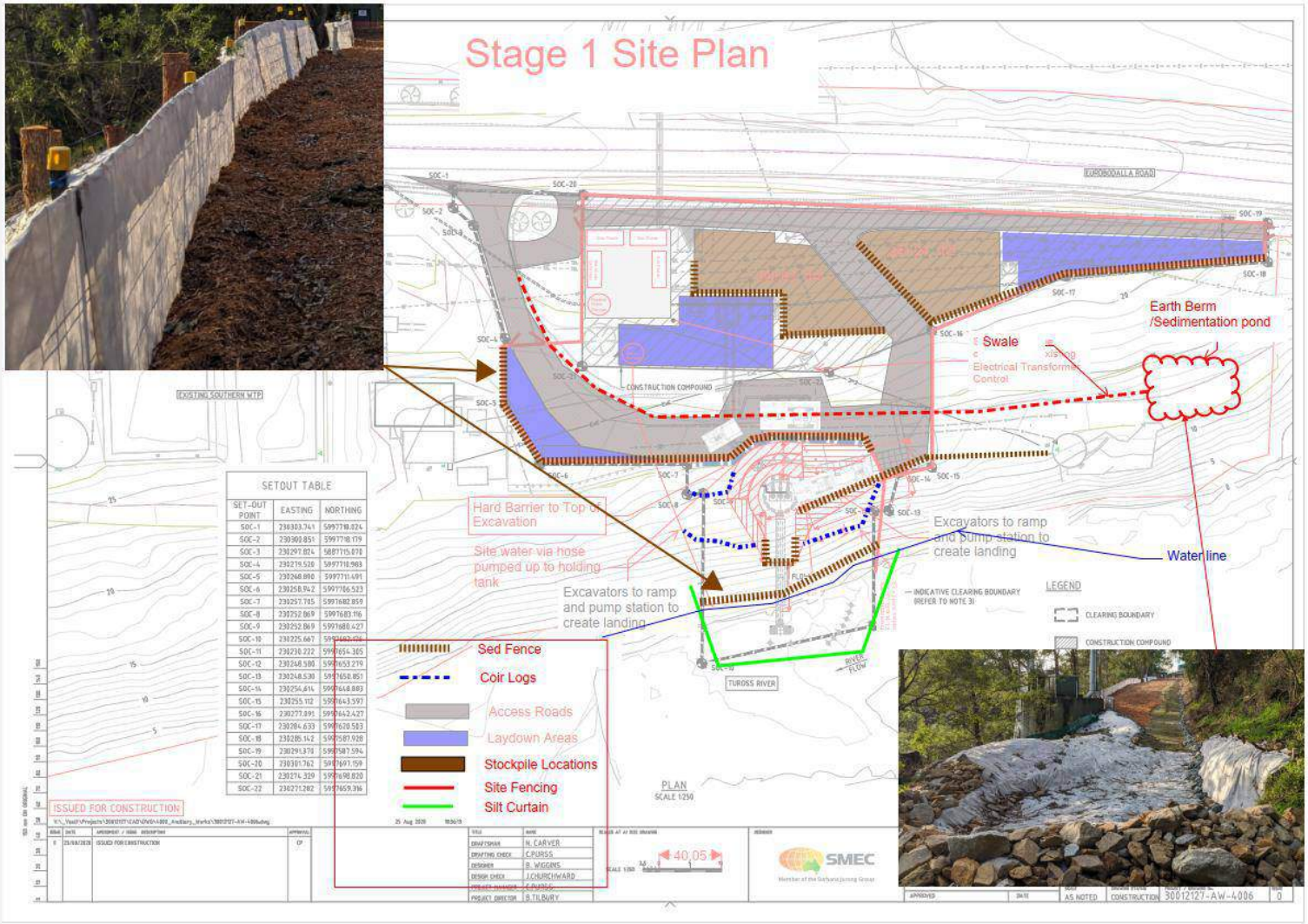


Figure 5.

Proposed Erosion and Sediment Controls

Appendix C Baseline Water Quality Monitoring Report

SMEC
Member of the Surbana Jurong Group

local people
global experience

DRAFT Baseline Water Quality Monitoring Report

Eurobodalla Southern Storage

Reference No. 30012127-R20
Prepared for NSW Public Works
25 May 2020

SMEC INTERNAL REF. 30012127

Document Control

Document:	DRAFT Baseline Water Quality Monitoring Report
File Location:	\\AUMBFPV002\projects\Projects\30012127 - Eurobodalla Storage\06 Deliverables\01 Reports and Tech Notes\R20 Baseline Water Quality Monitoring Report
Project Name:	Eurobodalla Southern Storage
Project Number:	30012127
Revision Number:	DRAFT

Revision History

Revision No.	Date	Prepared by	Reviewed by	Approved for Issue by
DRAFT	25 May 2020	Leura Kowald Cara Jacques	Alex Williams	Greg Tallentire

Issue Register

Distribution List	Date Issued	Number of Copies
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Cameron Purss (SMEC)	25 May 2020	1 electronic PDF and Word
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SMEC Company Details

Approved by:	Cameron Purss		
Address:	[Insert office address of approving manager]		
Signature:			
Tel:	+61 3 9869 0954]		
Email:	Cameron.purss@smec.com	Website:	www.smec.com

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Appendices

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Abbreviations and Acronyms

Abbreviation / Term	Parameter / Description
ANZECC	Australian and New Zealand Environment and Conservation Council
ANZG	Australian and New Zealand Guidelines
COC	Contaminant of Concern
CRMRM	Cumulative Residual Monthly Rainfall Mass
DO	Dissolved Oxygen
EC	Electrical Conductivity
EIS	Environmental Impact Statement
EPA	Environmental Protection Authority
EPL	Environmental Protection Licence
LOR	Limit of Reporting
LGA	Local Government Area
LLD	Lower Limit of Detection
m	meters
mAHD	Meters Australian Height Datum
mBGL	Meters Below Ground Level
RL	Relative Level in mAHD
MGA 94	Map Grid of Australia Projection 1994
mg/L	Milligrams per litre
ppm	Parts per million
NTU	Nephelometric Turbidity Unit
RL	Relative Level; generally referenced to mAHD
RPD	Relative Percent Difference
SEAR	Secretary's Environmental Assessment Requirements
SWL	Standing Water Level
SWTP	Southern Water Treatment Plant
TKN	Total Kjeldahl Nitrogen
WQM	Water Quality Meter (field portable)
µS/cm	Micro siemens per centimetre - units of measurement for electrical conductivity

1 Introduction

1.1 Project Overview

Eurobodalla Shire Council (Council) are planning the construction of a new 3000ML off-stream water supply storage and associated infrastructure (the Project). The Project will enable raw water to be extracted from the Tuross River from a new river intake pump station and the existing borefield for transfer to the new water supply storage. The Project Site is located within Tuross River and Bodalla State Forest in the Eurobodalla Shire LGA as shown in Figure 1.1.

Major components of the works include an embankment, spillway, inlet and outlet works, a transfer system, pipelines and road upgrade. Tuross River intake and pumping station (TRIPS) will be constructed adjacent to the Tuross River for extraction of raw water during Project operation. The scale of Project construction activities are expected to include:

- Clearing around 55 hectares of native vegetation
- Extraction and processing of around 487,000 m^3 of material within the storage inundation area for use onsite
- Importation of around 163,000 m^3 of material for construction
- Concrete batching
- Temporary coffer dam on the Tuross River for intake construction.

1.2 Background

SMEC Australia Pty Ltd (SMEC) prepared an Environmental Impact Statement (EIS) followed by a Submissions Report in which several environmental management and mitigation measures were adopted for the Project. The Project was approved in 2019 subject to the conditions of the Development Consent under Section 4.38 of the Environmental Planning and Assessment Act 1979.

Prior to surface disturbances, the Development Consent included a requirement to prepare of a Construction Soil and Water Management Plan as part of the Construction Environmental Management Plan (CEMP) (refer to Condition B13). Several management and mitigation measures applicable to water quality during construction were also noted as a result of the EIS and Submission Report.

As part of the EIS, Council previously carried out 12 months of baseline water quality monitoring between October 2017 and September 2018 in accordance with the Water Quality Monitoring Sampling Plan prepared by SMEC (Ref 30012127-R01, dated 17 August 2017). Following submission of the EIS, SMEC advised Council to undertake a further review of the water monitoring data to inform construction water quality monitoring and management measures. Council requested SMEC to prepare this Baseline Water Quality Monitoring Report (this report) and revision to the Water Quality Monitoring Sampling Plan for the construction phase of the project.

1.3 Purpose and scope

The purpose of this Baseline Water Quality Monitoring Report (the Report) was to review the 12 months of baseline water quality monitoring data and provide an assessment of the baseline water quality, covering physical and chemical parameters (excluding microbiological parameters). This included development of preliminary 'site-specific' assessment criteria (i.e. trigger values) used to compare future water quality results prior to, during and after construction identify potential issues with water quality and trigger the relevant management / mitigation responses.

The scope of this Report includes:

- Overview of monitoring methodology
- Collation of existing surface and groundwater monitoring data
- Presentation of results for key parameters
- Interpretation of results and recommendations
- Outline of the proposed second year of baseline monitoring program
- Development of investigation levels
- Response and mitigation measures.

It was beyond the scope of this assessment to review microbiological parameters for construction purposes, noting these are applicable to operational assessment the raw water quality suitability for drinking water supply purposes.

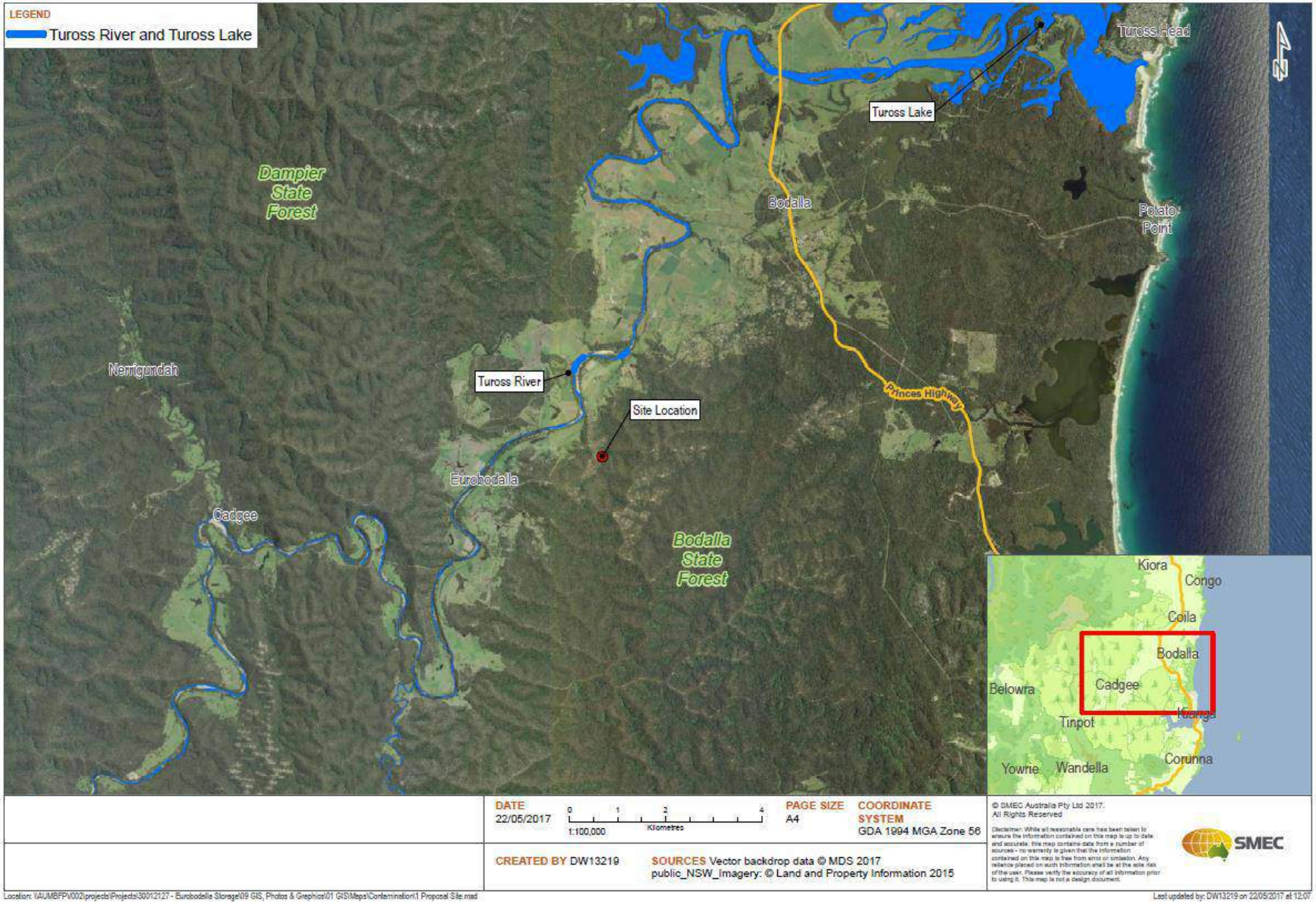

Figure 1.1: Site location and regional context

2 Site environmental setting

2.1 Site Description

The Site is located in the Eurobodalla Shire Council region on the New South Wales south coast around about 30 kilometres to the south of Moruya, 14km North-West from Narooma and around 7km south-west from Bodalla. The Storage site is located, on a third order ephemeral stream, approximately 950 metres east of the Tuross River, within the Tuross River catchment. Figure 2.1 shows the Site location, monitoring points and existing and proposed infrastructure. There are six surface water quality monitoring locations and one groundwater quality monitoring location.

The Site's surface water monitoring covers an approximate 4km section of the Tuross river, starting upstream of the construction just below the bridge which crosses the river at Nerrigundah Mountain Road. The construction area covers approximately 55 hectares and is bounded by the roads on the hills surround the Site; Bullocky's Hutt Road on the western and southern and Big Rock Road on the eastern side, which act as surface water catchment divides. An ephemeral creek connects the small catchment area to the Tuross River.

2.2 Climate and Meteorology

The Site is located within an area classified as temperate under the BOM Koppen Class, characterised by warm summer and cold winter with seasonal rainfall predominantly uniform to wet summer and low winter rainfall. The regional climate is strongly influenced by the Tasman Sea and the proximity of the coast to the Great Dividing Range. The closest weather station recording rainfall, weather and climate is Narooma (Marine Rescue) (Station Number 069022), approximately 16.4km south-east of the Site.

The nearest BOM station for evaporation data is Moruya Airport (Station number 069148) which is located approximately 29km north-east of the Site on a coastal aspect. The nearest rainfall station is located at Bodalla Post Office (Station Number 069036). The weather and climate data is summarised in Error! Reference source not found. and Table 2-1: Rainfall Data BOM Station 069036 for all years 1900 to February 2020

Statistic	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Mean rainfall (mm)	96.3	105.3	109.7	80.8	75.6	85.0	53.5	54.1	60.2	77.5	79.3	85.9	963.2
Median rainfall (mm)	74.5	62.5	70.4	45.8	46.0	45.2	28.0	23.9	44.4	51.7	65.0	67.4	624.8
Highest Daily (mm), month and year of highest on record	228.8, 29th 1999	337.3, 6th 1971	179.6, 21st 1914	293.4, 8th 1945	272.8, 28th 1900	162.6, 5th 1899	160.0, 11th 1957	132. 12th 1929	143.5, 28th 1970	187.6, 14th 1976	141.0, 5th 1973	159.0, 9th 1992	

Table 2-2 using Narooma and Bodalla and Figure 2.2 presents a summary of the monthly rainfall for 2019 compared to the mean and median. Evaporation is not considered as Moruya Airport is too far from the Site to be representative.

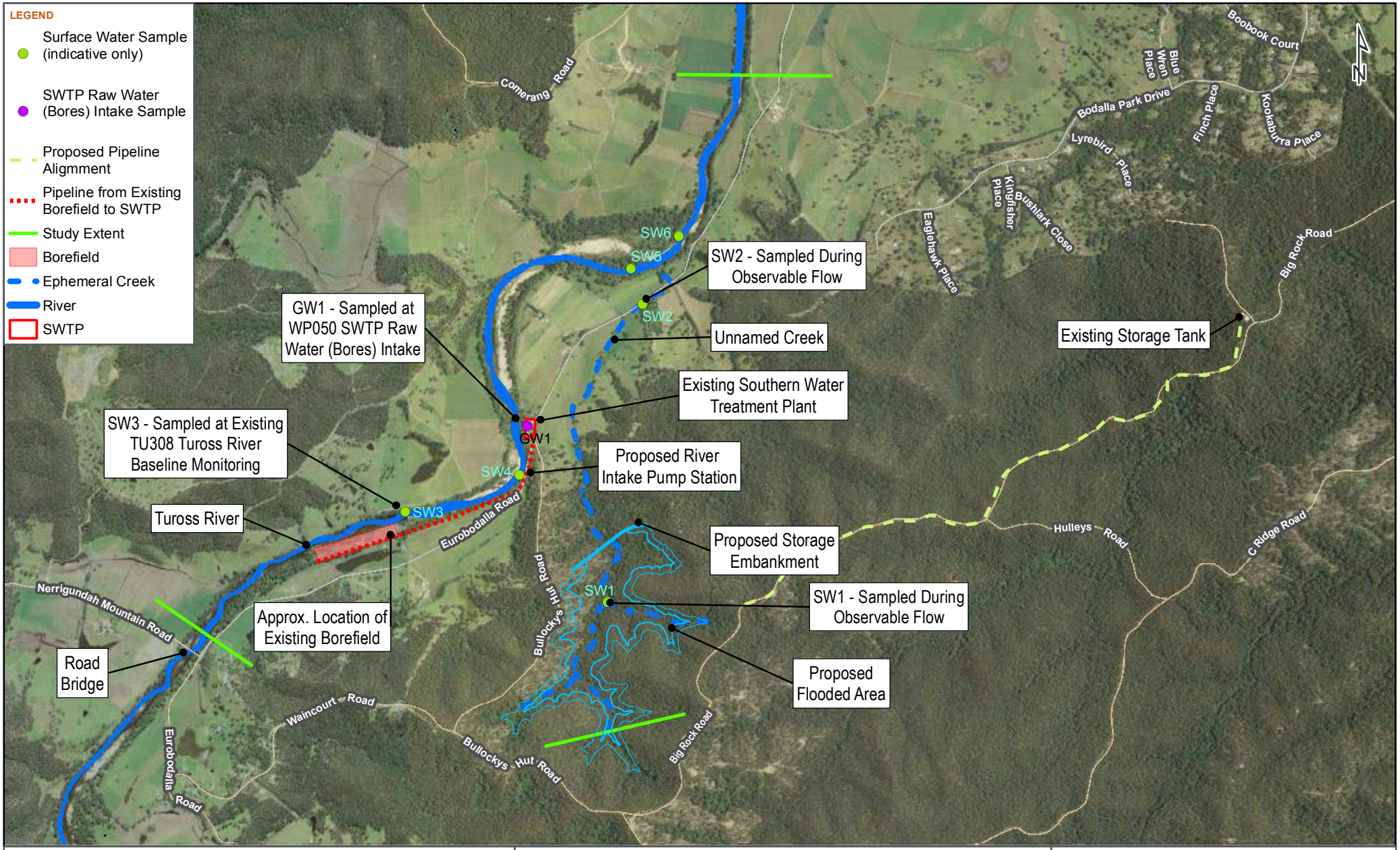

FIG NO. 2	**FIGURE TITLE** Proposal Site Features and Water Quality Monitoring Locations	**DATE** 04/08/2017	0 0.5 1 Kilometres 1:30,000	**PAGE SIZE** A4	**COORDINATE SYSTEM** GDA 1994 MGA Zone 56
PROJECT NO. 30012127	**PROJECT TITLE** Eurobodalla Southern Storage	**CREATED BY** FN12672	**SOURCES** Vector backdrop data © MDS 2017 public_NSW_Imagery: © Land and Property Information 2015		

SMEC

Location: \\AUMBFPV002\projects\Projects\30012127 - Eurobodalla Storage\09 GIS, Photos & Graphics\01 GIS\Maps\Contamination\2 Proposed Water Quality Monitoring Locations.mxd

Last updated by: FN12672 on 4/08/2017 at 11:50

Table 2-1: Rainfall Data BOM Station 069036 for all years 1900 to February 2020

Statistic	January	February	March	April	May	June	July	August	September	October	November	December	Annual
Mean rainfall (mm)	96.3	105.3	109.7	80.8	75.6	85.0	53.5	54.1	60.2	77.5	79.3	85.9	963.2
Median rainfall (mm)	74.5	62.5	70.4	45.8	46.0	45.2	28.0	23.9	44.4	51.7	65.0	67.4	624.8
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Table 2-2: Climate Data for BOM Station 069022 Narooma for 1965 to 2019

Statistic	January	February	March	April	May	June	July	August	September	October	November	December
Mean minimum temperature (°C)	23.8	23.7	22.9	21.2	19.0	16.8	16.3	16.9	18.4	19.6	20.8	22.1
Mean maximum temperature (°C)	16.7	16.8	15.5	13.1	10.2	8.0	6.7	7.4	9.1	11.3	13.3	15.2
Mean Rainfall (mm) (1910 to Feb 2020)	90.8	90.7	104.9	80.7	75.4	89.6	48.1	50.3	58.1	72.7	73.8	73.5
Mean 9am relative humidity % (1972 to 2010)	79	81	79	75	75	74	73	69	69	71	75	75
Mean 9am wind speed km/hr (1972 to 2010)	9.3	8.6	7.7	7.3	7.3	8.6	8.2	8.0	9.1	10.0	10.6	10.4
Mean 3pm relative humidity % (1972 to 2010)	74	74	71	68	65	62	60	58	63	70	72	73
Mean 3pm wind speed km/hr (1972 to 2010)	15.1	14.5	14.4	12.5	11.5	11.7	11.9	13.1	15.3	15.6	16.1	15.5

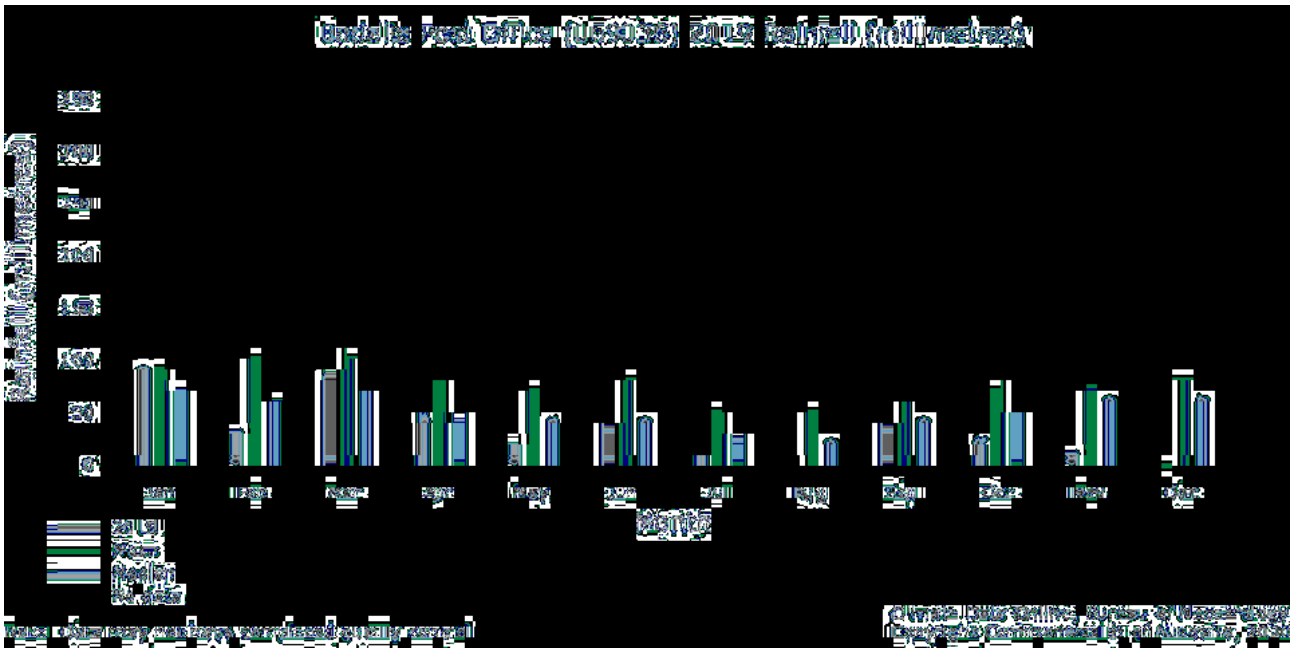

Figure 2.2: Monthly rainfall summary for 2019 comparing the mean and median results

2.2.1 Cumulative Residual Monthly Rainfall Mass

The cumulative residual monthly rainfall mass (CRMRM) trend compares the actual cumulative monthly rainfall with the long-term monthly average to establish a trend in terms of periods of above or below average rainfall. It is a useful tool for assessing drivers for water level changes in hydrographs and aids in the identification of impacts caused by factors other than climate. Where a water table aquifer is responding to climatic variations the hydrograph plot will tend to mirror the CRMRM.

Figure 2.3 presents a plot of monthly total rainfall and CRMRM between 1900 and June 2019 and Error! Reference source not found. presents the CRMRM between 1990 and 2019. The CRMRM was calculated using monthly total rainfall data from BOM station 90147 from 1899 to 2019. Where records did not exist, data has been taken from the following locations to infill the monthly totals:

- from the now closed Bodalla State Forest Station (No. 69007), which is approximately 6.9km away from the Site was used to infill monthly totals between July 1949 and January 1955;
- for February to September 1982 no nearby stations had data and the mean rainfall from Table 3.2 is used
- the mean monthly rainfall from Table 3.2 is used:
  - for July 1999;
  - November 2000;
  - May, September, November and December 2001;
  - December 2002;
  - May 2003;
  - September 2004;
  - January, June, July and August 2006;
  - November 2007;
  - December 2010; and
  - June 2016.

Figure 2.3 shows from 1900 to 1944 a persistent general trend of below average rainfall conditions followed by a strong change to above average rainfall conditions to around 1978. From 1978 to 1988 there is short period of below average rainfall followed by generally average to slightly above average rainfall to around 2002. From 2003 to 2013 generally average rainfall conditions are observed and from 2013 to 2019 the trend is for generally below average rainfall

conditions. Figure 2.4 presents the monthly rainfall totals from 2016 to 2019 with the CRMRM trend line. There is a short period of generally average rainfall conditions between February 2017 and November 2018.

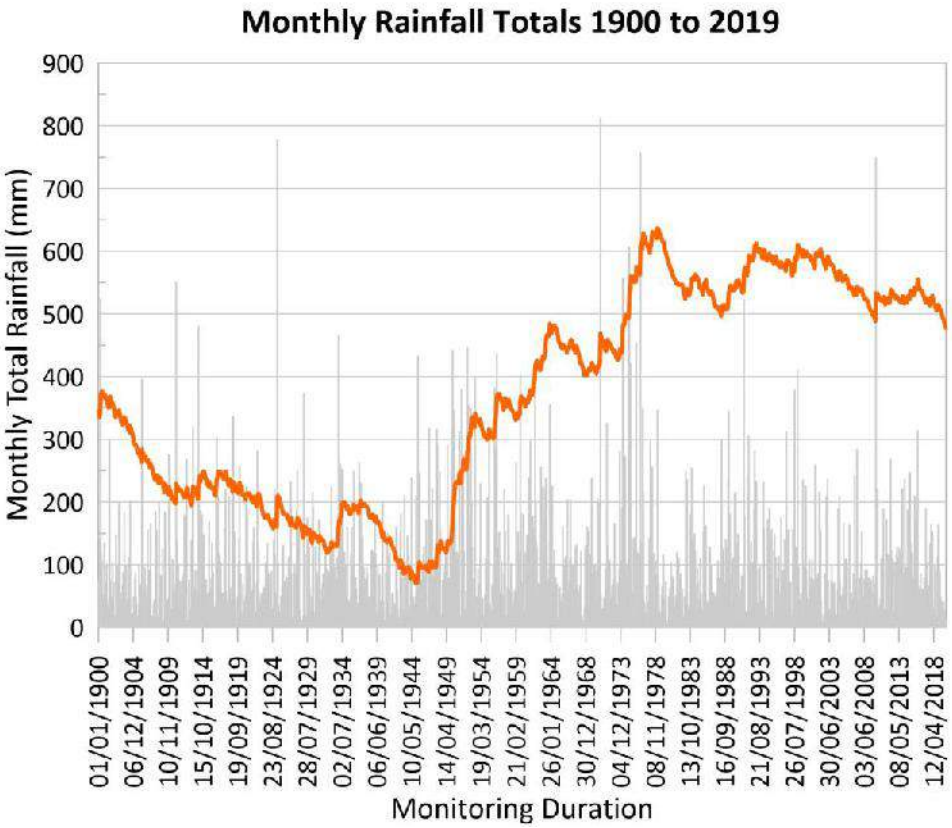

Figure 2.3: Monthly total rainfall from 1900 to 2019 with cumulative residual monthly rainfall mass (orange line)

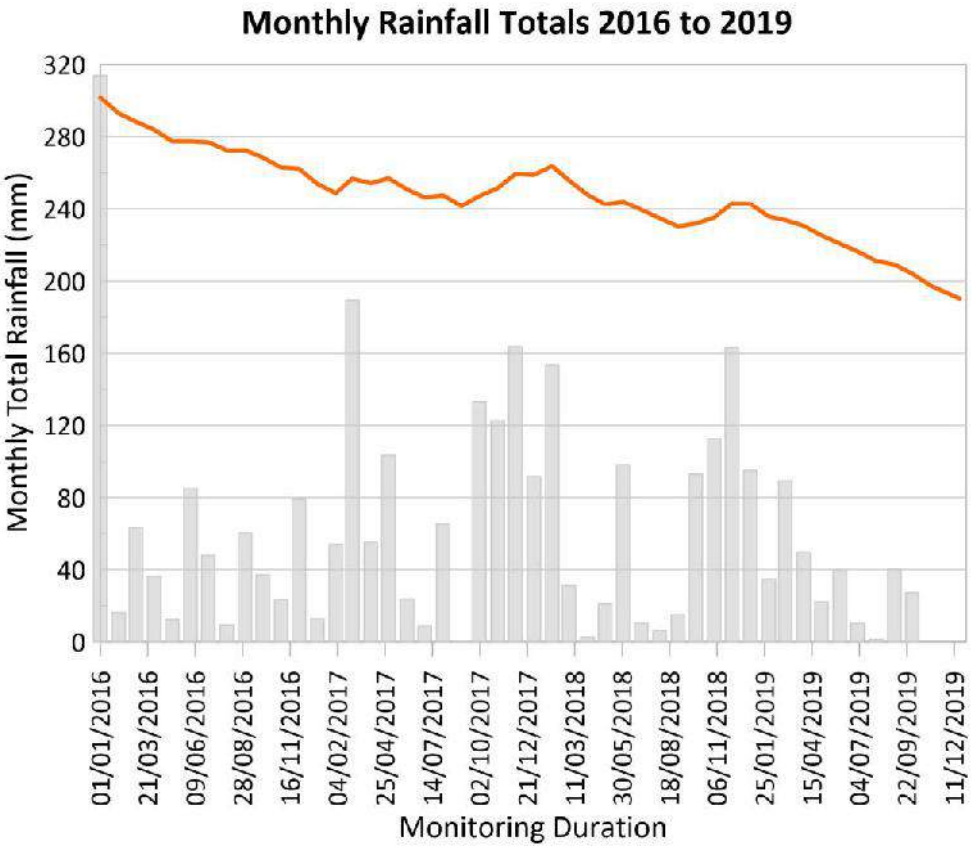

Figure 2.4: Monthly total rainfall from 2016 to 2019 with cumulative residual monthly rainfall mass (orange line)

2.3 Catchment and Geology

2.3.1 Tuross River Catchment

The Tuross River catchment covers an area of around 1814 km^2 and consists of mainly steep heavily forested land and low-land alluvial floodplains. The river rises on the western edge of the Wadbilliga National Park and flows in general north, east and north-east direction descending 1170 meters in elevation over 147 km and discharging into Tuross Lake and the South Pacific Ocean. The narrow river floodplain broadens from around 2.5m south-west of Bodalla. There 14 major tributaries, including Back River and Wadbilliga River that feed the Tuross River. The EIS outlines the river conditions index (RCI) as 'very good' for the Tuross River.

Current land use in the area is dominated by protected areas and privately-owned forest. Livestock grazing and irrigation for dairy farming with minor urban development make up around 10% of the catchment. These activities occur both up-gradient and downgradient of the Site. Tuross River and catchment is part of the Tuross River Water Sharing Plan for unregulated and alluvial water sources under the Water Act 2000 regulatory framework.

Within the low-land alluvial floodplain of the Site, the Tuross River and tributaries are subject to periodic erosion and sediment deposition. Large amounts of mobile sand are held within the lowland reaches of the Tuross River and tributary streams. The alluvial aquifer sediments of the Tuross river are comprised of eroded highlands of the Lachlan Fold Belt during the formation of the river system.

2.3.2 Geology

The bedrock of the Tuross River Catchment lies with the structural complex of the Lachlan Fold Belt and comprises metamorphosed Ordovician sandstone and Silurian ages and Devonian metasediments and granite intrusions. Ordovician sediments of the Adaminaby Group underlay the Site, comprising a turbiditic sequence of sandstone mudstone, shale carbonaceous shale, greywacke, chert, quartz arenite phyllite and slate. They are folded and generally steeply dipping.

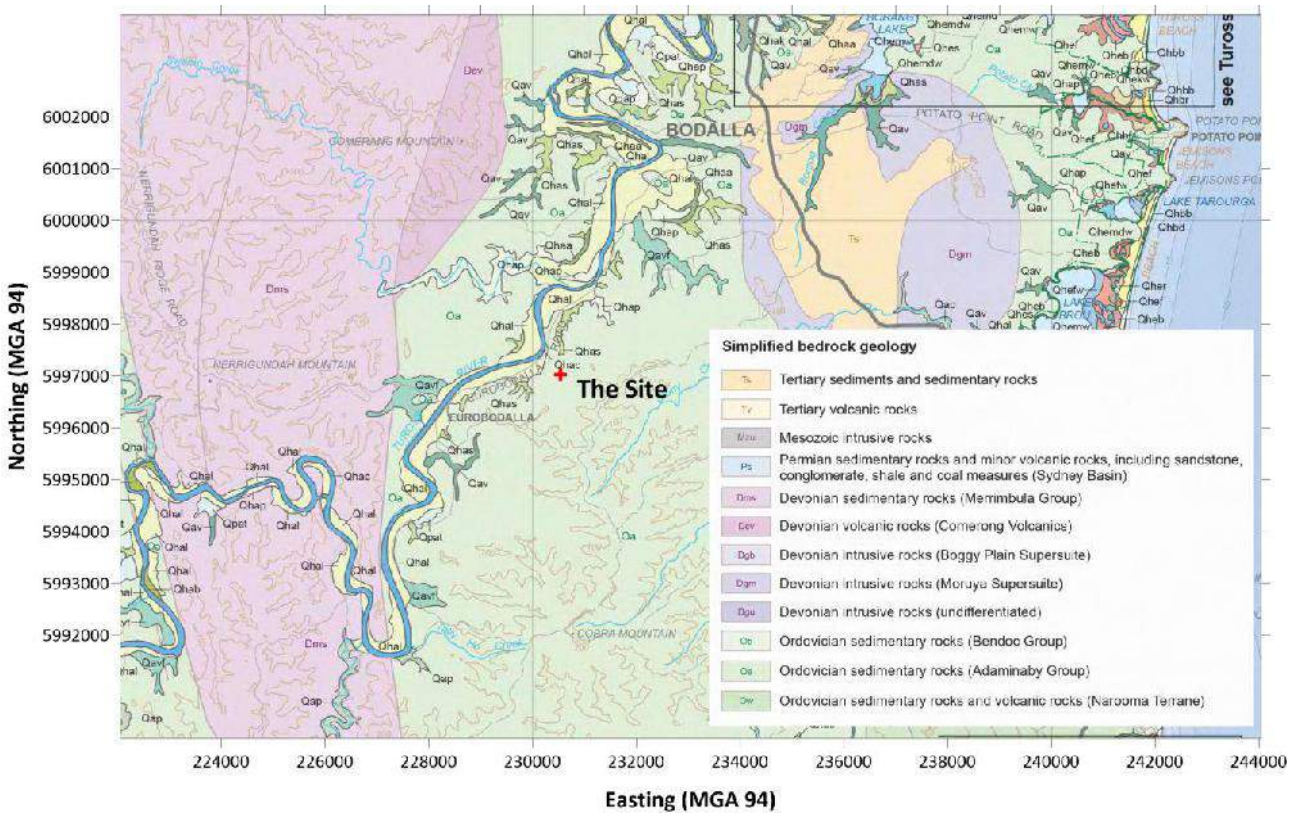

Figure 2.5: 1:100,000 coast quaternary geology map for Eurobodalla (modified from Troedson and Hashimoto 2013)

2.4 River data

The Tuross River has real-time continous water level and discharge monitoring at Station Number 218008, which can be accessed through the BOM Water Online portal and Water NSW online portal, details of which are shown on Figure 2.7. The guaging station is located just upstream the Southern Water Treatment Plant. The water level at the gauge ranges from just below 0 m to just over 12 m and is shown with river discharge on Figure 2.7.

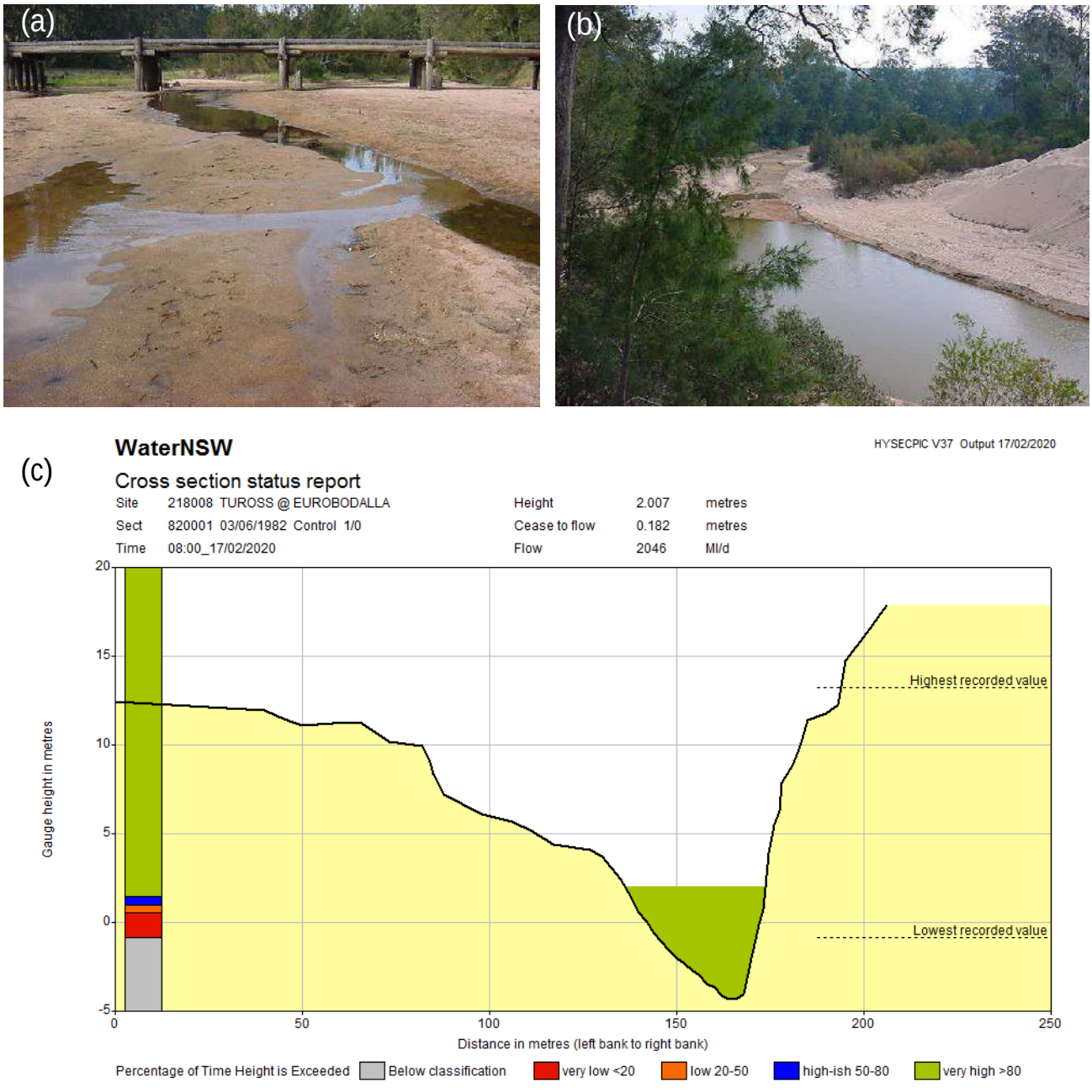

Figure 2.6: Tuross River gauge location view upstream (a), downstream (b) and cross section details (c) (WaterNSW, 2020)

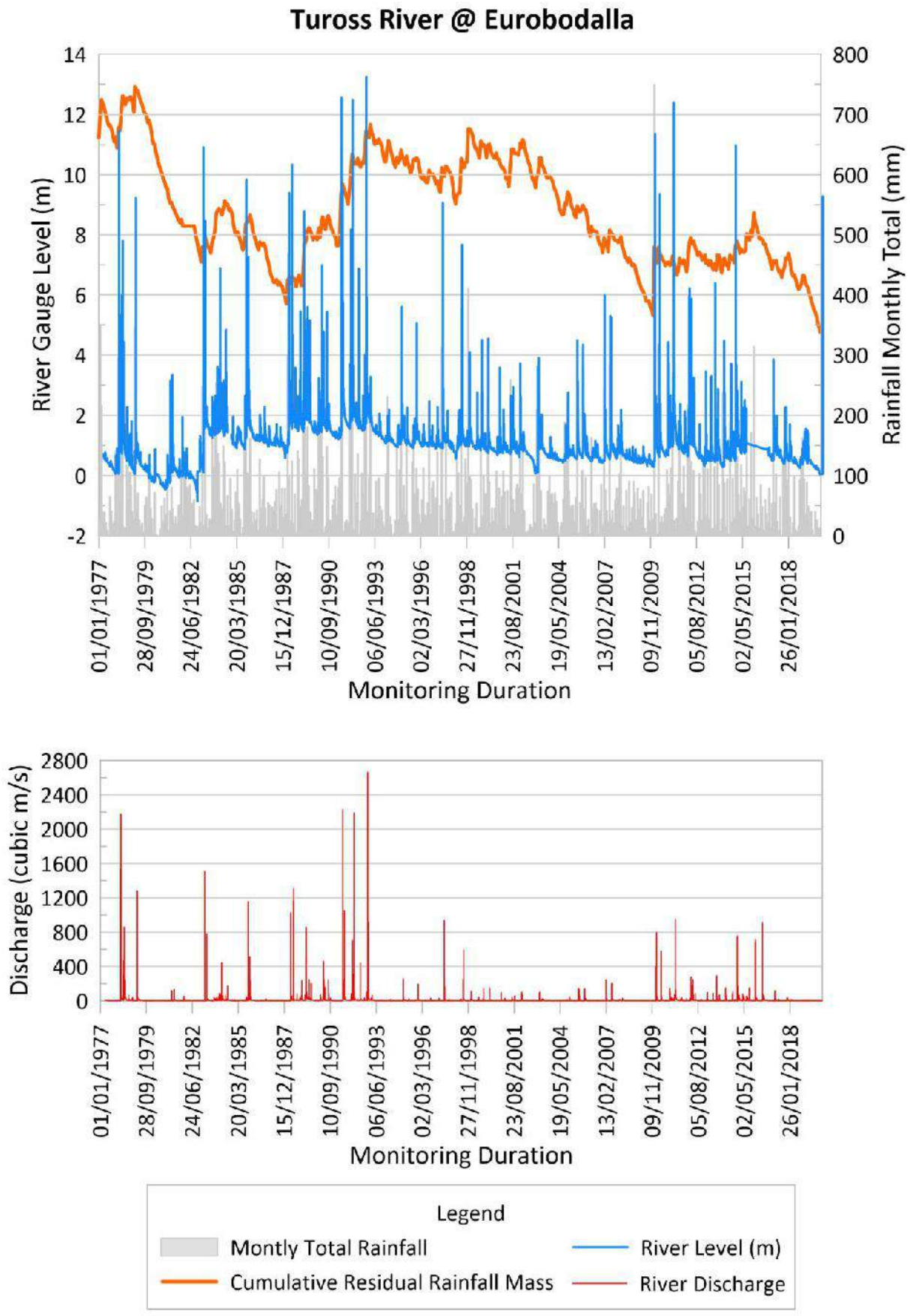

Figure 2.7: Tuross River discharge from 1977 to February 2020 (WaterNSW, 2020)

2.5 Groundwater bores

A review of WaterNSW online portal for registered groundwater bores shows several private bores near the site comprise a mix of alluvial and fractured rock. The Project groundwater monitoring standpipes installed by SMEC in 2017 at the Site and nearby registered private bores.

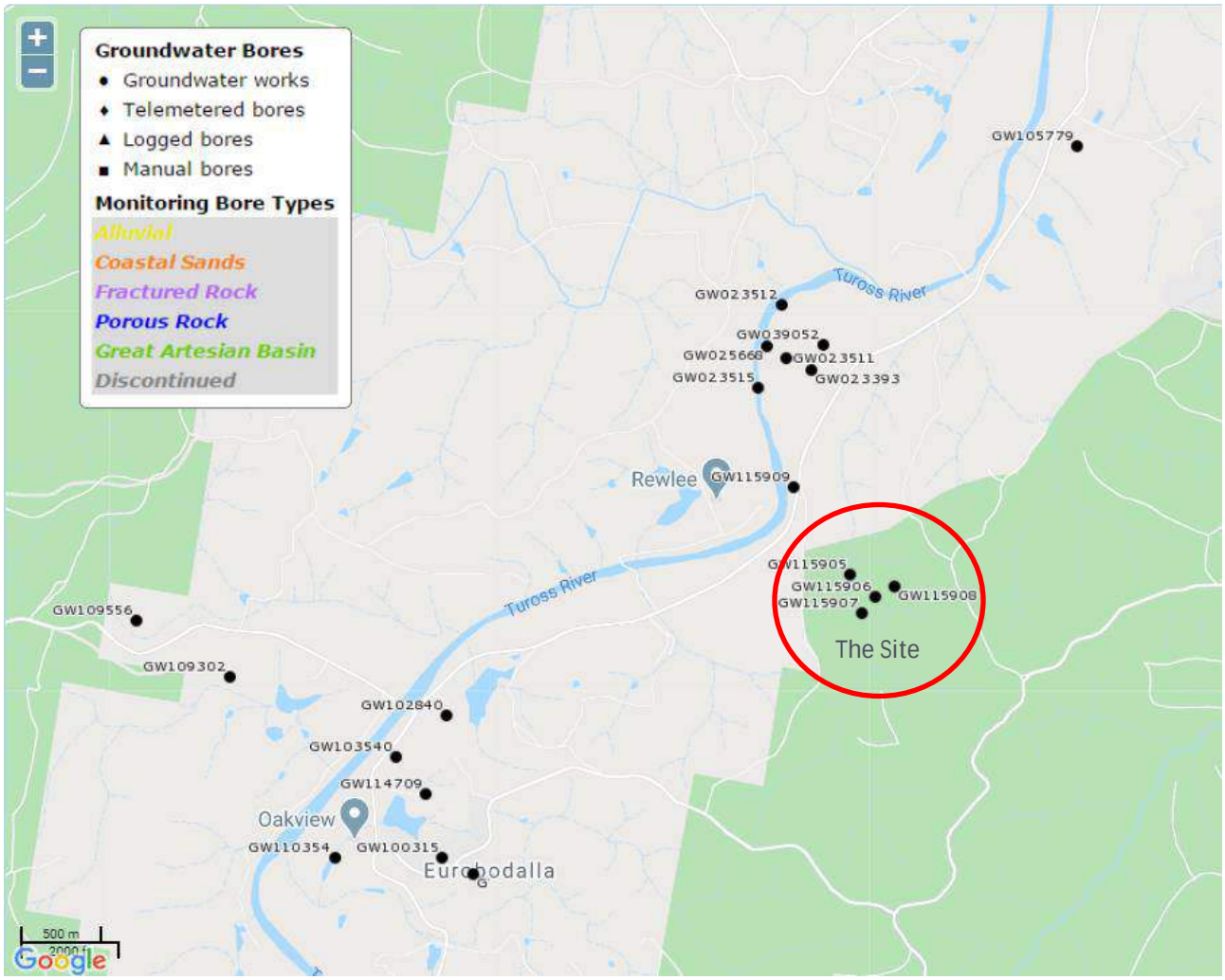

Figure 2.8: Groundwater Bores in the Tuross River Basin (WaterNSW Online) and standpipes installed by SMEC in 2017 (red circle)

3 Monitoring Network Details

3.1 General

To inform the Project EIS, Council carried out 12 months of baseline water quality monitoring between October 2017 and September 2018 in general accordance with the Water Quality Monitoring Sampling Plan (Ref 30012127-R01, dated 17 August 2017). Results of monitoring were presented to Council via the following factual summary letters:

- Eurobodalla Southern Storage – Water quality monitoring results - October 2017 (ref: 30012127-L01)
- Eurobodalla Southern Storage – Water quality monitoring results – November and December 2017 (ref: 30012127-L02)
- Eurobodalla Southern Storage – Water quality monitoring results – January to March 2018 (ref: 30012127-L03)
- Eurobodalla Southern Storage – Water quality monitoring results – April to June 2018 (ref: 30012127-L05)
- Eurobodalla Southern Storage – Water quality monitoring results – July to September 2018 (ref: 30012127-L07)

The follow sections outline the adopted methodology including where applicable any deviation from the WQMSP.

3.2 Monitoring locations

The Project monitoring network consisted of six surface water sample locations (designated SW1 to SW6) and one ground water sample (designated GW1) location which were established along the Tuross River and the Ephemeral creek drainage line. Monitoring locations are also shown on Figure 2.1.

Table 4.1 presents a summary of the monitoring locations and rationale.

In addition, Council undertake ongoing monthly raw water quality monitoring for assessing suitability for drinking water supply purposes as part of routine operation of the Southern Water Treatment Plant. These include the following monitoring locations:

- Council location ID WP050 (corresponding to GW1) - Represents groundwater quality raw water intake of the existing borefield which supplies the SWTP. Limited details are available on the borefield which is understood to be located on the southern banks of Tuross River approximately 1,000m upstream of the SWTP.
- Council location ID TU308 (corresponding to SW3) - Representing upstream surface water quality adjacent to the existing borefield upstream Tuross River upstream of the SWTP

Flowrate data is ongoing monitored by WaterNSW via the existing river gauging station data (Station ID 218008).

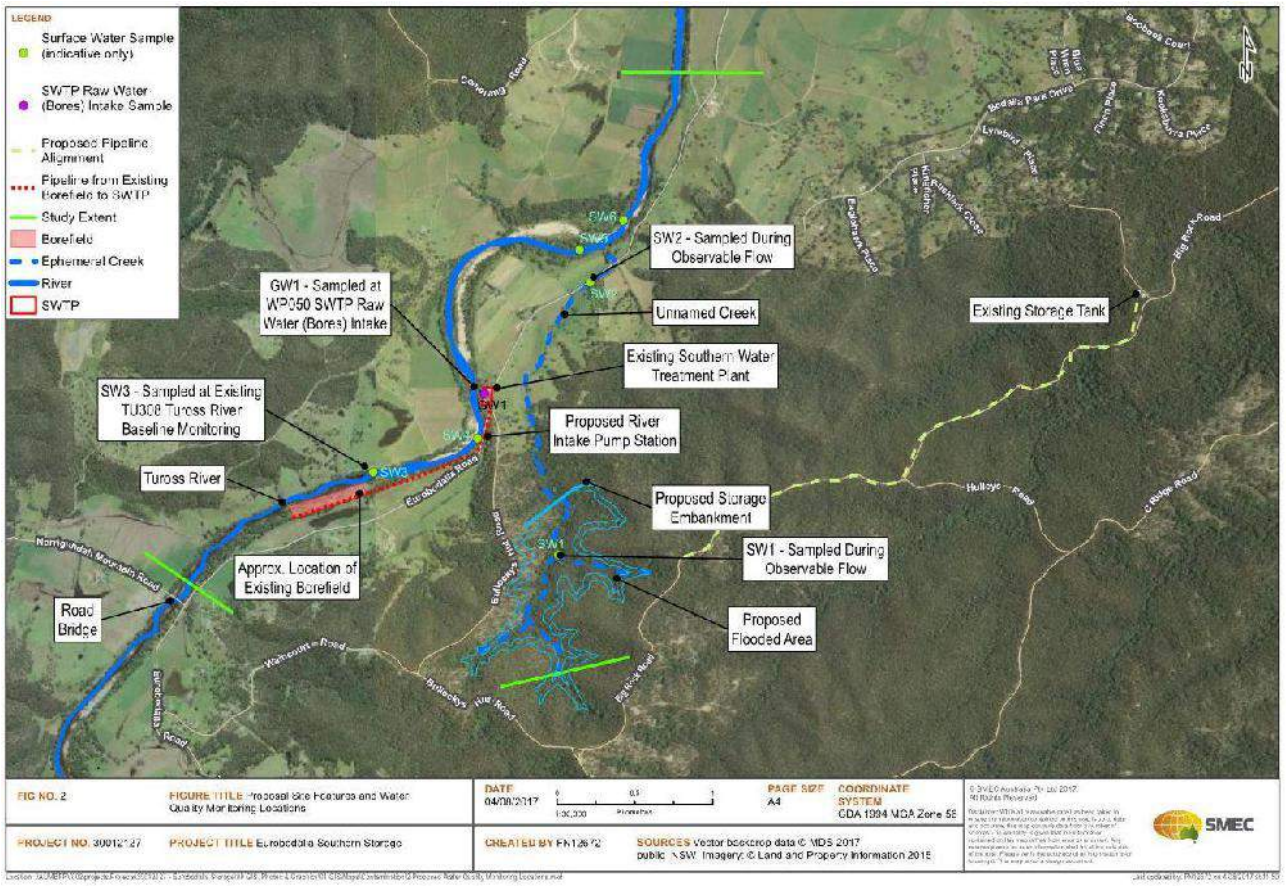

Table 3-1: Monitoring network location summary

Location ID	Easting (MGA 94)	Northing (MGA 94)	Type (Catchment)	Location description and rationale	Control or impact
SW1	230740	5996736	Surface Water (Unnamed Creek)	Upstream creek of proposed storage dam embankment.	Considered to represent 'control' sample location, upstream of impacts from construction of storage embankment.
SW2	230943	5998488	Surface Water (Unnamed Creek)	Downstream creek of proposed storage dam embankment. Upstream of the confluence with Tuross River.	Considered to represent 'impact' sample location.
SW3	769421	5997229	Surface Water (Tuross River)	Upstream on the Tuross River, at the existing monitoring point identified as 'TU308 - Tuross River Baseline Monitoring Data' (approximately 1000m upstream of the existing SWTP).	Considered to represent 'control' sample location, outside of the influence of Proposal features.
SW4	230025	5997369	Surface Water (Tuross River)	Upstream on the Tuross River, at the location of the proposed river intake pump station	Considered to represent 'impact' sample location and will input to pump design parameters.

Location ID	Easting (MGA 94)	Northing (MGA 94)	Type (Catchment)	Location description and rationale	Control or impact
				(approx. 500m upstream of the existing SWTP).	
SW5	230086	5998136	Surface Water (Tuross River)	Downstream along the Tuross River, downstream of the proposed river intake pump station, approx. 100m upstream of the confluence with the unnamed creek.	Considered to represent 'control' relative to confluence with unnamed creek and 'impact' relative to construction of river intake pump station.
SW6	231446	5998780	Surface Water (Tuross River)	Downstream along the Tuross River, approx. 100m downstream of the confluence with the unnamed creek (corresponding to existing bridge)	Considered to represent 'impact' relative to confluence with unnamed creek.
GW1*	230231	5997874	Groundwater (Tuross Alluvial Aquifer)	Sample location is same monitoring point identified as 'WP050 - SWTP Raw Water (bores) intake'.	Considered to represent 'control' sample location relative to groundwater quality.

Note: MGA 94 coordinates are in Zone 56H except for SW3 which is Zone 55H

3.3 Monitoring frequency

Monthly monitoring for baseline data collection over a 12-month period between October 2017 and September 2018. In accordance with the WQMSP, additional event-based monitoring was carried out within 48-78 hrs triggered by the following event within the 12-month monitoring period:

- Trigger 1: 30mm or greater of rainfall in a 24hr period - Weather station data was observed from the nearest weather station at Bodalla Post Office (Station ID 69036), or alternatively, the Tuross Head (Station 069067) to trigger the need for wet weather monitoring event (i.e. > 30mm rain in a 24-hour period). Additional wet weather monitoring was carried out by the following rainfall events above trigger 1:
  - 119mm of rainfall 27 October 2017 @ Tuross Head Weather station 069067
  - 55mm of rainfall 6th November 2017 @ Bodalla Post Office
  - 54mm of rainfall 4th December 2017 @ Bodalla Post Office
  - 63mm of rainfall 16th December 2017 @ Bodalla Post Office
  - 31mm of rainfall 2nd January 2018 @ Bodalla Post Office
  - 88mm of rainfall 19th February 2018 @ Bodalla Post Office
  - 48mm of rainfall 24th February 2018 @ Bodalla Post Office
  - 53mm of rainfall 5th June 2018 @ Bodalla Post Office
- Trigger 2: Peak river flow conditions 38,650 ML per day or greater in a 24hr period - Real-time monitoring data published by NSW Department of Primary Industries (DPI) Office of Water was reviewed at the Tuross River at Eurobodalla gauging station (ID 218008). Peak river flow conditions were not recorded above the trigger 2 for additional monitoring rounds for 12-month monitoring period.

A summary of monitoring rounds is included in Error! Reference source not found. below:

Table 3-2 Summary of monitoring rounds – physical and chemical parameters

Dates	Round type	Monitoring locations
23/10/17	Quarterly monitoring	SW3, SW4, SW5, SW6 and GW1 (SW1 and SW2 dry)
30/10/17	Wet Weather Event (Quarterly Analysis)	SW1, SW3, SW4, SW5, SW6 and GW1 (SW2 dry)
8/11/2017	Wet Weather Event (Quarterly analysis)	SW2, SW3, SW4, SW5, SW6, GW1 (SW1 dry)
13/11/2017	Monthly monitoring	SW2, SW3, SW4, SW5, SW6, GW1 (SW1 dry)
6/12/2017	Wet Weather Event (Quarterly analysis)	SW1, SW2, SW3, SW4, SW5, SW6, GW1
11/12/2017	Monthly monitoring	SW2, SW3, SW4, SW5, SW6, GW1 (SW1 dry)
18/12/2017	Wet Weather Event (Quarterly analysis)	SW2, SW3, SW4, SW5, SW6, GW1 (SW1 dry)
4/01/2018	Wet Weather Event (Quarterly analysis)	SW2, SW3, SW4, SW5, SW6, GW1 (SW1 dry)
15/01/2018	Quarterly monitoring	SW2, SW3, SW4, SW5, SW6, GW1 (SW1 dry)
21/02/2018	Wet Weather Event (Quarterly analysis)	SW2, SW3, SW4, SW5, SW6, GW1 (SW1 dry)
27/02/2018	Wet Weather Event (Quarterly analysis)	SW2*, SW3*, SW4, SW5, SW6*, GW1*
19/03/2018	Monthly monitoring	SW3, SW4, SW5, SW6 and GW1 (SW1 and SW2 dry)
30/04/2018	Quarterly monitoring	SW3, SW4, SW5, SW6 and GW1 (SW1 and SW2 dry)
14/05/2018	Monthly monitoring	SW3, SW4, SW5, SW6 and GW1 (SW1 and SW2 dry)
7/06/2018	Wet weather (quarterly) monitoring	SW2, SW3, SW4, SW5, SW6, GW1 (SW1 dry)
18/06/2018	Monthly monitoring	SW2, SW3, SW4, SW5, SW6, GW1 (SW1 dry)
16/07/2018	Quarterly monitoring	SW2, SW3, SW4, SW5, SW6, GW1 (SW1 dry)
13/08/2018	Monthly monitoring	SW3, SW4, SW5, SW6 and GW1 (SW1 and SW2 dry)
10/09/2018	Monthly monitoring	SW3, SW4, SW5, SW6 and GW1 (SW1 and SW2 dry)

Table 3-3 Summary of monitoring rounds – microbial parameters

Dates	Round type	Monitoring locations
09/10/17	Weekly monitoring	SW3
17/10/17	Weekly monitoring	SW3
23/10/17	Quarterly monitoring	SW3, SW6 and GW1 (SW2 dry)
30/10/17	Wet Weather Event (Quarterly analysis)	SW3, SW6 and GW1 (SW2 dry)
8/11/2017	Wet Weather Event (Quarterly analysis)	SW2, SW3, SW6 and GW1
13/11/2017	Monthly	SW3 and GW1
20/11/2017	Weekly monitoring	SW3
28/11/2017	Weekly monitoring	SW3 and GW1 (additional to requirements)
6/12/2017	Wet Weather Event (Quarterly analysis)	SW2, SW3, SW6 and GW1
11/12/2017	Monthly	SW3 and GW1
18/12/2017	Wet Weather Event (Quarterly analysis)	SW2, SW3, SW6 and GW1
4/01/2018	Wet Weather Event (Quarterly analysis)	SW2, SW3, SW6 and GW1
8/01/2018	Weekly monitoring	SW3
22/01/2018	Weekly monitoring	SW3
29/01/2018	Weekly monitoring	SW3
5/02/2018	Weekly monitoring	SW3
12/02/2018	Weekly monitoring	SW3

21/02/2018	Wet Weather Event (Quarterly analysis)	SW2, SW3, SW6 and GW1
27/02/2018	Wet Weather Event (Quarterly analysis)	SW2, SW3, SW6 and GW1
05/03/2018	Weekly monitoring	SW3
12/03/2018	Weekly monitoring	SW3
19/03/2018	Monthly	SW3 and GW1
26/03/2018	Weekly monitoring	SW3
4/04/2018	Weekly monitoring	SW3
10/04/2018	Weekly monitoring	SW3
18/04/2018	Weekly monitoring	SW3
23/04/2018	Weekly monitoring	SW3
30/04/2018	Quarterly monitoring	SW3, SW6 and GW1 (SW2 dry)
7/05/2018	Weekly monitoring	SW3
14/05/2018	Monthly monitoring	SW3 and GW1
21/05/2018	Weekly monitoring	SW3
28/05/2018	Weekly monitoring	SW3
4/06/2018	Weekly monitoring	SW3
7/06/2018	Wet Weather Event (Quarterly analysis)	SW2, SW3, SW6 and GW1
12/06/2018	Weekly monitoring	SW3
18/06/2018	Monthly monitoring	SW3 and GW1
25/06/2018	Weekly monitoring	SW3
4/07/2018	Weekly monitoring	SW3
9/07/2018	Weekly monitoring	SW3
16/07/2018	Quarterly monitoring	SW2, SW3, SW6 and GW1
24/07/2018	Weekly monitoring	SW3
30/07/2018	Weekly monitoring	SW3
6/08/2018	Weekly monitoring	SW3
13/08/2018	Monthly monitoring	SW3 and GW1
20/08/2018	Weekly monitoring	SW3
27/08/2018	Weekly monitoring	SW3
3/09/2018	Weekly monitoring	SW3*
10/09/2018	Monthly monitoring	SW1, SW2, SW3, SW4, SW5, SW6, GW1*
17/09/2018	Weekly monitoring	SW3*
24/09/2018	Weekly monitoring	SW3*

3.4 Monitoring parameters

The monitoring parameters and adopted testing frequency are summarised in Table 3-4 as follows:

Table 3-4: Monitoring network parameter testing frequency

Parameter	Testing Frequency / Locations (See notes)
Physical and chemical parameters - Field measurement	
pH	Monthly* - All
Electrical Conductivity	Monthly* - All
Turbidity	Monthly* - All
Dissolved oxygen	Monthly* - All
Temperature	Monthly* - All
Salinity	Monthly* - All
Physical and chemical parameters - Laboratory	
Biochemical oxygen demand (BOD)	Monthly* - All
Total organic carbon (TOC)	Monthly* - All
Dissolved organic carbon (DOC)	Monthly* - All
Nitrogen species (as N): Nitrate (NO_3), Nitrite (NO_2), Ammonia (NH_3), Total Kjeldahl Nitrogen and Total Nitrogen Ammonium ion (as NH_4^+)	Monthly* - All
Phosphorus nutrients: Total phosphorus (as P), and Filterable reactive phosphate (as PO_4)	Monthly* - All
Major anions: chloride, fluoride, sulphate (as SO_4), total alkalinity (as $CaCO_3$))	Monthly* - All
Major cations: calcium, potassium, sodium and hardness (as $CaCO_3$)	Monthly* - All
Chlorophyll	Monthly* - All
Total dissolved solids (TDS)	Monthly* - All
Total suspended solids (TSS)	Monthly* - All
True colour	Monthly* - All
Particle size distribution	Monthly* – SW4 only (see note 2)
Heavy Metals: aluminium, antimony, arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, uranium, vanadium and zinc	Quarterly* – SW2, SW3, SW6 (total concentration in surface water) Quarterly* – GW1 (dissolved concentration in groundwater)
Total Recoverable Hydrocarbons (TRH)	Quarterly* – SW2, SW3, SW6, GW1
Benzene, toluene, ethylbenzene and xylenes (BTEX)	Quarterly* – SW2, SW3, SW6, GW1
Polycyclic aromatic hydrocarbons (PAHs)	Quarterly* – SW2, SW3, SW6, GW1

Parameter	Testing Frequency / Locations (See notes)
Organochlorine Pesticides (OCPs)	Quarterly* – SW2, SW3, SW6, GW1
Organophosphorus Pesticides (OPPs)	Quarterly* – SW2, SW3, SW6, GW1
Speciated Phenols	Quarterly* – SW2, SW3, SW6, GW1
Acid Herbicides	Quarterly* – SW2, SW3, SW6, GW1
Microbiological parameters - Laboratory	
E. coli (Escherichia Coli) Protozoa – Cryptosporidium, Giardia Bacteria – Campylobacter Viruses – Noroviruses (or other cultivable human enteric virus, such as adenoviruses)	Weekly – SW3 only (see note 3) Monthly – GW1 (see note 3) Quarterly* – SW2 and SW6 only
Note 1: The asterix (*) indicates that additional testing for these parameters was carried out on event based (i.e. wet weather) events.	
Note 2: Particle size distribution was only needed for inputs to design of the Tuross River Intake Pump Station. Therefore, this parameter was monitored at monitoring location SW4 only.	
Note 3: Microbial parameters were carried out at increased 'weekly' frequency of monitoring within locations where raw water is currently or proposed for extraction for drinking water purposes.	

3.5 Field Sampling Methodology

The Council has undertaken the field sampling program in general accordance with the Council's standard sampling procedures and following guidelines and standards:

- Australian Guidelines for Water Quality Monitoring and Reporting, Chapter 4 Field Sampling Program (ANZECC/ARMCANZ 2000);
- AZ/NZS 5667.1:1998 Water quality – Sampling – Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples. Standards Australia, Homebush NSW;
- AZ/NZS 5667.6:1998 Water quality – Sampling – Guidance on sampling of rivers and streams. Standards Australia, Homebush NSW; and
- AZ/NZS 5667.11:1998 Water quality – Sampling – Guidance on sampling of groundwater. Standards Australia, Homebush NSW.

3.5.1 Surface Water Sampling

The general methodology of sampling is understood to comprise:

- Record sample time on bottles and COC;
- Spray denatured ethanol around sample jug;
- Rinse sample jug out downstream from sample point;
- Place bottles into head of swing pole to collect samples below surface mid depth of the water;
- Collect samples in laboratory supplied bottles;
- Add HNO to C9 bottle;
- Attach sample jug and collect sample for field meter readings;
- Place bottles in esky with ice bricks;
- Complete field readings and field data sheet; and
- Spray sample bottle with ethanol and wipe with paper towel at completion of each site sampling.

3.5.2 Groundwater Sampling

The general methodology of sampling is understood to comprise:

- Spray denatured ethanol around sample tap and outlet;
- Start bore pump and flush for minimum 10 minutes, reduce flow on outlet;
- Spray denatures ethanol liberally around sample jug;
- Use disposable gloves to collect biological samples directly from tap without rinsing;
- Fill 10L drums for virus analysis directly from tap outlet;
- Collect all other samples in disposable bottles directly from tap outlet following a single rinse of all bottles;
- Rinse sample jug under tap outlet and fill for metals sampling;
- Filter sample into filtered metal bottle;
- Add HNO to both C9 bottles;
- Use sample jug to collect sample for field meter readings;
- Place sample bottles in esky cooled with ice bricks;
- Complete field readings and field sheet; and
- Spay sample bottle with ethanol and wipe with paper towel at completion of each site sampling.

3.6 Specific Correspondence

October 2017	Samples could not be collected from SW1 and/or SW2 due to no observable flows during these monitoring events.

3.7 Quality Assurance and Quality Control

Collected samples were analysed at the Sydney Water Monitoring Services laboratory at the request of Council. Samples were also analysed at Australia Laboratory Services (ALS). Analysis reports have been provided directly to Council and are not included within this report. Summaries have been included where necessary. The internal quality assurance procedures of the laboratory are considered acceptable by SMEC and no significant issues with the results (i.e. contamination or unreliable concentration) were noted.

3.7.1 Precision

One duplicate (or blind intra-lab replicate) sample was collected each monitoring round. The duplicate sample is submitted to the laboratory with the samples for the purpose of assessing consistency in field practices and laboratory analysis methods.

3.7.2 Accuracy

Laboratory prepared VOC (trip) spikes consisting of distilled, de-ionised water or sand spiked with known concentrations of BTEX are included in QA/QC programmes where TPH and BTEX concentrations are being measured. Laboratory prepared VOC spikes should be included at a rate of one per sample batch. These samples should be submitted for BTEX and TPH (C6-C10) analysis with results compared with the known additions. The purpose of these samples is to monitor VOC losses during transit. Rinsate blanks consist of pre-preserved bottles filled with laboratory prepared water that has been passed over decontaminated field equipment. The purpose of the rinsate blanks is to determine the effectiveness of decontamination procedures

The results of the duplicate sample are required to be within a relative percentage difference (RPD) of less than 30% to 50% depending on the parameter with the exception of:

- nitrate in February 2018;
- ammonia, ammonium and nitrate in April and May 2018;
- Chlorophyll a in July 2018; and
- nitrate in September 2018.

Water is a non-homogenous matrix and some natural variation is anticipated. SMEC considers the results acceptable and in compliance with SMEC Quality Assurance and Quality Control procedures.

Field measurements were undertaken using a calibrated water quality meter (Instrument ID: Horiba H1). Daily instrument calibration was conducted using one-point standard (Horiba Cal Solution) in general accordance with manufacturers requirements. Calibration records are included in Attachment B.

3.7.3 Representativeness

Weather station data was observed from alternative weather station at Tuross Head (Station ID 069067) to trigger the need for wet weather monitoring. Data was not available or updated less-frequently at nearest weather station at Bodalla Post Office (Station ID 69036). Alternate weather stations are considered acceptable to trigger a wet weather monitoring event (i.e. 30mm per day or greater).

4 Assessment Criteria

The baseline water quality data is assessed against the adopted assessment investigation level (IL) for developing an understanding of exceedances and where the development of site specific assessment criteria may be required. The adopted assessment criteria are presented in Table 4-1 and derived from:

- ANZG (2020) Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments;
- ANZECC & ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality for 95% species protection; and
- NHMRC (2011) Australian Drinking Water Guidelines.

Table 4-1: Parameter or analyte and adopted assessment investigation level

Analyte group	Analyte	Units	Value / Range	Reference
In-Situ	pH	pH units	6.5 to 8.0	ANZECC (2000)
	Electrical conductivity	µS/m	125 to 2200	ANZECC (2000)
	Turbidity	NTU	>5	Drinking Water Guidelines (Aesthetic)
			>50	ANZECC (2000)
	Dissolved Oxygen	% Sat	<80% Sat	ANZECC (2000)
			<85% Sat	Drinking Water Guidelines (Aesthetic)
	Temperature	°C	No Criteria	
	Salinity	%	No Criteria	
Microbial parameters	E. coli	no./100 mL	No Criteria	
	Thermotolerant coliforms	cfu/100mL	No Criteria	
	Protozoa – Cryptosporidium	no./L	No Criteria	
	Bacteria – Campylobacter	no./L	No Criteria	
	Viruses -– Norovirus or other cultivable human enteric virus, such as adenoviruses	no./L	No Criteria	
Nutrients	Ammonia (as NH_3-N)	µg/L	500	Drinking Water Guidelines (Aesthetic)
			900	ANZECC (2000)
	Ammonium (as NH4+)	µg/L	26	ANZECC (2000)
	Nitrate (as N)	µg/L	90	ANZG (2018)
	Nitrite (as N)	µg/L	9	ANZECC (2000)
	Nitrate / Nitrite (as N)	µg/L	40	ANZECC (2000)
	Total Kjeldahl Nitrogen	µg/L	No Criteria	
	Total Nitrogen	µg/L	350	ANZECC (2000)
	Total Phosphorus (as P)	µg/L	25	ANZECC (2000)
	Filterable reactive Phosphate (as PO4)	µg/L	26	ANZECC (2000)
	Chlorophyll a	µg/L	3	ANZECC (2000)
Inorganics, Anions and Cations	Chloride	mg/L	175	ANZECC (2000)
	Fluoride	mg/L	2	Drinking Water Guidelines (Health)
	Sulphate (as SO4)	mg/L	250	Drinking Water Guidelines (Aesthetic)
			1000	ANZECC (2000)
	Total alkalinity	mg/L	No Criteria	-
	Calcium	mg/L	1000	ANZECC (2000)

Analyte group	Analyte	Units	Value / Range	Reference
	Potassium	mg/L	No Criteria	-
	Magnesium	mg/L	No Criteria	-
	Sodium	mg/L	115	ANZECC (2000)
	Hardness (as $CaCO_3$)	mg/L	200	Drinking Water Guidelines (Aesthetic)
			350	ANZECC (2000)
Physical & chemical Properties	True colour	HU	15	Drinking Water Guidelines (Aesthetic)
	Particle Size Distribution		No Criteria	
	Total Dissolved Solids	mg/L	600	Drinking Water Guidelines (Aesthetic)
			2000	ANZECC (2000)
	Total Suspended Solids	mg/L	No Criteria	
	Total organic carbon	mg/L	No Criteria	
	Dissolved organic carbon	mg/L	No Criteria	
	Biochemical oxygen demand	mg/L	No Criteria	
Metals	Aluminium	µg/L	55	ANZECC (2000)
	Antimony	µg/L	3	Drinking Water Guidelines (Health)
			9	ANZG (2018)
	Arsenic	µg/L	10	Drinking Water Guidelines (Health)
			13	ANZECC (2000)
	Barium	µg/L	2000	Drinking Water Guidelines (Health)
	Beryllium	µg/L	60	Drinking Water Guidelines (Health)
	Boron	µg/L	370	ANZECC (2000)
	Cadmium	µg/L	0.2	ANZECC (2000)
	Chromium (Total)	µg/L	1.0	ANZECC (2000)
	Cobalt	µg/L	1.4	ANZG (2018)
	Copper	µg/L	1.4	ANZECC (2000)
	Iron	µg/L	200	ANZECC (2000)
	Lead	µg/L	3.4	ANZECC (2000)
	Manganese	µg/L	100	Drinking Water Guidelines (Aesthetic)
			200	ANZECC (2000)
	Mercury	µg/L	0.06	ANZECC (2000)
	Molybdenum	µg/L	34	ANZG (2018)
	Nickel	µg/L	11	ANZECC (2000)
	Selenium	µg/L	5	ANZECC (2000)
	Silver	µg/L	0.05	ANZG (2018)
	Uranium	µg/L	0.5	ANZG (2018)
	Vanadium	µg/L	6	ANZG (2018)
	Zinc	µg/L	3000	Drinking Water Guidelines (Aesthetic)
			8	ANZECC (2000)
Total Recoverable Hydrocarbons (TRH)	TPH C6 - C10 less BTEX (F1)	mg/L	20	Limit of Reporting
	TRH C6 - C10	mg/L	20	Limit of Reporting
	TRH >C10 - C16 less Naphthalene (F2)	mg/L	100	Limit of Reporting
	TRH >C10-C16	mg/L	100	Limit of Reporting
	TRH >C16-C34	mg/L	100	Limit of Reporting
	TRH >C34-C40	mg/L	100	Limit of Reporting
Benzene, Toluene, Ethylbenzene, Xylenes (BTEX)	Benzene	µg/L	1	Drinking Water Guidelines (Health)
			950	ANZECC (2000)
	Ethylbenzene	µg/L	3	Drinking Water Guidelines (Aesthetic)
			80	ANZG (2018)
	Toluene	µg/L	25	Drinking Water Guidelines (Aesthetic)

Analyte group	Analyte	Units	Value / Range	Reference
			180	ANZG (2018)
	o-xylene	µg/L	350	ANZECC (2000)
	m and p-xylene	µg/L	75	ANZECC (2000)
	Xylene (Total)	µg/L	No Criteria	
Polycyclic Aromatic Hydrocarbons (PAHs)	Naphthalene	µg/L	16	ANZECC (2000)
	Anthracene	µg/L	0.4	ANZG (2018)
	Phenanthrene	µg/L	0.6	ANZG (2018)
	Fluoranthene	µg/L	1.0	ANZG (2018)
	Benzo(a)pyrene	µg/L	0.01	Drinking Water Guidelines (Health)
			0.1	ANZG (2018)
	Total PAHs	µg/L	No Criteria	
Organochlorine Pesticides (OCP)	Aldrin	µg/L	0.01	ANZG (2018)
	chlordane	µg/L	0.03	ANZECC (2000)
	DDE	µg/L	No Criteria	-
	DDT	µg/L	0.006	ANZECC (2000)
	Dieldrin	µg/L	0.01	ANZG (2018)
	Endosulfan	µg/L	0.03	ANZECC (2000)
	Endrin	µg/L	0.01	ANZECC (2000)
	Heptachlor	µg/L	0.01	ANZECC (2000)
	Hexachlorobenzene (HCB)	µg/L	No Criteria	
	Lindane	µg/L	0.2	ANZECC (2000)
	Methoxychlor	µg/L	0.01	ANZG (2018)
Organophosphorus Pesticides (OPP)	Atrazine	µg/L	13	ANZECC (2000)
	Azinphos methyl	µg/L	0.01	ANZECC (2000)
	Chlorpyrifos	µg/L	0.01	ANZECC (2000)
	Diazinon	µg/L	0.01	ANZECC (2000)
	Dimethoate	µg/L	0.15	ANZECC (2000)
	Fenitrothion	µg/L	0.2	ANZECC (2000)
	Malathion	µg/L	0.05	ANZECC (2000)
	Parathion	µg/L	0.004	ANZECC (2000)
Phenols	Phenol	µg/L	320	ANZECC (2000)
	2-chlorophenol	µg/L	340	ANZECC (2000)
	4-chlorophenol	µg/L	220	ANZECC (2000)
	2,4-dichlorphenol	µg/L	120	ANZECC (2000)
	2,4,6-trichlorophenol	µg/L	3	ANZECC (2000)
	2,3,4,6-tetrachlorophenol	µg/L	10	ANZECC (2000)
	Pentachlorophenol	µg/L	3.6	ANZECC (2000)
Herbicides	Diuron	µg/L	0.5	ANZECC (2000)
	2,4-D	µg/L	280	ANZECC (2000)
	2,4,5-T	µg/L	36	ANZECC (2000)
	MCPA	µg/L	1.4	ANZECC (2000)

5 Results

The water quality monitoring data for the period October 2017 to September 2018 is presented in Appendix A with exceedance of the ILs indicated with colour shading of the cells.

5.1 Field Parameter Results

The field parameter results show pH, electrical conductivity and turbidity have regular exceedance of the ILs. Figure 5.1 and Figure 5.2 present time series plots of field pH and EC results respectively. SW1 is regularly dry and limited results are available. Figure 5.1 shows exceedance of the low-level pH IL for all monitoring results at GW1 and some monitoring results at SW1 and SW2. For EC SW3, SW4, SW5 and SW6 are less than the low-level IL of 125 µS/cm occurs for most results and whilst exceedance of the ANZECC (2000) IL values these than 125 µS/cm are not considered to a risk and generally represent more pristine environments.

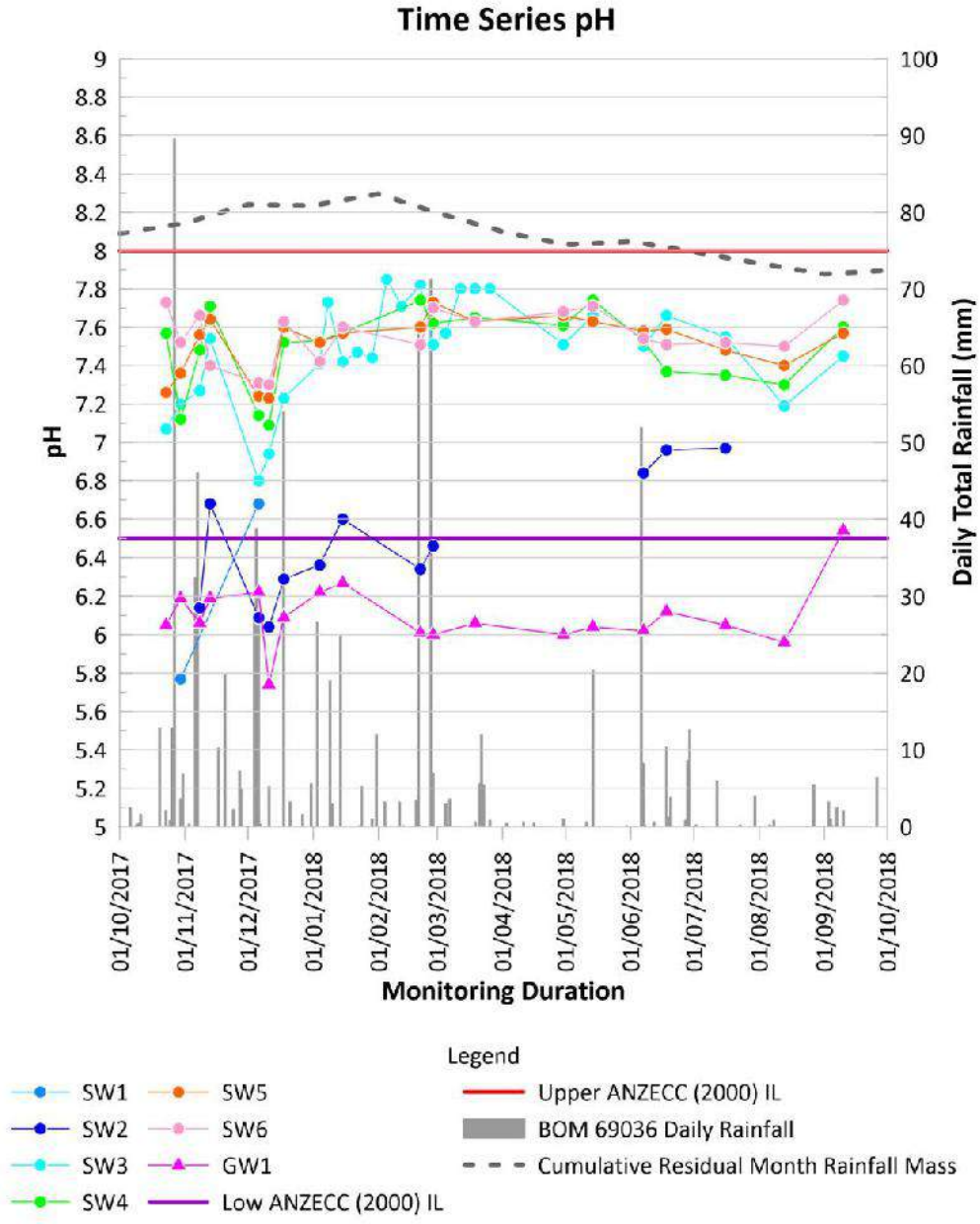

Figure 5.1: Time series plot of field pH with rainfall, CRMRM and ILs

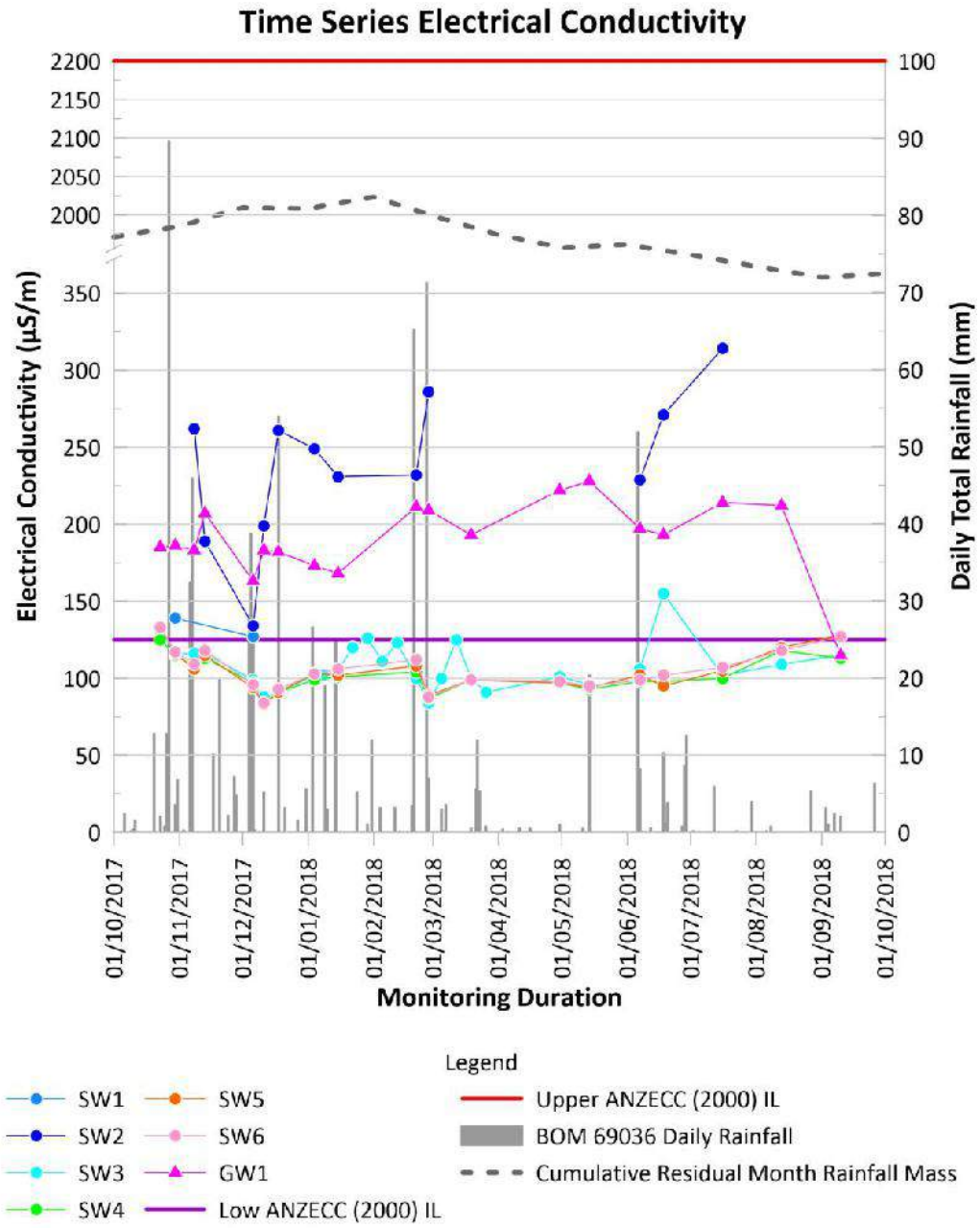

Figure 5.2: Time series plot of field electrical conductivity with rainfall, CRMRM and ILs

The results of turbidity show over the monitoring period most results were below the ANZECC (2000) IL and all results were below the Drinking Water Guidelines IL. Turbidity appears to increase following significant rainfall events in December 2017 at most monitoring locations except GW1 and in June 2018 at SW2 and GW1. SW2 the ephemeral creek shows a very high result in January 2018 which occurs without a significant rainfall event.

Dissolved oxygen results generally range from 80% to 120% saturation. The results are generally within the IL range except for all results SW1 and some results of SW2, SW3, SW4, SW5 and SW6 between October 2017 and May 2018. GW1 is generally below the ILs, ranging from 20% to 40% saturation. DO is generally lower in groundwater than surface water.

Surface water temperature shows seasonal variations and ranges from 9°C in winter months to around 24°C in the summer. Groundwater temperature also shows seasonal variability but with a less extreme range. The temperature varies from around 16°C to 21°C.

Salinity is recorded at generally 0.01 or less over the monitoring period.

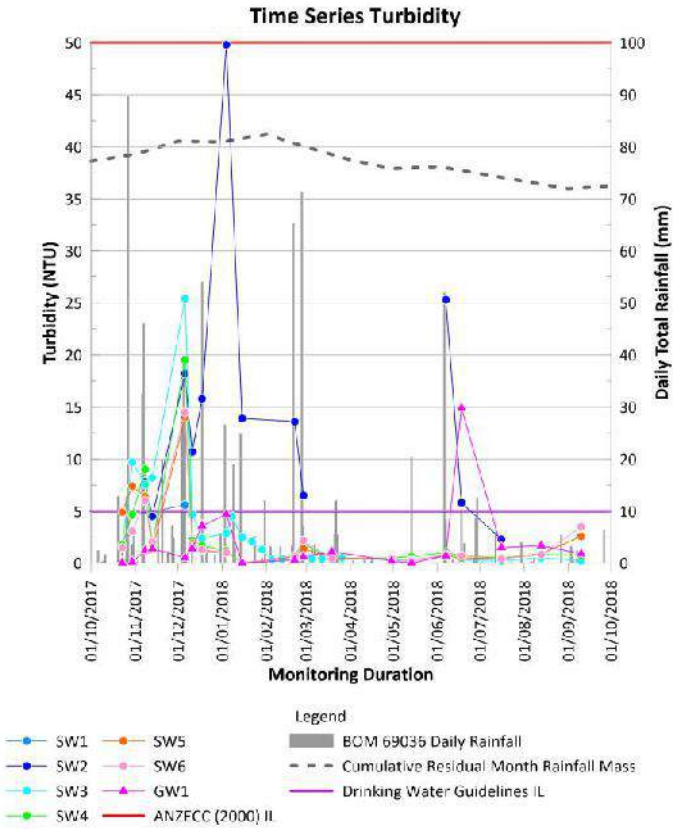

Figure 5.3: Time series plot of turbidity with rainfall, CRMRM and ILs

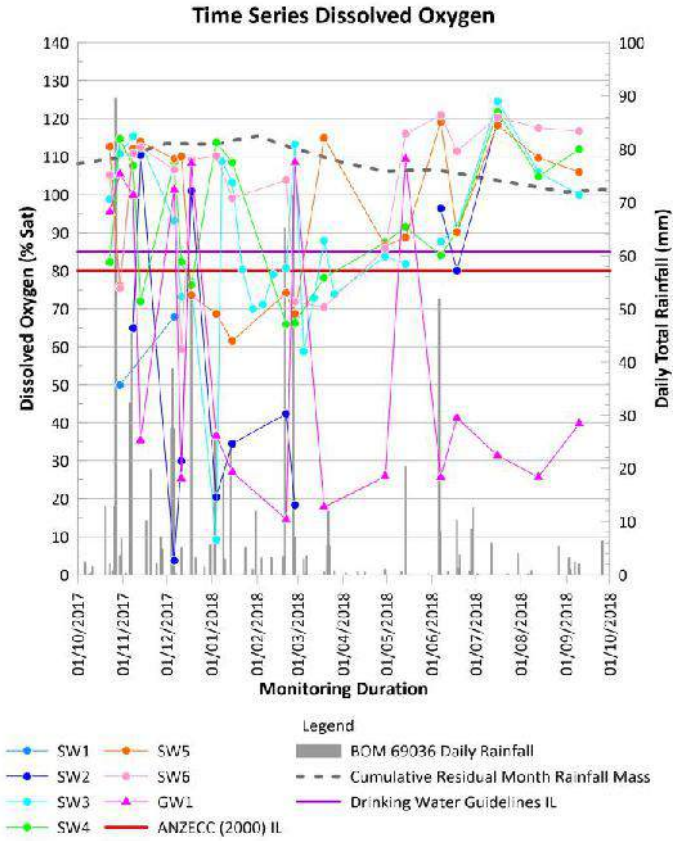

Figure 5.4: Time series plot of dissolved oxygen with rainfall, CRMRM and ILs

5.2 Microbial

The results of the microbial testing shows E.Coli was commonly observed at the surface water monitoring locations SW2, SW3 and occasionally SW6. The other locations were either not tested or not detected. Whilst there is no IL under the Drinking Water Guidelines any detection of E. Coli requires treatment. Results ranged from <1 to 3000 /100mL. Higher results appear to correlate with lower DO saturation of the surface water and increased turbidity. From July 2018 to September 2018 results were generally less than 100 / 100mL. An E. Coli result of 1/100mL in the groundwater occurred in December 2017 and January 2018.

Cryptosporidium was detected in the following samples:

- SW2 and SW3 – 21 February 2018;
- SW2 and SW3 27 February 2018;
- SW3 – 19 and 26 March 2018;
- SW3 – 18 April 2018;
- SW3 – 14 and 21 May 2018; and
- GW1 14 May 2018.

Giardia was detected in the following samples:

- SW3 – 9 and 30 October 2017;
- SW2, SW3, SW6 – 8 November 2017;
- SW3 – 13, 20, 28 November 2017;
- SW2 – 6 December 2017;
- SW3 – 11 December 2017; and
- SW2 – 4 January 2018.

Bacteria – Campylobacter was detected in the following samples as present:

- SW3 – 18 December 2017; and
- SW2 – 21 and 27 February 2018.

Viruses such as Norovirus or other cultivable human enteric virus was only present in SW3 in October 2017 and results in December 2017 for SW2 were inhibited.

5.3 Physio-Chemical Parameters

Total dissolved solids (TDS) and total suspended solids (TSS) are physio-chemical properties of water and are shown on Figure 5.5. The results show TDS is below both ILs with a range of around 50mg/L to 150 mg/L. SW2 shows the highest TDS for surface water with increases that appear to correlate to significant rainfall events. TSS in SW2 is also much higher than the other surface water locations with increases also appearing to correlate to significant rainfall events and likely increased river flow. The TDS in GW1 is relatively stable with a minor spike in December 2017 and a trend of decrease from July 2018. The other surface water sites show generally stable TDS which is less than 100mg/L.

The major ions include calcium, magnesium, potassium, sodium, sulphate, chloride and fluoride for which time series plots are presented in Appendix B along with a time series plot of hardness. The following observations are made regarding the results:

- Calcium – results are below the IL. Concentrations are highest in GW1 at around 10 mg/L and lowest in SW1 with SW2 showing the most variability. Increasing concentrations are seen between June 2018 and July 2018 at SW2 following a significant rainfall event
- Magnesium – results are generally for concentrations around 3 mg/L to 4 mg/L for SW1, SW3, SW4, SW5 and SW6. SW2 ranges from 4 mg/L to around 14 mg/L with increased concentration following significant rainfall events. GW1 shows generally higher concentrations than the surface water although is very similar to SW2;
- Potassium – results show slightly higher concentrations in GW1 compared to the surface water locations, excluding SW1 and SW2 which have the highest concentrations. SW2 shows variability in concentration with increases following periods of significant rainfall whist GW1 and SW3 to SW6 remain relatively stable;

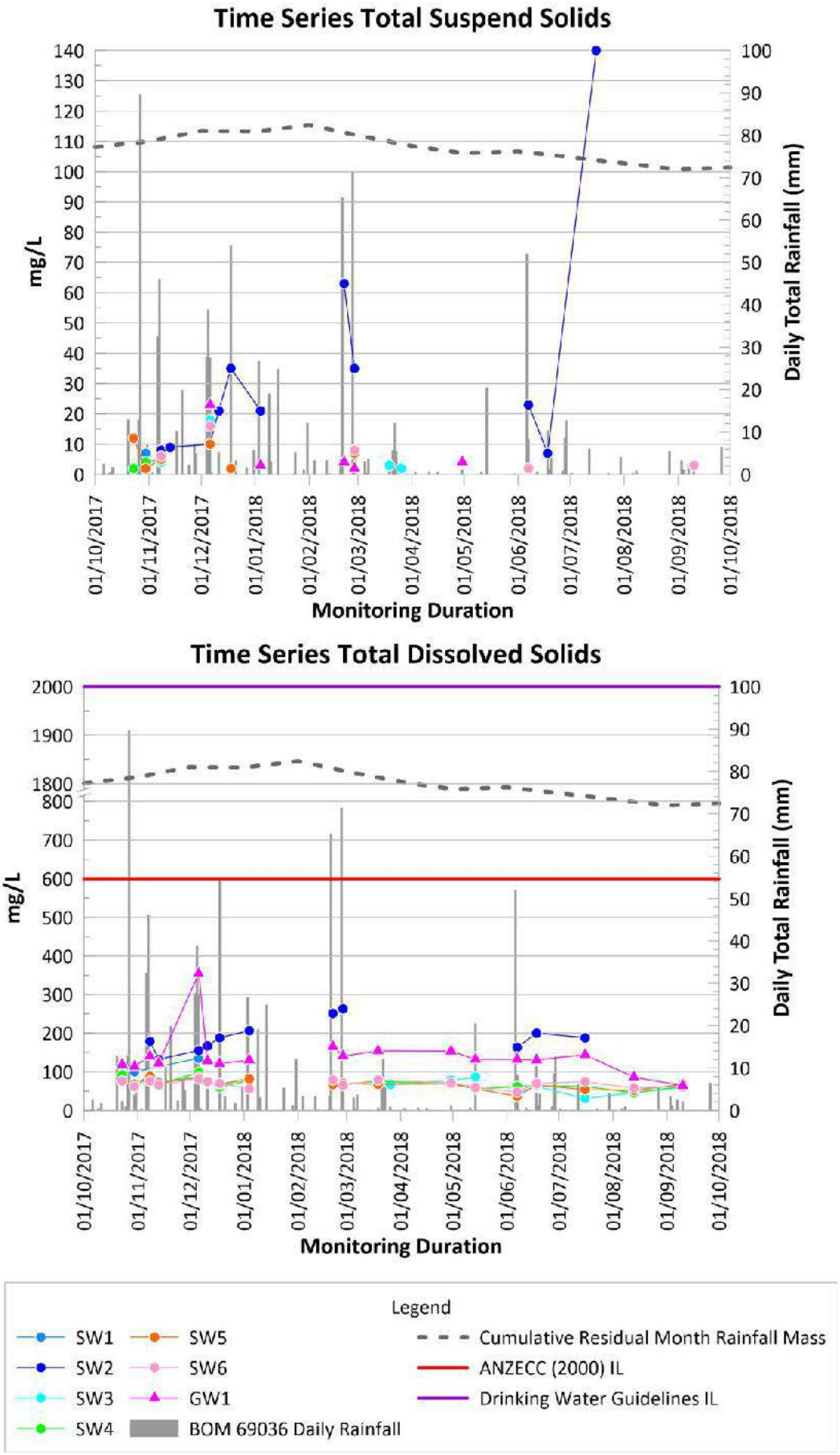

Figure 5.5: Time series plot of TDS and TSS with rainfall, CRMRM and ILs

- Sodium – all results are below the IL and generally range from 10 mg/L to 30 mg/L. SW2 has the highest concentration. The groundwater sample and other surface water samples are very similar and follow a similar trend of slight increases in concentration during periods of low rainfall or below average rainfall;
- Sulphate – results are below both ILs and sulphate concentrations are highest in GW1 followed by SW2. Results are generally around 25 mg/L for GW1, SW2 ranges from 2.5 mg/L to 20 mg/L and the other locations are generally less than 2.5 mg/L;
- Chloride – results range from 10 to 60 mg/L with all results below the IL. Chloride is highest in SW1 and SW2 and SW2 appears to increase after significant rainfall events. Increased concentrations in August and September 2018 may be in response to prolonged below average rainfall conditions;
- Fluoride – all results below the IL and generally less than 0.2 mg/L.; and
- The hardness of the water is below both ILs and for GW1 is generally around 60 mg/L. SW2 has a similar hardness to the groundwater and shows variability in response to rainfall events. SW 1 has the lowest hardness and SW3 to SW6 have results around 20 mg/L to 30 mg/L which are generally stable over the monitoring period. A slight increase from June 2018 to September 2018 is observed which appears to correlate to a period of low rainfall.

For True colour, which is what remains after the suspended particles are removed, exceedance of the IL occurred for the following results:

- SW1 – 30 October 2017 wet weather sample;
- SW2 – 8 November 2017 wet weather sample and 13 November 2017;
- SW1 to SW6 for 6 December 2017 wet weather samples;
- SW2 to SW6 – 11 December 2017 samples;
- SW2 to SW6 – 18 December 2017 wet weather samples;
- SW2 – 4 January 2018 wet weather sample;
- SW2 – 21 February 2018 wet weather sample;
- SW2 to SW6 – 27 February 2018 wet weather samples;
- SW2 – 7 June 2018 wet weather sample;
- SW2 – 18 June 2018 sample; and
- SW2 – 16 July 2018 sample.

A time series plot of Total and dissolved organic carbon is presented in Appendix B. The results show concentrations of total organic carbon is similar to the dissolved concentration with the dissolved concentration generally being slightly lower. SW1 and SW2 have the highest concentrations which appear to increase following significant rainfall events. A moderate increase is noted for SW3 to SW6 in December 2017 and a small increase in March 2018 in response to rainfall events. The concentrations in the groundwater remain relatively stable at less than 2.5 mg/L.

Biochemical oxygen demand is generally below the laboratory limit of detection except for the following results for SW2 wet weather samples:

- 18 December 2017;
- 4 January 2018;
- 21 February 2018;
- 28 February 2018 wet weather; and
- 7 June 2018.

The major ions are combined with alkalinity, TDS, pH and EC in the piper and durov diagrams presented in Figure 5.6 and Figure 5.7 for where a complete set of results was available. Appendix B presents piper plots for each individual location. The piper diagram plot shows SW1 and SW2 results for a distinctly different cluster to those of SW3, SW4, SW5 and SW6. SW2 shows a more distributed plot of data compared to the other surface water locations where the chemistry is relatively consistent. SW2 is characterised by increased chloride and decreased sulphate and calcium.

GW1 plots across the surface water results and in a small cluster characterised by increased calcium and magnesium. The variability has no linear trend of over time suggesting minor variations may be seasonal and influenced by river flow.

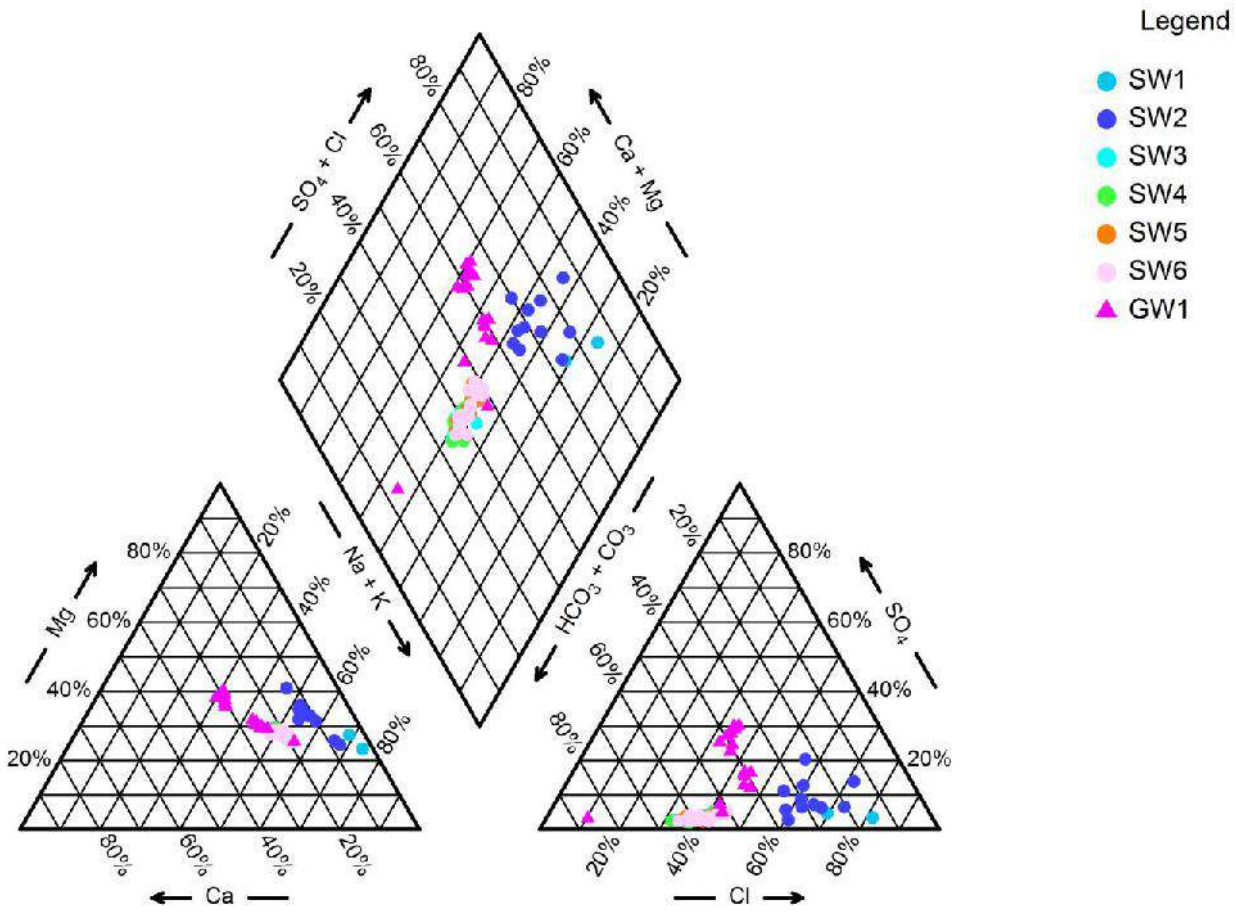

Figure 5.6: Piper diagram plot of water samples from 2017 to 2018

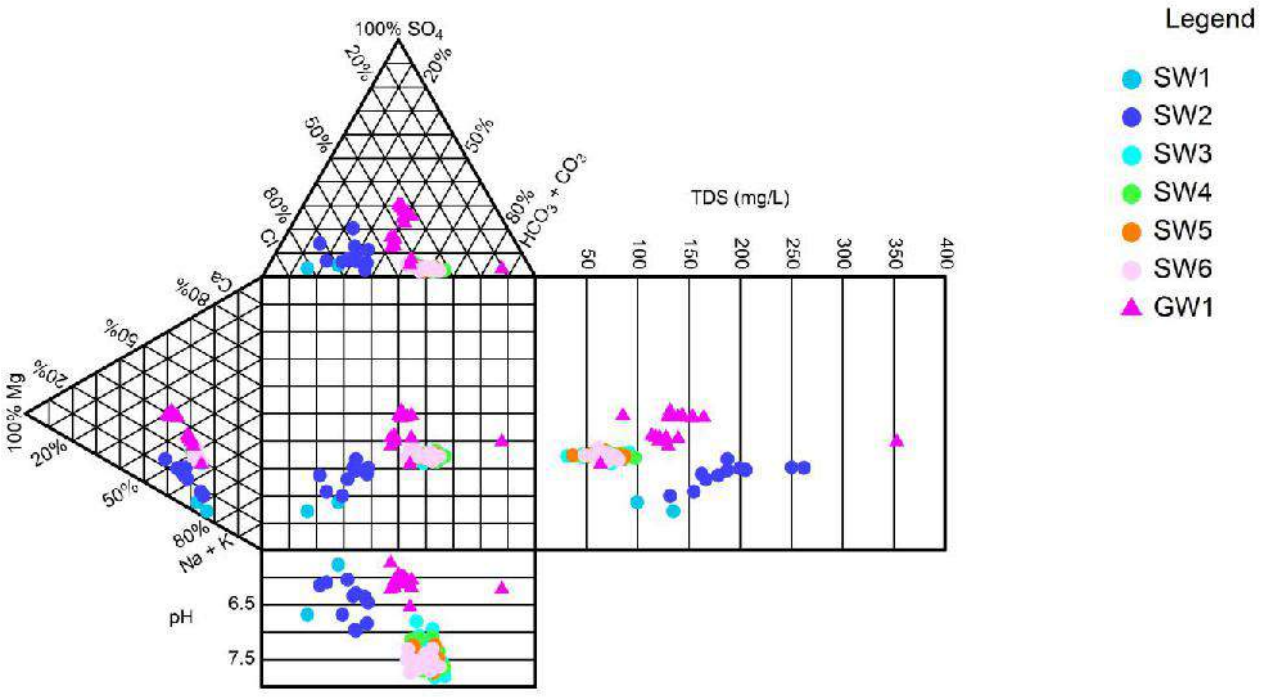

Figure 5.7: Durov diagram plot of water samples from 2017 to 2018

5.4 Nutrients

Time series plots of ammonia, ammonium, nitrate, nitrite, total nitrogen, TKN, total phosphorus and reactive phosphate are presented in Appendix B. The following observations are made on the results:

- Ammonia:
  - all results excluding are below both ILs;
  - increases in ammonia are see at SW2 following significant rainfall events;
  - concentrations in GW1 are relatively stable;
  - slight increase in concentrations in the Tuross River between SW3 the up-gradient and SW6 the down-gradient in December 2017 and May 2018;
- Ammonium:
  - SW2 shows increased ammonium following significant rainfall events and generally has results above the IL;
  - most results for GW1 are above the IL;
  - SW3, SW5 and SW6 have one or more results above the IL;
  - all results for SW4 are below the IL;
- Nitrate:
  - GW1 shows the most variability with increasing concentrations during periods of low rainfall.
  - Most results are above the IL however only result for SW1 is above the IL;
  - SW2 appears to have higher concentrations than SW3 to SW6, with concentrations increasing after significant rainfall events;
- Nitrite:
  - GW1 shows variability in concentration with increases following significant rainfall events;
  - SW2 shows the highest concentration with increases following significant rainfall events;
  - there appears to be a slight trend of increasing concentration from up-gradient to down-gradient surface water monitoring locations on the Tuross River
- TKN:
  - SW2 shows the highest concentration ranging from 700 µg/L to 2100 µg/L;
  - concentrations in SW1 are slightly higher than SW3 to SW6 and GW1;
  - concentrations appear to increase between SW3 and SW6 from up-gradient to down-gradient;
  - GW1 has a similar concentration to the Tuross River samples;
- Total Nitrogen:
  - SW1, SW2 and GW1, excluding two results, have all results are above the IL;
  - SW3 to SW6 results in December 2017 were above the IL and the increase is likely related to the significant rainfall event
  - GW1 appears to show increasing concentration during periods of below average rainfall with decreases in concentration following significant rainfall events. The result in September 2018 is much lower than other results and may be an outlier or represent a localised rainfall event;
- Total Phosphorus
  - most results are below the IL except for 4 results at GW1 and the December 2017 results at SW3 SW4 SW5 and SW6 and SW6 in November 2017;
  - apparent trend of decreasing concentration during below average rainfall conditions between March 2018 and August 2018;
  - for GW1 total phosphorus results appear the inverse of the total nitrogen results;
  - SW3 generally has lower concentrations than the down-gradient location SW6;
  - increases in concentration appear to follow significant rainfall events;
- Reactive Phosphate;
  - GW1 shows increasing concentration following the significant rainfall event in March 2018 and a period of low rainfall before declining; and
  - one result of SW2 and 3 results at GW1 exceed the IL;

- Chlorophyll:
  - SW2 has the highest results and exceeds the IL;
  - most results from October 2017 to December 2017 exceed the IL; and
  - shows a general trend of increase in response to rainfall events.

5.5 Heavy Metals

Time series plots of selected heavy metals are presented in Appendix B. For surface water samples total metals are presented, for the groundwater sample the results reflect the dissolved concentration. Metals were not tested at locations SW1, SW4 and SW5. The following heavy metals had either no results above the laboratory limit of detection (LLD) or only several results slightly above the LLD:

- Antimony – SW2 18 December 2017 wet weather, all results below ILs;
- Beryllium – no results above LLD;
- Cadmium – no results above LLD;
- Mercury – GW1 8 November 2017 wet weather (note the LLD for dissolved is different to total);
- Molybdenum – most results just above LLD but below IL;
- Selenium:
  - GW1 October and December 2017 and July 2018 wet weather
  - SW2 December 2017, January 2018, February 2018, June 2018, July 2018 wet weather.
  - All results below the IL;
- Silver – no results above LLD, IL is less than the LLD;
- Uranium:
  - GW1 30 October 2017 wet weather;
  - SW2, SW3, SW6 and GW1 6 December 2017 and 18 December 2017 wet weather samples;
  - SW2 4 January 2017 wet weather;
  - SW2 21 and 27 February 2018 wet weather samples;
  - SW2 7 June 2018 wet weather;
  - SW2 July 2018;
  - all results below the IL;
- Vanadium:
  - SW2 and SW6 8 November 2017 wet weather;
  - SW2, SW3 and SW6 6 December 2017 wet weather samples;
  - SW2, SW6 and GW1 18 December 2017 wet weather samples;
  - SW2 4 January 2018 wet weather;
  - SW2 21 February 2018 wet weather;
  - SW2 SW3 and SW6 27 February 2018 wet weather samples;
  - SW2 7 June 2018 and 16 July 2018 wet weather;
  - all results below the IL.

The following observations are made regarding the results of time series plots:

- Aluminium:
  - SW2 has the highest concentrations which appear to increase following rainfall events. All results are above the IL;
  - concentrations are generally higher at SW6 than SW3;
  - SW3 exceeds the IL for 3 results
  - SW6 exceeds the IL for4 results; and
  - GW1 has the lowest concentration and does not exceed the IL.
- Arsenic:
  - all results are below the ILs

  - SW2 has the highest concentrations;
  - SW3 is slightly lower in concentration that SW6 except in July 2018;
  - GW1 has similar concentrations to the surface water;
- Barium;
  - all results below the IL;
  - SW2 has highest concentrations;
  - SW6 slightly higher than SW3 except in March 2018;
  - GW1 has one result above the LLD;
- Boron:
  - all results below the IL
  - GW1 shows a spike in concentration in November 2017 following a rainfall event;
  - SW2 has higher concentrations than SW3 and SW
  - SW6 generally has higher concentrations than SW3;
- Chromium:
  - 5 results for SW2 are above the IL;
- Cobalt:
  - al results for SW2 are above the IL;
  - concentrations are higher in the groundwater than the surface water;
  - SW3 has lower concentrations than SW6;
- Copper:
  - SW2 shows most results exceed the IL
  - one result for GW1 and SW3 exceed in October 2017 and one result for SW6 in February 2018;
  - SW3 appears to have higher concentrations than SW6;
  - copper is not detected above LLD in SW6 from April 2018;
  - GW1 has similar concentration to the surface water;
- Iron:
  - all results above the IL;
  - SW2 has the highest concentration with results ranging from around 1900 µg/L to 16,000 µg/L;
  - SW6 shows higher concentrations than SW3
  - GW1 when detected above the LLD is slightly higher than the SW6 results
- Lead – all results are below the IL;
- Manganese:
  - one result for SW2 and SW6 exceeds the Drinking Water Guidelines IL but does not exceed the ANZECC (2000) IL;
  - SW6 has higher concentrations than SW3;
  - GW1 has higher concentrations than SW6
  - SW2 generally has the highest concentrations;
- Nickel – all results below the IL, SW2 has the highest concentrations;
- Zinc:
  - most results exceed ANZECC (2000) IL but no results exceed the Drinking Water Quality IL;
  - GW1 shows a trend of increase from May 2018 to August 2018 during a period of low rainfall; and
  - surface water concentrations are variable and appear to increase following significant rainfall events.

5.6 Hydrocarbons

The results show no detection above the LLD for:

- Total Recoverable Hydrocarbons (TRH);
- Benzene Toluene Ethylbenzene and Xylenes (BTEX); and

- poly aromatic hydrocarbons (PAH).

5.7 Pesticides

Pesticides both OPP and OCP had no detections above the LLD. Phenols and acid herbicides also had no results above the LLD. It is noted that some LLDs are higher than the adopted ILs.

6 Discussion and Recommendations

The results of the baseline water quality monitoring show some parameters exceed the adopted ILs with either an occasional result or most of the results. These are:

- In-Situ Measurements of:
  - pH
  - electrical resistivity
  - turbidity
  - dissolved oxygen saturation
- Nutrients
  - ammonium
  - nitrate
  - nitrite
  - total nitrogen
  - total phosphorus
  - Chlorophyll
- Physical Properties:
  - true colour
- Heavy Meals:
  - aluminium;
  - chromium (5 results);
  - cobalt (8 results);
  - copper (9 results);
  - iron;
  - manganese;
  - mercury (1 result); and
  - zinc.

6.1 In-Situ Measurements

Review of the in-situ measurements for pH shows the most common exceedance was the low-level value of 6.5 which occurred only at SW1, SW2 and GW1. All exceedances were within one pH unit of the IL. It results at GW1 continually were below 6.5 and relatively stable with minor variations. The groundwater has a naturally lower pH than the surface water. It is noted that the sample at GW1 is a composite sample from the borefield located near SW3. SW1 and SW2 which are along the ephemeral creek likely have lower pH results reflecting a greater contribution of groundwater discharge over surface water run-off.

Exceedance of the EC IL is most commonly the low-level value of 125 µS/cm with values less than this level at surface water samples from the Tuross River. The river is known to been in good health and EC values between 0 and 125 µS/cm are not considered to represent a negative impact rather they highlight the pristine nature of the environment. The EC in the groundwater is slightly higher than the surface water and SW2 shows higher values and variability.

Turbidity exceedance appears to correspond to significant rainfall events and river flows. In general, most groundwater and surface water results are below the 5 NTU value however a large portion of the baseline data was collected during a period of prolonged below average rainfall conditions. It is recommended the ILs for turbidity remain.

In field measurements of dissolved oxygen saturation provide a snapshot of conditions and do vary with time of day, exposure to sunlight and velocity of water movement. Groundwater generally has a lower concentration of dissolved oxygen than surface water. The extraction of groundwater, i.e. pumping, adds a small amount of oxygen to the water. The baseline monitoring results show exceedance of the ILs for GW1 for most monitoring results. SW1 and SW2 commonly exceed the ILs with very low saturation levels, likely due to being taken in an ephemeral creek. Adequate oxygen saturation in surface water is essential for good river health. Low oxygen conditions, which can result in lower

salinity, may be caused by algae growth from phosphorus or nitrogen. The monitoring results show some correlation with low oxygen and increased total nitrogen and phosphorus and Chlorophyll. Up-gradient of the site the application of fertilisers for cropping have the potential to impact on the water quality of the river.

6.2 Nutrients

Nitrogen compounds depend on the oxidation state of the waters. If the water is highly reducing then nitrogen will appear as ammonia (NH_3), where as in oxidising conditions it will appear as Nitrate (NO_3). Nitrite (NO_2) is an intermediate between ammonia and nitrate. Total Kjeldahl Nitrogen (TKN) is the sum of ammonia nitrogen plus organically bound nitrogen and does not include nitrate or nitrite.

The monitoring results show some correlation with low DO and increased ammonium, nitrate, total nitrogen and total phosphorus and reactive phosphate. These are indicative of activities, such as fertilising of crop areas and natural processes occurring in the catchment, upgradient of the Site and around the site. Figure 6.1 shows the Tuross River flow and level with the monitoring results for total nitrogen and total phosphorus. Nitrogen increases in the groundwater as the river flow and level decreases. Phosphorus in the surface water and groundwater appears to decrease as the river flow and level decreases. Periods of high river discharge / flow show increases in nitrogen and phosphorus in 2017. The Drinking Water Guidelines for nitrate and nitrite are 50000 µg/L and 3000 µg/L, significantly higher than the ANZECC (2000) criteria for the environment.

6.3 Physical Characteristics

The results for true colour and river flow and level are shown on Figure 6.2. Exceedance of the IL has occurred during tow high river flow periods in December 2017 and February 2018. The colour is likely due to the presence of dissolved organic matter which is observed to be elevated at these times. The Australian Drinking Water Guidelines state that a true colour range of 1 to 25 HU for filtered water supplies is typical in Australia. No change is recommended to the IL due to the limited number of exceedances in the baseline data.

6.4 Heavy Metals

In the surface water monitoring results concentrations of total heavy metal shows regular exceedance of the ILs for aluminium, iron, manganese and zinc and some exceedance of the ILs for chromium, cobalt and copper. These likely reflect the localised catchment geology and surface water and groundwater flow paths. Elevated levels of aluminium, iron, manganese and zinc are common with marine shales and sandstones which comprise the catchment bedrock. Within the river the alluvial material is comprised of weathered catchment host rock and water quality at GW1 reflects the combined borefield water source the residence time (e.g. how long in the formation), distance between location of recharge and point of sampling or discharge and the material through which it passes. Concentrations of heavy metals increases when the water is more turbid, such as during significant rainfall events which rapidly increase river flow, due to the suspended particle load.

Mercury and silver have LLDs which are greater than the ILs and whilst no results were detected above the LLD for silver one result was detected for mercury at the LLD. Analysis of ultra-trace levels is not considered to be required as for these two parameters the levels outlined in the Australian Drinking Water Guidelines should be adopted for protection of drinking water quality during construction.

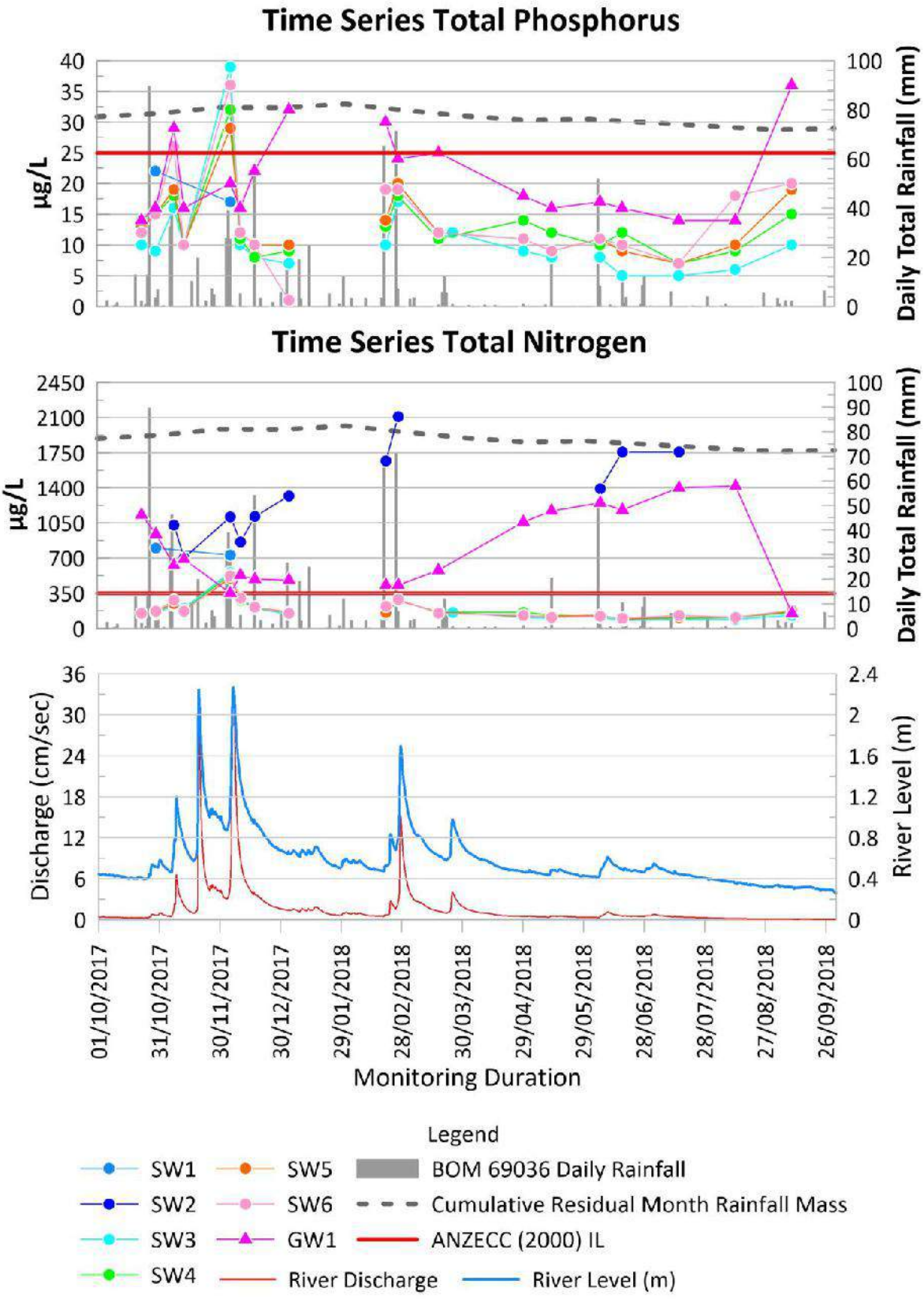

Figure 6.1: River discharge and level with Total Nitrogen and Total Phosphorus results from 2017 to 2018

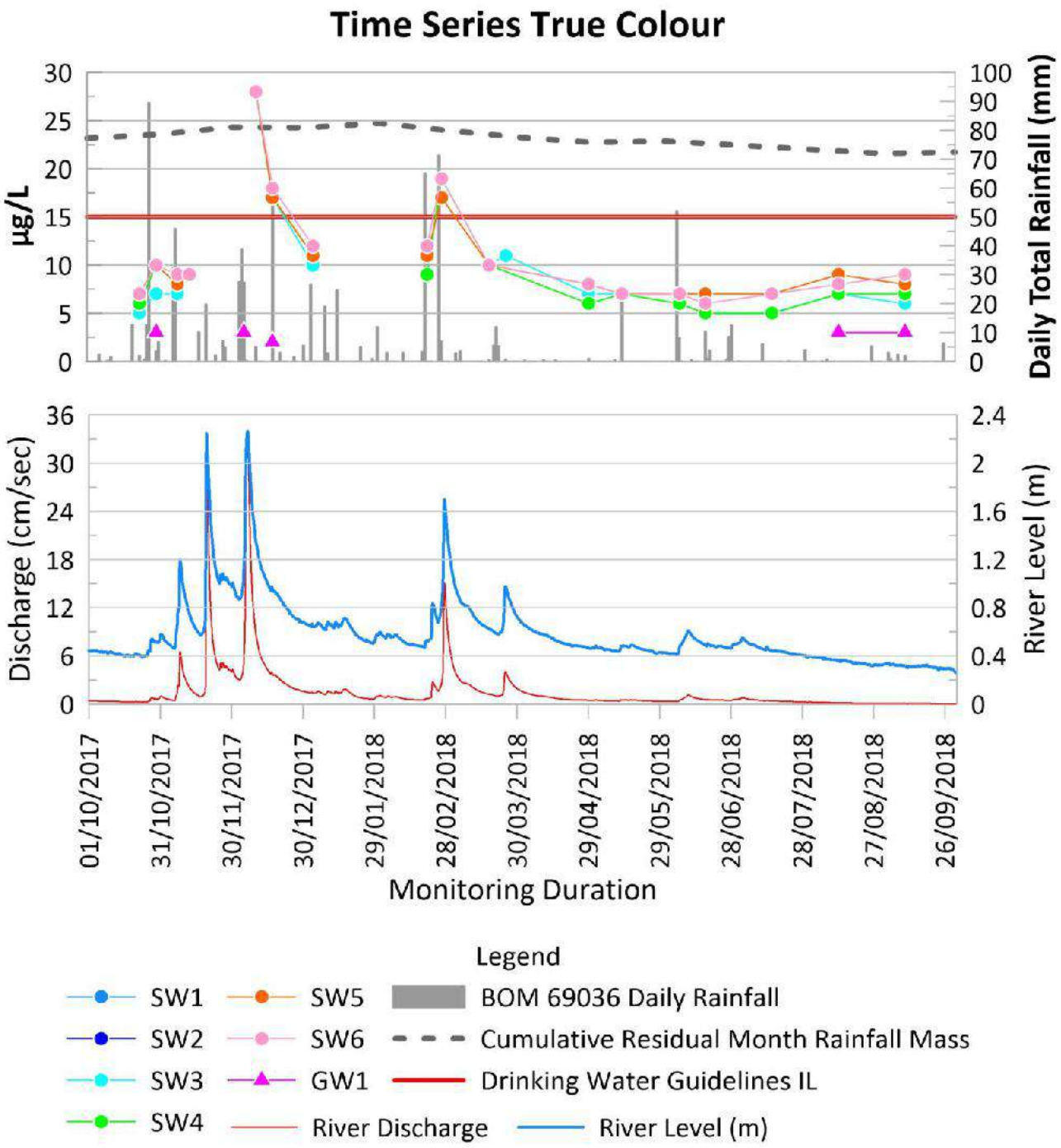

Figure 6.2: River discharge and level with true colour results from 2017 to 2018

6.5 Summary

The adopted ILs for the Site are used as a preliminary assessment of the baseline water quality results over the monitoring period. Exceedance of an IL may not indicate a risk / impact, rather a reflection of the existing natural conditions and variations. Up-gradient activities in the catchment will have an impact on down-gradient water quality. The baseline assessment shows some change between SW3 and SW6 in water quality that likely reflects the existing environment. During the construction phase monitoring SW3 provides an indication of any potential up-gradient contamination which is not attributable to the activities at the Site. GW1 represents a composite groundwater quality sample from the bores in the Councils borefield located near SW3. There are no construction details aviable for these bores. Review of registered private bores and test bores drilled by the Council would indicate approximated depths of 20m below ground surface with pump intakes at a similar depth.

Construction activities are likely to disturb the soil profile through stripping and exposure, alter the surface water catchment of the ephemeral creek due to de-vegetation and construction of the coffer dam and exposure of bedrock through the excavation of the dam foundations. These will likely cause temporary exceedances of ILs, localised to the ephemeral creek and groundwater system.

The main risks are likely to be sediment migration into the river from surface water run-off, mobilisation of metals and nutrients exposed in disturbed soil and rock, increased recharge to the groundwater system in excavated areas, increased run-off from de-vegetation and spills from onsite plant machinery. The WMP requires assessment criteria to trigger actions and responses for the protection of the Tuross River environment and the drinking water supply.

Where an activity is planned which will alter the environment it is important to assess the acceptable impacts and realistic monitoring and mitigation measures. The Tuross River is a reasonable healthy environment and through controls in the Site's Construction Environmental Management Plan (CEMP) impact to the groundwater and river should be minimal and short lived.

The borefiled has interconnectivity with the surface water and during pumping is in direct hydraulic connection with the river. Groundwater quality may be variable and at times results may be reflect the surface water samples, which is apparent with the September 2018 results. The groundwater aquifer is distinctly different to the surface water system. The cone of depression from pumping activities in the borefield will extend up-river and down river from the borefield the extent of which is not known and not part of this study. It does mean that groundwater migration

ANZECC (2000, Chapter 3 Section 3.1.4 and Chapter 7 Section 7.4.4.1) provides an avenue for the development of Site Specific assessment criteria using the baseline water quality data. The minimum data requirement for this is two years of continuous monthly data, which allows for seasonal variations to be captured. The baseline monitoring duration of this program has not covered 24 months. The monitoring data shows most exceedance of the ILs occurs at GW1, SW1 and SW2. The ephemeral creek is at time dry and an evaporative environment with potential groundwater discharge that is separate from the quality of the surface water samples in the Tuross River.

The focus of water quality monitoring should be on the quality of any surface water discharge from the construction site which may reach the river and or groundwater system (alluvial and bedrock). Parameters of regular monitoring should include:

- field pH, electrical conductivity;
- turbidity, total suspended solids, total dissolved solids;
- total and dissolved heavy metals (iron, aluminium, manganese, nickel, copper, lead and zinc);
- nutrients; and
- hydrocarbons and oil and grease.

Whilst the quality of the ephemeral creek is different to the River monitoring should assess for changes to the quality at GW1, SW4, SW5 and SW6 with a focus not just on exceedance of an IL but also trends of increase or decrease over time that may not reflect the observed baseline trends. ANZECC (2000), ANZG (2018) and the Australian Drinking Water Guidelines (2017) remain the most applicable ILs for the Tuross River. On the construction Site the CEMP is likely to use the Construction Blue Book for water quality. Use of water onsite and discharge from the site will need to meet these guidelines and it should be noted that some parameters limits are higher than the ANZECC (2000) ILs. Regular or continuous discharge to the river from the site may require an Environmental Protection Licence (EPL).

Assessment of future exceedances would consider if the exceedance is a result of a construction impact, natural climate variations or up-gradient catchment activities. Where a construction impact is noted assessment should consider if the impact is acceptable or un-acceptable. Given the construction activities are short lived the protection of the drinking

water source is most important. Acceptable impacts may be considered where exceedance of the ANZECC (2000) or ANZG (2018) IL has occurred but there is not an exceedance of the Drinking Water IL. Acceptable impacts may also be considered where the Drinking Water IL for aesthetic has been exceeded but not the IL for health. Where there is an impact to Drinking Water Quality it may be considered unacceptable if the Health ILs are exceeded or additional treatment is required to the drinking water source.

The monitoring results to date show there is exceedance of ILs under higher river flow conditions as well as during low river flow conditions. Additional baseline monitoring data prior to construction starting will provide the ability to design site specific investigation and trigger levels. Groundwater quality in the bedrock beneath the proposed construction site is not discussed in this report and may not be known. The alluvial groundwater aquifer at the Council borefield likely receives some volume of recharge from the bedrock aquifer.

6.6 Preliminary Investigation Levels

For the next year of baseline monitoring data the ILs are shown in Table 6-1 and have been revised, following the guidance of the method for developing site specific values and with consideration of acceptable and un-acceptable impacts. These ILs should be reviewed at the end of the next year of monitoring to ensure they are representative of the baseline data. Where only a few exceedances occurred for an analyte (i.e. in response to a high flow river event) the IL has not been adjusted. Reference is provided to the source of the IL value or its method of determination.

Table 6-1: Parameter or analyte and investigation level

Analyte group	Analyte	Units	Value / Range		Reference
In-Situ	pH Surface Water	pH units	<6.5		ANZECC (2000)
			>8.0		
	pH Groundwater	pH units	<6.0		Site Specific (20th Percentile)
			>8.0		ANZECC (2000)
	Electrical conductivity	µS/m	Level 1:	>300	Site Specific (1STV on the 95th percentile)
			Level 2:	>2200	ANZECC (2000)
	Turbidity	NTU	Level 1: >5		Drinking Water Guidelines (Aesthetic)
			Level 2: >50		ANZECC (2000)
	Dissolved Oxygen	% Sat	<80% Sat		ANZECC (2000)
	Temperature	°C	No Criteria		
	Salinity	%	No Criteria		
Microbial parameters	E. coli	no./100mL	No Criteria		
	Thermotolerant coliforms	cfu/100mL	No Criteria		
	Protozoa – Cryptosporidium	no./L	No Criteria		
	Bacteria – Campylobacter	no./L	No Criteria		
	Viruses –– Norovirus or other cultivable human enteric virus, such as adenoviruses	no./L	No Criteria		
Nutrients	Ammonia (as NH_3-N)	µg/L	Level 1:	500	Drinking Water Guidelines (Aesthetic)
			Level 2:	900	ANZECC (2000)
	Ammonium (as NH4+)	µg/L	220		Site Specific (95th Percentile)
	Nitrate (as N)	µg/L	Level 1:	90	ANZG (2018)
			Level 2:	50,000	Drinking Water Guidelines (Health)
	Nitrite (as N)	µg/L	Level 1:	9	ANZECC (2000)
			Level 2:	3,000	Drinking Water Guidelines (Health)
	Total Kjeldahl Nitrogen	µg/L	No Criteria		

Analyte group	Analyte	Units	Value / Range		Reference
	Total Nitrogen	µg/L	350		ANZECC (2000)
	Total Phosphorus (as P)	µg/L	25		ANZECC (2000)
	Filterable reactive Phosphate (as PO4)	µg/L	61		ANZECC (2000)
	Chlorophyll a	µg/L	3		ANZECC (2000)
Inorganics, Anions and Cations	Chloride	mg/L	175		ANZECC (2000)
	Fluoride	mg/L	1.5		Drinking Water Guidelines (Health)
	Sulphate (as S04)	mg/L	250		Drinking Water Guidelines (Aesthetic)
			1000		ANZECC (2000)
	Total alkalinity	mg/L	No Criteria		-
	Calcium	mg/L	1000		ANZECC (2000)
	Potassium	mg/L	No Criteria		-
	Magnesium	mg/L	No Criteria		-
	Sodium	mg/L	180		Drinking Water Guidelines (Aesthetic)
	Hardness (as $CaCO_3$)	mg/L	Level 1:	200	Drinking Water Guidelines (Aesthetic)
			Level 2:	350	ANZECC (2000)
Physical & chemical Properties	True colour	HU	Level 1:	15	Drinking Water Guidelines (Aesthetic)
			Level 2:	25	
	Particle Size Distribution		No Criteria		
	Total Dissolved Solids	mg/L	Level 1: Level 2:	600 1,200	Drinking Water Guidelines (Aesthetic)
			Level 3: 2,000		ANZECC (2000)
	Total Suspended Solids	mg/L	No Criteria		
	Total organic carbon	mg/L	No Criteria		
	Dissolved organic carbon	mg/L	No Criteria		
	Biochemical oxygen demand	mg/L	No Criteria		
Metals	Aluminium	µg/L	Level 1:	55	ANZECC (2000)
			Level 2:	200	Drinking Water Guidelines (Health)
	Arsenic	µg/L	10		Drinking Water Guidelines (Health)
	Barium	µg/L	2000		Drinking Water Guidelines (Health)
	Boron	µg/L	Level 1:	370	ANZECC (2000)
			Level 2:	4,000	Drinking Water Guidelines (Health)
	Cadmium	µg/L	Level 1:	0.2	ANZECC (2000)
			Level 2:	2	Drinking Water Guidelines (Health)
	Chromium (Total)	µg/L	Level 1:	1.0	ANZECC (2000)
			Level 2:	50	Drinking Water Guidelines (Health)
	Cobalt	µg/L	1.4		ANZG (2018)
	Copper	µg/L	Level 1:	1.4	ANZECC (2000)
			Level 2:	1000	Drinking Water Guidelines (Aesthetic)
	Iron	µg/L	Level 1:	200	ANZECC (2000)
			Level 2:	300	Drinking Water Guidelines (Aesthetic)
	Lead	µg/L	Level 1:	3.4	ANZECC (2000)
			Level 2:	10	Drinking Water Guidelines (Aesthetic)
	Manganese	µg/L	Level 1:	100	Drinking Water Guidelines (Aesthetic)

Analyte group	Analyte	Units	Value / Range	Reference
			Level 2: 200	ANZECC (2000)
	Mercury	µg/L	1	Drinking Water Guidelines (Health)
	Molybdenum	µg/L	Level 1: 34	ANZG (2018)
			Level 2: 50	Drinking Water Guidelines (Health)
	Nickel	µg/L	Level1: 11	ANZECC (2000)
			Level2: 20	Drinking Water Guidelines (Health)
	Selenium	µg/L	Level 1: 5	ANZECC (2000)
			Level 2: 10	Drinking Water Guidelines (Health)
	Zinc	µg/L	Level 1: 8	ANZG (2018)
			Level 2: 3,000	Drinking Water Guidelines (Aesthetic)
Total Recoverable Hydrocarbons (TRH)	TPH C6 - C10 less BTEX (F1)	mg/L	20	Limit of Reporting
	TRH C6 - C10	mg/L	20	Limit of Reporting
	TRH >C10 - C16 less Naphthalene (F2)	mg/L	100	Limit of Reporting
	TRH >C10-C16	mg/L	100	Limit of Reporting
	TRH >C16-C34	mg/L	100	Limit of Reporting
	TRH >C34-C40	mg/L	100	Limit of Reporting
Benzene, Toluene, Ethylbenzene, Xylenes (BTEX)	Benzene	µg/L	1	Drinking Water Guidelines (Health)
			950	ANZECC (2000)
	Ethylbenzene	µg/L	3	Drinking Water Guidelines (Aesthetic)
			80	ANZG (2018)
	Toluene	µg/L	800	Drinking Water Guidelines (Aesthetic)
			180	ANZG (2018)
	o-xylene	µg/L	350	ANZECC (2000)
	m and p-xylene	µg/L	75	ANZECC (2000)
	Xylene (Total)	µg/L	20	Drinking Water Guidelines (Aesthetic)
Polycyclic Aromatic Hydrocarbons (PAHs)	Naphthalene	µg/L	16	ANZECC (2000)
	Anthracene	µg/L	0.4	ANZG (2018)
	Phenanthrene	µg/L	0.6	ANZG (2018)
	Fluoranthene	µg/L	1.0	ANZG (2018)
	Benzo(a)pyrene	µg/L	0.01	Drinking Water Guidelines (Health)
			0.1	ANZG (2018)
	Total PAHs	µg/L	No Criteria	
Organochlorine Pesticides (OCP)	Aldrin	µg/L	0.01	ANZG (2018)
	chlordane	µg/L	0.03	ANZECC (2000)
	DDE	µg/L	No Criteria	-
	DDT	µg/L	0.006	ANZECC (2000)
	Dieldrin	µg/L	0.01	ANZG (2018)
	Endosulfan	µg/L	0.03	ANZECC (2000)
	Endrin	µg/L	0.01	ANZECC (2000)
	Heptachlor	µg/L	0.01	ANZECC (2000)
	Hexachlorobenzene (HCB)	µg/L	No Criteria	
	Lindane	µg/L	0.2	ANZECC (2000)
	Methoxychlor	µg/L	0.01	ANZG (2018)

Analyte group	Analyte	Units	Value / Range	Reference
Organophosphorus Pesticides (OPP)	Atrazine	µg/L	13	ANZECC (2000)
	Azinphos methyl	µg/L	0.01	ANZECC (2000)
	Chlorpyrifos	µg/L	0.01	ANZECC (2000)
	Diazinon	µg/L	0.01	ANZECC (2000)
	Dimethoate	µg/L	0.15	ANZECC (2000)
	Fenitrothion	µg/L	0.2	ANZECC (2000)
	Malathion	µg/L	0.05	ANZECC (2000)
	Parathion	µg/L	0.004	ANZECC (2000)
Phenols	Phenol	µg/L	320	ANZECC (2000)
	2-chlorophenol	µg/L	340	ANZECC (2000)
	4-chlorophenol	µg/L	220	ANZECC (2000)
	2,4-dichlorphenol	µg/L	120	ANZECC (2000)
	2,4,6-trichlorophenol	µg/L	3	ANZECC (2000)
	2,3,4,6-tetrachlorophenol	µg/L	10	ANZECC (2000)
	Pentachlorophenol	µg/L	3.6	ANZECC (2000)
Herbicides	Diuron	µg/L	0.5	ANZECC (2000)
	2,4-D	µg/L	280	ANZECC (2000)
	2,4,5-T	µg/L	36	ANZECC (2000)
	MCPA	µg/L	1.4	ANZECC (2000)

6.7 Water Monitoring Program Changes

For the next year of baseline monitoring the following changes are recommended:

- quarterly water quality monitoring of the parameters listed in Table 6-2;
- TRH, BTEX, PAH, OPP and OCP Phenols and Herbicides removed;
- particle size distribution is removed;
- microbial monitoring is removed;
- removal of antimony, beryllium, silver, uranium, vanadium from heavy metals sampling;
- dissolved metals added to SW3 and SW6
- one wet weather event per month; and
- one peak river flow event per month where river gauge level is greater than 2m.

When construction activities commence the water quality parameters and frequency may be adjusted. TRH, BTEX and PAH sampling with the addition of Oil and Grease for all monitoring locations is recommended during construction.

Table 6-2: Parameter or analyte monitoring frequency

Parameter	Field or laboratory method	Nominated Testing Frequency / Locations (See notes)	Locations
pH	Field measurement	Quarterly and Wet Weather / River Flow	All
Electrical Conductivity	Field measurement	Quarterly and Wet Weather / River Flow	All
Turbidity	Field measurement	Quarterly and Wet Weather / River Flow	All

Parameter	Field or laboratory method	Nominated Testing Frequency / Locations (See notes)	Locations
Dissolved oxygen	Field measurement	Quarterly and Wet Weather / River Flow	All
Temperature	Field measurement	Quarterly and Wet Weather / River Flow	All
Salinity	Field measurement	Quarterly and Wet Weather / River Flow	All
Biochemical oxygen demand	Laboratory	Quarterly and Wet Weather / River Flow	All
Nitrogen (as N) including Nitrate NO_3, Nitrite NO_2, Ammonia NH_3, Ammonium NH_4^+ Total Kjeldahl Nitrogen and Total Nitrogen.	Laboratory	Quarterly and Wet Weather / River Flow	All
Phosphorus (as P) including total phosphorus, and plant-available phosphate (PO_4)	Laboratory	Quarterly and Wet Weather / River Flow	All
Chlorophyll	Laboratory	Quarterly and Wet Weather / River Flow	All
Total dissolved solids (TDS)	Laboratory	Quarterly and Wet Weather / River Flow	All
Total suspended solids (TSS)	Laboratory	Quarterly and Wet Weather / River Flow	All
Major anions (Cl, Fl, SO_4, total alkalinity)	Laboratory	Quarterly and Wet Weather / River Flow	All
Major Cations (Ca, K, Mg, Na, Hardness)	Laboratory	Quarterly and Wet Weather / River Flow	All
True colour	Laboratory	Quarterly and Wet Weather / River Flow	All
Total organic carbon	Laboratory	Quarterly and Wet Weather / River Flow	All
Dissolved organic carbon	Laboratory	Quarterly and Wet Weather / River Flow	All
Total Metals (Al, As, B, Cd, Co, Cr, Cu, Fe, Pb, Mn, Mo, Hg, Ni, Se, Zn)	Laboratory	Quarterly and Wet Weather / River Flow	All
Dissolved Metals (Al, As, B, Cd, Co, Cr, Cu, Fe, Pb, Mn, Mo, Hg, Ni, Se, Zn)	Laboratory	Quarterly and Wet Weather / River Flow	GW1, SW3, SW6

6.8 Response and Mitigation Actions for Construction

During construction the water quality monitoring results should be reviewed against the ILs each time data is collected along with observations of the environment, noting river habitat or channel stability, vegetation type, algae blooms or plant growth and visible construction activities. When an IL is exceeded the first response protocol is to review the available information to assess if a construction impact is a likely source of the exceedance. If a construction impact is assessed as a likely source the second response protocol is to review the CEMP mitigation measures to establish if they are adequate and in place or require remediation works, such as a collapsed sediment control fence. Council may consider regular inspection of the construction site CEMP control measures as a means of mitigation of potential impacts.

Where impacts from construction are consistent, such as regular discharge of water from the site with a quality limit already higher than the ANZECC (2000) ILs mitigation measures should be applied at the point of mixing with the Tuross River including erosion and sediment controls.

6.9 Recommendations

The following recommendations are made for the second year of baseline monitoring:

- additional of a surface water monitoring point in the ephemeral creek down-gradient of SW1 near GW1; and
- monitoring of groundwater level and quality at the standpipes (installed by SMEC in 2017) in the construction site area.

SMEC also recommend consideration is given to adequate decommissioning of the groundwater standpipes located in the construction site footprint, prior to the start of construction. These standpipes may have been damaged by the recent bushfires and an assessment of their condition should be undertaken. Decommissioning in accordance with the Minimum Construction Requirements of Water Bores in Australia – Chapter 18 (3rd Ed, NUDLC, 2012) should be undertaken to avoid them becoming a conduit to the groundwater system if damaged or to be destroyed during construction.

7 References

Bureau of Meteorology (2017) Available at http://www.bom.gov.au/climate/data/index.shtml

BOM Australian Climate Maps

http://www.bom.gov.au/jsp/ncc/climate_averages/climate-classifications/index.jsp?maptype=seasgrpb

Troedson A.L. & Hashimoto T.R. 2013. Eurobodalla 1:100 000 and 1:25 000, Coastal Quaternary Geology Map Series. Geological Survey of New South Wales, Maitland.

National Uniform Drillers Licencing Committee (2012) Minimum Construction Requirements for Water Bores in Australia, 3rd Edition

Appendix A Monitoring location photographs

Figure Error! No text of specified style in document..1: Location SW1 photograph taken 8 August 2018

Figure Error! No text of specified style in document..2: Location SW2 photograph taken 8 August 2018

Figure Error! No text of specified style in document..3: Location SW3 photograph taken 8 August 2018

Figure Error! No text of specified style in document..4: Location SW4 photograph taken 8 August 2018

Figure Error! No text of specified style in document..5: Location SW5 photograph taken 8 August 2018

Figure Error! No text of specified style in document..6: Location SW6 photograph taken 8 August 2018

Appendix A – Monitoring locations photographs

Figure Error! No text of specified style in document..7: Location GW1 photograph

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Appendix D Requirements for Temporary In-stream Structures – Policy and Guidelines for Fish Habitat Conservation and Management (DPI, 2013)

Temporary in-stream structures include coffer dams, construction pads, sediment erosion booms, and drought water retention dams.

Requirements for temporary in-stream structures as per the Policy and Guidelines for Fish Habitat Conservation and Management (DPI, 2013) include:

- Temporary in-stream structures should avoid spanning the full width of the waterway channel to ensure base flow conditions are maintained down the waterway. If a channel spanning structure is required, measures (e.g. diversion channel) will need to be implemented to ensure that minimum base flow conditions are maintained. Local stream gauges should be consulted to determine appropriate minimum base flows for the prescribed season that temporary works will be installed.
- Temporary in-stream structures should not be constructed from unconsolidated, imported earth fill material. Dispersive material (e.g. clays and sands) used in the construction of temporary in-stream structures should be fully enclosed by geotextile, sheet piling, or similar means to limit erosion and sedimentation within the waterway. If using rock fill, the rock should be clean of fines and of suitable size (≥ 150 mm diameter) to avoid erosion. Use of instream bed material will be evaluated on a case by case basis by NSW DPI and will be dependent upon the proponent demonstrating that the project has a net benefit to fish habitat and will not destabilise the waterway channel.
- Temporary in-stream structures should be inserted during low-flow periods, with management plans being submitted to NSW DPI detailing how high flow events will be managed to limit erosion of the structures and associated sedimentation of downstream waterways.
- Dewatering of temporary in-stream structure should follow the following guidelines:
    - NSW DPI is to be notified 7 days prior to any dewatering activities in order to organise potential fish rescue activities. A separate s.37 permit may be required from NSW DPI to relocate fish.
    - Water is to be pumped a minimum of 30 m away from the waterway and should preferentially not re-enter the waterway. If water is to re-enter the waterway, ANZECC water quality guidelines need to be adhered to with the proponent being required to submit a detailed water quality monitoring program.

Appendix E Site Water Management Strategy

Site Water Management Strategy

Tuross River Intake Pump Station

Contract Number: 10018531

Quay Civil Project Ref: 20016

QUAY CIVIL

YOUR QUAY FOR SUCCESS

Rev	Date	Revision Description	Prepared	Reviewed	Approved
0	30/10/20	Issued For Construction	N.Yekta	S.Wing	P.Kennedy
1	4/11/20	Minor Amendments for IFC	N.Yekta	S.Wing	P.Kennedy
2	13/01/21	Additional content Sec 3 and 7	N.Yekta	S.Wing	P.Kennedy

Table of Contents

1 Introduction

The purpose of this strategy is to outline the methods by which water quality will be monitored, including the logic of monitoring, the parameters of monitoring, the frequency and location of monitoring and

2 Background information

It is essential that the quality of the receiving waters is established through background monitoring and sampling, prior to any discharge from site, so that the potential impact of discharge water can be determined. Monitoring of the receiving waters must be undertaken prior to any land disturbance works (to establish a baseline) as well as during construction.

This plan has been developed in consideration of the NSW Water Quality Objectives (WQO) for the Tuross River and satisfied planning consent B.13 relating to Construction Soil and Water Management Plan (hereafter, CSWMP) (Refer to 2.1 CSWMP).

Baseline criteria for discharge and monitoring

- WQO stipulate for Lowland Rivers – Turbidity trigger values 6 - 50 NTU.
- When river turbidity levels are above 6-50 NTU range, discharge criterion of maximum 50mg/L will be adhered to as per Managing Urban Stormwater (blue book).

Appendix C of the Construction Soil and Water Management Plan outlines the baseline water quality monitoring of the Tuross River and various surface water and ground water tributaries. Figure 6-1 (from appendix C CSWMP) outlines low-risk trigger values as per the Water Quality Objectives (WQO) for the Tuross River, which are consistent with ANZECC 2000, for investigation, action or further monitoring. These values were established to form a baseline water quality to which any future impact can be compared to. To avoid causing pollution and breaches of section 120, any water discharged from site must be of the same quality, or better, than the quality of the receiving waters (at the time of discharge). This criterion is in line with the WQO.

Water quality criteria given in this guideline for discharge ranges 6-50NTU are based on the WQO trigger values. Testing and treatment techniques are in line with ANZECC 2000 and Blue Book guidelines. However, compliance with these does not, of itself, provide any defence to an alleged breach of section 120 of the POEO Act. This could include situations where:

- Water discharged with Turbidity below 50 NTU may still cause pollution, if the receiving waters have a 50 NTU at the time the discharge occurs.
- Appropriate erosion and sediment controls are in place, but a rainfall event occurs beyond the design capacity of those controls.

3 Risk assessment

The discharge of the Tuross River Intake Pump Station (TRIPS) site will be comprised of the following types outlined in
Table 1.

Table 1 - Types of site discharge and their risks

Discharge Type	Potential effect	Characteristics	Risks	Duration
Rain water collected in excavation and rain surface run off	Large, depending on the rain event	High turbidity Wash out of surface contamination if present	Moderate if untreated	Ongoing over the site duration of 10 months
Dewatering of excavations (seepage)	Small; large only after a rain event requiring dewatering	Potential higher salinity Potential low pH Potential for higher heavy metals	Moderate if untreated	6 months, including dewatering of wet well structure
In river excavations/piling	Large	High turbidity due to grinding, drilling or scraping of rock	Large if untreated	2 weeks for piling, 4 weeks underwater trenching
Excavation dust suppression water from Southern WTP	Moderate	Higher turbidity after run off Wash out of surface contamination	Moderate if untreated	6 months, including wetting during backfill operations
Hydrotesting water from Southern WTP	Small	Very close to potable quality Wash out of items inside pipework	Negligible with good construction practice	6 weeks maximum for all pipework and structure hydrotesting

Impacts are based on rain water run-off, whether collected in excavations or passing through site. Seepage will occur into the excavations which occur beneath the water table; with the proximity to the river, this seepage is anticipated to be of near river water quality.

Dust suppression and hydrotesting will occur with water of a near potable standard. During dust suppression processes, the run off water generated will present a risk much like rain fall run off. However, for hydrotesting of pipelines and structures, the water will be contained in a clean environment and as such the risks are minimal.

4 Management of risks

Risks will be managed with the use of the controls identified in the Construction Soil and Water Management Plan and Sediment and Erosion Control Plan. These will include the site erosion and

sediment controls, the submersible silt curtain for all run off down the river bank during rain and in river excavation work and in extreme cases on site treatment.

5 Ongoing monitoring

Figure 6-1 in Appendix C of the Construction Soil and Water Management Plan presents the investigation levels for a large range of parameter for complete health monitoring of the Tuross River. These have been based on the Water Quality Objectives for the Tuross River. Based on the types and nature of the discharges from the Tuross River Intake Pump Station construction identified in Table 1, Table 2 and Table 3 presents the locations of monitoring and the parameters being monitored.

Table 2 - Monitoring locations and parameters

Location	Monitored Parameters	Trigger values	Comments
SW4 Upstream Location	pH	6 < pH < 8	SW4 is upstream of Quay Civil's impact, and thus can be used as an upstream baseline
	Turbidity	6 - 50 NTU	
SW5 Downstream Location	pH	6 < pH < 8	Upstream impact point consistent with Baseline Water Quality Monitoring
	Turbidity	6 - 50 NTU	

Table 3 – Discharge Monitoring Requirements

Location	Monitored Parameters	Trigger values	Comments
QC1 On site location	pH	6 < pH < 8	Sampled from clear water discharge after on-site treatment. When lower range turbidity levels exist, discharge levels should be the same turbidity or better.
	Turbidity	6 - 50 NTU	

The above monitoring parameters are a result of the baseline report. If monitoring at locations SW4 and SW5 have river monitoring parameters above the baseline report trigger values of 6-50NTU as mentioned in Table 2, then discharge from site will be controlled as per Blue Book requirements, i.e. discharge of up to a maximum of 50mg/L TSS, and maximum pH of 8.5.

Locations are retained as per the baseline water quality monitoring to allow a record of existing data. As parameters of ongoing concerns and impact, relative to the volume, pH and turbidity are considered to be the parameters which will need regular monitoring. The Level 2 trigger values have been adopted from the Baseline report.

The pH value proposed is slightly different from that found in ordinary practice. This is based on the baseline water quality report of the groundwater pH being lower than the surface water pH. The baseline values from the report of min 6 and max 8 pH have been adopted.

Figure 1 - Sampling locations SW4 and SW5, QC1 representing upstream , and downstream (from SMEC Baseline Water Quality Report Appendix C) and Construction Site

6 Sample frequency

Discharges from site (QC1) will be occurring infrequently and in normal conditions will be controlled as to their timing. Quay Civil will take a sample of each discharge. For example, if all discharges for the day are held in a sediment basin, a sample will be taken of the content of the combined basin prior to discharge. Another example may be the dewatering of the pump station shaft after a rain event. This volume may be sufficiently large such that this water will be treated in situ and discharged directly. In this case, this water will be sampled also. In this way, the frequency of monitoring will be variable.

Sampling frequency for the upstream and downstream locations are provided in Table 4. These differ based on the project stage, as the amount of discharge at each stage will differ. The only constant discharge across each project stage will be rainwater runoff. This discharge will cause the greatest impact during the earthworks phase, as open excavations will fill with water.

During the course of the project these nominated frequencies may change, depending on the water quality of the discharges from the site. For example, if consistently high results are observed, frequency of monitoring may increase. Conversely, if values are consistently the same upstream and downstream of the site, frequency of monitoring may decrease.

Table 4 - Tuross River Sampling frequency. Subject to change

Stage of works	Expected discharge	Frequency of SW4 & SW5 sampling
Site set up/barge piling works	In river due to barge activities within silt boom	Daily
Earthworks	In river excavation, dust suppression and wetting, dewatering (frequent), increased run off	Daily
Backfill operations	Wetting run off, dewatering (rain only)	Twice/week
Concrete Works	Curing run off, dewatering (rain only)	Twice/week
Mechanical Works	Hydrotest water, dewatering (rain only)	Weekly
Completion	Commissioning water, dewatering (rain only)	Weekly

Stage of works	Expected discharge	Frequency of QC1 sampling
Water Discharge at QC1	Discharge of dewatering or site water	Prior to discharge

7 Procedural outline

7.1 Risk assessment of discharge

Figure 2 provides the procedure for the testing at QC1 on site. Testing of the samples must be done in accordance with the manufacturer's recommendations, and this must be verified before any sample is considered valid. If one or both of the parameters is out of specification, a risk assessment for discharge must be undertaken prior to discharging this water into the Tuross River. This risk assessment must consider:

- The volume of the out of specification discharge: very small volumes are unlikely to affect water way health
- The reason for the out of specification discharge. These may not be treatable or may not require treatment depending on the situation in the water way e.g. heavy rain event through well maintained sediment controls
- Mitigation strategies

If water treatment is required, this is assessed on a case-by-case basis, with common treatments available securely storage on site.

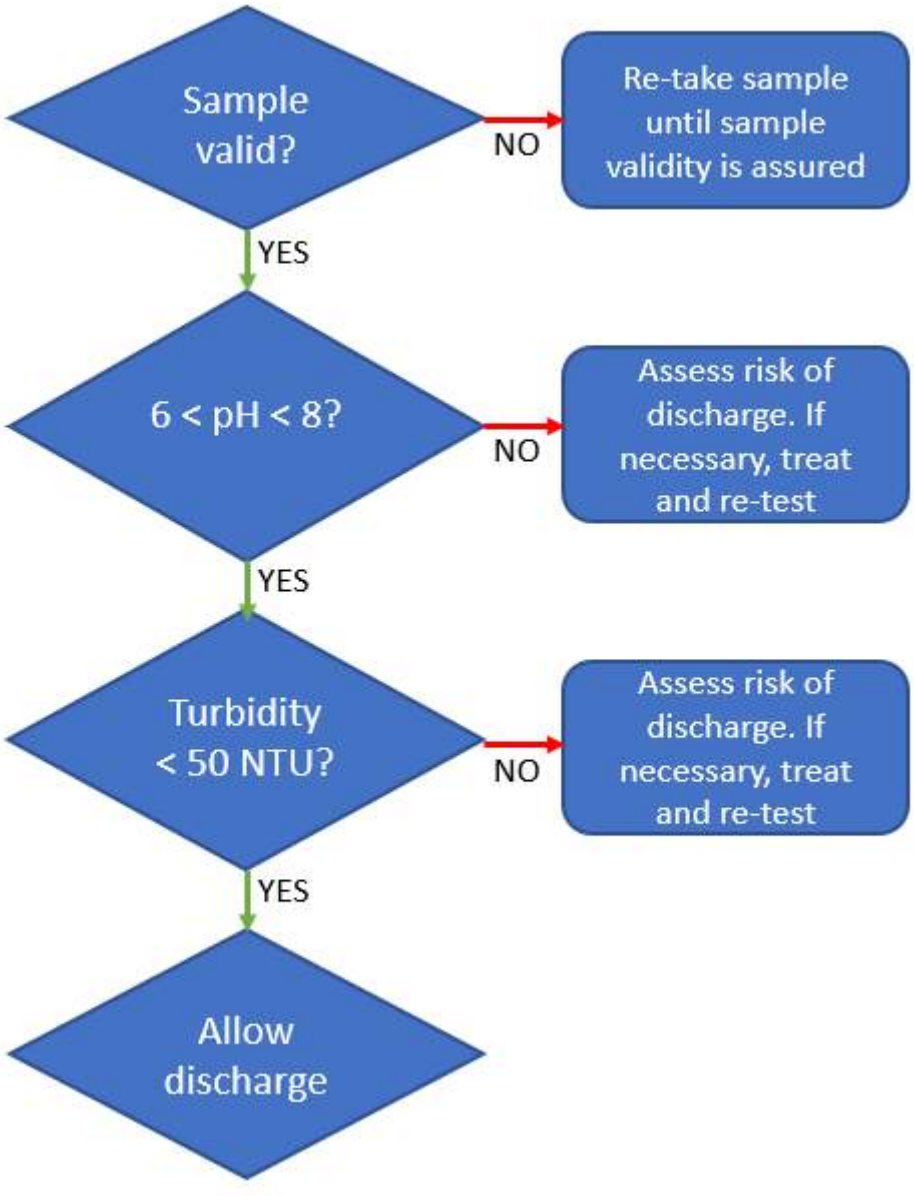

Figure 2 - Flow chart for on site discharge testing

7.2 Ongoing monitoring of efficacy

Continual monitoring to assess the effectiveness of the environmental sediment controls in place is required in conjunction with the ongoing turbidity monitoring, which will provide triggers to investigate the causes of pollution. The following items are considered to be indications of a potential breakdown in the efficacy of the pollution controls and a trigger point to assess site conditions:

- Significant differences (outside of a margin of error in instrumentation and natural condition) in the values of upstream and downstream turbidity, even if the trigger value has not been met
- Visible plumes of sediment on site, or at either sampling location
- Equal sediment concentration inside and outside the silt curtain, indicating a problem with the floating containment boom

7.2.1 Monitoring for Effective Environmental Controls

Monitoring to ensure the effectiveness of the controls in place will be undertaken by:

- In the case in a significant difference between upstream and downstream turbidity, investigation of the potential causes of this, including but not limited to assessing:
    - Immediate re-assessment of site environmental controls on land and in river, and inspection to determine any immediately evident reason for turbid water
    - Rainwater or other weather events
    - Nearby industrial sources of pollution at the time e.g. farming or quarry activities up or downstream of the site
    - Any items introduced into the river which could cause a disturbance e.g. illegal or weather induced dumping of material or flora
    - Works on site which may have caused the disturbance
    - Potential undetected breaches in the site environmental controls
- Daily visual inspection of the floating containment boom, to identify any damages present, plumes of sediment or potential locations for breach
- Daily visual inspection of erosion and sediment controls on site
- Daily weather monitoring for precipitation likely to cause trouble for site controls and actioning of appropriate countermeasures e.g. varying timing of works, use of flocculation chemicals prior to discharge etc.
- Ongoing maintenance of floating containment boom ensuring that silt is contained within, and is settling as designed
- Ongoing maintenance of erosion and sediment controls including replacement of materials as required
- Repair of any damage to silt curtain due to wet weather events

8 Treatment of water prior to discharge

Prior to the use of any testing equipment on site, the appropriate calibrations must be conducted as per the manufacturer's recommendations and recorded for future referral if required.

Any visible oil and grease will be treated as follows:

- Examine surface of water immediately prior to discharge for evidence of oil and grease (e.g. sheen, discolouration).
- No action is required if there is no visual contamination.
- If there is contamination, the contaminated water must either be disposed of at a licenced disposal facility, or treated using appropriate absorbent materials, which must be spread on the surface.
- Any used absorbent materials are to be disposed of appropriately.

For pH levels outside the range:

- If pH is outside the range 6–8 the water will need to be neutralised. This may be achieved via three methods which are dependent on site and time constraints

  - natural – allowing the water to sit for a period of time and naturally neutralise.
  - mixing – by mixing with other site water of a higher or lower pH (i.e. other water has also been tested), to achieve compliance

- Acid/base addition – if the water is above 8.5, acid is used to lower the pH; if the water is below 6.5 a base is used to raise the pH. To treat water with acid or base, safety requirements must be followed as outlined in the relevant material safety data sheet (MSDS).
- Re-test the water pH following treatment – repeat as necessary, until the acceptable pH range is reached.(c) Total suspended solids

If TSS are greater than 50mg/L, the sediments need to settle to the bottom or be removed. This can be achieved via the following methods:

- Natural settlement
- Flocculation – chemical treatment with a flocculent (e.g. gypsum). If the flocculant is being applied manually, an even application over the surface of the water is essential. Only environmentally safe flocculants are to be used.
- Filtration – pumping or gravity feeding the water through a filter medium (e.g. geofabric) to another storage area (e.g. container or sediment basin) to remove sediment.
- Re-testing of water is required once treatment has been undertaken to ensure criterion for TSS is met.

9 Requirements for discharge to land

The objective of discharging water to land (within the site boundary) is to allow the water to infiltrate into the ground, thus avoiding direct discharge to, or pollution of, waters. Any suspended solids in the water are deposited either on the surface or retained in underlying soil layers, so the TSS criterion does not apply. However, to avoid impacts to vegetation or soil contamination pH testing and a visual inspection for oil or grease must be undertaken.

9.1 Determining a Suitable Location

Consideration should be given to the following factors when determining a suitable offsite location:
(a) Direction of groundwater flow – recharging groundwater that will subsequently flow either back onto site, into excavations or low lying areas should be avoided.

(b) Erosion – the receiving area should have complete groundcover (e.g. grass) and established vegetation to minimise the risk of erosion.

(c) Flora and fauna – water must not be discharged to areas where there is potential to have an adverse effect on any flora or fauna species.

(d) Flooding – the receiving area must have the infiltration capacity to receive the volume of water to be discharged, without causing flooding or significantly increasing the risk of flooding should subsequent rainfall occur.

9.2 Criteria for Discharge to Land

Discharge to land within the site boundary shall only occur if:

(a) there is no visible oil or grease (otherwise treat in accordance with 5.1.2 (a) above)

(b) the pH levels are in range (otherwise treat in accordance with 5.1.2 (b) above)

(c) no surface runoff will be generated from the discharge and there is no potential for discharged water to reach any watercourse (within or outside the site)

(d) no erosion is caused from the discharge and appropriate erosion and sediment control are installed in accordance with the Blue Book

(e) all discharge water can be wholly contained within the site boundary.

9.3 Reuse on site

Water may be reused on site, for example, for dust suppression, to assist with compaction or for watering landscape/bush regeneration areas. As with discharges to land, the TSS criterion does not apply as water will not be discharged to any waters. However, pH testing and a visual inspection for oil or grease must be undertaken.

9.3.1 Criteria for reuse on site

Reuse on site shall only occur if:

(a) there is no visible oil or grease (otherwise treat in accordance with 5.1.2 (a) above)

(b) the pH levels are in range (otherwise treat in accordance with 5.1.2 (b) above)

(c) no erosion is caused from the discharge

(d) any runoff generated by the reuse is controlled entirely within the site boundary and appropriate sediment controls are installed and maintained in accordance with the Blue Book.

9.4 References

Blue Book - Managing Urban Stormwater: Soils & Construction 2004, Landcom

Water Discharge and Reuse Guideline – Document No. 7TP-SD-146/4.0 (2016) – TfNSW

NSW Water Quality and River FLow Objectives – Tuross River
https://www.environment.nsw.gov.au/ieo/Tuross/report-02.htm

Water Quality Monitoring Register - Site Location SW4/SW5

Project Name	Tuross River Intake Pump Station			**Client**	Eurobodalla Shire Council
Project Number	20016			**Contract No.**	10018531
Revision Number	0	**Date**	30/10/2020	**Status**	For Construction

No	Date:	Time	Location	pH (6 < PH <8)	Turbidity (<50 NTU)	Oil/Grease (Y/N)	Responsible Site Staff	Notes

Figure 3 – Water Quality Monitoring Register

Water Discharge Register - Construction Site

Project Name	Tuross River Intake PS			Client	Eurobodalla Shire Council
Project Number	20016			Contract No.	10018531
Revision Number	0	Date	30/10/2020	Status	For Construction

No	Date:	Time	Location	pH (6 < PH <8)	Turbidity (<50 NTU)	Oil/Grease (Y/N)	Qty Discharge	Responsible Site Staff	Notes

Figure 4 – Water Quality Monitoring Register

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Construction Flora and Fauna Management Plan

Eurobodalla Southern Water Supply Storage: Tuross River Intake Pump Station (TRIPS)

Reference No. SSD-7089
Prepared for Quay Civil Pty Ltd
17 November 2020

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SMEC Company Details

Approved by:	Mark Davey		
Address:	Level 5/20 Berry Street, North Sydney NSW 2060		
Signature:	MARK DAVEY		
Tel:	02 9925 5515	Fax:	Click or tap here to enter text.
Email:	MARK.DAVEY@SMEC.COM	Website:	www.smec.com

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1 Introduction

1.1 Context

This Construction Flora and Fauna Management Sub Plan (CFFMP) forms part of the Construction Environmental Management Plan (CEMP) and has been prepared to outline and describe how the contractor responsible for the construction of Stage 2 – Tuross River Intake Pump Station (TRIPS) as part of the Eurobodalla Southern Water Supply Storage Project (the Project) will comply with State Significant Development (SSD) 7089 Development Consent, the Environmental Impact Statement (EIS), Addendum Submissions Report and all associated licences, permits and approvals required for the Project. Figure 1 of the CEMP outlines the TRIPS location.

A separate FFMP was produced specifically to address vegetation clearing to facilitate the TRIPS (SMEC 2019), while this document is to cover the construction and rehabilitation phase of the Stage 2 – TRIPS construction.

1.2 Background and Project description

The Eurobodalla Southern Storage (ESS) EIS, submitted for determination in September 2018, assessed the impacts of the Project's construction and operation on flora, fauna and ecological communities. As part of the EIS, a detailed flora and fauna assessment was prepared in the form of a *Biodiversity Assessment Report* (BAR) (SMEC 2018) to assess the impact of the Project and provide measures to minimise and manage impacts to flora and fauna. The BAR was included in the EIS as Appendix E.

The EIS proposed the implementation of the mitigation and management measures, including further survey, monitoring and the development of a CFFMP. As this CFFMP only relates to the Stage 2 – TRIPS construction, not all of the matters identified within the EIS and BAR are relevant to this CFFMP.

1.2.1 Project description

The Project location is approximately 30 kilometres south of Moruya within the Eurobodalla Local Government Area. The TRIPS site is located along the eastern bank of the Tuross River, just south of the existing water treatment facility on Eurobodalla Road within Lot 1 DP 1168581. The TRIPS site will be located on a section of the Tuross River that runs in a north-easterly direction through the valley on the western side of Bodalla State Forest.

The TRIPS will abstract river flow and direct flow to the Eurobodalla Southern Storage facility. It will consist of a 4.5 m diameter, 18 m deep concrete wet well with 3 submersible flight pumps receiving water from an inlet screen installed in the flowing river. This screen will be protected by marine piles. Associated ancillary infrastructure will include concrete structures used in the operation and maintenance of the pump station, flow control and sampling instrumentation and all associated electrical works. Power will be fed by a new transformer, and power and water flow will be provided by new in ground services. Control of the new infrastructure will take place remotely, with a Supervisory Control and Data Acquisition (SCADA) system being developed to monitor, control and report fault status of the new infrastructure.

The TRIPS component of the overall EES Project is divided into two stages, specifically:

- Stage 1 – Clearing of the Tuross River Intake Pump Station (TRIPS) site. This stage of the Project has since been completed
- Stage 2 – Construction of the river intake pump station component of the works (covered by this CEMP and Sub-plans)
- Stage 3 - Clearing and construction of the remaining components of the Eurobodalla Southern Water Supply Storage (which will be covered by a separate CEMP and Sub-plans).

This CFFMP relates to Stage 2 only.

1.2.2 Construction activities

The Stage 2 - TRIPS construction works would include:

- Site mobilisation and preparation of work area including:
  - Traffic control and erection of site fencing
  - Installation of erosion and sediment control as outlined in this CSWMP
  - Floating of plant and equipment

- In-river works, likely involving:
  (a) Crane and barge mobilisation/demobilisation
  (b) Drilling of intake pile and fender piles
  (c) Bulk excavation to platform level, likely involving:
  (d) Excavation of access track cut into river bank face
  (e) Batter stabilisation and anchoring
  (f) Intake Pipe Installation, likely involving:
  (g) Staged excavation of intake trench
  (h) Assembly, installation of intake pipe
  (i) Concrete encasement and backfill of intake pipe
  (j) Wet well construction and commissioning, likely involving:
  (k) Completion of wet well excavation
  (l) Construction of wet well
  (m) Backfilling and installation of retaining wall
  (n) Installation of in-ground services such as wet well valve chamber pipework, drainage, electrical
  (o) Roadworks and finishing.

2 Purpose

The purpose of this CFFMP is to describe how impacts on flora and fauna will be minimised and managed during the Stage 2 – TRIPS construction.

The Development Consent SSD-7089, provided by the Minister for Planning, states that the Conditions are required to:

- Prevent, minimise, or offset adverse environmental impacts
- Set standards and performance measures for acceptable environmental performance
- Require regular monitoring and reporting
- Provide for the ongoing environmental management of the development.

Condition B2 states The CFFMP must form part of the CEMP required by Condition C2 and, in addition to the general management plan requirements listed in Condition C1, the CFFMP must include the conditions that are described in Table 2-1 below. Additional conditions are given in Condition of Consents Appendix Section 3.1.

Table 2-1 Construction Flora and Fauna Management Conditions of Development Consent SSD-7089

Condition	Section where condition addressed in CFFMP
a. measures to ensure biodiversity values not intended to be impacted are delineated by mapping of 'no-go areas' and the installation of on-site measures such as temporary exclusion fencing prior to clearing,	Refer to Section 6.1.3.
b. measures to minimise the risk of introducing weed species via construction vehicles, plant and equipment and control of pest and weed species existing at the site,	Refer to Section 6.1.2 and Appendix A.
c. method of vegetation removal and measures to minimise impacts outside the water storage facility construction boundary and within the perimeter road construction boundary as a result of the equipment used for clearing and general access for heavy vehicles and construction plant and equipment,	Clearing is not applicable to the Stage 2 – TRIPS construction.
d. options to reuse cleared vegetation, in preference to burning, such as relocation of hollow logs for habitat and mulch for use in areas to be revegetated within the site and use elsewhere within the local area	Clearing is generally not applicable to the Stage 2 – TRIPS construction. However, requirements relating to habitat retention are reiterated in Section 6.1.6 for reference.
e. measures to minimise the impacts on fauna within the site including the installation of nest boxes prior to clearing, relocation of fauna to adjacent habitat (including any fish during dewatering of the cofferdam), staged clearing and timing of clearing outside breeding seasons, and	The TRIPS site has already been cleared of vegetation (refer to Section 1.2.1 above). However, fauna handling protocols are provided in Section **Error! Reference source not found.** in case of unanticipated finds, or if additional vegetation clearing is required, or where injured wildlife are otherwise encountered at the site. Coffer dam and nest box conditions are not relevant to this Stage 2 – TRIPS construction.
f. details on rehabilitation and revegetation including:	Section 6.4 sets out revegetation requirements relevant to the Stage 2 -TRIPS construction site. Conditions (i) and

Condition	Section where condition addressed in CFFMP
(i) use of locally indigenous plant species including collection of seed prior to clearing for this purpose, (ii) for construction areas outside the full supply level including the construction compounds, on-site quarry areas and the new storage access road batters, (iii) for the construction area at the existing water treatment plant (WTP) including for the bed and banks of the Tuross River affected by the temporary cofferdam.	(ii) are relevant to the larger storage site, and so are not managed under this CFFMP.
Appendix 3.1 • plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas.	Refer to Section 4. Revegetation area details pending finalisation within the landscaping plan, and guidance is also provided in Section 6.4.
Appendix 3.1 • pre-clearing survey requirements	Clearing is not applicable to the Stage 2 – TRIPS construction.
Appendix 3.1 • procedures for unexpected threatened species finds and fauna handling.	The TRIPS site has already been cleared of vegetation (refer to Section 1.2.1 above). However, fauna handling protocols are provided in Section **Error! Reference source not found.** in case of unanticipated finds, or if additional vegetation clearing is required, or where injured wildlife are otherwise encountered at the site.
Appendix 3.1 • procedures addressing relevant matters specified in the Policy and guidelines for fish habitat conservation and management (DPI Fisheries,	There are no direct impacts to fish habitat in this stage. The CSWMP covers other potential impacts.

2.1 Objectives

The CFFMP must outline the implementation of all avoidance, mitigation and management measures relevant to the protection of native flora and fauna, including threatened species and endangered ecological communities referred to in the EIS and Development Consent SSD-7089. By outlining these avoidance, mitigation and management measures the CFFMP will provide technical input to assist in the execution of the TRIPS construction contract.

2.2 Targets

The following targets have been established for the management of flora and fauna impacts during the Stage 2 – TRIPS construction:

- Ensure full compliance with the relevant legislative requirements, EIS, and Development Consent SSD-7089
- No disturbance to flora and fauna outside the proposed construction footprint and associated access tracks and site compounds
- No increase in distribution of weeds currently existing within the Project Areas
- No new weeds introduced to the Project Areas
- No transfer of plant diseases or pathogens to or from work areas

- All fauna species encountered during construction are handled humanely in accordance with industry standards
- No pollution or siltation of aquatic ecosystems, wetlands, endangered ecological communities or threatened species habitat
- Minimise barriers to fauna movement.

3 Environmental requirements

3.1 Legislation

All legislation relevant to this CFFMP is included in Section 2 of the CEMP, including the following:

- EP&A Act
- *Biodiversity Conservation Act 2016* (BC Act)
- *Fisheries Management Act 1994*
- *Biosecurity Act 2015.*

3.2 Additional approvals, licences, permits and requirements

As part of the EP&A Act, there are Conditions of Development Consent SSD-7089 that have been specified by the Minister for Planning that the Project must comply with. These Conditions are stated in Section 2.

The Project was determined as an SSD, and as such, it must comply with the relevant guidelines for SSD under the EP&A Act.

3.3 Guidelines

The main guidelines, specifications and policy documents relevant to this CFFMP include:

- *Best Practice Management Guidelines for Phytophthora cinnamomi within the Sydney Metropolitan Catchment Management Authority Area* (Botanic Gardens Trust 2008)
- *New South Wales Weed Control Handbook* (DPI 2018)
- *Hygiene protocol for the control of disease in frogs* (DECCW 2008)
- *Australian Standard AS4373 Pruning of Amenity Trees* (Standards Australia 2007)
- *Australian Standard AS4970 Protection of Trees* (Standards Australia 2009)
- *NSW Biodiversity Offsets Policy for Major Projects* (OEH 2014).

4 Existing environment

4.1 Location and surrounding terrain

The Project's location is approximately 30 kilometres south of Moruya within the Eurobodalla Local Government Area. The TRIPS site is located along the eastern bank of the Tuross River, just south of the existing water treatment facility on Eurobodalla Road – Lot 1 DP 1168581. The TRIPS facility will occur on a section of the Tuross River that runs in a north-easterly direction through the valley on the western side of Bodalla State Forest. The extent of the Tuross River occurring within the TRIPS site has created a steep bank (refer to Photograph 4-1 and Photograph 4-2 below).

Photograph 4-1. The steep bank of the Tuross River within the TRIPS site supports extents of both vegetated and rocky terrain

Photograph 4-2. Vegetated and rocky terrain on the banks of the Tuross River

The site was cleared early in 2020, under a separate, approved CEMP and CFFMP. Three mature trees remain on the TRIPS site, including a habitat tree.

4.2 Threatened Ecological Communities

As previously mentioned, the Plant Community Type (PCT) (1108/SR608) identified within the TRIPS site prior to the site being cleared, was a component of a TEC. Specifically, PCT1108/SR608 is a component of *River Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions*. This community is listed as an Endangered Ecological Community under Schedule 2 of the BC Act. No EPBC listed TECs were found to occur within the development site.

The TRIPS site has been cleared according to the approved clearing boundary (Figure 4-1) under separate approvals, therefore will not be discussed further.

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COORDINATE SYSTEM GDA 1994 MGA Zone 56

FIG NO. 4-1

FIGURE TITLE Existing Environment

PROJECT NO. 30012466

PROJECT TITLE Eurobodalla Southern Storage TRIPS CFFMP

CREATED BY FA13847

SOURCES Roadnet MDS 2017
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Location: I:\projects\30012835 - Eurobodalla Southern Storage\140 Deliverables\02 CEMP\FFMP\GIS\30012835_Figure_1.mxd

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4.3 Fauna habitat

Fauna habitat types that remain at the TRIPS site following the approved clearing are listed in Table 4-1 below.

Table 4-1 Fauna habitat types in the TRIPS site

Name	Habitat features
Hollow bearing trees	Nesting, roosting and sheltering habitat for numerous threatened and non-threatened birds, arboreal mammals and microbats. Species predicted to occur that may utilise this resource on site include *Callocephalon fimbriatum* (Gang Gang Cockatoo), *Tyto novaehollandiae* (Masked Owl) and various microbat species.
Fallen tree trunks, woody debris and deep leaf litter	Sheltering habitat for small terrestrial mammals, amphibians, and reptiles.
Access roads and pathways	Foraging habitat and flyways for microbats.
Tuross River	Riparian vegetation contains foraging, nesting, roosting and sheltering habitat for small, medium and large birds, arboreal mammals, as well as providing connectivity through cleared agricultural land. River provides foraging habitat for threatened and non-threatened microbat species. The river also provides foraging habitat for water birds, namely birds in the groups Anseriformes, Ciconiiformes and Coraciiformes.

4.4 Threatened fauna

Threatened fauna species identified during the ESS EIS surveys and those which were predicted to occur using the Biobanking Calculator are listed in Table 4-2. These include species known to be associated with the site's vegetation type in this Bioregion. Potential impacts to habitat of these species has already been considered under offset calculations for the BAR and clearing of potential habitat has been completed (refer to Section 1.2.1 above). There is a small potential for there to be incidental finds of these species in the construction area. None of these species has been identified as a requiring specific attention on site. All native fauna must be unharmed even if there are doubts to its identity.

Table 4-2 Threatened fauna recorded/predicted to occur in the TRIPS site

Common name	Scientific name	BC Act	EPBC Act	Recorded
Regent Honeyeater	*Anthochaera phrygia*	CE	CE	-
Gang-gang Cockatoo	*Callocephalon fimbriatum*	V	-	✓
Varied Sitella	*Daphoenositta chrysoptera*	V	-	✓
Spotted-tailed Quoll	*Dasyurus maculatus*	V	E	-
Eastern False Pipistrelle	*Falsistrellus tasmaniensis*	V	-	-
Little Lorikeet	*Glossopsitta pusilla*	V	-	-
Little Eagle	*Hieraaetus morphnoides*	V	-	-
Square-tailed Kite	*Lophoictinia isura*	V	-	-
Eastern Coastal Free-tailed Bat	*Micronomus norfolkensis*	V	-	✓
Southern Myotis	*Myotis macropus*	V	-	-

Common name	Scientific name	BC Act	EPBC Act	Recorded
Turquoise Parrot	*Neophema pulchella*	V	-	-
Barking Owl	*Ninox connivens*	V	-	-
Powerful Owl	*Ninox strenua*	V	-	-
Scarlet Robin	*Petroica boodang*	V	-	-
Koala	*Phascolarctos cinereus*	V	V	-
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*	V	-	✓
Greater Broad-nosed Bat	*Scoteanax rueppellii*	V	-	✓
Diamond Firetail	*Stagonopleura guttata*	V	-	-
Masked Owl	*Tyto novaehollandiae*	V	-	✓

4.5 Aquatic fauna

Species recorded in freshwater and estuarine habitats during investigations for the EIS, as well as those predicted to occur, are shown in Table 4-3 below.

One threatened aquatic fauna species, *Prototroctes maraena* (Australian Grayling), had previously been recorded in the Tuross River by NSW Fisheries in 2003/04. *Prototroctes maraena* was not detected in subsequent sampling or surveys for the EIS. The Aquatic Ecological Assessment (écologique 2017) prepared for the EIS determined that it was unlikely both that the Australian Grayling was present in the development site and that the development site was an important habitat for the species.

Table 4-3 Aquatic fauna recorded in the Tuross River

Common name	Scientific name	BC Act	EPBC Act
Short-finned Eel	*Anguilla australis*	-	-
Long-finned Eel	*Anguilla reinhardtii*	-	-
Plague Minnow	*Gambusia holbrookii**	-	-
Striped Gudgeon	*Gobiomorphus australis*	-	-
Firetail Gudgeon	*Hypseleotris galii*	-	-
Australian Smelt	*Retropinna semoni*	-	-
Mullet (juvenile)	*Mugil cephalus*	-	-
Freshwater Shrimp	*Paratya australiensis*	-	-

** denotes an introduced species*

The fisheries habitat classification for each of the waterways referred to above is provided in Table 4-4. TRIPS construction does not affect important fish habitats.

Table 4-4 Aquatic habitat in the TRIPS site

Waterway	Classification	Description
Tuross River	Class 1 Waterway, major key fish habitat (reference AE report)	Sand-bedded meandering river with an intermittent/ephemeral discharge regime. Limited cobbles and gravels. Adjacent vegetation = PCT SR608

4.6 Aquatic flora

Species recorded in freshwater and estuarine habitats during investigations for the EIS are shown in Table 4-5.

Table 4-5 Aquatic flora recorded in the Tuross River

Common name	Scientific name	BC Act	EPBC Act
Dense water weed*	*Egeria densa*	-	-
Spotted Knotweed	*Persicaria praetermissa*	-	-
Water Pepper	*Persicaria lapathifolia*	-	-

5 Environmental impacts

5.1 Bushfire

Fires affected the site of the storage area during the Summer 2019-2020 fires. The TRIPS site was unaffected and previous fire history is unknown. Construction activity constituting hot works will not occur in outside environments during times of total fire bans.

5.2 Ecological impacts

The biodiversity impacts associated with the Stage 2 – TRIPS construction is discussed in the EIS, BAR and Aquatic Ecology Report. Those relevant to the TRIPS construction are summarised in Table 5-1 below. As this area has already been cleared, this CFFMP only details management measures relevant to construction activities.

Table 5-1 Summary of potential impacts of the Stage 1 TRIPS site clearing to terrestrial ecology

Potential Impact	Details	Extent/Scale	Relevant mitigation measure
Fauna mortality.	May result from earthworks or collisions with vehicles or machinery.	Most likely during clearance activities.	Delineation of no-go zones. Fauna management protocols
Degradation of aquatic habitats.	Caused by changes in run-off, infiltration, pollution and erosion. May influence downstream habitats.	Short term changes in water quality which could impact aquatic ecology.	Erosion and sediment control. See CSWMP document.
Edge effects and weed invasion.	Vehicles and plant may transport weed propagules into the development site. Disturbed edges area vulnerable to weed establishment	Cleared edges adjacent to retained native vegetation.	Implementation of hygiene control points during site set up. Weed control and management.
Pests and pathogens.	Vehicles and plant may transport pathogens into the development site. Clearing of native vegetation and increased human activity increase the risk of pest animal species increasing.	May occur during construction and operational phases.	Implementation of hygiene control points during site set up.
Risks of the introduction and spread of water weeds.	Egeria densa (Leafy Elodea, Dense Waterweed, Egeria), a water weed is reasonably widespread in the TRIPS site.	Already present in the Tuross River. Risk is only to spreading to other water bodies	Hygiene control points to remove vegetation debris from any in-river equipment before leaving site.

5.3 Tree Hollow Loss

The remaining hollow bearing trees on the TRIPS site would not be cleared during the Stage 2 construction. A hollow-bearing tree and one large fallen log remain within the TRIPS post-clearing. The largest tree was retained specifically to save its high habitat value. Three hollow-bearing trees occur just outside the TRIPS clearing boundary. These have been identified and marked. The hollow-bearing tree that remains on site is to be managed so that direct impacts are avoided (Table 5-2).

Table 5-2 Tree hollow remaining in the TRIPS clearing boundary

	Hollow 1 size (centimetres)	Hollow 2 size (centimetres)	Hollow 3 size (centimetres)
Tree 1 (Retained)	20+	11-15	6-10

6 Mitigation and management measures

6.1 Vegetation management during construction

6.1.1 Environmental inductions

An environmental induction must be carried out by all contractors and subcontractors working on the site prior to works commencing.

Minimum points to include

- Importance and location of hygiene control points.
- Location of no-go zones and avoiding disturbing vegetation and fallen logs or rocks in these areas.
- Instructions to stop work and reporting unexpected fauna finds in the construction areas to the Site Engineer.

6.1.2 Hygiene control points.

Site set up includes establishing site access points located off Eurobodalla Road. Hygiene control points will be maintained at all site access points for tracked vehicles and machinery. A mixture of bleach to water with a ratio of 1:1 should be used for all wash down procedures in in line with best practice methods of managing the spread of Phytophthora cinnamomic and Chytrid fungus. Hygiene management protocols are detailed in Appendix A.

6.1.3 Delineation of No-go zones

'No-go zones' are any areas outside the designated boundary indicated in Figure 4-1 in Section 4.2 above. A clearing boundary was identified prior to clearance and 'No-go zones' marked with high visibility bunting. The Project Manager/Project Engineer/Site Supervisor must ensure this boundary marking remains in place throughout the construction.

The retained habitat trees on the site, (Tree 1), which can clearly be identified as being the largest tree on site has specifically been retained because of its high habitat value. The tree was flagged with high visibility bunting and identified for avoiding any damage. Excessive ground disturbance should also be avoided within its Tree Protection Zone (TPZ – which equates to 12 time the trunk diameter measured at a height of 1.4 metres above ground, as per *AS 4970-2009 Protection of trees on development sites*). Where possible, these protection measures must remain in position and intact throughout construction so that the TPZ for this tree is marked as a no-go zone.

Moreover, where weed control measures are to be used within the TPZ of this tree, it is recommended that a suitable herbicide chemical formula be used in consultation with an arborist and/or hand removal of weed species be used as preferred weed control measures.

6.1.4 Weed control and management

Weed control has been carried out prior to vegetation clearing for construction works. Ongoing weed control is required to prevent the seeding cycles of any weeds on disturbed areas prior to landscaping and revegetation. This is particularly given the case as the Stage 1 – Clearing of the Tuross River Intake Pump Station (TRIPS) site works commenced in first quarter 2020, whereas the Stage 2 - TRIPS construction is not scheduled to commence until fourth quarter 2020 at the earliest. This means that various weed species will have had sufficient time to re-establish themselves at the site in the interim. Moreover, earthworks activities during the Stage 2 - TRIPS construction works would lead to the disturbance and relocation of various weed species propagules throughout the site. Weed control measures would therefore be required to be employed at the site so that post-construction vegetation rehabilitation measures have a better chance of success.

Specific weed control measures are contained within Appendix A.

6.1.5 Erosion and Sediment Control

Erosion and sediment control measures will be implemented to minimise impacts to retained vegetation and waterbodies as a result of erosion and water runoff. The specific erosion and sediment control measures as detailed within the Construction Soil and Water Management Plan (CSWMP).

6.1.6 Retention of fallen logs and bushrock.

Fallen logs greater than 10 centimetres in diameter and bushrock greater than approximately 20 centimetres by 20 centimetres in size have been retained within, or adjacent to the clearing boundary. Where possible, these should not be removed during the construction phase. If construction activities require these to be moved, they should be moved

to retained vegetation while causing minimal disturbance of the no go zone with machinery. Should any fauna be found during the relocation process, it should be relocated in accordance with the protocols detailed in Section 6.2.

6.1.7 Preclearing surveys

This measure is included in the unlikely event that additional trees or vegetation require clearing during the construction phase. Immediately prior to clearance of any vegetation, pre-clearing surveys and inspections for threatened and non-threatened fauna must be conducted. The surveys and inspections, and any subsequent relocation of species and associated management measures, must be undertaken under the guidance of a suitably qualified and experienced ecologist. Mowing or slashing of regrowth in the areas already cleared during the initial clearing phase will not require preclearing survey or the involvement of an ecologist.

6.1.8 Additional vegetation clearing

This measure is included in the unlikely event that additional trees or intact native vegetation require clearing during the construction phase. It is not relevant to mowing or slashing of regrowth in the areas already cleared during the initial clearing phase of the TRIPS site. Vegetation clearing if required would take place as a two-stage process, with understorey and non-hollow bearing trees removed prior to habitat trees. This Section 6.1.8 pertains to the first stage of vegetation clearance. Vegetation clearance must be overseen by a suitably qualified ecologist. The following best-practice vegetation clearing methodology will be applied to the TRIPS site:

- Light vegetation (shrubs, herb, forbs and grasses) should be cut down to ground level. This could be achieved with either a slasher of flail mower
- Grubbing and soil disturbance should be avoided. Retained roots can assist in soil stabilisation and some regrowth and coppicing can assist in the rehabilitation stage post construction
- Slashed native vegetation, unless there is a specific need to remove, should be left in place
- Weed and exotic vegetation in seed should be removed and disposed of appropriately in order to prevent spread as required under the *Biosecurity Act 2015*. This would namely include the Honeysuckle and Blackberry vines
- Larger trees within 10 metres of the clearing boundary are to be cut down with a chainsaw, not pushed over. Trees are to be felled into the clearing boundary to minimise damage to retained vegetation. Trunks and roots are to be left in situ to minimise soil erosion
- Trees could be chipped, and the mulch used in windrows to control potential run off if appropriate and/or spread over disturbed earth to avoid soil erosion
- Larger timber can be removed from site. However, where practicable, some should be retained as fauna habitat. The ecologist present for habitat tree removal should be consulted during this process.

6.1.9 Habitat tree clearing

Again, this measure is only included in the unlikely event that additional habitat trees require clearing during the construction phase. These trees have been marked with an 'H' and/or flagged with flagging tape. Habitat tree clearance must be overseen by a suitably qualified ecologist. The following best-practice vegetation clearing methodology will be applied to the identified fauna habitat trees within the TRIPS site:

- Removal of understorey vegetation and non-hollow bearing trees will occur at least 48 hours before habitat trees are removed
- HBTs are felled in the following method:
  - HBT to be knocked or shaken with an excavator bucket or other machinery to encourage fauna to evacuate the tree immediately prior to felling
  - Pause and wait five minutes to give fauna the opportunity to escape
  - Repeat knocking or shaking HBT with excavator bucket
  - Pause and wait five minutes to give fauna the opportunity to escape
  - Using the excavator bucket, slowly lower the tree to the ground. Where feasible, HBT should be lowered in a direction or position such that damage to hollows are minimised
- Felled trees must be left for a short period of time on the ground to give any fauna trapped in the trees an opportunity to escape before further processing of the trees
- Felled hollow bearing trees must be inspected by an ecologist as soon as possible (not any longer than 2 hours after felling)

- Should fauna be observed either during the felling process or during the inspection by an ecologist, the tree should be retained in place for 24 hours to allow fauna the opportunity to move on during the night.

6.2 Fauna management protocols

6.2.1 General protocols

Stock piles or materials can be used as temporary shelter sites for some animals. Should fauna be observed by workers on the Project Area prior to or during the movement of materials, and there is a risk these activities may harm the animal or pose risk to site personnel, the following steps will be taken:

- Stop all work in the vicinity of the fauna and immediately notify the Project Manager/Project Engineer/Site Supervisor
- Preferably allow fauna to leave the area without intervention
- If the fauna cannot or will not leave the area without intervention, the fauna will be removed by contacting a licensed fauna ecologist or wildlife carer with specific animal handling experience as follows:
  - Cover larger animals with a towel or blanket and place in a cardboard box and/or canvas bag
  - Place smaller animals in a cotton bag, tied at the top
  - Keep the animal in a quiet, cool, ventilated and dark located away from noisy construction activities until it can be relocated
  - Aquatic fauna are to be placed in plastic aquaria or a plastic bag with sufficient amount of water. Frogs will be transported in moistened plastic bags (1 frog/bag) with a small amount of leaf litter. The translocation of frogs shall be in accordance with the Hygiene Protocol for the Control of Disease in Frogs (refer to Section 6.2.4 below for more details)
  - If the animal cannot be handled (i.e. venomous reptiles):
    - Exclude all personnel from the vicinity with fencing and/or signage
    - Record the exact location of the animal/s and provide to the Project Manager/Project Engineer/Site Supervisor or appropriate rescue agency (i.e., WIRES).

6.2.2 Injured fauna

Should fauna be injured during construction, the following steps will be taken:

- Call the appropriate rescue agency immediately and follow any advice provided by the agency
- Once the rescue agency arrives at the site, they are responsible for the animal. Any decisions regarding the care of the animal will be made by the rescue agency
- In the event the rescue service and/or local veterinary service cannot be contacted, the injured animal will be delivered to the relevant agency as soon as practicably possible.

The relevant fauna rescue services and local veterinary surgeries contact details are listed in Table 6-1.

Table 6-1 Fauna rescue services' contact details

Agency/Business	Contact Number
WIRES	1300 094 737
Vet 1 – Narooma Veterinary Hospital	(02) 4476 1125
Vet 2 – Moruya Veterinary Hospital	(02) 4474 2532

6.2.3 Relocation of fauna

Relocation of fauna adjacent to the footprint will be carried out by a wildlife rescuer if self-relocation is not a suitable option. If the animal is not injured or stressed, it may be released nearby in an area that is not to be disturbed by the Stage 2 – TRIPS construction works, in accordance with the following procedures:

- Site identified as suitable release points by the a wildlife rescuer

- Release site will contain similar habitat and occur as close to the original capture location as possible
- If the species is nocturnal, release will be carried out at dusk
- Release would generally not be carried out during periods of heavy rainfall
- Hollow-dependent species, particularly those with dependent young, shall be released into a temporary nest box.

Adjacent riparian vegetation directly south of clearing site offers the best relocation site for most species. The area of riparian vegetation maintains some connection with native vegetation and is in closest proximity to Bodalla State Forest.

6.2.4 Important fauna handling information

It is important to consider the following information when handling fauna:

- Some animals require particular handling (e.g. venomous reptiles, raptors) and should only be handled by appropriately qualified personnel i.e., WIRES representative(s)
- If handling bats, the handler must be vaccinated against the Australian Bat Lyssavirus (ABL – a form of rabies)
- Any frog handling will be carried out in accordance with the Hygiene Protocol for the Control of Disease in Frogs (DECC 2008). This protocol recommends onsite hygiene precautions be carried out to minimise the transfer of disease between and within wild frog populations. Measures recommended include:
  - Thoroughly cleaning/disinfecting footwear and equipment when moving from one site to another
  - Where necessary in high risk areas, spraying/flushing vehicle tyres with a disinfecting solution
  - Cleaning/disinfecting hands between collecting samples/frogs (preference would be given to using bags, rather than bare hands to handle frogs). Limiting one frog or tadpole to a bag. Bags should not be reused.

6.3 Unexpected finds

If any threatened species are observed within the Project Area during the Stage 2 – TRIPS construction activities that were not identified within this plan, the following procedure will be followed:

- Immediately cease all work likely to affect the threatened species
- The Project Manager/Project Engineer/Site Supervisor shall contact the relevant representatives from Eurobodalla Shire Council to inform them of the situation
- The Project Manager/Project Engineer/Site Supervisor shall then contact the following stakeholders to determine the appropriate corrective actions and additional safeguards to be carried out:
  - DPIE ESS (131 555)
  - Others as instructed DPIE ESS
- The adequacy of existing safeguards will be reviewed in consultation with the above stakeholders
- Project Manager/Project Engineer/Site Supervisor to record find using the Environmental Incident Reporting process where required following consultation with Council representatives. All relevant characteristics of the find should be recorded to the extent practicable
- Following consultation with all relevant stakeholders, the Environmental Representative shall implement any corrective actions and additional safeguards
- Following confirmation by the Environmental Representative that all appropriate safeguards have been implemented, construction works shall recommence
- All relevant Project documentation would be updated to display the new findings and subsequent management measures required. This would include such documents as the CFFMP (and associated documents) and the CEMP.

6.4 Rehabilitation and re-vegetation

The very steep riverbank section of the Project Area provides some challenges for revegetation on account of accessibility. Retained rootstock of trees and shrubs and the existing surface soil profile are to be preserved as much as possible surrounding the excavation of the intake trench and access track and this is expected to contribute to some natural revegetation post construction. Additional direct seeding with local native grasses in conjunction with hydromulching could be considered if feasible on this embankment and in other disturbance areas.

A hydromulching seed mix containing the following species is proposed:

- *Bothriochloa macra*
- *Microlaena stipoides*
- *Poa labillardieri*
- *Lomandra longifolia*
- and companion grasses- Sterile Rye corn or Millet (depending on season), Perennial rye grass.

Direct planting of native grasses and sedges may be used in areas where hydromulching or direct seeding is not feasible. This could include planting appropriate grasses and sedges among the rocky rip-rap along drainage lines and around the drainage sump.

Revegetation surrounding the operational infrastructure will require alignment with the landscape subplan to be produced in latter stages of the Project to incorporate features such as asset protection zones and accessibility. Revegetation should incorporate the following requirements to be implemented by a qualified bush regeneration contractor.

2. It is noted that approximately 0.26 ha of vegetation was cleared during Stage 1 of the TRIPS (refer to Section 1.2.1 above). It is therefore recommended that revegetation at the TRIPS site be undertaken to achieve this quantum of native vegetation where it is reasonable and feasible to do so (noting the landform challenges presented by the finished TRIPS site may not allow this to be achieved). Use should be made of native trees, shrubs and ground covers adjacent to retained vegetation where reasonable and feasible to do so.
3. Re-vegetation should include local provenance species and include at least three tree species aligned to PCT 1108 and other plants from the TRIPS site identified in the BAR (EIS Appendix E). A list of suggested species meeting these criteria are provided in Table 6-2 below, although this should not be seen as prescriptive given potential limitation on locally available stock.
4. Areas within the clearing area required to be kept open for APZ or operational purposes, or impractical to plant with trees and shrubs will be seeded or planted with local native grasses and groundcoves.
5. Retained exotic lawn adjacent to Eurobodalla Rd can be maintained as is by mowing and managed toprevent weed spread.

Table 6-2 Potential revegetation species found on the site or suitable for the vegetation community.

Revegetation species
Trees
Angophora floribunda
Eucalyptus elata
Eucalyptus botriyodes
Eucalyptus muelleriana
Casuarina cunninghamiana
Shrubs and small trees
Melicytus dentatus
Breynia oblongifolia
Acacia mernsii
Trema tomentosa
Leptospermum trinervium
Ground covers
Lomandra longifolia
Microlaena stipodes
Carex longebrachiata
Echinopogon ovatus
Dianella caeurlea

6.4.1 Weed management

On-going maintenance weeding is required for the successful establishment of revegetation. A weeds and pathogens management sub plan are included in Appendix A.

7 Monitoring

7.1 Monitoring schedule

Monitoring activities for key mitigation and management issues during construction is outlined in Table 7-1. Monitoring obligations are expected to be extended beyond the timeframes below when incorporated into the Stage 2 CEMP.

Table 7-1 Monitoring schedule for Mitigation and Management Measures

Measures	Monitoring	Timing	Performance Measures	Who	Reporting
Avoid and minimise clearing impacts to native PCTs where possible.	Visual inspection of clearance activity	Regularly – at least weekly during construction	No clearing in no go zone.	Site Engineer	On site reporting
Clearing limits will be clearly marked to prevent unnecessary clearing or damage.	Inspection of protected vegetation demarcation.	All times	All no-go zones clearly demarked with bunting or similar zone.	Site Engineer	On site reporting
Identify the location of any 'No Go Zones' in site inductions.	Induction signature	At time of induction	Induction material contains this information.	Site Engineer	Induction records.
Rehabilitating and revegetating areas with species that are endemic to the area.	Ecological inspection assessing dominant species and mapping of revegetated areas.	Progressively during TRIPS construction and post construction prior to Quay Civil demobilising from site.	70% Native cover by 1-year post construction or suitable mulch or rock coverage if season unfavourable for seed growth which will assist the Applicant (Eurobodalla Shire Council) to meet the 70% native cover by 1-year post construction target, noting that Quay Civil is contracted to hand control of the site including revegetation activities back to the Applicant before the 1-year post construction point	Bush regeneration contractor	Regeneration progress reporting.
Control weeds and feral pests.	Inspection during construction by Site manager for outbreaks.	Seasonal checks for high threat weeds outbreaks	New weed outbreaks contained before spreading.	Bush regeneration contractor.	Regeneration progress reporting

Measures	Monitoring	Timing	Performance Measures	Who	Reporting
			Weed density below 10% cover over revegetation areas.		
Control feral pest	Feral sightings recorded – e.g. rabbits.	Incidental sighting during construction.	Feral species are identified, and management activated in consultation with Eurobodalla Shire Council.	Site Engineer or regenerating contractors.	On site reporting Project Ecologist annual reports
Appropriate vehicle wash-down and hygiene facilities to clean vehicles maintained.	Inspection of availability and functionality of the facilities	Daily during construction	All tracked vehicles and heavy machinery cleaned prior to arrival and when leaving site.	Site Engineer	On site reporting

Appendix A Weeds and pathogens management sub-plan

Hygiene measures and protocols

The following general weed management measures are to be adopted for the clearing works in the TRIPS site:

- Light vehicles and mobile plant should be brought to site in clean condition to prevent the introduction of new weeds or pathogens. Likewise, soil and plant material should be cleaned from vehicles before leaving the site in order to prevent the transport of weeds into areas outside the development site
- Vehicle wash bays equipped with a high-pressure water cleaner and backpack or handheld sprayer containing disinfectant solution will be established at vehicle access points. Prior to entering site, the vehicle or plant (namely wheels, chassis, undercarriage) must be cleaned with the high-pressure water cleaner or hard bristled brush to remove loose soil and weed propagules. The vehicle must then be disinfected for pathogens using the disinfectant solution
- Boot washdowns will be located adjacent to site offices and ancillaries and equipped with a tub filled with disinfectant solution and scrubbing brush. Prior to accessing the site, boots must be washed in the disinfectant solution with the scrubbing brush used to remove dirt and mud

Most measures to prevent the colonisation of weeds in disturbed areas are to be addressed in the construction and rehabilitation stages, including follow up weed treatment and monitoring. No pre-clearance management of weeds is seen as necessary other than the appropriate disposal of any material removed.

Priority weed control

Weeds that are listed as 'priority weeds' for the Eurobodalla Shire Local Government Area must be removed from the site or controlled depending on the category of weed and according to the provisions of the *Biosecurity Act 2015*. Priority weed control is to be carried out across the entire site for the duration of the management works recommended in the CFFMP. Works will be undertaken according to industry best practices.

Primary Weeding

Primary weeding is the first round of weeding activity and involves the removal of most of the weed biomass present (shown in Figure A-1 below). Primary weeding methods include:

- 'Cut-and-paint', 'frill and fill', long stem scrape or target spraying of woody weeds (e.g., *Grevillea robusta*)
- Hand-removal and spot spraying of smaller woody, vine and herbaceous weeds
- Spot-spraying and hand-weeding of annuals (e.g. Blackberry, Fireweed and *Bidens pilosa*).

Primary weeding was to occur prior to construction commencing, however the status of weed management is not presently known.

Secondary weeds

Secondary weeding will occur approximately one to three months after the completion of primary weeding, depending on the amount of regrowth of herbaceous annuals (and other weeds that have an abundant seed source present in the soil). This will vary according to the timing of the primary weeding, insofar as regrowth will be stronger if primary weeding occurs during spring and summer, and slower during autumn and winter. The need for secondary weeding will also depend on climatic conditions in the intervening period (eg periods of sustained rainfall will promote germination of weed seeds and require secondary weeding to occur sooner than it would under dry conditions).

Secondary weeding will involve the targeted removal of priority weed regrowth and hand removal and spot spraying of exotic grasses, herbaceous weeds and seedlings of woody weeds.

Maintenance weeding

Maintenance weeding will occur after construction works and should target all exotic species in revegetation areas to reach a target cover of 10% exotic or less, with less than 2% priority weeds. Figure A-1 indicates the locations of weed infestations found prior to clearing. Propagules of some of these species are likely to result in regrowth during or following construction.

Herbicide Application

Herbicide applications by cut and paint, frill and fill, long stem scrape or spray will mainly use Glyphosate (or equivalent). Treatment of some noxious weeds species or grass weeds may require selective or residual herbicides. The use of herbicides on the site must be in accordance with labelling instructions and MSDS's and comply with the NSW Pesticides Act 1999. Herbicides should generally be applied when wind speeds are generally low. Where possible herbicide application should take place after two consecutive days with no rain; application should be delayed if rain is forecasted. Appropriate PPE should be worn during herbicide application.

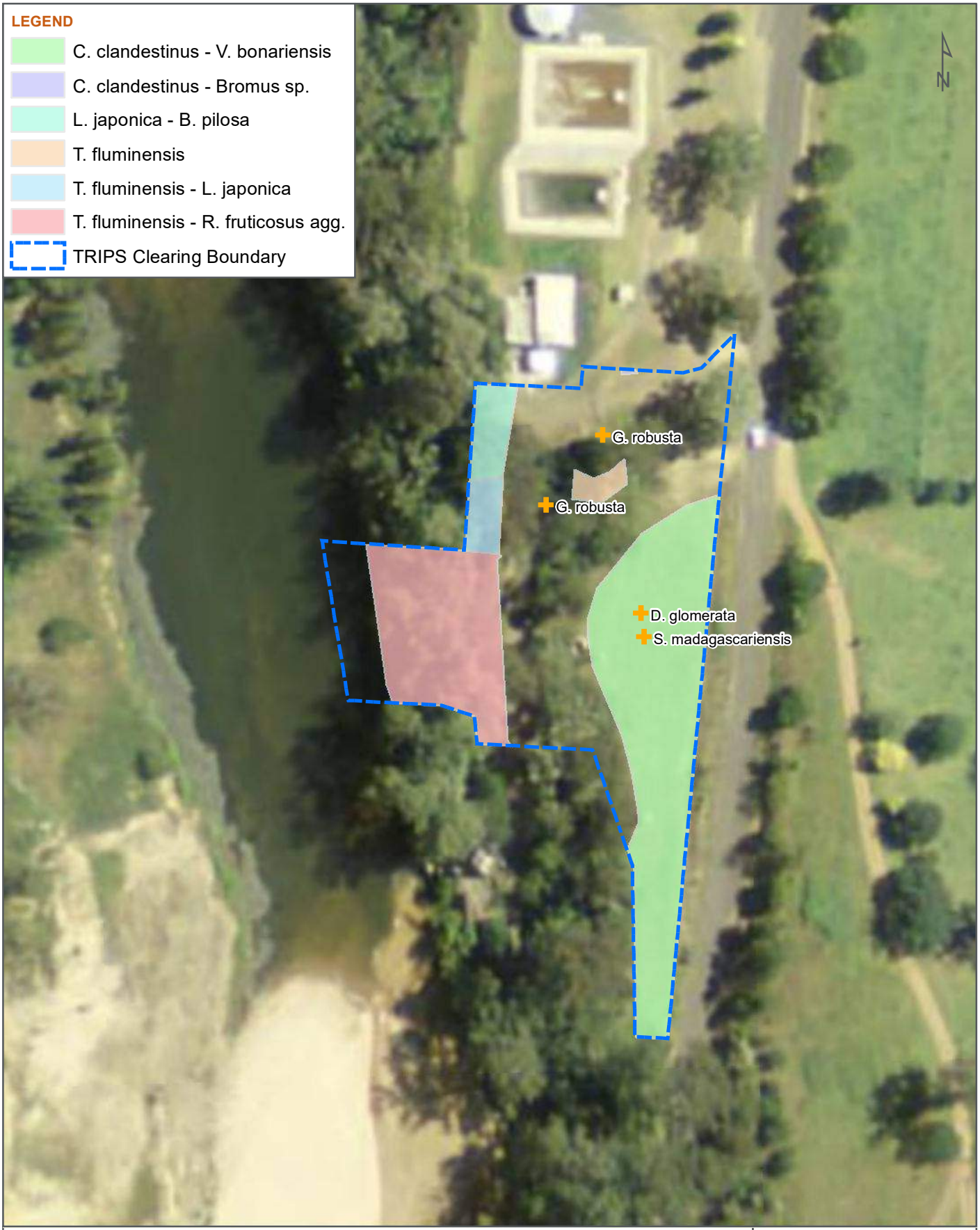

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FIG NO. 4

FIGURE TITLE Weeds and Exotic Flora

PROJECT NO. 30012466

PROJECT TITLE Eurobodalla Southern Storage TRIPS CFFMP

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Traffic Management Plan

Tuross River Intake Pump Station

Contract Number: 10018531

Quay Civil Project Ref: 20016

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Rev	Date	Revision Description	Prepared	Reviewed	Approved
0	28/09/20	Issued For Construction	N. Yekta	S. Wing	P.Kennedy

Table of Contents

1 Purpose

As part of Quay Civil's construction of the Tuross River Intake Pump Station (TRIPS) project, there will be significant movement of vehicles of various types. To assess, mitigate and monitor the impacts of this traffic movement, Quay Civil has prepared a Construction Traffic Management Plan (CTMP). This plan will outline key traffic management objectives, assess existing site conditions,

2 Traffic Management Objectives

Quay Civil shall undertake the works in a manner which aims to:

- Minimise and manage impacts on existing traffic including pedestrians and vehicles
- Minimise delays to traffic to a maximum of 15 minutes no more than twice an hour
- Limit damage to existing roads
- Maintain property access

This plan is written with the above key objectives in mind, and the various responses are written with the intent to comply with these objectives during the full construction duration.

3 Existing Site Environment

The main access to the site is from Eurobodalla Road, immediately adjacent to the Southern Water Treatment Plant. This access track is shown in Figure 1 and Figure 2.

Figure 1 - Photo showing access track into site from Eurobodalla Rd

Figure 2 - Showing access track into site and fenced entrance gate

Eurobodalla Rd runs in a North-South direction almost parallel to the Tuross River. This will be the only route for transporting machinery, construction equipment and waste removal. Eurobodalla Road has two traffic lanes, is sealed and approximately 7 m wide. Speed limits are between 60 – 80 km/h. According to Appendix J of the SMEC Environmental Management Plan, as of 2017, the section of Eurobodalla Road where Quay Civil will be producing the most impact has an estimated daily traffic flow of 464 vehicles, with a peak hour (7AM to 9AM) traffic flow of 65 vehicles. The location of the TRIPS project on Eurobodalla Road is shown in Figure 3.

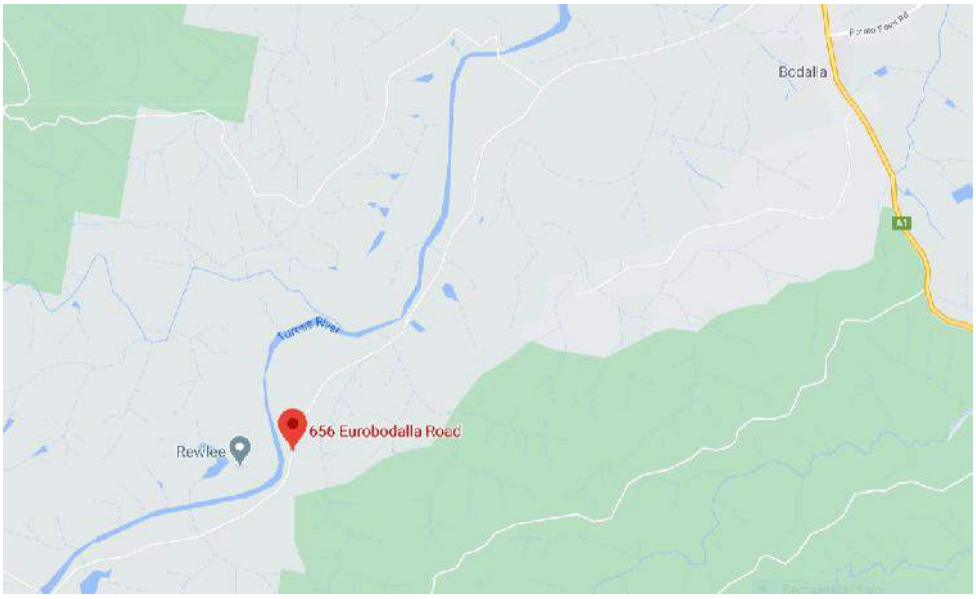

Figure 3 - Location of TRIPS project on Eurbodalla Rd (approximate)

4 Impacts

Traffic impacts caused by the construction works will mainly occur Eurobodalla Road due to the increase in traffic volumes.

Key traffic issues will mainly relate to:

- Access to the site by heavy vehicles for delivery of materials, equipment and machinery
- Disruption to traffic due to road/lane closures brought about by construction activities
- Increase in travel time along Eurobodalla Road
- Ability of the roads to handle the volume of construction traffic
- Road safety

4.1 Impacts from Construction Traffic

Increased traffic movements generated through the construction phase will result from the delivery of construction materials, personnel and equipment. Movement of these vehicles will be managed to minimise the impacts to the local community, who will be kept informed of the construction activities throughout the course of the project. Public information processes are listed in Section 5 of this plan. This will have a particular impact during the earthworks phase, where truck movements around the site will spill out as material is taken from site to Eurobodalla Road close to the Nerrigundah Bridge for roadworks fill. At times, there will also be an impact on the movement of oversize trucks.

4.2 Impacts from Construction Access Points

Access to work sites will only be through approved access tracks and construction corridors. Quay Civil have designated two (2) site access points: one through the existing access track and one cut in to allow the movement of trucks. This is shown on the attached site plan.

Specific traffic control plans (TCPs) for construction traffic movements will be developed progressively during the works and submitted for approval to the Principal prior to commencing works. The TCPs will include procedures and measures to maintain safe traffic movements on Eurobodalla Rd and allow safe access and egress to the site. The TCPs will be in compliance with Australian Standards and will be prepared by accredited personnel. During the project, traffic control operations will be monitored and audited to ensure that implementation complies with the intent of this plan.

4.3 Impacts from Road Blockage

Full and/or half road closures at the site entrance will occur as large items of plant (excavators etc.) are delivered or when an oversize load is brought to site. Full road closure is not anticipated to occur frequently; potentially only during the erection or removal of temporary signage.

5 Mitigation Measures

Site traffic management layout can be found on Quay Civil's site plan. This covers location of turn around bays, pedestrian and vehicle access, delivery areas, material storage and location of parking such that the movement of traffic can be minimised.

5.1 Project duration traffic signage and speed limits

Recognising that the movement of plant, materials and site vehicles into the TRIPS location will be happening regularly throughout the day, Quay Civil has compiled a traffic control plan where by the speed limit is reduced to 60 km/h for a distance of 430 m on either side of the site entrance. Signage will be provided up and down road to gradually warn incoming vehicles of the change in speed limit. Signage may include heavy vehicle warning signs and access roads to construction site signs.

During the period of signage set up, or for any period where the road around the site entrance must be partially blocked off, the speed limit will gradually reduce to 40 km/h. Traffic controllers will then slow traffic to a stop and direct vehicle movement around any obstacle.

5.2 Site set up and site traffic management

As part of the works, Quay Civil intend on site staff (subcontractors, site works and site staff) cars be parked adjacent to the Southern Water Treatment Plant. This will be well within the slow down zone around the site, and prevent the excessive movement of vehicles into and out of the construction compound, resulting in poor ground condition.

Larger vehicles such as excavators, bogies etc. will be parked within the construction compound overnight. They may also be left on the existing access track above the 1:100 flood level. Turn around bays and the cut in of additional access track has been considered in the site plan are included graphically for review as part of this plan.

Site Vehicle and site pedestrian interaction will be controlled with the use of a spotter during the movement of plant or craneage. Site pedestrian walkways will be demarcated as far as reasonably practicable to ensure access to pump station. During earthworks, dumpers and trucks will be moving into and out of the excavation zone with plant working and a crane set up on the road.

5.3 Movement of materials and deliveries

According to the traffic impact assessment provided in Appendix J of the environmental impact assessment provided by SMEC, the number of vehicles between the peak hours of 7AM to 9AM is estimated to be 65. As part of these vehicles, there is also a school bus route travelling to Bodalla. This means that movement of material or construction vehicles during this time should be avoided to prevent disruption. Quay Civil has identified a number of strategies to minimise the impact to these services, namely:

- Haul Roads to be defined based on entry and exit locations for material delivery as well as tip and quarry locations.
- Limiting trucks moving to quarries or fill points between the hours of 8AM and 9AM; this time should be spent filling or unloading to avoid clashing with the school bus route
- Trucks between quarry and site, or from site to various locations (e.g. landfill, supplier) should be spaced a minimum of 10 minutes apart where possible to prevent undue congestion
- Over size or over dimension vehicles to have required escort as per National heavy Vehicle Regulator and RMS requirements, and delivered outside of peak hours
- Maximise the on-site reuse of any material not required to be taken to the location of the RMS fill for use at a later date
- Heavy vehicle movements are spotted to ensure their travel is done safely from their parking place to the work front is safe and stable

To educate drivers regularly travelling to and from site, the site induction will cover issues regarding expectations of slow down, entrance and exit routes and the minimisation of hard braking. The induction will also cover emphasis on approved working hours and extent of approved traffic operations.

Construction Vehicles will be required to comply with the following:

- Prime movers and trailers shall have airbag / pneumatic suspension systems in lieu of conventional springs where economically feasible;
- Vehicles shall have a sound power level in compliance with ADR 28/01 specifications;
- Vehicles entering the site shall have a flashing amber light attached to the roof of the cabin and reversing alarms;
- Vehicles shall not use engine exhaust braking on Eurobodalla Road;
- Trucks hauling material over public roads shall be fitted with tight tailgates and shall be loaded with adequate freeboard of not less than 75mm and without precarious cones or piles of materials. Loose material shall be covered with tarpaulins;
- Flagmen shall be employed where haulage routes for heavy earthmoving equipment cross public roads; and
- Flagmen shall be employed in emergency situations to stop and direct traffic as necessary.

All deliveries to site by heavy vehicles, either regional or local, shall be accompanied by a delivery docket. The docket shall state, as a minimum, the following:

- point of origin;
- date and time of delivery to site;
- vehicle registration number; and
- materials or items delivered.
- The following vehicular movements are exempt from the above requirements:
    - vehicles proceeding to or from local lodgings either at the start or completion of a working day; and
    - vehicles with separate special “heavy load” permits.

5.4 Communication protocols and liaison

As part of the initial works, Quay Civil will liaise with the two most sensitive receptors as identified in the Construction Noise and Vibration Report, namely residences at 586 Eurobodalla Road and 758 Eurobodalla Road. After land owners have been approached and approval obtained by Quay Civil and Eurobodalla Shire Council, noise monitors will be set up at these residences during the initial pre-construction to provide a baseline noise measure. During this time, Quay Civil can establish a base line. By monitoring after the baseline for a full cycle of nominally four (4) weeks, Quay Civil will then establish the impact on the property of construction traffic.

In addition to the above, Quay Civil will work with Council to undertake a letter box drop campaign to key properties along Eurobodalla Road, such that the local community is aware that we are working in their vicinity and have a point of contact should there be undue disturbance due to construction traffic.

Quay Civil will erect signage whereby truck drivers entering the site can link in to the site UHF radio frequency and speak to the site team about their delivery. This way, the truck can be quickly managed, rather than idling near the road way and providing an impediment to the local traffic.

Quay Civil will provide the site supervisor's and site engineer's name (contact details on signage) as contacts in case of traffic noise complaint, and will log noise complaints with the following information:

- Date of complaint
- Date of occurrence of incident
- Time of occurrence of incident
- Location of incident
- Any license plate information of vehicles involved in complaint
- Name and address of person filing complaint
- Contact details of person filing the complaint

Quay Civil will raise any complaints with the Principal as they occur, and agree a strategy to ensure the complaints do not occur again. These could include:

- Education of any drivers involved
- Black banning of any companies who engage with repeat offenders
- Removal of uncooperative individuals from the project
- Additional passive construction signage to ensure slowdown in heavily affected areas

Quay Civil firmly believe that the local community will always have a stronger knowledge, and for this reason will engage with local traffic control companies, who provide service to Eurobodalla Shire Council through their Batemans Bay office. Any road closures or the like will be communicated to the Client and gain approval from local council well in advance of the date such that the local community can be informed.

Communication will be undertaken with local council with submission of TCPs for works to be undertaken, which will include notice to important services utilising this route. Site induction will include information about the risks of mobile plant and site vehicles travelling to and from site, and site personnel will be expected to use designated pedestrian areas. Spotters will be equipped with UHF radio to better direct flow of traffic.

5.5 Care of public roads

Before commencing work on site, Quay Civil will undertake an inspection of public roads which will be used by construction traffic. Quay Civil will include this in the dilapidation report, to be issued to and agreed by the PAP any local authorities if required.

5.6 Continuous Improvement

As part of Quay Civil's ongoing commitment to continuous improvement, and based on any feedback received both before and during construction, Quay Civil will modify this plan to include any further mitigation measures outlined.

5.7 References

- Eurobodalla Southern Storage – Tuross River Intake Pump Station Technical Specification
- EIS Appendix J - Traffic Impact Assessment
- Development consent (17/10/2019) B28 Traffic and Access

6 Assessment of TMP against EIS

Table 1 lists the per the SMEC Environmental Report Appendix J – Traffic Impact assessment. This report outlines Quay Civil's response to each of these criteria, and the section where this is addressed in this report.

Table 1 – Recommendations from traffic impact assessment relevant to TRIPS site

Traffic Impact Assessment Criteria	Section
Identify the traffic management requirements during construction	2
Describe the general approach and procedures to be adopted when producing specific TCP	2
Identify designated parking areas for construction workforce	5.2
Determine temporary speed restrictions to ensure safe driving environment around work zones, including on unsealed roads and major intersections	5.1
Identify any high-risk periods (such as during school bus operations), and whether site deliveries or material haulage can be undertaken outside of these hours	5.2/5.3
Identify opportunities to stagger heavy vehicle arrivals to site (e.g. use of minimum headways between arriving haul trucks), to avoid the potential for heavy vehicle convoys arriving on site	5.2/5.3
Identify and provide temporary works, such as for site access, turn-around bays, parking areas for heavy vehicle dwelling, and minor site distance clearing around local and road intersection sites	5.2
Provide temporary warning and advisory signposting, such as during periods of material haulage, and at major intersections (e.g. Nerrigundah Mountain Road and Eurobodalla Road), where there will be increased traffic activity	5.1
Where practical, program deliveries of construction plant and materials (such as over-mass and over dimension vehicles) outside peak traffic period	5.3
Regularly review and modify the TMP (such as at changes of construction stages), to ensure the TMP remains valid and accurate	5.6
Document communication protocols amongst heavy vehicle operators, such as when approaching higher risk areas. This could be through the establishment of a call point system, whereby call point signage is erected on the approach to higher risk areas, such as the intersection of Nerrigundah Mountain Road and Eurobodalla Road, or the single lane Tuross River (Tyrone) bridge, and access points to the construction site	5.4
Identify a contact person (and phone number) for liaison and complaints, by project stakeholders and the community	5.4

7 Appendix A
Traffic Control Plans

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Legend

- Cones
- Distance Marker
- Team Leader
- Traffic Controller
- Work Area

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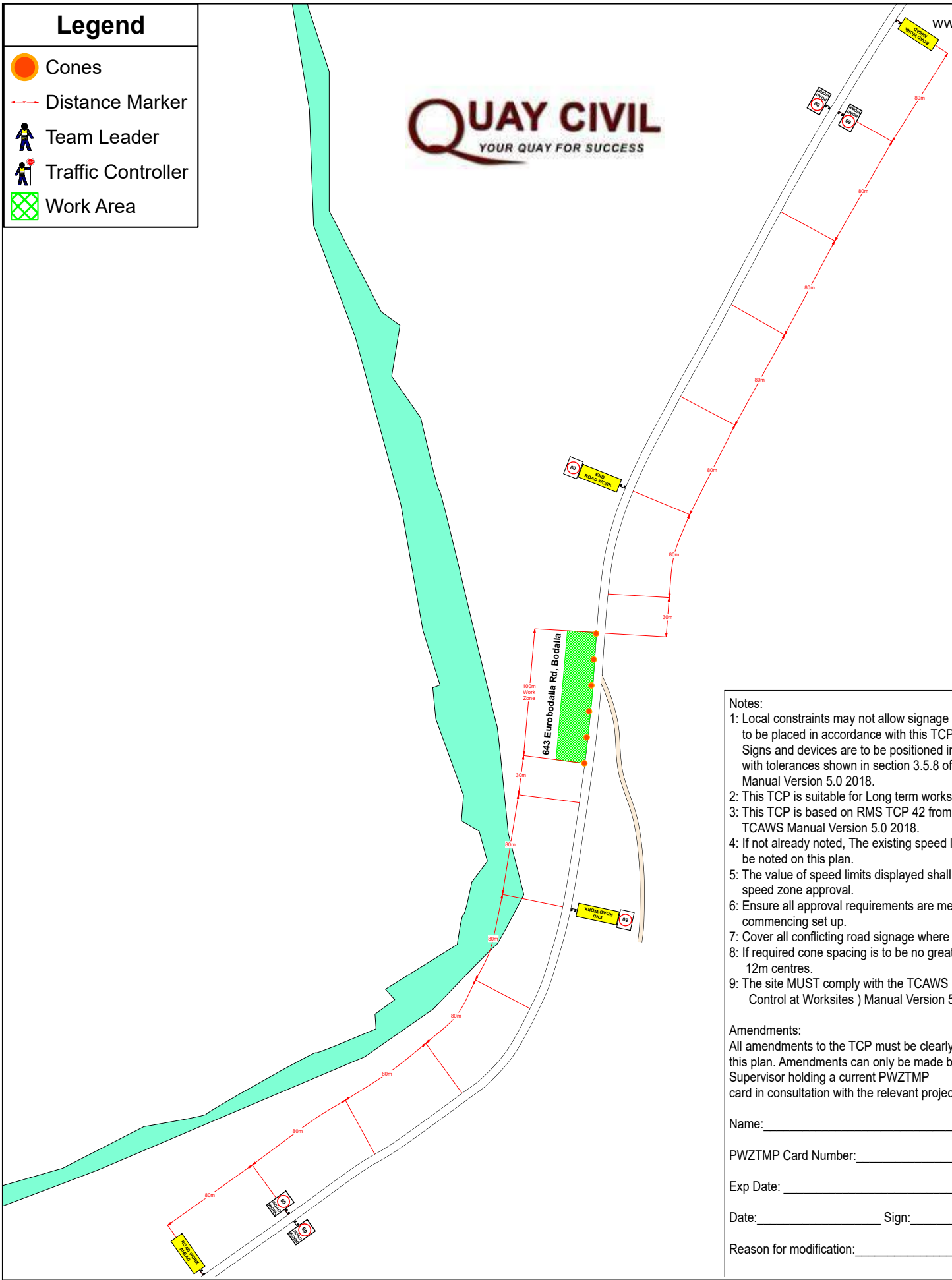

Notes:
1: Local constraints may not allow signage and devices to be placed in accordance with this TCP. Signs and devices are to be positioned in accordance with tolerances shown in section 3.5.8 of the TCAWS Manual Version 5.0 2018.
2: This TCP is suitable for Long term works.
3: This TCP is based on RMS TCP 42 from the TCAWS Manual Version 5.0 2018.
4: If not already noted, The existing speed limit is to be noted on this plan.
5: The value of speed limits displayed shall match the speed zone approval.
6: Ensure all approval requirements are met prior to commencing set up.
7: Cover all conflicting road signage where required.
8: If required cone spacing is to be no greater than 12m centres.
9: The site MUST comply with the TCAWS (Traffic Control at Worksites) Manual Version 5.0 2018.

Amendments:
All amendments to the TCP must be clearly documented on this plan. Amendments can only be made by the Traffic Control Supervisor holding a current PWZTMP card in consultation with the relevant project works supervisor.

Name:_____

PWZTMP Card Number:_____

Exp Date: _____

Date:_____ Sign:_____

Reason for modification:_____

PLATINUM TRAFFIC SERVICES

Client Contact: Stuart Wing
Contact Number: 0417 042 365

Revisions

No:	By:	Date:	Description:	Appr:
1	TMc	02/09/20	Issued for Implementation	BR
2				
3				
4				
5				
6				

Original Size A3 | This TCP is not to scale

N NW NE W E SW SE S

Job Location: 643 Eurobodalla Rd, Bodalla	Work Activity: Pump Station Maintenance
Client: Quay Civil Pty Ltd	Drawing Number: TCP- 00000
Drawn By: Thomas McNair — Prepare Work Zone Number : 0046695053 — Exp Date: 28th Oct 2020	Signed:
Approved By: — Prepare Work Zone Number : 0052086882	Signed:

Disclaimer:

This guidance scheme is for Traffic Management purposes only. Platinum Traffic disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages and costs you might incur as a result of the information being inaccurate or incomplete in any way, and for any reason. This plan is drawn in accordance with the TCAWS manual.

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Legend

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- Traffic Controller
- Work Area

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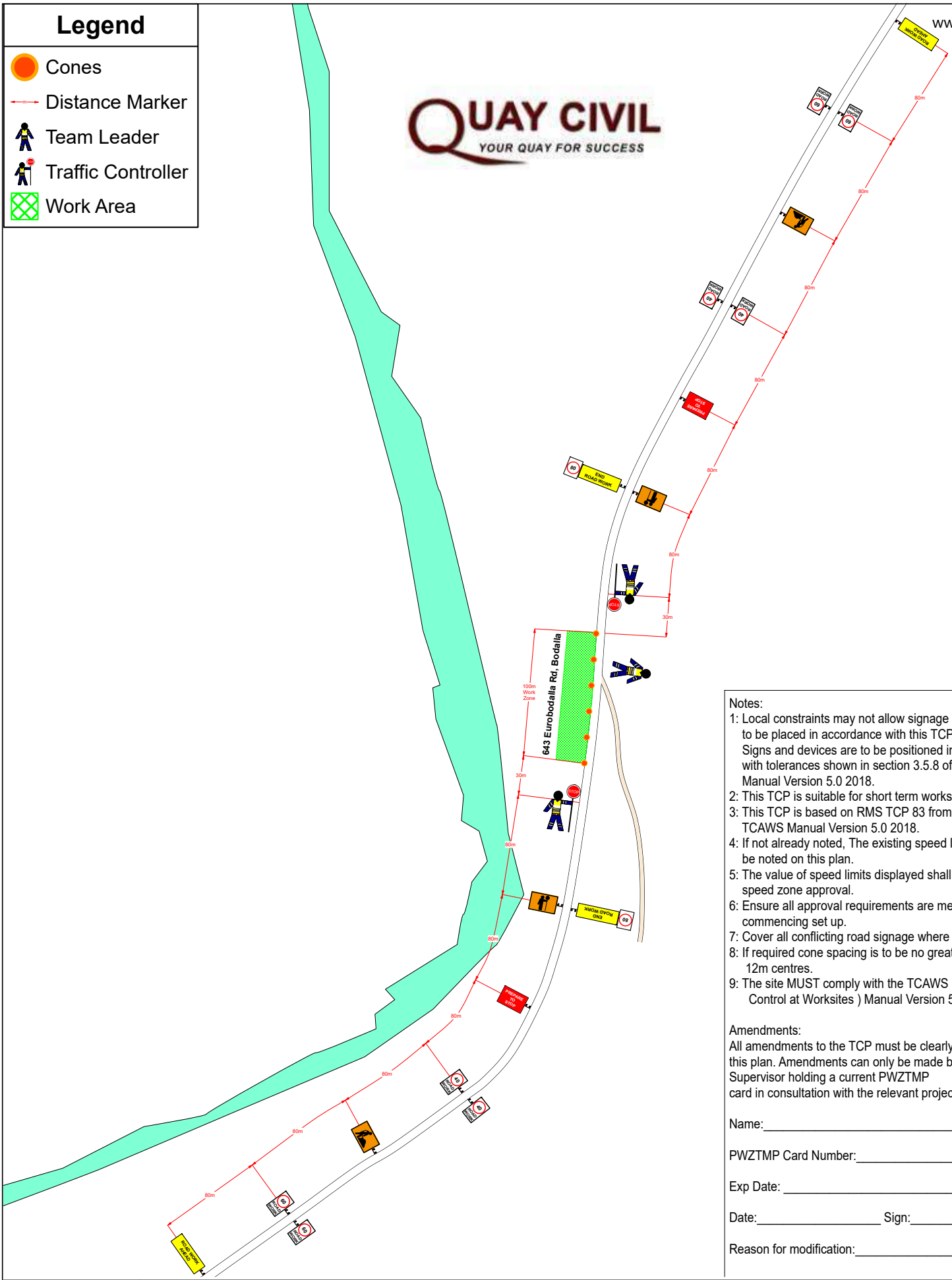

Notes:
1: Local constraints may not allow signage and devices to be placed in accordance with this TCP. Signs and devices are to be positioned in accordance with tolerances shown in section 3.5.8 of the TCAWS Manual Version 5.0 2018.
2: This TCP is suitable for short term works.
3: This TCP is based on RMS TCP 83 from the TCAWS Manual Version 5.0 2018.
4: If not already noted, The existing speed limit is to be noted on this plan.
5: The value of speed limits displayed shall match the speed zone approval.
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Exp Date: _____

Date:_____ Sign:_____

Reason for modification:_____

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Construction Noise & Vibration Management Plan

Tuross River Intake Pump Station (TRIPS)

Prepared for: Quay Civil

23 September 2020

Report number: 0120-047-01

Prepared by: Mark Della Sabina

Document Control

Report Revision History				
Rev no.	**Date**	**Description**	**Prepared by**	**Reviewed by**
0.1	21/09/2020	Initial Draft	Mark Della Sabina	Rauf Osterman
1	23/09/2020	Minor update following internal review	Mark Della Sabina	Rauf Osterman

Table of Contents

1. Introduction

1.1 Context

The Tuross River Intake Pump Station (TRIPS) forms part of the larger Eurobodalla Southern Water Storage project located approximately 6km south-west of Bodalla, on the south coast of NSW. The river intake pump station will extract raw water from the Tuross River for transfer to the new water storage facility.

Osterman has been engaged by Quay Civil to develop this Construction Noise and Vibration Management Plan (CNVMP) for the construction phase of the TRIPS.

1.2 Project Overview

The new TRIPS is to be located next to the existing intake pump station, which is located on the riverbank of the Tuross River, as shown in Figure 1.

Figure 1: Locality Plan

Works on the new intake include:

- Piling of upstream fender piles for large debris diversion;
- Construction of the river intake structure and wet well pump station set back off the intake structure;
- Installation of pipework with valving arrangement connecting the river intake and the high lift pump station;
- Installation of electrical supply and control panel for the pump station; and
- Road works for access to the river intake pump station.

1.3 Objectives of the CNVMP

The principal objective of this CNVMP is to provide detailed and site-specific methodologies to effectively mitigate and manage the impacts of noise and vibration from construction works on sensitive receivers surrounding the site. This includes strategies for:

- minimising unreasonable noise and vibration impacts on sensitive receivers;
- avoiding cosmetic and structural damage to sensitive receivers and utilities from construction vibration;
- maintaining positive working relationships with surrounding residents; and
- effective community consultation and complaints handling.

1.4 Roles and Responsibilities

Quay Civil shall be responsible for ensuring that noise and vibration from activities carried out on site is minimised as far as practical. This includes responsibility for:

- Ensuring that any site noise and vibration and, in particular, any complaints regarding noise and vibration are monitored, investigated, managed and controlled, in accordance with the recommendations provided in this document.
- Ensuring all works are undertaken in strict accordance with the requirements of the contract documents and this plan.
- Ensuring all Project personnel and sub-contractors employed are aware of their responsibilities in regard to the management of noise and vibration during construction and assume the responsibilities assigned to them within this Plan.
- Monitoring and managing noise and vibration impacts on receivers, in accordance with the requirements of this Plan.
- Consulting with key stakeholders to inform them of the nature of the construction work, to determine any specific noise and vibration sensitivity they may have and to negotiate appropriate respite periods.

2. Contractual and Regulatory Requirements

2.1 Technical Specification

This CNVMP has been prepared to address the requirements of the Technical Specification for the project reproduced in Table 1.

Table 1. Technical Specification Requirements

No.	Condition	Reference
	3.11 Noise from Construction	
1	The Contractor shall include a Construction Noise and Vibration Management Plan in the Contractor's CEMP. All construction work shall be carried out in accordance with Section 6 of the Australian Standard AS 2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites, the NSW Interim Construction Noise Guideline (DECC, 2009), ESC and EPA requirements.	This plan
2	The Construction Noise and Vibration Management Plan shall:	
a)	be prepared by a suitably qualified and experienced noise expert;	Osterman Consult
b)	describe procedures for achieving the noise management levels in EPA's Interim Construction Noise Guideline (DECC, 2009);	Section 6
c)	include strategies that have been developed with the affected sensitive receivers for managing high noise generating works; and	Section 6.5
d)	include a complaints management system that would be implemented for the duration of the development.	Section 6.2
3	All machines, equipment, plant and vehicles proposed for construction of the Works shall be of types complying with Environmental Protection Agency (EPA) construction noise guidelines and the Protection of the Environment Operations Act 1997.	Section 6.5
4	For the purposes of this Clause "out of hours work" is defined as all work undertaken between the hours of 1800 and 0700 Monday to Friday, between the hours of 0000 to 0800 and 1300 to 2400 on Saturdays, or any work undertaken on Sundays or Public Holidays.	Section 6.3
5	The Contractor shall obtain approval for all "out of hours work". During this period the Contractor shall restrict activities to those that do not generate excessive levels of noise. Activities such as rock dumping, hammer drilling and equivalent activities that generate significant levels of noise shall not be undertaken during this construction period. Heavy vehicle transport shall not be used outside the Works area during any period of "out of hours" work.	Section 6.3
6	Contractor shall limit construction noise management levels detailed in the Interim Construction Noise Guideline (DECC, 2009). All feasible and reasonable noise mitigation measures must be implemented and any activities that could exceed the construction noise management levels must be identified and managed	Section 4.1 and Section 6.3

Table 1. Technical Specification Requirements		
No.	**Condition**	**Reference**
7	The Contractor shall monitor the noise levels on a continuous basis at the locations defined in the Contractor's Noise Management Plan. The Contractor shall make available to the Principal the results of noise monitoring on a daily basis. Additionally, the Contractor shall provide the Principal with a report of the following information, on a monthly basis: A. The LA1, LA10, and LA90 noise levels plotted as a time series; B. A table showing the LA1, LA10, and LA90 noise levels for the period shown for: i. 0700 hours to 1900 hours Monday to Saturday, ii. 0900 hours to 1900 hours Sunday and public holidays, iii. 1900 hours to 2200 hours all days, iv. 2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays. C. The monthly noise reports shall summarise the noise data received, any exceedances and detail any public/community concerns or complaints and the actions taken in response to the public/community concerns or complaints. The report shall also include a description of the plant or operations that caused the exceedance or issue of concern or complaint.	Section 6.4
	3.12 Noise from Traffic	
1	General A. The Contractor shall ensure heavy vehicles do not use engine braking on Eurobodalla Road unless in an emergency; B. unless otherwise approved by the Principal, heavy vehicles are restricted to 7am to 6pm Mondays to Friday, 8am to 1pm Saturdays and not used on public holidays and Sundays; C. have airbag / pneumatic suspension systems in lieu of conventional springs where ever possible; and D. have a sound power level in compliance with ADR 28/01 specifications. E. Where the Contractor does not take effective action to meet the specified noise limits, the Principal may direct the Contractor to undertake specific measures within such time as may be deemed necessary to ensure the requirements are met. Where the Contractor fails to take action within the time specified, the Principal may take such actions as necessary to reduce noise emissions to an acceptable level.	Section 6.5

Table 1. Technical Specification Requirements		
No.	**Condition**	**Reference**
2	Monitoring A. The Principal has conducted ambient noise monitoring in the vicinity of the works in 2006. This information is available as an Appendix to the Contract. B. During the construction period the Contractor shall conduct monitoring one working day a month at a location along Eurobodalla Road agreed with the Principal. Monitoring shall include, but not be limited to: i. types of vehicles passing; ii. vehicle speeds; iii. LAmax levels; and iv. sound power levels. C. The Contractor shall provide the Principal with a monthly report containing the following information: i. the average measured noise level for each type of vehicle; ii. the LAmax for all vehicles iii. the average sound level for each construction related vehicle; iv. details of any construction related vehicles that did not comply with the traffic noise criteria; and v. any general comments. D. The Contractor shall keep a log of these reports, associated actions and any improvements made to vehicles to ensure they met the specified criteria.	Section 6.4

2.2 Standards & Guidelines

In preparing this plan, Osterman Consult has considered the following standards and guidelines:

- NSW Interim Construction Noise Guideline (ICNG), Department of Environment and Climate Change 2009
- Australian Standard AS2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites
- British Standard 7385: Part 2-1993 'Evaluation and measurement of vibration in buildings'
- Environmental Noise Management Manual (ENMM), Roads and Traffic Authority NSW, 2001
- Transit Noise and Vibration Impact Assessment, Federal Transit Administration, 2006
- Update of Noise Database for Prediction of Noise on Construction and Open Sites, Department for Environment Food and Rural Affairs (UK), 2005
- Industrial Noise Policy (INP), Environment Protection Authority NSW, 2000
- Assessing Vibration, A Technical Guideline (Vibration Guideline) DEC 2004

3. Sensitive Receivers

Sensitive receivers have been identified in the Eurobodalla Southern Storage Water Supply Noise Impact Assessment conducted by Pacific Environment (dated 3 November 2017). These are outlined in Table 2 and illustrated in Figure 2. All receivers were identified as residential.

For the purposes of this CNVMP, assessment of noise and vibration impacts has focussed on the nearest receivers to the south and north of the river intake site being 758 Eurobodalla Rd (R2) and 586 Eurobodalla Rd (R13), respectively. Note that 644 Eurobodalla Rd (R1) identified in the original noise impact assessment has since been acquired by Eurobodalla Shire Council and is no longer considered a sensitive receiver for the purposes of this Plan.

Table 2. Sensitive Receivers

ID	Receiver	Building Category	Approx. Distance
1	644 Eurobodalla Road	Residence	200m
2	758 Eurobodalla Road	Residence	1000m
3	198 Waincourt Road	Residence	
4	168 Waincourt Road	Residence	
5	156 Waincourt Road	Residence	
6	818-820 Eurobodalla Road	Residence	
7	818-820 Eurobodalla Road	Residence	
8	97 Waincourt Road	Residence	
9	93 Waincourt Road	Residence	
10	51-53 Nerrigundah Mountain Road	Residence	
11	350 Comerang Forest Road	Residence	
12	585 Eurobodalla Road	Residence	
13	586 Eurobodalla Road	Residence	600m
14	530 Eurobodalla Road	Residence	

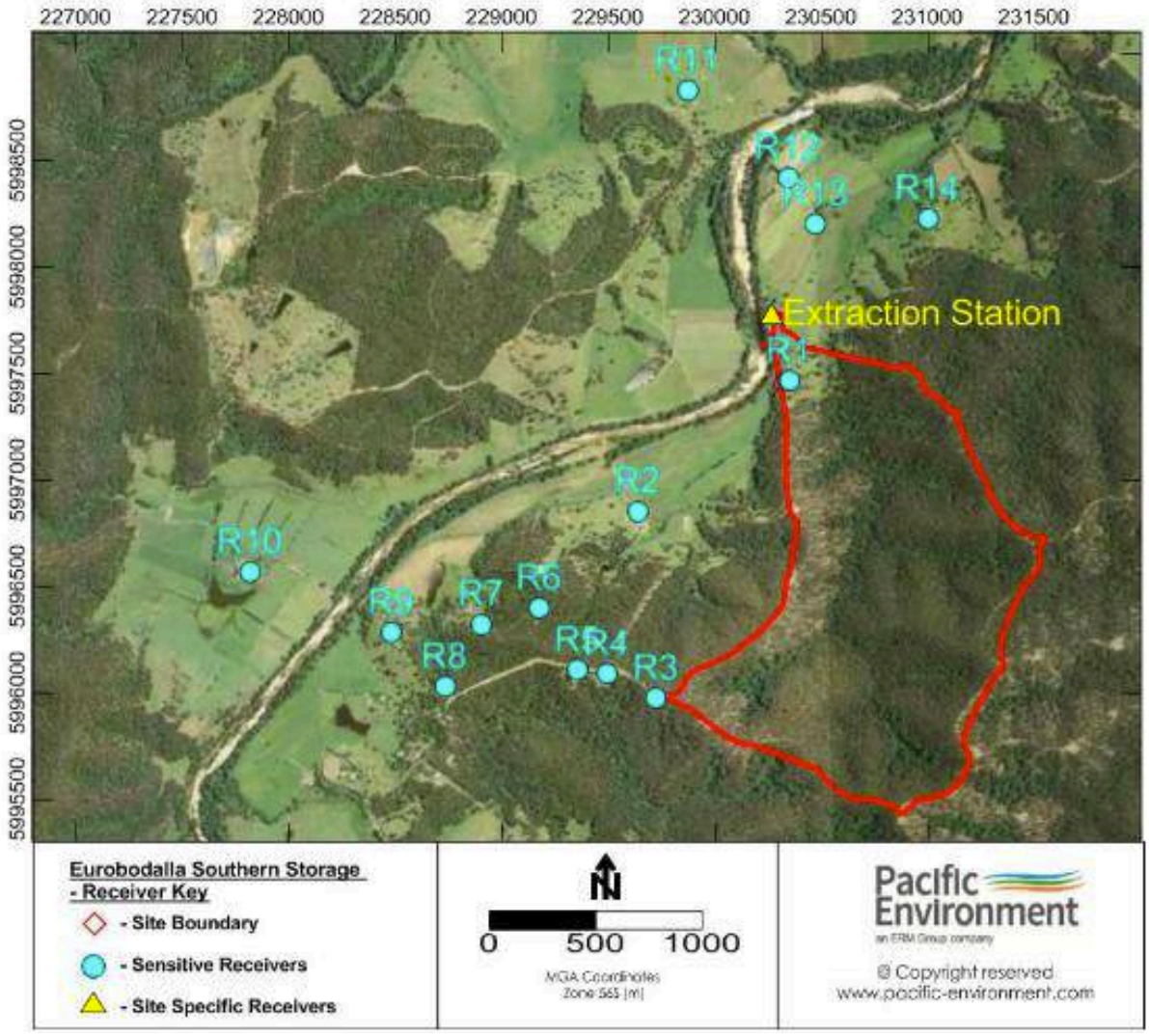

Figure 2: Sensitive Receivers (*Pacific Environment, 2017*)

4. Construction Noise and Vibration Criteria

4.1 Noise Management Levels

Pursuant to Technical Specification Requirement 3.11 (1), Noise Management Levels (NMLs) for the project are defined according to DECC's *Interim Construction Noise Guideline (ICNG)*.

The ICNG stipulates NML's for residential receivers that are based on the Rating Background Level (RBL) plus an allowance dependent on the time of day. This data is reproduced in Table 3.

Table 3. ICNG Noise Criteria

Time of Day	Management Level $L_{Aeq\ (15\ min)}$*	How to apply
Recommended standard hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays / Public Holidays	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. • Where the predicted or measured $L_{Aeq\ (15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. • The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. • Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences 2. if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	• A strong justification would typically be required for works outside the recommended standard hours. • The proponent should apply all feasible and reasonable work practices to meet the noise affected level. • Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community. • For guidance on negotiating agreements see section 7.2.2.

*Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

For the purpose of establishing construction Noise Management Levels in accordance with Table 3, the Rating Background Level (RBL) has been sourced from the Eurobodalla Southern Storage Water Supply Noise Impact Assessment conducted by Pacific Environment (dated 3 November 2017). This report derived, based on short-term attended monitoring, a representative RBL of 30dB(A).

Table 4 presents the NML applicable to residential receivers for standard and out-of-hours works.

Table 4. Residential Noise Management Levels

Time of Day	NML $dBL_{Aeq\ (15\ min)}$
Standard Hours	40
Outside Standard Hours	35

4.2 Construction Vibration

Construction vibration is assessed against either Human Comfort criteria or Structural Damage criteria. Assessment against Human Comfort criteria is reasonable for long term vibration however is unnecessarily restrictive for relatively short periods of vibration such as that associated with works on this Project. Compliance with Human Comfort criteria may significantly prolong the works and result in greater disturbance to occupants of surrounding sensitive receivers. Vibration criteria is therefore based on British Standard 7385: Part 2 1993 which suggests levels of vibration at which 'cosmetic', 'minor' and 'major' damage may occur. This standard is based on data collated from a wide range of national and international sources which collectively saw relatively few cases of damage caused by vibration. BS7385 suggests that vibration levels up to the cosmetic damage level are considered 'safe' and have produced no observable damage for particular building types.

For the purposes of this standard, damage includes minor non-structural effects such as hairline cracks on drywall surfaces, hairline cracks in mortar joints and cement render, enlargement of existing cracks and separation of partitions or intermediate walls from load bearing walls.

BS7385, reproduced in Table 5, is based on peak particle velocity and specifies damage criteria for transient vibration within the range of frequencies usually encountered in buildings, being 4Hz to 250Hz.

Table 5. BS7385: Part 2 Damage Criteria					
Group	**Type of Structure**	**Damage Level**	**Peak component particle velocity, mm/s**		
			4 Hz - 15 Hz	**15 Hz - 40 Hz**	**40 Hz and above**
1	Reinforced or framed structures Industrial and heavy commercial buildings	Cosmetic	50		
		Minor	100		
		Major	200		
2	Unreinforced or light framed structures Residential or light commercial type buildings	Cosmetic	15 to 20	20 to 50	50
		Minor	30 to 40	40 to 100	100
		Major	60 to 80	80 to 200	200

Note that the British Standard states that the guide values (Table 5) relate predominantly to transient vibration which does not give rise to resonant responses in structures and low-rise buildings. Where dynamic loading caused by continuous vibration may result in magnification of vibration through a building structure the guideline values may need to be reduced by up to 50 per cent. Rock breaking, rock hammering and sheet piling activities are considered to have the potential to cause dynamic loading in some structures.

4.3 Road Traffic

Criteria for the assessment of road traffic noise for construction are set out in the Road Noise Policy (RNP) (DECC 2011). Traffic associated with the TRIPS is expected to be limited to Eurobodalla Road.

For existing residences affected by additional traffic on existing local roads generated by land use developments, the criteria, applicable at 1m from the façade, is:

- $L_{Aeq,1h}$ 55 dB(A) day (7.00am – 10.00pm).
- $L_{Aeq,1h}$ 50 dB(A) night (10.00pm – 7.00am).

The RNP states that if existing traffic levels exceed these noise levels, the development should not result in an increase in existing traffic noise levels by more than 2dB, thereby resulting in a barely perceptible change in noise level.

5. Noise and Vibration Assessment

5.1 Construction Activities and Sources of Noise

Noise intrusive activities associated with construction works are outlined in Table 6.

Table 6. Construction Activities and Associated Equipment

Activity	Equipment Types
Site clearing and bulk excavation works	excavators, trucks, transverse cutter
New access road works	excavators, trucks, transverse cutter
In-ground services trenches	excavators, trucks, transverse cutter
Concrete foundations and structures	excavators, cranes, concrete pumps, hand tools
Installation of electrical supply/controls	cranes, hand tools
Piling of upstream bollards	piling rig, barge
General	delivery trucks, site vehicles, hand tools

An overview of equipment noise associated with these construction activities is presented in Table 7.

Table 7. Construction Equipment and Associated Sound Power Levels

Equipment	Assumed Sound Power* Level dB(A)	Adjustment#	Effective Sound Power Level dB(A)
30T Excavator w/2T hammer	113	5	118
5.5T Excavator w/bucket	102		102
Transverse cutter	110		110
30T Crane	98		98
100T Crane	104		104
12T Bogie Trucks	104		104
Piling Rig (on barge)	110	5	115
Powered Hand Tools	103		103
Angle Grinder (grinding steel)	108		108
Concrete pump	103		103

*Source: *Noise Database for Prediction of Noise on Construction and Open Sites* (DEFRA, 2005)

#5dB(A) penalty for annoying characteristics

5.2 Airborne Noise Predictions

Using the sound power levels stated in Section 5.1, predicted noise levels have been calculated at the nearest sensitive receivers to the works (Table 8). Highlighted values represent those above the relevant noise management level outlined in Section 4.1.

Table 8. Predicted Noise Levels

Equipment	Predicted Noise Level dB(A)	
	R2 758 Eurobodalla Road	R13 586 Eurobodalla Road
30T Excavator w/2T hammer	50	54
5.5T Excavator w/bucket	34	38
Transverse cutter	42	46
30T Crane	30	34
100T crane	36	40
12T Bogie Trucks	36	40
Piling Rig (on barge)	47	51
Powered Hand Tools	35	39
Angle Grinder (grinding steel)	40	44
Concrete Pump	35	39

The results show that noise levels are predicted to exceed construction noise criteria at the nearest receivers R2 and R13.

Noise levels are however not predicted to exceed the highly noise affected noise level of 75 dB(A). Based on the results of this assessment, noise management and mitigation measures have been recommended as presented in Section 6.5.

5.3 Traffic Noise

Traffic noise predictions were conducted as part of the original Noise Impact Assessment by Pacific Environment for the overall Eurobodalla Southern Water Storage project. The worst-case scenario for all truck movements on the overall project indicated that noise from construction vehicle volumes would comply with relevant road noise criteria at the nearest receivers.

As the TRIPS forms only a portion of the overall Eurobodalla Southern Water Storage project, traffic noise contributions arising from the TRIPS are considered also to be compliant with relevant road noise criteria at the nearest receivers.

5.4 Vibration Predictions

Vibration at the nearest sensitive receivers (adjacent to the building foundation) has been estimated using the following formula from the FTA Guideline "Transit Noise and Vibration Impact Assessment". This method is recommended in *Assessing Vibration a Technical Guideline*.

$$PPV_{Receiver} = PPV_{Ref} \times \left(\frac{d_{ref}}{d}\right)^{1.5}$$

Where: $PPV_{Receiver}$ = peak particle velocity at the receiver in mm/s
PPV_{Ref} = peak particle velocity of the source, measured at the reference distance (7.6 m)
d_{ref} = reference distance for the vibration source (7.6 m)
d = horizontal distance from the source to the receiver (m)

The values of PPV_{Ref} are based on a review of current literature and are provided in Table 9 for reference.

Table 9. Reference PPV's

Vibration-Generating Equipment	PPV @ 7.6m (mm/s)
Piling Rig	18.4
Trucks	1.3

Predicted vibration levels are provided in Table 10. Note that these predictions represent maximum instantaneous levels for the purpose of assessing the likelihood of cosmetic damage. These predictions are not applicable for the assessment of human comfort which is measured as vibration dose values.

Table 10. Predicted Vibration Levels		
Equipment	Predicted PPV (mm/s)	
	Pier 2/3 Shore Shed	Pier 6/7 Shore Shed
Piling Rig	<0.1	<0.1
Trucks	<0.1	<0.1

Results indicate that vibration from construction activities would have no significant impact at the nearest sensitive receivers.

6. Noise and Vibration Management

6.1 Community Communication Strategy

Successful management of noise and vibration impacts on sensitive receivers will depend on open and timely communication with the local community. Quay Civil has an established strategy for community communication and consultation which will be further refined for the project in consultation with Eurobodalla Shire Council.

6.2 Complaints Management System

In the first instance, complaints shall be directed to a nominated email address monitored by the Quay Civil site team. Other means of receiving complaints shall also be made available including a telephone number and a postal address.

On receipt of a complaint, the following shall occur:

- Investigate and determine the source of a complaint immediately, including an initial call to the complainant (where a telephone number was provided).
- Keep the complainant informed of the process until the complaint is resolved.
- Provide feedback to requests for information from the complainant.
- Take all actions and implement all measures to prevent the reoccurrence of the complaint (where possible).
- Close out complaints within agreed timeframe (with complainant).

6.3 Hours of Work

Pursuant to Section 3.11 of the Project Specification, standard hours of work for the project are:

a) 7am to 6pm, Mondays to Fridays inclusive;

b) 8am and 1pm, Saturdays.

Works carried outside these times are considered “out-of-hours” works and require approval. Where approval for “out-of-hours” works is given, Quay Civil shall restrict activities to those that do not generate excessive levels of noise. Heavy vehicle transport shall not be used outside the Works area during any period of “out of hours” work.

6.4 Environmental Monitoring

6.4.1 Methodology

Where required, real-time noise monitoring shall be undertaken by a specialist consultant using permanent monitor installations at key sensitive receivers around the site. It is proposed to implement an automated monitoring system whereby monitor data is instantly and automatically uploaded to a central server via the 3G network. Data shall be accessible by way of an online gateway whereby users can log on to the system and interrogate monitors in real-time and view a full history of results for each location. Login credentials for the web portal will be supplied to the Principal as required.

Monitoring will be conducted in accordance with Australian Standard (AS) 1055:1997 Acoustics Description and Measurement of Environmental Noise and the INP (DECC, 2000).

6.4.2 Monitoring Locations

The results of this assessment have found that construction works are likely to generate levels of noise in excess of the recommended criteria. As such, noise monitoring shall be conducted at the nearest sensitive receivers during early stages of the project to establish baseline data and confirm validity of noise predictions.

Noise monitoring shall be conducted for an initial period of 1 week prior to full mobilisation of primary noise-generating equipment to establish a baseline of the existing noise environment. Monitoring shall continue for a further 4 weeks following full mobilisation to establish noise impacts from the works. Monitoring requirements shall be reassessed at the end of the initial 5-week monitoring period taking into account any adverse community response to construction noise.

Initial monitoring locations are outlined in Table 11.

Table 11. Monitoring Locations

Location	Monitor Category
758 Eurobodalla Road	Noise
586 Eurobodalla Road	Noise

Results from these monitors shall be reviewed on a weekly basis to ensure ongoing compliance. Where complaints are received, additional monitoring may be required at the specific location of complaint.

6.4.3 Attended Monitoring

Where complaints are received, attended monitoring may be conducted at the specific location of complaint. Operator-attended noise monitoring will be conducted for a minimum of 15 minutes at each location during the works. Where a longer monitoring duration is required, measurements shall be made in consecutive 15-minute periods.

It is noted that the Technical Specification provides for the requirement to conduct monitoring one working day a month at a location along Eurobodalla Road agreed with the Principal. This monitoring is to include data on the types of vehicles passing, vehicle speeds, L_{Amax} levels and sound power levels.

Quay Civil intend to negate this requirement through the installation of permanent monitors as outlined in Section 6.4.2.

6.4.4 Reporting

Where noise monitoring is conducted at sensitive receivers, results shall be compiled into a monthly compliance report for assessment against the nominated goals. The monthly reports shall summarise the noise data received, any exceedances and detail any public/community concerns or complaints and the actions taken in response to the public/community concerns or complaints. The report shall also include a description of the plant or operations that caused the exceedance or issue of concern or complaint.

6.5 Mitigation Measures

6.5.1 Standard Mitigation Measures

Table 12 defines a range of standard noise and vibration mitigation measures that shall be adopted on the Project.

Table 12. Noise and Vibration Mitigation Measures

No.	Control	Anticipated Noise Reduction	Timing
Administration			
NVM1	Conduct a site induction addressing the requirements of this CNVMP for all new personnel undertaking site activities	N/A	Prior to starting works
NVM2	Educate staff on noise and the impacts of workers activities on the noise environment	N/A	Prior to starting works / following noise complaints
NVM3	Respond to complaints in accordance with complaints handling procedure	N/A	Prior to starting works / as required
NVM4	Advertise contact details for complaints to be directed to.	N/A	Prior to starting works / as required
NVM5	Conduct regular toolbox talks to reiterate the appropriate noise and vibration management methodologies	N/A	Periodically
Procedural			
NVM6	Turn off machinery when not in use	Up to 10 dB	Daily
NVM7	Conduct regular noise measurements in the vicinity of the site to assess compliance with noise criteria	N/A	As needed / following changes in activities
NVM8	Avoid the coincidence of noisy plant working simultaneously close together	Up to 10 dB	Where practicable

Table 12. Noise and Vibration Mitigation Measures			
No.	**Control**	**Anticipated Noise Reduction**	**Timing**
NVM9	Operate and maintain equipment according to manufacturers' specifications.	Up to 3 dB	Daily
NVM10	Do not use crane whistles, amplified external telephone ringers/ horns or alarms (excluding emergencies)	N/A	Daily
NVM11	Heavy vehicles must not use engine braking on Eurobodalla Road unless in an emergency.	N/A	Daily
NVM12	Maximise offset of noisy plant to sensitive receivers as much as possible.	N/A	Where practicable
NVM13	Unless otherwise approved, heavy vehicles are restricted to 7am to 6pm Mondays to Friday, 8am to 1pm Saturdays and not used on public holidays and Sundays;	N/A	Prior to starting works / as required
Engineering			
NVM14	Use site offices and sheds as noise barriers during construction works	5 to 15 dB	Where practicable
NVM15	Use equipment appropriately sized for each task.	Up to 2 dB	Daily
NVM16	Use smart broadband reversing alarm on mobile equipment where possible.	2 to 5 dB	Where practicable
NVM17	Heavy vehicles shall have airbag / pneumatic suspension systems in lieu of conventional springs where ever possible	Up to 10 dB	Where practicable
NVM18	Heavy vehicles shall have a sound power level in compliance with ADR 28/01 specifications		
Hours of Work			
NVM19	Operate during standard work hours wherever possible	N/A	Daily
NVM20	Consult with affected sensitive receivers to determine sensitive periods	N/A	As required
NVM21	Implement respite periods if necessary	N/A	As required

6.5.2 Additional Mitigation Measures

Where exceedance of imposed limits is expected, even after the implementation of standard mitigation measures, it may be necessary to implement additional mitigation measures. The extent to which additional mitigation measures are employed shall be commensurate with the degree of exceedance and may include:

- Letterbox drops;
- Targeted monitoring;
- Individual briefings;
- Phone calls; and
- Specific respite offers;

7. Conclusion

This CNVMP has assessed the potential for noise and vibration impacts associated with the construction of the Tuross River Intake Pump Station. The results of this assessment have found that construction works are like to generate levels of noise in excess of recommended criteria. This may necessitate the implementation of additional mitigation measures where there is adverse community response. A proactive approach would be to monitor at the nearest sensitive receiver during early stages of the project to confirm validity of predictions and establish baseline data in the event of a complaint.

Conversely, prediction calculations indicate that vibration from construction activities will be imperceptible at the nearest sensitive receivers and thus no vibration monitoring is necessary.

The establishment of a sound Community Communications Strategy and Complaints Management System that facilitates open communication between the site team and the local community will be key to the successful mitigation and management of noise and vibration impacts.

Dust Management Plan

Tuross River Intake Pump Station

Contract Number: 10018531

Quay Civil Project Ref: 20016

QUAY CIVIL

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Rev	Date	Revision Description	Prepared	Reviewed	Approved
0	29/09/20	Issued For Construction	S. Wing	N. Yekta	P.Kennedy

Table of Contents

1 Introduction

Eurobodalla Shire Council (ESC) has engaged Quay Civil to undertake the construction of the Tuross River Intake Pump Station as part of the Eurobodalla Southern Water Supply Storage project. The works involve the construction of a new river intake pump station and associated pipeline works, with a total river extraction capacity made up of a combination of flows from the river intake (up to 26 megalitres) and the borefield (up to six megalitres). The pump station construction includes the following components:

- A wet well pump station, approximately 18.5 m deep, 4.5 m diameter including Three duty submersible pumps
- River intake pipeline and intake screen to within the Tuross River
- Marine works including pile and fender pile installations
- A reinforced concrete retaining wall and canopy to house electrical infrastructure
- Access track works and construction of a mobile crane hardstand area
- Revetment restoration including gabion basket works and rip rap to bank
- Security fencing
- Pipeline works, including cutover of borefield pipework to integrate with new pump station
- Electrical and communications infrastructure

2 Document Scope

This document seeks to identify, assess and provide mitigation and control measures for air quality control associated with the construction of the Tuross River Intake Pump Station.

The document will assess:

- The main activities associated with construction of the project .
- The risks associated with dust, based upon the guidance within Appendix J of the EIS – Air Quality Assessment
- Identify the measures that are recommended to manage any potential air quality impacts

3 Risk Assessment of Air Quality Impacts

Exhaust emissions from the plant and light vehicles during both construction and operational phases of the Proposal are not expected to pose a significant risk to air quality due to the localised and short-lived nature of those activities. Therefore, the risk assessment focuses on dust generated through construction activities – i.e. the main source of potential air quality impacts from the project.

Construction activities are divided into four types to reflect their different potential impacts, and the potential for dust emissions is assessed for each activity that is likely to take place. These activities are:

- Demolition. This is any activity that involves the removal of existing structures. This may also be referred to as de-construction, specifically when a building is to be removed a small part at a time.
- Earthworks. This covers the processes of soil stripping, ground levelling, excavation and landscaping. Earthworks will primarily involve excavating material, haulage, tipping and stockpiling
- Construction. This is any activity that involves the provision of new structures, modification or refurbishment. A structure will include a residential dwelling, office building, retail outlet, road, etc.
- Track-out. This involves the transport of dust and dirt by heavy-duty vehicles (HDVs) from the work sites onto the public road network, where it may be deposited and then re-suspended by other vehicles.

The assessment methodology considers three separate dust impacts:

- Annoyance due to dust soiling
- The risk of health effects due to an increase in exposure to PM_{10}
- Harm to ecological receptors

The assessment provided within *Appendix L – EIS – Air Quality Assessment* was undertaken for both the Dam construction as well as the pump station. This assessment has been modifiedto take in to consideration only the pump station risks and is provided below.

3.1 - Step 2A: Potential for dust emissions

Dust emissions have been categorised as the following based on the TRIPS site:

Table 7-1. Site categories (scale of works) (from IAQM, 2014).

Type of activity	Site category		
	Large	Medium	Small
Demolition N / A	Building volume >50,000 m³, potentially dusty construction material (e.g. concrete), on-site crushing and screening, demolition activities >20 m above ground level.	Building volume 20,000–50,000 m³, potentially dusty construction material, demolition activities 10-20 m above ground level.	Building volume <20,000 m³, construction material with low potential for dust release (e.g. metal cladding, timber), demolition activities <10 m above ground and during wetter months.
Earthworks	Site area >10,000 m², potentially dusty soil type (e.g. clay, which will be prone to suspension when dry due to small particle size), >10 heavy earth-moving vehicles active at any one time, formation of bunds>8 m in height, total material moved >100,000 tonnes.	Site area 2,500-10,000 m², moderately dusty soil type (e.g. silt), 5-10 heavy earth moving vehicles active at any one time, formation of bunds 4-8 m in height, total material moved 20,000-100,000 tonnes.	Site area <2,500 m², soil type with large grain size (e.g. sand), <5 heavy earth moving vehicles active at any one time, formation of bunds <4 m in height, total material moved <20,000 tonnes, earthworks during wetter months.
Construction	Total building volume >100,000 m³, piling, on site concrete batching; sandblasting	Building volume 25,000-100,000 m³, potentially dusty construction material (e.g. concrete), piling, on site concrete batching.	Total building volume <25,000 m³, construction material with low potential for dust release (e.g. metal cladding or timber).
Track-out	>50 HDV (>3.5t) outward movements in any one day, potentially dusty surface material (e.g. high clay content), unpaved road length >100 m.	10-50 HDV (>3.5t) outward movements in any one day, moderately dusty surface material (e.g. high clay content), unpaved road length 50–100 m.	<10 HDV (>3.5t) outward movements in any one day, surface material with low potential for dust release, unpaved road length <50 m.

Figure 1 – Table 7.1 from EIS Appendix J – Assessed for TRIPS Only

3.2 - Step 2B: Sensitivity of area

3.2.1 Sensitivity of area to dust soiling effects on people and property

The sensitivity of the area takes into account the specific sensitivities of local receptors, the proximity and number of the receptors, and the local background PM10 concentration. Dust soiling and health impacts are treated separately.

Based on the initial assessment, sensitive receptors were estimated for both dam and pump station. Due to the locality of the project, the same sensitive receptors have been adopted as a conservative and worst case approach, even though the likely receptors will be less.

Table 7-3. Results - sensitivity to dust soiling effects

Activity	Receptor sensitivity	Number of receptors by distance from source				Sensitivity of area
		<20 m	20-50 m	50-100 m	100-350 m	
Demolition	N/A					
Earthworks	High	3	0	3	3	Medium
Construction	High	3	0	3	3	Medium
Track-out	High	0	3	-	-	Low

Figure 2 – Table 7.3 from EIS Appendix J – Sensitivity to Dust Soiling - Assessed for TRIPS Only

3.2.2 Sensitivity of area to dust health impacts

Based on the initial assessment, sensitive receptors were estimated for both dam and pump station. Due to the locality of the project, the same sensitive receptors have been adopted as a conservative and worst case approach, even though the likely receptors will be less.

Table 7-5. Results - sensitivity to health impacts

Activity	Receptor sensitivity	Annual mean PM_{10} conc. ($\mu g/m^3$)	Number of receptors by distance from source					Sensitivity of area
			<20 m	20-50 m	50-100 m	100-200 m	200-350 m	
Demolition			N/A					
Earthworks	High	17.5-20	3	0	3	0	3	High
Construction	High	17.5-20	3	0	3	0	3	High
Track-out	High	17.5-20	0	3	-	-	-	Medium

Figure 3 – Table 7.5 form EIS Appendix J – Sensitivity to Health Impacts - Assessed for TRIPS Only

3.2.3 Sensitivity of area to ecological impacts

Based on the initial assessment, sensitive receptors were estimated for both dam and pump station. Due to the locality of the project, the same sensitive receptors have been adopted as a conservative and worst case approach, even though the likely receptors will be less.

Table 7-7. Results - sensitivity to ecological impacts

Activity	Receptor sensitivity	Sensitivity of area
Demolition	N/A	
Earthworks	High	High
Construction	High	High
Track-out	High	High

Figure 4 – Table 7.7 from EIS Appendix J – Sensitivity to Ecological Impacts –- Assessed for TRIPS Only

3.3 - Step 3: Risk of Dust Impacts

Table 7-8. Criteria of risk to health impacts (from **IAQM, 2014**)

Type of activity	Sensitivity of area	Dust emission potential		
		Large	Medium	Small
Demolition N / A	High	High Risk	Medium Risk	Medium Risk
	Medium	High Risk	Medium Risk	Low Risk
	Low	Medium Risk	Low Risk	Negligible
Earthworks	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible
Construction	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible
Track-out	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Low Risk	Negligible
	Low	Low Risk	Low Risk	Negligible

Figure 5 – Table 7.8 from EIS Appendix J – Risk of Dust Impacts – Dust Soiling - Assessed for TRIPS Only

Table 7-8. Criteria of risk to health impacts (from **IAQM, 2014**)

Type of activity	Sensitivity of area	Dust emission potential		
		Large	Medium	Small
Demolition N / A	High	High Risk	Medium Risk	Medium Risk
	Medium	High Risk	Medium Risk	Low Risk
	Low	Medium Risk	Low Risk	Negligible
Earthworks	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible
Construction	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible
Track-out	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Low Risk	Negligible
	Low	Low Risk	Low Risk	Negligible

Figure 6 – Table 7.8 from EIS Appendix J – Risk of Dust Impacts – Human Health - Assessed for TRIPS Only

Table 7-8. Criteria of risk to health impacts (from **IAQM, 2014**)

Type of activity	Sensitivity of area	Dust emission potential		
		Large	Medium	Small
Demolition N / A	High	High Risk	Medium Risk	Medium Risk
	Medium	High Risk	Medium Risk	Low Risk
	Low	Medium Risk	Low Risk	Negligible
Earthworks	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible
Construction	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Medium Risk	Low Risk
	Low	Low Risk	Low Risk	Negligible
Track-out	High	High Risk	Medium Risk	Low Risk
	Medium	Medium Risk	Low Risk	Negligible
	Low	Low Risk	Low Risk	Negligible

Figure 7 – Table 7.8 from EIS Appendix J – Risk of Dust Impacts – Ecological - Assessed for TRIPS Only

3.4 – Summary of Results

The summary of results in the table below show the risk as being low for all earthworks and construction, with track-out being Negligible.

	Step 2A: Potential for dust emissions	**Step 2B: Sensitivity of area**			**Step 2C: Risk of dust impacts**		
		Dust soiling	Human health	Ecological	Dust soiling	Human health	Ecological
Demolition	N/A						
Earthworks	Small	Medium Risk	High Risk	High Risk	Low Risk	Low Risk	Low Risk
Construction	Small	Medium Risk	High Risk	High Risk	Low Risk	Low Risk	Low Risk
Track-out	Small	Low Risk	Medium Risk	High Risk	Negligible	Negligible	Low Risk

Figure 8 – Summary of Risks - Assessed for TRIPS Only

4 Recommendations

Based on the results of the risk assessment in Section 3, Quay Civil will implement a mitigation strategy to minimise harm associated with uncontrolled dust. Based on the severity of the risks, and the location of the River Intake Pump station site, the mitigation measures highlighted should be sufficient to ensure no dust related complaints. Should there be a number of dust related complaints from the local community, Quay Civil would employ one or more of the following strategies:

- Re-assessment of the mitigation measures to include more control
- Increasing frequency of site audits to ensure existing measures are being implemented
- Discussions with drivers of plant and equipment and
- In case of all other aspects being insufficient to allay community complaints, selective monitoring of dusts at strategic locations as required

5 Mitigation

Mitigation guidance measures were suggested within section 7.4 Appendix L of EIS – Air Quality Impact Assessment, based on a higher assessed summary risk table. The following mitigations will be undertaken on site to reduce the risk and impact of air quality within the construction of TRIPS project.

Table 1 - Summary of mitigation measures

Area	Mitigation Measure	Reference Document
Communications		
	Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site manager.	Site Signage to be installed
Dust Management		
Site Management	Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions, approved by the local authority. The level of detail will depend on the risk, and should include as a minimum the highly recommended measures in this document. The desirable measures should be included as appropriate for the site.	Refer to this document
Site Management	Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken.	Complaints Log
Site Management	Make the complaints log available to the local authority / client when asked.	Complaints Log
Monitoring	Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.	Incident Form
Monitoring	Carry out regular site inspections to monitor compliance with the DMP, record inspection results, and make an inspection log available to the local authority when asked.	Incident Form
Monitoring	Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being out	Site inspection form Site prestart

Area	Mitigation Measure	Reference Document
	and during prolonged dry or windy conditions carried out and during prolonged dry or windy conditions.	
Site Prep and Maintenance	Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.	Site Layout
Site Prep and Maintenance	Avoid site runoff of water.	Erosion and Sedimentation Control Plan
Site Prep and Maintenance	Keep site fencing, barriers and scaffolding clean using wet methods.	Erosion and Sedimentation Control Plan
Site Prep and Maintenance	Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site. If they are being re-used on-site cover as described below.	Erosion and Sedimentation Control Plan
Site Prep and Maintenance	Cover, seed or fence stockpiles to prevent wind whipping.	Erosion and Sedimentation Control Plan
Operating vehicle/machinery and suitable travel	Ensure all on-road vehicles comply with their relevant standards.	Induction Traffic Management Plan
Operating vehicle/machinery and suitable travel	Ensure all vehicles switch off engines when stationary - no idling vehicles.	Induction
	If possible, avoid the use of diesel or petrol-powered generators and use mains electricity or battery powered equipment where practicable.	SWMS Risk Assessments to cover controls
	Impose and signpost a maximum-speed-limit of 20 km/h on surfaced and unsurfaced haul roads and in work areas. Haul roads should be treated with water carts and monitored during earthworks operations, ceasing works if necessary during excessive winds where dust controls are not effective.	Site Signage to be installed
	Where practicable, only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust	SWMS Risk Assessments to cover controls

Area	Mitigation Measure	Reference Document
	suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.	
	Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.	Site Layout
	Where possible, use enclosed chutes and conveyors and covered skips.	Erosion and Sedimentation Control Plan
	Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate.	SWMS Risk Assessments to cover controls
	Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.	Site Layout Erosion and Sedimentation Control Plan
Earthworks		
	Re-vegetate earthworks and exposed areas/soil stockpiles to stabilise surfaces as soon as practicable.	Erosion and Sedimentation Control Plan
	Only remove the cover in small areas during work and not all at once.	Erosion and Sedimentation Control Plan
Construction		
	Ensure sand and other aggregates are stored in bunded areas and are not allowed to dry out, unless this is required for a particular process, in which case ensure that appropriate additional control measures are in place.	Erosion and Sedimentation Control Plan
	Use water-assisted dust sweeper(s) on the access and local roads where possible, to remove as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.	Erosion and Sedimentation Control Plan
	Avoid dry sweeping of large areas.	Induction
	Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.	Induction Traffic Management Plan

Area	Mitigation Measure	Reference Document
	Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.	Site inspection form / site prestart
	Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).	Site Layout Erosion and Sedimentation Control Plan
	Ensure there is an adequate area of hard surfaced road between the wheel wash facility and the site exit, wherever site size and layout permits.	Site Layout Traffic Management Plan
	Access gates to be located at least 10m from receptors where possible.	Site Layout Traffic Management Plan

6 Record and Review

The effectiveness of controls will be reviewed and changes implemented as needed. The following form is utilised for environmental inspections and will be utilised for review and changes required. E-F-012 Safety Environment Walkaround Checklist.

Complaints will be recorded and complied in a complaint register. The following document will be utilised for recoding. QA-F-011 Record of Complaint.

Emergency Response Procedure

Tuross River Intake Pump Station (TRIPS)

Contract No. 10018531 / 20016

QUAY CIVIL

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Rev	Date	Revision Description	Prepared	Reviewed	Approved
0	22/09/20	Issued For Construction	D.Potter	N.Yekta	S. Wing
1	04/12/20	Revised with review comments	N. Yekta	D. Potter	S. Wing
2	16/12/20	Final issued for acceptance	D. Potter	N.Yekta	S. Wing
3	01/08/21	Update RL Levels for engulfment and flood trigger	S.Wing	S.Martin	S.Wing

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Emergency Response Procedure

Project Name	Tuross River Intake Pump Station (TRIPS)	**Project No.**	Contract No. 10018531 / 20016

This Emergency Response Procedure (ERP) has been developed to describe the Quay Civil response to any environmental and/or health & safety emergencies associated with the Tuross River Intake Pump Station (TRIPS) Project construction. It should be read in conjunction with 20016 Emergency Response Plan found as an appendix to this document.

Where an emergency dictates the requirement to notify and involve offsite emergency and/or other services, the emergency shall be actioned by Quay Civil's personnel in accordance with the responsibilities detailed below:

1. Responsibilities

All site personnel upon becoming aware of a situation that is or has the potential of becoming an emergency situation, are responsible to:

- Take all reasonable steps to make the situation safe or to reduce the hazard to themselves or others.
- Summon what assistance is required to treat the immediate effects of the emergency.
- Report the details of the emergency to the Quay Civil Site Supervisor/Engineer.
- Provide assistance as required to the Site Supervisor/Engineer or emergency response personnel.
- Report the incident/ emergency to the Client

1.1 Site Supervisor/Emergency Co-ordinator

The Site Engineer/Emergency Coordinator is the Quay Civil representative permanently based on site and shall provide Quay Civil's leadership for the site-based response to the emergency. Specific responsibilities include, but are not limited to:

- Initial assessment of the severity of the incident and the necessity for notification and mobilisation of emergency services including police, fire brigade, ambulance and/or air/sea rescue
- Ensuring that emergency services have been mobilised
- Immediate notification of the Client
- Initial contacts with emergency services
- Providing safety advice for emergency response and work practices
- Implementing procedures outlined in this plan to minimise harm to all site personnel

1.2 Site Engineer/Emergency Co-ordinator

The Site Engineer / Emergency Coordinator is the senior Quay Civil representative permanently based on site and shall be the secondary responsibility for the site-based response to the emergency. Specific responsibilities include, but are not limited to:

- Initial assessment of the severity of the incident and the necessity for notification and mobilisation of emergency services including police, fire brigade, ambulance and/or air/sea rescue
- Ensuring that emergency services have been mobilised
- Immediate notification of the Client
- Initial contacts with emergency services
- Providing safety advice for emergency response and work practices
- Implementing procedures outlined in this plan to minimise harm to all site personnel
- Recording of the emergency in accordance with Quay Civil's IMS

1.3 Project Manager

The Project Manager has overall responsibility for the Project site and activities and shall provide support to the Site Engineer in the response to the emergency. Specific responsibilities include, but are not limited to:

- Confirming the initial assessment of the severity of the incident by the Site Engineer
- Assisting in the notification and mobilisation of emergency services
- Assisting in communications with Client Representatives
- Liaising with the Quay Civil Construction Manager with regard to any emergency involving injury to personnel serious environmental impact or property loss
- Ensuring all required notifications are completed including WorkCover, the Regulator, Insurers, EPA, Council
- Review of the emergency and recording of any actions arising from the emergency in accordance with Quay Civil's IMS

1.4 HSE Coordinator

The HSE Coordinator is primarily responsible to represent workers on health, safety and environmental matters within the workplace. Specific responsibilities include, but are not limited to:

- Monitor the HSE measures taken by the project group ensuring compliance to relevant legislation and company policy
- Conduct regular audits and inspections at project locations
- Investigate or arrange for all accidents and near-misses be investigated and prepare a report of findings

1.5 Director and COO

The Director/COO has overall responsibility for Quay Civil's construction operations and shall provide support and advice to the Project personnel in the response to the emergency. Specific responsibilities include, but are not limited to:

- Liaising with Client Representatives to ensure information issued is technically accurate
- Providing further resources or information required in dealing with the emergency
- Final review of emergency against Quay Civil's IMS

2. Priorities in Emergencies

Quay Civil's priorities in an emergency are as follows:

- To ensure the safety of site personnel and the public
- To minimise the impact on the environment of the emergency and subsequent actions
- To minimise potential losses or damage to equipment and assets
- To minimise disruption to other work activities

3. Pre-Planning and Emergency Training

Quay Civil's Emergency Preparedness Procedure SE-P-003 is utilised in training personnel and planning the response that is detailed in this Site Emergency Response Plan.

All Quay Civil personnel are encouraged to download the Emergency+ App (available for iOS and Android). This allows the person reporting the situation to quickly reference their current coordinates for faster dispatch of emergency services to the correct location.

First Aid and Fire Safety trained personnel shall be available at site. All personnel shall be inducted into the requirements of this ERP. Personnel involved in emergency response shall be given appropriate training to perform their emergency response tasks in a safe and effective manner.

Emergency responses shall be included in the project specific induction provided the first time a worker attends site. Drills, rehearsals, emergency exercises shall be held at least quarterly to test the effectiveness of the responses and the readiness of project staff in addition to an Emergency Response Exercise that will be facilitated as part of the pre-commencement briefing. External parties and emergency providers may be invited to participate in these exercises.

Emergency 24-hour telephone contacts and an action flowchart are provided on the following page and these shall be printed and displayed on all site notice boards for the duration of the project.

All site supervisors must be equipped with UHF radios, and all plant must be equipped with UHF radios. Trucks entering site must also have radio access.

4. Emergency Response Facilities

Prior to site establishment, the following facilities will be contacted to be advised of our presence and planned works in the area. Contact numbers and in some cases specific contact persons will be confirmed and documented in the Emergency Response Plan as per Appendix 1.

Table 1 - Table of Emergency Contacts

Type	Facility/Organisation	Address	Contact Phone No.
Medical Centre	Narooma Medical and Specialist Centre	185 Princes Hwy, Narooma 2546	(02) 4476 5588
Hospital	Moruya District Hospital	2 River St, Moruya 2537	(02) 4474 2666
RFS	NSW RFS - Bodalla	109 Princes Hwy Bodalla 2545	02 4474 2855 [Council Fire Control Centre]
Police	Narooma Police Station	Princes Highway Bodalla 2545	000/4473 5244
EPA	NSW Environmental Protection Authority (EPA)	4 Parramatta Square, 12 Darcy Street, Parramatta 2150	(02) 9995 5000
Marine Rescue	Tuross Marine Rescue	Details TBC	
Council	Eurobodalla Shire Council	89 Vulcan Street, Moruya 2537	(02) 4474 1342 [Harvey Lane]
SafeWork NSW	SafeWork NSW		13 10 50
WIRES	Wildlife Rescue Emergency	Suite 1-5, Lifestyle Working, 117 Old Pittwater Road, Brookvale 2100	1300 094 737
NSW SES	State Emergency Services		13 25 00

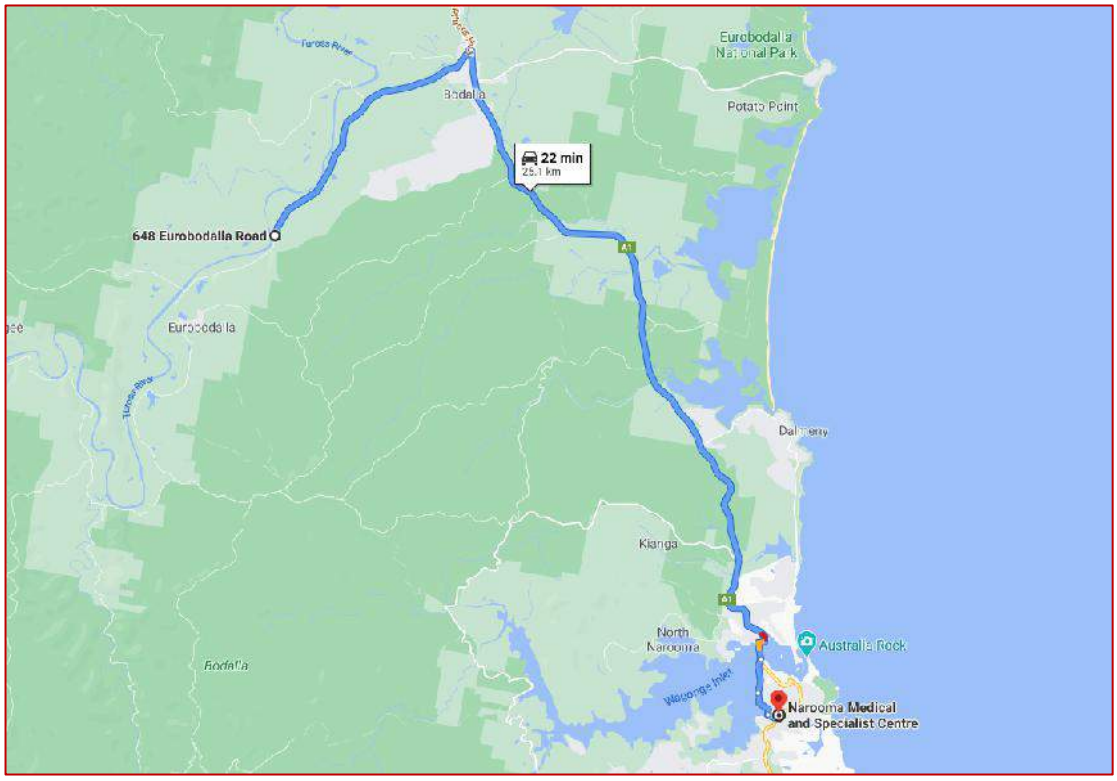


Figure 1 - Narooma Medical and Specialist Centre

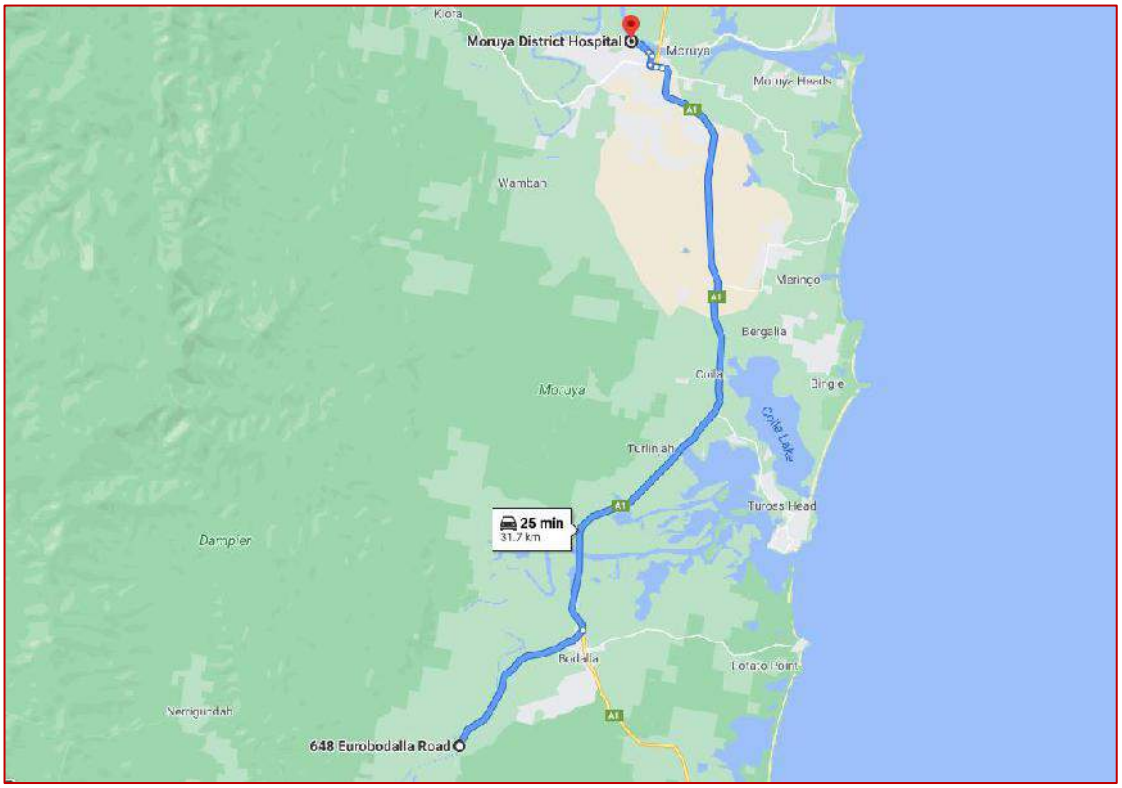


Figure 2 – Moruya Hospital

5. Emergency Response

After reviewing the possible emergency scenarios, the following are considered relevant to the Project operations and are addressed in the following pages and the Emergency Response Flowchart of this ERP.

- Major Incident
- Fire
- Explosion
- Pollution Event including Chemical Spills or Hazardous Substances
- Flooding/ Rising River Level
- Engulfment
- Rescue from Confined Space
- Ground Slip
- Marine Craft Overturning
- Plant Incident
- Person in Water
- Electrical Incident

In all cases, accurate details are required to allow the Supervisor or Site Engineer to quickly evaluate the situation and set in motion the appropriate response. The Quay Civil Incident Report and Investigation Form SE-F-003 will need to be filled out and the details required include:

- Location of Accident / Emergency
- Type of Injury / Emergency
- Severity of Injury / Emergency
- No. of people involved in Injury
- Will emergency services (Ambulance, Fire Brigade) be required?
- Name and contact details of person completing the form.

6. Major Incident

As per Quay Civil's Incident Management Procedure (SE-P-002) this ERP shall be invoked for incidents classified as Major Incidents. Minor incidents shall be controlled and resolved to minimise further impact and restore the site to a safe condition.

In the event of a major incident contact emergency services via Triple Zero "000" (or 112 from a mobile phone) providing details of:

- Name and address of site (including coordinates if available)
- Location of entry to site, noting there will be someone there to meet the service
- No. of people involved in injury
- Site telephone number
- Your name

After contacting emergency services, or if emergency services are not required, the Site Engineer and/or First Aider is to be notified immediately.

When emergency services are required, the Supervisor must inform the Project Manager who will notify the HSE Representative.

Do not move injured personnel unless there is a high risk of further injury. Send an employee to the site entry to wait for emergency services and alert authorities to the precise location of the incident.

NOTE: Quay Civil will always consider retrieval of an injured person when designing temporary access.

The injured person's Supervisor must notify the Manager immediately so that Injury Reporting and Investigation procedures can be initiated. Refer to the Quay Civil Incident Report and Investigation Form (SE-F-003) for details.

In the event of a fatality, the Site Engineer must notify the Police and WorkCover as well as the Managing Director and HSE Representative. The area where the incident occurred must be immediately roped off a minimum of four-metre (4m) radius until the investigation by Workcover, the Authorities and Quay Civil / Client Management.

7. Fire and Bushfire

Firefighting equipment is to be provided at the work site and workers shall be trained in its use. The site is cleared and therefore the risk of conflagration is low. In the event of a fire on site, emergency procedure is as follows:

- Alarm is to be raised over the site radio frequency.
- Site supervisor and site engineer will organise the evacuation of personnel to the site muster point
- When the safety of all personnel is secured, fire blankets and fire extinguishers will be utilised to attempt to stifle the blaze. The fire brigade is notified as the situation is understood better. In case of small spot blazes that can be contained by site crew
- With or without external assistance the blaze is contained, and works remain on hold until the area is fully cleared by the brigade
- If, and when, the fire becomes a threat to personnel, personnel will evacuate site

In the case of a bushfire in the vicinity of site being identified:

- Site staff monitor nearby blazes via Fires Near Me or other means
- If Watch and Act level is reached, site is closed and people are evacuated
- If nearby roads are becoming dangerous and it is unsafe to leave site, shelter in place in an area away from the smoke of the blazes, ideally inside the site sheds

8. Explosion

Materials and equipment used on the Tuross River Intake Pump Station (Trips) Project site that could result in an explosion include:

- Fuels contained in drums, tanks or while refuelling takes place.
- Compressed gas bottles - air, oxygen, acetylene, LPG.

The results of an explosion may include personnel injury and damage to property and the environment caused by the explosion event and/or any subsequent fire.

The prime consideration is to ensure the safety of nearby personnel, which includes assessing and minimising the threat of subsequent explosions or fires.

Medical emergency and firefighting procedures shall be implemented as relevant to the type of explosion. Dry fire extinguishers and fire blankets will be available at sites of regular hot work or locations of refuelling. General first aid and the like will be available at a designated first aid point.

Clean up of the affected areas of the site shall be in accordance with the following pollution controls.

9. Pollution

Quay Civil will make available two (2) people and their contact numbers (Site Supervisor & the Project Manager) to the EPA on a 24hr basis. Quay Civil will notify the EPA Regional Manager (or the EPA pollution line 131 555 if the incident occurs out of hours) of pollution incidents on or around the site which have occurred in the course of Quay Civil activities in the following circumstances:

A) If the actual or potential harm to the health or safety of human beings or ecosystems is not trivial;

B) If actual or potential loss or property damage (including clean-up costs) associated with a pollution incident exceeds $10,000.

Quay Civil shall notify the Client verbally within two (2) hours and in writing within 24 hours of any pollution incidents which should involve the EPA. Furthermore, Quay Civil shall prepare a report on each occasion when the site is visited by the EPA, notifying the Superintendent of the purpose and outcome of the EPA visit and of all actions being undertaken by the contractor in response to the EPA visit. This report shall be submitted to the Client within five (5) working days of the EPA site visit.

The following procedures will be followed in the event of a pollution event involving chemicals, fuels, oil/sludge, sewage, hazardous materials and non-hazardous liquids:

9.1 The Site Supervisor and or the Project Manager shall be notified of the pollution event immediately so that appropriate spill and clean-up controls can be implemented, including notifications, and that the clean-up is adequately supervised and all pertinent records are maintained

9.2 For pollution events involving gross pollutants, the response shall contain the pollutant by use of appropriate Pollution Control Materials maintained on site (see below)

9.3 **Pollution Control Materials**

The site facilities compound shall contain, as a minimum, the following materials to be utilised in response to a pollution event and to be used/placed at the Project Manager's direction

- Spill kit including absorbent sausages, bags of absorbent material
- Sand-bags for bunding / water diversion
- Rolls of Geo tech fabric etc

9.4 The pollutant and threat posed shall be identified and the pollutant contained/ covered to minimise environmental impact and ensure it does not reach natural watercourses.

9.5 Pollutants identified as non-hazardous shall be fully contained / bagged / binned and transported to an appropriate waste disposal facility.

9.6 Noxious wastes and odours shall be contained by covering with Fortecon and/or sand. Where required, specialist advice/resources may be accessed as provided for in this Emergency Response Plan.

9.7 Hazardous Materials maintained on site are limited to fuels and oils and are identified in the register of MSDS maintained in the Site Office. MSDS sheets for all chemicals shall be available at all work sites.

10.Engulfment and Flood

As precipitation or flood begins and water level increases, the responses described below are triggered. Monitoring of the Floods Near Me app may also reveal a flood event on the Tuross River which may affect the TRIPS site. When the event has ceased for a minimum period of one hour the situation will be assessed and the supervisors for each crew will risk assess a return to work against:

- Chance of further rainfall or flood
- Ground and site condition
- Ability of site infrastructure to dewater to required levels to continue work

10.1 Engulfment

Emergency responses to water engulfment are presented in Table 3 and Table 3.

Table 2 – Response plan for works inside shaft excavation up to Platform Level (RL 3.0m)

Lower flows are experienced when the river level is below the platform of RL3.0. This allows the gauge levels to increase slightly higher in comparison to the Access platform level. Changes in river heights from the range of 0-2.8m usually occur with ample assessment to the site conditions.

	Gauge Level	River Level (RL)	Lowest Permitted Worker Access Level	Action triggered
Early Warning	1.5 m	2.5 m	-1.92 m (base access still allowed)	- Monitor river level every 10 minutes. - Confined Space conditions required
Watch and Act	1.7 m	2.7 m	-1.92 m (base access still allowed)	Complete current tasks and plan for evacuation
Evacuation	1.8 m	2.8 m	No access allowed	Evacuate immediately

During excavation and backfill operations, a second platform level of RL5.5 is utilised, and trigger levels are presented in Table 3. Volume of water and velocity increases as the river approaches the RL5.5 platform. For this reason, triggers are more conservative to ensure ample time for works assessment.

Table 3 – Response plan for works inside shaft excavation up to Platform Level (RL 5.5m)

	Gauge Level	River Level (RL)	Lowest Permitted Worker Access Level	Action triggered

Early Warning	3.5 m	4.5 m	-1.92 m (base access still allowed)	- Monitor river level every 10 minutes - Confined Space conditions required
Watch and Act	4 m	5 m	-1.92 m (base access still allowed)	Complete current tasks and plan for evacuation
Evacuation	4.2 m	5.2 m	No access allowed	Evacuate immediately

In the event of material engulfment the following activities will commence immediately, or as soon as is reasonably practicable.

1. Call emergency services on Triple Zero (000) or 112 from a mobile.
2. The most senior worker in the immediate vicinity to perform a risk assessment to determine whether a rescue attempt is safe to do.
3. If it is safe to attempt a rescue, the most senior worker onsite will coordinate the rescue team and process of attempt.
4. If it is not safe to attempt a rescue, the activities become a recovery that will be facilitated by emergency services. In this situation, the site must be secured and made as safe as practicable and all personnel must be evacuated from the immediate vicinity until emergency services arrive.

10.2 Flood

Emergency responses to floods are presented in Table 4.

Table 4 - Responses to flooding scenarios

	Gauge Level	River Level	Permitted Works	Action triggered
Early Warning	3.5 m	4.5 m	Works on river bank not allowed Works on platform level allowed	Monitor river level every 10 minutes
Watch and Act	4 m	5 m	Works on river bank not allowed Works on platform level to be monitored	Complete tasks and plan for evacuation
Evacuation	4.5 m	5.5 m	No works allowed below EL 14.5	Evacuate immediately

All workers in the zone outside of the handrailed platform area below the platform level, as depicted in Figure 2, will be required to wear a Level 100 or above Personal Flotation Device (PFD) at all times. This is for primarily for workers working near the river's edge, involved in barge work or clean out of environmental controls. Refer to Quay Civil Working Over Water Procedure (SE-P-042).

11.Confined Space

To determine if a confined space is required to operate or not, the Wet Well/Excavation Access Permit is required to be filled in. Prior to commencing any work in Confined Spaces, and in conjunction with Quay Civil's Confined Space Procedure (SE-P-021), an Authorised Person must complete both a Confined Space Permit (SE-F-039) and a Confined Space Rescue Plan Form (SE-F-075).

Quay Civil has identified the emergency responses and their triggers in Table 5.

Table 5 - Confined Space emergency responses

Risk	Mitigation	Emergency Response
Hazardous Atmosphere due to construction work e.g. welding of reinforcement below RL 5.5 in shaft	Provision of atmospheric monitor	When monitor reaches trigger level, evacuate personnel from space
	Provision of mechanical ventilation (if required)	Mechanical ventilation in use at all times
Injury inside space in a location where davit arm use is possible e.g. uppermost wall lift platform	Each worker to wear three-point harness	Crew inside confined space to communicate the emergency
	Confined space supervisor to carry UHF radio	Rescue via winch from davit arm location, via crane and man box or craned harness
Injury inside space in a location where Davit arm use is not possible e.g. deck level underneath uppermost wall lift platform	Confined space supervisor to carry UHF radio	Crew inside confined space to communicate the emergency
		Crane rescue man box or craned stretcher to be used to remove worker from confined space
Dropped objects causing serious injury (wet well FRP works)	Access hatch between levels of decking inside wet well construction	Hatch closed or equipped with toe boards when working at a level below other works
Engulfment	As per engulfment emergency response procedures in Section 10	

12.Marine Vessel Overturn

As the Barge Operator is the subject matter expert with regards to Marine Vessel Operations, Quay Civil will be deferring to the procedures used by the Barge Operator for Emergency Response to a marine vessel overturn.

These procedures will be audited and reviewed in line with Quay Civil's IMS System.

13.Ground Slip

Table 6 outlines emergency responses and mitigations to ground slip. Complete collapse of an excavation is mitigated by use of the techniques described such that in a ground slip scenario, workers will have time to evacuate themselves and plant safely.

Table 6 - Mitigation and responses to ground slippage

Risk	Mitigation	Emergency Response
Flooding of river causing ground or excavation failure Failure in rock or embankment causing ground or excavation failure Improper excavation for the ground condition	Monitoring and response of flood levels as per Section 10. Geotechnical and geological advice during project planning to confirm an initial stabilisation strategy. Daily risk assessment of excavation stability and condition, including geotechnical advice. Stabilisation works as required, via shotcreting and mesh or mesh and bolting. Crews equipped with UHF radio to communicate movement.	Emergency notification to all personnel via UHF radio. Evacuation of area to muster point offices. Depending on severity of failure, plant may have to be abandoned. Unstable ground or excavation monitored from safe location. Notification of Council to notify any affected parties downstream of the site regarding material in the river due to flooding, as well notifying SES. In case of collapse, notification of SES and 000 to rescue trapped workers.

The prime consideration is to ensure the safety of nearby personnel. If plant or equipment must be abandoned it must be uncovered later after the extent of failure is assessed and it is deemed safe to do so.

If it becomes apparent that ground is moving, a radio call is raised and workers must be moved to the muster point and the roll called. In case of workers engulfed by ground slip, notify of SES and 000 to rescue trapped workers. Quay Civil would provide assistance to SES with use of excavators, cranes and other machinery. If possible, trapped workers would be provided with food and water roped in via containers until rescue could be undertaken.

14.Plant Incident

Table 7 outlines emergency responses for various plant incident scenarios.

Table 7 - Plant emergency responses

Risk	Mitigation	Emergency Response
Wash away of plant in extreme flood event	Equip plant with life jackets or life ring in place of flood risk.	

Overturn due to flood or ground slip Engulfment in excavation in case of sudden rain event Falling into river due to failure of excavation or loss of stability Strike of overhead or underground service	Service plant as per manufacturer recommendation to prevent breakdown during emergency. Ensure slopes being navigated by plant are within manufacturer tolerances. Ensure access tracks are suitably stable and firm with geotechnical advice; lay granular material as required. Ensure access tracks are wide enough or barriers have enough height to prevent accidental falling of plant. Secure plant to designated anchoring point, if deemed necessary via risk assessment. Equip operators or plant spotters with UHF radios in case of sudden evacuation. Spotter always in place when excavating or tracking near overhead services	If plant is caught in wash away, abandon plant, taking life ring, and raise the emergency when safe to do so. If plant is overturning, abandon plant, taking life ring, and raise the emergency when safe to do so. Handrails or rockfaces should prevent plant from washing away in case of slight movement. Refer to engulfment action plan in Section 10 for evacuation in case of engulfment in excavation. In case of ground failure risking plant, ensure safety of operator first and foremost. If safe to do so, remove plant from affected area. If less time available, pull in arm/boom/mast etc, kill power to engine and leave in position. If absolutely critical, abandon plant. Operator to wear life ring or vest when evacuating plant in flood event. Raise alarm when safe to do so. If excavator comes in to contact with underground or overhead service, operator to stay in cabin if safe to do so. If Operator must exit cabin, they are to jump with feet together as far as possible from excavator, and hop with feet together away from machine.

The prime consideration is to ensure the safety of nearby personnel. If plant or equipment must be abandoned, then it must be abandoned until it is deemed safe to retrieve.

15.Person in Water

Should a person fall into the water from any of the above-mentioned water edge locations, a water rescue utilising available life rings shall be initiated.

If the person in the water cannot be immediately retrieved and the barge is in operation, the Barge Operator will be required to call Triple Zero “000” (or 112 from a mobile phone) asking for police. Police will then activate the agencies required to respond to a person in the water. If the Barge Operator has a marine radio on board, he is also required to call MayDay in order to immediately notify Tuross Marine Rescue.

In cases when the barge is not operation, Quay Civil will have a small work punt available on site, moored and available for use as person in water rescue. Rescuers will throw a life ring to the person in water and mobilise in the work punt to recover them. Tuross Marine Rescue will be notified.

16.Electrical Incident

Table 8 outlines emergency responses for various electrical incident scenarios.

Table 8 - Emergency Response for electrical shock

Risk	Mitigation	Emergency Response
Electrical Shock	All electrical isolation and terminations must be performed by a licensed electrician, and all such works must be covered by a SWMS. All isolations must follow Quay Civil's isolation procedures and must be locked out by the electrician so that it cannot be energised by any other party. As far as reasonably practicable, all works must be carried out de-energised. All electrical equipment shall be tagged and tested within date prior to use. All portable generators, electrical DBs and powered tools and equipment, as appropriate, shall be fitted with an Residual Current Device (RCD). All persons using electrical tools or equipment, or who are working around powered equipment shall be trained in both the procedures for the work and these emergency procedures.	Call for emergency services, Triple Zero (000). Do **NOT** touch the person who has been contacted by electricity. Turn the power off and isolate at the source of the current. If unable to turn the power off, end the person's contact with the current by using an insulated object to push the person clear of the electrical source eg an item made of wood or rubber. The first aider may then administer first aid to the injured person. Call an electrician to provide and electrical assessment and repair any damaged circuitry. Report the incident to the regulator.

17.Applicable Documents

Document Title	Document Type	Document number
Training, Awareness and Competency	Procedure	HR-P-001
Incident Management	Procedure	SE-P-002
Emergency Preparedness	Procedure	SE-P-003
Confined Space Procedure	Procedure	SE-P-021
Working Over Water	Procedure	SE-P-042
Incident Report & Investigation	Form	SE-F-003
Confined Space Permit	Form	SE-F-039
Confined Space Rescue Plan	Form	SE-F-075

18.Emergency Response Plan

The “Emergency Response Plan” provided in Appendix 1 will be printed (A3) and displayed at prominent locations throughout the site, i.e. Site Office, Lunch Room etc.

- Site location and egress points
- Office facilities and amenities locations
- Emergency assembly muster points
- Hazardous materials stores
- First Aid facility
- Telephone locations
- Emergency contact personnel and phone numbers
- Emergency services contact details
- Local Authority contact details
- EPA, WIRES, WorkCover, SafeWorkNSW, Council details

This Emergency Response Plan provides the basic details and response required from Quay Civil's employees and subcontractors in the event of an emergency at the Project Site.

Incidents need to be categorised to allow the selection of the appropriate response:

☐ Major Incident	☐ Fire	☐ Explosion	☐ Pollution/ Contaminant Spill
☐ Flooding/ Engulfment	☐ Confined Space	☐ Marine Vessel Overturn	☐ Ground Slip
☐ Plant Incident	☐ Person in Water	☐ Electrical Incident	

The response to the incident in all cases requires the notification of the Site Engineer or next available Quay Civil management representative, the notification of the Client Superintendent and the implementation of the emergency response plan as detailed below.

Refer to the attached Emergency Response Plan of the site and site compound for the following:

- A First Aid Cabinet is located in the Crib Room.
- First Aid kits are provided in each of the Quay Civils site utilities.
- Telephones are located in the Quay Civil Site Office and Client Office.
- The Emergency Assembly Points are located adjacent to the main entry gate of the Site Compound

19.Emergency Response Flowchart

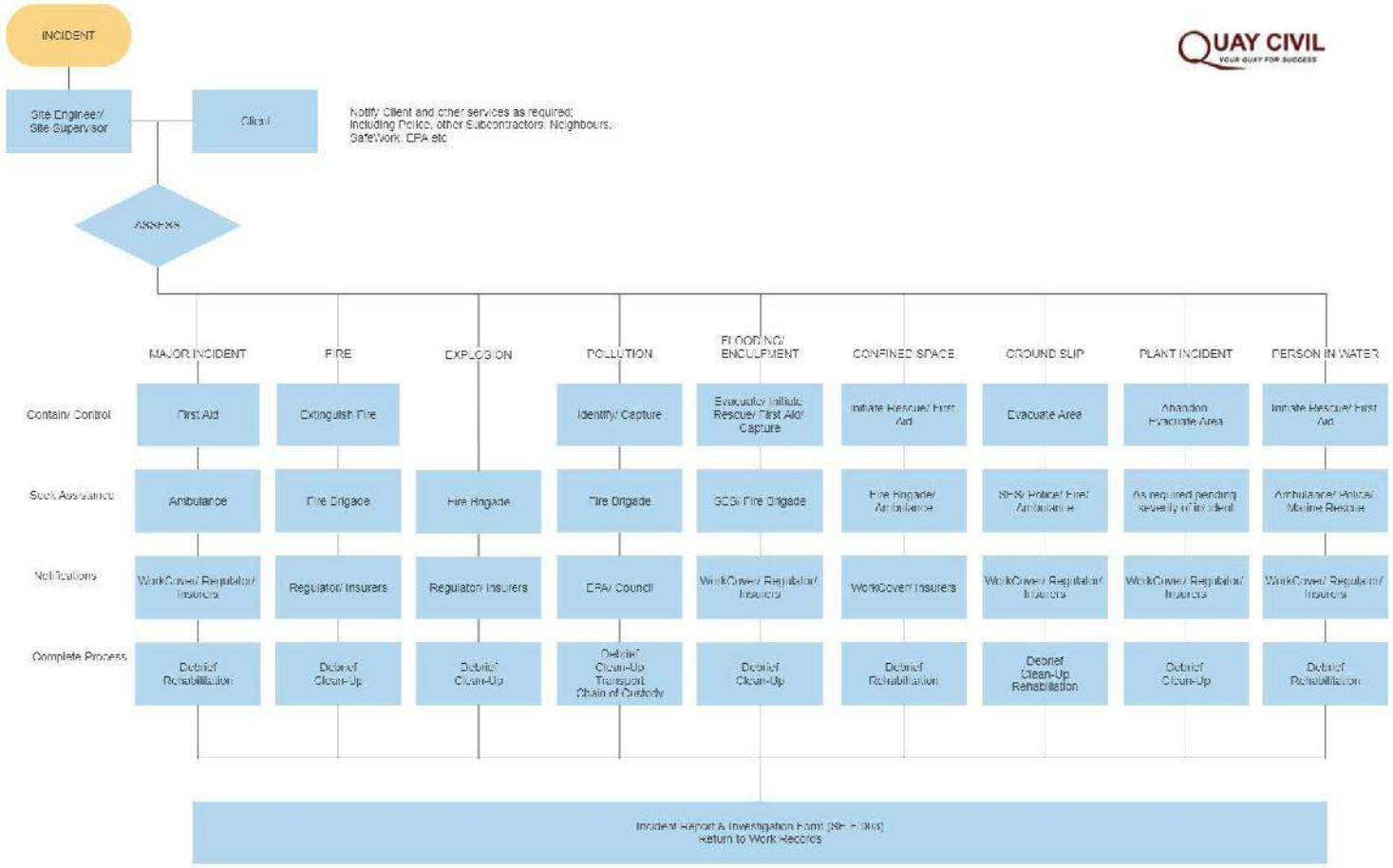
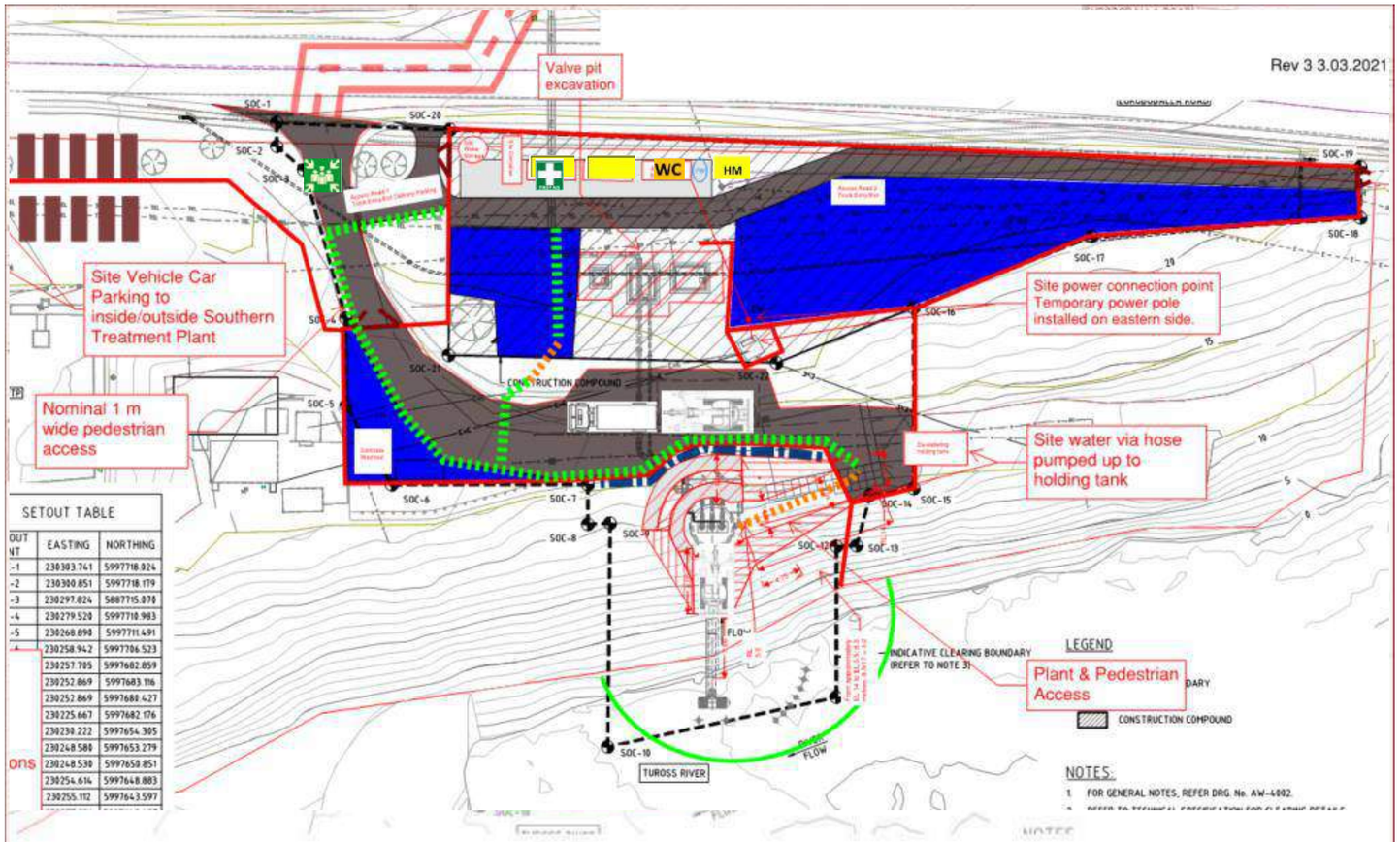


Figure 3 - Emergency Response Flowchart

Appendix 1. Emergency Response Plan

Tuross River Intake Pump Station - Emergency Response



LEGEND

Laydown Areas		First Aid		Amenities	WC
Hazardous Material Container	HM	Muster Point		Radio Location	
Site Boundary Fence		Site Shed			
Evacuation Route		Shelter in place points			

Site Location:	643 Eurobodalla Rd, Bodalla, NSW 2545	
Emergency contact personnel:		
QC		
Site Supervisor	Ciaran Cullen	- 0450 731 477
Project Engineer	Sam Martin	- 0430 833 234
Project Manager	Stuart Wing	- 0417 042 365
WHS Adviser	Dani Potter	- 0411 515 903
ESC		
PAP	Ross Bailey	- 0412 320 064
ESC Head Works Super	Adam Bellis	- 047 365 222
Police:	13 14 14 (non-emergency) 000 (Emergency)	
Ambulance	000 (Emergency)	
Closest Hospital	Moruya District Hospital 2 River St, Moruya 2537 (02) 4474 2666	
Closest Medical Centre	Narooma Medical and Specialist Centre 185 Princes Hwy, Narooma 2546 (02) 4476 5588	
Wildlife Rescue:	1300 094 737	
WorkCover NSW:	13 10 50	

Revision	Date
Rev3	**01/08/2021**