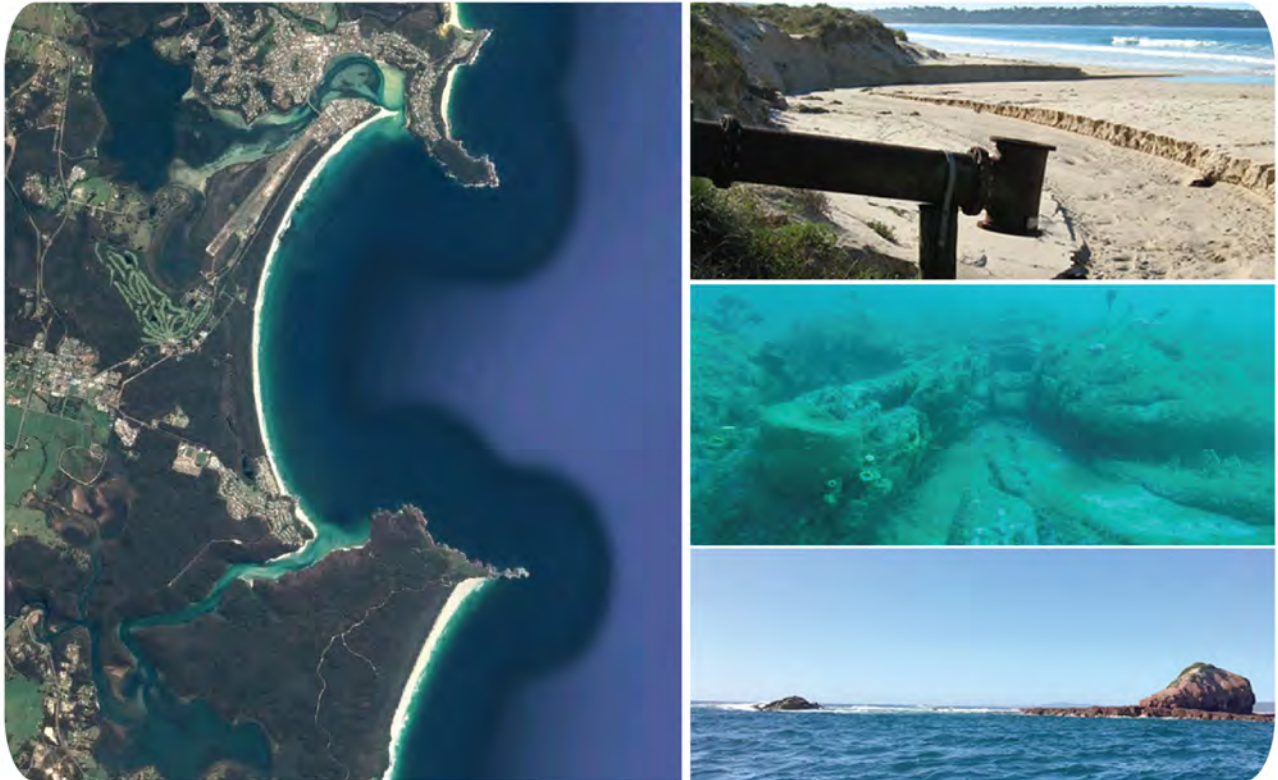


Merimbula Sewage Treatment Plant Upgrade and Ocean Outfall

Appendix E Water Quality Report

Merimbula Sewage Treatment Plant Upgrade Ocean Outfall Concept Design and Environmental Assessment



WATER QUALITY

Final

Prepared for
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WATER QUALITY**Executive Summary**

This water quality report was undertaken as part of the EIS requirements for the Project with key objectives including:

- To identify environmental values and define water quality objectives (indicators and trigger values) for receiving environments within the study area that includes marine coastal waters, estuaries, groundwater and wastewater re-use areas.
- To describe ambient background water quality for receiving environments.
- To describe existing characteristics of treated wastewater quality.
- Assess potential impacts of the Project construction and operational phases on water quality.

The report incorporates findings presented in two previous studies, the *Preliminary Water Quality Assessment memorandum* (AECOM, 2019b) and the *Merimbula Ocean Outfall Dispersion Modelling Report* (AECOM, 2020a). Note that this report does not include assessment of groundwater, which has been reported separately in the Groundwater Technical report (**Appendix D** in the EIS).

Environmental values to be protected include aquatic ecosystem health, primary and secondary contact recreation, visual amenity, aquatic foods, and cultural and spiritual values. The indicators and trigger values for each environmental value are based on DECC (2005) and DECC (2006), which in turn defer to the ANZECC (2000) guidelines as updated in ANZG (2018). The Project adopts a consolidated marine water quality objective (MWQO) trigger value which is typically the lowest trigger value and protective of all environmental values. For estuarine waters of Merimbula Lake and Pambula River estuary, there are some differences in trigger values for some physico-chemical and nutrient parameters compared to marine waters and these are noted where relevant.

A summary of key findings is provided below:

- Coastal processes including tidal flows, oceanic current conditions, and local climatic conditions (i.e. catchment flood events, large swell events) have a direct influence on ambient water quality of Merimbula Bay. Ambient marine water quality is described based on median values derived from a 24-month monitoring program (2014-2015 and 2016-2017) that collected water quality data from sites within and outside Merimbula Bay over a range of boundary current conditions and included three upwelling events. Data shows that during upwelling events, concentrations of nutrients are delivered to the nearshore zone of Merimbula Bay that exceed MWQOs.
- Merimbula Lake and Pambula River estuary are characterised by high water quality under normal tidal and baseflow conditions. Dispersion modelling of the existing beach-face outfall shows that treated wastewater at 1,000 – 10,000 times dilution may enter Merimbula estuary under certain current conditions while Pambula River is not affected. The high level of dilution means that wastewater would be below detection limits and would comply with WQOs in the event that it does enter the estuary. Estuarine water quality conditions decline following significant rainfall events with catchment inputs of elevated levels of suspended sediment, nutrients and microbiological parameters exceeding MWQOs. It is during these episodic events that high loads of sediment and nutrients may be exported to Merimbula Bay during ebb tidal stages.
- Existing treated wastewater quality (ETWWQ) can be broadly described as (based on median concentrations):
 - o Freshwater, relatively low in salinity.
 - o Well oxygenated.
 - o Near neutral pH.

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- o Relatively low in suspended solids with intermittent higher suspended loads such as during wet weather flow.
- o Containing levels of microalgae as represented by chlorophyll-a. Once discharged the marine environment, microalgae in treated wastewater would not survive due to the saline environment.
- o Containing elevated levels of nutrients that include ammonia, nitrate, oxides of nitrogen, total nitrogen, total phosphorus and orthophosphate.
- o Relatively low microbiological indicators of *Enterococci* and faecal coliform counts with intermittent higher counts that exceed MWQOs such as during wet weather flow.
- o Containing concentrations of metals that include instances of aluminium, copper, iron, selenium and zinc, reported above MWQOs.
- Proposed STP upgrades are expected to result in improved wastewater quality over the ETWWQ that includes:
 - o PAC dosing for phosphorus removal.
 - o Tertiary filtration, although this is a Project uncertainty as to whether this is needed for water quality objectives to be met.
 - o UV treatment.
 - o Chlorine dosing, but only for wastewater to be reused, not for wastewater to be discharged from the ocean outfall.
 - o Decommissioning of open 17 ML wastewater storage pond and replaced with a closed 2.3 ML storage tank.
- Hydrodynamic modelling of the study area is provided in the dispersion modelling report (AECOM, 2020a) that describes the range of ocean current conditions expected at the ocean outfall location. Modelling results indicate that discharge of treated wastewater at the ocean outfall location, situated 2.7 km offshore in 30 m depth provides significant improvement in dispersion over the existing beach-face outfall, based on a diffuser design with three ports, each with two risers and wastewater discharged at 80 L/s.
 - o Under typical conditions of median ETWWQ and a range of ocean current conditions, a mixing zone of 25 m is required to achieve necessary dilution to meet MWQOs. This dispersion scenario would be expected to occur the majority of the time, estimated at 99% of the time.
 - o Under worse-case conditions of ETWWQ discharge at EPL limits or 90th percentile concentrations and low current speeds with or without stratification, the mixing zone extends to within 200 m of the outfall location. This would be expected to occur a minor proportion of the time which is estimated at 1% of the time, based on 90th percentile ETWWQ (10%) combined with 10th percentile (10%) low current conditions (northward or southward).
 - o Given that modelling was based on existing wastewater quality and that proposed upgrades at the STP would result in improved future wastewater quality, it is expected that maintenance of MWQOs would be achieved over time beyond the mixing zone for normal and worse-case conditions.

Assessment of potential impacts of the Project construction and operational phases on water quality was undertaken in an environmental risk analysis. Findings include:

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Construction phase impact assessment

- Potential release of drilling fluids at end of Section 1 tunnel into surface waters beyond the surf zone of Merimbula Bay. Low risk through waste management measures. Drilling fluids would be captured in an above ground tank and recycled as part of the drill rig set up where possible. Opportunities to re-use drilling fluids, using a recycling unit to separate the solids from the liquid, would be investigated further during detailed design and construction planning. Where feasible, this waste would be re-used under the NSW EPA Resource Recovery Order for treated drilling fluid.
- Spills and leaks from support vessel(s). Low risk through CEMP mitigation measures.
- Potential for turbidity plume in water column adjacent to the pipeline route from sediment disturbance. Assessed qualitatively as low risk, based on factors including particle size distribution (PSD) results, significant distance to nearest sensitive receptors, regional turbidity influences from estuary discharge and swell events, and lay and cover method presenting less disturbance than trenching.
- Potential mobilisation of contaminants in benthic sediments. Risk assessed as low based on screening of available sediment data.

Operational phase impact assessment

Potential impacts of the operational phase considered threats to aquatic ecosystem health, primary and secondary contact recreation and aquatic foods from water quality changes associated with the discharge of treated wastewater to the mixing zone. Note that the assessment of impacts adopted a conservative approach and was based on hydrodynamic modelling of ETWWQ. Proposed STP upgrades are expected to result in improved wastewater quality over the ETWWQ. Key factors for the assessment included:

- Under typical conditions majority of time (estimated at 99%), a mixing zone of 25 m is required to achieve necessary dilution to meet MWQOs. Mixing zone located over sandy seabed habitat.
- Under worse-case scenario (estimated 1% of the time) the mixing zone required to achieve all MWQOs is predicted to occur within 200 m from the diffuser location based on the ETWWQ. Mixing zone located over sandy seabed habitat.
- The nearest receptors of subtidal and intertidal reef communities, Merimbula Offshore Artificial Reef (OAR), Pambula and Merimbula Lakes and recreational beaches have the following distances from the proposed diffuser location:
 - o Hunter Reef ~1400 m to the south-east.
 - o Rocky reef shorelines from Pambula Lake entrance to Haycock Point ~2000 m to the south south-west.
 - o Rocky reef shorelines from Merimbula Lake entrance to Long Point ~2300 m to the north.
 - o Merimbula Offshore Artificial Reef (OAR) ~1000 m to the north-east.
 - o Entrances to Merimbula Lake, Pambula Lake and the between recreational beaches of ~2700m to 3000m to the south-west, west and north-west.

The above receptors are located outside of the mixing zones predicted to be required to meet MWQOs, both for discharge under normal conditions the majority of time (~25 m) and at a modelled worse-case scenario for a minority of time (~200 m).

- o Discharge of treated wastewater to Merimbula Bay has occurred since 1971, including from the existing beach-face outfall since 1974.

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Potential impacts assessed included:

- Discharge of nutrients to mixing zone. Risk assessed as low, with factors that include ammonia equilibrium in marine water chemistry, regional influences such as upwellings and estuary discharge, and STP upgrade of PAC dosing to further remove phosphorus from wastewater stream.
- Discharge of metals to mixing zone. Risk assessed as low, also supported by results of metal testing in fish and shellfish biota in *Marine Ecology Assessment* (**Appendix G** in the EIS) Risk to recreational and commercial fisherman is also considered low. If required, a mitigation measure to reduce the risk of metals in the wastewater would be the addition of tertiary filtration which would improve metal removal from the wastewater stream. However, with nutrients requiring the highest dilution and effectively defining the extent of mixing zone, further metal removal would not change the mixing zone extent and would be expected to only marginally decrease an already low risk. Therefore, including tertiary filtration would be unlikely to be justified from a metal removal perspective.
- Discharge of microbial contaminants to mixing zone. Risk assessed as low, ceasing of beach-face outfall and moving to ocean outfall reduces public health risk to recreational beachgoers.
- Discharge of wastewater with low salinity. Risk assessed as low, due to rapid mixing effects with seawater.
- Settling of contaminants on seabed. Risk assessed as medium in mixing zone, low risk outside mixing zone. Potential changes to seabed chemistry in mixing zone may impact benthic infaunal assemblage. The extent of potential impact to this receptor is expected to decrease with distance away from the diffuser. This potential impact is to be monitored with benthic infauna monitoring proposed as a key element of marine ecological monitoring program to determine background natural variation.

The water quality assessment has the following findings to inform the impact assessment to marine ecological communities:

- Ecological receptors within the 25 m mixing zone is limited to sandy seabed habitat and its epifauna and infauna communities. The worse-case scenario with a larger mixing zone of up to 200 m also occurs in the same sandy seabed habitat. Fish and cetaceans would transit through this mixing zone on an intermittent basis. Potential impacts to ecological receptors are most likely to be detected within the predicted mixing zone of 25 m. Detection of impacts to ecological receptors beyond this zone becomes less likely due to the high levels of dilution achieved over the relatively short distance, and the highly infrequent nature of the predicted worse-case scenario.
- For both typical and worse-case scenarios, sensitive marine ecological receptors including Hunter Reef, rocky shorelines of Haycock Point and Long Point, the offshore artificial reef (OAR) and Merimbula and Pambula estuaries are located significant distances from the mixing zone and would not be impacted by changes in water quality from the discharge of treated wastewater from the ocean outfall.

As part of operational licence requirements, it is expected that water quality monitoring of marine and estuarine waters would need to be undertaken as a key performance indicator of environmental compliance. A preliminary monitoring program is provided in **Section 8** of the report that identifies proposed water quality monitoring locations, monitoring frequency, indicators and an outline of contingency actions.

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- Certificate of Analysis – Particle Size Distribution (PSD) results
- Excerpt from Marine and Earth Sciences (2018)

WATER QUALITY**List of Abbreviations and Acronyms**

ADWG	Australian Drinking Water Guidelines
AGWR	Australian Guidelines for Water Recycling
AHD	Australian Height Datum
ANZECC	Australian and New Zealand Environment and Conservation Council
ARI	Average Recurrent Interval
ASS	Acid Sulphate Soils
AWQ	Ambient Water Quality
AWS	Automatic Weather Station
BoM	Bureau of Meteorology
BVSC	Bega Valley Shire Council
cfu	Colony Forming Units
cm	Centimetres
Coastal Management SEPP	<i>State Environmental Planning Policy (Coastal Management) 2016</i>
CWG	Community Working Group
DPI	NSW Department of Primary Industries
EAC	East Australian Current
ECL	East Coast Low
EIS	Environmental Impact Statement
EP	Equivalent Population
EPA	Environment Protection Authority
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPL	Environment Protection Licence
ETWWQ	Existing Treated Wastewater Quality
FM Act	<i>Fisheries Management Act 1994</i>
hr	Hour
IDEA	Intermittently Decanted Extended Aeration
IMOS	Integrated Marine Observing System
ISQG	Interim Sediment Quality Guidelines
km	Kilometres
kg	Kilograms
L	Litres
m ²	Square metres
m ³	Cubic meters
µg	Micrograms
mg	Milligrams
mm	Millimetres
MES	Marine and Earth Sciences

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ML	megalitres
MWQO	Marine Water Quality Objective
Oaklands	Oaklands agricultural area
OAR	Offshore Artificial Reef
OEH	Office of Environment and Heritage
PAC	Poly Aluminium Chloride
PMGC	Pambula-Merimbula Golf Club
PSD	Particle Size Distribution
PSU	Practical Salinity Unit
N/A	Not Applicable
NHMRC	National Health and Medical Research Council
NSW	New South Wales
NTU	Nephelometric Turbidity Unit
s	Second
SEAR	Secretary of Planning and Environment's Assessment Requirements
STP	Sewerage Treatment Plant
TKN	Total Kjeldahl Nitrogen
TN	Total Nitrogen
TOC	Total Organic Carbon
TP	Total Phosphorous
TWWQ	Treated Wastewater Quality
UV	Ultraviolet
WQO	Water Quality Objectives

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1 Introduction

Bega Valley Shire Council (BVSC) engaged AECOM to prepare a concept design and Environmental Impact Statement (EIS) for the Merimbula Sewage Treatment Plant (STP) Upgrade and Ocean Outfall Project, referred to hereafter as the Project, in accordance with the Wastewater Management Strategy adopted by BVSC on 25 June 2014. Elgin Associates Pty Ltd (Elgin Associates) has been engaged by AECOM to complete this water quality technical report for the EIS.

The report draws on previous findings by AECOM in its Preliminary Water Quality Assessment memorandum (AECOM 2019b), which is included in **ANNEXURE A**. The other key reports referenced by this report includes the *Merimbula Ocean Outfall Dispersion Modelling report* – **Appendix Q** in the EIS (AECOM, 2020) and the *30% Concept Design report* (AECOM, 2019a).

Note that this report does not include assessment of groundwater, which has been reported separately in the Groundwater Technical report – **Appendix D** in the EIS (AECOM, 2020b).

1.1 Purpose of this technical report

The purpose of this technical report is to:

- define water quality objectives for the study area;
- describe water quality for existing treated wastewater;
- describe ambient marine coastal, nearshore and estuarine waters; and
- assess potential impacts on water quality from the Project.

1.2 Study area

The Water Quality Study Area includes terrestrial environment nearby to Merimbula STP that receive treated wastewater for reuse or disposal, and marine receiving waters for wastewater disposal via the existing beach-face outfall and proposed ocean outfall.

Terrestrial environments in the Study Area that receive treated wastewater for reuse or disposal include (refer to **Figure 1-1**):

- Pambula-Merimbula Golf Club (PMGC) grounds in Merimbula, which reuse wastewater for irrigation;
- Oaklands agricultural area (Oaklands) in Pambula, which reuse wastewater for irrigation; and
- Dunal exfiltration ponds to the east of Merimbula STP, for wastewater disposal.

It is expected that reuse of wastewater at the PMGC and Oaklands would continue after completion of the Project, whilst disposal of wastewater to the dunal exfiltration ponds would cease.

Marine and estuarine environments in the Study Area include (refer **Figure 1-1**):

- marine coastal waters of Merimbula Bay and south of Haycock Point towards Quondolo Point;
- marine nearshore waters of Merimbula Bay adjacent to the existing beach-face outfall, Merimbula Beach and Pambula Beach; and
- estuary waters of Merimbula Lake and Pambula Lake.



Figure 1-1 Water quality study area. Marine and estuarine environments in the study area and location of existing wastewater re-use (PMGC and Oaklands) and disposal sites (dunal exfiltration ponds and beach-face outfall)

1.3 Existing STP operations

The Merimbula STP is located between the regional coastal townships of Merimbula to the north and Pambula to the south. It is an intermittently decanted extended aeration (IDEA) activated sludge plant designed to serve an equivalent population (EP) of 15,500. The STP has a capacity to accommodate an average dry weather flow (ADWF) of up to 3.7 megalitres per day (ML/day) and a peak wet weather flow (PWWF) of seven times the ADWF, or 26 ML/day. It handles an average of 790 megalitres (ML) of wastewater per year (AECOM, 2019a).

The current strategy for managing treated wastewater is a combination of 25% beneficial reuse and 75% disposal as follows:

- Beneficial reuse of treated wastewater for irrigation (preferred disposal option) to PMGC (approximately 20% of annual wastewater); and Oaklands (approximately 5% of annual wastewater). It is understood this reuse has been underway at PMGC since 1980 and Oaklands since 2013.
- Disposal of excess treated wastewater to the environment via dunal exfiltration ponds located within the sand dunes east of the STP between the ocean and Merimbula Lake (approximately 25% of annual wastewater); or via the existing beach-face outfall east of the STP at Merimbula Beach (approximately 50% of annual wastewater). This disposal option commenced in 1991.

Sewage is pumped to the STP from pump stations in Merimbula, Pambula and Pambula Beach. The sewage flows into the inlet works and is screened by mechanical step-screens to remove non-organic macro solids (e.g.

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plastics, rags). The screened sewage then flows into two IDEA tanks for secondary treatment. The IDEA tanks provide a regulated supply of oxygen from surface aerators for bacteria and other micro-organisms to coagulate and biochemically degrade the organic matter and reduce the number of faecal bacteria and pathogenic microorganisms. The aeration phase is followed by a settlement phase and then a decant phase. These three phases cycle about six to eight times per day.

Secondary treated wastewater is decanted from the IDEA tanks and flows to a catch pond for temporary storage. From the catch pond the wastewater flows to a chlorine contact pipe and is dosed with chlorine (sodium hypochlorite) to reduce the number of microorganisms in the wastewater.

Following disinfection, the wastewater is stored in the 17 ML wastewater storage pond for between 5 and 9 days (detention time dependent on outflow volumes) from where it is pumped to either the PMGC or Oaklands for reuse; or the dunal exfiltration ponds or ocean outfall for disposal. Under high rainfall conditions, when inflows are elevated, the wastewater may be directed to the wet-weather overflow pond for temporary storage for pumping back to the wastewater pond upon the return of dry weather flows. The wet weather overflow pond has a capacity of approximately 20 ML.

1.3.1 Existing beach-face outfall

The existing beach-face outfall consists of a pipeline from the STP wastewater pump station to a pipe head structure located in the foredune at the centre of Merimbula Beach, between the estuary entrances of Merimbula Lake in the north and Pambula Lake in the south. Treated wastewater is discharged just above the mean high-water mark and flows across the beach and into the ocean waters of Merimbula Bay (**Figure 1-2**). The beach-face outfall is used in preference to the dunal exfiltration ponds during the cooler winter periods of the year, when beach and swimming activities are reduced. The outfall is also used when the groundwater level around the dunal exfiltration ponds is high or being allowed to fall.

When the STP was built and commissioned in 1971, the pipeline originally extended into the wave zone but was damaged by storms in the early 1970s and was not reinstated to the original design (Elgin 2013). Approximately 160 ML of wastewater was disposed via the ocean outfall during the first year of operation in 1971. By 1980 the volume of wastewater discharged to the ocean had increased to approximately 400 ML/year, due to the rapid population growth in the 1970's. In 1980, wastewater reuse on the PMGC commenced helping to reduce the volume of wastewater disposed to the ocean from year to year. In 1991, the dunal exfiltration ponds were commissioned providing another disposal option. From wastewater monitoring data collected between 2009-2016, the volume of wastewater discharged to the beach-face outfall ranged between 280 and 660 ML/year.

In describing ambient marine water quality, it is noted that treated wastewater has been disposed to the Merimbula Bay environment since 1971.

WATER QUALITY



Figure 1-2 Existing beach-face outfall pipe terminating in the foredune (*left image*); treated wastewater is discharged to the beach and flows to the ocean as evidenced by scouring of beach sands (*right image*)

1.4 Project overview

The Merimbula Sewage Treatment Plant (STP) Upgrade and Ocean Outfall, the Project, includes the design, construction and operation of the Merimbula STP upgrade (to support ongoing treated wastewater reuse), and a new ocean outfall for disposal of any excess treated wastewater not able to be used as part of the existing beneficial re-use scheme - or future expansions thereof. The new ocean outfall would replace the current beach-face outfall and dunal exfiltration methods of excess treated wastewater disposal.

1.4.1 Pipeline alignment options

Two potential pipeline alignments, a northern alignment and southern alignment, and four diffuser location options were considered by the Project team and community working group (CWG) (**Figure 1-3**). Selection of the preferred alignment outfall option used a multi-criteria analysis approach that considered a range of criteria such as environmental constraints, constructability, as well stakeholder and community consultation.

Location 1, referred to as the 'North-Short' outfall option, was selected as the preferred option by BVSC in October 2019.

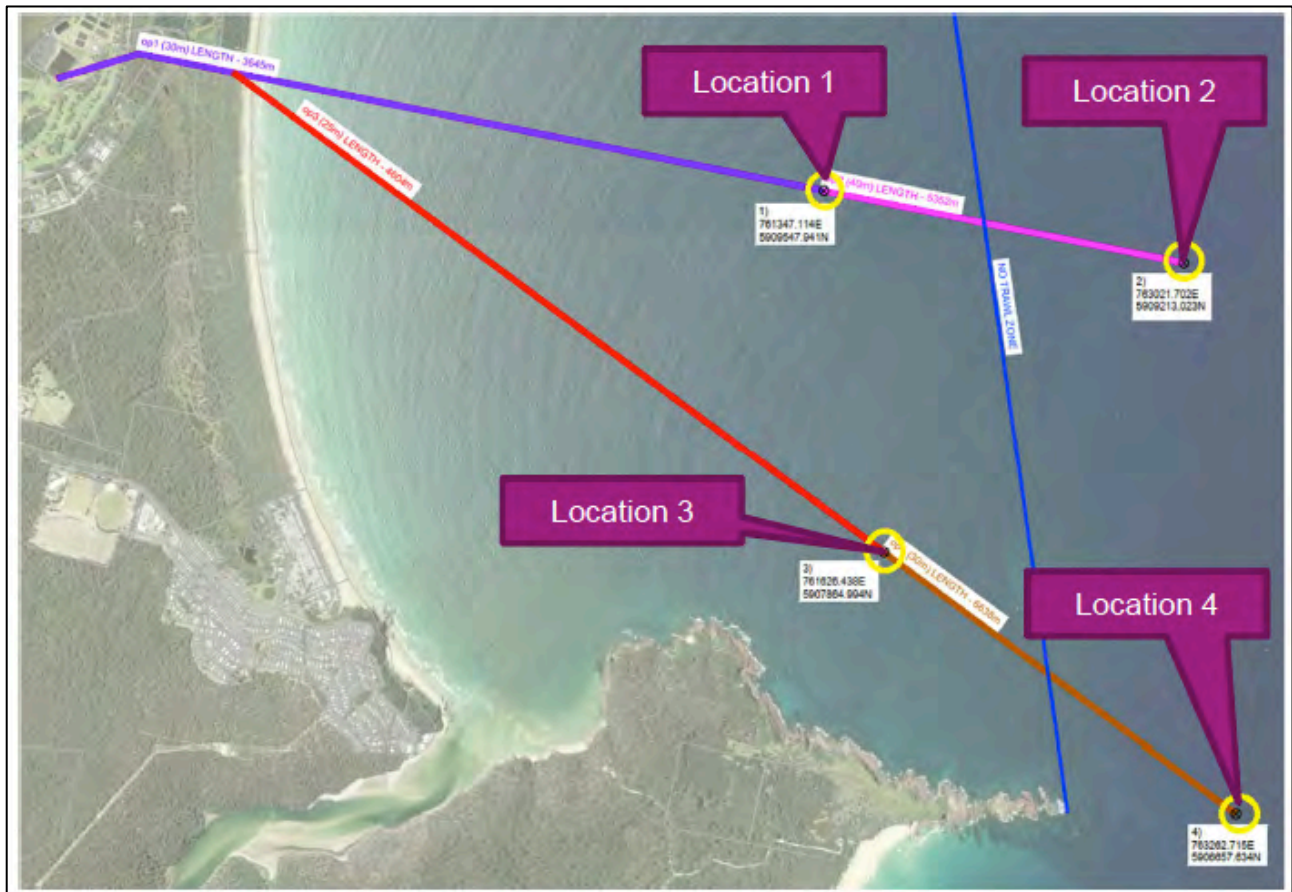


Figure 1-3 Ocean outfall pipeline alignment and diffuser location options (from AECOM 2020a)

1.4.2 Preferred pipeline alignment – 'North-Short' outfall 30m depth

Based on the 30% Concept Design Report (AECOM, 2019a), the preferred outfall pipeline alignment would travel from the STP in an east-south-easterly direction to a location approximately 2.7 kilometres offshore in Merimbula Bay, or 3.5 kilometres from the STP (**Figure 1-3, 1-8**). The onshore component of the pipeline would be 0.8 kilometres and the offshore component would be 2.7 kilometres.

A brief summary of proposed Project key elements including the STP upgrade is provided in Table 1-1. The Project area is shown on Figure 1-4.

WATER QUALITY**Table 1-1 Project summary (AECOM, 2019a)**

Project element	Summary
STP upgrade	The STP upgrade would involve additional treatment processes incorporated into the existing STP site, including two stage poly aluminium chloride (PAC) dosing, ultraviolet (UV) disinfection, chlorine dosing and tertiary filtration (if required). The indicative physical layout of the proposed STP upgrade is shown in Figure1-5. The new treatment processes would be incorporated into the following existing STP phases (refer Chapter 2 Project description for further information): <u>Phase two: secondary treatment</u> Addition of: - two stage PAC dosing for phosphorous removal. <u>Phase three: disinfection</u> A change to the existing disinfection (chlorine dosing) treatment, involving: - addition of ultraviolet (UV) treatment; - chlorine dosing, using chlorine gas, would continue to be applied to treated wastewater, however wastewater would be divided into two separate streams: - wastewater to be beneficially re-used would be dosed with chlorine; and - wastewater to be discharged via the ocean outfall would no longer be subject to chlorine dosing. - the chlorine dosing proposed would involve installation of a new chlorine dosing unit (including two 920 kg drum storage of chlorine, and a new pump system). The chlorine dosing unit would be stored at a dedicated storage facility within the STP (either the existing chlorine storage shed would be upgraded to house the increased volume of chlorine required for the Project, or a new shed would be built on or near to the site of the existing shed); and - tertiary filtration could also be installed (if required). The Project would also require the following within the existing STP site: - a new storage tank and new chlorine contact tank; - installation of up to four additional pump stations: - ocean outfall pump station – to pump treated wastewater through the outfall pipeline; - storage tank pump station – to pump treated wastewater to the new storage tank; - chemical sludge pump station (if tertiary filters required) – to pump sludge and treated wastewater; and - pump station - to pump from the wet weather overflow back into the STP. - installation of ancillary infrastructure (including new sheds/structures to house new treatment processes, above-ground storage tanks, pipes, pits, power supply and additional low voltage (LV) connection (including transformer, cabling and distribution board), control kiosks, a retaining wall and internal access roads); and - relocation and upgrade of utilities to accommodate the additional features proposed.
Existing STP effluent storage pond	The existing 17 ML effluent storage pond within the STP site would be decommissioned, including dewatering and sediment/sludge removal.
New ocean outfall pipeline and effluent diffuser, and associated pump station	<u>Phase four: Disposal and beneficial re-use</u> New additions would involve: - installation of a 3.5 km outfall pipeline – the pipeline would travel from the STP in an east-south-easterly direction to a location approximately 2.7 km offshore in Merimbula Bay; - the pipeline would involve two construction methods for different sections of the pipeline as follows:

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Project element	Summary
	- 'Section one' – STP to a location beyond surf zone: underground trenchless drilling method (refer Figure 1-6); and - 'Section two' – Location beyond surf zone to offshore pipeline termination point: laying of pipeline on sea floor and covering with rock or concrete mattresses (refer Figure 1-7). • Section one of the pipeline (the onshore component) would be about 0.8 km and below ground. installation of the underground section would be via a trenchless method (e.g. horizontal direction drilling or direct drive tunnelling), followed by pipeline insertion via pulling or pushing; • Section two (the above ground section of the pipeline) would be installed via direct placement on the sea floor in 600 m to 800 m pipe lengths. This would also involve progressive protection and stabilisation works for the pipeline (e.g. potentially using concrete or rock mattresses) held together with ropes/ slings/ cables (an indicative cross section of the ocean outfall pipeline is provided in Figure 1-9); • the terrestrial component of the outfall pipeline would be laid between about -9.3 m and -19.5 m AHD, with greater depth largely depending on the nature of the overlying sand dunes; • a multi-port pipeline diffuser would be located at the end of the pipeline at a depth of approximately 30 m; the diffuser would be approximately 80 m in length; • the pipeline would have an outer diameter of up to 450 mm (366 mm internal diameter) and consist of pipeline lengths welded together; • a transition riser may be required to connect the underground pipeline with the above ground section of pipeline on the sea floor (if required, the riser would be located beyond the surf zone); and • the pipeline would contain valves along its length for mitigating against air entrapment.
Existing exfiltration ponds	The existing exfiltration ponds within the adjacent sand dunes (east of the STP site) would cease to be used under the Project.
Existing beach-face outfall	The existing public beach-face outfall pipeline would be decommissioned. The exposed end of the outfall pipeline would be removed, and the remainder of the pipeline would remain in-situ (i.e. would remain buried underground).
Water use	The STP would continue to use potable town water for kitchen and amenities on site. Apart from these water inputs, the Project would not require any other ongoing water source during operation.
Construction	
Construction footprint	The construction footprint includes temporary compound and laydown areas as shown in Figure 1-8. The location of laydown areas would be confirmed during detailed design and would depend on the method and location/s proposed to be used for directional drilling by the construction contractor. Temporary construction laydown areas would be located: • within the STP site; • within a portion of the adjacent PMGC grounds; and • on Merimbula Beach (if required, for pipe stringing and potentially an intermediate drill rig site for directional drilling). A total of approximately 2,800 square metres (m²) (or 0.28 hectares) of vegetation removal / trimming would be required in the following locations: • approximately 217 m² at the Pambula Beach access track; and • approximately 2,464 m² of regrowth scrub within the existing STP site and for construction access from the construction laydown area within the PMGC grounds; and 47 m² at the existing beach-face outfall pipeline.

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Project element	Summary
Construction timing, hours and workforce	Pending Project approval, it is proposed to commence construction in early 2022, with construction anticipated to be undertaken over a period of 24 months. Construction would be staged and there would be times when some construction stages overlap. Works would typically be limited to standard daytime hours, which include: • 7:00 am to 6:00 pm Monday to Friday; • 8:00 am to 1:00 pm Saturday; and • No work on Sundays, public holidays. Certain works may need to occur outside standard construction hours for the safety of workers, in accordance with transport licence requirements, or for constructability reasons. Activities to be carried out during out of hours periods may include oversized load deliveries and pipeline pulling as part of the directional drilling (which would need to be undertaken continuously until completed, which may take up to 48 hours). Construction works in Merimbula Bay would occur seven days a week to maximise works during favourable offshore weather conditions. Approval from BVSC would be required for any out of hours work and the affected community would be notified. Construction of the Project would require a workforce of around 20 workers, with peak construction periods requiring up to 30 workers.
Traffic, construction vehicle types and workforce	Construction traffic would indicatively comprise: • 5 to 10 heavy vehicles per day (e.g. truck and dogs); and • 10 to 20 light vehicles per day. Vehicles transporting machinery or oversized materials such as prefabricated units may be required from time to time, and oversized vehicles would require escort to and from site. The largest truck expected as part of construction is the directional drilling rig truck (the exact size would be confirmed by the construction contractor). The construction phase of the Project would require construction vehicles to transport materials and equipment along the existing road network to the construction compound/laydown areas at the Merimbula STP and PMGC grounds and, if required, at the Merimbula Beach laydown area via Pambula Beach. In facilitating these construction activities, various plant and equipment would be required, including: • small, medium and large excavators (3 to 25 tonne) (tracked and wheeled); • compaction plant (e.g. roller/s, plate compactor); • grader; • bulldozer; • directional drilling rig truck and associated infrastructure (i.e. drilling fluid recovery and recovery unit); • pumps for dewatering (if required); • vacuum truck; • bobcat; • concrete trucks and pumps; • mobile cranes (e.g. franna crane, scissor lift, forklift); • semi-trailers and tipper truck; • telehandlers; • micro-piling rig (on barge);

WATER QUALITY

Project element	Summary
	• water carts; • hand tools and welding equipment; • barges (e.g. 55 m and 73 m barges, jack-up barge) and tugs; • small, self-propelled vessel; • demolition saw, jackhammer, grinder; • generator/s, lighting tower; • light vehicles and light trucks; and • heavy vehicles. The size of vehicles used for haulage would be consistent with the access route constraints, safety and any worksite constraints. Some construction activities (such as the delivery of precast sections) may require truck and trailer combinations or semi-trailers.
Access	Construction vehicles would access/egress the STP site via the following accesses: • Arthur Kane Drive, via either the northern end of the STP site, and/or the existing main STP entrance. Construction of the outfall pipeline would also utilise the following accesses: • Coraki Drive, Pambula (construction vehicles would enter the temporary beach access track from the end of Coraki Drive, before traversing the beach access track to the laydown area on Merimbula Beach); and • Port of Eden, Twofold Bay (barge/s would transport materials and equipment northward to the location of the proposed outfall pipeline alignment). Construction site accesses at Arthur Kane Drive and Pambula Beach are shown in Figure 1-8. Construction materials and equipment could also be delivered to the Port of Eden using shipping containers, with construction vehicles expected to haul these containers to the construction sites via the Princes Highway.

1.5 Operational stage

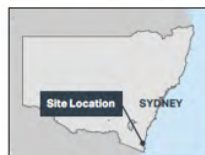
The Project would be operated with the additional treatment processes which would improve the quality of the treated wastewater. Levels of total phosphorus, total suspended solids, biological oxygen demand, virus, bacteria and other pathogens would be managed to be within discharge limits. Treated wastewater would be tested for quality prior to discharge via the ocean outfall pipeline or via beneficial re-use offsite (to existing land application areas at the Oaklands agricultural area or the adjacent PMGC grounds). Maintenance activities for the STP and ocean outfall would also be undertaken and would continue until the STP is decommissioned or further upgraded in the future.

One of the Project uncertainties relating to water quality is the need for tertiary filtration. The requirement for tertiary filtration and the type of tertiary filtration to be installed is to be determined, and may include continuous sand filtration. This uncertainty would be resolved in a subsequent design stage with consideration to projected performance against water quality objectives for the Project design.



FIGURE 2-1: PROJECT AREA

- Legend
- Project area
 - Project area (temporary construction area)



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Source: Source: East Map, Decades, Earthstar Geographics, CHRS/Mapbox OS, LIDAR, VLOS, Aerial, 404 and the 100 Year Community.

Figure 1-4 Project area



FIGURE 2-2: PROPOSED STP LAYOUT (INDICATIVE)

- Legend
- Project area
 - Project area (temporary construction area)
- Proposed Project Upgrades
- PAC dosing, UV disinfection, tertiary treatment
 - PAC dosing (second unit)
 - Pump stations, storage, chlorine disinfection
 - Effluent storage pond to be decommissioned



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Source: Neatmap, 2017

Figure 1-5 Proposed STP layout (indicative)



Figure 1-6 Ocean outfall pipeline – Section 1 (below ground)

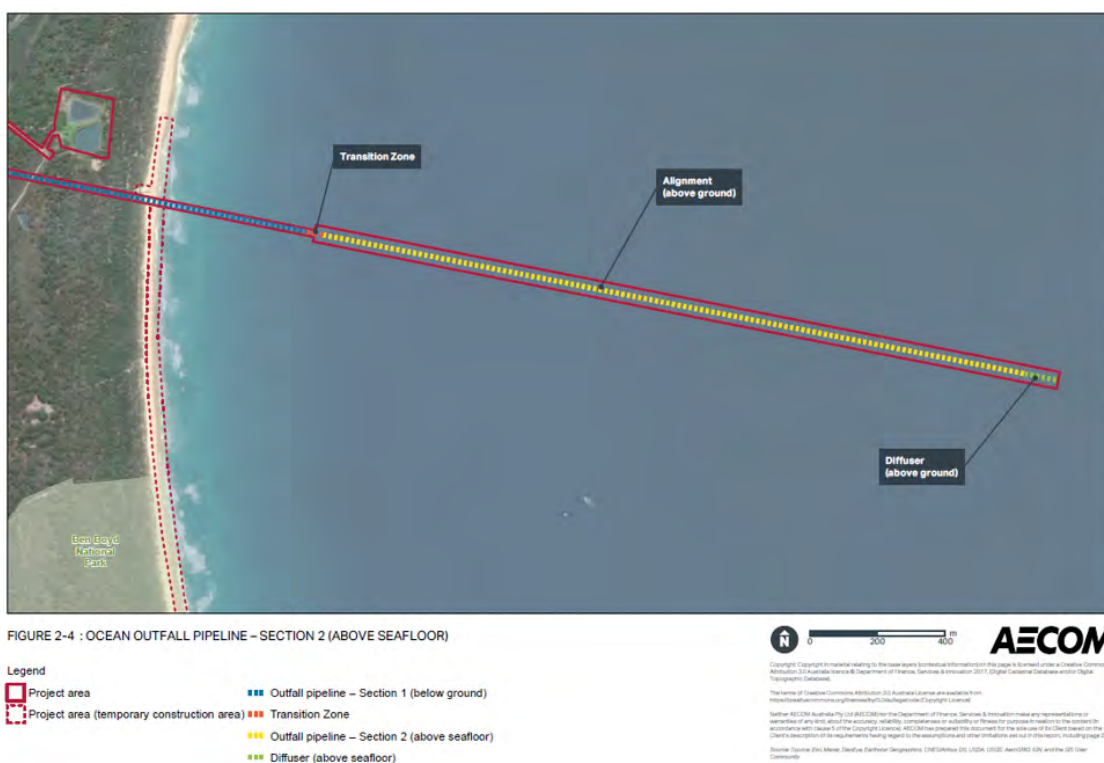


Figure 1-7 Ocean outfall pipeline – Section 2 (above seafloor)



FIGURE 2-5: CONSTRUCTION COMPOUND/LAYDOWN AREAS

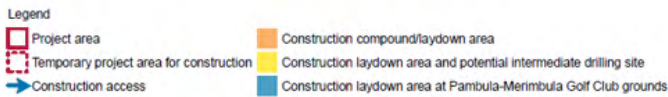


Figure 1-8 Construction compound laydown areas

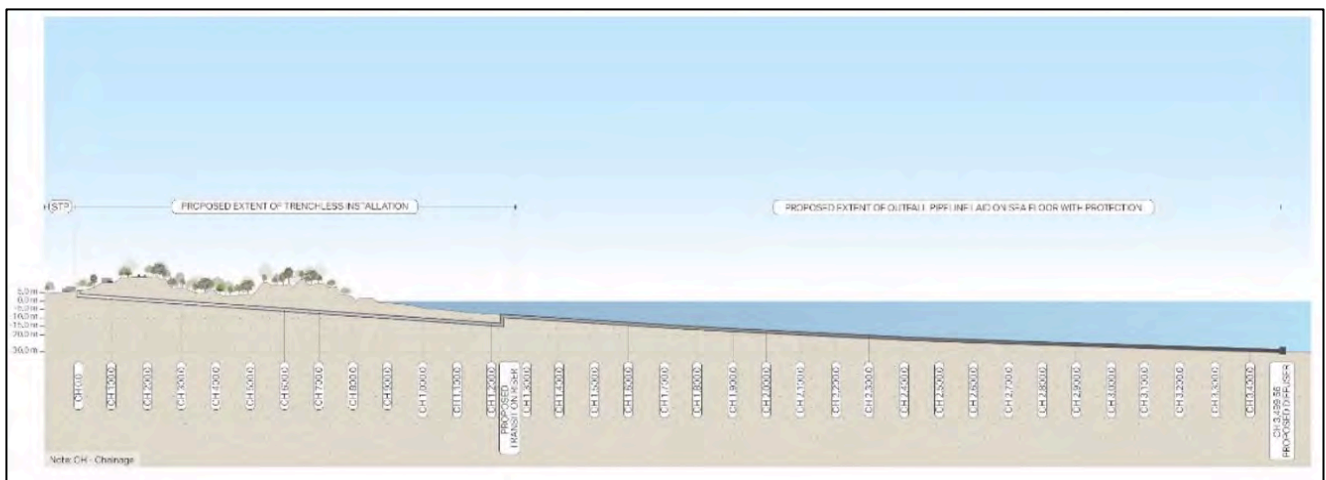


Figure 1-9 Conceptual cross section of ocean outfall pipeline alignment

WATER QUALITY**1.6 SEARs**

The EIS for the Project would comply with the Secretary of Planning and Environment's Assessment Requirements (SEARs). A summary of the SEARs relevant to water quality is provided in **Table 1-2** below.

Table 1-2 Water Quality SEARs

Key Issue and Desired Performance Outcome	
The Project is designed, constructed and operated to protect the NSW Water Quality Objectives where they are currently being achieved, and contribute towards achievement of the Water Quality Objectives over time where they are currently not being achieved, including downstream of the Project to the extent of the Project impact including estuarine and marine waters (if applicable).	
1. The Proponent Must:	Report section(s) where addressed
a) State the ambient NSW Water Quality Objectives (NSW WQO) and environmental values for the receiving waters relevant to the Project, including the indicators and associated trigger values or criteria for the identified environmental values.	2
b) Identify and estimate the quality and quantity of all pollutants that may be introduced into the water cycle by source and discharge point and describe the nature and degree of impact that discharge(s) may have on the receiving environment, including consideration of all pollutants that pose a risk of non-trivial harm to human health and the environment.	4,5,6
c) Assess the significance of any identified impacts including consideration of the relevant ambient water quality outcomes;	5,6,7
d) Demonstrate how construction and operation of the Project will, to the extent that the Project can influence, ensure that: - Where the NSW WQOs for receiving waters are currently being met they will continue to be protected. - Where the NSW WQOs are not currently being met, activities will work toward their achievement over time.	4,5,6,7
e) Include results of sampling of sediments (particularly particle size analysis) along the preferred pipeline route to quantify the risk of a sediment plume being created during the construction phase.	3, 7
f) Include results of wastewater plume dispersal modelling including quantification of the impact zone under a range of conditions including northerly current, southerly current, and worse-case scenario.	6
g) Include results of water quality modelling and analysis including descriptions of water quality impacts under the worse-case scenario.	5,6,7
h) Justify, if required, why the WQOs cannot be maintained or achieved over time.	7.4

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Key Issue and Desired Performance Outcome	
i) Demonstrate that all practical measures to avoid or minimise water pollution and protect human health and the environment from harm are investigated and implemented.	4, 7, 8
j) Identify sensitive receiving environments (which may include estuarine and marine waters downstream) and develop a strategy to avoid or minimise impacts on these environments.	3, 7, 8
k) Identify proposed water quality monitoring locations, monitoring frequency and indicators of water quality, including groundwater quality.	8

WATER QUALITY

2 Water quality objectives

Ambient NSW Water Quality Objectives (NSW WQO) and environmental values for the receiving waters relevant to the Project are stated in this section, including indicators and trigger values or criteria for the identified environmental values.

Receiving waters relevant to the Project include:

- marine coastal waters of Merimbula Bay, Haycock Point and south towards Quondolo Point, including nearshore waters along Merimbula Beach and Pambula Beach;
- estuary waters of Merimbula Lake and Pambula Lake, both of which are permanently open to the ocean, well flushed and highly influenced by ocean waters; and
- groundwater in and around the existing dunal exfiltration ponds where treated wastewater is currently disposed, and groundwater in and around Oaklands and PMGC where treated wastewater is reused via irrigation.

2.1 Relevant guidelines and policies

Relevant guidelines and policies for defining the NSW WQO and environmental values for the receiving waters include:

- *Marine Water Quality Objectives for NSW Ocean Waters – South Coast* (DECC, 2005).
- *NSW Water Quality and River Flow Objectives, Towamba and Genoa River* (DECC, 2006).
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000), and as updated online at <https://www.waterquality.gov.au/anz-guidelines> (ANZG, 2018).
- *Using the ANZECC Guidelines and Water Quality Objectives in NSW* (DEC, 2006).
- *Approved Methods for the Sampling and Analysis of Water Pollutants in NSW* (DECC, 2008).
- *Managing Urban Stormwater: Soils and Construction Volume 1* (Landcom, 2004) and *Volume 2* (A. Installation of Services; B. Waste Landfills; C. Unsealed Roads; D. Main Roads; E. Mines and Quarries) (DECC, 2008).
- *Environmental Guidelines – Use of effluent by irrigation* (DEC, 2003).
- *NSW Guidance for Recycled Water Management Systems* (DPI Office of Water, 2015).

2.2 Marine and estuary water quality objectives

2.2.1 Background

Water quality objectives adopted for marine and estuary receiving waters are based on the *Marine Water Quality Objectives for NSW Ocean Waters – South Coast* (DECC, 2005). These objectives apply to ocean waters that adjoin the NSW coast and extend three nautical miles seaward from the shore (DECC, 2005).

Water quality objectives for Merimbula Lake and Pambula Lake are also based on the *NSW Water Quality and River Flow Objectives, Towamba and Genoa River* (DECC, 2006), with both lakes within the Genoa and Towamba catchment as shown in the statewide map for NSW Water Quality and River Flow Objectives at: <https://www.environment.nsw.gov.au/ieo/statewide.htm>.

For the Project and Study Area, these objectives have been adopted for marine and estuary receiving waters as Marine Water Quality Objectives (MWQOs) and include:

- marine coastal waters of Merimbula Bay, Haycock Point and south towards Quondolo Point, including nearshore waters of Merimbula Beach and Pambula Beach; and

WATER QUALITY

- estuary waters of Merimbula Lake and Pambula Lake, both of which are permanently open to the ocean, well flushed and highly influenced by ocean waters.

The process for setting these MWQOs was based on the national framework outlined in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2000 and as updated online ANZG, 2018 at <https://www.waterquality.gov.au/anz-guidelines>). The ANZECC guidelines advocate an 'issues based' approach to assessing ambient water quality, rather than the application of rigid numerical criteria with no appreciation of context (DECC, 2006). The guidelines are not regulatory or mandatory and are just intended as a tool for strategic planning and development assessment processes influencing coastal water quality (DECC, 2005).

Based on DECC (2005), the MWQOs identify environmental values to be protected, indicators that provide a measure of water quality, and guideline criteria (trigger values) for assessing the risk of impacts to water quality and these environmental values. Relevant to the Project are the following considerations when applying MWQOs:

- The MWQOs do not apply as an end-of-pipe wastewater discharge criteria.
- The MWQOs apply as a strategic objective for ambient waters at the outer extent of a predicted (modelled) zone of influence (hereby referred to as a mixing zone) from the outlet.
- Achievement of the MWQOs at the outer extent of the mixing zone is affected by multiple diffuse sources including estuary outflows and with it stormwater discharge and agricultural runoff, marine upwellings, as well as the proposed treated wastewater discharge from the ocean outfall pipeline.
- The MWQOs are to be used as a tool only by Project decision makers rather than as fixed criteria.

2.2.2 Environmental values

Environmental values and associated objectives for receiving marine and estuary waters relevant to the Project, based on those identified for South Coast of NSW (DECC, 2005) and for Towamba and Genoa River catchments (DECC 2006), and are summarised in **Table 2-1** below:

Table 2-1 Environmental values and marine water quality objectives

Environmental Value		Marine Water Quality Objectives
	Aquatic ecosystem health	Marine: To maintain or improve the ecological condition of ocean waters. Estuary: Maintaining or improving the ecological condition of waterbodies and their riparian zones over the long term.
	Primary contact recreation	Marine: To maintain or improve the ocean water quality so that it is suitable for activities such as swimming and other direct water contact sports. Estuary: Maintaining or improving water quality for activities such as swimming in which there is a high probability of water being swallowed.
	Secondary contact recreation	Marine: To maintain or improve ocean water quality so that it is suitable for activities such as boating and fishing where there is less bodily contact with the waters. Estuary: Maintaining or improving water quality for activities such as boating and wading, where there is a low probability of water being swallowed.

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Environmental Value		Marine Water Quality Objectives
	Visual amenity	Marine: To maintain or improve ocean water quality so that it looks clean and is free of surface films and debris. Estuary: Aesthetic qualities of waters.
	Aquatic foods	Marine: To maintain or improve ocean water quality for the production of aquatic foods for human consumption (where derived from aquaculture or recreational, commercial or indigenous fishing). Estuary: Refers to protecting water quality so that it is suitable for the production of aquatic foods for human consumption and aquaculture activities.

In addition to the environmental values listed above, **cultural and spiritual values** of indigenous people are acknowledged. In accordance with ANZG (2018) objectives include:

- water country and sea country are healthy;
- water quality is safe for sourcing food, recreation and ceremonial purposes; and
- water quality supports economic well-being of indigenous peoples.

The MWQOs for the maintenance and improvement of environmental values listed in **Table 2-1** also cover the objectives of cultural and spiritual values.

2.2.3 Indicators and trigger values

Indicators and trigger values to assess the potential risk of treated wastewater discharge to the environmental values were evaluated in the Preliminary Water Quality Assessment (AECOM, 2019b) in **ANNEXURE A**. Wastewater indicators were based on parameters historically monitored at the Merimbula STP under its EPA licence and also monitored in the Merimbula Bay ambient marine water quality and Pambula-Merimbula Lake estuary water quality monitoring programs.

- For trigger values for aquatic ecosystem health, the default level of protection of 'slightly to moderately disturbed' was applied, with 95% protection toxicant trigger values. A higher protection level of 99% was applied for bioaccumulative metals to account for this property. Bioaccumulative metals include mercury and selenium, both with bioconcentration factors >10,000. In marine systems, cadmium was also considered to have bioaccumulative properties. For protection of aquatic ecosystem health from bioaccumulative contaminants, the water quality objective is "bioaccumulation of contaminants – no change from natural conditions" (DECC, 2005).
- For estuarine waters of Merimbula Lake and Pambula Lake, there are some differences in trigger values for some physico-chemical and nutrient parameters compared to marine waters. These include pH, total nitrogen, oxides of nitrogen, ammonium, total phosphorus, orthophosphate and chlorophyll-a, and are based on numerical criteria in DECC (2006) and stressor values in Table 3.3.2 of ANZECC (2000). These trigger values for estuarine waters are also included in **Table 2-2**, below. In addition, NSW estuary health reporting program (OEH 2016) provides trigger levels for eutrophication indicators turbidity and chlorophyll a for six different classes of estuary in NSW.

The indicators and trigger values for each environmental value were based on DECC (2005) and DECC (2006), which in turn defer to the ANZECC (2000) guidelines as updated in ANZG (2018), and are summarised in **Table 2-2**, below. **Table 2-2** also includes a consolidated adopted MWQO trigger value which is typically the lowest trigger value and protective of all environmental values.

WATER QUALITY**Table 2-2 Marine water quality objective (MWQO) trigger values adopted for the Project (from AECOM, 2019b). Estuarine WQOs are provided where different from the adopted MWQO**

Indicator	Units	Adopted MWQO Trigger Values			
		Aquatic Ecosystem Health	Primary and Secondary Contact Recreation Visual Amenity ⁴	Aquatic Foods ⁵	Adopted MWQO Trigger Value
pH	pH units	8.0-8.4 ¹ 7.0-8.5 ⁹	5.0-9.0	6.0-9.0	8.0-8.4 marine 7.0-8.5 estuary
Suspended Solids	mg/L	-	-	10	10
Turbidity	NTU	0.5-10 ¹	-	-	0.5 ⁸ 6 estuary ¹¹ 2.8 estuary ¹²
Secchi Depth	m	-	>1.6	-	>1.6
Dissolved Oxygen	Varies	90-110% sat. ¹	>6.5 mg/L	>5 mg/L	>5 mg/L
Total Nitrogen (TN)	mg/L	0.12 ¹ 0.3 ⁹	-	-	0.12 marine 0.3 estuary
Oxides of Nitrogen (NOx)	mg/L	0.025 ¹ 0.015 ⁹	-	-	0.025 marine 0.015 estuary
Nitrate (default guideline values)	mg/L	0.7 ⁶	10	100	0.7
Nitrate (Twofold Shelf Bioregion physical and chemical stressor percentiles) ¹⁰	µmol NO ₃ -N/L	Marine water 80 th percentile surface waters 4 seasons range: 0.567 (summer) to 2.623 (winter)			
		Marine water 80 th percentile bottom waters 4 seasons range: 9.257 (spring) to 11.849 (summer)			
	mg/L (NO ₃ as N)	Marine water 80 th percentile surface waters 4 seasons range: 0.008 (summer) to 0.037 (winter)			
		Marine water 80 th percentile bottom waters 4 seasons range: 0.13 (spring) to 0.17 (summer)			
Ammonia	mg/L	0.91 ²	0.01	0.1	0.01
Ammonium	mg/L	0.02 ¹ 0.015 ⁹	-	-	0.02 marine 0.015 estuary
Total Phosphorus (TP)	mg/L	0.025 ¹ 0.030 ⁹	-	-	0.025 marine 0.030 estuary
Orthophosphate	mg/L	0.01 ^{1,7} 0.005 ⁹	-	-	0.01 marine 0.005 estuary
Chlorophyll-a	µg/L	1 ¹ 4 ⁹	-	-	1 marine 5 estuary ¹¹ 2.3 estuary ¹²
Faecal Coliforms	cfu/100mL	-	150	-	150
Enterococci	cfu/100mL	-	35	-	35
Aluminium	µg/L	-	200	10	10
Antimony	µg/L	270 ⁶	-	-	270
Arsenic (III)	µg/L	2.3 ⁶	100	-	2.3
Arsenic (V)	µg/L	4.5 ⁶	100	-	4.5

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Indicator	Units	Adopted MWQO Trigger Values			
		Aquatic Ecosystem Health	Primary and Secondary Contact Recreation Visual Amenity ⁴	Aquatic Foods ⁵	Adopted MWQO Trigger Value
Barium	µg/L	-	1000	-	1000
Boron	µg/L	-	1000	-	1000
Cadmium	µg/L	0.7 ³	5	<0.5-5	0.7
Chromium (Total)	µg/L		50	20	20
Chromium (III)	µg/L	27.4 ²	-	-	27.4
Cobalt	µg/L	1 ²	-	-	1
Copper	µg/L	1.3 ²	1000	5	1.3
Iron	µg/L	-	300	-	300
Lead	µg/L	4.4 ²	50	<1-7	4.4
Manganese	µg/L	-	100	-	100
Mercury (Inorganic)	µg/L	0.1 ³	1	1	0.1
Nickel	µg/L	70 ²	100	100	70
Selenium	µg/L	3 ⁶	10	10	3
Silver	µg/L	1.4 ²	50	3	1.4
Zinc	µg/L	15 ²	5000	5	5

Notes:

- ¹ ANZECC (2000) Stressor guidelines for marine aquatic ecosystems, SE Australia – Tables 3.3.2 and 3.3.3. Also draft guideline values (DGVs) in ANZG (2018).
- ² ANZECC (2000) Toxicant stressor guidelines for marine aquatic ecosystems – 95% protection – Table 3.4.1. Also draft guideline values (DGVs) in ANZG (2018).
- ³ ANZECC (2000) Toxicant stressor guidelines for marine aquatic ecosystems – 99% protection – Table 3.4.1. Also draft guideline values (DGVs) in ANZG (2018).
- ⁴ ANZECC (2000) Water quality guidelines for recreational purposes – Tables 5.2.2 and 5.2.3.
- ⁵ ANZECC (2000) Physico-chemical stressors and toxicant guidelines for saltwater aquaculture species – Tables 4.4.2 and 4.4.3.
- ⁶ ANZECC (2000) Interim working level, Volume 2.
- ⁷ Filterable reactive phosphate (FRP) generally considered indicative of orthophosphate
- ⁸ ANZECC (2000) Low turbidity value normally found in offshore waters – Table 3.3.3.
- ⁹ ANZECC (2000) Stressor guidelines for estuaries aquatic ecosystems, SE Australia – Tables 3.3.2 and 3.3.3. Also draft guideline values (DGVs) in ANZG (2018).
- ¹⁰ ANZG (2018) Twofold Shelf Bioregion percentiles for nitrate physical and chemical stressor, surface water and bottom water for 4 seasons as published at: <https://www.waterquality.gov.au/anz-guidelines/your-location/australia-marine-IMCRA/search-results?region=TWO&stressor=Nitrate>
- ¹¹ Chlorophyll a and turbidity trigger levels adopted by the NSW estuary MER program for estuary class Lake – applicable to Merimbula Lake (OEI 2016)
- ¹² Chlorophyll a and turbidity trigger levels adopted by the NSW estuary MER program for estuary class River Lower – applicable to Pambula River estuary (OEI 2016)

WATER QUALITY**2.4 Wastewater reuse water quality objectives**

Defining WQOs for wastewater reuse at Oaklands and PMGC considers its use for irrigation of grassed public open spaces, in areas that are frequented by recreational users and workers such as groundskeepers. Wildlife such as kangaroos and domestic stock are also known to transit or be kept at Oaklands or PMGC. Based on this setting, water quality objectives for wastewater reuse that are protective of these potential receptors are the trigger values for primary and secondary contact, recreation and visual amenity as listed in **Table 2-2** above.

In addition to the trigger values listed above, the NSW Guidelines for Recycled Water Management Systems (2015) adopts the Australian Guidelines for Water Recycling (AGWR) framework. This includes microorganism log reduction targets for wastewater reuse for municipal use and non-food crops which are provided below in **Table 2-3**.

Table 2-3 Microorganism log reduction targets for wastewater re-use (adapted from AGWR Table 3.7 and Table 3.8)

End Use	Route of exposure	Exposure L x frequency (per year)	Protozoa	Virus	Bacteria
Municipal use	Ingestion of sprays	0.001 x 50	3.7	5.2	4.0
Non-food crops		0.001 x 50	3.7	5.2	4.0

Note

Log values used in conjunction with number of organisms in sewage and exposure as per the formulas below (from Table 3.7 in AGWR):

Log reduction calculations

- Protozoa = $\text{Log} (\text{number of organisms in sewage} \times \text{exposure (L)} \times \text{frequency}) / 1.6 \times 10^{-2}$
- Virus = $\text{Log} (\text{number of organisms in sewage} \times \text{exposure (L)} \times \text{frequency}) / 2.5 \times 10^{-3}$
- Bacteria = $\text{Log} (\text{number of organisms in sewage} \times \text{exposure (L)} \times \text{frequency}) / 3.8 \times 10^{-2}$

3 Existing environment

3.1.1 Physical characteristics and bathymetry

Merimbula Bay is located on the far south coast of New South Wales with the townships of Merimbula and Pambula situated on its northern and southern shoreline, respectively. It is a large sandy embayment bounded by the rocky headlands of Long Point at the north and Haycock Point at the south. It is the receiving environment of the Merimbula and Pambula River estuaries whose ocean entrances are situated at the northern-most and southern-most extent respectively.

The embayment has an easterly aspect and bathymetric charts show seabed depth gradually increases with increasing distance from the shoreline. The seabed of Merimbula Bay is predominantly sand with extensive sub-tidal reefs extending from Long Point at the north and Haycock Point at the south. A large isolated sub-tidal reef that is surrounded by sand, known as Hunter Reef, exists approximately 500 m north of Haycock Point. The outer margins of Hunter Reef lie within the 35 to 40 m depth contours with the reef system rising to its shallowest point approximately 10 m below the surface with large, long period swells resulting in a breaking wave. The prominence and size of Hunter Reef is expected to exert local influence on hydrodynamics in the southern part of Merimbula Bay.

3.2 Overview of coastal processes

Coastal processes have a direct influence on the ambient water quality of Merimbula Bay, and these include tidal flows, ocean currents, and local climatic conditions (i.e. catchment flood events, large swell events).

3.2.1 Tidal flows

The tidal regime of Merimbula Bay is meso-tidal semi-diurnal with a diurnal inequality; the tidal range lies between 2 and 4 metres, there are two high tides and two low tides each day and there is a once-daily inequality in the tidal range. The higher spring tides occur near and around the time of new or full moon and rise highest and fall lowest from the mean sea level. The average spring tidal range is 1.6m and the maximum range reaches 2.1m. Neap tides occur near the time of the first and third quarters of the moon and have an average range of around 0.4m (AECOM, 2010).

3.2.2 Ocean currents

The hydrodynamics of Merimbula Bay are influenced by a combination of broadscale oceanographic circulation, local wind advection (wind strength and direction) and bathymetry. Ocean currents are seasonally influenced by the East Australian Current (EAC), which brings warm, typically nutrient-poor, subtropical water from the Coral Sea down the east coast of Australia. The EAC is Australia's largest ocean boundary current, its maximum speed exceeding 4 knots (7 km per hour) near the surface and its effects extending to several thousand meters in depth (Cresswell, 2001). It flows as a continuous current along the edge of the continental shelf south to Smoky Cape, where it typically breaks into a series of counter-clockwise-rotating, warm core eddies up to 250 km in diameter (Cresswell, 2001; Short and Woodroffe, 2009). These eddies spiral further south along the continental margin producing strong currents and rapid changes in water temperature along the coastline of southern NSW (**Figure 3-1**).

The continental shelf waters offshore of Merimbula are dominated by the EAC eddy field, although the complex nature of the EAC and its eddies means that its influence on coastal and offshore conditions is highly variable. It has been estimated that the warm waters of the EAC influence the inshore marine environment of southern NSW approximately 10% of the time (Pollard *et al.*, 1997) with its effects most noticeable during summer and autumn when its flow is strongest (CSIRO Australia, 2001). Although the EAC does bring warm water to the southern NSW intermittently, the Twofold Shelf bioregion that includes Merimbula Bay is typically characterised by temperate conditions moderated by contributions from a northward flow of cooler, well-mixed waters originating from Bass Strait driven by local winds and coastal-trapped-waves, an oceanographic feature influencing ocean circulation in the shelf zone (Church *et al.* 1986; Griffin and Middleton 1991; Zann 2000). At

the local level, ocean current monitoring over a period of 18 months at Haycock Point by MHL (2017) showed current flow to be southward 88% of the time and stronger than the less frequent and weaker northward flowing current (**Section 3.2.3** below).

Near-shore effects of the EAC are also observed even when the main current is flowing well offshore, as intrusions of EAC onto the shelf are an important mechanism for driving upwellings of cold, nutrient-rich waters from the continental slope towards the coast (Cresswell, 2001). These upwelling events usually result in increased phytoplankton abundance (Oke and Middleton, 2001) which in turn may drive increased productivity at higher levels of the food chain. Coastal winds generating waves and driving near-shore currents are another important mechanism for upwellings. In NSW, N to NE wind generates a south-flowing coastal current, which is deflected offshore due to the Coriolis effect (Short and Woodroffe, 2009). As surface waters move offshore an upwelling effect is created which draws cooler waters up from the seabed, a phenomenon known as Ekman transport. Upwellings may result in a sudden decrease in sea surface temperature by as much as 5-7 °celsius. Conversely, a strong southerly wind blowing along the NSW coast drives a northerly current that is deflected towards the coast. This brings oceanic water to the coast and usually returns near-shore sea surface temperatures to a more stable average. Under upwelling conditions, stratification can occur where a pycnocline develops separating warmer and less dense surface waters from cooler dense bottom waters. Further information regarding the delivery of nutrients to the nearshore zone via upwellings is presented in **Section 3.3.2** below.

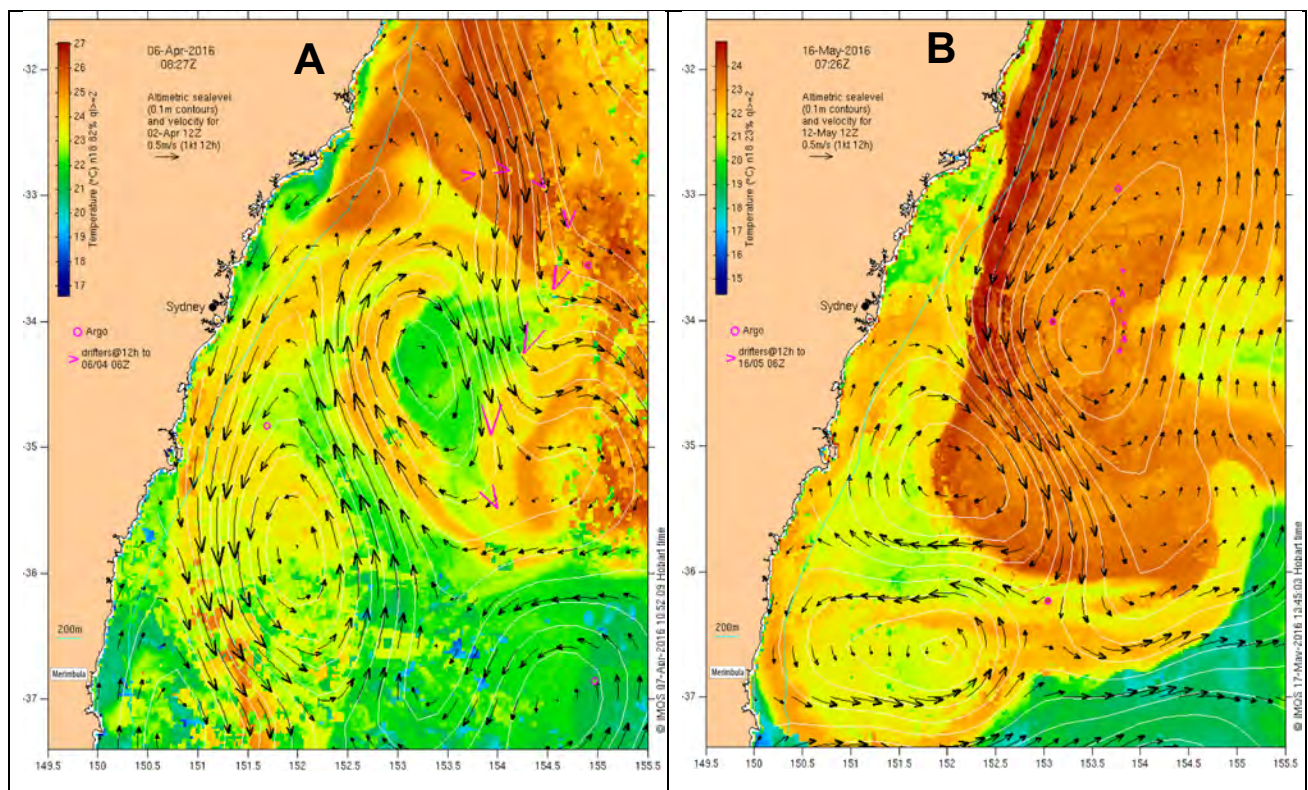


Figure 3-1 Sea surface temperature and ocean current charts showing the influence of East Australian Current (EAC) eddy field on the Twofold Shelf bioregion (Source: IMOS, <http://oceancurrent.imos.org.au/SNSW/latest.html>). (A) Counterclockwise eddy offshore from Merimbula with nearshore zone experiencing northward flowing currents, April 2016; (B) Counterclockwise eddy close to nearshore zone with Merimbula experiencing southward flowing currents, May 2016.

WATER QUALITY**3.2.3 Ocean current statistics (Haycock Point mooring)**

Ocean current strength and direction was monitored at Haycock Point over 18-month period (31 March 2015 to 26 October 2016) by MHL (2017) as part of preliminary data gathering for the Project. A mooring buoy was situated directly east of Haycock Point in 30 m depth. Monitoring data showed current flow to be southward approximately 88% of the time (AECOM 2020a) with southward current speed generally higher than the less frequent and typically weaker northward current (**Table 3-1**).

Table 3-1 Haycock Point mooring current statistics (from AECOM 2020a)

Statistic	Northward Current Speed (m/s)	Southward Current Speed (m/s)
10 th percentile	0.03	0.15
50 th percentile	0.15	0.40
90 th percentile	0.34	0.56
99 th percentile	0.51	0.78
Maximum	0.53	0.96
Mean	0.17	0.38

Note – mooring data collected by MHL between 31/10/2015 to 26/10/2016 (MHL 2017).

3.2.4 Significant weather events

Significant local weather events, though episodic, can markedly influence water quality conditions via one of or a combination of high rainfall resulting in catchment flood-flow discharge, sustained strong winds and large seaway. Three types of weather events that can affect southern coastal NSW simultaneously with heavy rainfall, strong winds and large swells include a 'Southerly Buster', East Coast Low (ECL) and strong NE winds generated by a monsoon trough such as a 'Black Nor' Easter'.

3.2.5 Estuary discharge

Merimbula Lake and Pambula River estuary are both permanently open to the ocean environment of Merimbula Bay and both well flushed by tidal flows. In addition to ocean boundary and wind driven currents, the tidal flux of the Merimbula and Pambula River estuaries also influences the local hydrodynamics within Merimbula Bay, particularly during catchment flood flow events.

Merimbula Lake has exceptional tidal flushing due to its wide, deep entrance and on average provides regular tidal exchange of approximately 1,800 ML per tidal cycle (Webb, McKeown and Associates, 1997) such that weekly tidal flows through the entrance are equivalent to approximately twice the total volume of the lake (Webb, McKeown and Associates, 1997). Pambula River estuary entrance is approximately 290 m wide with a 4 km long entrance channel opening to the basin (Pambula Lake). The flushing time for majority of Pambula River estuary is estimated at less than 4 days such that the potential for water quality issues to arise on a day to day basis is limited (Cardno, 2012).

3.3 Marine coastal waters**3.3.1 Data sources**

Collection of ambient marine water quality data for Merimbula Bay, Haycock Point and south towards Quondolo Point was undertaken in a water quality monitoring program by Elgin Associates between 2014 and 2017. The program involved collection of water quality data in 25 monitoring rounds at up to six sites (shown on **Figure 3-2** below), with vertical profiling and sampling at multiple depth intervals (surface, mid and benthos). The six sites included

- Sites MBWQ20, MBWQ30, MBWQ40 in Merimbula Bay;

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- Sites Hay20 and Haysth20 off Haycock Point; and
- Site Quon20 off Quondolo Point.

Water quality was tested for a range of physico-chemical, microbiological, nutrient and metal parameters using field water testing instrumentation and analysis by NATA accredited laboratory Australian Laboratory Services (ALS). The tabulated dataset is included in **ANNEXURE B**.

Water quality data for marine nearshore waters in the beach zone of Merimbula Beach and Pambula Beach drew upon the ambient dataset above, along with data from the NSW Beachwatch program for sites in the Study Area. The Beachwatch dataset includes weekly enterococci data collected between November and February for the period 2009-2020 and was downloaded from the Beachwatch website at: <https://www.environment.nsw.gov.au/topics/water/beaches/beachwatch-water-quality-program>.

The tabulated dataset from this download is included in **ANNEXURE B**.



Figure 3-2 Ambient marine water quality monitoring sites

3.3.2 Oceanic upwellings

Upwellings or intrusions of cold nutrient-rich water from the continental slope, though transient and episodic in nature, represents a significant source of nutrient supply to the coastal zone. As mentioned in **Section 3.1.2** (above), upwelling events occur under particular oceanographic and climatic conditions with seasonal trends indicating a higher prevalence for upwellings to occur during spring and summer in NSW (Pritchard *et al.* 2003). Slope waters are typically characterised by low temperatures (<14 °C) and low salinity (<35.3 PSU) with studies

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showing these waters carry high concentrations of bioavailable nitrate ($>70 - 250 \mu\text{g/L}$) and phosphate ($>22 \mu\text{g/L}$) (Pritchard *et al.* 2003, Suthers *et al.* 2011). As upwellings operate over large spatial scales of hundreds of kilometres, these nutrient concentrations represent a significant contribution of nutrients to the coastal zone. Pritchard *et al.* (2003) considered the various sources of nutrients to the coastal zone of the Sydney region and found slope water to be the dominant source of nutrients during upwelling events with daily nutrient loads exceeding STP wastewater and riverine discharges by orders of magnitude.

The frequency of upwellings on the NSW south coast like many other regions have been inferred from satellite images showing phytoplankton blooms as a response to these events. Data collected from Merimbula Bay during three separate upwelling events between 2014 and 2017 reported nitrate concentration of bottom waters up to $147 \mu\text{g/L}$, and at the same time reported surface water nitrate at $1 \mu\text{g/L}$ (**Table 3-2** below). Furthermore, the 80th percentile value for nitrate of bottom waters within the Twofold Shelf Bioregion is reported at $170 \mu\text{g/L}$ (ANZG 2018). This data demonstrates that upwellings provide a significant contribution of nutrients to the nearshore areas of Merimbula and the Twofold Shelf bioregion more broadly, and at a similar scale reported by other studies (Pritchard *et al.* 2003, Suthers *et al.* 2011). The NSW node of the Integrated Marine Observing System (IMOS) have installed oceanographic instruments off the coast of Narooma in an effort to gather data regarding the oceanographic conditions including upwelling events in the NSW far south coast region.

3.3.3 Ambient marine water quality

Statistical analysis of the ambient marine water quality dataset was undertaken by AECOM in the Preliminary Water Quality Assessment (2019b), which compared monitoring data for various datasets including:

- all monitoring sites;
- individual monitoring sites; and
- sites within Merimbula Bay (MBWQ20, MBWQ30, MBWQ40)
- reference sites;
- coastal process conditions, including upwelling events, weak current, north current, south current events; and
- different depths in the water column – surface, middle and bottom waters.

Charts summarising the statistical analysis and the adopted ambient concentrations as ambient water quality (AWQ) are included in AECOM (2019b) in **ANNEXURE A**. Generally, AECOM adopted median concentrations of the Merimbula Bay monitoring sites as the AWQs for each indicator, whilst also assessing differences and defining AWQs for upwelling events. The monitoring program included three monitoring events that were considered to be undertaken during upwelling events: 15 December 2014, 19 February 2015 and 21 March 2017. The criteria for defining an upwelling event included observations of regional current and sea surface temperature charts, and elevated nitrate concentrations in conjunction with a temperature differential between surface and bottom waters of $4-6^\circ\text{C}$ or greater.

Data analysis of the difference in nitrate concentrations reported in surface and bottom waters for the three upwelling events, also in context of adopted MWQOs, are summarised in **Table 3-2**, below.

WATER QUALITY**Table 3-2 Nitrate (NO₃) concentrations recorded during upwelling events**

Upwelling Event Date	Site	Nitrate as N (mg/L)			Factor Difference ³
		Surface water	Mid water	Bottom water	
Guideline - 80 th Percentile Twofold Shelf Bioregion ¹		0.008	-	0.17	-
Guideline - Aquatic Ecosystems ²		0.025	0.025	0.025	-
15/12/2014	MBWQ20	0.016	0.016	0.035	2
	MBWQ30	0.001	0.052	0.089	89
	MBWQ40	0.001	0.109	0.134	134
19/2/2015	MBWQ20	0.001	0.001	0.031	31
	MBWQ30	0.001	0.001	0.101	101
	MBWQ40	0.001	0.001	0.147	147
21/3/2017	MBWQ20	0.017	-	0.126	7
	MBWQ30	-	-	-	n/a
	MBWQ40	0.022	-	0.138	6

Notes -

Values in bold text and shaded indicate guideline value exceeded

¹ IMCRA mesoscale bioregions (Australia) default guideline values (DGVs) for physical and chemical (PC) stressors.<https://www.waterquality.gov.au/anz-guidelines/your-location/australia-marine-IMCRA/search-results?region=TWO&stressor=Nitrate>² WQOs for protection of Marine Aquatic Ecosystems in South-East Australia (ANZECC/ARMCANZ 2000 - Table 3.3.2)³ Nitrate concentration of bottom waters greater than surface watersThe data in **Table 3-2** indicates:

- The difference in nitrate results reported between surface and bottom waters for the three upwelling events were most pronounced in the December 2014 and February 2015 events when nitrate concentrations were 89 to 147 times higher in bottom waters than in surface waters. This was reported at the MBWQ30 and MBWQ40 sites. Differences were less pronounced in the furthest inshore MBWQ20 site, with nitrate in bottom waters 2 to 31 times higher than surface waters.
- Nitrate reported in bottom waters in the deepest and furthest seaward site MBWQ40 ranged between 0.134 mg/L to 0.147 mg/L and was similar to the 80th percentile value published for the Twofold Shelf Bioregion (ANZG 2018).
- The nutrient concentrations reported at the Merimbula Bay sites during the three upwelling events indicates significant nutrient loads are delivered to the nearshore coastal waters of the NSW South Coast during these events, and correlate with the findings of Pritchard *et al.* (2003) for coastal waters off Sydney.

AECOM's statistical analysis of water quality data during upwelling events included data from all depths and found that concentrations of some indicators were statistically higher during upwelling events, including nitrate, total nitrogen, chlorophyll-a, suspended solids, oxides of nitrogen, total phosphorus, orthophosphate, faecal coliforms and enterococci. These differences are shown in Tables 4 and 5 of AECOM (2019b) in **ANNEXURE A**.

In adopting ambient water quality (AWQ), AECOM assumed upwelling events to be infrequent and to be conservative, calculated median concentrations from Merimbula Bay site data that mostly excluded upwelling event data to provide medians that were considered more representative of typical ambient water quality

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conditions. Separate AWQs for Merimbula Bay were also calculated representing upwelling events for comparison purposes and to also inform required dilution for treated wastewater during such events. A summary of the adopted AWQs from AECOM (2019b) is included in **Table 3-3**, below:

Table 3-3 Summary of adopted Ambient Water Quality (AWQ) and upwelling AWQ (AECOM, 2019a)

Indicator	Units	Adopted Ambient Water Quality (AWQ)	Upwelling Event AWQ	Assumption for Adopted AWQ
pH	pH units	8.17	8.13	Median of Merimbula Bay sites
Suspended Solids	mg/L	12	12	Median of Merimbula Bay sites excluding upwelling events
Turbidity	NTU	0.3	0.5	Median of Merimbula Bay sites
Electrical Conductivity	µs/cm	53408	53114	Median of Merimbula Bay sites
Dissolved Oxygen	mg/L	7.6	7.4	Median of Merimbula Bay sites
Secchi Depth	m	8.9	7.0	Median of Merimbula Bay sites
Total Nitrogen (TN)	mg/L	0.12	0.13	Median of Merimbula Bay sites excluding upwelling events
Oxides of Nitrogen (NO _x)	mg/L	0.017	0.048	Median of Merimbula Bay sites excluding upwelling events
Nitrate	mg/L	0.017	0.047	Median of Merimbula Bay sites excluding upwelling events
Ammonia	mg/L	0.008	0.007	Median of Merimbula Bay sites
Ammonium	mg/L	0.008	0.007	Median of Merimbula Bay sites
Total Phosphorus (TP)	mg/L	0.007	0.010	Median of Merimbula Bay sites excluding upwelling events
Orthophosphate	mg/L	0.004	0.008	Median of Merimbula Bay sites excluding upwelling events
Chlorophyll-a	µg/L	1.2	1.7	Median of Merimbula Bay sites excluding upwelling events
Faecal Coliforms	cfu/100 mL	1	47	Median of Merimbula Bay sites excluding upwelling events
Enterococci	cfu/100 mL	1	11	Median of Merimbula Bay sites excluding upwelling events
Aluminium	µg/L	4.5	13.5	Median of Merimbula Bay sites
Antimony	µg/L	0.25	0.25	Median of Merimbula Bay sites
Arsenic (III)	µg/L	1.8	2.1	Median of Merimbula Bay sites
Barium	µg/L	5.9	No data	Median of Merimbula Bay sites
Boron	µg/L	4295	4005	Median of Merimbula Bay sites
Cadmium	µg/L	0.1	0.1	Median of Merimbula Bay sites
Chromium (total)	µg/L	0.25	0.25	Median of Merimbula Bay sites
Cobalt	µg/L	0.025	0.025	Median of Merimbula Bay sites
Copper	µg/L	0.2	0.1	Median of Merimbula Bay sites
Iron	µg/L	5	10	Median of Merimbula Bay sites
Lead	µg/L	0.1	0.1	Median of Merimbula Bay sites
Manganese	µg/L	0.25	0.25	Median of Merimbula Bay sites
Mercury	µg/L	0.05	0.02	Median of Merimbula Bay sites
Nickel	µg/L	0.25	0.25	Median of Merimbula Bay sites
Selenium	µg/L	1	1	Median of Merimbula Bay sites
Silver	µg/L	0.35	0.13	Median of Merimbula Bay sites

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Indicator	Units	Adopted Ambient Water Quality (AWQ)	Upwelling Event AWQ	Assumption for Adopted AWQ
Zinc	µg/L	2.5	2.5	Median of Merimbula Bay sites

3.3.4 Nearshore marine water quality

Nearshore marine waters were considered as the zone between the surf and shoreline for the stretch of crescent shaped beach between Merimbula and Pambula. Treated wastewater currently discharges to this nearshore zone via the beach face outfall, which is located approximately halfway along this beach with wastewater disposal to this zone occurring since 1971. This nearshore zone hosts a variety of recreational beach users, including swimmers, surfers, fishers and walkers as well as a small number of beach worm collectors under commercial licence.

Water quality in the nearshore zone is considered to be largely represented by the AWQs for marine waters as tabulated in **Table 3-3** above, with potential influences from estuary discharge during ebb flow and treated wastewater discharge from the beach face outfall. This is based on field observations and data analysis of the ambient marine water dataset, estuary monitoring dataset for Merimbula Lake and Pambula Lake and the tidal regime for Merimbula Bay.

Additional data available for the nearshore zone is the Beachwatch enterococci dataset, which is collected from five sites in the study area including: Short Point, Bar Beach, Merimbula Main Beach, Pambula Beach and Pambula River Mouth. The enterococci dataset is a useful addition to the water quality dataset for the Project, although it does have some limitations which includes:

- Data is collected in late spring and summer between November and February and largely the summer holiday season. This coincides to periods when wastewater disposal via the beach-face outfall is typically not occurring and disposal is instead via the dunal exfiltration ponds. There may be some instances where wastewater discharge via the beach-face outfall occurs during this period, such as if the ponds are at capacity or during wet weather flows, but this would be a minority of the time and would also coincide with high stormwater runoff to the estuaries.
- No enterococci data exists for the nearshore zone in and around the beach-face outfall discharge point.

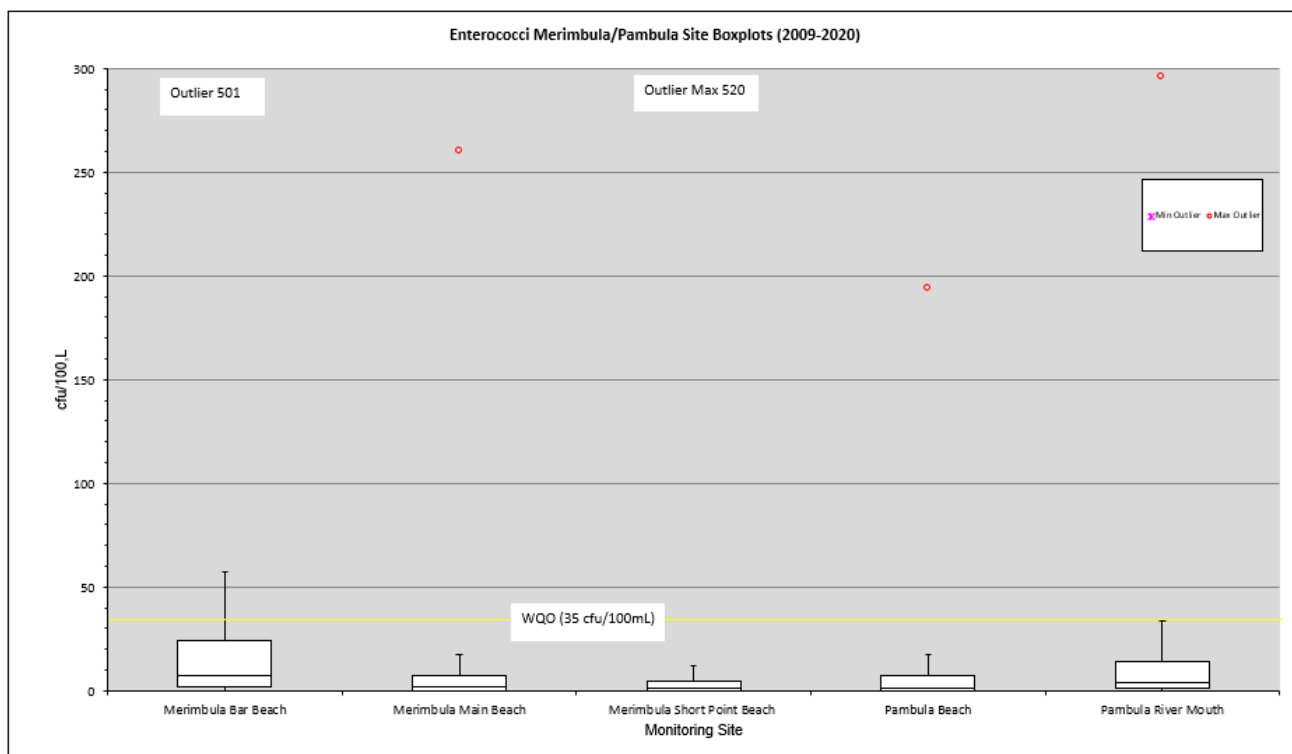
Notwithstanding these limitations, dispersion modelling (refer **Section 6**) for the existing beach-face outfall shows dispersion of wastewater can occur in a longshore drift parallel with the beach towards the Beachwatch sites in both Merimbula and Pambula, and it is possible that some of the enterococci counts in the dataset are attributable to the wastewater. Enterococci counts are also likely from other sources such as stormwater runoff into Merimbula and Pambula Lakes and its subsequent discharge to Merimbula Bay during ebb tide.

Summary statistics of the enterococci dataset (2009-2020) for the Beachwatch sites in the study area are provided in **Table 3-4** and data distribution in the box and whisker plot below (**Figure 3-3**).

WATER QUALITY**Table 3-4 Nearshore marine waters enterococci (cfu/100ml) statistics (2009-2020)**

Site	Sample n	Min	Max	50 th percentile Median	90 th percentile	Sample n >35 cfu/100mL WQO	% samples > 35 cfu/100mL WQO
Merimbula Bar Beach	121	0	501	7	73	23	19%
Merimbula Main Beach	122	0	260	2	22	9	7%
Merimbula Short Point Beach	122	0	520	1	29	9	7%
Pambula Beach	123	0	194	1	18	4	3%
Pambula Rivermouth	123	0	296	4	41	18	15%

Note – dataset from <https://www.environment.nsw.gov.au/topics/water/beaches/beachwatch-water-quality-program>.

**Figure 3-3 Beachwatch enterococci data for Merimbula and Pambula (2009-2020)**

The Beachwatch enterococci dataset indicated the following:

- Median enterococci counts for all five sites were less than the WQO of 35 cfu/100mL.
- 90th percentile enterococci counts for Merimbula Main Beach, Merimbula Short Point Beach and Pambula Beach were less than the WQO of 35 cfu/100mL, whilst 90th percentiles for Merimbula Bar Beach and Pambula Rivermouth exceeded the WQO.
- The percentage of results that exceeded the WQO of 35 cfu/100mL ranged between 3% and 7% for Merimbula Main Beach, Merimbula Short Point Beach and Pambula Beach and was relatively infrequent. A higher percentage of results exceeded the WQO for Merimbula Bar Beach and Pambula Rivermouth at 19% and 15%, respectively.

The results indicate that the five Beachwatch sites in the study area meet the enterococci WQO for the majority of the time, although there are a minority of instances during the sampling season where the WQO is exceeded.

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It is not known from the dataset the extent that these exceedances are attributed to wastewater discharge from the beach face outfall, but it cannot be ruled out given the wastewater dispersion modelling for this current discharge scenario as shown in **Figure 6-2**.

The results from Merimbula Bar Beach and Pambula Rivermouth also indicate the potential for influences from estuary waters, as both sites are located at the estuary entrances to Merimbula Lake and Pambula Lake, respectively. The occasional higher enterococci count in both magnitude and frequency for both these sites may indicate estuarine influences that can occur from time to time, such as greater potential for impacts from stormwater runoff or urban sewer leaks, when compared to Pambula Beach and Merimbula Main Beach which are coastal beach sites. It is noted that the threat risk of urban sewer leak impacting estuary waters is greater for Merimbula Lake than for Pambula River based on the level of urban development around each estuary.

3.3.5 Marine sediments

Marine sediments have been previously sampled in Merimbula Bay and includes sampling sites located on or in the vicinity of the alignment of the outfall pipeline. This data is presented in this section with sediment sampling locations shown below on **Figure 3-4**.

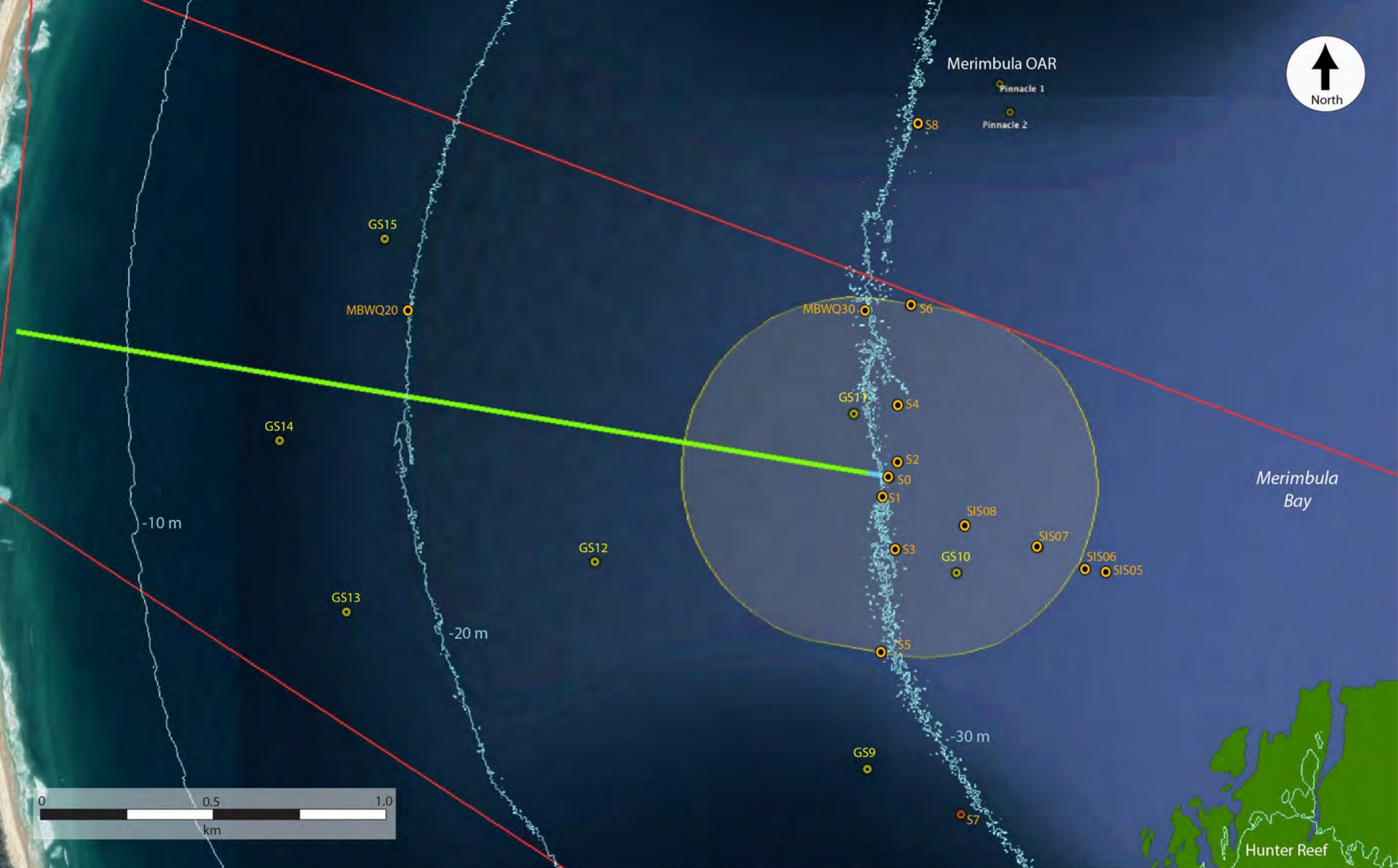
Data sources

Available marine sediment data includes:

- Sediment grab samples collected by Elgin at ambient background water quality monitoring sites on 12/12/2016. Sediment samples were collected from five sites by grab sampler and analysed for parameters that included: pH, redox potential, Total Organic Carbon (TOC), Particle Size Distribution (PSD), nutrients (TN, NO_3^- , NO_2^- , NO_x , NH_3 , TP, PO_4^{3-}) and metals (Sb, As, Be, B, Cd, Cr, Co, Cu, Pb, Mn, Mo, Ni, Se, Ag, Sn, Zn, Hg). Of the five sites sampled, site MBWQ20 is located closest to the preferred pipeline alignment, approximately 200m to the north.
- Sediment grab samples collected by Elgin to assess the benthic infauna community of Merimbula Bay as part of the marine monitoring program for this EIS. Sediment samples were collected for benthic infauna taxonomic enumeration along with parameters that included: pH, redox potential, TOC, PSD, nutrients and metals. Of the 11 sites sampled, site S0 is located at the diffuser location for the preferred outfall option, with the next nearest sites S1 and S2 located 50 m south and north of the diffuser location, respectively.
- Sediment grab samples collected by Marine and Earth Sciences (MES) as part of geophysical investigations in Merimbula Bay for the Project (MES, 2018). A total of 15 grab samples were collected by MES (refer Figure 2 in MES, 2018) with grab samples from sites GS10, GS11, GS14 and GS15 located nearest to the pipeline alignment. Samples were photographed with qualitative descriptions provided for sediment type, dominant grain shape, shell content, minor components and colour. There is no PSD data for these samples.
- Underwater video transects collected along the seabed of the pipeline alignment by Elgin in June 2020. This footage has been provided to AECOM to assist the Project team, with screenshot photos included herein to assist in sediment description along the route.

Relevant sediment data and information has been compiled into **ANNEXURE D**.

The location of existing sediment sampling sites that are on or in the vicinity of the preferred route is shown on **Figure 3-4** below:



LEGEND

- | | | | |
|--|---------------------------------|---|---|
| | area of investigation | | Elgin sample 2017 - 2020 (PSD, chemistry) |
| | reef area | | MES sample 2017 (field obs) |
| | proposed ocean outfall pipeline | | 500m radius around outfall diffuser |

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Concept Design and Environmental Assessment



TITLE: **SEDIMENT
SAMPLE LOCATIONS**

FIGURE 3-4

Ver. 1

A4

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Sediment descriptions and particle size distribution (PSD) results for sampling sites on or near the preferred outfall pipeline route are summarised in **Table 3-5**, below. PSD certificates of analysis for MBWQ20, S0, S1 and S2 sites and excerpts from MES (2018) are included in **Annexure D**.

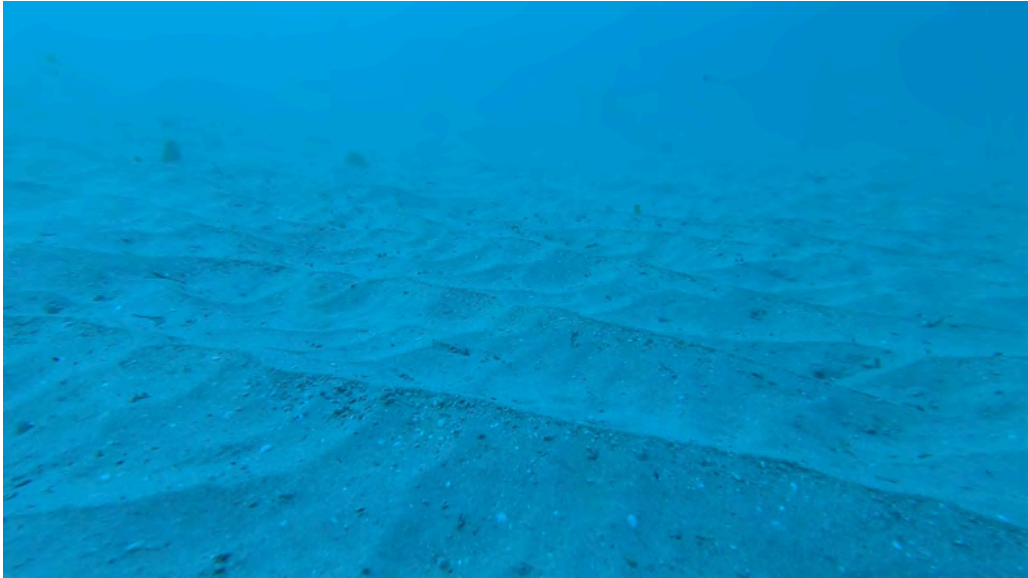
Table 3-5 Summary of sediment descriptions and particle size distribution (PSD) results

Site	Description	PSD median particle size (µm)	Photograph
MBWQ20 (corresponds to WQ site, 200 m north of preferred pipeline alignment)	Sand, brown, fine grained with trace black sediment and trace quartzite	203	
S0 (benthic infauna site, located at diffuser location)	Sand, brown, medium to coarse grain, shell grit, trace fines. Sand ripples <10 cm high.	513 and 516	
S1 (benthic infauna site, located 50 m south of diffuser location)	Sand-silt, dark brown, fine to medium grain, minor shell, clay balls. Sand ripples <10 cm high.	168 and 474	
S2 (benthic Infauna site, located 50 m north of diffuser location)	Sand, dark brown, medium to coarse grain, trace fines. 5-10% shell. Sand ripples >10 cm high.	571 and 657	
GS10 (geophysics site, located south of preferred pipeline alignment – MES, 2018)	Coarse sand, light brown, angular, shell content 30-40%	-	

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Site	Description	PSD median particle size (µm)	Photograph
GS11 (geophysics site, located south of preferred pipeline alignment – MES, 2018)	Silty sand, grey-brown, sub-rounded, shell content <5%	-	
GS14 (geophysics site, located south of preferred pipeline alignment – MES, 2018)	Fine sand, light grey, sub-rounded, shell content <5%	-	
GS15 (geophysics site, located south of preferred pipeline alignment – MES, 2018)	Fine sand, light grey, sub-rounded, shell content <5%	-	
Screenshots from video transect inside 500m radius of preferred diffuser locations (Elgin, 2020)	 Transition from sand waves (>10 cm high) to sand ripples		

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Site	Description	PSD median particle size (µm)	Photograph
			 Sand ripples (<10 cm high)
			 Sand waves (>10 cm high)

Sediment PSD and chemistry results for MBWQ20, S0, S1 and S2 sites are included in **Annexure D**, with results including:

- The PSD results and sediment descriptions indicate variability in sediment types at the four sites. At the preferred outfall diffuser location S0 and to the north at S2, sediments comprise medium to coarse brown sands with only trace fines and differs to the sediments sampled to the south at S1 which had higher proportion of fine sediments. These differences are reflected in the PSD tables and graphs and more coarsely in the difference between median particle size. Sediments with a higher proportion of fine-grained particles were also evident at site MBWQ20, located in 20 m depth of water inshore of S0 and approximately 200 m north of the preferred pipeline route. It is acknowledged that of these sites, S0 is the only one that actually occurs on the preferred route, located at the end of the route at the

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diffuser location and there is limited application for the other sites S1, S2 and MBWQ20 other than providing some insight into seabed sediment variation in nearby locations.

- Metals reported above limits of reporting in one or more of the four sites included aluminium, arsenic, chromium, cobalt, copper, iron, lead, manganese, nickel, selenium, silver, mercury, vanadium and zinc. All metals results were reported below the ANZECC (2000) Interim Sediment Quality Guidelines (ISQG) - Low trigger values, where applicable.
- Nutrients in sediment samples were reported as both totals (TN and TP) and individual nutrient species including ammonia, nitrite, nitrate, ammonia and reactive phosphorus. Nitrate and ammonia were reported in S0, S1 and S2 but not in MBWQ20, and comprised only a minor component of TN with Total Kjeldahl Nitrogen (TKN) results indicating the majority of nitrogen species in organic form. Reactive phosphorus was reported in all four samples and represented a minor proportion of TP.
- TOC ranged between 0.08% (S0) and 0.2 % (S2) across the four samples.
- The sediment results were also compared to publicly available data for similar projects, which included data from the Wonthaggi Desalination Plant EES (2008) on the Victorian Bass Strait coast. Whilst some distance from Merimbula, the Wonthaggi data nevertheless provides some further context for the sediment results and are included in the tabulated results for reference. Note publicly available background sediment data for NSW coastal sites were not able to be sourced.

The video footage screenshots were taken in ~28 m depth inside the 500 m radius of the preferred diffuser location and illustrate a transition from relatively flat sand ripple areas characterised by fine, medium grain sands to large sand waves characterised by coarser grain sands and shell material. The latter indicative of a more active hydrodynamic environment along some sections of the preferred pipeline alignment, these areas are also visible in the hydrosurvey data (MES, 2018).

WATER QUALITY**3.4 Estuarine waters**

Estuarine waters within the study area includes Merimbula Lake and Pambula River estuary. A description of estuarine environments and values is provided in the Marine Ecology Assessment (**Appendix G** in the EIS). Key findings from that description included:

- Both estuaries are listed as wetlands of national importance based on their significant ecological and cultural values. Both estuaries support a range of habitats including seagrass meadows, mangroves, saltmarsh and intertidal sand/mud flats.
- Both estuaries are characterised by good water quality and high level of tidal flushing. In 2014, the health of both estuaries was rated 'very good' in terms of eutrophication indicators turbidity and chlorophyll a.
- Both estuaries have significant areas of coastal wetland identified under the *State Environmental Planning Policy (Coastal Management) 2016* (Coastal Management SEPP).
- A range of threatened wader and shorebirds have been recorded from both estuaries.
- No fish species listed as threatened under the *NSW Fisheries Management Act 1994* (FM Act) or *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) are known to occur in the estuaries. However, at least six species belonging to the Syngnathiformes (seahorse, pipefish, pipehorses) and protected under the FM Act are known to occur. These include *Syngnathoides biaculeatus*, *Vanacampus poecilolaemus*, *Urocampus carinirostris*, *Vanacampus phillipi*, *Stigmatophora nigra*, and *Stigmatophora argus*.
- Both estuaries support a valuable oyster aquaculture industry primarily cultivating the Sydney Rock oyster (*Saccostrea glomerata*) but also southern mud oyster (*Ostrea angasi*).
- The natural amenity and significant ecological values of the estuaries are important assets to the coastal townships of Merimbula and Pambula, with the estuarine environment representing a key attraction for local residents and tourists that visit the coastal towns annually. They are among the most popular estuaries within the Bega Valley for recreational use with swimming, boating, fishing, kayaking, paddle-boarding and snorkelling popular activities.

Maintaining and good water quality is vital to the protection of estuarine communities and environmental values. The mechanism by which the Project may impact the estuarine environment is if treated wastewater discharge disperses into the estuaries. The purpose of this section is to describe existing ambient estuarine water quality both in normal conditions and post-rainfall event, in order to assess the potential impact of this scenario.

3.4.1 Data sources

Assessment of Merimbula Lake and Pambula River estuary water quality is based on data collected as part of the NSW estuary health Monitoring Evaluation Reporting (MER) program and post-event data collected as part of the Merimbula ocean outfall ambient water quality monitoring program. Datasets include:

Normal flow conditions (i.e. low rainfall and baseflow catchment inflows)

- 2012-2013 Merimbula Lake MER (Elgin 2014a).
- 2014-2015 Merimbula Lake MER (DPIE, *unpubl.*).
- 2010-2013 Pambula River estuary MER (Elgin 2014b).
- 2008-2009, 2017-2018 Pambula River estuary MER (DPIE, *unpubl.*).

Post-event conditions

- 2015-2016 Merimbula lower estuary (Elgin, *this study*).
- 2015-2016 Pambula River estuary (Elgin, *this study*).

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The tabulated datasets are included in **ANNEXURE B**.

3.4.2 Merimbula Lake water quality

A summary of Merimbula Lake water quality is provided in **Table 3-6**, with key points inferred for normal flow and post-event conditions provided below.

Normal flow conditions

Under normal conditions the estuary has a high level of water quality with marine tidal flows a key process in maintaining water quality conditions. Depth profiling (Elgin 2014a) shows that the estuary basin is well-mixed by tidal flushing, with results of key water quality indicators including:

- High water clarity with turbidity levels typically less than 1 Nephelometric Turbidity Unit (NTU) and well below the MER guideline of 6 NTU for coastal lakes. Water clarity is highest during winter periods with the benthos visible even in the deepest parts of the basin at 8.5 m depth.
- Low microalgal abundance as indicated by mean concentration of chlorophyll *a* less than 3 µg/L and below the MWQO of 5 µg/L.
- Median nutrient levels including TN, oxides of nitrogen (NO_x), ammonium, TP and ortho-phosphate are below MWQOs. For majority of nutrient parameters, the maximum values are also below MWQOs. Exceptions include NO_x at 0.056 mg/L (17/4/2012) and TN at 0.36 mg/L (16/12/2014). For these results, review of rainfall records of the relevant sample periods, indicate the estuary had experienced significant catchment inflows in the preceding weeks as indicated by lower conductivity (~41,000 – 48,000 µS/cm) at the time of sampling. It is apparent that catchment inflow events that bring sediment and nutrients to the estuary in stormwater can result in elevated nutrient levels that can remain elevated for some time after the actual event.

Post-event conditions

Post-event water quality of Merimbula Lake is based on data collected after three separate rainfall events corresponding to an average recurrent interval (ARI) of less than one year (9/4/2015), 2 to 5-year event (6/6/2016), and 10 to 20-year event (31/1/2016). The latter was the most significant event in terms of water impacts with rainfall total of 103.6 mm reported at Merimbula Airport Automatic Weather Station (AWS) (BoM station #69147) in 24 hours to 9am. However, majority of that rainfall (95.4 mm) was recorded over a 165-minute period between midnight and 3 am (31 January 2016), equivalent to rainfall intensity of 34.7 mm/hr (**ANNEXURE B**).

After significant rainfall, estuary water quality is poor with elevated levels of turbidity, nutrients and biological parameters all exceeding MWQOs (**Figure 3-5**).

- Water clarity is typically very poor immediately following a rainfall event. For the 31 January 2016 event, maximum turbidity of 34 NTU and suspended solids of 36 mg/L were measured during the first ebb tide. This represents a 75-fold increase above normal turbidity levels (mean 0.5 NTU). Due to exceptional tidal flushing water clarity improves quickly. For the 31 January 2016 event, turbidity reduced to 9 NTU and suspended solids of 9 mg/L after the first ebb-flood tide cycle, equivalent to 20 times greater than normal turbidity levels.
- Mean levels of nutrient parameters increase by a factor of 2 to 7 compared to normal conditions. TN levels increase to twice the normal mean concentration and do not show the marked increase expected given the urbanised catchment compared to other estuaries in the region with forested catchments whose TN levels can increase by as much as x10 following a significant rainfall event (Elgin, *pers. obs.*). Mean levels of NO_x increase by a factor of 7 above the normal mean concentration.
- Microbiological parameters faecal coliforms and enterococci exceed the MWQOs with maximum level of enterococci reported at 24,600 cfu/100 mL, 700 times greater than the MWQO and indicative of

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possible failure of the sewer network infrastructure during high rainfall event. Faecal coliforms have been reported as high as 3,900 cfu/100mL, 26 times greater than the MWQO during post-event conditions.



Figure 3-5 Surface waters of Merimbula Lake at the causeway following significant rainfall event. (Site MER_03 during ebb tide at 9 am, 31/1/2016).

3.4.3 Pambula River estuary water quality

A summary of Pambula River estuary water quality is provided in **Table 3-7**, with key points inferred for normal flow and post-event conditions provided below.

Normal flow conditions

Under normal conditions the estuary has a high level of water quality with parameters generally meeting MWQOs.

- Depth profiling indicates that mixing processes in the basin including tidal flushing and wind advection, are effective with water quality conditions generally uniform throughout the water column. Density gradients have been observed in summer and autumn seasons, and following post-rainfall event inflows, with differences in water temperature and salinity between surface and bottom waters. Depth profile data also show that levels of dissolved oxygen of bottom waters do not decline to levels that would be harmful aquatic organisms living near or in the benthic sediments.
- Under normal tidal and baseflow conditions, mean level of dissolved oxygen is 95 % saturation and water clarity is high with mean turbidity of 1 NTU. Estuarine waters are predominantly marine with electrical conductivity (EC) typically ~53,000 $\mu\text{S}/\text{cm}$.
- Nutrient levels including TN and TP are typically below MWQOs, while mean levels of ammonia, ammonium, NO_x , and orthophosphate slightly exceed MWQOs.
- Low microalgal abundance as indicated by mean concentration of chlorophyll-*a* less than 2 $\mu\text{g}/\text{L}$ and below the MWQO of 2.3 $\mu\text{g}/\text{L}$.

Post-event conditions

Post-event water quality for Pambula River estuary is based on data collected after four separate rainfall events (23/4/2012, 9/4/2015, 31/1/2016, 6/6/2016), the three most recent events correspond to those same events described for Merimbula Lake above with details provided in **ANNEXURE B**. The most significant event was 31 January 2016.

After significant rainfall, impact to estuarine water quality from stormwater runoff and catchment inflows is apparent with brown-coloured waters, poor clarity, high suspended load, and reduced salinity (**Figure 3-6**).

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Surface water quality is poor with elevated levels of turbidity, nutrients and biological parameters all exceeding MWQOs.

- Water clarity is typically very poor immediately following a rainfall event. For the 31 January 2016 event, maximum turbidity of 72 NTU was measured during the first ebb tide representing a 50-fold increase above normal turbidity levels (mean 1.4 NTU). Large inflows of freshwater can dramatically lower salinity as was observed in 31 January 2016 event when EC decreased to as low as 140 $\mu\text{S}/\text{cm}$. These conditions are extreme and would attenuate with each ebb-flood tidal cycle.
- Mean levels of nutrient parameters increase by a factor of 2 to 7 compared to normal conditions. Total nitrogen (TN) levels increase by a factor of 4, while mean levels of NO_x increase by a factor of 8 above the normal mean concentration. All nutrient parameters exceed MWQOs.
- Microbiological parameters faecal coliforms and enterococci exceed the MWQOs with maximum level of enterococci reported at 9,700 cfu/100mL, 280 times greater than the MWQO while faecal coliforms have been reported as high as 6,000 cfu/100mL, 40 times greater than the MWQO during post-event conditions.



Figure 3-6 Surface waters of Pambula Lake at the entrance (PAM_03) and boat-ramp (PAM_04) following significant rainfall event (31/1/2016)

WATER QUALITY**Table 3-6 Summary of Merimbula Lake ambient water quality (2012-2016)**

Parameter	Units	Adopted MWQO Trigger Value ^a	Normal Conditions - BASIN ^a					Post Event - LOWER ESTUARY ^b			
			Sample n	Min	Max	Median	Mean	Sample n	Min	Max	Mean
PHYS-CHEM											
Dissolved Oxygen (DO)	% sat.	80-110 ¹	0	0	0	0	0	4	80	108	89.8
Dissolved Oxygen (DO)	mg/L	>5 ²	10	5.8	8.3	6.5	6.7	4	6.8	7.9	7.2
Turbidity	ntu	6 ³	34	0.1	2.6	0.3	0.5	6	0.1	34.0	10.7
Salinity	ppt	-	33	26.3	37.8	35.4	34.8	6	18.3	33.8	25.9
Conductivity (EC)	uS/cm	-	34	41034	55612	53490	52574	6	29548	51469	40338
Temperature	°C	-	34	12.1	24.6	18.8	19.3	6	16.0	25.6	19.3
pH	pH	7.0-8.5 ¹	34	8.0	9.1	8.1	8.2	6	7.4	8.0	7.8
Suspended Solids (SS)	mg/L	10 ⁵	0					6	4	36	17
NUTRIENTS											
Ammonia	mg/L	0.01 ⁴	15	0	0.090	0.005	0.015	6	0.011	0.040	0.024
Ammonium (NH4+)	mg/L	0.015 ¹	10	0.003	0.010	0.007	0.006	6	0.011	0.039	0.024
Nitrate	mg/L	0.7 ⁵	-	-	-	-	-	6	0.009	0.207	0.067
Oxides of Nitrogen (NOx)	mg/L	0.015 ¹	16	0.000	0.056	0.003	0.009	6	0.009	0.207	0.067
TKN	mg/L		16	0.100	0.240	0.200	0.183				
Total Nitrogen (TN)	mg/L	0.3 ¹	22	0.070	0.360	0.196	0.202	6	0.220	0.680	0.422
Total Phosphorus (TP)	mg/L	0.03 ¹	22	0.004	0.022	0.012	0.011	6	0.002	0.050	0.023
Orthophosphate	mg/L	0.005 ¹	12	0.000	0.003	0.002	0.002	4	0.003	0.016	0.008
BIOLOGICAL											
Chlorophyll a (Lab)	ug/L	5 ³	20	0.6	10.6	2.0	2.9	1	1.6	1.6	1.6
Chlorophyll a (probe)	ug/L	5 ³	34	0.1	7.5	0.9	1.6	2	0.6	1.1	0.8
Faecal Coliforms	cfu/100 mL	150 ⁴	-	-	-	-	-	6	8	3900	974
Enterococci	cfu/100 mL	35 ⁴	-	-	-	-	-	6	62	24600	4864

NOTE

Values in bold text and shaded exceed MWQOs

^a Adopted MWQO trigger value relevant to estuarine waters from Table 2-2 in this report^a Data collected for the NSW estuary MER program for years 2012-2013 (Elgin 2014), 2014-2015 (DPIE unpubl.)^b Post event data collected following a range of significant rainfall events in 2015 and 2016 (Task 2) as part of Merimbula Ocean Outfall Ambient WQ Monitoring¹ ANZECC (2000) Stressor guidelines for estuaries aquatic ecosystems, SE Australia – Tables 3.3.2 and 3.3.3. Also draft guideline values (DGVs) in ANZG (2018).² ANZECC (2000) Physico-chemical stressors and toxicant guidelines for saltwater aquaculture species – Tables 4.4.2 and 4³ Chlorophyll a and turbidity trigger levels adopted by the NSW estuary MER program for estuary class Lake – applicable to Merimbula Lake (OEI 2016)⁴ ANZECC (2000) Water quality guidelines for recreational purposes – Tables 5.2.2 and 5.2.3⁵ ANZECC (2000) Interim working level, Section 8.3.7.2 of Volume 2

WATER QUALITY**Table 3-7 Summary of Pambula River estuary ambient water quality (2010-2018)**

Parameter	Units	Adopted MWQO Trigger Value ^a	Normal Conditions - BASIN ^a					Post Event - LOWER ESTUARY ^b			
			Sample <i>n</i>	Min	Max	Median	Mean	Sample <i>n</i>	Min	Max	Mean
PHYS-CHEM											
Dissolved Oxygen (DO)	% sat.	80-110 ¹	51	78.8	106.0	98.0	97.1	10	67.0	100.8	86.3
Dissolved Oxygen (DO)	mg/L	>5 ²	12	5.9	7.7	6.9	6.9	6	7.3	9.0	8.0
Turbidity	ntu	2.8 ³	66	0	5	1.3	1.4	14	4	72	32
Salinity	ppt	-	54	30.9	37.5	35.3	35.1	14	0.1	27.5	8.4
Conductivity (EC)	uS/cm	-	66	45330	55273	53059	52749	14	140	42719	13750
Temperature	°C	-	66	11.9	25.9	20.5	19.4	14	14.7	21.5	17.5
pH	pH	7.0-8.5 ¹	51	7.8	8.2	8.1	8.0	14	6.4	8.2	7.4
Suspended Solids (SS)	mg/L	10 ⁵						10	8	70	39
NUTRIENTS											
Ammonia	mg/L	0.01 ⁴	16	0.003	0.090	0.007	0.017	12	0.016	0.047	0.028
Ammonium (NH4+)	mg/L	0.015 ¹	14	0.003	0.087	0.007	0.018	12	0.015	0.046	0.028
Nitrite	mg/L							5	0.003	0.006	0.005
Nitrate	mg/L	0.7 ⁵						10	0.064	0.539	0.209
Oxides of Nitrogen (NOx)	mg/L	0.015 ¹	20	0.000	0.110	0.021	0.025	12	0.064	0.544	0.197
TKN	mg/L		22	0.080	0.200	0.160	0.153	2	0.300	0.400	0.350
Total Nitrogen (TN)	mg/L	0.3 ¹	24	0.060	0.560	0.175	0.181	12	0.270	1.190	0.724
Total Phosphorus (TP)	mg/L	0.03 ¹	24	0.004	0.027	0.011	0.013	12	0.013	0.078	0.044
Orthophosphate	mg/L	0.005 ¹	20	0.003	0.015	0.006	0.007	12	0.005	0.012	0.008
BIOLOGICAL											
Chlorophyll a (Lab)	ug/L	2.3 ³	38	0.7	3.8	1.6	1.8	2	0.8	1.7	1.2
Chlorophyll a (probe)	ug/L	2.3 ³	51	0.5	4.6	1.6	1.7	6	0.8	2.0	1.1
Faecal Coliforms	cfu/100 mL	150 ⁸						10	340	6000	1897
Enterococci	cfu/100 mL	35 ⁴						10	527	9700	4697

NOTE

Values in bold text and shaded exceed MWQOs

^{*} Adopted MWQO trigger value relevant to estuarine waters from Table 2-2 in this report^a Data collected for the NSW estuary MER program for years 2010-2013 (Elgin 2014), 2008-2009 and 2017-2018 (DPIE unpubl.)^b Post event data collected following a range of significant rainfall events in 2015 and 2016 (Task 2) as part of Merimbula Ocean Outfall Ambient WQ Monitoring¹ ANZECC (2000) Stressor guidelines for estuaries aquatic ecosystems, SE Australia – Tables 3.3.2 and 3.3.3. Also draft guideline values (DGVs) in ANZG (2018).² ANZECC (2000) Physico-chemical stressors and toxicant guidelines for saltwater aquaculture species – Tables 4.4.2 and 4³ Chlorophyll a and turbidity trigger levels adopted by the NSW estuary MER program for estuary class Riverine Lower – applicable to Pambula River estuary (OEI 2016)⁴ ANZECC (2000) Water quality guidelines for recreational purposes – Tables 5.2.2 and 5.2.3⁵ ANZECC (2000) Interim working level, Section 8.3.7.2 of Volume 2**3.4.4 Summary of estuarine waters**

Merimbula Lake and Pambula River estuary are characterised by high water quality under normal tidal and baseflow conditions. Water quality conditions decline following significant rainfall events with elevated levels of suspended sediment, nutrients and microbiological parameters exceeding MWQOs. It is during these episodic events that high loads of sediment and nutrients may be exported to Merimbula Bay.

3.5 Back dunes of Merimbula Beach

The back dunes of Merimbula Beach, located east of the STP, hosts a wetland that extends south from the Project area and south of the existing dunal exfiltration ponds. This wetland was mapped in the Merimbula STP Groundwater Dependant Ecosystem Assessment (EcoLogical Australia, 2020) and the Merimbula STP Groundwater Technical Report (**Appendix D** in the EIS).

Whilst the wetland is not mapped in the Groundwater Dependant Ecosystem (GDE) Atlas, it has the potential to be a GDE and host surface water because of the shallow groundwater table in the area (EcoLogical Australia, 2020). The water table is close to the surface of this wetland because of its topographic low relief, with groundwater fluctuating around 0.5m in response to seasonal rainfall recharge (AECOM, 2020b).

Drilling of the outfall pipeline section 1 from the STP to Merimbula Beach would pass beneath the northern end of this wetland, at a depth of approximately 6 m below the bottom of the wetland, and 5 m below the average water table (EcoLogical Australia, 2020). The potential for impacts on the wetland from the Project during construction and operational phases was subsequently assessed in both the GDE Assessment by EcoLogical Australia (2020) and the Groundwater Technical Report by AECOM (2020b).

The findings of Ecological Australia's assessment were as follows:

- Drilling beneath the wetland during construction at a depth of 6 m is expected to pose a negligible threat to the wetland, noting drilling controls that would include maintenance of the integrity of the drill hole and immediate installation of the pipeline.
- For operation of the pipeline beneath the wetland, the pipeline is expected to constitute a minor barrier to groundwater flow, with a rate of reduction in water moving northward across the pipeline predicted at 0.7% in the Groundwater Technical Report (**Appendix D** in the EIS). This level of change was noted to be well within the range of natural climate variability, and unlikely to have a significant impact. This potential loss to the northern end of the wetland would be expected to be compensated with its addition instead to the southern end of the wetland. It was concluded there would be a negligible impact on groundwater flow, quality or level beneath this wetland.

The findings of AECOM's assessment were as follows:

- For construction phase, the risks of significant changes to the water table elevation and quality of groundwater that supports the wetland and its ecosystem due to drilling are low.
- For operational phase, risks to groundwater level and quality and dependent receptors from the operational pipeline are considered to be low.
- A groundwater monitoring program which includes monitoring of levels and quality in bores located in proximity to the wetland.

With potential impacts on this wetland already assessed in the GDE Assessment and the Groundwater Technical Report, it has not been assessed further in this report.

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4 Treated wastewater characteristics

4.1 Data sources

Water quality data for influent and treated wastewater from the Merimbula STP was provided by BVSC in a spreadsheet file entitled '*Merimbula STP influent and effluent quality data_kb02112017.xls*.' The data is from the period 2004 and 2017 and was collected by BVSC as part of the EPL for the STP.

The tabulated influent and effluent data from the BVSC spreadsheet are included in **ANNEXURE C**.

4.2 Influent quantity and quality

Influent is sourced from Merimbula, Pambula and Pambula Beach, with sewage pumped from these townships to the STP which is designed to serve an equivalent population (EP) of 15,500.

Influent quality is based on raw sewage samples monitored between April 2004 and May 2017 (BVSC, 2017). Median values of influent quality, along with proposed 2042 median design values, based on information provided by AECOM in the 30% Concept Design Report (2019a) as summarised in **Table 4-1**, below:

Table 4-1 Merimbula STP influent quality (from AECOM, 2019a)

Parameter	Current Median Influent Value (n=158)	Proposed 2042 Median Influent Design Value
Suspended Solids	270 mg/L	300 mg/L
Biological Oxygen Demand	293 mg/L	300 mg/L
Chemical Oxygen Demand	577 mg/L	580 mg/L
Total Nitrogen	60 mg/L	65 mg/L
Ammonia	46 mg/L	46 mg/L
Total Phosphorus	11 mg/L	11 mg/L
Alkalinity	276 mg/L	-
Electrical Conductivity	1130 μ S/cm	-

The data distribution in the influent for the above parameters (n=158) is shown below in box and whisker plots:

- boxplot of suspended solids, BOD, COD and Total Alkalinity; and
- boxplot of nutrients TN, TP and Ammonia as N.

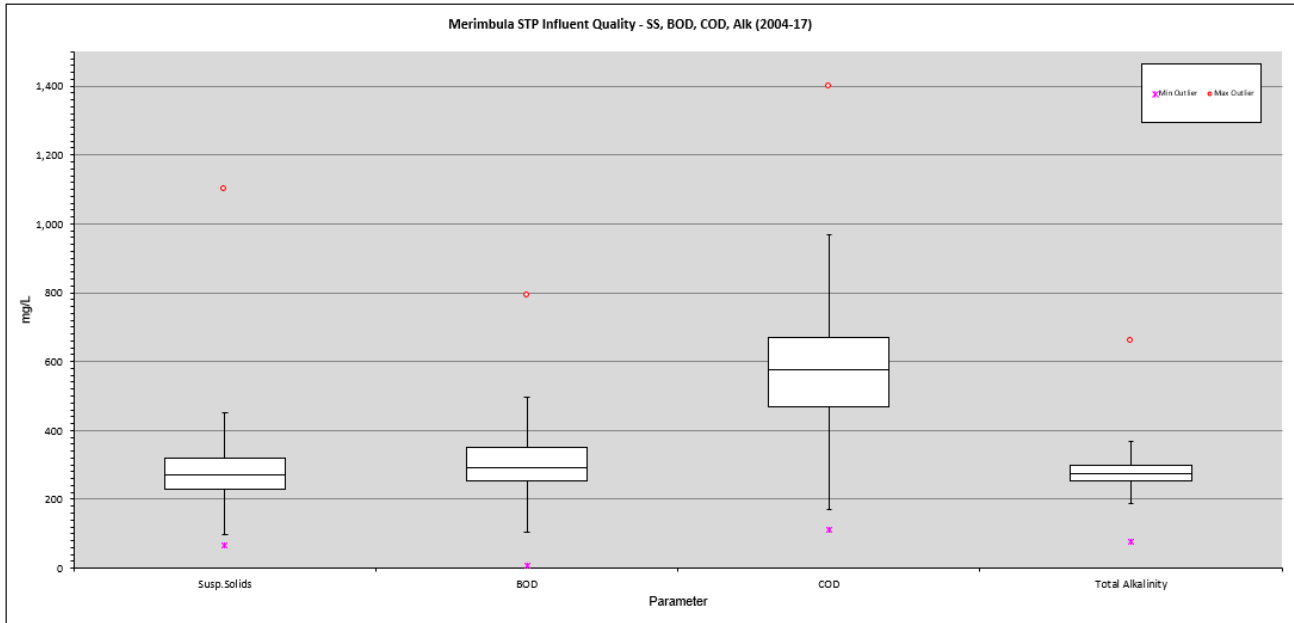


Figure 4-1 Box and whisker plot - influent SS, BOD, COD, alkalinity (2004-17)

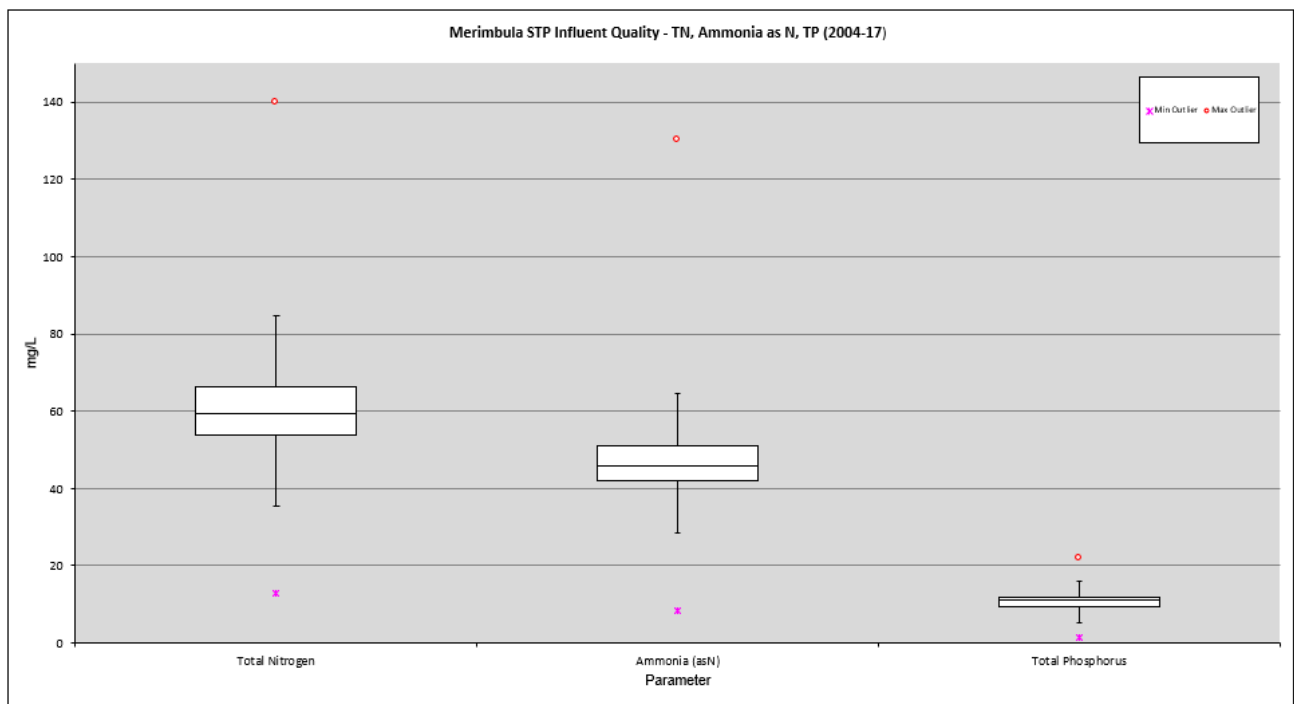


Figure 4-2 Box and whisker plot - influent TN, ammonia as N, TP (2004-17)

Trade waste is a potential source of pollutants in influent, and the BVSC procedure for liquid trade waste (Procedure 4.06.3) sets out a process for regulating sewage and trade waste inputs into its sewerage system, and includes:

- An objective to protect the environment from the discharge of waste that may have a detrimental effect.
- Prior approval from BVSC for disposal of liquid trade waste to sewer, noting that disposal without prior approval is an offence under the *Local Government Act 1993*. BVSC are also not able to grant an approval without concurrent approval from the Director-General of the NSW Office of Water.

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- Categorisation of dischargers of liquid trade waste according to the risk profile to the sewerage system, with Categories 1, 2 and 3. Category 1 is considered low risk, whilst Category 2 (low to medium risk commercial activities) and Category 3 (industrial activities and/or large discharge volume) have requirements as a prescribed type of waste which includes pre-treatment and the wastewater well characterised.
- Non-compliance penalty provisions where BVSC can seek compensation for illegal, prohibited or unapproved liquid trade waste discharged to the sewerage system. This also includes fines under the *Environment Operations Act 1997* for pollution of any waters by a discharger who fails to comply with conditions of approval of liquid trade waste to sewer.
- A set of criteria for approval of liquid waste discharges, which is based on preventative risk management and which includes parameter limits for acceptance and substances prohibited to be discharged into the sewerage system. These include:
 - o Acceptance limits for cadmium, selenium, mercury, phenolic compounds (except pentachlorophenol), polyaromatic hydrocarbons, and pesticides in general (except organochlorine and organophosphorus).
 - o Specific prohibition of organochlorines, organophosphorus, organic solvents and chromate from cooling towers.
 - o Ability to prohibit substances which are assessed as unsuitable for discharge into the sewerage system, which may include bioaccumulative contaminants.
- A formalisation of a discharge of trade waste to sewer in an enforceable trade waste agreement between BVSC and a discharger. Compliance provisions include monitoring and testing, with medium and high-risk dischargers also requiring due diligence and contingency planning.

The EPL for the STP defines pollutant load limits, pollutant concentration limits, and volume discharge limits, including:

- Concentration limits for a list of tabulated pollutants that includes nutrients, oil and grease, biochemical oxygen demand, faecal coliforms, pH and total suspended solids. The EPL also includes condition L3.3 that it “does not authorise the pollution of waters by any pollutant other than those specified in the table/s”.
- Specific conditions (O5.1 and O5.2) relating to organochlorine and organophosphorus contaminants where it states that “the licensee must not enter into any trade waste agreement to discharge organophosphate pesticides (including chlorpyrifos, diazinon, malathion) into the system and “the licensee must not consent to any discharge of organochlorine pesticides (such as dieldrin, heptachlor and chlordane) into the sewerage system.

The operational and legal controls in place for the Merimbula STP are measures that mitigate environmental risks, including risks from pollutants in influent that may enter the STP and wastewater stream.

4.3 Treated wastewater quality

4.3.1 Existing wastewater quality (ETWWQ) data

ETWWQ was characterised from the results of treated wastewater monitoring data at the STP, with monitoring periods of April 2004 to September 2016 for physico-chemical, nutrient and some microbiological indicators, and October 2014 to September 2016 for metals and microbiological indicators (BVSC, 2017), and consistent with the time periods adopted by AECOM in the Preliminary Water Quality Assessment (AECOM 2019b). Summary statistics for key parameters are summarised in **Table 4-2** below.

WATER QUALITY**Table 4-2 Existing treated wastewater quality summary statistics (April 2004 to September 2016)**

Parameter	Sample # (n)	Units	Min	Max	Median	Wet Weather Flow Median	90 th percentile
pH	645	pH units	6.16	9.44	7.80	7.4	8.31
Suspended Solids	647	mg/L	0	56	5	11	13
Electrical Conductivity	389	µs/cm	11	2140	730	641	874
Dissolved Oxygen	368	mg/L	0.7	24	9.7	7.2	12.9
BOD	648	mg/L	0	104	2	19	6
COD	645	mg/L	3	138	28	51	40
Total Nitrogen	648	mg/L	1.09	30	4.29	9.10	10.1
Oxides of Nitrogen NO _x (as N)	646	mg/L	0.04	29	1.92	3.40	8.06
Ammonia (as N)	648	mg/L	0.01	17	0.34	4.1	2.0
Total Phosphorus (as P)	648	mg/L	2.82	18.0	9.3	9	12.0
Ortho Phosphate (as P)	374	mg/L	2.62	15	8.1	9	11
Chlorophyll "a"	158	µg/L	0.15	300	5.2	5.2	68.8
Cl-Combined	350	mg/L	0.01	1.00	0.09	0.03	0.30
Cl-Free	359	mg/L	0	1.03	0.09	0.14	0.26
Cl-Total Residual	359	mg/L	0	1.55	0.17	0.16	0.52
Faecal Coliforms (2004-2016)	647	cfu/100mL	<1	15000	50	242	672
Faecal Coliforms (2014-2016)	89	cfu/100mL	<1	1320	1	242	180
Enterococci	89	cfu/100mL	<1	4080	1	384	188
<i>E. coli</i>	87	cfu/100mL	<1	1320	1	172	140
Oil and Grease	647	mg/L	<1	13	1	1	1
Calcium	101	mg/L	16.6	25.6	20.3	18.9	23.4
Magnesium	101	mg/L	5.1	16.2	9.8	8.6	13.5
Potassium	101	mg/L	9.2	33.3	21.4	17.2	25.4
Sodium	101	mg/L	40.4	184	112	85.5	156
Aluminium	101	µg/L	10	177	40.0	124	74.6
Antimony	101	µg/L	<3	<3	<3	<3	<3
Arsenic	101	µg/L	<1	4	2	2	3
Barium	101	µg/L	3.2	31.4	6.0	6.1	10.2
Beryllium	101	µg/L	<0.1	0.3	<0.1	0.1	0.1
Boron	101	µg/L	30	140	60	60	80
Cadmium	101	µg/L	<0.05	0.32	<0.05	<0.05	<0.05
Chromium	101	µg/L	<1	3	<1	<1	1
Cobalt	101	µg/L	<0.2	1	0.3	0.3	0.5

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Parameter	Sample # (n)	Units	Min	Max	Median	Wet Weather Flow Median	90 th percentile
Copper	101	µg/L	4	677	21	11.5	272
Iron	101	µg/L	50	1910	150	300	706
Lead	101	µg/L	<0.2	11.8	0.2	0.3	5.6
Manganese	101	µg/L	10.2	91.4	33.8	50	54.2
Mercury	101	µg/L	<0.1	0.2	<0.1	<0.1	<0.1
Molybdenum	101	µg/L	<1	2	<1	<1	<1
Nickel	101	µg/L	<1	4	2	2	3
Selenium	101	µg/L	<1	14	3.0	2.5	7.8
Silver	101	µg/L	<1	<1	0.5	0.5	0.5
Zinc	101	µg/L	<5	248	50	30	140.4

Note - where results were reported below the limits of reporting, a value equal to half the limit of reporting was adopted for statistical analysis.

Merimbula STP also has the following EPL discharge limits for wastewater disposal (beach-face outfall or ex-dunal filtration ponds) applicable for a subset of the parameters above, summarised in **Table 4-3**, below.

Table 4-3 Merimbula STP current EPL discharge limits

Parameter	Units	90 th percentile limit	100 th percentile limit
BOD	mg/L	10	15
Faecal Coliforms	cfu/100mL	-	200
Nitrogen (ammonia)	mg/L	2	5
Nitrogen (total)	mg/L	10	15
Oil and Grease	mg/L	2	10
pH	pH units	-	6.5-8.5
Phosphorus (total)	mg/L	13 (current) 1.0 (expected future limit)	-
Suspended Solids	mg/L	20	30

The data distribution in the wastewater for a subset of key parameters is shown below in box and whisker plots:

- boxplot of suspended solids, BOD and COD;
- boxplot of nutrients TN, TP, NO_x and Ammonia as N;
- boxplot of microbiological indicators enterococci, faecal coliforms and *E. coli*; and
- boxplot of metals.

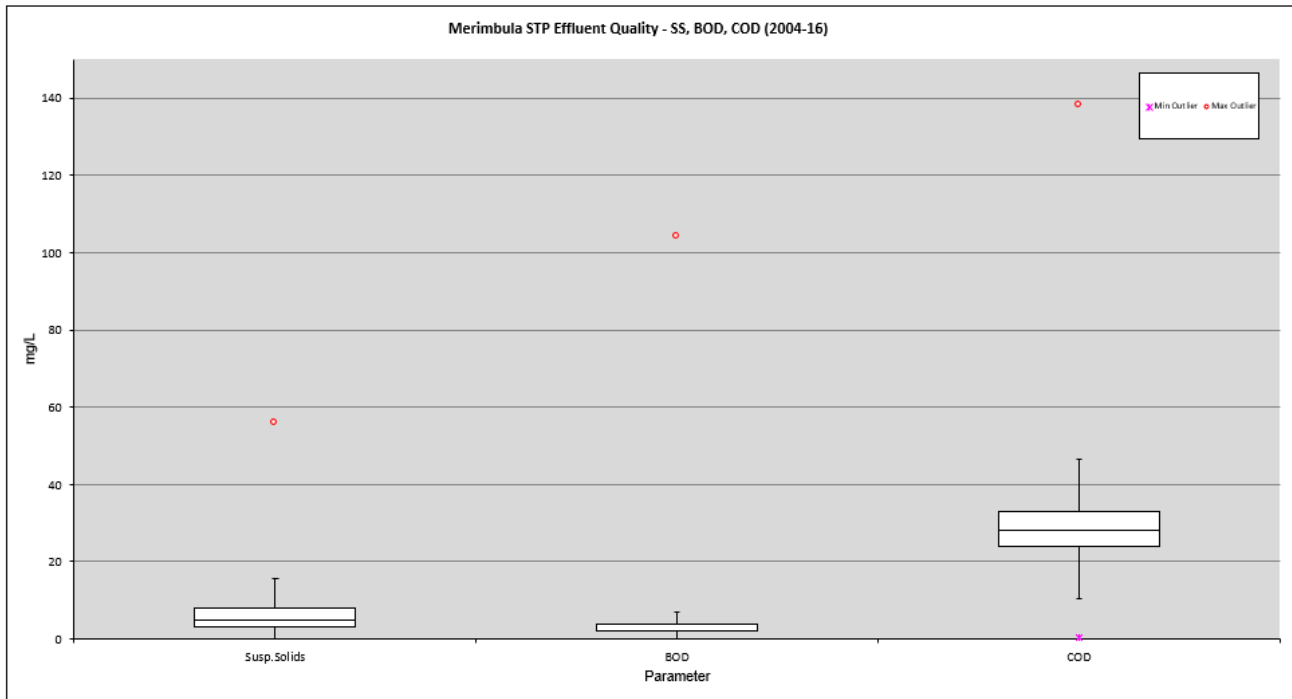


Figure 4-3 Box and whisker plot - wastewater SS, BOD, COD (2004-16)

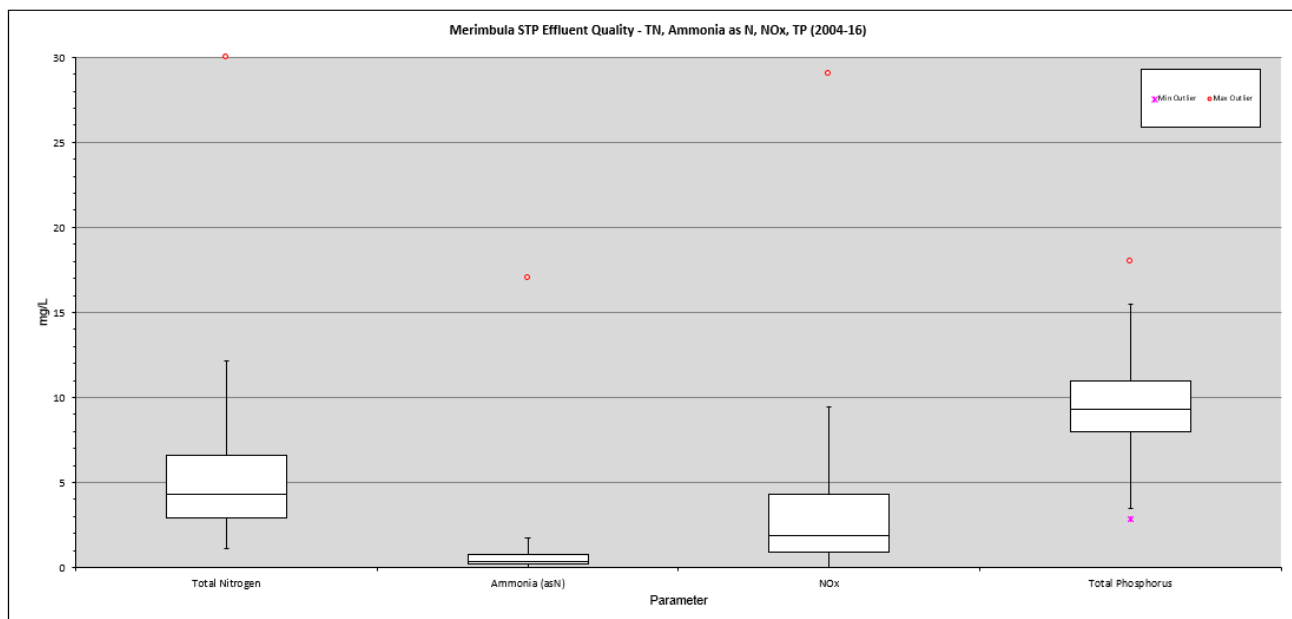


Figure 4-4 Box and whisker plot - wastewater TN, ammonia as N, NO_x, TP (2004-16)

ETWWQ is characterised by high levels of dissolved nutrients that can provide stimulus for rapid growth of microalgae in the wastewater storage pond, particularly during the warmer months. As the wastewater is characterised by high levels of ortho-phosphate, there is a risk that the microalgal assemblage of the storage pond can become dominated by planktonic cyanobacteria, some of which can be harmful to humans (i.e. *Microcystis aeruginosa* and *Anabaena circinalis* among others). Cyanobacteria tend to dominate freshwater settings loaded with phosphorous nutrients as they have evolved capacity to fix intracellular stores of nitrogen from the atmosphere and can therefore outcompete other algae when there is an excess availability of phosphorous. This risk is relevant to the beneficial re-use of wastewater where humans may become exposed

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to microalgae contaminated waters through applications via irrigation sprinklers. The risk of freshwater microalgae in treated wastewater is not relevant to disposal via the ocean as microalgae would not survive in the saline environment. It is expected that the STP upgrade changing from an open wastewater storage pond to a closed 2.3 ML storage tank would eliminate the growth of microalgae in wastewater.

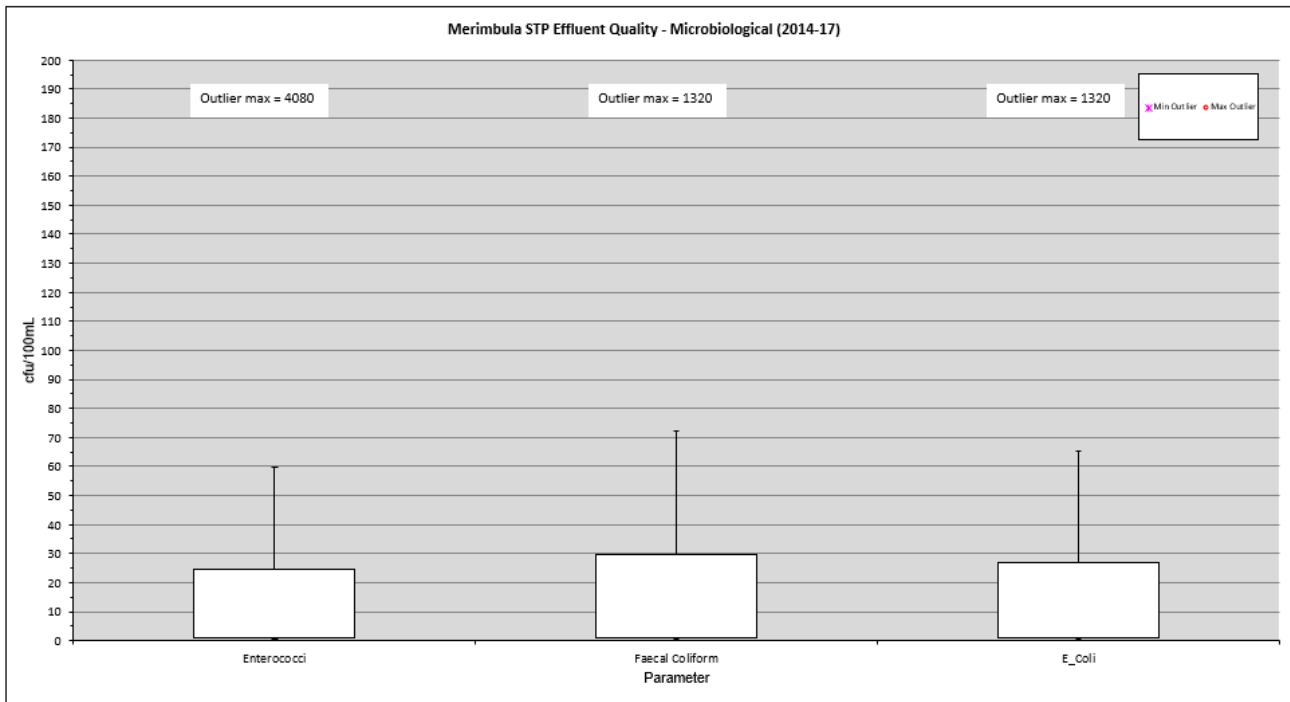


Figure 4-5 Box and whisker plot - wastewater microbiological indicators (2014-17)

For the three-year period between 2014-2017, microbiological parameters (*E.coli*, faecal coliforms and enterococci) were reported below laboratory detection limits for dry weather flow conditions. However, median levels of faecal coliforms and enterococci typically exceeded the EPL limit of 200 cfu/100ml during wet weather flow conditions.

Elevated levels of faecal coliforms in ETWWQ during dry weather flows are reported occasionally. These instances have been attributed to contamination by waterfowl guano whose population at the wastewater storage pond varies on a seasonal basis. It is expected that the STP upgrade changing from an open wastewater storage pond to a closed 2.3 ML storage tank would eliminate the risk of treated wastewater contamination by waterfowl.

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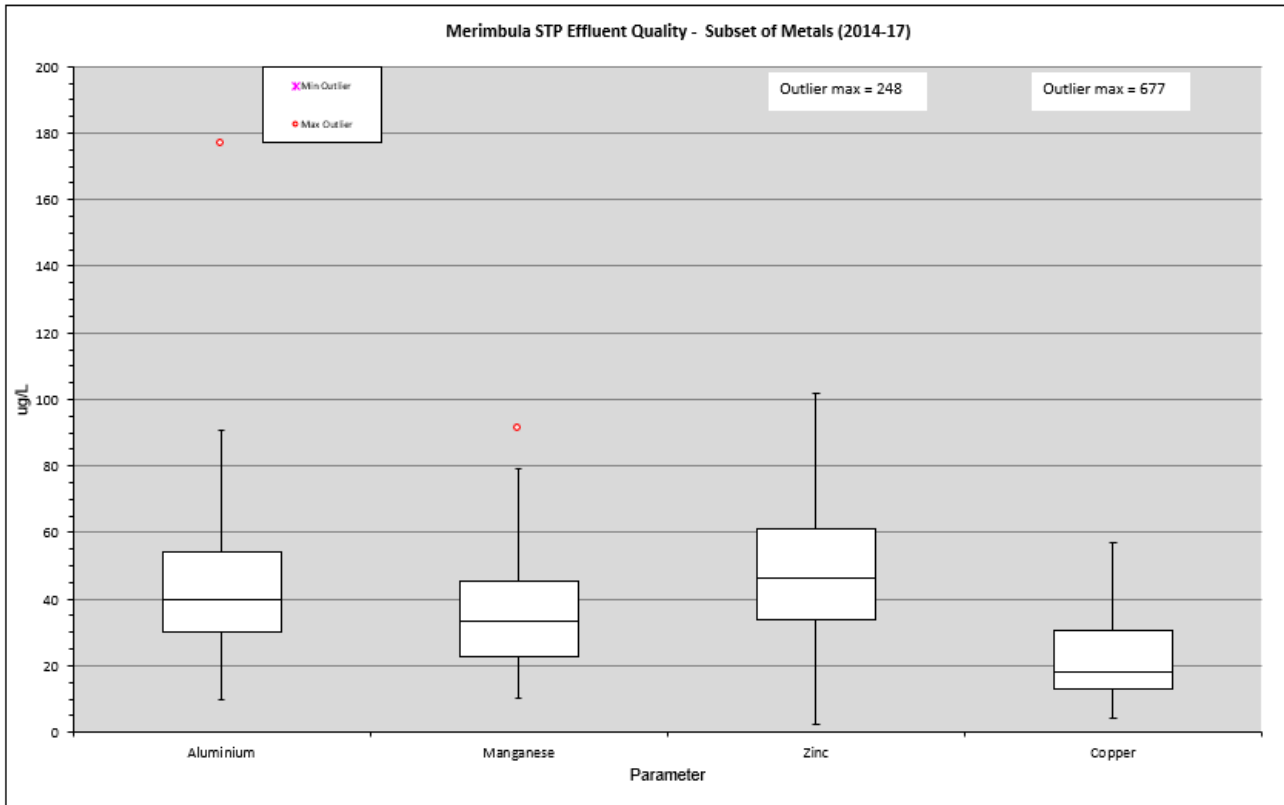


Figure 4-6 Box and whisker plot - wastewater subset of metals (2014-17)

Comparison of influent and wastewater quality and data distribution for mutually analysed parameters is shown in the following box and whisker plots:

- boxplot for influent and wastewater for suspended solids, BOD and COD; and
- boxplot for influent and wastewater for TN, ammonia and TP.

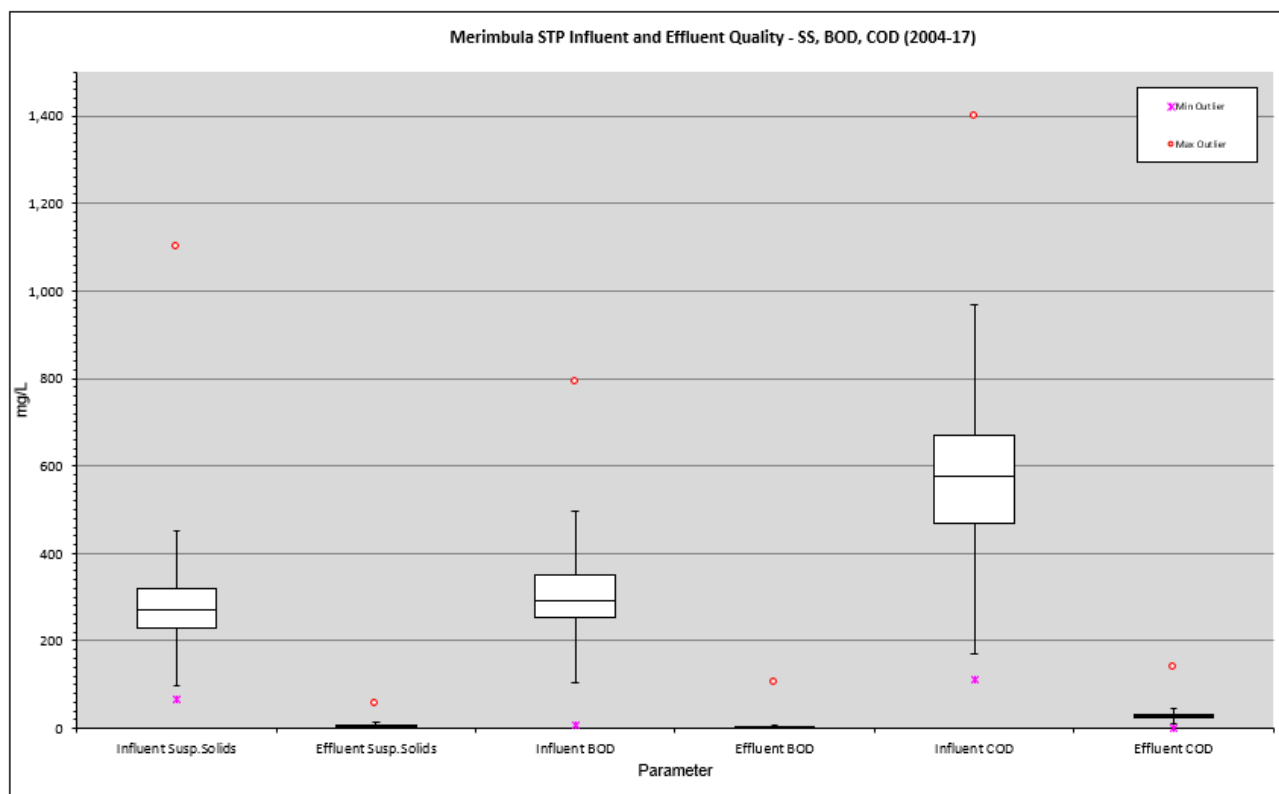


Figure 4-7 Box and whisker plot - influent vs wastewater for SS, BOD, COD (2004-17)

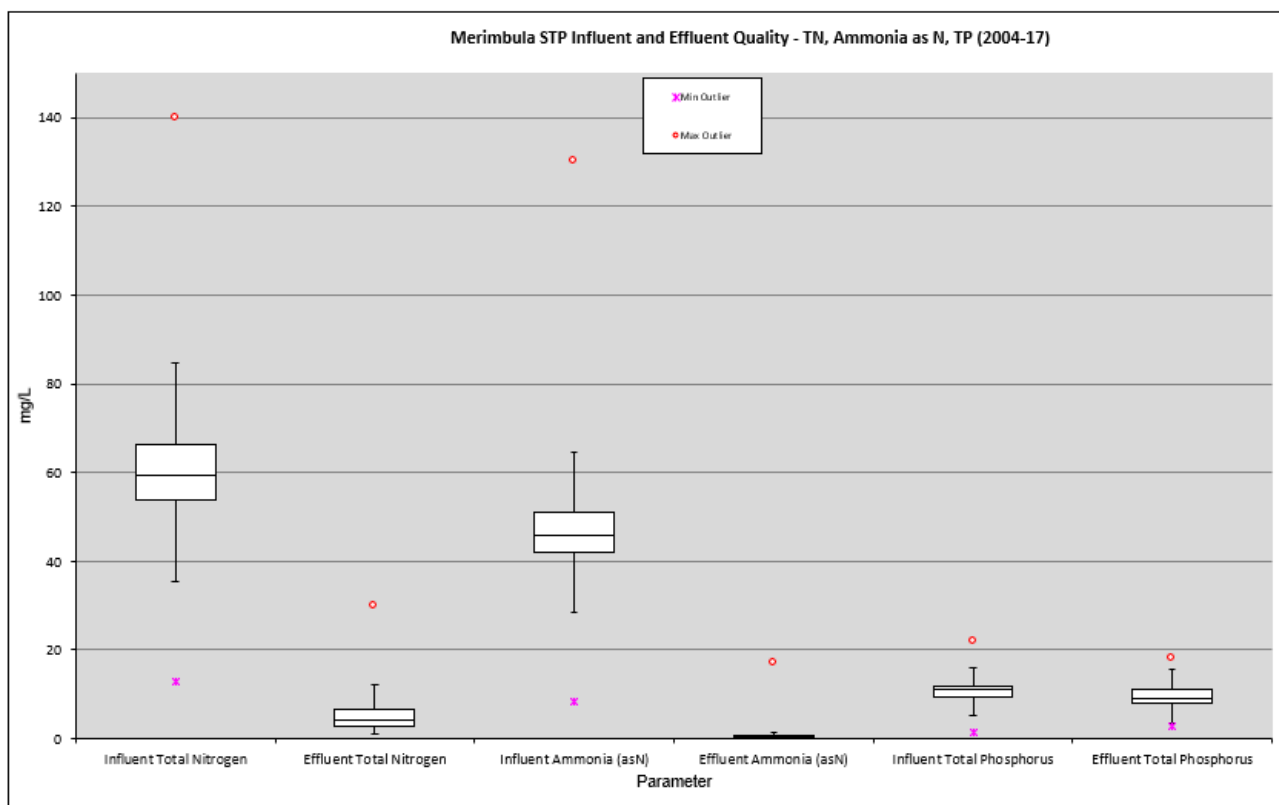


Figure 4-8 Box and whisker plot - influent vs wastewater for TN, Ammonia as N, TP (2004-17)

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Summary of existing treated wastewater quality

In summary, based on median (50th percentile) concentrations ETWWQ can be broadly described as:

- Freshwater, relatively low in salinity.
- Well oxygenated.
- Near neutral pH.
- Relatively low in suspended solids with intermittent higher suspended loads such as during wet weather flow.
- Containing levels of microalgae as represented by chlorophyll-a. Once discharged into the marine environment, microalgae in treated wastewater would not survive due to the saline environment.
- Containing elevated levels of nutrients that include ammonia, nitrate, oxides of nitrogen, total nitrogen, total phosphorus and orthophosphate.
- Relatively low microbiological indicators of enterococci and faecal coliform counts with intermittent higher counts that exceed MWQOs such as during wet weather flow.
- Containing concentrations of metals that include instances of aluminium, copper, iron, selenium and zinc reported above MWQOs.

4.3.2 Expected changes in wastewater quality

As summarised in **Table 1-1**, the proposed STP upgrade includes additional treatment processes which include:

- PAC dosing for phosphorus removal;
- UV treatment;
- chlorine dosing, but only for wastewater to be reused, not for wastewater to be discharged from the ocean outfall; and
- tertiary filtration, although this is a Project uncertainty of whether this is needed for water quality objectives to be met.
- decommissioning of the existing open 17 ML wastewater storage pond and replaced with a closed 2.3 ML wastewater storage tank.

These upgrades are expected to result in improved wastewater quality that includes:

- Enhanced phosphorus removal.
- Improved removal of aluminium and additional removal of protozoa, viruses, bacteria, TSS and BOD from tertiary filtration (if required).
- Improved removal of virus, bacteria and pathogens from UV disinfection and chlorine dosing of reuse water.
- Eliminate the risk of contamination to stored treated wastewater by waterfowl through their guano deposits and also microalgal growth.

Expected future EPL limits include a total phosphorus 90th percentile of 1.0 mg/L for reuse water, facilitated by STP upgrade as noted in the 30% Concept Design report (AECOM, 2019a). The report also notes a requirement for 4-log reduction in virus, bacteria and pathogens at the discharge point for reuse water as an expected future limit, facilitated by STP upgrade of final disinfection by UV radiation and chlorination. Whilst the current STP has existing chlorination, an upgrade of the existing disinfection system is required in the upgrade (AECOM, 2019a).

It is understood that BVSC also has a long-term strategy to upgrade the reticulated water system that should

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result in reduction of copper and zinc concentrations in the wastewater stream.

4.4 Wastewater quantity and discharge points

The current Environment Protection Licence (EPL 1741) for the Merimbula STP permits a maximum daily disposal volume of 4 ML, and a total maximum annual discharge volume of 1,000 ML to the current ocean outfall or dunal exfiltration ponds (NSW EPA 2014). Since 2007, the total volume of wastewater discharged to the ocean ranged between 230 and 400 ML/year (Elgin 2013a).

The volume of wastewater disposed via the outfall in any one year would be dependent on total annual flows minus the volume of wastewater re-used. The STP current average dry weather flow is 2 ML/day. The strategy for managing treated wastewater currently and after the Project is complete is provided in **Table 4-4** (refer EIS **Chapter 2 Project Description**).

Table 4-4 Treated wastewater management strategy

Phase	Inflow	Sludge treatment / disposal	Beneficial Reuse		Disposal
			PMGC	Oaklands	
Current average	2 ML/day	0.1 ML/day	0.4 ML/day	0.1 ML/day	1.4 ML day
Project completion projected average	2 ML/day	0.1 ML/day	0.4 ML/day	0.4 ML/day	1.1 ML day

For proposed future operation post-Project are two wastewater discharge points:

- ongoing re-use of treated wastewater for irrigation of PMGC and Oaklands; and
- disposal of excess treated wastewater to the ocean outfall and discharge to marine coastal waters of Merimbula Bay.

The dunal exfiltration ponds and beach-face outfall would cease as discharge points post-Project. Further expansion of the re-use scheme would be considered post-Project through the Integrated Water Cycle Management (IWCM) project.

5 Preliminary water quality screening for dispersion modelling

5.1 Marine and estuary receiving waters

The Preliminary Water Quality Assessment (AECOM, 2019b) in **ANNEXURE A** included preliminary screening of ETWWQ against AWQ and MWQOs. The screening process was used to identify indicators in the wastewater that may present a potential risk to the environmental values of marine and estuary receiving waters and warrant more detailed quantitative assessment.

The screening process is included in Section 3.4 of the Preliminary Water Quality Assessment (AECOM, 2019b) and included the following:

- identifying indicators for which ETWWQ, AWQ and MWQOs were all available for evaluation;
- evaluation of relative indicator concentrations of ETWWQ, AWQ and MWQOs for the six different scenarios where relative concentrations between ETWWQ, AWQ and MWQOs can vary; and
- assessment of indicators with potential to approach the MWQO.

Based on this screening process, the following indicators were identified for more detailed quantitative assessment through modelling:

- physical and chemical stressors: pH, suspended solids, total nitrogen, oxides of nitrogen, ammonia, total phosphorus, orthophosphate, chlorophyll-a, faecal coliforms and enterococci; and
- metals: aluminium, arsenic, cobalt, copper, iron, lead, manganese, nickel, selenium, silver and zinc.

For modelling purposes, the following was adopted:

- ETWWQ deferred to 100th percentile EPL discharge limits where applicable, otherwise 90th percentile concentrations were adopted as an upper discharge scenario such as wet-weather flow.
- ETWWQ median for total phosphorus deferred to future expected discharge limit of 1.0 mg/L, with orthophosphate at 0.8 mg/L as historical dataset indicates 80% of total phosphorus comprises orthophosphate. Median concentrations were also assessed to represent conditions for the majority of the time, including dry weather flow.
- AWQs also included both median concentrations and concentrations during upwelling events.

A summary of ETWWQ, MWQO and AWQs for the above indicators is included in **Table 5-1**, below.

WATER QUALITY**Table 5-1 Summary of key indicators for ETWWQ, compared to MWQO and AWQ used for modelling**

Indicator	Units	ETWWQ 90 th percentile or EPL	ETWWQ Median	ETWWQ Wet Weather Flow	MWQO Trigger Value	AWQ Median	AWQ Upwelling
pH	pH units	6.5-8.5 ¹	7.80	7.4	8.0-8.4 ⁴	8.17	8.13
Suspended Solids	mg/L	30¹	5	11	10	12	12
Total Nitrogen	mg/L	15¹	4.29	9.10	0.12 ⁴	0.12	0.13
Oxides of Nitrogen NO _x (as N)	mg/L	8.06	1.92	3.40	0.025 ⁴	0.017	0.048
Ammonia (as N)	mg/L	5¹, 1.9	0.34	4.1	0.01 ⁴	0.008	0.007
Total Phosphorus (as P)	mg/L	13¹	1²	9	0.025 ⁴	0.007	0.010
Ortho Phosphate (as P)	mg/L	11	0.8³	9	0.01 ⁴	0.004	0.008
Chlorophyll "a"	µg/L	68.8	5.2	5.2	1	1.2	1.7
Faecal Coliforms	cfu/100 mL	200¹	50	242	150	1	47
Enterococci	cfu/100 mL	188	1	384	35	1	11
Aluminium	µg/L	74.6	40	124	10	4.5	13.5
Arsenic	µg/L	3	2	2	2.3	1.8	2.1
Cobalt	µg/L	0.5	0.3	0.3	1	0.025	0.025
Copper	µg/L	272	21	11.5	1.3	0.2	0.1
Iron	µg/L	706	150	300	300	5	10
Lead	µg/L	5.6	0.2	0.3	4.4	0.1	0.1
Manganese	µg/L	54.2	33.8	50	100	0.25	0.25
Nickel	µg/L	3	2	2	70	0.25	0.25
Selenium	µg/L	7.8	3	3	3	1	1
Silver	µg/L	0.5	0.5	0.5	1.4	0.35	0.13
Zinc	µg/L	140.4	50	30	5	2.5	2.5

Notes

TWWQ = existing treated wastewater water quality, MWQO = marine water quality objective, AWQ = ambient water quality

Values in bold text and shaded exceed MWQO trigger level

¹ Based on EPL discharge limit² Based on expected future EPL discharge limit of 1.0 mg/L.³ Based on expected future EPL discharge limit for TP of 1.0 mg/L, assuming 80% comprises orthophosphate from historical data⁴ Marine trigger value rather than estuary trigger value adopted for modelling of discharge to coastal waters

WATER QUALITY**5.2 ETWWQ dilution factors**

Based on the outcomes of the screening process, a subset of indicators was carried forward by AECOM modellers for further evaluation of the dilution factors required for ETWWQ to meet the MWQOs and inform wastewater plume dispersion modelling. The subset of indicators for which dilution factors were calculated were selected by AECOM following screening of indicators that reported ETWWQ at the highest factors above MWQO or AWQ and hence would require the highest levels of dilution and included:

- Oxides of nitrogen (NO_x), ammonia, Total Phosphorus, orthophosphate, faecal coliforms, enterococci, aluminium, arsenic, copper, iron, lead, selenium and zinc.

The evaluation of ETWWQ for these indicators included the calculation of dilution factors required to meet MWQO in ambient coastal waters for the following TWWQ scenarios:

- ETWWQ at median concentrations (**Table 5-2**).
- ETWWQ at EPL discharge limits or 90th percentile concentrations (**Table 5-3**).
- ETWWQ in wet weather flow (**Table 5-4**).

Table 5-2 Dilution factors required for ETWWQ at median concentrations

Indicator	Units	ETWWQ Median	MWQO	AWQ	Dilution Required
		Ce	Co	Cb	$[D=(Ce-Cb)/(Co-Cb)]$
Oxides of Nitrogen (NO _x)	mg/L	1.915	0.025	0.017	237
Ammonia	mg/L	0.335	0.01	0.008	164
Total Phosphorus (TP)	mg/L	1	0.025	0.007	55
Orthophosphate	mg/L	0.8	0.01	0.004	133
Aluminium	µg/L	40	10	4.5	6
Copper	µg/L	21	1.3	0.2	19
Selenium	µg/L	3	3	1	1
Zinc	µg/L	50	5	2.5	19

Note – worse case dilution factor in bold text and shaded.

Table 5-3 Dilution factors required for ETWWQ at EPL discharge limits or 90th percentile concentrations

Indicator	Units	ETWWQ 90 th percentile or EPL	MWQO	AWQ	Dilution Required
		Ce	Co	Cb	$[D=(Ce-Cb)/(Co-Cb)]$
Oxides of Nitrogen (NO _x)	mg/L	8.06	0.025	0.017	1005
Ammonia	mg/L	5	0.01	0.008	2496
Total Phosphorus (TP)	mg/L	13	0.025	0.007	722
Orthophosphate	mg/L	11	0.01	0.004	1833
Faecal coliforms	cfu/100 ml	200	150	1	1
Enterococci	cfu/100 ml	188	35	1	6
Aluminium	µg/L	74.6	10	4.5	13
Arsenic	µg/L	3	2.3	1.8	2
Copper	µg/L	272	1.3	0.2	247

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Indicator	Units	ETWWQ 90 th percentile or EPL	MWQO	AWQ	Dilution Required
		Ce	Co	Cb	$[D=(Ce-Cb)/(Co-Cb)]$
Iron	µg/L	706	300	5	2
Lead	µg/L	5.6	4.4	0.1	1
Selenium	µg/L	7.8	3	1	3
Zinc	µg/L	140.4	5	2.5	55

Note – worse case dilution factor in bold text and shaded.

Table 5-4 Dilution factors required for ETWWQ in wet weather flow

Indicator	Units	ETWWQ Wet Weather Flow	MWQO	AWQ	Dilution Required
		Ce	Co	Cb	$[D=(Ce-Cb)/(Co-Cb)]$
Oxides of Nitrogen (NO _x)	mg/L	3.40	0.025	0.017	423
Ammonia	mg/L	4.1	0.01	0.008	2046
Total Phosphorus (TP)	mg/L	9	0.025	0.007	500
Orthophosphate	mg/L	9	0.01	0.004	1499
Faecal coliforms	cfu/100 ml	242	150	1	2
Enterococci	cfu/100 ml	384	35	1	11
Aluminium	µg/L	124	10	4.5	22
Copper	µg/L	11.5	1.3	0.2	10
Iron	µg/L	300	300	5	1
Zinc	µg/L	30	5	2.5	11

Note – worse case dilution factor in bold text and shaded.

For the ETWWQ scenarios above, the highest analyte dilutions required include:

- ETWWQ at median concentrations: a dilution factor of 237 (from oxides of nitrogen) is required to achieve all MWQOs. This scenario represents typical discharge conditions for the majority of the time.
- ETWWQ at EPL discharge limits or 90th percentile concentrations: a dilution factor of 2496 (from ammonia at EPL of 5 mg/L) is required to achieve all MWQOs. This dilution factor is greater than for ETWWQ at wet weather flow, which had a dilution factor of 2046 also from ammonia (at 4.1 mg/L). These scenarios represent infrequent discharge conditions when considering the wet weather flow concentration of 4.1 mg/L represents the 97th percentile, and the 5 mg/L EPL the 98th percentile – that is, these conditions are infrequent as representing 2-3% of the time.

These results were carried forward for near-field and far-field wastewater plume dispersion modelling to determine mixing zone extents to achieve the MWQOs at the required dilutions, as discussed in **Section 6** below.

6 Wastewater dispersion modelling

A key aspect of the Project is the wastewater dispersion modelling that examines the predicted behaviour and trajectory of the discharged wastewater plume under a range of ambient current conditions and identifies the extent of wastewater influence in marine receiving waters, known as the 'wastewater mixing zone'.

Wastewater dispersion modelling for the Project was undertaken by AECOM in the *Merimbula Ocean Outfall – Dispersion Modelling Report – Appendix Q* in the EIS (AECOM, 2020). The report presents AECOM's dispersion modelling results for the four proposed ocean outfall options that were under consideration by BVSC and the CWG (**Figure 6-1**), as well as the existing beach-face outfall. For the purposes of this report, an overview of wastewater dispersion modelling key findings is provided for:

- the existing beach-face outfall; and
- the preferred ocean outfall option selected by BVSC and CWG, namely North Short (Location 1), situated at 30 m depth approximately 2.7 km offshore from the existing beach-face outfall.

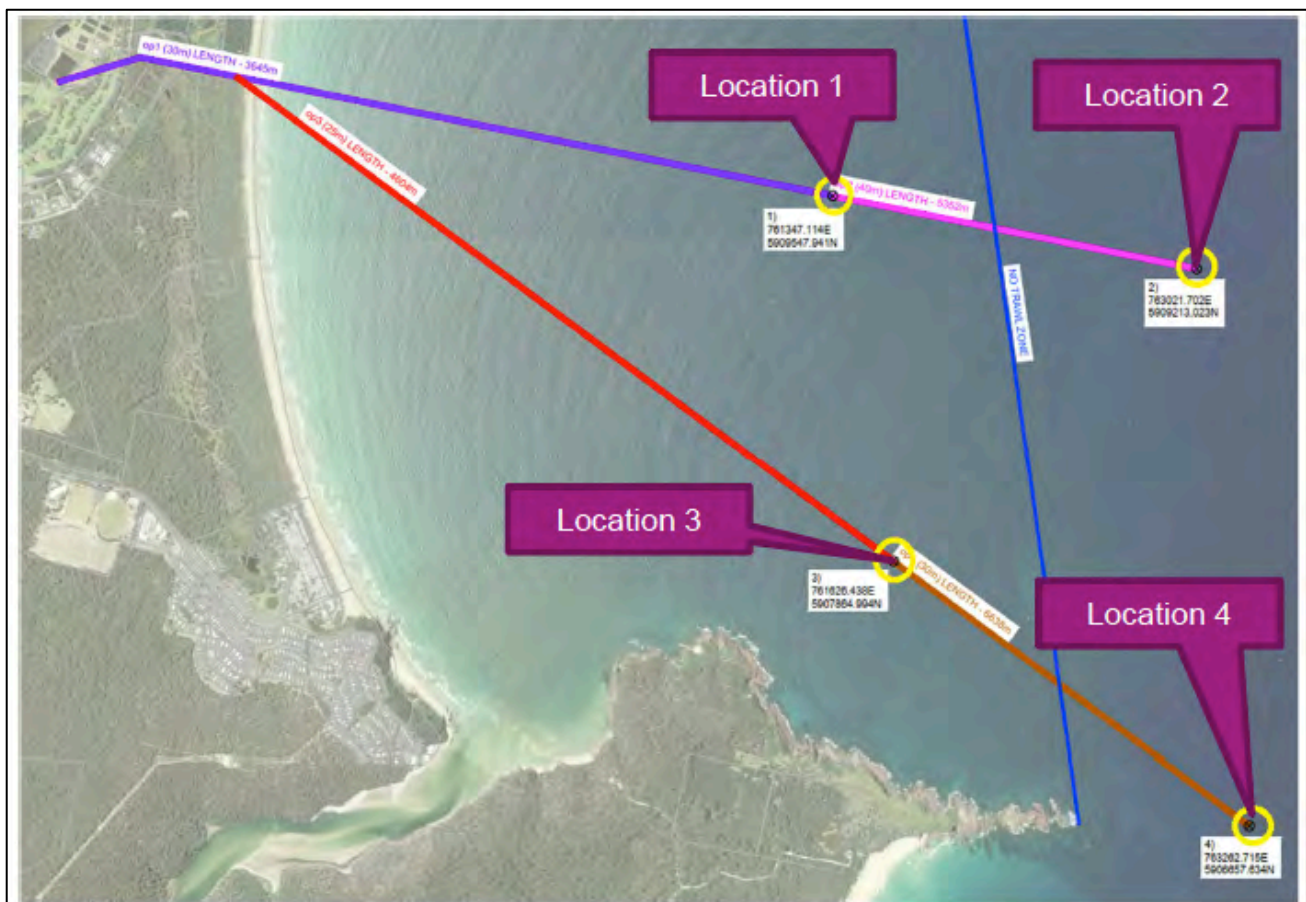


Figure 6-1 Ocean outfall locations considered with wastewater dispersion modelling (from AECOM 2020a)

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6.1 Approach

The numerical modelling by AECOM was used to assess the water quality impacts of wastewater discharged at the existing beach-face outfall and also at the preferred ocean outfall location to assess how the discharge of wastewater at the preferred diffuser location, 2.7 km offshore in 30 m depth, is predicted to disperse and dilute the wastewater plume due to ocean currents and vertical mixing processes compared to the existing discharge at the beach zone.

The range of dispersion modelling scenarios consisted of a mix of near-field and far-field model runs for various ambient conditions. Near-field modelling focused on the plume behaviour near the discharge location where it is typically dominated by momentum and turbulent mixing. Far-field modelling accounted for larger-scale mixing associated with the ambient conditions and hydrodynamics of the discharge environment (AECOM, 2020a). Near-field and far-field modelling was undertaken by AECOM using software CORMIX and Delft3D respectively.

As outlined by AECOM (2020a) the model approach used a mix of ambient current strengths and directions expected at the preferred outfall location, with model outputs providing a reasonable representation of the treated wastewater plume behaviour including its dilution, and dispersion trajectory under the conditions modelled. It was noted that modelling is an approximation and model outputs represent simplified versions of very complex processes, with modelling outputs supported by model calibration and analysis of its accuracy and uncertainties.

6.1.1 Target dilution

Modelling was based on typical and worse case analyte dilution scenarios by adopting the median and 90th percentile ETWWQ respectively and their dilution factors required to meet the MWQOs. As discussed in **Section 5.2 ETWWQ dilution factors**, the worse-case analyte target dilutions for ETWWQ are:

- For median ETWWQ a target dilution factor of 237 is required (based on oxides of nitrogen, NO_x) to meet all MWQOs.
- For 90th percentile ETWWQ, representing a worse-case wastewater quality that may be discharged a minor proportion of time such as during wet weather flows, a target dilution factor of 2,496 is required (based on ammonia and its licence discharge limit) to meet all MWQOs. This is a conservative scenario with modelling based on the ammonia licence discharge limit (5 mg/L) which is higher than the 90th percentile (1.9 mg/L) and wet weather flow (4.1 mg/L) ammonia concentrations.

The highest dilution factors for both median and 90th percentile ETWWQ is nitrogen-based parameters NO_x and ammonia, respectively. Required dilutions for metals are lower as indicated by **Tables 5-2, 5-3 and 5-4**:

- For median ETWWQ, copper and zinc are metals that require the highest dilution factors of 19, compared to 237 for NO_x.
- For 90th percentile ETWWQ, copper requires the highest dilution of 247, compared to 2496 for ammonia. Further analysis of bioaccumulative metals in Bioaccumulation Risk to Fish and Shellfish in the Marine Ecology Assessment (**Appendix G** in the EIS) found that cobalt at 90th percentile ETWWQ required a dilution factor of 100.

Outputs from both scenarios provides an understanding of the maximum extent of wastewater influence from which an assessment of impacts can be inferred.

6.1.2 Model parameters

Modelling was based on an 80 m long diffuser, comprising 3 ports spaced at 25 m intervals with 2 risers per port, treated wastewater flow discharge 80 L/s, with dispersion examined for uniform and stratified conditions under range of current directions and velocities. Details of model parameters used in near-field modelling are provided in the Dispersion Modelling Report (**Appendix Q** in the EIS) and summarised in **Table 6-1**.

WATER QUALITY**Table 6-1 CORMIX model inputs (from AECOM, 2020a)**

Parameter	Value
Ambient current speed	Varied from 0.05 m/s to 0.78 m/s
Ambient current direction	90 degrees to diffuser (see "UA" arrow in Figure 3)
Treated wastewater flow rate	0.08 m ³ /s or 80 L/s
Treated wastewater density	1,000 kg/m ³
Average water depth	30 m
Depth at discharge	30 m
Wind speed	2 m/s
Manning's n roughness	0.025
Ambient water density	Uniform conditions (i.e. non-stratified): 1,020 kg/m ³ Stratified conditions: 20 °C surface, 14 °C bottom with the pycnocline height at 15 m (mid-depth)
Diffuser length	50 m (25 m between risers)
Risers/Ports	Three risers with two ports per riser (facing opposite directions)
Port Diameter	0.225m (area = 0.04 m ²)
Port height	1 m

6.1.3 Ocean current conditions

Modelling investigated wastewater plume behaviour and trajectory for a range of ambient current strengths expected at the preferred outfall location for both uniform and stratified conditions, as detailed in the Dispersion Modelling Report (**Appendix Q** in the EIS). The reported noted that current speeds were varied from 0.05 m/s to 0.78 m/s representing the 10th percentile to 99th percentile range of currents from the Haycock Point mooring data (**Table 6-2**).

Table 6-2 Near-field model current scenarios (from AECOM 2020a)

Scenario	Current Speed (m/s)
10 th percentile northward current	0.05
10 th percentile southward current	0.15
90 th percentile northward current	0.34
50 th percentile southward current	0.40
90 th percentile southward current	0.56
99 th percentile southward current	0.78
Note: Both uniform and stratified conditions were run for each current speed. CORMIX does not differentiate between northward and southward current directions, so a range of current speeds were selected to encompass the current speeds measured at the mooring.	

WATER QUALITY***Southward and northward flowing current conditions***

Statistical analysis of current data showed that southward flowing current conditions occurred 88% of the time (AECOM, 2020a) and that southward flowing currents are stronger than the weaker northward flowing currents. Southward flowing current conditions can occur anytime through the year, but typically occur during the summer to autumn period when the influence of the EAC boundary current and its eddy field is strongest.

Worse-case 'extreme' current conditions

Modelling also considered extreme current conditions including zero current, conversely very strong currents and also stratified conditions that are expected to occur a very small proportion of time (AECOM, 2020a). Stratified conditions, defined as a temperature differential of ~6 °C between surface and bottom waters was characterised by a mid-depth pycnocline. Under stratified conditions, the wastewater plume has potential to become trapped and dispersion may not be as effective. Stratified conditions are most likely associated with the occurrence of upwelling events that can occur anytime of the year and represents a worse-case scenario for dispersion that may occur for a minor proportion of ambient conditions.

Based on the scenarios above, the data indicates that for either southward or northward flowing conditions, current speeds of 0.15 m/s or less (as 10th percentiles) occur around 10% of the time.

6.2 Existing conditions – beach-face outfall

Modelling of treated wastewater dispersion for the existing beach-face outfall was undertaken by AECOM (2020a) for southward and northward current conditions considered to influence to nearshore beach zone. Current conditions modelled include:

- 10th percentile (0.15 m/s) and median (0.4 m/s) southward flowing current speeds; and
- 10th percentile (0.05 m/s) and median (0.15 m/s) northward flowing current speeds.

Far-field wastewater dispersion plots for each of the modelled current conditions are included in the Dispersion Modelling Report. The plots show that under weak southward or northward flowing current conditions of 0.15 m/s or less, treated wastewater gradually disperses to the north and south along the beach zone, and to offshore deeper waters of the central bay region. This dispersion trend occurs over a number of days with dilution factor of 1000 achieved relatively quickly and dilution factor increasing with distance from the beach-face outfall discharge point.

The plots also show that highly dilute treated wastewater enters Merimbula estuary. This general trend is apparent in plots that show wastewater dispersion 3 days post-discharge for the 10th percentile southward, 10th percentile northward and median northward current as represented by the dispersion trend in **Figure 6-2A**. Under this modelling, treated wastewater is 1,000 to 10,000 times dilute before it enters Merimbula Lake. Under the median southward flowing current of 0.4 m/s (the strongest current modelled for the existing beach-face outfall) the dilute treated wastewater plume disperses north along the beach towards Merimbula where treated wastewater enters the estuary at 1,000 to 10,000 times dilution and some proportion flows east along Long Point and disperses further in oceanic currents (**Figure 6-2B**). For both the 1000 to 10,000 and 10,000 to 100,000 dilution levels, the dilute treated wastewater would be at concentrations that would be below estuary MWQOs and unlikely to be detectable in laboratory analysis. For example, ammonia at 5 mg/L.

Key findings of the far-field dispersion modelling undertaken for existing conditions includes:

- Treated wastewater discharged at the beach-face outfall, rapidly achieves 1,000 times dilution in the nearshore beach zone and gradually disperses to the north and south along the beach zone, and to offshore deeper waters of the central bay region where it dilutes further.

WATER QUALITY

- Under the existing conditions, the treated wastewater although highly dilute, typically remains within Merimbula Bay and enters Merimbula Lake, the latter trend becoming more evident under stronger southward flowing current conditions.
- Treated wastewater that currently may enter Merimbula Lake is between 1000 to 10,000 or 10,000 to 100,000 times dilution. Ambient water quality data for Merimbula Lake basin shows that median nutrient levels are below MWQOs. Typically, nutrient levels of Merimbula Lake only exceed MWQOs after significant rainfall that results in catchment inflows that bring sediment and nutrients to the estuary in stormwater (**Refer Section 3.2.2**). The pool of nutrients in ambient estuarine waters represents the sum total of all catchment inputs from various diffuse and point sources. Only by using nitrogen stable isotope analysis could one differentiate whether some of the nitrogen pool in estuarine waters are derived from nutrient loads discharged in wastewater at the beach-face outfall.

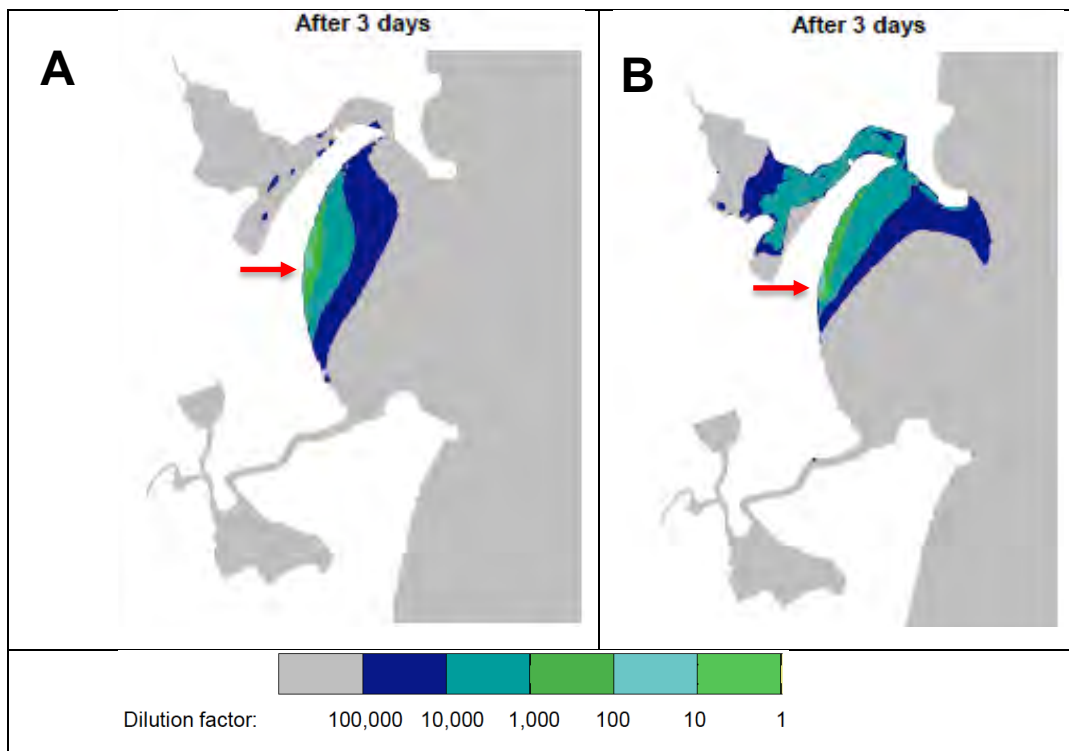


Figure 6-2 Far-field modelling plots showing treated wastewater dispersion 3 days after discharge from the existing beach-face outfall (indicated by red arrow). (A) Treated wastewater dispersion trend under weak current conditions as modelled for 10th percentile southward, 10th percentile northward and median northward currents; (B) Treated wastewater dispersion trend under stronger median southward flowing current conditions.

WATER QUALITY**6.3 Preferred ocean outfall option – North-Short 30 m depth****6.3.1 Near-field modelling**

The treated wastewater being a freshwater discharge, would be buoyant and rise vertically up through the water column as depicted in CORMIX model output (reproduced from AECOM (2020a) in **Figure 6-3**). Further dilution and mixing would continue to occur in surface waters aided by wind advection induced turbulence. Results of near-field modelling are provided in **Table 6-1** below.

Table 6-3 Near field modelling results (from AECOM, 2020a)

Scenario	Current Speed (m/s)	Distance to Required Dilution (m) ^A			
		Uniform Conditions		Stratified Conditions	
		Median ETWWQ	90 th percentile ETWWQ	Median ETWWQ	90 th percentile ETWWQ
10 th percentile northward current	0.05	15	N/A ^B	20	N/A ^B
10 th percentile southward current	0.15	25	N/A ^B	<5	N/A ^B
90 th percentile northward current	0.34	<5	25	<5	50
50 th percentile southward current	0.40	<5	20	<5	35
90 th percentile southward current	0.56	<5	15	<5	20
99 th percentile southward current	0.78	<5	10	<5	10
Notes:					
A) Distances rounded to the nearest 5 m.					
B) Distance marked 'N/A' did not reach the required dilution within CORMIX's near field calculations. Distances for required dilution would be based off of far-field model results for these scenarios.					

Key findings from near-field modelling include:

- For the median ETWWQ, the required dilution factor of 237 would be achieved within 25 m of the diffuser for all conditions modelled. For the currents greater than 0.34 m/s, the required dilution was achieved within 5 m (**Figure 6-4**). This dilution factor was based on NO_x – for metals which required a dilution factor of 19 to achieve the MWQO, this would be expected to be achieved less than the 5-25m range.
- For 90th percentile ETWWQ (included as sensitivity test in CORMIX), the required dilution factor of 2,496 would be achieved in less than 50 m for currents at or above 0.34 m/s. For the lower current speeds modelled (0.05 and 0.15 m/s), these scenarios did not reach the required dilution within CORMIX's near-field calculations and were therefore carried forward for further analysis in far-field modelling.
- For majority of the time, a mixing zone of 25 m achieves the required dilution to meet MWQOs (**Figure 6-5**).

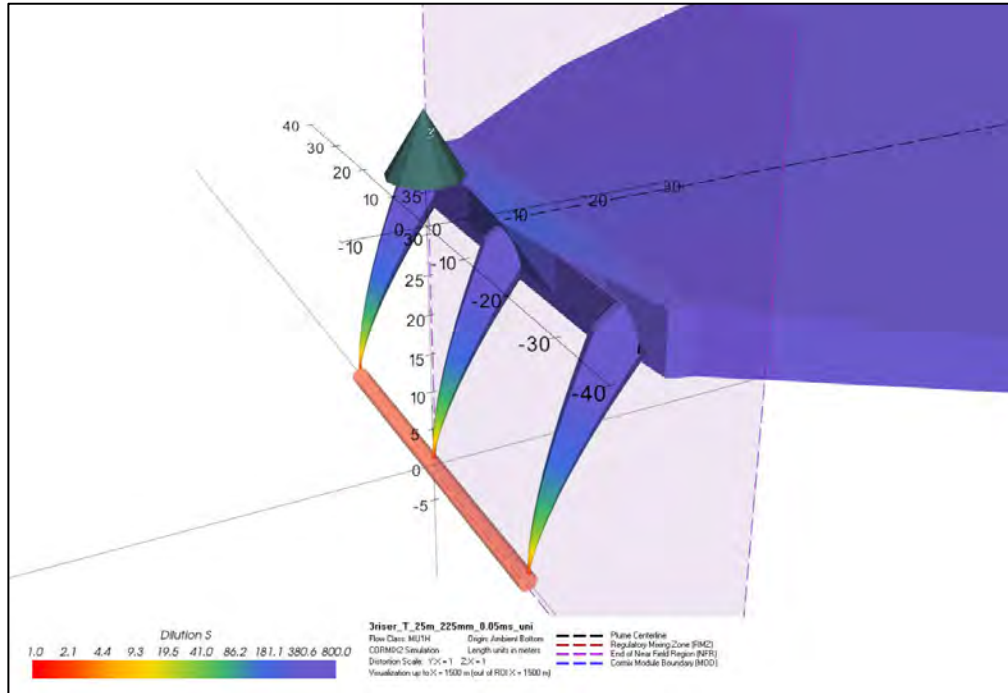


Figure 6-3 Example from AECOM (2020a) of near-field modelling plot showing the buoyant dispersion behaviour of treated wastewater plume discharged 30 m depth under uniform conditions and weak current strength (10th percentile current 0.05 m/s shown). MWQOs are achieved within 25 m for median TWWQ but 90th percentile TWWQ was beyond the limit of the model indicating that required dilution to meet MWQOs would be achieved in the far-field.

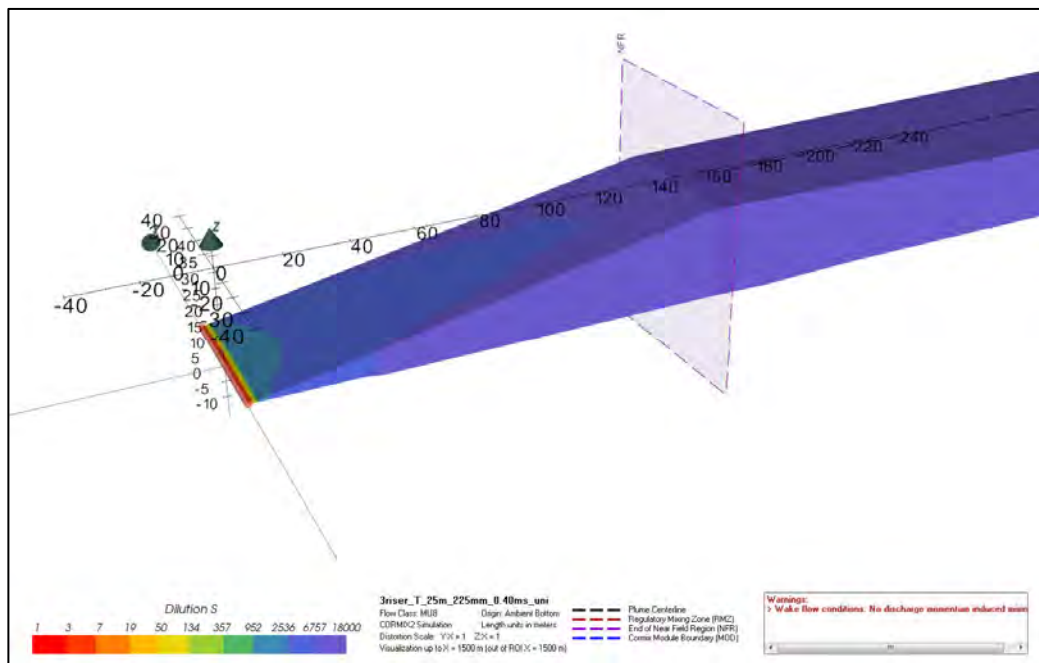


Figure 6-4 Example from AECOM (2020a) of near-field modelling plot that shows treated wastewater dispersion behaviour discharged 30 m depth under uniform conditions and stronger median current strength (0.40 m/s). MWQOs are achieved within 5 m for median TWWQ and 20 m for 90th percentile TWWQ.

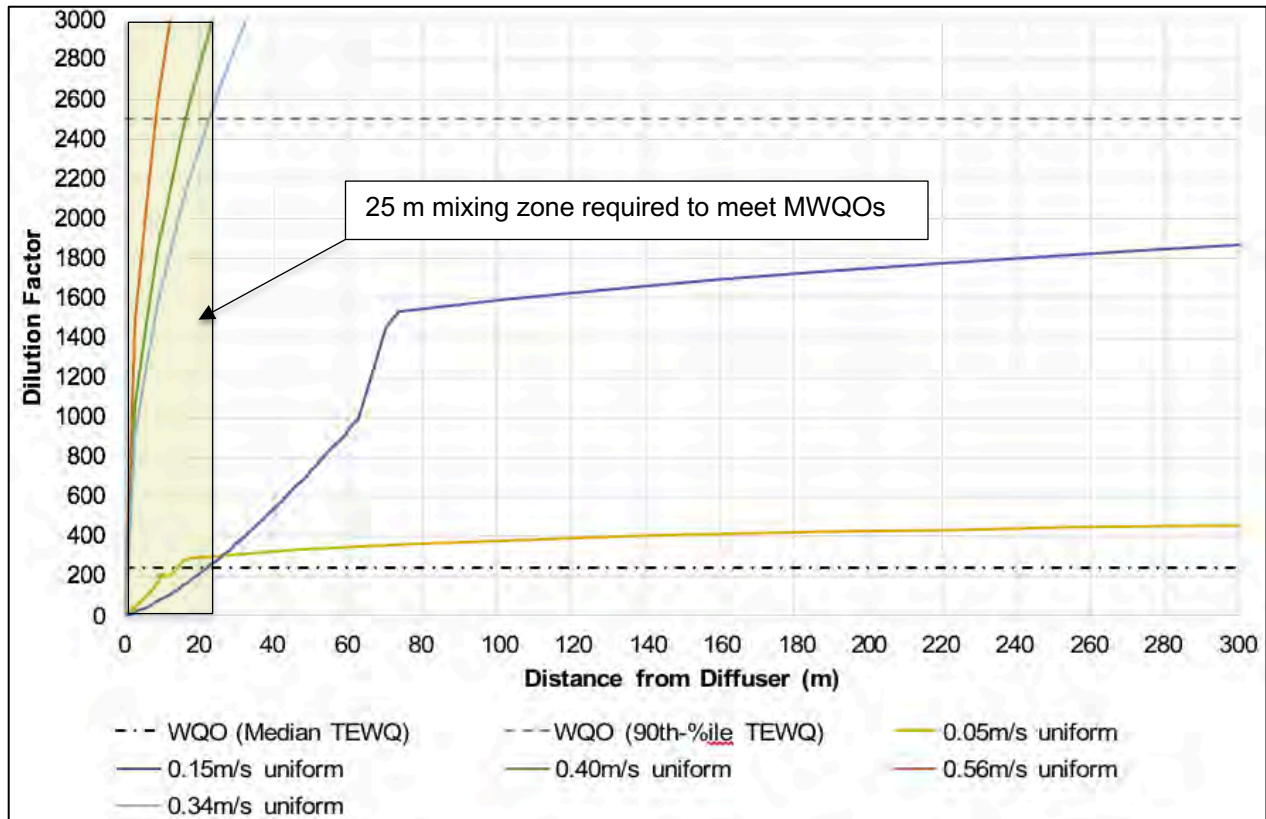
WATER QUALITY

Figure 6-5 From AECOM (2020a) of near-field dilution achieved within 25 m from diffuser during uniform ambient conditions for various currents

6.3.2 Far-field modelling

Far-field modelling used Delft3D with detailed description for boundary current conditions, modelling outputs and dispersion plots for the various modelled current conditions are provided in the *Dispersion Modelling Report* (**Appendix Q** in the EIS).

As an overview, dispersion plots by AECOM showing the 3-day post discharge for southward currents (**Figure 6-6**), northward currents (**Figure 6-7**) and for zero and extreme currents (**Figure 6-8**) are provided below.

The plots show that treated wastewater rapidly dilutes by a factor of 1,000 to 10,000 in proximity to the outfall before gradually dispersing from the discharge point with an initial north and north-west trajectory common, and often remains within Merimbula Bay at very high levels of dilution (i.e. greater than 10,000 dilution factor).

The dispersion plots include worse case conditions, which is assumed to be ETWWQ at 90th percentile or EPL concentrations, and low current speeds less than 0.15 m/s with or without stratification. Under some worse case current scenarios treated wastewater that is 10,000 to 100,000 times dilute may also enter Merimbula or Pambula estuaries.

Key findings from far-field modelling include:

- For all model runs, the only dilution contours visible are between the 1,000 to 100,000 dilution factor range. These dilution contours are well above the required water quality target dilution of 237 for median TWWQ. These higher dilution contours are only shown for reference on the greater plume trajectory. The high dilution factor results were expected after seeing the results of the near-field model predictions that showed a high dilution factor within 25 m distance from the diffuser.

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- For worse case conditions of current speeds less than 0.15 m/s and 90th percentile or EPL TWWQ, the far-field model showed that the 2500 times dilution contour was achieved within a mixing zone of 200 m from the diffuser. This is based on discharge of ammonia at the EPL limit of 5 mg/L (which is higher than its 90th percentile) with a required dilution factor of 2496 to achieve the MWQO. For metals, the highest dilution factors for 90th percentile TWWQ is 247 for copper and 100 for cobalt which would be expected to be achieved in a mixing zone of far less than 200 m.
- Far-field modelling indicates that treated wastewater discharged at the outfall may enter Merimbula Lake or Pambula Lake at 10,000 to 100,000 times dilution 3-days post discharge. At these dilution factors, wastewater indicators would be below laboratory detection limits and meet estuary MWQOs. Dilution achieved from discharge at the outfall would be an order of magnitude greater than that achieved for the existing beach-face outfall where treated wastewater at 1,000 to 10,000 times dilution may enter Merimbula Lake under some conditions (**Section 6.2**).

6.4 Summary of key findings

Near-field and far-field dispersion modelling provides valuable insight into the potential behaviour of treated wastewater plume dispersion. Given the limitations of the modelling (**Appendix Q** in the EIS), are the following key findings:

- Dispersion modelling shows that existing treated wastewater discharged at the preferred ocean outfall location offers a significant improvement in dispersion over the existing beach-face outfall.
- Under typical conditions of median ETWWQ and a range of current conditions, a mixing zone of 25 m is required to achieve necessary dilution to meet MWQOs based on a diffuser design with three ports, each with two risers and wastewater discharged at 80 L/s. This dispersion scenario would be expected to occur the majority of the time, estimated at 99% of the time.
- Under worse-case conditions of ETWWQ discharge at EPL limits or 90th percentile concentrations and low current speeds with or without stratification, the mixing zone extends 200 m from the outfall location. This would be expected to occur a minor proportion of the time which is estimated at 1% of the time, based on 90th percentile ETWWQ (10%) combined with 10th percentile (10%) low current conditions (northward or southward),
- Potential impacts associated with treated wastewater discharge on marine communities are most likely to be detected within the typical mixing zone of 25 m, which is estimated to occur 99% of the time. Detection of impacts beyond this zone becomes less likely due to the high levels of dilution achieved over the relatively short distance, and the minor occasions estimated 1% of the time that worse case conditions may occur within an enlarged mixing zone of 200 m.

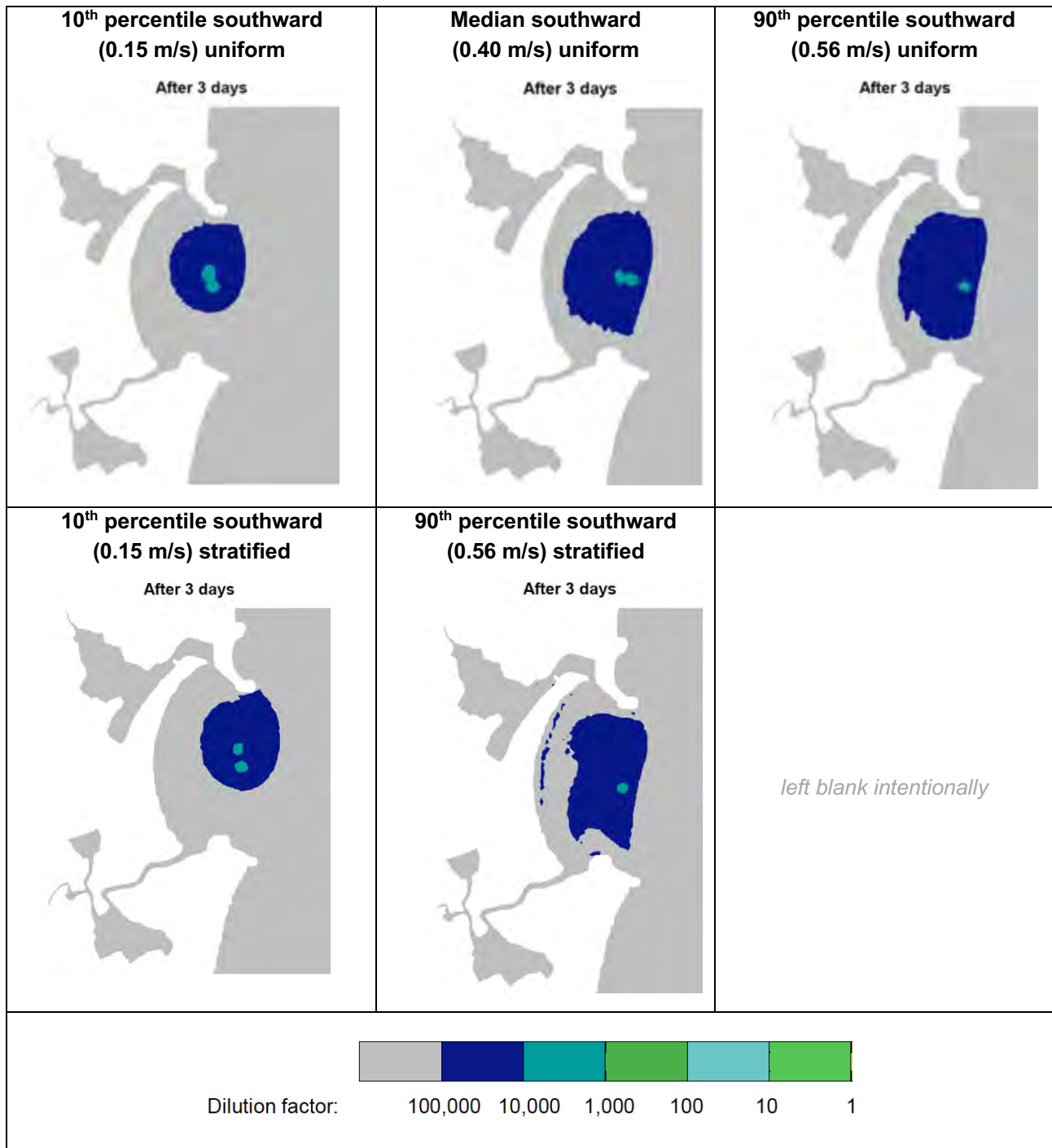
WATER QUALITY

Figure 6-6 Summary of treated wastewater dispersion under various southward flowing current scenarios (data from AECOM 2020a). Plots show far-field modelling of wastewater dispersion trajectory 3-days post discharge from the preferred outfall location at 30 m depth

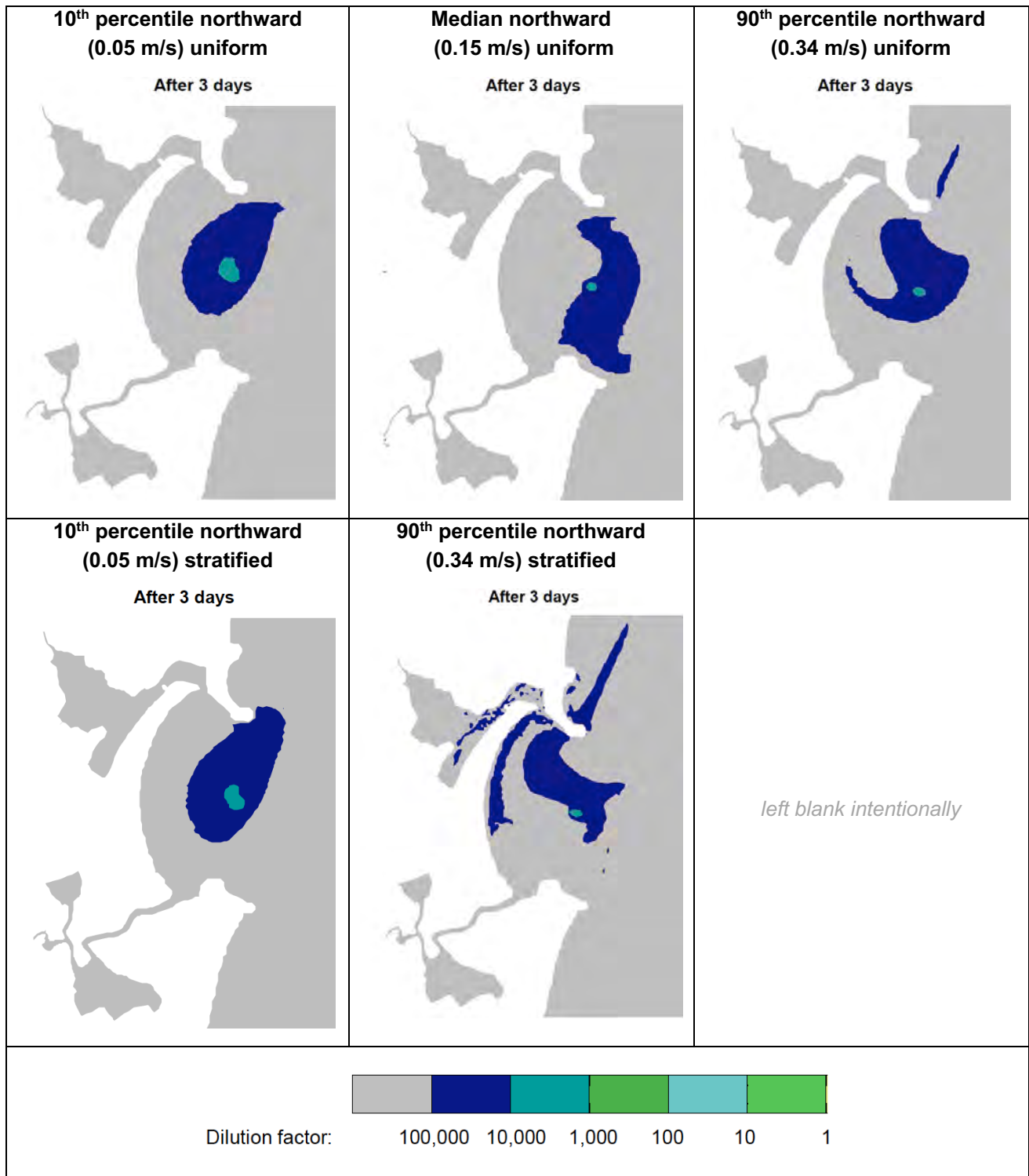
WATER QUALITY

Figure 6-7 Summary of treated wastewater dispersion under northward flowing current scenarios (data from AECOM 2020a). Plots show far-field modelling of wastewater dispersion trajectory 3-days post discharge from the preferred outfall location at 30 m depth

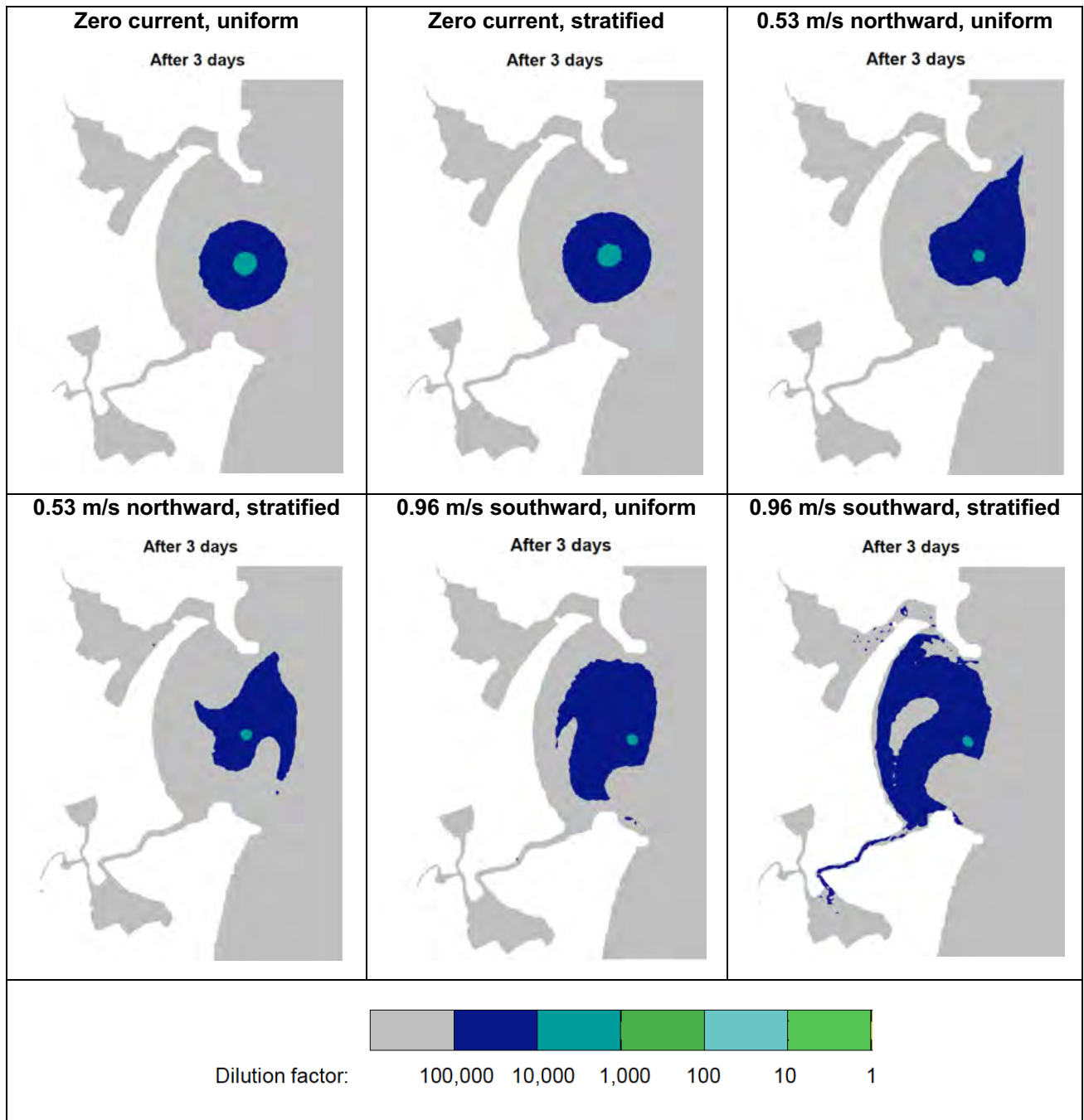


Figure 6-8 Summary of treated wastewater dispersion under zero and extreme currents conditions (data from AECOM 2020a). Plots show far-field modelling of wastewater dispersion trajectory 3-days post discharge from the preferred outfall location at 30 m depth

7 Impact assessment

7.1 Approach and assessment

Assessing potential impacts of the Project construction and operational phases on water quality has been undertaken in an environmental risk analysis which considers the information and data described in **Sections 1 to 6**, with the following key elements:

1. Upgrade of STP processes to improve wastewater quality;
2. Construction and operation of ocean outfall for disposal of treated wastewater ;
3. Decommission of beach-face outfall;
4. Decommissioning dunal exfiltration ponds;
5. Decommissioning of effluent storage pond and replaced by a 2.7 ML storage tank; and
6. Ongoing beneficial re-use of treated wastewater.

Potential receptors (refer **Figure 1-2**):

- marine coastal waters;
- marine nearshore waters;
- estuary waters of Merimbula Lake and Pambula River estuary; and
- treated wastewater beneficial re-use irrigation areas of PMGC and Oaklands.

Environmental Values to be protected:

- aquatic ecosystem health;
- primary contact recreation;
- secondary contact recreation;
- visual amenity;
- aquatic foods; and
- cultural and spiritual values.

The risk analysis was undertaken using a matrix of likelihood and consequence developed for assessing risks associated with identified impacts to water quality receptors and environmental values. This was assessed for both the construction phase of the Project and the operational phase of the Project – for the latter that is the long-term operation of an upgraded STP with an outfall pipeline, ceasing of the beach-face outfall and ex-dunal filtration ponds, and ongoing irrigation of treated wastewater at PMGC and Oaklands.

The likelihood and consequence definitions and risk ratings tables are included as **Tables 7-1, 7-2, and 7-3**

WATER QUALITY**Table 7-1 Water quality impact likelihood definitions**

Likelihood level	Rare 1	Unlikely 2	Possible 3	Likely 4	Almost Certain 5
Likelihood of impacts	Never reported for this situation, but still plausible within the timeframe (< 5%)	Uncommon, but has been known to occur elsewhere. Expected to occur here only in specific circumstances within the timeframe (5-30%)	Some clear evidence exists to suggest this is possible in this situation within the timeframe (30-50%)	Expected to occur in this situation within the timeframe (50-90%)	A very large certainty that this will occur in this situation within the timeframe (>90%)

Table 7-2 Water quality impact consequence definitions

CONSEQUENCE	Insignificant 1	Minor 2	Moderate 3	Major 4	Catastrophic 5
Aquatic Ecosystems, Aquatic Foods, Cultural Spiritual Values	No measurable negative impacts on habitats and/or biotic assemblages are or will be evident against natural variations	Barely measurable negative impacts on habitats and/or biotic assemblages are or will be evident compared to total habitat area or abundance of biota against natural variations.	Measurable and on-going negative impacts on habitats and/or biotic assemblages are or will be evident in one or more locations. Nevertheless, both the level and the percentage of habitats and/or biotic assemblages affected have not or will not influence their overall recovery capacity, and a change in the overall trophic/community structure isn't and will not be evident.	Substantial measurable and on-going negative impacts on habitats and/or biotic assemblages are or will be evident in one or more locations, and the proportion of habitats and/or biotic assemblages affected will influence the recovery capacity of the habitats and/or biotic assemblages, with some clear shifts in the overall trophic/community structure and function	The level of habitat and/or biotic assemblages negatively affected endangers their long-term survival, and will result in extreme changes to the region's trophic/community structure as well as the function of the remaining habitat and/or biotic assemblages.
Recreational Users - Primary and Secondary Contact, Visual Amenity	Episodic breach of MWQOs, loss of aesthetic water quality for short period of time, impact similar to what would be observed under large swell event or catchment rainfall event. Technical compliance breach with limited material impact resulting in improvement notice.	Infrequent breach of MWQOs. Loss of water quality aesthetics with multiple complaints. Compliance breach resulting in minor corrective action.	Regular breach of MWQOs, occasional algal blooms and odours. Possible media coverage. Moderate compliance breach leading to low level investigation or moderate penalties.	Frequent breach of MWQOs, algal blooms and odours common. Widespread impacts to habitats and communities. Reduction in beach users, impacts to reputation and tourism. Media coverage. Serious compliance breach resulting in significant fines.	Constant breach of MWQOs, extensive algal blooms and odours persisting. Extensive impacts to habitats and communities. Reduction in beach users, impacts to reputation and tourism. Widespread media coverage. Extensive breach with fines. Loss of licence to operate.

WATER QUALITY**Table 7-3 Impact risk ratings matrix**

		Consequence				
		Insignificant 1	Minor 2	Moderate 3	Major 4	Catastrophic 5
Likelihood	Almost Certain 5	Medium 5	Medium 10	High 15	High 20	High 25
	Likely 4	Low 4	Medium 8	Medium 12	High 16	High 20
	Possible 3	Low 3	Medium 6	Medium 9	Medium 12	High 15
	Unlikely 2	Low 2	Low 4	Medium 6	Medium 8	Medium 10
	Rare 1	Low 1	Low 2	Low 3	Low 4	Medium 5

Note:

Low risk, considered acceptable

Medium risk, tolerable

High risk, unacceptable level of risk

Table 7-4 Risk assessment of project activities and potential impacts to water quality

PROJECT ACTIVITY	POTENTIAL HAZARD / THREAT	POTENTIAL IMPACT TO VALUE	Likelihood	Consequence	Pre-Control Threat RISK	Comment	Proposed mitigation measure/s	Post-Control Threat RISK
CONSTRUCTION PHASE								
Construction of section 1 pipeline by horizontal directional drilling to beyond surf zone of Merimbula Bay.	Potential release of drilling fluids into surface waters, from fluids built up at end of tunnel section.	Contamination of surface waters, sheen on water surface, discolouration and/or odour	Possible 3	Major 4	Medium 12	Further information pending including: feasibility of recovering all fluids at portal entrance; fluid volumes involved, and what proportion recovered versus could be released; if a temporary construction EPL may be triggered if a release is expected.	To be evaluated, including controls on preventing release, recovering fluids, use of NSF certified fluids for potable use (such as xanthan gum in saline waters), and/or biodegradable fluids.	Pending further information
Support vessel for tow and standby of pipeline and associated infrastructure	Accidental spill of fuel, oil or other harmful substances from construction vessels	Water quality of Merimbula Bay with harmful substances sinking to benthos and impacting benthic communities	Possible 3	Major 4	Medium 12	Construction Environmental Management Plan for Project is expected to cover management of risks and controls for support vessels.	Implement environmental controls to reduce risks, such as procedures for storing and managing fuels, oils and hydraulic fluids on the vessel, available spill kits to clean up a spill quickly if one occurs. Visual monitoring of water quality around on-water vessel and workzone during construction activities. All vessels and construction equipment inspected by qualified personnel prior to commencement of work.	Low 3
Lay and cover of pipeline with rock or concrete mattress	Disturbance of sediments resulting in a turbidity plume	Aesthetic impacts to Merimbula Bay water quality	Possible 3	Insignificant 1	Low 3	Sediment particle size distribution (PSD) data collected at the Project site including the diffuser location indicate sediments are fine to medium grained sands (<1mm in size) with 5-10% shell content. Clay and silt fines represent a minor proportion of sediment PSD. Risk of sediment plume being created during construction activities is anticipated to be low as method does not involve trenching. Some short-term disturbance to sediments may occur during the placement of rock and/or concrete mattress over pipeline. However, the disturbance is not expected to result in turbidity that would not be any worse than what would occur under a large swell event, and is expected to be less than post-flood event effects. Construction impacts are likely to be confined to the local area and be short-term in duration.	The lay and cover construction method would have less sediment disturbance and potential for a turbidity plume than the alternative 'trench and fill' method because excavation of sediments would be minimal in comparison	Low 3
	Fate of turbidity plume and settling of sediments	Smothering of sensitive benthic communities	Unlikely 2	Minor 2	Low 4	Sandy seabed habitat (Type 3 fish habitat) surrounds the pipeline alignment and it is expected that construction impacts are likely to be confined to the local area and be short-term in duration. The nearest sensitive marine communities that could be impacted by persistent turbidity plumes include seagrass meadows (Type 1 fish habitat) in Merimbula and Pambula estuaries more than 3km from the construction site, and rocky reef community (Type 2 fish habitat) of Hunter Reef more than 1.5 km to the southeast. The risk of turbidity plume is assessed as low and therefore the risk of sediments settling on sensitive marine communities is also low.	Locating the pipeline and diffuser of the outfall pipeline over sandy seabed and away from rocky reef (at least 1400m).	Low 4
	Potential mobilisation of contaminants in sediments	Water quality of Merimbula Bay with benthic communities exposed to contaminants	Unlikely 2	Insignificant 1	Low 2	The existing sediment chemistry dataset included analysis for a range of metals and nutrients.	Screening against the ANZECC Interim Sediment Quality Guidelines (ISQG) indicates levels of metals and nutrients are relatively low and also below the ISQG-Low guidelines where available. Risk of mobilising contaminants is low.	Low 2
OPERATIONAL PHASE								
Upgrade of STP processes								
PAC dosing	PAC dosing designed to reduce phosphorus in treated wastewater	None	Unlikely 2	Insignificant 1	Low 2	PAC dosing expected to result in decrease in phosphorus in treated wastewater	Discharge of phosphorus nutrients to Merimbula Bay reduced.	Low 2
UV disinfection	No threat to WQ	None	Unlikely 2	Insignificant 1	Low 2	Log reduction in pathogens in the treated wastewater stream.		Low 2
Change from open 17 ML wastewater storage pond to closed 2.3 ML storage tank	No threat to WQ	None	Unlikely 2	Insignificant 1	Low 2	Eliminates the risk of treated wastewater quality contamination by waterfowl guano and microalgal growth. Expected benefits to treated wastewater quality from a closed 2.3 ML storage tank include reduced levels of microbiological parameters E. coli and faecal coliforms and microalgal growth as indicated by chlorophyll a.		Low 2
Tertiary continuous filtration	No threat to WQ	None	Unlikely 2	Insignificant 1	Low 2	Tertiary filtration would improve removal of suspended fine solids and colloidal particles in the wastewater stream.		Low 2
Cessation of wastewater disposal to dunal exfiltration ponds	No threat to WQ	None	Unlikely 2	Insignificant 1	Low 2	The barrier dune system has high aboriginal archaeological significance. The project will improve water quality outcomes by ceasing use of the area for disposal and improve cultural and spiritual values. No need to consider further with regard to potential impacts to WQ.		Low 2

PROJECT ACTIVITY	POTENTIAL HAZARD / THREAT	POTENTIAL IMPACT TO VALUE	Likelihood	Consequence	Pre-Control Threat RISK	Comment	Proposed mitigation measure/s	Post-Control Threat RISK
OPERATIONAL PHASE								
Ocean Outfall								
Discharge of treated wastewater at ocean outfall 'North-Short' option.	Discharge of nutrients in treated wastewater to mixing zone, threat to aquatic ecosystem health and aquatic foods.	Water quality of Merimbula Bay, Merimbula and Pambula estuaries, increased risk of algal blooms.	Possible 3	Minor 2	Medium 6	Nutrients in wastewater discharge screened above MWQOs include oxides of nitrogen (NO _x), ammonia, total phosphorus, orthophosphate. Nutrients meet MWQOs within 25m of diffuser for majority of conditions, with oxides of nitrogen requiring highest dilution. For worst-case scenario, ammonia requires highest dilution within a 200m mixing zone to achieve MWQOs. Marine water chemistry indicates ammonia equilibrium heavily favours ammonium ion which has lower toxicity than ammonia and more potential to impact as a nutrient stressor. Potential for nutrient uptake by phytoplankton, microalgae and macroalgae resulting in increased primary production and increased algal bloom risk. However, this risk of nutrient enrichment from wastewater discharge within a relatively small mixing zone is considered minor when in context of regional episodic nutrient input events, such as discharge of nutrient rich estuary waters during rain events from Merimbula and Pambula Lake and nutrient inputs from marine upwelling events from the Shelf.	STP upgrade to include PAC dosing for increased phosphorus removal from the wastewater stream. Effluent reuse for irrigation to realise benefits of nutrients in wastewater to promote terrestrial vegetation growth. Moving of outfall from beach face to ocean outfall increases dispersion and reduces risk of entrapment in surf zone and less potential for nutrients to enter Merimbula or Pambula estuaries. Monitoring of water quality as part of operations to include nutrient parameters.	Low 4
	Discharge of metals in treated wastewater to mixing zone, threat to aquatic ecosystem health, primary and secondary contact recreational users, aquatic foods.	Water quality of Merimbula Bay with receptors including ecological communities and recreational users. Impacts for recreational and commercial fishermen.	Unlikely 2	Minor 2	Low 4	Screening of metals aluminium, arsenic, copper, iron, lead, selenium and zinc, with wastewater discharge above MWQOs to mixing zone. Required dilution to meet MWQOs are relatively low when compared to nutrients and modelling indicates metal MWQOs achieved within 5-25m from diffuser in sandy seabed habitat and a significant distance from rocky reef communities of Hunter Reef, Long Point, Haycock Point or the OAR. The potential for toxicants to impact on water quality for primary and secondary contact recreation is reduced with the proposed change from beach face outfall to ocean outfall as the distance to beach users is greatly increased and the risk of wastewater entrapment in surf zone is eliminated. Similar also for potential impacts on Merimbula and Pambula estuaries. Receptors with potential to be exposed to toxicants in wastewater at the ocean outfall location include demersal fish species of sandy seabed habitat that would prey upon benthic infauna within the mixing zone, and potential future sessile colonisers of the diffuser structure.	Moving of outfall from beach face to ocean outfall increases dispersion and reduces risk of entrapment in surf zone and potential exposure to beach users and receptors of Merimbula or Pambula estuaries. Proposed outfall is located in sandy seabed and significant distance from the nearest rocky reef communities of Hunter Reef, Long Point, Haycock Point or the OAR. As some toxicants are bioaccumulative metals, collect baseline dataset for metals in target species biota from Merimbula Bay and nearby reference sites. Monitoring of water quality as part of operations to include metal parameters. Addition of tertiary filtration would increase metal removal from the wastewater stream, but with nutrients requiring the highest dilution and the extent of mixing zone, further metal removal would not change mixing	Low 2
	Discharge of microorganisms enterococci, faecal coliforms and virus pathogens in treated wastewater to mixing zone, threat to primary and secondary contact recreational users, aquatic foods.	Water quality of Merimbula Bay with receptors recreational users of primary and secondary contact recreation.	Possible 3	Minor 2	Medium 6	Only during peak wet weather events does treated wastewater discharge exceed MWQOs for microbiological parameters and this represents a minor proportion of time. Dispersion modelling for the existing beach-face outfall shows that treated wastewater disperses in a longshore drift parallel to shoreline towards Beachwatch sites in both Merimbula and Pambula. It is possible that some of the Beachwatch enterococci counts are attributable to the treated wastewater. Although enterococci counts are also likely influenced from other sources such as stormwater runoff into Merimbula and Pambula Lakes and its subsequent discharge to Merimbula Bay during ebb tidal flows. Ceasing the beach-face outfall will eliminate the discharge of wastewater to the nearshore zone regularly used by beachgoers, whilst the proposed ocean outfall is a significant distance from recreational beaches and the estuary entrances.	STP upgrade to include UV disinfection expected to result in lower counts of enterococci, faecal coliforms, virus, pathogens and protozoa. Moving of outfall from beach face to ocean outfall increases dispersion and reduces risk of entrapment in surf zone and reduces potential exposure to beach users and receptors of Merimbula or Pambula estuaries. Monitoring of water quality as part of operations to include microbiological indicators.	Low 4
	Discharge of wastewater resulting in marine waters with reduced salinity within the mixing zone	Water quality of Merimbula Bay with receptors including ecological communities and stenohaline species	Unlikely 2	Minor 2	Low 4	Based on the physical properties of the wastewater (i.e. lower in salinity and less dense than seawater), the wastewater will be buoyant upon discharge and rise upwards through the water column under normal conditions. Hydrodynamic processes will act to dilute and disperse the wastewater such that it is expected that salinity is near seawater at the edge of the 25 m mixing zone. Impact to benthic communities and stenohaline species is possible within the immediate vicinity of the diffuser structure but the buoyant property of the wastewater reduces the potential exposure of fauna that inhabit the benthos. Impacts to broader Merimbula Bay marine environment is unlikely. Episodic discharge of floodwaters to Merimbula Bay from estuaries would exert more influence over marine waters compared to the ocean outfall.	None proposed	Low 4
Discharge of treated wastewater at ocean outfall 'North-Short' option.	Suspended sediments, organic particulate material and toxic contaminants settling to seabed zone around the diffuser within the mixing zone	Changes to sediment chemistry in vicinity of diffuser resulting in altered soft sediment infaunal and sessile epifaunal community	Possible 3	Minor 2	Medium 6	Changes to sediment chemistry may occur within the mixing zone due to deposition of suspended solids, organic particulate material and toxicants discharged in treated wastewater. This has potential to impact soft sediment infaunal assemblages within the mixing zone, causing changes in community composition (i.e. species abundance and diversity). The extent of potential impact to this receptor is expected to decrease with increasing distance away from the diffuser. This potential impact is to be monitored with soft sediment infauna monitoring proposed as a key element of marine ecological monitoring program to determine background natural variation.	There is potential for soft sediment infaunal assemblages to be impacted in the mixing zone, with this risk decreasing to low because of the relatively small size of the mixing zone, the generally low suspended solid load in the wastewater, and the infrequency of wet weather flow discharges. Monitor soft sediment infauna and sediment chemistry as part of operations to inform potential impacts.	Low 4

WATER QUALITY**7.2 Construction phase – outfall construction**

Potential impacts to water quality from the construction phase of the Project were identified for the construction of the proposed outfall based on construction of the preferred option that would involve an outfall pipeline from the STP in an east-south-easterly direction to a location approximately 2.7 kilometres offshore to a depth of approximately 30 metres. The pipeline would be constructed in two sections using two different construction methods as follows:

- ‘Section one’ - STP to a location beyond surf zone would be established via underground horizontal directional drilling method.
- ‘Section two’ - Location beyond surf zone to offshore diffuser would be constructed by laying of pipeline on seabed floor and covering with rock and or concrete mattress.

Potential impacts assessed in **Table 7-4** include:

- Potential release of drilling fluids into surface waters beyond the surf zone of Merimbula Bay at the seabed end of the tunnel of Section 1, where it transitions to a lay and cover pipeline via a portal entrance. Risk of build-up of drilling fluids at end of tunnel, and subsequent release into the water column through the portal entrance. Depending on the drilling fluids used, potential impacts on water quality could include contamination of surface waters, sheen on water surface, water discoloration and/or odour. It is understood further information being obtained from the Principal to inform this risk, such as:
 - o feasibility of recovering all fluids at portal entrance;
 - o fluid volumes involved, and what proportion recovered versus could be released;
 - o if a temporary construction EPL may be triggered if a release is expected; and
 - o available management measures to mitigate risk, such recovery options, use of biodegradable fluids.
- Support vessel for tow and standby of pipeline and associated infrastructure, with potential for spills or leaks of fuels, hydraulic fluids, oils from the vessel or its working deck. The Construction Environmental Management Plan (CEMP) for the Project is expected to cover management of risks and controls for support vessels, including measures that would typically include procedures for storage and use of fuel, oil and hydraulic fluids. Without controls, the initial risk was assessed by medium, with this reduced to a low risk with inclusion of CEMP controls.
- Potential for turbidity plume in water column adjacent to the pipeline route from sediment disturbance during construction, with factors that include:
 - o A preferred construction method of section two using the ‘lay and cover’ method. The lay and cover construction method would have less sediment disturbance and potential for a turbidity plume than the alternative ‘trench and fill’ method because excavation of sediments would be minimal in comparison, and selection of the ‘lay and cover’ method is a risk mitigating factor for water quality in this context.
 - o Potential for turbidity plume in water column adjacent to the pipeline route, with potential for aesthetic impacts to Merimbula Bay water quality. It can be expected that some short-term disturbance to sediments would occur during the placement of rock and/or concrete mattress over pipeline. However, the disturbance is not expected to result in turbidity that would be any worse than what would occur under a large swell event and is expected to be less than post-flood event effects. Construction impacts are likely to be confined to the local area and be short-term in duration. From a qualitative assessment, this threat risk is assessed as low.

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- o Potential of turbidity plume settling on nearby sensitive benthic communities. Sandy seabed habitat (Type 3 fish habitat) surrounds the pipeline alignment with the nearest sensitive marine communities that could be impacted by a persistent turbidity plume being seagrass meadows (Type 1 fish habitat) in Merimbula and Pambula estuaries more than 3 km from the construction site, and rocky reef community (Type 2 fish habitat) of Hunter Reef more than 1.5 km to the south-east. The potential for a turbidity plume to pose a risk is assessed as low.
- Potential mobilisation of contaminants in benthic sediments. The existing sediment chemistry dataset included analysis for a range of metals and nutrients. Screening against the ANZECC Interim Sediment Quality Guidelines (ISQG) indicates levels of metals and nutrients are relatively low and also below the ISQG-Low guidelines where available. Risk of mobilising contaminants is low.

7.3 Operational phase – STP upgrade and discharge of treated wastewater to marine receiving waters

The proposed STP upgrade was considered in context of impacts identified to receiving waters and wastewater irrigation areas from the wastewater discharge and reuse, noting the following additional treatment processes:

- PAC dosing for phosphorus removal;
- Tertiary filtration, although a Project uncertainty and may not be included;
- UV treatment;
- chlorine dosing for reuse water, not for wastewater discharged to the ocean outfall; and
- decommissioning of open wastewater storage pond and replaced with closed 2.7 ML storage tank.

These upgrades are expected to result in the following improved wastewater quality:

- enhanced phosphorus removal;
- improved removal of aluminium, TSS and BOD from tertiary filtration if required;
- improved removal of virus, bacteria and pathogens from UV disinfection and chlorine dosing of reuse wastewater; and
- eliminated contamination of stored wastewater by waterfowl guano and microalgal growth.

It is understood that BVSC also has a long-term strategy to upgrade the reticulated water system that should result in reduction of copper and zinc concentrations in the wastewater stream.

Impacts associated with operation of the outfall with cessation of treated wastewater disposal via the existing beach-face outfall and replacing it with an ocean outfall pipeline have been evaluated in the risk analysis in **Table 7-4**, with the following water quality impacts identified:

- Impacts to aquatic ecosystem health, primary and secondary contact recreation and aquatic foods from water quality changes with the discharge of nutrient and toxicants in treated wastewater to the mixing zone. Parameters in the treated wastewater that the screening and modelling indicates would discharge above MWQOs into the mixing zone include oxides of nitrogen (NO_x), ammonia, total phosphorus, orthophosphate, faecal coliforms, enterococci, aluminium, arsenic, copper, iron, lead, selenium and zinc.
- Impact to aquatic ecosystem health from altered water quality due to reduced salinity in the mixing zone.
- Impact to aquatic ecosystem health and aquatic foods from suspended sediment load, organic particulate material, nutrients and toxicants settling to seabed zone around the diffuser and within the mixing zone.

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The following assumptions were adopted in assessing risks from these impacts:

- Under most conditions and majority of time (estimated at 99%), a mixing zone of 25 m is required to achieve necessary dilution to meet MWQOs. The extent of this mixing zone is shown in **Figure 7-1** below with the trajectory of the highly dilute wastewater plume (at 1,000 – 10,000 times dilution) inferred from the dispersion modelling outputs (AECOM, 2020a). Ecological receptors occurring within this mixing zone area is limited to Type 3 sandy seabed habitat and its epifauna and infauna communities. Fish and cetaceans would transit through this mixing zone on an intermittent basis. Potential impacts associated with treated wastewater discharge on marine communities are most likely to be detected within the predicted mixing zone of 25 m. Detection of impacts beyond this zone becomes less likely due to the high levels of dilution achieved over the relatively short distance.
- Occasionally, there may be infrequent instances where treated wastewater discharged at EPL discharge limits coincides with weak ocean current conditions. Under this modelled worse-case scenario, the mixing zone required to achieve all MWQOs is predicted to occur within 200 m from the diffuser location. Based on weak currents being in the lower 10th percentile and higher concentrations at upper 90th percentile, these combined conditions are predicted a minority, or 1%, of the time. The extent of this mixing zone is shown on **Figure 7-1** inferred from the dispersion modelling outputs of wastewater at 2,500 times dilution. Ecological receptors in this larger mixing zone are also limited to sandy seabed habitat and its epifauna and infauna communities.
- The nearest receptors of subtidal and intertidal reef communities, Merimbula Offshore Artificial Reef (OAR), Pambula and Merimbula Lakes and recreational beaches have the following distances from the proposed diffuser location:
 - o Hunter Reef ~1400 m to the south-east.
 - o Rocky reef shorelines from Pambula Lake entrance to Haycock Point ~2,000 m to the south south-west.
 - o Rocky reef shorelines from Merimbula Lake entrance to Long Point ~2,300 m to the north.
 - o Merimbula Offshore Artificial Reef (OAR) ~1,000 m to the north-east;
 - o Entrances to Merimbula Lake, Pambula Lake and the between recreational beaches of ~2,700 m to 3,000 m to the south-west, west and north-west.

The above receptors are located beyond the modelled mixing zones, both for discharge under normal conditions the majority of time (~25 m) and at a modelled worse-case scenario for a minority of time (~200 m).

In addition to the above assumptions, it is important to note that the discharge of treated wastewater to Merimbula Bay has occurred since 1971, including from the existing beach-face outfall since 1974. The replacement of the beach face outfall to ocean outfall results in change of distance from wastewater discharge point to the above receptors. The distance to receptors of Merimbula Lake, Pambula Lake and the recreational beaches increases substantially with the ocean outfall compared to the existing beach face outfall. Conversely, ecological receptors of Hunter Reef, Haycock Point and Long Point and the Merimbula OAR are closer to the proposed ocean outfall than the beach-face outfall.

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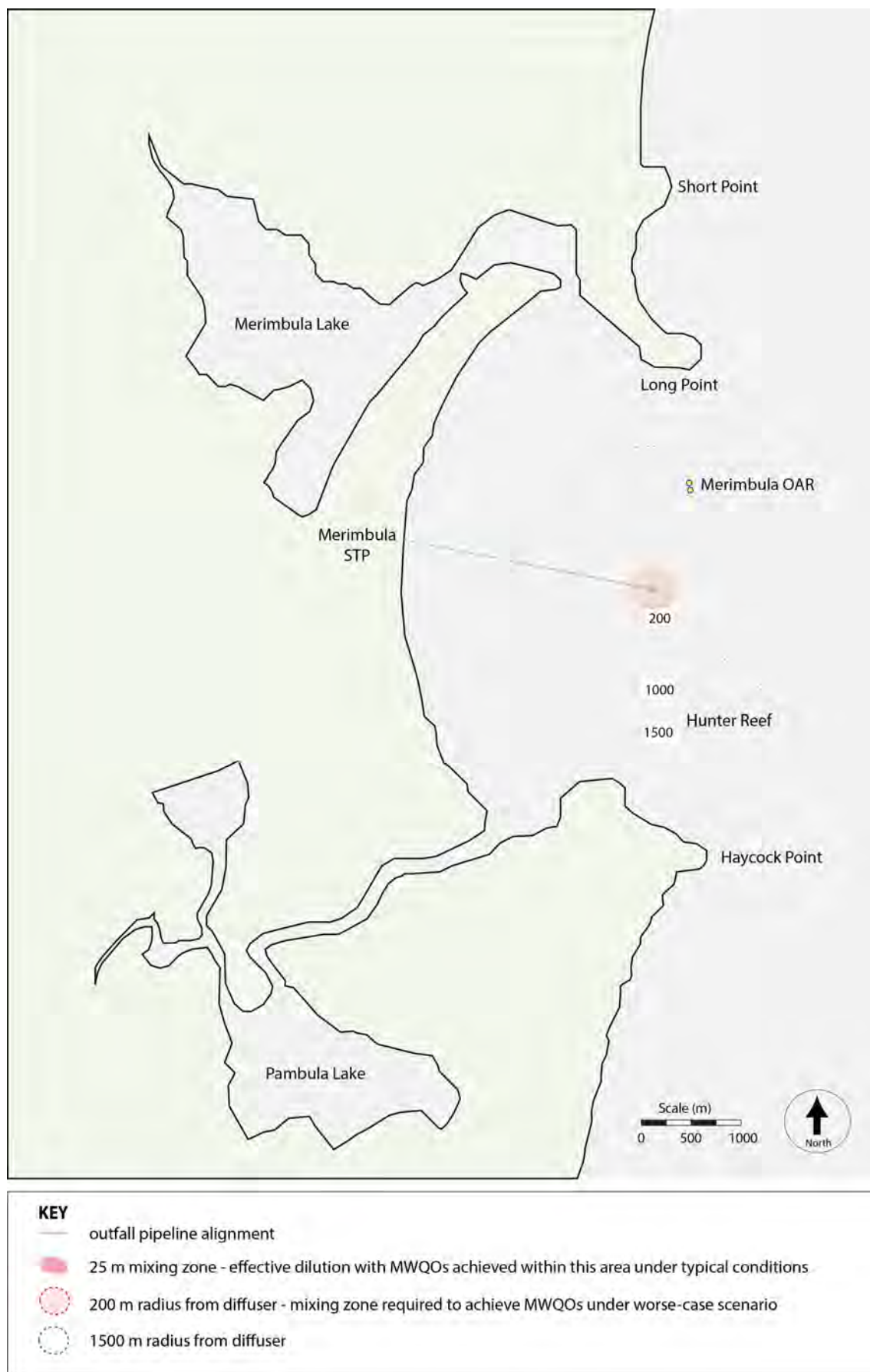


Figure 7-1 Treated wastewater mixing zone (inferred from AECOM, 2020a)

WATER QUALITY**7.3.1 Discharge of nutrients to mixing zone**

Current treated wastewater quality includes levels of nutrients that exceed MWQOs including oxides of nitrogen (NO_x), ammonia, total phosphorus, and orthophosphate. For majority of time and conditions (estimated at 99%), nutrient concentrations would dilute rapidly and meet MWQOs within a 25 m mixing zone, with oxides of nitrogen requiring the highest dilution. For worse-case scenario such as during a peak wet weather event where treated wastewater may discharge with higher nutrient concentrations, historical data shows ammonia would require the highest dilution within a mixing zone of 200 m needed to achieve MWQOs. This latter worse-case scenario would occur only a minor proportion of time estimated at 1% of the time.

The marine environment is generally considered to be oligotrophic (i.e. contain low available nutrients) and it is widely understood that among all the possible limiting elements, nitrogen most frequently limits primary productivity (Lobban and Harrison 1994). Marine water chemistry indicates that ammonia equilibrium heavily favours the bioavailable ammonium ion which has lower toxicity than ammonia and more potential to impact as a nutrient stressor. In addition to oxides of nitrogen (NO_x), the discharge of nutrients in bioavailable forms provides nutrient uptake opportunity for phytoplankton, benthic microalgae and macroalgae resulting in increased primary productivity and potential increased risk of algal bloom.

Nuisance drift algal blooms have been a historical issue for the Merimbula and Pambula communities, and has prompted studies to investigate their occurrence. Algal blooms within Merimbula Bay have typically been attributed to floating biomass of *Hinckisa sordida* (Elgin, 2013) with anecdotal accounts reporting occurrence of algal blooms back to the 1950s and prior to the commissioning of the Merimbula STP and discharge of treated wastewater to Merimbula Bay. The potential increased risk of algal bloom stimulus from the discharge of treated wastewater to a diffuser located at 30 m depth in central bay region needs to be considered within the broader context of regional episodic nutrient input events which can deliver significant concentrations of nutrients to the coastal zone that exceed nutrient contributions of treated effluent discharge. These other sources of nutrient input to the coastal zone include discharge of nutrient rich estuary waters during post-flood events from Merimbula and Pambula Lake and nutrients from marine upwelling events from shelf waters.

The STP upgrade includes a number of measures that mitigate the potential risk associated with nutrient discharge to marine receiving waters including PAC dosing to increase the removal of phosphorous from wastewater, continuation of the beneficial reuse of wastewater for irrigation at PMGC and Oaklands, and moving of outfall from the current beach-face to an ocean outfall. An ocean outfall would result in improved dispersion and reduces risk of entrapment in surf zone and less potential for nutrients to enter Merimbula or Pambula estuaries. Monitoring of water quality as part of STP operations would include nutrient parameters. Overall, the risk of nutrient discharge to mixing zone and impacts to water quality is assessed as low.

7.3.2 Discharge of metals to mixing zone

Screening of metals shows that treated wastewater contains levels of aluminium, arsenic, copper, iron, lead, selenium and zinc above MWQOs. The required dilution for these metals to meet MWQOs is relatively low when compared to nutrients and modelling indicates metal MWQOs would be achieved within 5-25 m from the diffuser over sandy seabed habitat and a significant distance from rocky reef communities of Hunter Reef, Long Point, Haycock Point or the OAR. The potential for metals to impact on water quality for public health uses of primary and secondary contact recreation is reduced with the proposed change from beach-face outfall to ocean outfall as the distance to beach users is greatly increased and the risk of wastewater entrapment in surf zone is eliminated. Similar also for potential impacts on Merimbula and Pambula estuaries. Receptors with potential to be exposed to toxicants at the ocean outfall location include transient demersal fish species foraging over sandy seabed habitat within the mixing zone, and potential future sessile colonisers of the diffuser structure.

As some metals are bioaccumulative, a baseline dataset for metals in target species biota from Merimbula Bay and nearby reference sites was collected and reported in Marine Ecology Assessment (**Appendix G** in the EIS). Findings from this biota metals dataset was that it reflected current environmental conditions in this part of the

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NSW coast and there were no standout results, including at the Merimbula Bay sites, that indicated a potential impact from metals discharged in wastewater from the existing STP operation and its beach face outfall. The dataset provided a further line of evidence that the risk of bioaccumulative metals to fish and shellfish is low.

Overall, the risk from metals discharge to mixing zone and impact to water quality is considered low. The risk to recreational and commercial fisherman is also considered low.

If required, an option to reduce the risk of metals in the wastewater would be the addition of tertiary filtration which would improve metal removal from the wastewater stream. However tertiary filtration would be expected to only marginally decrease an already low risk and would not change the extent of the mixing zone required for the necessary dilution of nutrients (NO_x and ammonia) to meet MWQOs. Therefore, including tertiary filtration for the purposes of enhanced metal removal would be unjustified.

Monitoring of water quality as part of operations would include metal parameters to check that this risk profile remains low.

7.3.3 Discharge of microbial contaminants to mixing zone

In terms of microbial contaminants such as indicated by enterococci and faecal coliforms, treated wastewater typically contains low counts and meets MWQOs. Elevated counts that exceed MWQOs typically only occurs during peak wet weather events and this represents a minor proportion of time. Dispersion modelling for the existing beach-face outfall shows that treated wastewater disperses in a longshore drift parallel to shoreline towards Beachwatch sites in both Merimbula and Pambula. It is possible that some of the Beachwatch enterococci counts are attributable to the treated wastewater discharged from the beach-face, although enterococci counts are also likely influenced from other sources such as stormwater runoff into Merimbula and Pambula Lakes and its subsequent discharge to Merimbula Bay during ebb tidal flows. Ceasing the beach-face outfall would eliminate the discharge of wastewater to the nearshore zone regularly used by beachgoers and reduce the risk posed by microbial contaminants, with the proposed ocean outfall a significant distance from recreational beaches.

The STP upgrade would include addition of UV disinfection and replacement of the open wastewater storage ponds with a 2.7 ML storage tank which would be expected to result in lower counts of enterococci, faecal coliforms and virus, pathogens and protozoa. Moving the outfall from beach-face to ocean outfall increases dispersion and reduces risk of entrapment in surf zone and potential exposure to beach users and receptors of Merimbula or Pambula estuaries. Overall, the risk of impacts from microbial contaminants from the Project is low, with this risk expected to be monitored in the water quality monitoring program.

7.3.4 Discharge of wastewater with low salinity

Based on the physical properties of the wastewater (i.e. lower in salinity and less dense than seawater), the wastewater would be buoyant upon discharge and rise upwards through the water column under normal conditions. Hydrodynamic processes would act to dilute and disperse the wastewater such that it is expected that salinity of the treated wastewater plume is near seawater at the edge of the 25 m mixing zone. Impact to benthic communities and stenohaline species (i.e. marine species with low tolerance to variable salinity change) is possible within the immediate vicinity of the diffuser structure but impacts to broader Merimbula Bay marine environment is unlikely due to rapid mixing effects. Episodic floodwater discharge to Merimbula Bay from estuaries would exert more influence over marine waters compared to discharge of treated wastewater at outfall.

7.3.5 Settling of wastewater contaminants on seabed

It is possible that changes to sediment chemistry may occur within the mixing zone due to deposition of suspended solids, particulate organic material and toxicants discharged in treated wastewater. This has potential to impact soft sediment infaunal assemblages within the mixing zone, causing changes in community composition (i.e. species abundance and diversity). The extent of potential impact to this receptor is expected to decrease with increasing distance away from the diffuser.

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ETWWQ indicates that total suspended sediment (TSS) load is typically low (median TSS = 5 mg/L). Historical exceedance of the TSS discharge limit (30 mg/L) occurred six times over 10-year period and is attributed to microalgae growth within the wastewater storage pond prior to discharge. The discharge of microalgae in wastewater represents a potential food-source for filter-feeding invertebrates and zooplankton and may provide some benefit in the marine environment. Furthermore, TSS of ambient ocean waters can often be higher than that contained in wastewater discharge, particularly during upwelling events. This potential impact is to be monitored with soft sediment infauna monitoring proposed as a key element of marine ecological monitoring program to determine background natural variation.

7.4 Maintenance of MWQOs beyond mixing zone

As a requirement of the SEARs, the Project must *justify, if required, why the WQOs cannot be maintained or achieved over time.*

The maintenance of marine water quality objectives (MWQOs) over time would be contingent on size of the mixing zone licensed for the outfall by NSW EPA. The wastewater mixing zone is defined as an area around the discharge point where some, or all, MWQOs may not be met. The size of the mixing zone is determined by the distance required to achieve the necessary dilution to meet all MWQOs.

Based on dispersion modelling predictions of existing wastewater quality, under normal conditions all MWQOs would be met within a mixing zone of 25 m radius buffer majority of the time. This is estimated to be 99% of time. Under worse-case conditions, where treated wastewater discharges at EPL limits or 90th percentile concentrations coincident with low current speeds with or without stratification, the mixing zone extends to 200 m from the outfall location. The worse-case conditions would be expected to occur only a minor proportion of the time, estimated at 1% of the time.

Given that modelling was based on existing wastewater quality and that proposed upgrades at the STP would result in improved wastewater quality, it is expected that maintenance of MWQOs would be achieved over time beyond the mixing zone for normal and worse-case conditions.

Furthermore, future average daily disposal volumes are forecast to decrease to 1.1 ML from the current 1.4 ML.

7.5 Operational phase – beneficial reuse of wastewater for irrigation

Risk screening of TWWQ against adopted water quality objectives for wastewater reuse was undertaken to identify potential risks for the proposed STP upgrade and beneficial reuse component. This reuse is understood to be continued irrigation of treated wastewater at PMGC and Oaklands which has been underway at PMGC since 1980 and Oaklands since 2013.

As noted in **Sections 2.4** and **4.3.2**, for the proposed STP upgrade it is expected that future limits applicable for reuse water would include:

- total phosphorus limit of 1 mg/L; and
- 4-log reduction in virus, bacteria and pathogens.

The inclusion of PAC dosing in the STP upgrade would result in increased phosphorus removal from the treated wastewater, whilst UV disinfection and chlorine dosing for the reuse water would be key processes in meeting the reductions for virus, bacteria and pathogens.

Considering potential receptors at PMGC and Oaklands, trigger values for primary and secondary contact, recreation and visual amenity listed in **Section 2.2.3** were also included in the screening.

TWWQ median and 90th percentile concentrations were screened against trigger values where available and is summarised in **Table 7-5** below.

WATER QUALITY**Table 7-5 ETWWQ screening against wastewater beneficial reuse trigger values**

Parameter	Units	Trigger Value	ETWWQ Median	ETWWQ 90 th percentile
pH	pH units	5.0-9.0 ¹	7.80	8.31
Electrical Conductivity	µs/cm	-	730	874
Oxides of Nitrogen NO _x (as N)	mg/L	10 ¹	1.92	8.06
Ammonia (as N)	mg/L	0.01 ² , 0.41 ²	0.34	2.0
Total Phosphorus (as P)	mg/L	1.0 ³	9.3	12.0
Faecal Coliforms (2004-2016)	cfu/100mL	150 ¹	50	672
Enterococci	cfu/100mL	35 ¹	1	188
Aluminium	µg/L	200 ²	40.0	74.6
Arsenic	µg/L	100 ²	2	3
Barium	µg/L	1000 ⁴	6.0	10.2
Beryllium	µg/L	60	<0.1	0.1
Boron	µg/L	1000 ¹	60	80
Cadmium	µg/L	5 ¹	<0.05	<0.05
Chromium	µg/L	50 ²	<1	1
Copper	µg/L	1000 ²	21	272
Lead	µg/L	50 ¹	0.2	5.6
Manganese	µg/L	100 ²	33.8	54.2
Mercury	µg/L	1 ²	<0.1	<0.1
Nickel	µg/L	100 ¹	2	3
Selenium	µg/L	10 ²	3.0	7.8
Silver	µg/L	50 ¹	0.5	0.5
Zinc	µg/L	5000 ¹	50	140.4

Note – values in bold text and shaded exceed the reuse trigger value

¹ ANZECC (2000) Water quality guidelines for recreational purposes – Tables 5.2.2 and 5.2.3.

² NHMRC (2018) Australian Drinking Water Guidelines. Aesthetic and or health values adjusted for incidental contact.

³ Expected future EPL 90% percentile limit for Total Phosphorous

⁴ NHMRC (2008) Guidelines for managing risk in recreational waters

The screening indicated the following:

- EC of the wastewater was relatively low, with an estimated TDS calculated from the EC of 475 mg/L (mean) and 570 mg/L (90th percentile) that is comparable to TDS levels in 'good quality' potable water in the Australian Drinking Water Guidelines (ADWG) (NHMRC 2018).
- Metals reported in the treated wastewater at median and 90th percentile concentrations were below adopted trigger values, including aluminium, arsenic, barium, beryllium, boron, cadmium, chromium, copper, lead, manganese, mercury, nickel, selenium, silver and zinc.
- Ammonia as N in treated wastewater was reported above the adopted trigger value of 0.01 mg/L for both median (0.34 mg/L) and 90th percentile concentrations (2.0 mg/L). Further assessment of these results included:

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- o Comparison to the aesthetic guideline for ammonia as N (0.41 mg/L) in the ADWG, noting that a health-based guideline is not set in the ADWG. Median TWWQ was reported below the aesthetic guideline which is expected to represent the majority of wastewater reuse conditions. The 90th percentile concentration was above the aesthetic guideline, which is expected to occur infrequently or during wet weather flow, noting that irrigation demand is unlikely during wet weather flow.
- o Review of ammonia chemistry in Chapman et al (1997), which indicates that the likely fate of ammonia in wastewater irrigation to soil would be either volatilisation to atmosphere, binding to soil particles or microbial transformation to nitrate. Further transformation is likely to involve assimilation of nitrate and ammonia as inorganic forms of nitrogen (and essentially nutrients) by plants and micro-organisms into organic forms of nitrogen such as amino acids.
- Total phosphorus in treated wastewater was reported above the adopted trigger value of 1.0 mg/L for both median (9.3 mg/L) and 90th percentile concentrations (12 mg/L). The trigger value is based on the future expected EPL limit for reuse water, which is to be achieved by the proposed enhanced phosphorus removal in the STP upgrade, by inclusion of the two-point PAC dosing in the treatment process.
- Microbiological indicators faecal coliforms and enterococci were reported in the treated wastewater, with median counts below trigger values and representing the majority of wastewater reuse conditions. 90th percentile counts were reported above trigger values, which is expected to occur infrequently such as during times of wet weather flow which are also times when irrigation demand is expected to be low. Faecal coliforms and enterococci are also indicators for the potential presence of viruses, bacteria and protozoa. It is expected that future EPL limits would include a requirement for 4-log reduction in virus, bacteria and pathogens at the discharge point for reuse water, which is to be facilitated by STP upgrade of final disinfection by UV radiation and chlorination. The current STP has existing chlorination, so the upgrade should result in higher reductions than what is achieved currently.

For potential runoff of wastewater to Merimbula Lake or Pambula Lake from the irrigation areas, it is understood this risk is managed by an irrigation regime that occurs during dry periods and which avoids wet weather periods. Review of the ambient water quality dataset for Merimbula and Pambula estuaries shows that water quality is typically very high and potential runoff from the PMGC or Oaklands irrigation schemes have not been identified as a cause of concern. Whilst surface water and groundwater are not monitored at PMGC, surface water bodies are accessible and there are also existing monitoring bores on the PMGC which if serviceable could be utilised for monitoring groundwater levels and quality in the irrigation areas if required.

Based on the screening process undertaken, the existing treated wastewater quality used for reuse, and the proposed wastewater improvements expected from STP upgrades, risks associated with the ongoing reuse of the treated wastewater at PMGC or Oaklands under the Project are assessed to be low.

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8 Water quality monitoring – operational phase

In regard to the water quality SEARs to: *identify proposed water quality monitoring locations, monitoring frequency and indicators of water quality, including groundwater quality*, a preliminary surface water quality monitoring program for the operational phase of the STP upgrade and outfall has been proposed which would comprise the following:

- Marine coastal waters of Merimbula Bay and north and south of Merimbula Bay;
- Estuarine waters of Merimbula Lake and Pambula Lake; and

Proposed groundwater monitoring is outlined in Groundwater Technical Report (**Appendix D** in the EIS)

8.1 Marine coastal waters and estuarine waters

As part of operational licence requirements, it is expected that water quality monitoring of marine and estuarine waters would need to be undertaken as a key performance indicator of environmental compliance. The monitoring program would have the objective of assessing marine water quality at sites inside and outside the treated wastewater mixing zone against MWQO trigger values to ensure sensitive receptors and environmental values are protected.

8.1.1 Monitoring sites

A total of nine (9) monitoring sites is proposed, including six (6) marine coastal waters, two (2) estuarine waters and one (1) treated wastewater site as summarised in **Table 8-1** and shown in **Figure 8-1**.

Table 8-1 Monitoring sites and rationale

Site code	Rationale
Diffuser	One (1) site adjacent to the outfall diffuser location situated just outside the boundary of the inferred 25 m mixing zone, based on near-field dispersion modelling results that indicates 25 m mixing zone is required for the majority of time for MWQOs to be met.
MBWQ30	MBWQ30 is located approximately 500 m to the north of the diffuser location and just outside the outer extent of the inferred 200 m mixing zone that may occur a minor proportion of the time (i.e. 90 th percentile TWWQ, 10 th percentile weak currents). This location is also situated between the diffuser location and the Offshore Artificial Reef (OAR) and could be used to represent WQ conditions for this recreational fishing asset. The baseline dataset for MBWQ30 can also be used for comparison purposes.
MBWQ20	Water quality of Merimbula Bay at two (2) sites located inshore (MBWQ20) and offshore (MBWQ40) of the outfall diffuser location. These sites would be used to assess for changes in ambient water quality more broadly in Merimbula Bay and protection of Bay receptors and environmental values. Utilising existing baseline monitoring sites MBWQ20 and MBWQ40 is proposed for this purpose for data continuity and receptors that include: • rocky reef habitats, such as at Hunter Reef (MBWQ40); • sandy habitats inshore and offshore in Merimbula Bay (MBWQ20 and MBWQ40); • nearshore waters and recreational beach zones of Merimbula and Pambula (MBWQ20); and • marine water column for passage of fish and other mobile species
MBWQ40	
LONG20	Water quality to the north of Merimbula Bay, as a northern reference site that is sufficiently distant from the zone of wastewater influence. New monitoring site.

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Site code	Rationale
HAYSTH20	Water quality to the south of Merimbula Bay, as a southern reference site that is sufficiently distant from the zone of wastewater influence. Corresponds with baseline monitoring site.
MER01	Water quality of the lower Merimbula Lake, for assessing protection of environmental values. Sampled during flood tide when Bay waters are entering estuary.
PAM01	Water quality of the lower Pambula River estuary, for assessing protection of environmental values. Sampled during flood tide when Bay waters are entering estuary.
STP	Treated wastewater quality at the STP prior to discharge to the ocean outfall pipeline.

8.1.2 Sampling and monitoring frequency

For coastal monitoring sites, samples would be collected from surface and bottom waters to take into account potential stratification and/or elevated nutrient concentrations that can occur where monitoring events co-incide with upwelling events. Depth profiling using multi-parameter instrument would be used to record physico-chemical parameters.

For lower estuary monitoring sites, samples would be collected from surface waters only, as the relatively shallow entrances to each Lake result in well-mixed marine waters entering each estuary during flood tide.

Monitoring frequency would initially be monthly for a minimum 24-month period in order to build up a dataset sufficient for statistical analysis and for detecting potential changes in water quality when compared to the baseline dataset of 2014-17. Monitoring events would be timed to coincide with discharge of treated wastewater from the ocean outfall. Monitoring frequency to be reviewed after the initial 24-month period.

8.1.3 Monitoring indicators

Monitoring indicators would be consistent with those previously monitored during the 2014-15, 2016-17 baseline program and include parameters from physico-chemical, nutrients, metals and biological indicator groups, as well as extend to include nitrogen stable isotopes (**Table 8-2**). Although nitrogen stable isotope analysis was not part of the baseline program it has been included in previous STP studies in Merimbula Bay (Elgin, 2013) and there is value including it in this monitoring program because of its ability to differentiate between wastewater derived nitrogen and other ambient sources. The treated wastewater data would be critical for this purpose because it would provide the nitrogen isotope signature for the wastewater which can then be assessed for its presence at receiving water monitoring sites.

WATER QUALITY**Table 8-2 Summary of marine water quality monitoring indicator groups and parameters**

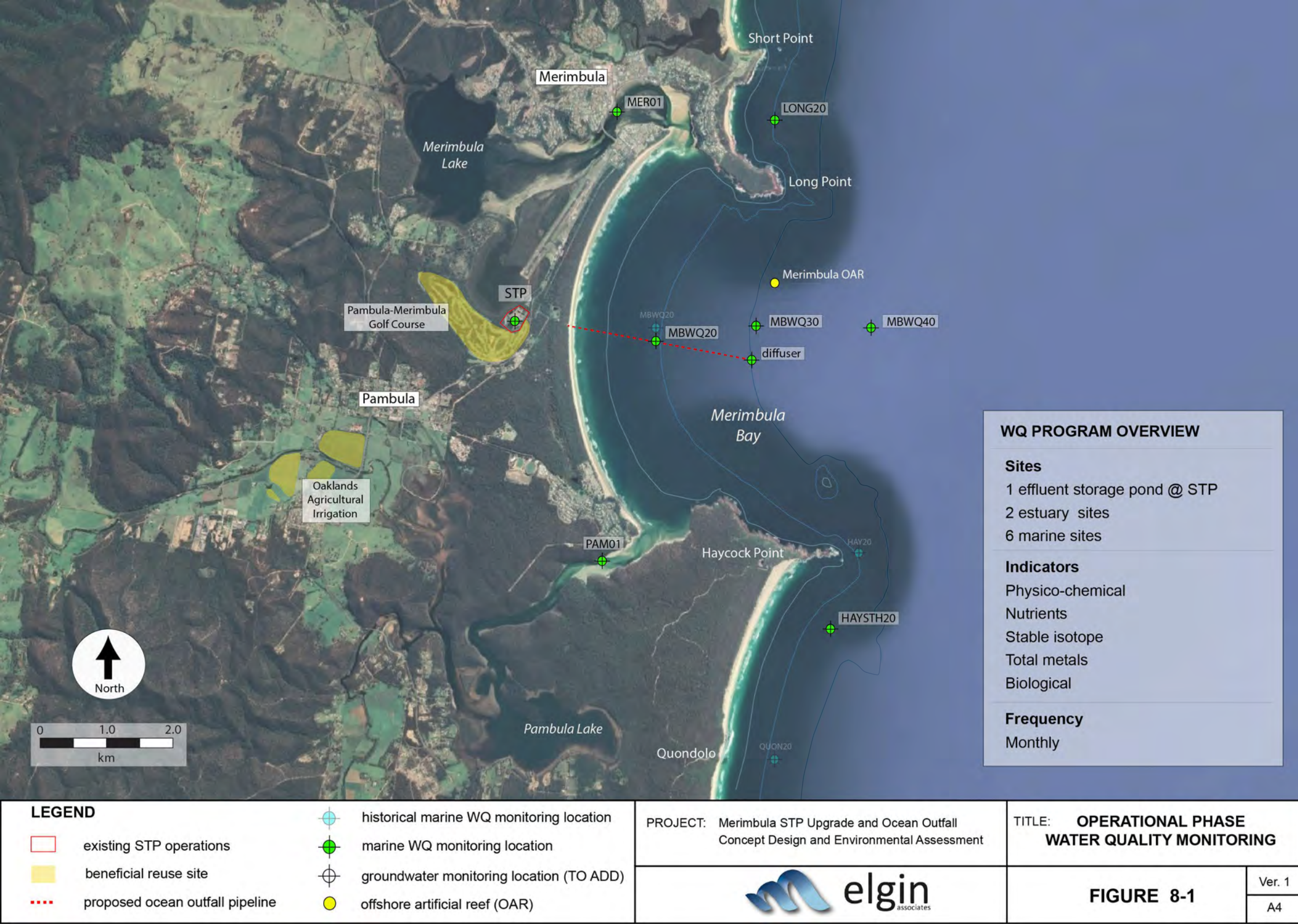
Indicator group	Parameters	Sample	Frequency	Marine sites	Estuarine sites
Physico-chemical	Dissolved oxygen (DO), electrical conductivity (EC), pH / redox, turbidity, temperature	Field <i>in-situ</i>	Monthly	surface and bottom waters	surface waters
	Suspended solids (TSS)	Lab	Monthly	surface and bottom waters	surface waters
Nutrients	Total nitrogen (TN), ammonia, oxides of nitrogen (NO _x), nitrate (NO ₂), nitrate (NO ₃), total phosphorous (TP), orthophosphate (FRP),	Lab	Monthly	surface and bottom waters	surface waters
Total metals	Al, Ag, Fe, Cd, Co, Cr, Cu, Hg, Mn, Ni, Pb, Sb, Se, Sn, Zn	Lab	Monthly	surface and bottom waters	surface waters
Biological	Chlorophyll a, faecal coliforms, enterococci	Lab	Monthly	surface and bottom waters	surface waters
Stable isotope	¹⁵ N: ¹⁴ N stable isotopes	Lab	Monthly	surface waters only	surface waters

It is anticipated the data from the water quality monitoring program would be used in an initial screening process of results against MWQO trigger values for protection of nearby receptors and environmental values. In the event trigger values were exceeded in frequency and/or magnitude, contingency actions would typically include:

- confirming result(s) with follow up sampling;
- checking treated wastewater quality for any significant changes;
- assessing regional factors such as fluvial/rainfall event outflows from Merimbula and Pambula estuaries and marine upwelling; and
- more detailed Tier 2 risk assessment of potentially impacted receptor and/or values such as, soft sediment infauna, recreational beach users, aquaculture, fish or shellfish.

The program is likely to run in parallel with an aquatic ecological monitoring program with a similar risk-based approach, which is anticipated to include as a minimum benthic infauna monitoring.

As noted in **Section 8.1.2**, an initial 24-month monitoring period is proposed, with commencement coinciding with operation of the outfall at its normal flow rate. It is not proposed to undertake this program during the construction phase – water monitoring during construction is anticipated to instead involve visual/ *in-situ* monitoring of water quality from support vessels as an element of the CEMP.



9 Conclusions

This water quality report was undertaken as part of the EIS requirements for the Project with key objectives including:

- To identify environmental values and define water quality objectives (indicators and trigger values) for receiving environments within the study area that includes marine coastal waters, estuaries, groundwater and wastewater re-use areas.
- To describe ambient background water quality for receiving environments.
- To describe existing characteristics of treated wastewater quality.
- Assess potential impacts of the Project construction and operational phases on water quality.

The report incorporates findings presented in two previous studies, the *Preliminary Water Quality Assessment memorandum* (AECOM, 2019b) and the *Merimbula Ocean Outfall Dispersion Modelling Report* (AECOM, 2020a). Note that this report does not include assessment of groundwater, which has been reported separately in the Groundwater Technical Report (**Appendix D** in the EIS).

A summary of key findings is provided below:

- Environmental values to be protected include aquatic ecosystem health, primary and secondary contact recreation, visual amenity, aquatic foods, and cultural and spiritual values. The indicators and trigger values for each environmental value are based on DECC (2005) and DECC (2006), which in turn defer to the ANZECC (2000) guidelines as updated in ANZG (2018). The Project adopts a consolidated marine water quality objective (MWQO) trigger value which is typically the lowest trigger value and protective of all environmental values. For estuarine waters of Merimbula Lake and Pambula River estuary, there are some differences in trigger values for some physico-chemical and nutrient parameters compared to marine waters and these are noted where relevant.
- Coastal processes including tidal flows, oceanic current conditions, and local climatic conditions (i.e. catchment flood events, large swell events) have a direct influence on ambient water quality of Merimbula Bay. Ambient marine water quality is described based on median values derived from a 24-month monitoring program (2014-2015 and 2016-2017) that collected water quality data from sites within and outside Merimbula Bay over a range of boundary current conditions and included three upwelling events. Data shows that during upwelling events, concentrations of nutrients are delivered to the nearshore zone of Merimbula Bay that exceed MWQOs.
- Merimbula Lake and Pambula River estuary are characterised by high water quality under normal tidal and baseflow conditions. Dispersion modelling of the existing beach-face outfall shows that treated wastewater at 1,000 – 10,000 times dilution may enter Merimbula estuary under certain current conditions while Pambula River is not affected. Estuarine water quality conditions decline following significant rainfall events with catchment inputs of elevated levels of suspended sediment, nutrients and microbiological parameters exceeding MWQOs. It is during these episodic events that high loads of sediment and nutrients may be exported to Merimbula Bay during ebb tidal stages.
- Current treated wastewater quality can be broadly described as (based on median concentrations):
 - o Freshwater, relatively low in salinity;
 - o Well oxygenated;
 - o Near neutral pH;
 - o Relatively low in suspended solids with intermittent higher suspended loads such as during wet weather flow;

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- o Containing levels of microalgae as represented by chlorophyll-a. Once discharged to the marine environment, microalgae in treated wastewater would not survive due to the saline environment.
- o Containing elevated levels of nutrients that include ammonia, nitrate, oxides of nitrogen, total nitrogen, total phosphorus and orthophosphate;
- o Relatively low microbiological indicators of enterococci and faecal coliform counts with intermittent higher counts that exceed MWQOs such as during wet weather flow.
- o Containing concentrations of metals that include instances of aluminium, copper, iron, selenium and zinc, reported above MWQOs.
- Proposed STP upgrades are expected to result in improved wastewater quality that includes:
 - o PAC dosing for phosphorus removal.
 - o Tertiary filtration, although this is a Project uncertainty of whether this is needed for water quality objectives to be met.
 - o UV treatment.
 - o Chlorine dosing, but only for wastewater to be reused, not for wastewater to be discharged from the ocean outfall.
 - o Decommission of open wastewater storage pond and replaced with closed 2.7 ML storage tank.
- Hydrodynamic modelling of the study area is provided in the dispersion modelling report (AECOM, 2020a) that describes the range of ocean current conditions expected at the ocean outfall location. Modelling results indicate that discharge of treated wastewater at the ocean outfall location, situated 2.7 km offshore in 30 m depth provides significant improvement in dispersion over the existing beach-face outfall, based on a diffuser design with three ports, each with two risers and wastewater discharged at 80 L/s.
 - o Under typical conditions of median ETWWQ and a range of current conditions, a mixing zone of 25 m is required to achieve necessary dilution to meet MWQOs. This dispersion scenario would be expected to occur the majority of the time, estimated at 99% of the time.
 - o Under worse-case conditions of ETWWQ discharge at EPL limits or 90th percentile concentrations coinciding with low current speeds with or without stratification, the mixing zone extends to within 200 m of the outfall location. This would be expected to occur a minor proportion of the time which is estimated at 1% of the time, based on 90th percentile ETWWQ (10%) combined with 10th percentile (10%) low current conditions (northward or southward).
 - o Given that modelling was based on ETWWQ and that proposed STP upgrades would result in improved future TWWQ, it is expected that maintenance of MWQOs would be achieved over time beyond the predicted mixing zone for normal and worse-case conditions.

Assessment of potential impacts of the Project construction and operational phases on water quality was undertaken in an environmental risk analysis. Findings include:

Construction phase impact assessment

- Potential release of drilling fluids at end of Section 1 tunnel into surface waters beyond the surf zone of Merimbula Bay. Low risk through waste management measures. Drilling fluids would be captured in an above ground tank and recycled as part of the drill rig set up where possible. Opportunities to re-use drilling fluids, using a recycling unit to separate the solids from the liquid, would be investigated further during detailed design and construction planning. Where feasible, this waste would be re-used under the NSW EPA Resource Recovery Order for treated drilling fluid.

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- Spills and leaks from support vessel(s). Low risk through CEMP mitigation measures.
- Potential for turbidity plume in water column adjacent to the pipeline route from sediment disturbance. Assessed qualitatively as low risk, with factors including particle size distribution results (medium to coarse grain sands), significant distance to nearest sensitive receptors, regional turbidity influences from estuary discharge and swell events, and lay and cover method presenting less disturbance than trenching.
- Potential mobilisation of contaminants in benthic sediments. Risk assessed as low based on screening of available sediment data.

Operational phase impact assessment

Potential impacts of the operational phase considered threats to aquatic ecosystem health, primary and secondary contact recreation and aquatic foods from water quality changes associated with the discharge of treated wastewater to the mixing zone. Key factors included:

- Typical conditions majority of time (estimated at 99%), a mixing zone of 25 m is required to achieve necessary dilution to meet MWQOs. Mixing zone located over sandy seabed habitat.
- Worse-case scenario, the mixing zone required to achieve all MWQOs is predicted to occur within 200 m from the diffuser location, 1% of the time. Mixing zone located over sandy seabed habitat.
- The nearest receptors of subtidal and intertidal reef communities, Merimbula Offshore Artificial Reef (OAR), Pambula and Merimbula Lakes and recreational beaches have the following distances from the proposed diffuser location:
 - o Hunter Reef ~1400 m to the south-east.
 - o Rocky reef shorelines from Pambula Lake entrance to Haycock Point ~2000 m to the south south-west.
 - o Rocky reef shorelines from Merimbula Lake entrance to Long Point ~2300 m to the north.
 - o Merimbula Offshore Artificial Reef (OAR) ~1000 m to the north-east;
 - o Entrances to Merimbula Lake, Pambula Lake and the between recreational beaches of ~2700m to 3000m to the south-west, west and north-west.

The above receptors are located beyond the modelled mixing zones, both for discharge under normal conditions the majority of time (~25 m) and at a modelled worse-case scenario for a minority of time (~200 m).

- o Discharge of treated wastewater to Merimbula Bay has occurred since 1971, including from the existing beach-face outfall since 1974.

Potential impacts assessed included:

- Discharge of nutrients to mixing zone. Risk assessed as low, with factors that include ammonia equilibrium in marine water chemistry, regional influences such as upwellings and estuary discharge, and STP upgrade of PAC dosing to further remove phosphorus from wastewater stream.
- Discharge of metals to mixing zone. Risk assessed as low, also supported by results of metal testing in fish and shellfish biota (Marine Ecology Assessment - **Appendix G** in the EIS). Risk to recreational and commercial fisherman is also considered low. If required, a mitigation measure to reduce the risk of metals in the wastewater would be the addition of tertiary filtration which would improve metal removal from the wastewater stream. However, with nutrients requiring the highest dilution and effectively defining the extent of mixing zone, further metal removal would not change the mixing zone

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extent and would be expected to only marginally decrease an already low risk. Therefore, including tertiary filtration would be unlikely to be justified from a metal removal perspective.

- Discharge of microbial contaminants to mixing zone. Risk assessed as low, ceasing of beach-face outfall and moving to ocean outfall reduces public health risk to recreational beachgoers.
- Discharge of wastewater with low salinity. Risk assessed as low, due to rapid mixing effects with seawater.
- Settling of contaminants on seabed. Risk assessed as medium in mixing zone, low risk outside mixing zone. Potential changes to seabed chemistry in mixing zone may impact benthic infaunal assemblage. The extent of potential impact to this receptor is expected to decrease with distance away from the diffuser. This potential impact is to be monitored with benthic infauna monitoring proposed as a key element of marine ecological monitoring program to determine background natural variation.

The water quality assessment has the following findings to inform the impact assessment to marine ecological communities:

- Ecological receptors within the 25 m mixing zone is limited to sandy seabed habitat and its epifauna and infauna communities. The worse-case scenario with a larger mixing zone of up to 200 m also occurs in the same sandy seabed habitat. Fish and cetaceans would transit through this mixing zone on an intermittent basis. Potential impacts to ecological receptors are most likely to be detected within the predicted mixing zone of 25 m. Detection of impacts to ecological receptors beyond this zone becomes less likely due to the high levels of dilution achieved over the relatively short distance, and the highly infrequent nature of the predicted worse-case scenario.
- For both typical and worse-case scenarios, sensitive marine ecological receptors including Hunter Reef, rocky shorelines of Haycock Point and Long Point, the offshore artificial reef (OAR) and Merimbula and Pambula estuaries are located significant distances from the mixing zone and would not be impacted by changes in water quality from the discharge of treated wastewater from the ocean outfall.

As part of operational licence requirements, it is expected that water quality monitoring of marine and estuarine waters would need to be undertaken as a key performance indicator of environmental compliance. A preliminary monitoring program is provided in **Section 8** of the report that identifies proposed water quality monitoring locations, monitoring frequency, indicators and an outline of contingency actions.

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11 Limitations

Elgin Associates Pty Ltd has prepared this report for the sole use of AECOM in accordance with generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the Marine Ecology Work Plan dated 18 October 2017.

The methodology adopted and sources of information used by Elgin Associates are outlined in this report. Elgin Associates has made no independent verification of this information beyond the agreed scope of works and Elgin Associates assumes no responsibility for any inaccuracies or omissions. No indications were found during our investigations that information contained in this report as provided to Elgin Associates was false.

This report was prepared between April 2020 and February 2021 and is based on the conditions encountered and information reviewed during that period up to the time of preparation. Elgin Associates disclaims responsibility for any changes that may have occurred after this time. Opinions and recommendations contained in this report are based upon information gained during desktop study and fieldwork and information provided from government authorities' records and other third parties. The information in this report is considered to be accurate at the date of issue and reflects at the site at the dates sampled. This document and the information contained herein should only be regarded as validly representing the site conditions at the time of the fieldwork unless otherwise explicitly stated in a preceding section of this report.

This report should be read in full together with all other reports referenced by this report. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties.

Preliminary Water Quality Assessment (AECOM, 2020a)

Memorandum

To	Ross Bailey (NSW PWA)	Page	1 of 39
CC	Toby Browne (BVSC), Jim Collins (BVSC), Ed Couriel (MHL)		
Subject	Merimbula Ocean Outfall - Preliminary Water Quality Assessment		
From	Will Legg, Dr. Judith Herold		
File/Ref No.	60541653	Date	17 July 2019

1.0 Introduction

AECOM has been commissioned by the Bega Valley Shire Council (BVSC) to provide engineering services for the Merimbula Sewage Treatment Plant Upgrade and Deep Ocean Outfall Concept Design and Environmental Assessment (hereafter, the Project). This preliminary water quality assessment memorandum presents the water quality considerations relevant to effluent disposal as part of the Project.

Central to the water quality considerations are the definitions of the treated effluent water quality, the water quality objectives (trigger levels) and the ambient water quality to which the proposed outfall discharges. An understanding of the indicator concentrations for these three groups is essential for undertaking the modelling (near-field and far-field modelling). In addition, this memorandum presents the water quality framework for disposal and based on a preliminary water quality assessment, identifies those indicators which require further assessment.

The purposes of this memorandum are two-fold as follows:

1. To provide statistics on the water quality monitoring data. Specifically, to separate the water quality monitoring data (undertaken between October 2014 and April 2017 by Elgin Associates Pty Ltd) into different sites and offshore events and to observe any correlations.

The water quality monitoring was conducted to allow determination of a representative ambient water quality for the Project. Water quality monitoring was conducted at a total of six locations (the sites) in Merimbula Bay and further south of the bay as illustrated in Figure 1.
2. To provide a foundation to allow consultation with NSW EPA, specifically to discuss the water quality considerations, the water quality framework and the outcomes of a preliminary water quality assessment.

The technical objectives of this memorandum are to:

- Document the process and findings of a water quality data review to determine the indicators and relevant ambient water quality conditions to be used during the hydrodynamic modelling;
- Define the marine water quality objectives and set out an approach for how the marine water quality objectives are to be considered as part of the Project which aligns with relevant guidance; and
- Document the process and findings of a preliminary water quality assessment undertaken to determine the indicators of interest which require further assessment (i.e. to be assessed as part of the hydrodynamic modelling).

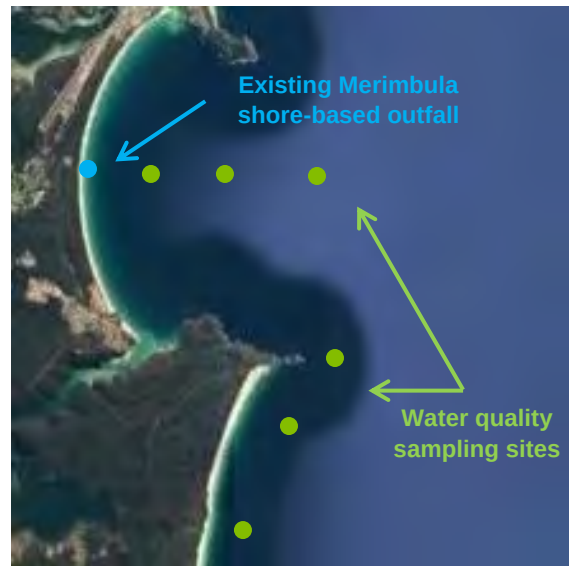


Figure 1 Water quality monitoring sites in Merimbula Bay and surrounds

The memorandum is set out as follows:

- Section 1.0 – provides the background, purpose and layout of this memorandum
- Section 2.0 – discusses the adopted marine water quality objectives and defines the indicators of potential interest and associated trigger levels
- Section 3.0 – defines the ambient water quality and treated effluent water quality for assessment purposes and presents the approach and findings of a preliminary water quality assessment to identify key indicators (pollutants) which require further assessment through modelling
- Section 4.0 – outlines the next steps to be undertaken in terms of water quality assessment including modelling and risk evaluation
- Section 5.0 – provides the conclusions of this assessment
- Section 6.0 – provides a list of references
- Section 7.0 – lists the attachments to this memorandum

2.0 Marine Water Quality Objectives

2.1 Background

In 1999, water quality objectives for NSW rivers and estuaries were introduced in 31 catchments. To complement these, the Government developed a set of Marine Water Quality Objectives (MWQOs) for NSW ocean waters. This was a key initiative under the Government's Coastal Protection Package announced in June 2001. The aim of the MWQOs is to simplify and streamline the consideration of water quality in coastal planning and management. This will ensure that the values and uses that the community places on ocean waters are recognised and protected, now and into the future (DEC, 2005).

The process for setting MWQOs was based on the national framework outlined in the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000), part of the *National Water Quality Management Strategy* (ANZECC & ARMCANZ, 1994). The ANZECC (2000) guidelines advocate an 'issues-based' approach to assessing ambient water quality, rather than the application of rigid numerical criteria with no appreciation of context (DEC, 2006). They are not regulatory or mandatory and are just intended as a tool for strategic planning and development assessment processes influencing coastal water quality (DEC, 2005).

The MWQOs apply to those ocean waters that adjoin the NSW coast and extend three nautical miles from the shore (DEC, 2005). The MWQOs consist of three parts, the environmental values, their indicators and guideline criteria for assessing the risk of impact to water quality (trigger levels). The adopted MWQOs are based on the *Marine Water Quality Objectives for NSW Ocean Waters, South Coast* (DEC, 2005).

The key considerations for applying the MWQOs to the Project are:

- The MWQOs do not apply as an end-of pipe effluent discharge criteria.
- The MWQOs apply as a strategic objective for ambient waters at the outer extent of a nominated zone of influence (100 m radius, hereby referred to as the mixing zone) from the outlet.
- Achievement of the MWQOs at the outer extent of the mixing zone is affected by multiple diffuse sources (e.g. stormwater, agricultural runoff) as well as the proposed effluent discharge from the Merimbula ocean outfall.
- The MWQOs are to be used as a tool only by the project decision makers rather than as fixed criteria.

2.2 Environmental values

The environmental values and associated objectives that apply to the South Coast of NSW are listed in Table 1.

Table 1 Environmental values and marine water quality objectives

Environmental Value	Marine Water Quality Objective
 Aquatic ecosystem health	To maintain or improve the ecological condition of ocean waters
 Primary contact recreation	To maintain or improve the ocean water quality so that it is suitable for activities such as swimming and other direct water contact sports.
 Secondary contact recreation	To maintain or improve ocean water quality so it is suitable for activities such as boating and fishing where there is less bodily contact with the waters.
 Visual amenity	To maintain or improve ocean water quality so that it looks clean and is free of surface films and debris.
 Aquatic foods	To maintain or improve ocean water quality for the production of aquatic foods for human consumption (where derived from aquaculture or recreational, commercial or indigenous fishing).

2.3 Indicators and trigger levels

The ANZECC (2000) guidelines provide trigger levels for a wide range of indicators which vary for each environmental value. Ambient water quality monitoring results can be compared with the trigger levels to assess whether the environmental values are at risk. DEC (2006) states that indicators should be selected based on the key issues in the waterway and main pollutants that might be generated by the activity under consideration, in this instance an effluent discharge.

A preliminary list of potential indicators for consideration and respective marine trigger levels for the various environmental values based on the ANZECC (2000) guidelines is provided in Table 2 with the source of the trigger levels listed in Table 3. The preliminary list was developed based on indicators monitored historically in effluent at the Merimbula sewage treatment plant and within coastal waters as part of the water quality monitoring as part of this Project.

Table 2 Marine Water Quality Objective trigger levels

Indicator	Units	MWQO Trigger Levels			
		Aquatic ecosystem health	Primary and secondary recreation and visual amenity ⁴	Aquatic foods ⁵	Adopted WQO trigger level
pH	pH units	8.0 - 8.4 ¹	5.0-9.0	6.0 - 9.0	8.0 - 8.4
Suspended solids	mg/L			10	10
Turbidity	NTU	0.5-10 ¹			0.5 ⁸
Electrical Conductivity	µS/cm				NA
Secchi depth	m		>1.6		>1.6
Dissolved Oxygen	Varies	90-110% sat. ¹		>5 mg/L	>5 mg/L
Total Nitrogen (TN)	mg/L	0.12 ¹			0.12
Oxides of Nitrogen (NOx)	mg/L	0.025 ¹			0.025
Nitrate	mg/L	0.7 ⁶	10	100	0.7
Ammonia	mg/L	0.91 ²	0.01	0.1	0.01
Ammonium	mg/L	0.02 ¹			0.02
Total Phosphorus	mg/L	0.025 ¹			0.025
Orthophosphate	mg/L	0.01 ^{1,7}			0.01
Chlorophyll a	µg/L	1 ¹			1
Faecal coliforms	cfu/100 ml		150		150
Enterococci	cfu/100 ml		35		35
Aluminium	µg/L		200	10	10
Antimony	µg/L	270 ⁶			270
Arsenic (III)	µg/L	2.3 ⁶			2.3
Arsenic (V)	µg/L	4.5 ⁶			4.5
Barium	µg/L		1000		1000
Boron	µg/L		1000		1000
Cadmium	µg/L	0.7 ³	5	<0.5-5	0.7
Chromium (total)	µg/L		50	20	20
Chromium (III)	µg/L	27.4 ²			27.4
Cobalt	µg/L	1 ²			1
Copper	µg/L	1.3 ²	1000	5	1.3
Iron	µg/L		300		300
Lead	µg/L	4.4 ²	50	<1-7	4.4
Manganese	µg/L		100		100
Mercury (inorganic)	µg/L	0.1 ³	1	1	0.1
Nickel	µg/L	7 ³	100	100	7

Indicator	Units	MWQO Trigger Levels			
		Aquatic ecosystem health	Primary and secondary recreation and visual amenity ⁴	Aquatic foods ⁵	Adopted WQO trigger level
Selenium	µg/L	3 ⁶	10	10	3
Silver	µg/L	1.4 ²	50	3	1.4
Zinc	µg/L	15 ²	5000	5	5

¹ Protection of marine aquatic ecosystems in South East Australia (Table 3.3.2 and Table 3.3.3 of ANZECC, 2000)

² Marine water trigger values for 95% species protection (Table 3.4.1 of ANZECC, 2000)

³ Marine water trigger values for 99% species protection (Table 3.4.1 of ANZECC, 2000)

⁴ Water quality guidelines for recreational purposes (Table 5.2.2 and Table 5.2.3 of ANZECC, 2000)

⁵ Physico-chemical stressor and toxicant guidelines for the protection of saltwater aquaculture species (Table 4.4.2 and Table 4.4.3 of ANZECC, 2000)

⁶ Interim Working level (Volume 2, ANZECC, 2000)

⁷ Filterable reactive phosphate (FRP) is generally considered to be chemically indicative of orthophosphate

⁸ Low turbidity value normally found in offshore waters (Table 3.3.3 of ANZECC, 2000)

Table 3 Source of trigger levels

Environmental value / type of indicator	Trigger level reference (unless otherwise stated)
Aquatic ecosystem health – physical and chemical stressors	Protection of marine aquatic ecosystems in South East Australia as defined in Table 3.3.2, ANZECC (2000)
Aquatic ecosystem health – toxicants	Default trigger values for slightly to moderately disturbed systems as defined by grey shaded values in Table 3.4.1, ANZECC (2000)
Primary, secondary recreation and visual amenity	Summary of water quality guidelines for recreation purposes, Table 5.2.2 and Table 5.2.3, ANZECC (2000)
Aquatic foods	Physico-chemical stressor and toxicant guidelines for the protection of saltwater aquaculture species, Table 4.4.2 and Table 4.4.3, ANZECC (2000)

To understand which of these indicators warrants further assessment (i.e. modelling), a preliminary screening assessment was then undertaken to identify which indicators present a risk to the environmental values and warrant being modelled. This required ambient water quality and treated effluent water quality assumptions to be derived to inform the screening assessment and for use as required during future modelling. The method and findings of this process are described in section 3.0.

3.0 Water Quality Data Review and Preliminary Assessment

3.1 Risk based approach

A risk based approach is required to assess and manage water quality with respect to the MWQOs. The proposed approach is summarised in Figure 2. The approach generally aligns with the following guidelines:

- *Marine Water Quality Objectives for NSW Ocean Waters, South Coast (DEC, 2005)*
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC, 2000)*
- *Using the ANZECC Guidelines and Water Quality Objectives in NSW (DEC, 2006)*
- *Risk-based Framework for Considering Waterway Health Outcomes in Strategic Land-use Planning (Dela-Cruz et al., 2017)*

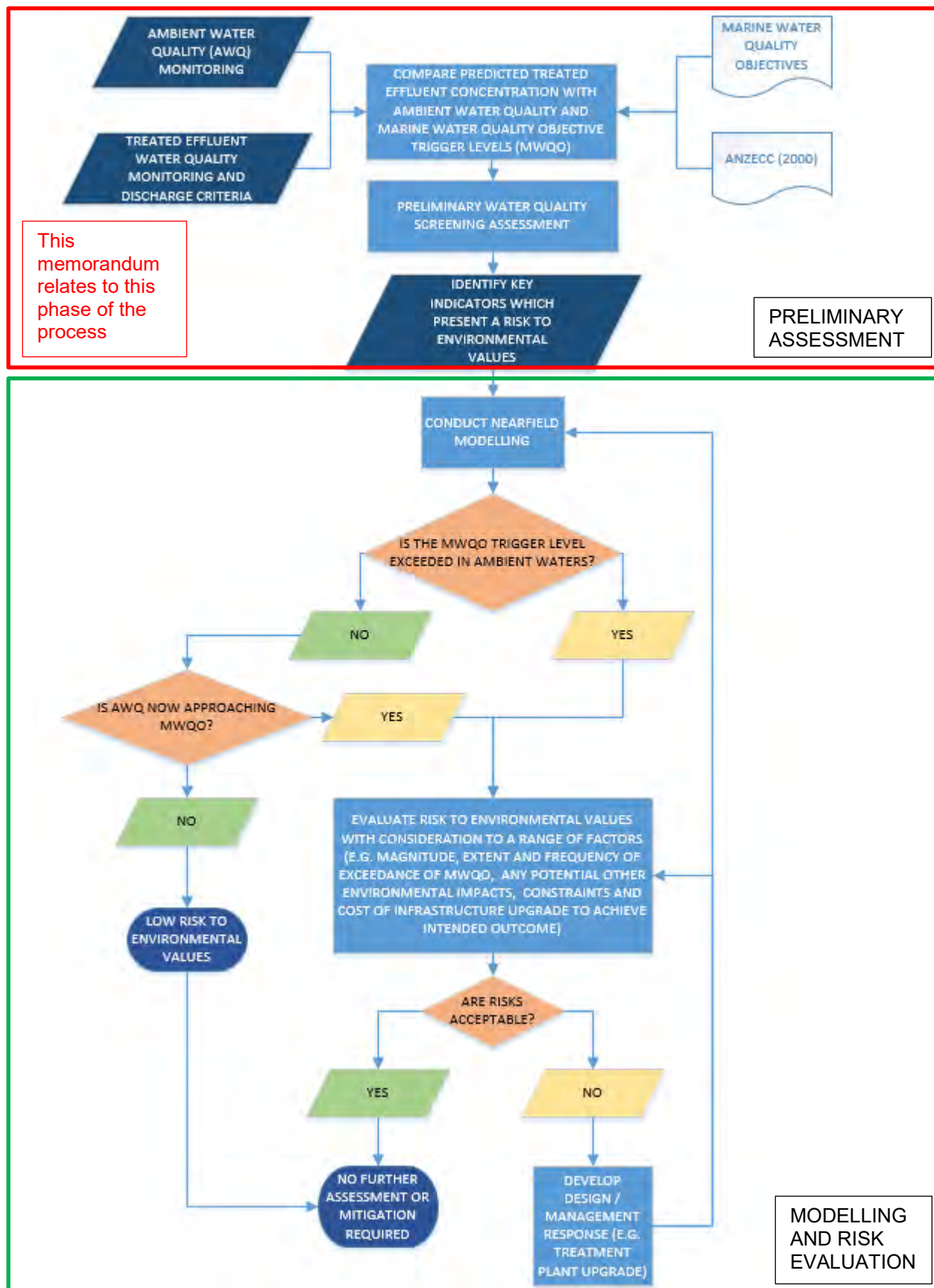


Figure 2 Risk based process for assessing and managing water quality for the Project

Section 3.4 outlines the first phase of the risk based approach (preliminary assessment). The process and assumptions adopted for ambient water quality and treated effluent water quality which informed this assessment is described in section 3.2 and 3.3 respectively.

3.2 Ambient Water Quality

Water quality monitoring has been conducted by Elgin Associates Pty Ltd as part of the Project off the coast of Merimbula between October 2014 and April 2017. Three sets of data were obtained by Elgin as follows:

1. Ambient water quality monitoring in Merimbula Bay (at sites MBWQ20, MBWQ30 and MBWQ40) during the period October 2014 to October 2015
2. Three post event (significant rain) estuary sampling (inside Merimbula and Pambula lakes) on 9 April 2015, 31 January 2016 and 5 to 6 June 2016. The purpose of this data set was to gain an understanding of what indicator concentrations may discharge to Merimbula Bay following major rainfall events. As this sampling data is not from the bay and specifically post event, this data set has not been used in the analysis as part of this memorandum.
3. Ambient water quality monitoring in Merimbula Bay (at sites MBWQ20 and MBWQ40 only) and at Reference sites further south (sites HAY20, HAYSTH20 and QUON20) during the period April 2016 to April 2017

The locations of the water quality monitoring sites are shown below in Figure 3.

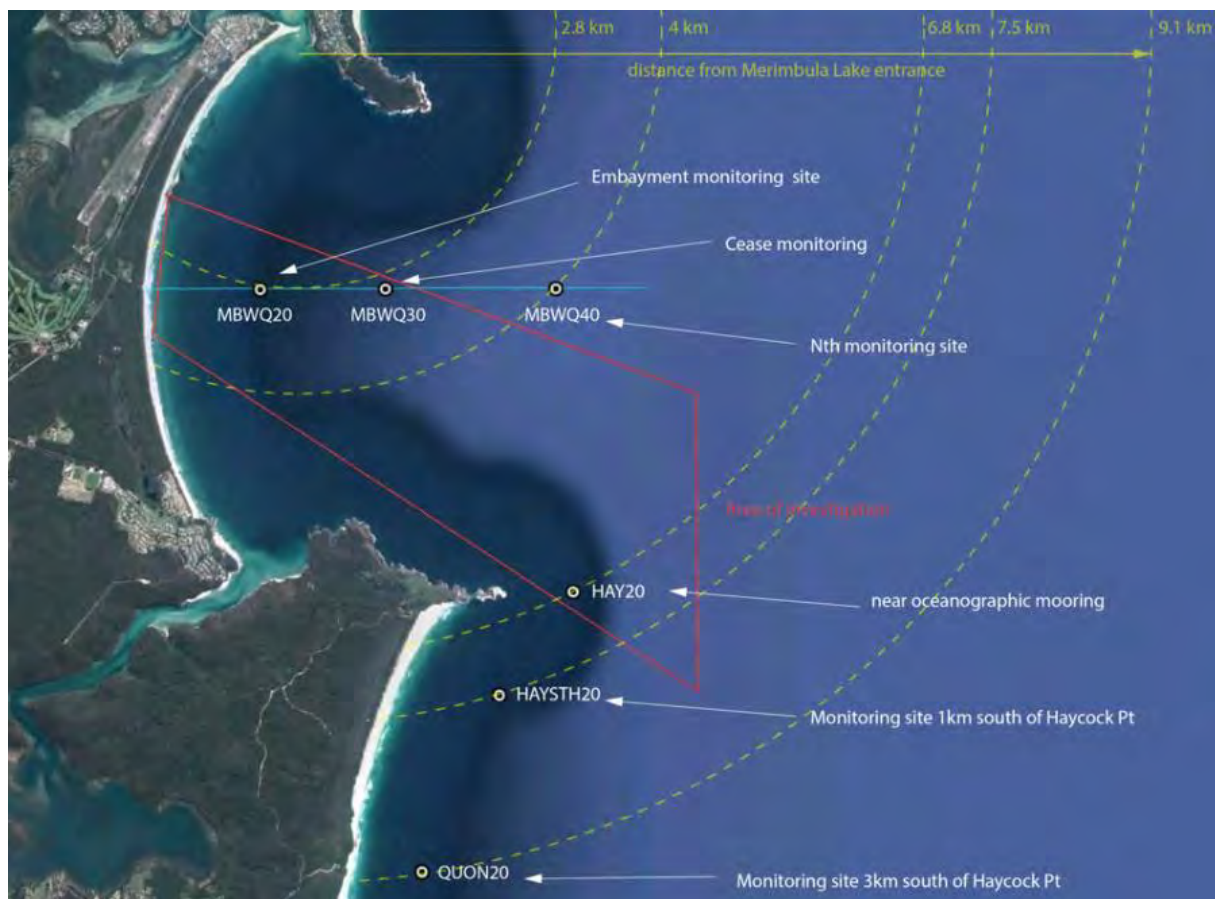


Figure 3 Locations of the water quality monitoring sites (Source: Elgin, 2016)

A statistical analysis of the water quality data was undertaken which compared monitoring results for various datasets including:

- All data
- Individual monitoring sites
- Sites within Merimbula Bay (sites MBWQ20, MBWQ30 and MBWQ40)
- Reference sites (i.e. monitoring conducted outside the assumed zone of influence of the current outfall)
- Coastal process events such as upwelling, weak current, south current and north current events
- Monitoring at different depths within the water column (surface, middle and bottom)

Graphs summarising the statistics for the various indicators are provided in Attachment 1. It is noted that where results were below the limit of reporting, a value equal to half the limit of reporting was adopted for statistical analysis.

The data and statistics were reviewed and an assumed ambient concentration was selected for each indicator. The adopted ambient water quality concentrations (AWQ) and the assumptions for their adoption are provided in Table 9 in Attachment 2.

Generally the median concentration of the bay sites was adopted as ambient water quality. For some indicators (including total nitrogen, chlorophyll a, suspended solids, nitrate, NO_x, total phosphorus, orthophosphate, faecal coliforms and enterococci), concentrations were observed to be statistically higher during upwelling events. As these events are relatively infrequent, to be conservative, the median concentration was calculated without inclusion of upwelling event data. This enabled the median concentration to be more representative of typical ambient water quality conditions.

For comparison purposes only, Table 4 presents adopted ambient water quality values for those indicators in which upwelling events were excluded and with the inclusion of upwelling events. The indicators NO_x, Nitrate and Orthophosphate show a very slight increase in median concentration where all data is included.

Table 4 Comparison of ambient water quality medians excluding and including upwelling

Indicator	Units	Adopted Ambient Water Quality (AWQ)	Ambient Water Quality (AWQ) - for comparison
		Median of Bay sites excluding upwelling event samples	Median of Bay sites (including upwelling event samples)
Suspended solids	mg/L	12	12
Total Nitrogen (TN)	mg/L	0.12	0.12
Oxides of Nitrogen (NO _x)	mg/L	0.017	0.018
Nitrate	mg/L	0.017	0.018
Total Phosphorus	mg/L	0.007	0.007
Orthophosphate	mg/L	0.004	0.005
Chlorophyll a	µg/L	1.2	1.2
Faecal coliforms	cfu/100 ml	0.5	0.5
Enterococci	cfu/100 ml	0.5	0.5

It is not uncommon during water quality studies to find ambient water quality concentration for some indicators to be at or exceeding the water quality objective. In Advisian (2018), the baseline water quality assessment conducted for the Eden Breakwater Wharf Extension Project is presented. For this project, eight rounds of water quality monitoring was undertaken at six sites in Snug Cove and Twofold Bay (the reference sites) over a short four month period (September 2016 to January 2017) in order to describe ambient water quality conditions. It found that the ambient water quality median for both Chlorophyll a and total nitrogen exceeded the water quality objective trigger levels at the bay reference sites. Chlorophyll a ranged between 1-6 µg/L (ANZECC guideline of 1 µg/L) and total nitrogen generally exceeded the ANZECC guideline (<0.12 mg/L) with median values ranging between 0.13-0.145 mg/L. Possible contributors to the elevated concentrations may be a bloom of the toxic dinoflagellate *Alexandrium fundyense* that occurred during the monitoring program and a moderate upwelling detected from water temperature differential data from one round of monitoring. The post-event (wind and ocean swell event) sampling demonstrated disturbance on colour and clarity with all other parameters relatively unaffected by the event.

It is well-known that upwelling events that occur off the south-east coast of Australia are a natural oceanic source of nutrients and although only episodic, they have the ability to overwhelm anthropogenic nutrient loads off Sydney (Pritchard & Lee, 2001). In Dela-Cruz et al. (2002), the temporal abundance patterns of the red tide *Noctiluca scintillans* along the southeast coast of Australia were investigated. It is one of the most common red tide forming species along the south-east coast. Samples were collected approximately weekly from two coastal stations off Port Hacking between March 1997 to March 1998. During the monitoring period, three main uplifting events were observed during the Spring and Summer months. Results suggest that naturally occurring nutrient enrichment processes promote the species population growth, with peaks observed at the same time or subsequent to diatom blooms caused by episodic uplifting of nutrient-rich slope water. The single most important variable related to the species abundance was the Ammonia content of surface waters. It is important to acknowledge this backdrop of natural upwelling events and associated elevations in nutrient concentrations in water quality assessment studies.

To illustrate elevated indicator concentrations during upwelling events, Table 5 presents AWQ concentrations during potential upwelling events as recorded by Elgin Associates Pty Ltd during water quality monitoring between October 2014 and April 2017. From observation of IMOS (Integrated Marine Observing System) regional current and sea surface temperature (SST) charts, one monitoring event was classified as an upwelling event (21 March 2017). If an upwelling event is defined by elevated Nitrate levels in conjunction with a temperature differential between surface and bottom waters of approximately 3-4 °C or greater, a further two monitoring events could potentially be classified as an upwelling (15 December 2014 and 19 February 2015) (email correspondence with Elgin, 24 Jan 2019). In Table 5, the AWQ concentrations have been determined from averages of the data for both the single upwelling event and also for the three upwelling events, for both all sites and bay only sites. Due to the limited data, average concentration is more appropriate to report. Metal sampling data was only reported from the middle of the water column for the 21 March 2017 upwelling event, hence the non-varying values in Table 5. As can be seen (highlighted orange), numerous indicators exceed the MWQOs during the defined upwelling events.

Table 5 Ambient water quality concentrations during recorded upwelling events

Indicator	Units	Adopted MWQO	Adopted AWQ	AWQ (all sites, 1 upwelling event)	AWQ (all sites, 3 upwelling events)	AWQ (bay sites, 1 upwelling event)	AWQ (bay sites, 3 upwelling events)
pH	pH units	8.0 - 8.4	8.17	8.06	8.12	8.04	8.13
Suspended solids	mg/L	10	12	20	14	15	12
Turbidity	NTU	0.5	0.3	0.3	0.4	0.1	0.5
Electrical Conductivity	µS/cm	NA	53408	53665	53289	53715	53114
Secchi depth	m	>1.6	8.9	5.9	6.8	5.6	7.0

Indicator	Units	Adopted MWQO	Adopted AWQ	AWQ (all sites, 1 upwelling event)	AWQ (all sites, 3 upwelling events)	AWQ (bay sites, 1 upwelling event)	AWQ (bay sites, 3 upwelling events)
Dissolved Oxygen	mg/L	>5	7.6	7.6	7.4	7.8	7.4
Total Nitrogen (TN)	mg/L	0.12	0.12	0.15	0.14	0.17	0.13
Oxides of Nitrogen (NOx)	mg/L	0.025	0.017	0.052	0.045	0.076	0.048
Nitrate	mg/L	0.7	0.017	0.052	0.045	0.076	0.047
Ammonia	mg/L	0.01	0.008	0.014	0.008	0.015	0.007
Ammonium	mg/L	0.02	0.008	0.013	0.008	0.014	0.007
Total Phosphorus	mg/L	0.025	0.007	0.011	0.010	0.012	0.010
Orthophosphate	mg/L	0.01	0.004	0.009	0.008	0.012	0.008
Chlorophyll a	µg/L	1	1.2	5.4	2.9	3.8	1.7
Faecal coliforms	cfu/100 ml	150	0.5	117.5	42.3	254.8	46.7
Enterococci	cfu/100 ml	35	0.5	23.7	9.1	53.0	10.5
Aluminium	µg/L	10	4.5	48.2	48.2	13.5	13.5
Antimony	µg/L	270	0.25	0.25	0.25	0.25	0.25
Arsenic (III)	µg/L	2.3	1.8	2.0	2.0	2.1	2.1
Arsenic (V)	µg/L	4.5	NA	NA	NA	NA	NA
Barium	µg/L	1000	5.9	No data	No data	No data	No data
Boron	µg/L	1000	4295	3894	3894	4005	4005
Cadmium	µg/L	0.7	0.1	0.1	0.1	0.1	0.1
Chromium (total)	µg/L	20	0.25	0.25	0.25	0.25	0.25
Chromium (III)	µg/L	27.4	NA	NA	NA	NA	NA
Cobalt	µg/L	1	0.025	0.025	0.025	0.025	0.025
Copper	µg/L	1.3	0.2	0.5	0.5	0.1	0.1
Iron	µg/L	300	5	13	13	10	10
Lead	µg/L	4.4	0.1	0.2	0.2	0.1	0.1
Manganese	µg/L	100	0.25	0.32	0.32	0.25	0.25
Mercury (inorganic)	µg/L	0.1	0.05	0.02	0.02	0.02	0.02
Nickel	µg/L	7	0.25	0.34	0.34	0.25	0.25
Selenium	µg/L	3	1	1	1	1	1
Silver	µg/L	1.4	0.35	0.08	0.08	0.13	0.13
Zinc	µg/L	5	2.5	2.5	2.5	2.5	2.5

Notes:

1. Orange highlighted cells indicate exceedance of the MWQOs
2. For AWQ data, indicator recorded as Arsenic and Chromium.

3.3 Treated Effluent Water Quality

Treated effluent water quality is monitored at the Merimbula sewage treatment plant outfall. Monitoring data for EPA monitoring point 4 and treated effluent discharge criteria stated within the design criteria for the project (AECOM, 2018), were used to establish treated effluent concentrations for the various indicators. For the purposes of this assessment, the assumed effluent quality was established based on the following:

- Where an effluent discharge criteria has been set for the indicator, the maximum criteria (whether that be the 100th percentile or the 90th percentile criteria depending on indicator) was adopted
- Where no discharge criteria were set, the 90th percentile historical effluent quality was adopted for the purposes of this preliminary screening assessment. Further assessment through modelling will also consider median water quality concentrations.

The adopted treated effluent water quality concentration (TEWQ) and assumptions are listed in Table 10 in Attachment 3.

3.4 Preliminary Water Quality Assessment

3.4.1 Preliminary screening

A preliminary water quality impact assessment was undertaken to select indicators which could potentially present a risk to the environmental values and warrant a more detailed quantitative assessment. There are six different cases where the relative concentrations of TEWQ, AWQ and MWQO trigger levels vary in each case as shown in Figure 4.

The adopted treated effluent water quality concentration, ambient water quality concentration and MWQO trigger level were compared for each indicator and the risk to the environment was assessed based on the conditions set out in Table 6. The results of the assessment are provided in Table 7.

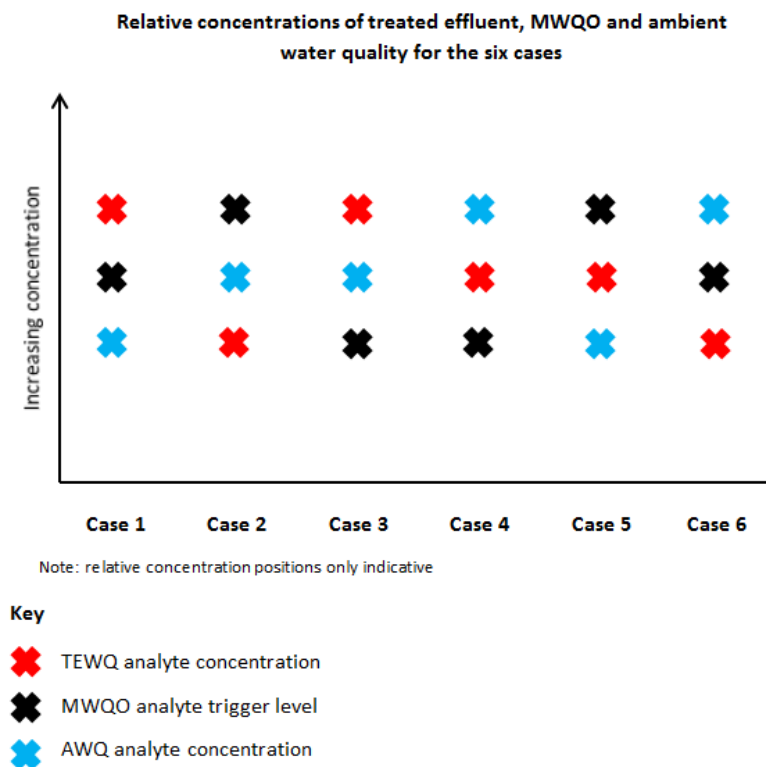


Figure 4 Varying cases of relative concentrations

Table 6 Criteria for preliminary water quality screening assessment

Case	Condition	Preliminary Assessment	Conclusion
1	TEWQ > MWQO TEWQ > AWQ AWQ < MWQO	Discharge could potentially increase AWQ to above MWQO.	Presents a potential risk, further assessment of indicator required.
2	TEWQ < MWQO TEWQ < AWQ AWQ < MWQO	As the TEWQ is less than AWQ, the discharge could improve the AWQ. As AWQ already below the MWQO, no risk of MWQO being exceeded. The increased load within the receiving waters is unlikely to present a risk due to mixing.	Low risk to environment with potential for some improvement. No further assessment of indicator required.
3	TEWQ > MWQO TEWQ > AWQ AWQ > MWQO	AWQ already exceeds MWQO. Discharge could potentially increase AWQ further above the MWQO.	Presents a potential risk, further assessment of indicator required.
4	TEWQ > MWQO TEWQ < AWQ	As the TEWQ is less than AWQ, the AWQ could potentially be improved. The increased load within the receiving waters is not considered to present a risk due to adequate mixing within ocean waters.	Low risk to environment with potential for some improvement, no further assessment of indicator required.
5	TEWQ < MWQO TEWQ > AWQ	Potential to increase AWQ but due to dilution, the AWQ will continue to remain below the MWQO. The increased load within the receiving waters is unlikely to present a risk due to adequate mixing within ocean waters.	Compare magnitude of TEWQ with MWQO trigger level to assess risk of raising ambient water to close to MWQO (refer section 3.4.2). Where potential for AWQ to approach MWQO, further assessment of indicator required.
6	TEWQ < MWQO TEWQ < AWQ AWQ > MWQO	As the TEWQ is less than AWQ, the discharge could improve the AWQ. The increased load within the receiving waters is unlikely to present a risk due to mixing however given the MWQO may still be exceeded, this should be considered further.	Low risk to environment with potential for some improvement. No further assessment of indicator required.

TEWQ – Adopted Treated Effluent Water Quality

AWQ – Adopted Ambient Water Quality

MWQO – Adopted Marine Water Quality Objective Trigger Level

Only indicators with a MWQO trigger level, ambient water quality monitoring data and treated effluent monitoring data were assessed. On this basis, the following indicators were excluded:

- Turbidity, nitrate, ammonium and secchi depth as no treated effluent water quality concentration was available.
- BOD, COD, Total Oil and Grease, E-Coli, total calcium, total potassium and total magnesium as no ambient water quality samples were collected and no marine water trigger level was available.
- Beryllium as no marine water trigger level is available.

The following indicators exceeded the MWQO trigger level in the TEWQ:

- Physical and chemical stressors – pH, suspended solids, total nitrogen, oxides of nitrogen, ammonia, total phosphorus, orthophosphate, chlorophyll a
- Microbiological - Faecal coliforms and enterococci
- Metals – aluminium, arsenic, copper, iron, lead, selenium and zinc

The following indicators exceeded the MWQO trigger level in the AWQ:

- Physical and chemical stressors – suspended solids, chlorophyll A and boron, noting the AWQ for total nitrogen was equal to the MWQO

Table 7 Preliminary Water Quality Assessment

Indicator	Units	Current Treated Effluent Water Quality (TEWQ)	MWQO trigger level	Ambient Water Quality (AWQ)	Condition
pH	pH units	6.5-8.5	8.0 - 8.4 ¹	8.17	TEWQ range outside MWQO range and different to AWQ AWQ within MWQO range
Suspended solids	mg/L	30	10 ⁴	12	TEWQ > WQO, TEWQ > AWQ AWQ > WQO
Electrical Conductivity	µS/cm	874	NA	53,408	Not applicable - EC to be modelled for information purposes only
Dissolved Oxygen	mg/L	12.9	>5 ⁴	7.6	TEWQ < MWQO, TEWQ < AWQ AWQ < MWQO (noting low risk trigger level is high value not low value)
Total Nitrogen (TN)	mg/L	15	0.12 ¹	0.12	TEWQ > MWQO, TEWQ > AWQ AWQ = MWQO
Oxides of Nitrogen (NOx)	mg/L	8.06	0.025 ¹	0.017	TEWQ > MWQO, TEWQ > AWQ AWQ < MWQO
Ammonia	mg/L	5	0.01 ⁵	0.008	TEWQ > MWQO, TEWQ > AWQ AWQ < MWQO
Total Phosphorus	mg/L	13	0.025 ¹	0.007	TEWQ > MWQO, TEWQ > AWQ AWQ < MWQO
Orthophosphate	mg/L	11	0.01 ¹	0.004	TEWQ > MWQO, TEWQ > AWQ AWQ < MWQO
Chlorophyll a	µg/L	68.8	1 ¹	1.2	TEWQ > MWQO, TEWQ > AWQ AWQ > MWQO
Faecal coliforms	cfu/100 ml	200	150 ⁵	0.5	TEWQ > MWQO, TEWQ > AWQ AWQ < MWQO
Enterococci	cfu/100 ml	188	35 ⁵	0.5	TEWQ > MWQO, TEWQ > AWQ

Indicator	Units	Current Treated Effluent Water Quality (TEWQ)	MWQO trigger level	Ambient Water Quality (AWQ)	Condition
					AWQ < MWQO
Aluminium	µg/L	74.6	10 ⁴	4.5	TEWQ > MWQO, TEWQ > AWQ AWQ < MWQO
Antimony	µg/L	1.5	270 ⁶	0.25	TEWQ < MWQO, TEWQ > AWQ
Arsenic	µg/L	3	2.3 ^{6,7}	1.8	TEWQ > MWQO, TEWQ > AWQ AWQ < MWQO
Barium	µg/L	10.2	1000 ⁵	5.9	TEWQ < MWQO, TEWQ > AWQ
Boron	µg/L	80	1000 ⁵	4295	TEWQ < MWQO, TEWQ < AWQ AWQ > MWQO
Cadmium	µg/L	0.025	0.7 ³	0.1	TEWQ < MWQO, TEWQ < AWQ AWQ < MWQO
Chromium	µg/L	1	20 ⁴	0.25	TEWQ < MWQO, TEWQ > AWQ
Cobalt	µg/L	0.5	1 ²	0.025	TEWQ < MWQO, TEWQ > AWQ
Copper	µg/L	272	1.3 ²	0.20	TEWQ > MWQO, TEWQ > AWQ AWQ < MWQO
Iron	µg/L	706	300 ⁵	5	TEWQ > MWQO, TEWQ > AWQ AWQ < MWQO
Lead	µg/L	5.6	4.4 ²	0.1	TEWQ > MWQO, TEWQ > AWQ AWQ < MWQO
Manganese	µg/L	54.2	100 ⁵	0.25	TEWQ < MWQO, TEWQ > AWQ
Mercury	µg/L	0.05	0.1 ³	0.05	TEWQ < MWQO, TEWQ = AWQ AWQ < MWQO
Nickel	µg/L	3	7 ³	0.25	TEWQ < MWQO, TEWQ > AWQ
Selenium	µg/L	7.8	3 ⁶	1	TEWQ > MWQO, TEWQ > AWQ AWQ < MWQO
Silver	µg/L	0.5	1.4 ²	0.35	TEWQ < MWQO, TEWQ > AWQ
Zinc	µg/L	140.4	5 ⁴	2.50	TEWQ > MWQO, TEWQ > AWQ AWQ < MWQO

Bold values indicate exceedance of MWQO trigger level

¹ Protection of marine aquatic ecosystems in South East Australia (Table 3.3.2 and Table 3.3.3 of ANZECC, 2000)

² Marine water trigger values for 95% species protection (Table 3.4.1 of ANZECC, 2000)

³ Marine water trigger values for 99% species protection (Table 3.4.1 of ANZECC, 2000)

⁴ Physico-chemical stressor and toxicant guidelines for the protection of saltwater aquaculture species (Table 4.4.2 and Table 4.4.3 of ANZECC, 2000)

⁵ Water quality guidelines for recreational purposes (Table 5.2.2 and Table 5.2.3 of ANZECC, 2000)

⁶ Interim Working level (Volume 2, ANZECC, 2000)

⁷ Based on Arsenic (III)

3.4.2 Assessment of indicators with potential to approach WQO trigger level

Dela-Cruz (2017) states that allowing waterways to be affected up to the numerical criterion (i.e. MWQO trigger level) should be avoided to reserve the maximum opportunity for other present and future uses of the waterway and allow adoption of a precautionary approach where there is uncertainty about the environmental outcomes of the land-use activity.

With consideration to the mixing and dilution effects of release to the ocean, the treated effluent loading is unlikely to raise ambient water quality to a concentration greater than the TEWQ. Therefore by comparing the magnitude of the TEWQ with the MWQO it is possible to assess whether there is a risk of effluent raising the AWQ to a concentration approaching the MWQO. An assessment of the indicators where $TEWQ < MWQO$ but $> AWQ$ and recommendation where further assessment would be required is provided below:

- Antimony - MWQO is over 100 times greater than the TEWQ, therefore discharge presents a low risk and no further assessment required
- Barium – MWQO is over approximately 100 times greater than the TEWQ, therefore discharge presents a low risk and no further assessment required
- Chromium – MWQO is 20 times greater than the TEWQ, therefore discharge presents a low risk and no further assessment required
- Cobalt - MWQO is only slightly (2 times) higher than the TEWQ, therefore there is potential risk of discharge causing the AWQ to approach the WQO, further assessment required
- Manganese – MWQO is slightly (less than 2 times) higher than the TEWQ, therefore there is potential risk of discharge causing the AWQ to approach the MWQO, further assessment required
- Nickel - MWQO is slightly (less than 3 times) higher than the TEWQ, therefore there is potential risk of discharge causing the AWQ to approach the MWQO, further assessment required
- Silver - MWQO is slightly (less than 3 times) higher than the TEWQ, therefore there is potential risk of discharge causing the AWQ to approach the MWQO, further assessment required.

3.5 Indicators which present a potential risk to environmental values

Based on the assessment above, the following indicators are considered to warrant a more detailed quantitative assessment through modelling:

- **Physical and chemical stressors** – pH, suspended solids, total nitrogen, oxides of nitrogen, ammonia, total phosphorus, orthophosphate, chlorophyll-a, faecal coliforms and enterococci
- **Metals** - aluminium, arsenic, cobalt, copper, iron, lead, manganese, nickel, selenium, silver and zinc

The purpose of this assessment is not to identify the reasons contributing to potential risk nor propose mitigation measures. These will be addressed during the concept design and environmental assessment process.

4.0 Quantitative assessment and risk evaluation

Further assessment (modelling) of the indicators identified in section 3.5 is required to better define the potential change in ambient water quality conditions within the receiving waters.

As presented in Figure 2, where modelling indicates that ambient water quality is neither exceeding or approaching (refer section 3.4.2) the MWQO, the proposed discharge is considered to present a low risk to the environmental values and as such, no risk evaluation is considered to be required. Where the MWQO is exceeded or being approached, risk evaluation will be undertaken.

The adopted TEWQ should be used for modelling purposes in the first instance, but where modelling indicates ambient waters will exceed the MWQO, expected median TEWQ should also be considered for the purpose of informing the risk evaluation phase.

The risk evaluation process may include (but is not limited to) consideration of:

- Magnitude, extent and frequency of exceedance of the MWQO and change in ambient water quality.
- Likely environmental outcomes of the change in water quality conditions.
- Constraints and practicalities of implementing a design/management response to achieve an improved water quality outcome (e.g. improved treatment infrastructure, altering the proposed discharge criteria). This may include some form of cost-effectiveness analysis and/or cost vs benefit analysis. Potential improvements in effluent concentrations should be modelled as required.

Where risks are deemed to be unacceptable, a design (e.g. potentially increasing treatment) or management response will need to be developed and where required, further evaluation (and modelling as required) undertaken until all risks are deemed to be acceptable or as otherwise agreed with the relevant authorities.

5.0 Conclusions

This memorandum has identified:

- Ambient water quality concentrations for the Merimbula ocean outfall receiving waters for assessment and modelling purposes.
- Treated effluent water quality concentrations for the purpose of this preliminary assessment. Other concentrations (i.e. median concentrations) may be used for modelling and risk evaluation purposes as required.
- Marine water quality objective trigger levels to support the environmental values identified by the Marine Water Quality Objectives.
- Indicators (i.e. pollutants) within the treated effluent which present a potential risk to the environmental values of the receiving waters and require further assessment and risk evaluation.

The assumed ambient water quality, marine water quality objectives and treated effluent concentrations will form the basis of future modelling and risk evaluation. It is therefore recommended that this memorandum and its assumptions and approach are reviewed and approved by relevant stakeholders and authorities prior to modelling and risk evaluation phases being undertaken.

6.0 References

- Advisian, 2018, Water Quality CEMP Sub-plan (Eden Breakwater Wharf Extension - Stage 2)
- AECOM, 2018, Merimbula STP upgrade and ocean outfall concept design and environmental assessment, prepared for Bega Valley Shire Council
- Dela-Cruz J, Pik A & Wearne P, 2017, Risk-based framework for considering waterway health outcomes in strategic land-use planning decisions, Office of Environment and Heritage and Environment Protection Authority, Sydney
- Dela-Cruz et al, 2002, Temporal abundance patterns of the red tide dinoflagellate *Noctiluca scintillans* along the southeast coast of Australia, Marine Ecology Progress Series, Vol. 236: 75-88
- Department of Environment and Conservation NSW (DEC), 2005, Marine Water Quality Objectives for NSW Ocean Waters, South Coast
- Department of Environment and Conservation NSW (DEC), 2006, Using the ANZECC Guidelines and Water Quality Objectives in NSW
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- Pritchard T, Lee R, 2001, How do ocean outfalls affect nutrient patterns in coastal waters of New South Wales, Australia?, Aust J Coast Res 34:87-95

7.0 Attachments

- Attachment 1 – Statistical Analysis of Water Quality Monitoring Results
- Attachment 2 – Ambient Water Quality Review
- Attachment 3 – Treated Effluent Water Quality Assumptions

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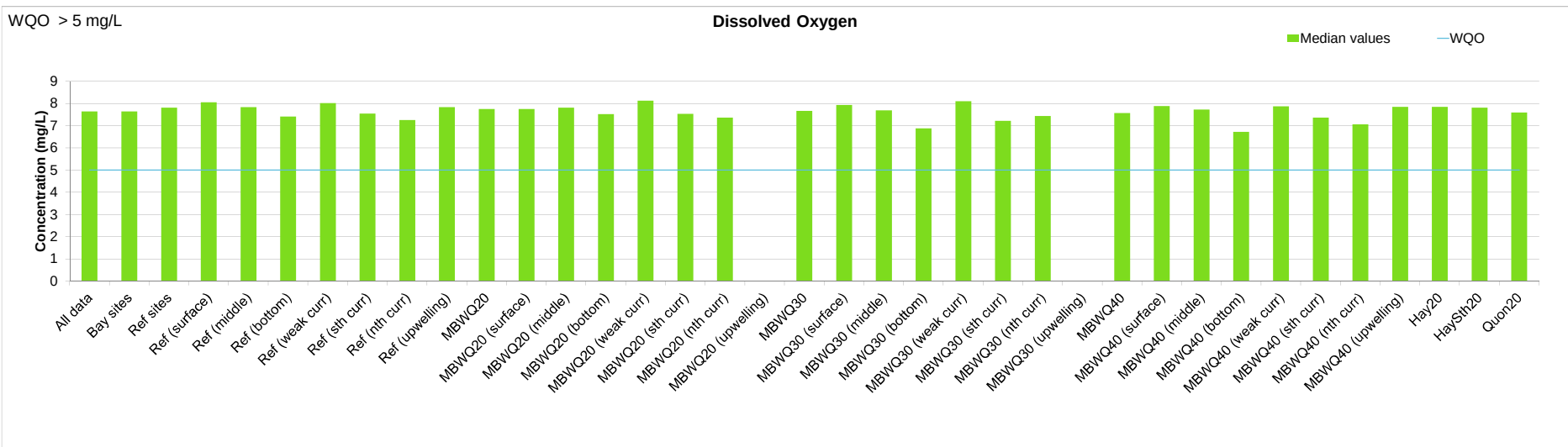
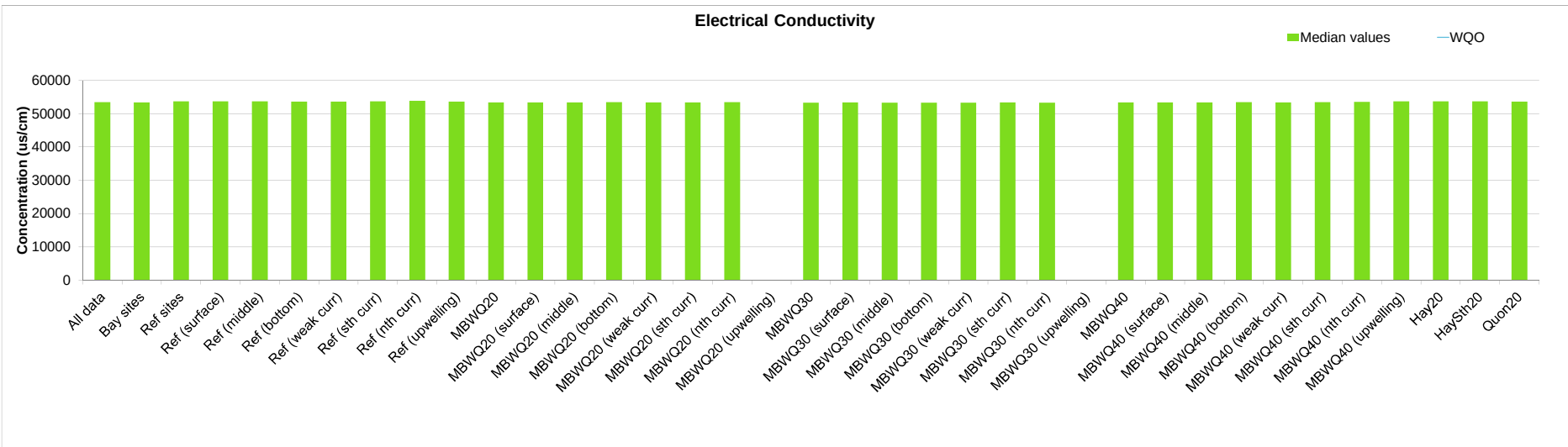
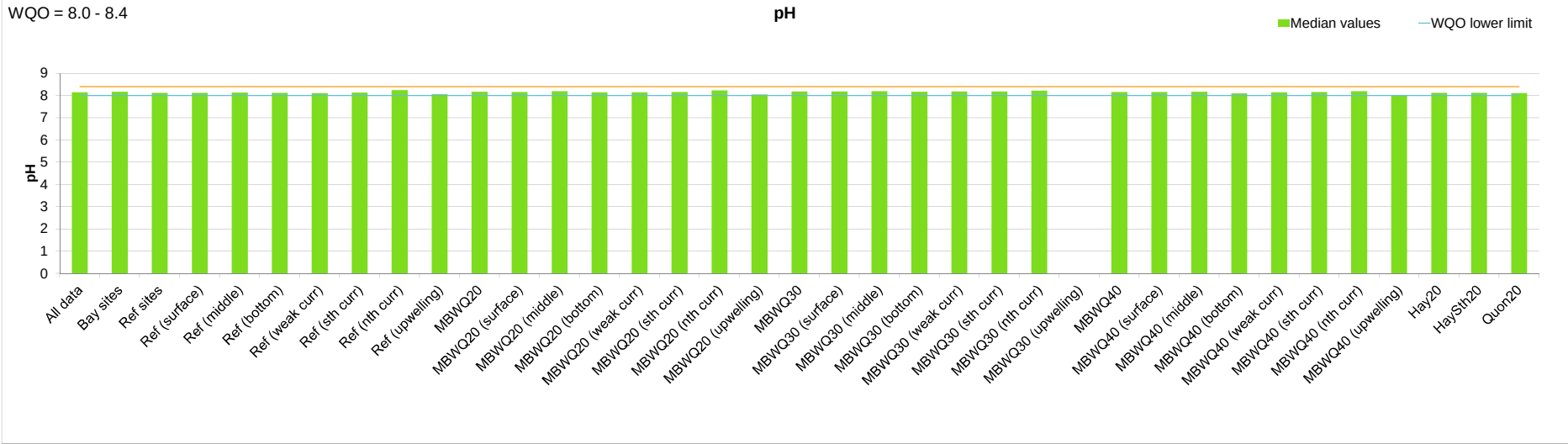
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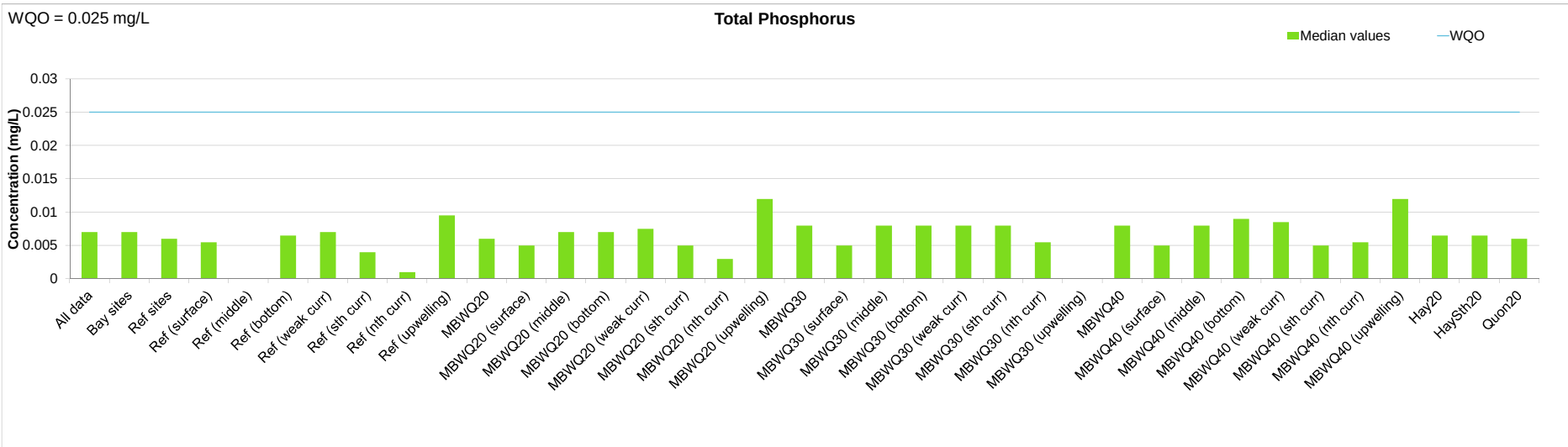
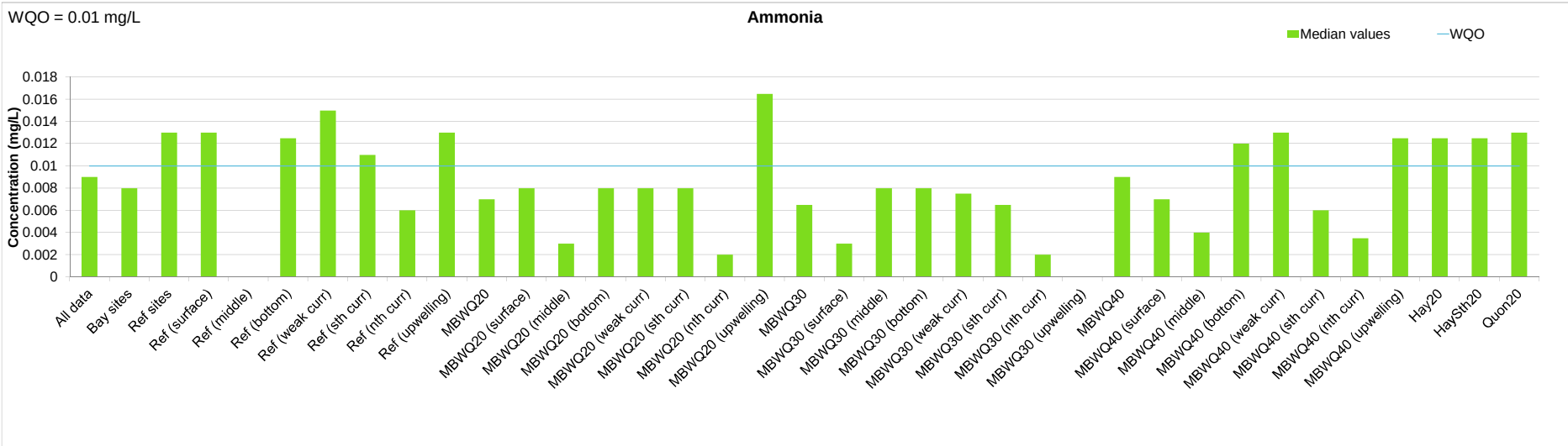
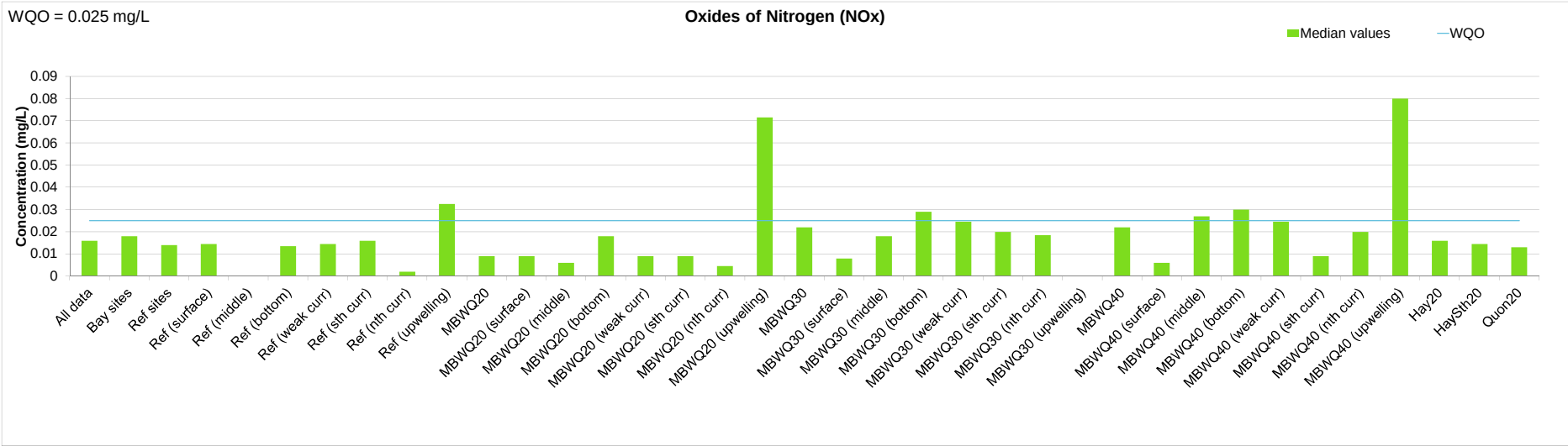
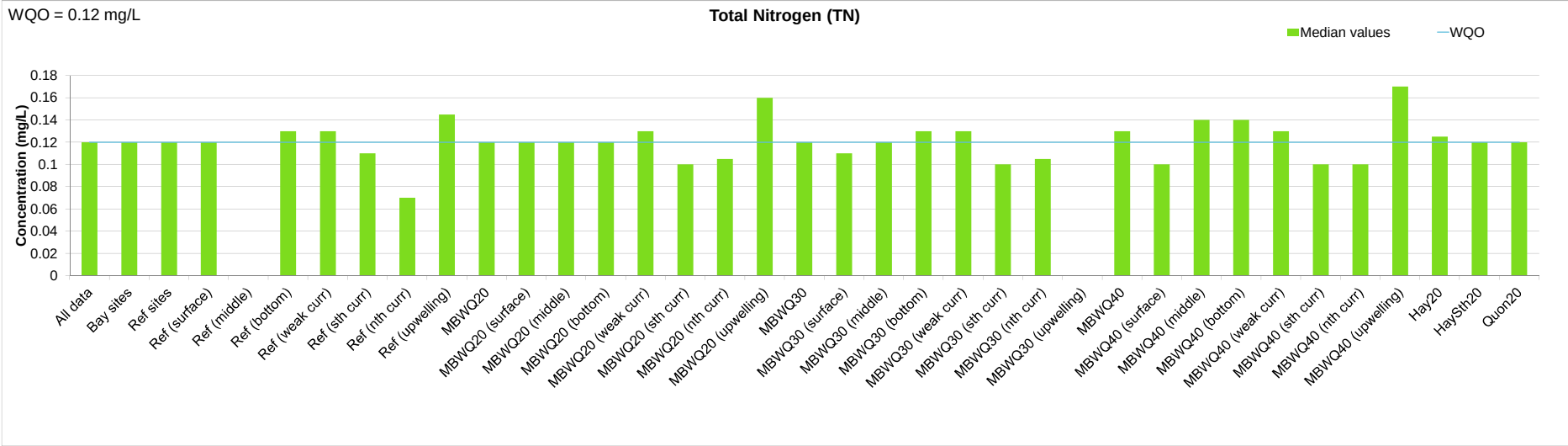
Attachment 1 – Statistical Analysis of Water Quality Monitoring Results

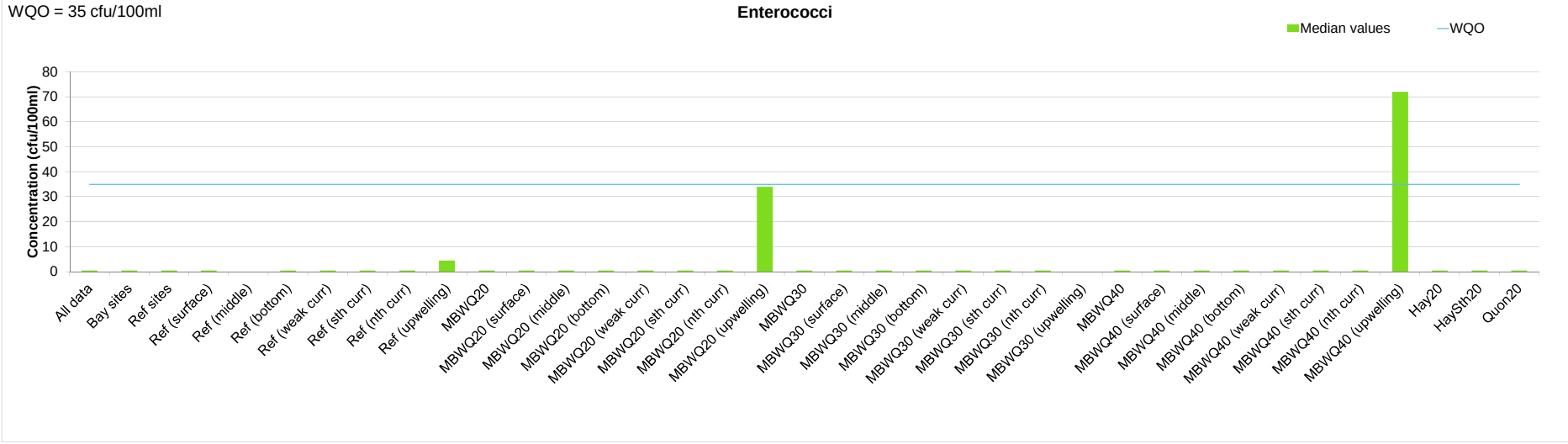
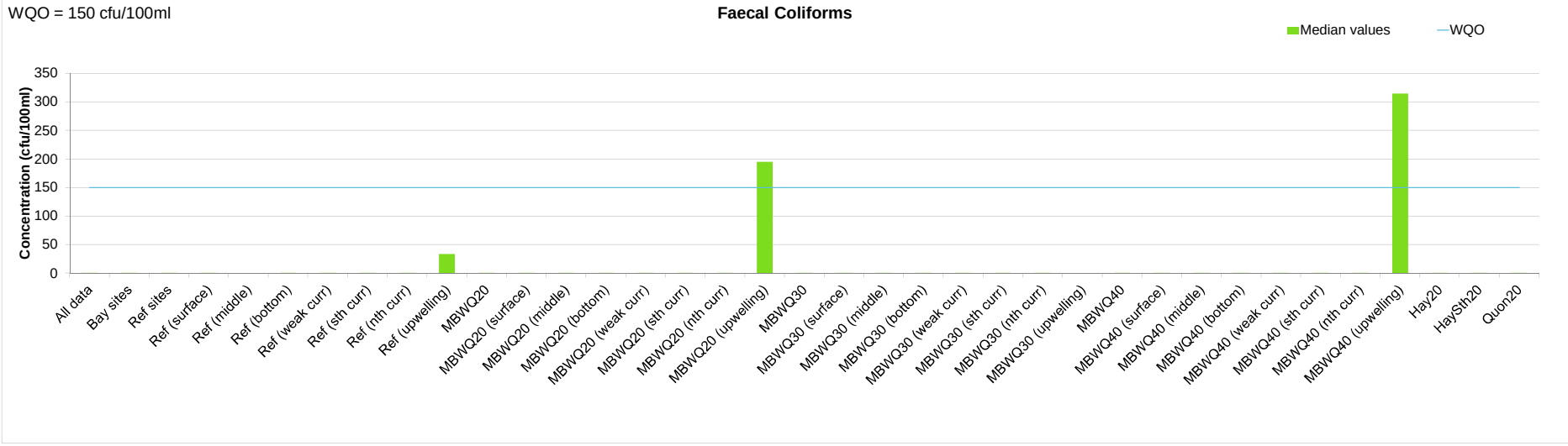
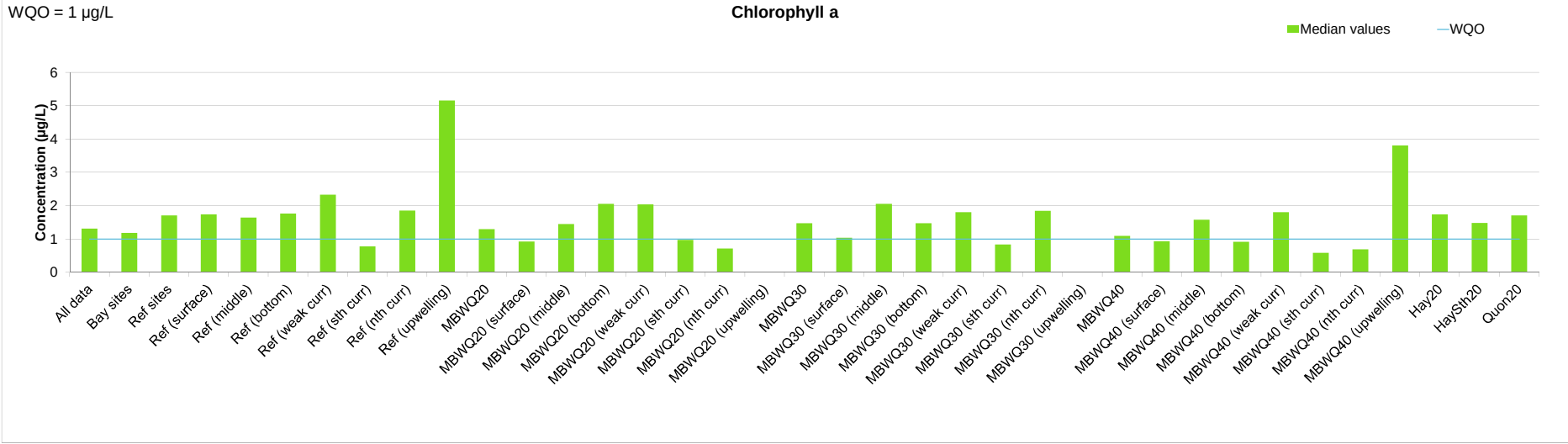
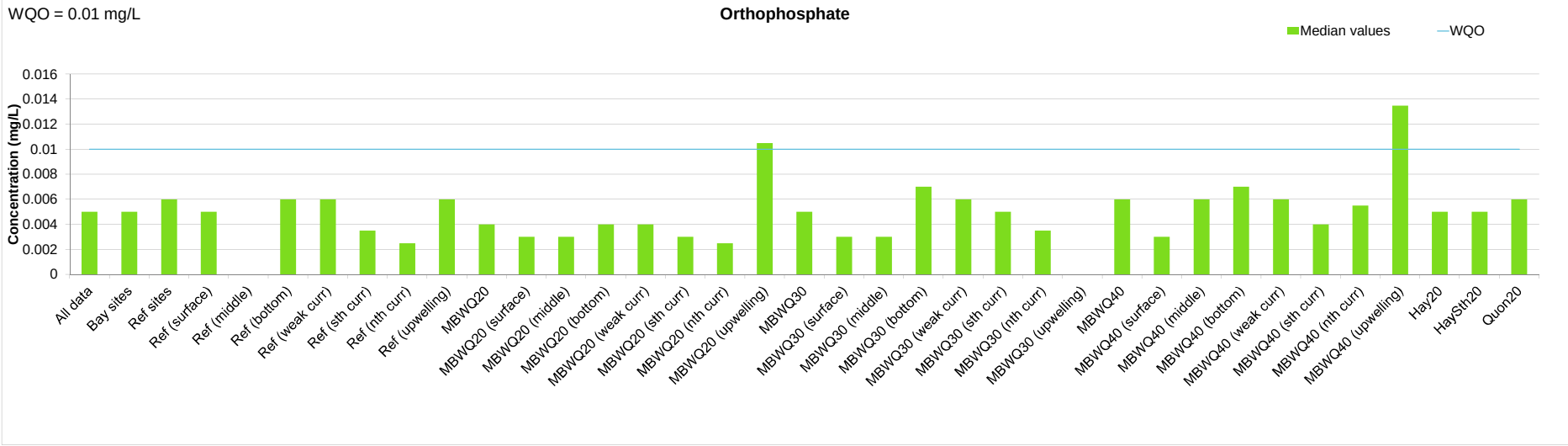
Table 8 Explanation of categories for statistical analysis

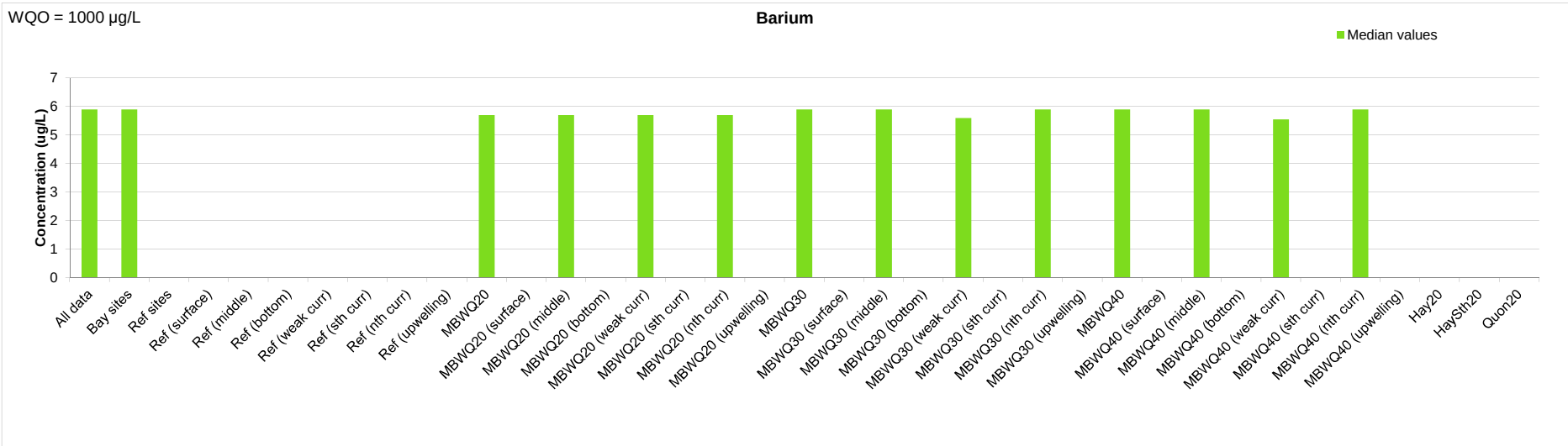
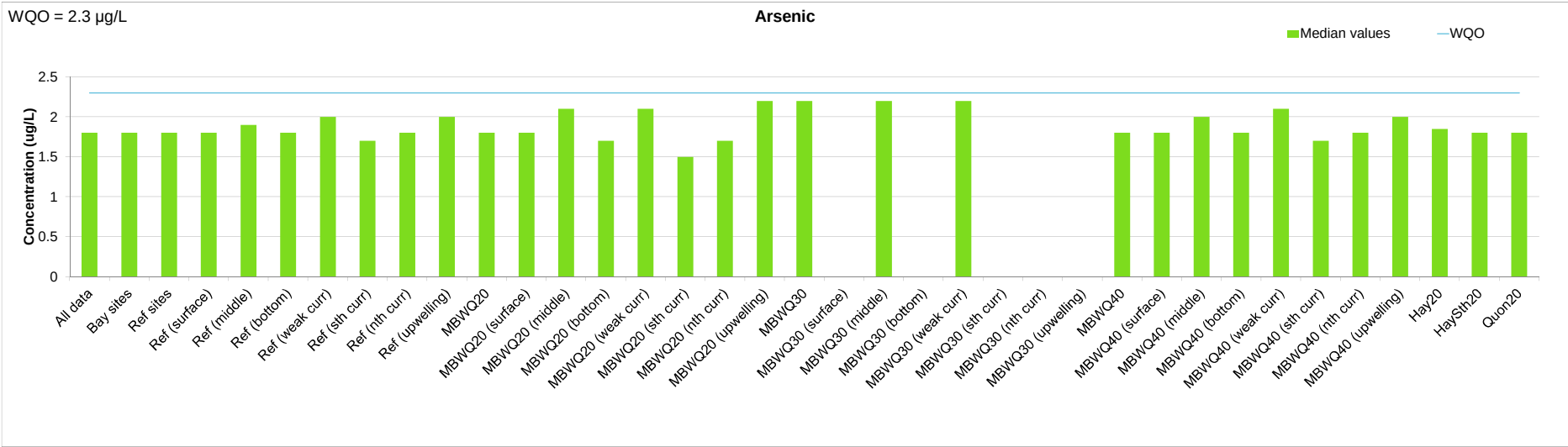
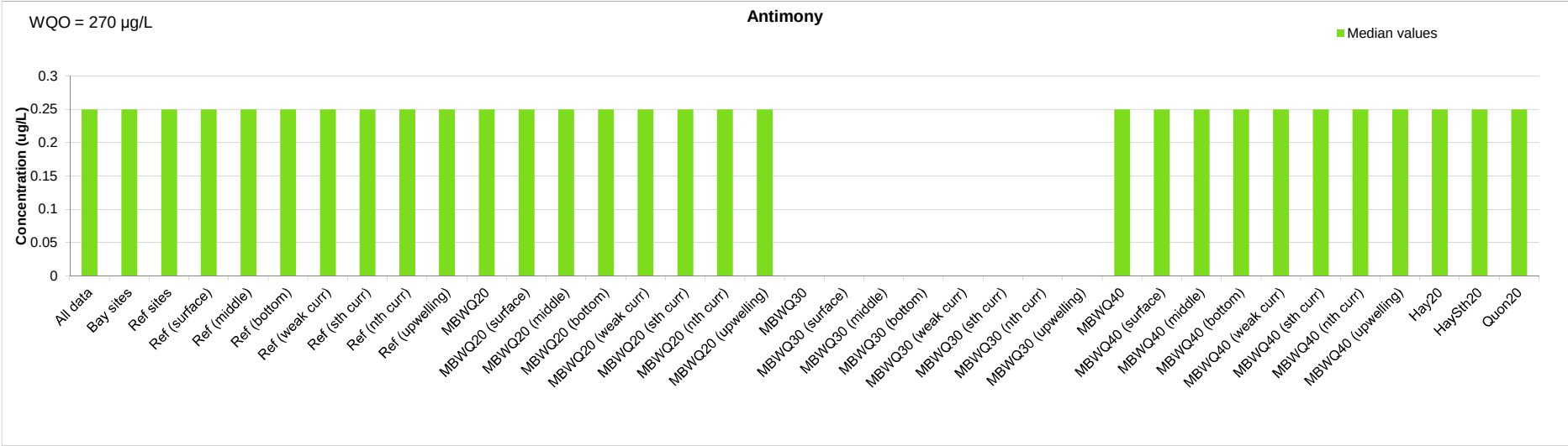
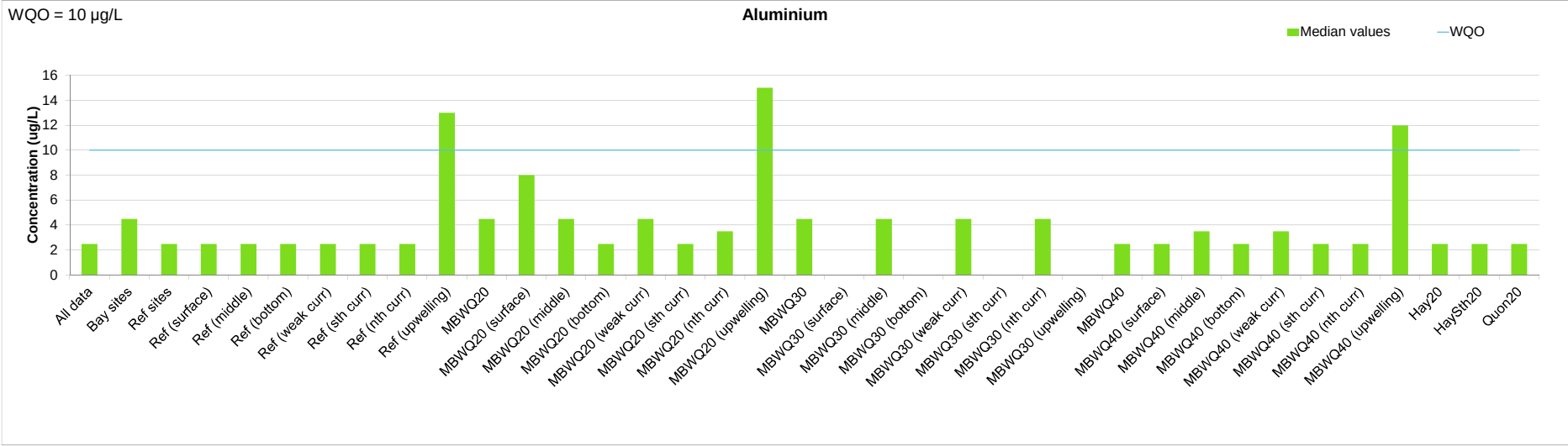
No.	Category	Site	Subset of data used
1	All data	All sites	All data
2	Bay sites	Bay sites only	All data
3	Ref sites	Reference sites only (Hay20, HaySth20, Quon20)	All data
4	Ref (surface)	Reference sites only (Hay20, HaySth20, Quon20)	Top of water column sample data
5	Ref (middle)	Reference sites only (Hay20, HaySth20, Quon20)	Mid-depth of water column sample data
6	Ref (bottom)	Reference sites only (Hay20, HaySth20, Quon20)	Bottom of water column sample data
7	Ref (weak curr)	Reference sites only (Hay20, HaySth20, Quon20)	Weak N or S offshore current, not apparent
8	Ref (sth curr)	Reference sites only (Hay20, HaySth20, Quon20)	Strong South flowing offshore current
9	Ref (nth curr)	Reference sites only (Hay20, HaySth20, Quon20)	Strong North flowing offshore current
10	Ref (upwelling)	Reference sites only (Hay20, HaySth20, Quon20)	Upwelling event occurring
11	MBWQ20	Merimbula bay 20 m depth	All data
12	MBWQ20 (surface)	Merimbula bay 20 m depth	Top of water column sample data
13	MBWQ20 (middle)	Merimbula bay 20 m depth	Mid-depth of water column sample data
14	MBWQ20 (bottom)	Merimbula bay 20 m depth	Bottom of water column sample data
15	MBWQ20 (weak curr)	Merimbula bay 20 m depth	Weak N or S offshore current, not apparent
16	MBWQ20 (sth curr)	Merimbula bay 20 m depth	Strong South flowing offshore current
17	MBWQ20 (nth curr)	Merimbula bay 20 m depth	Strong North flowing offshore current
18	MBWQ20 (upwelling)	Merimbula bay 20 m depth	Upwelling event occurring
19	MBWQ30	Merimbula bay 30 m depth	All data
20	MBWQ30 (surface)	Merimbula bay 30 m depth	Top of water column sample data
21	MBWQ30 (middle)	Merimbula bay 30 m depth	Mid-depth of water column sample data
22	MBWQ30 (bottom)	Merimbula bay 30 m depth	Bottom of water column sample data
23	MBWQ30 (weak curr)	Merimbula bay 30 m depth	Weak N or S offshore current, not apparent
24	MBWQ30 (sth curr)	Merimbula bay 30 m depth	Strong South flowing offshore current
25	MBWQ30 (nth curr)	Merimbula bay 30 m depth	Strong North flowing offshore current
26	MBWQ30 (upwelling)	Merimbula bay 30 m depth	Upwelling event occurring
27	MBWQ40	Merimbula bay 40 m depth	All data

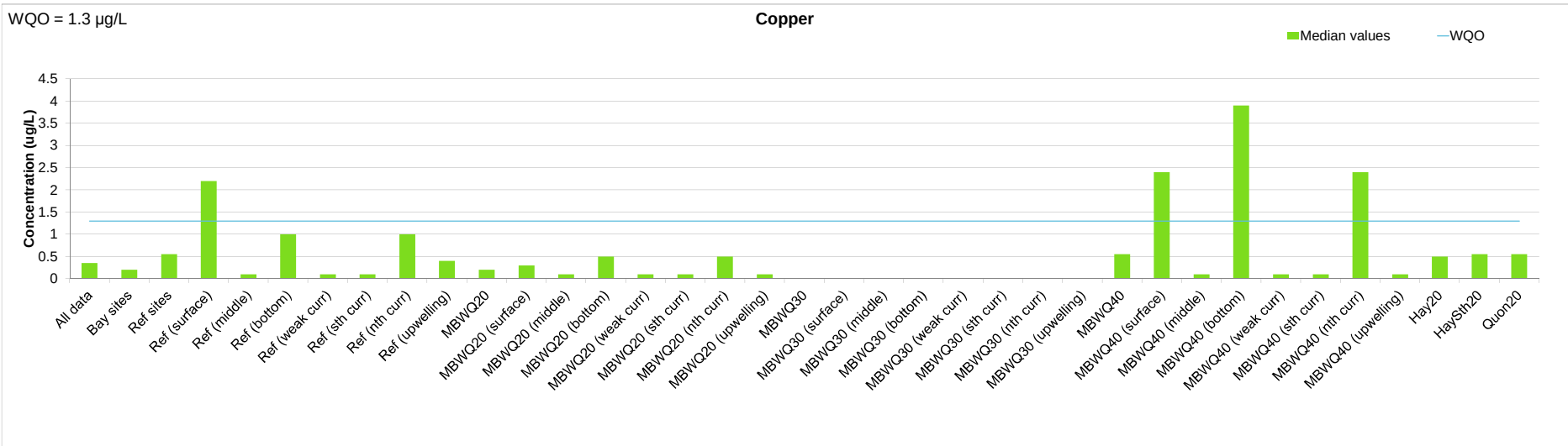
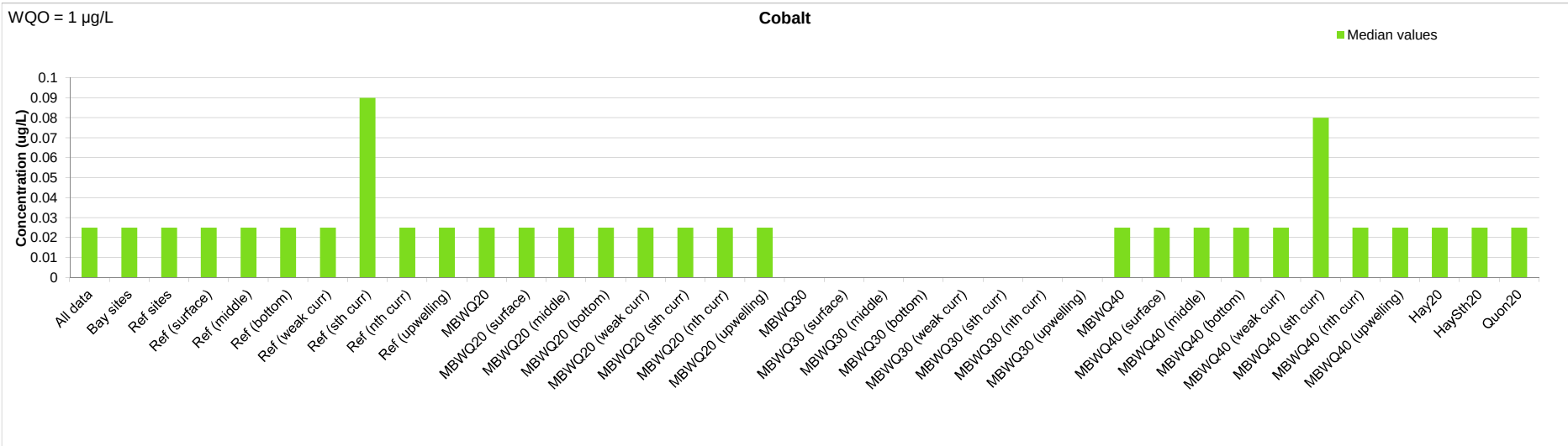
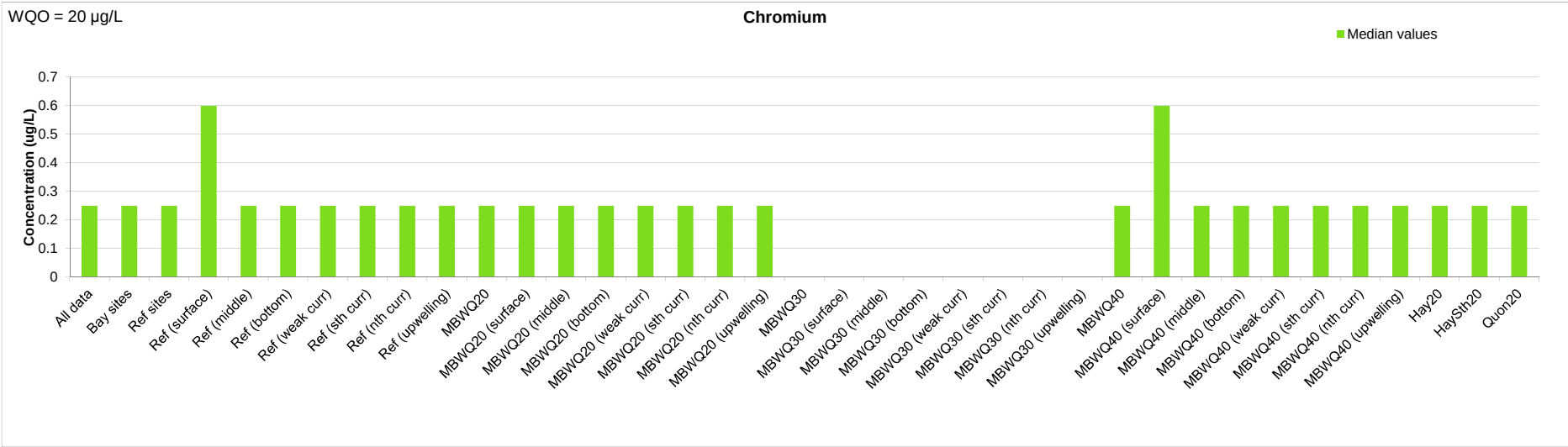
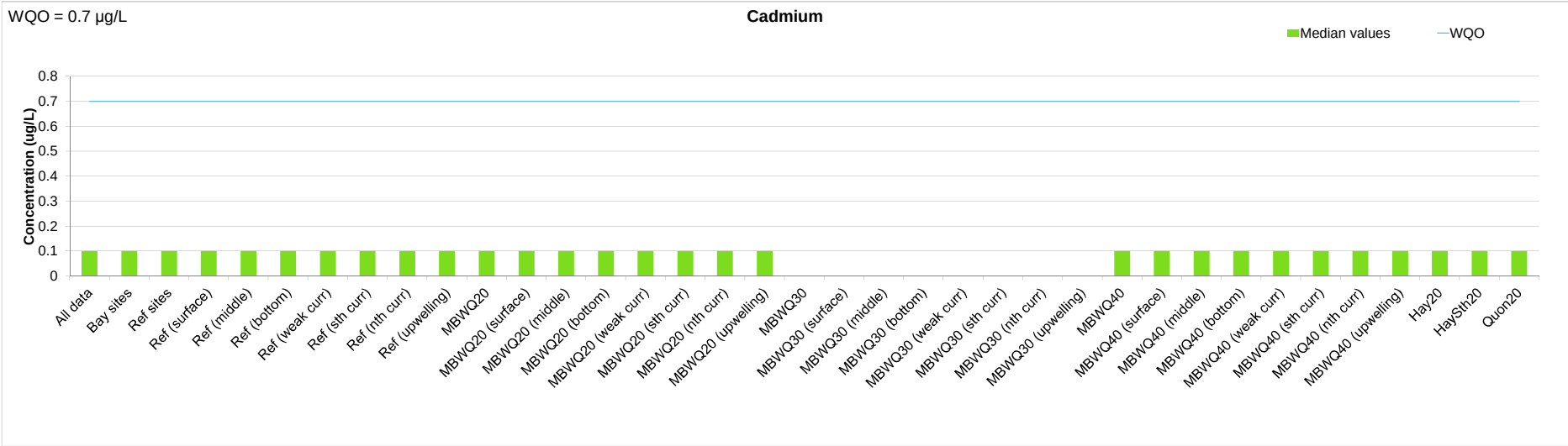
No.	Category	Site	Subset of data used
28	MBWQ40 (surface)	Merimbula bay 40 m depth	Top of water column sample data
29	MBWQ40 (middle)	Merimbula bay 40 m depth	Mid-depth of water column sample data
30	MBWQ40 (bottom)	Merimbula bay 40 m depth	Bottom of water column sample data
31	MBWQ40 (weak curr)	Merimbula bay 40 m depth	Weak N or S offshore current, not apparent
32	MBWQ40 (sth curr)	Merimbula bay 40 m depth	Strong South flowing offshore current
33	MBWQ40 (nth curr)	Merimbula bay 40 m depth	Strong North flowing offshore current
34	MBWQ40 (upwelling)	Merimbula bay 40 m depth	Upwelling event occurring
35	Hay20	Off Haycock Point 20 m depth	All data
36	HaySth20	South of Haycock Point 20 m depth	All data
37	Quon20	Off Quondolo Point 20 m depth	All data

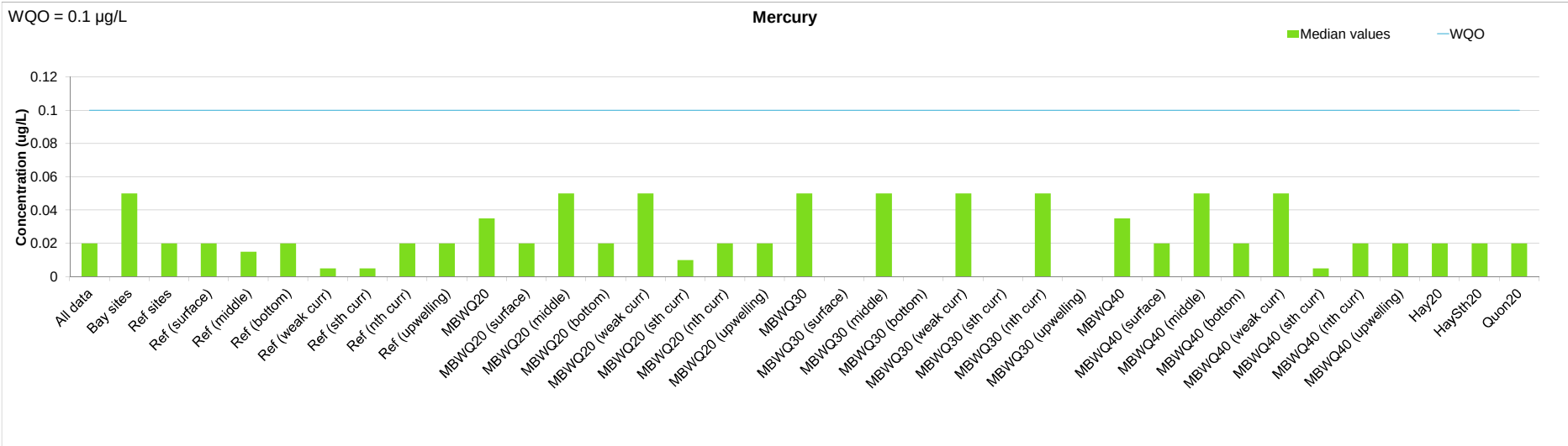
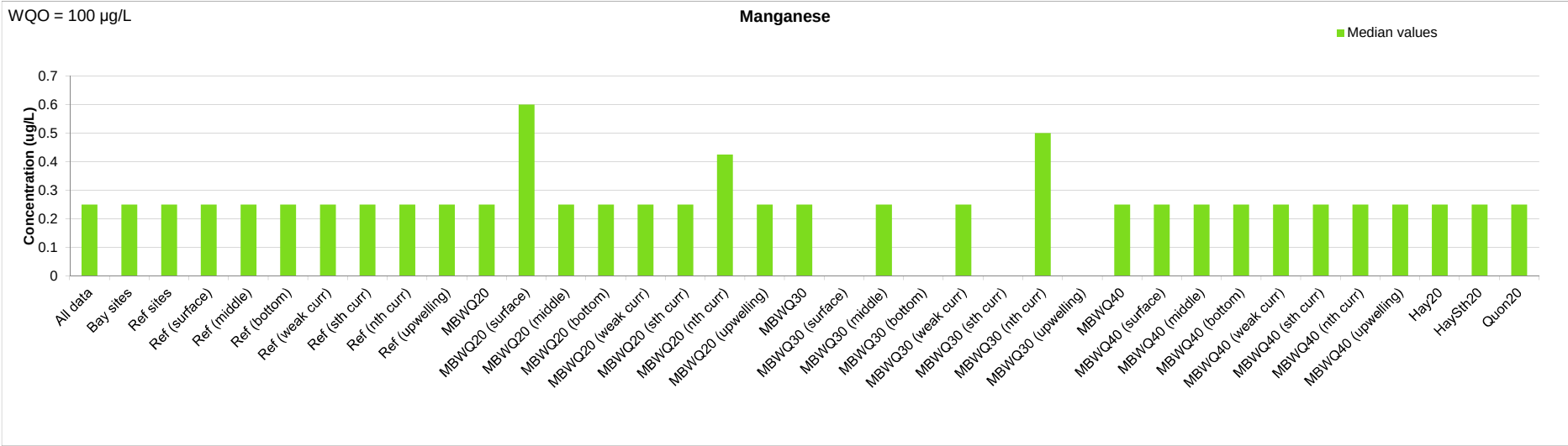
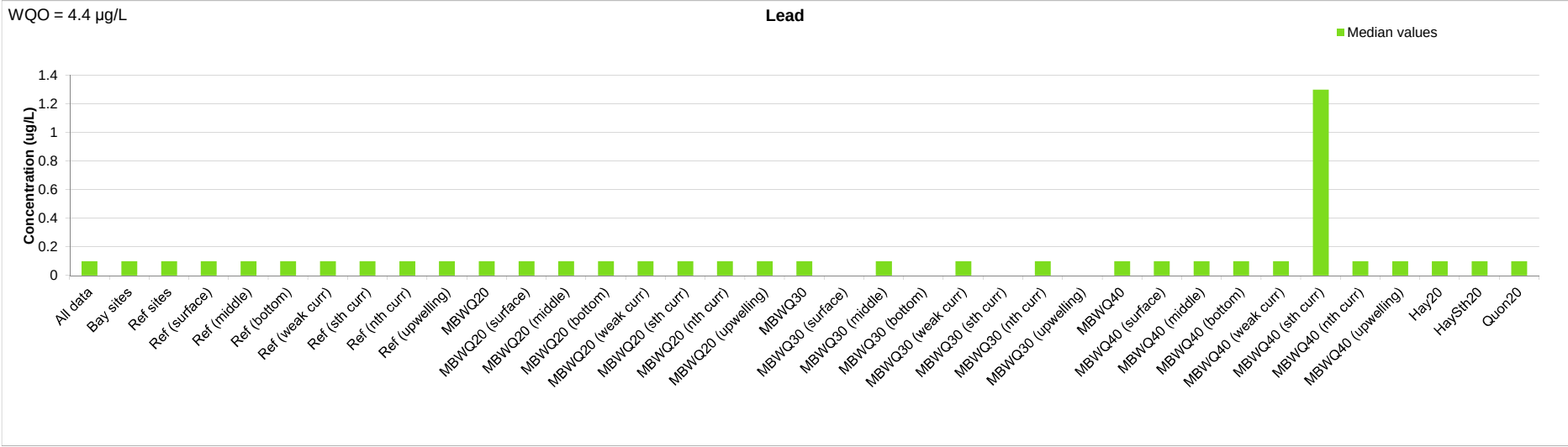
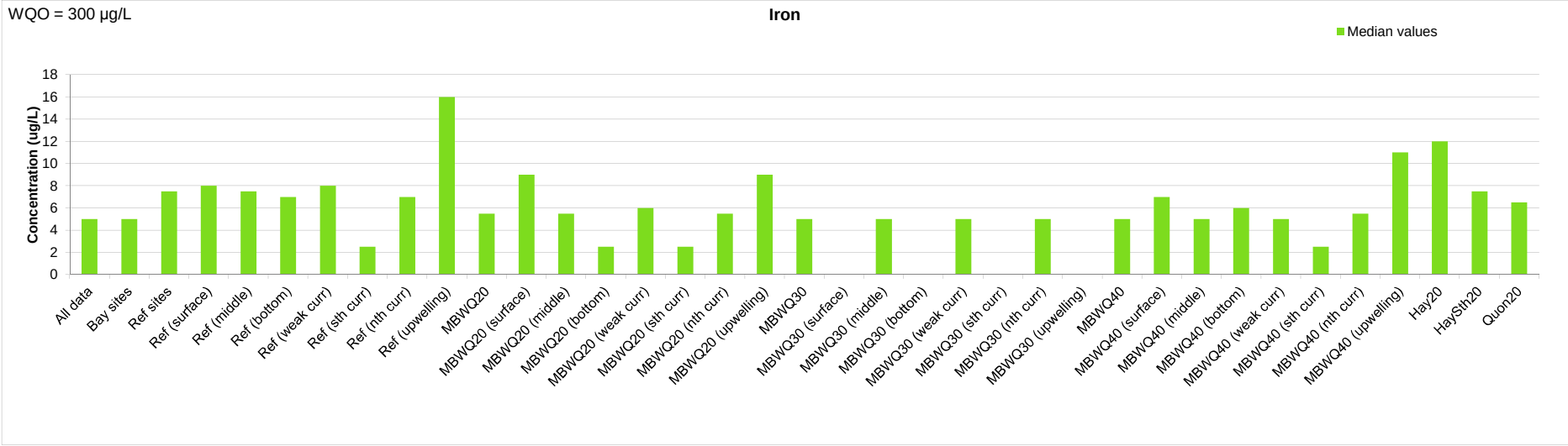


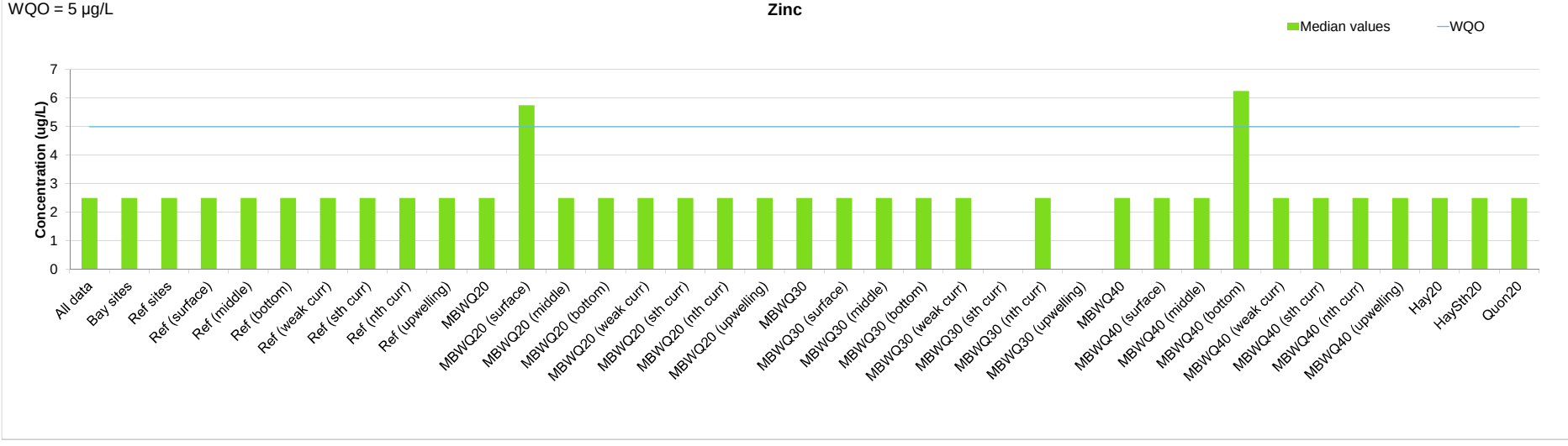
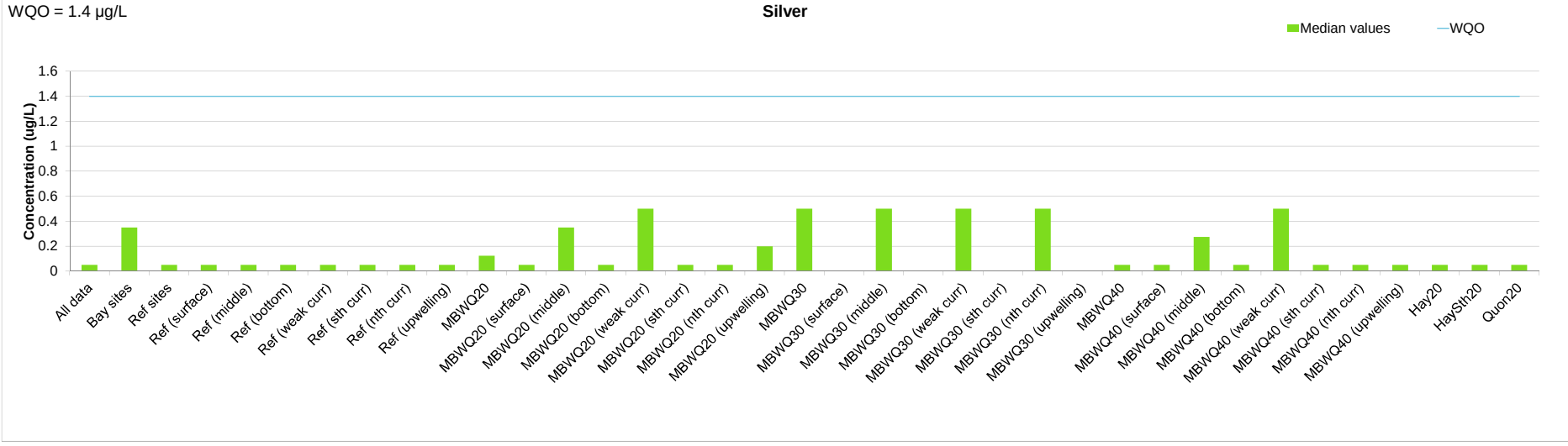
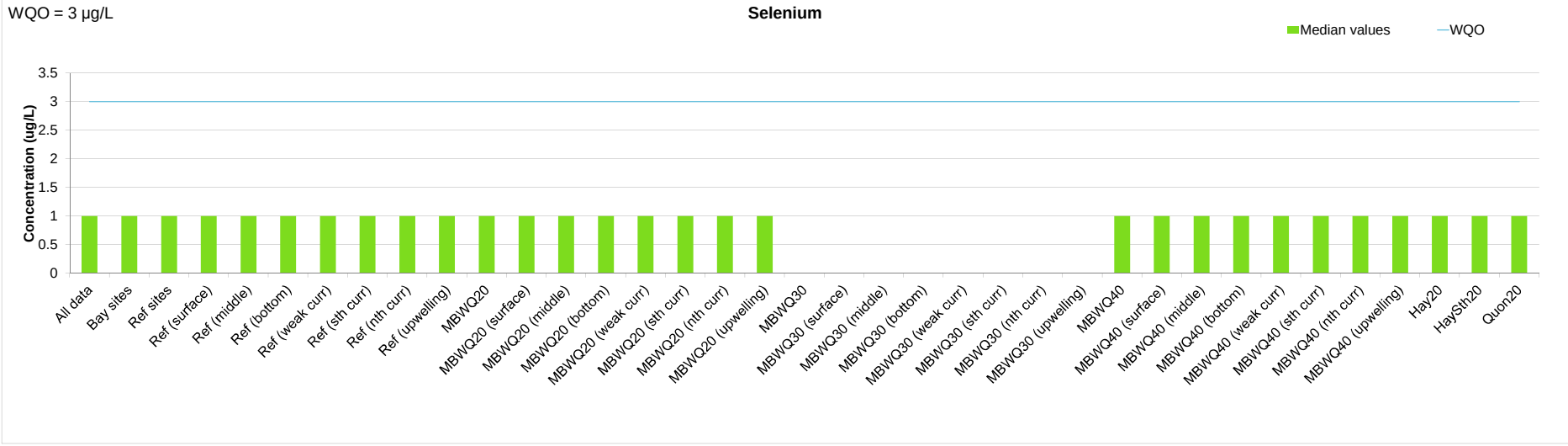
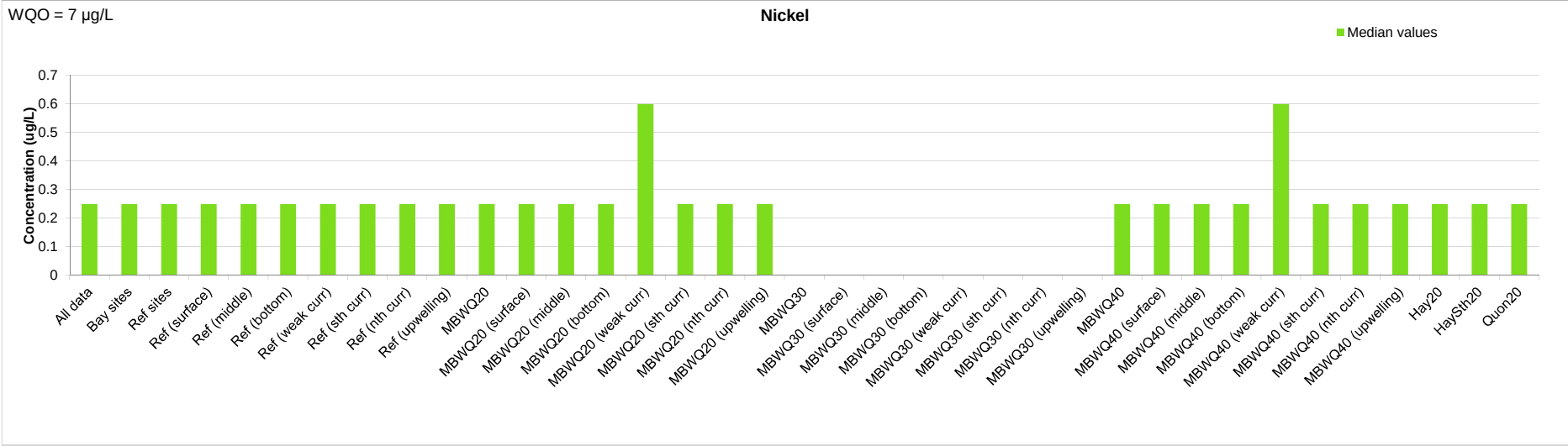


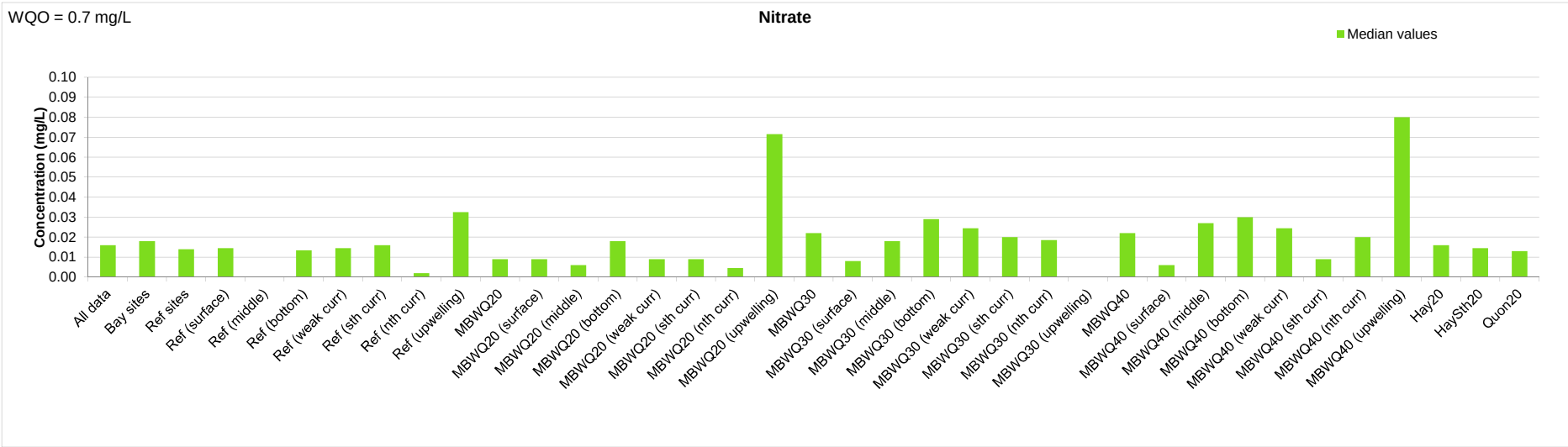
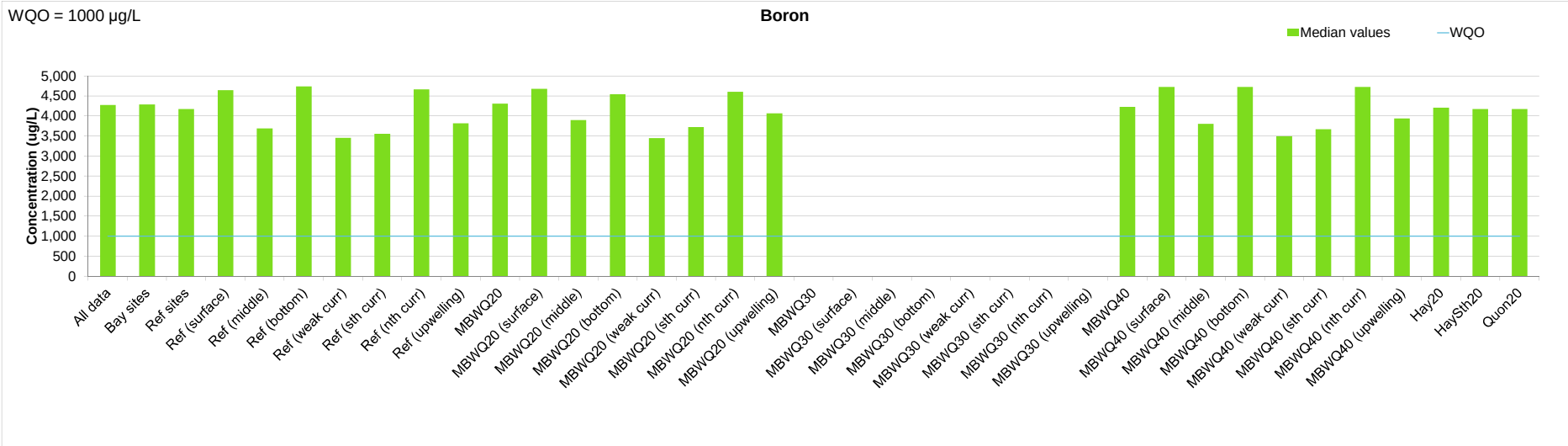
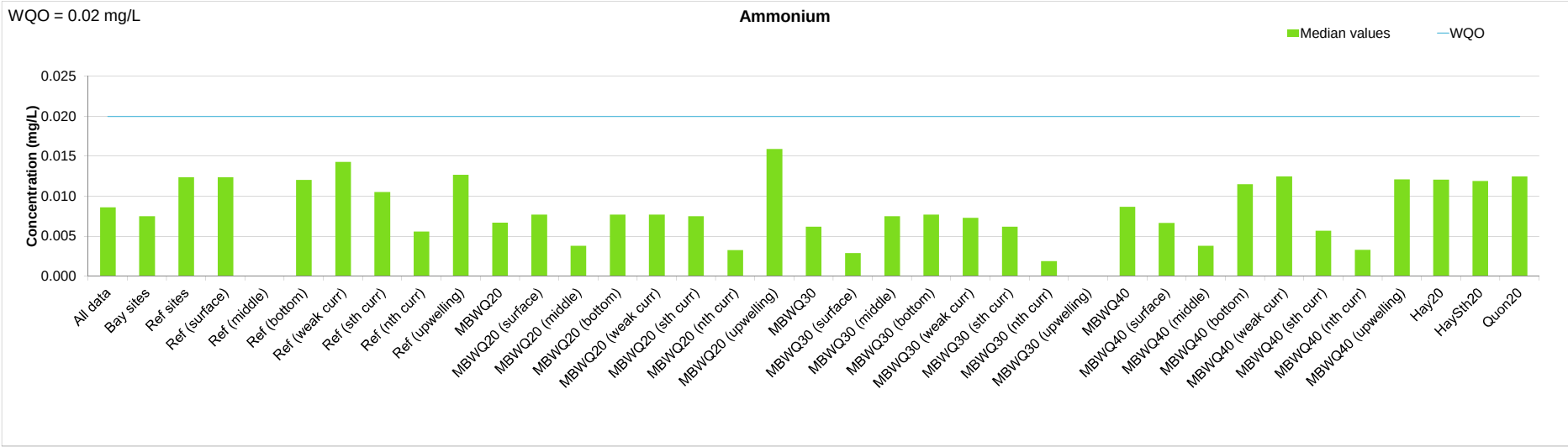
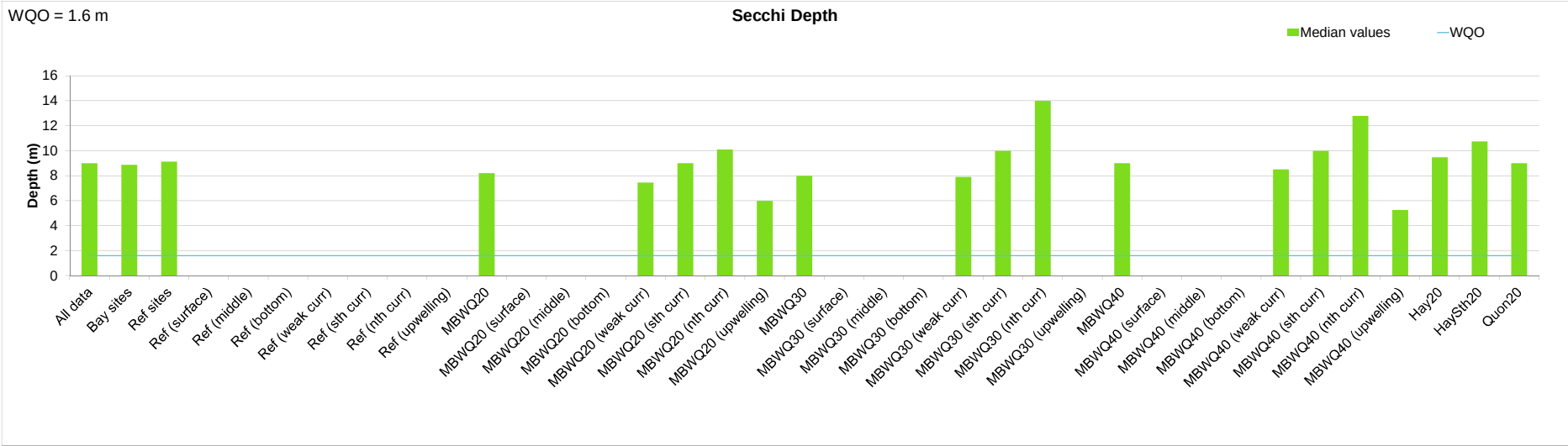


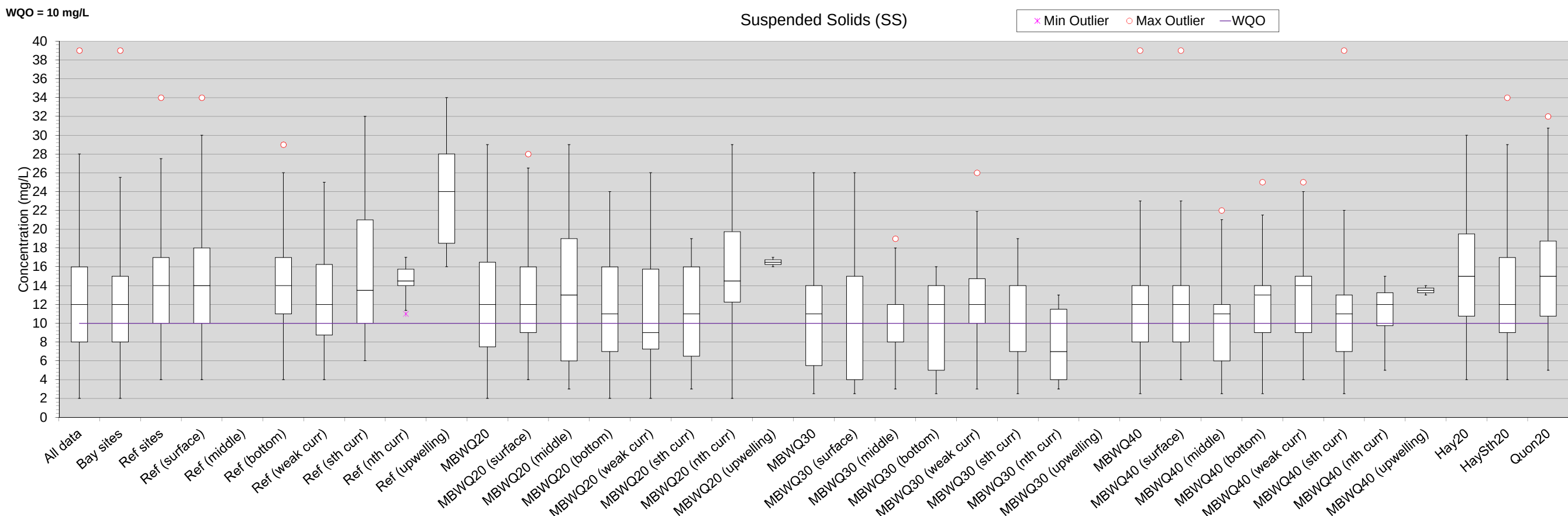
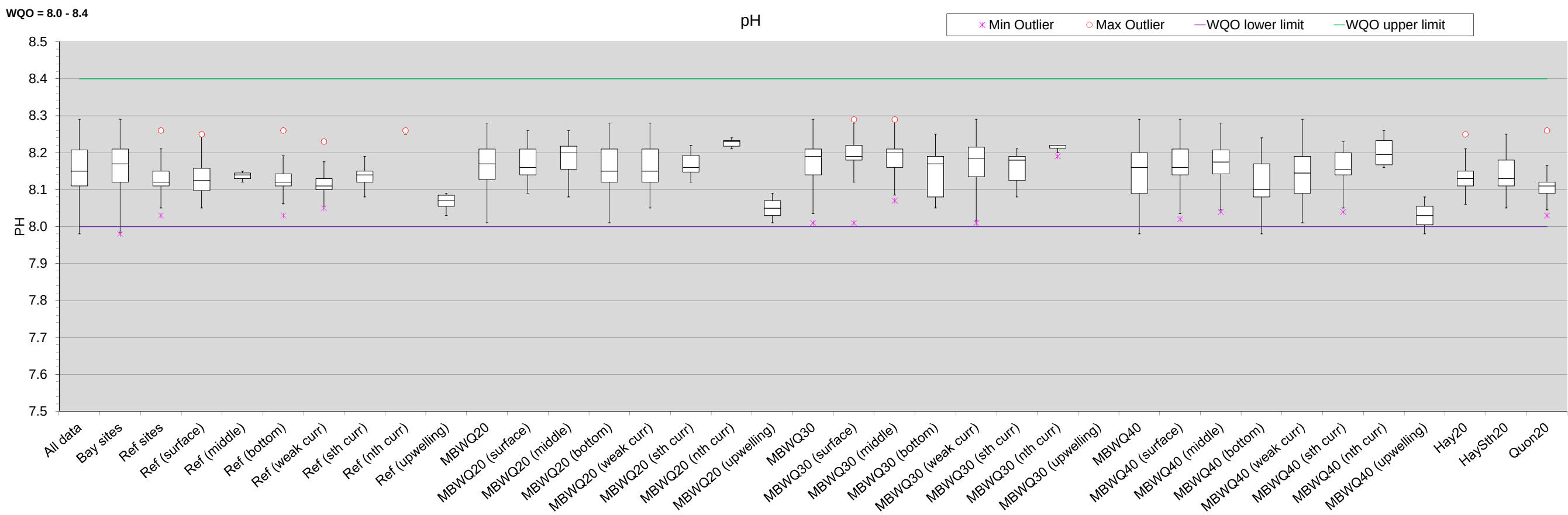


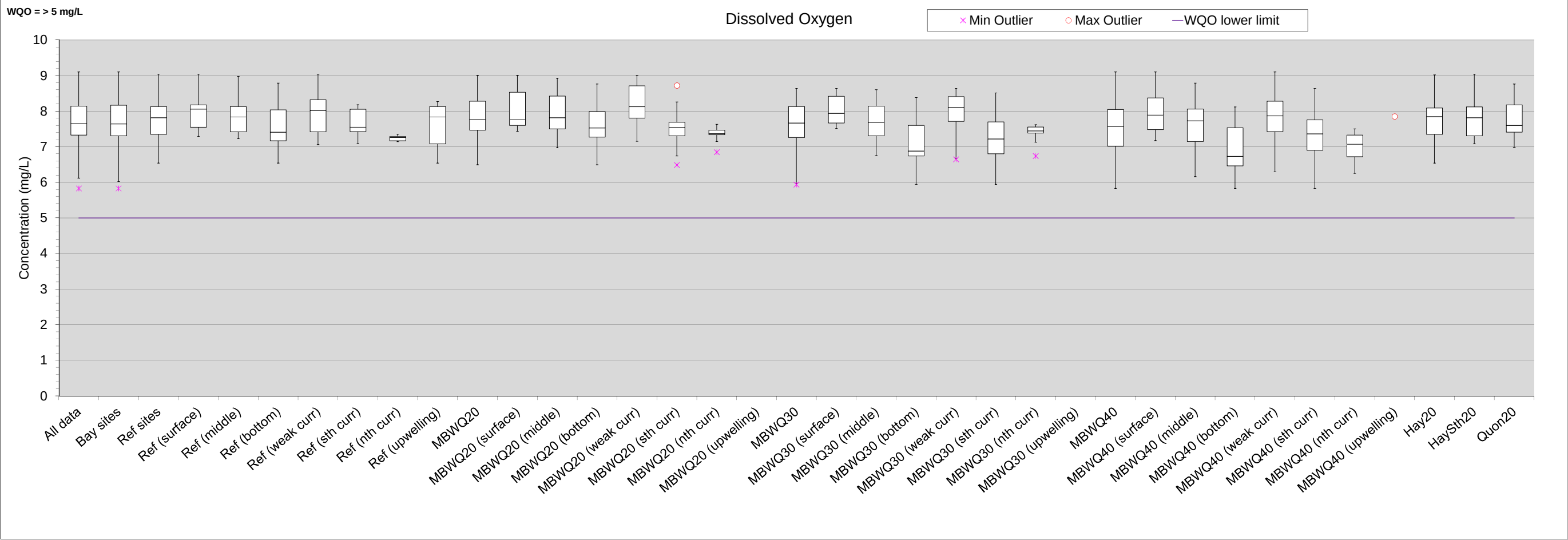
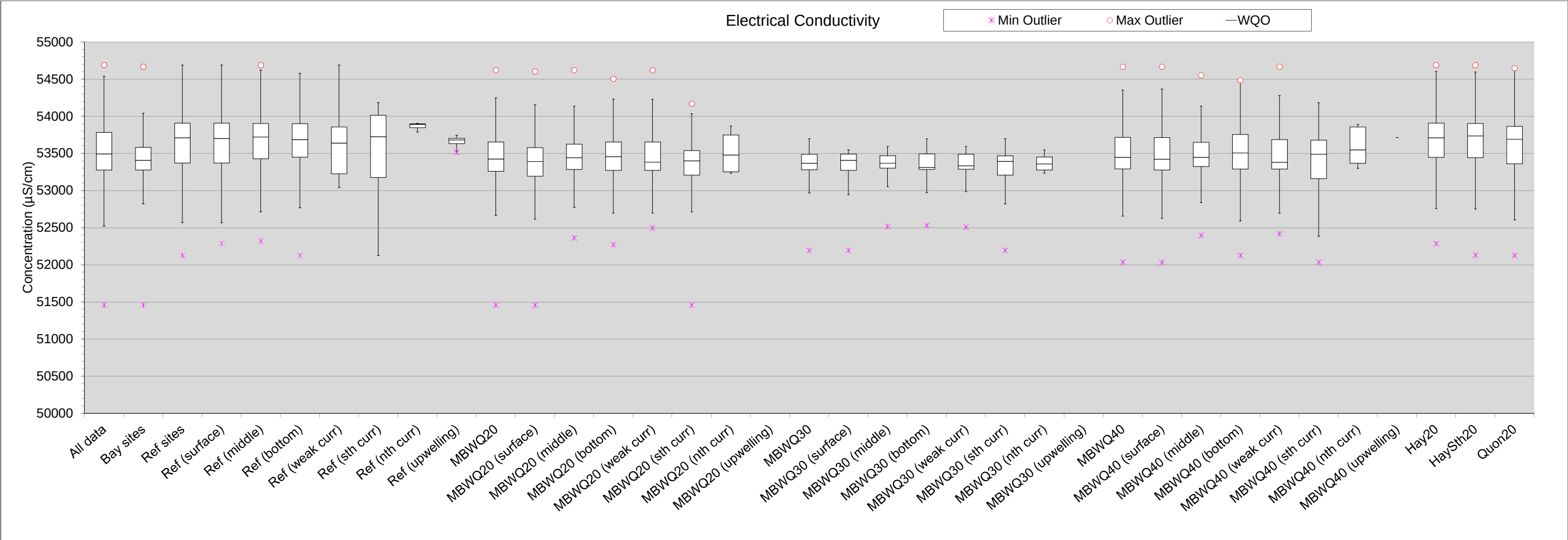


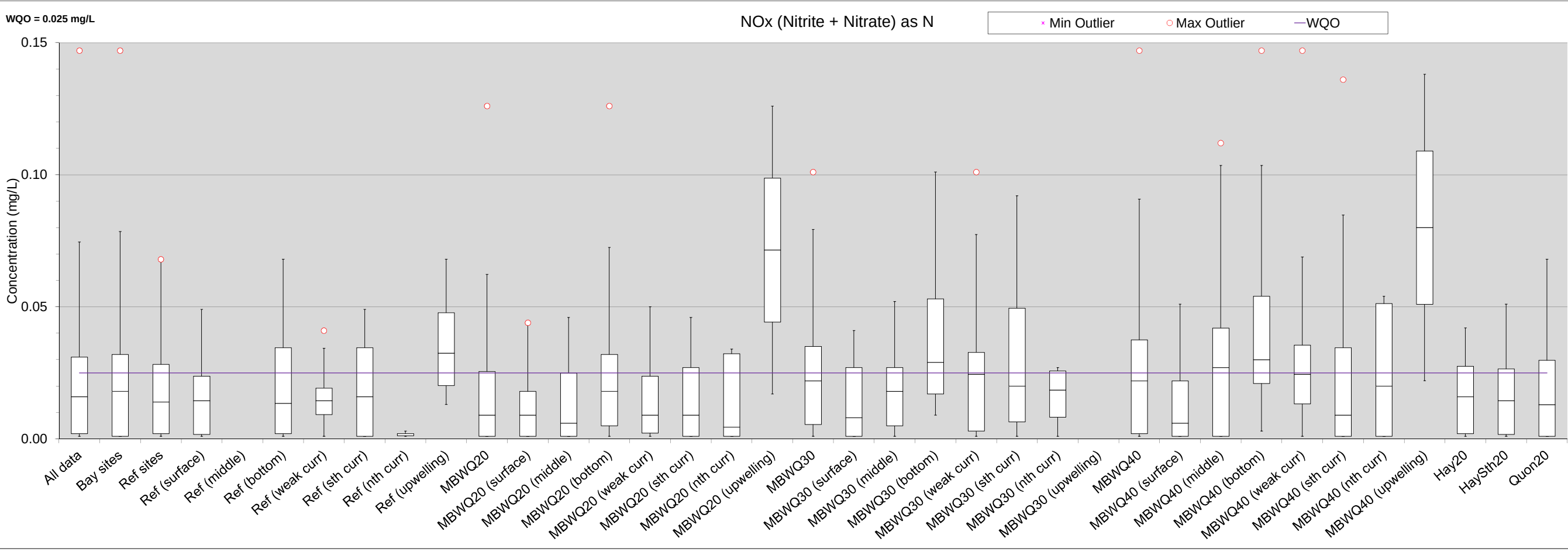
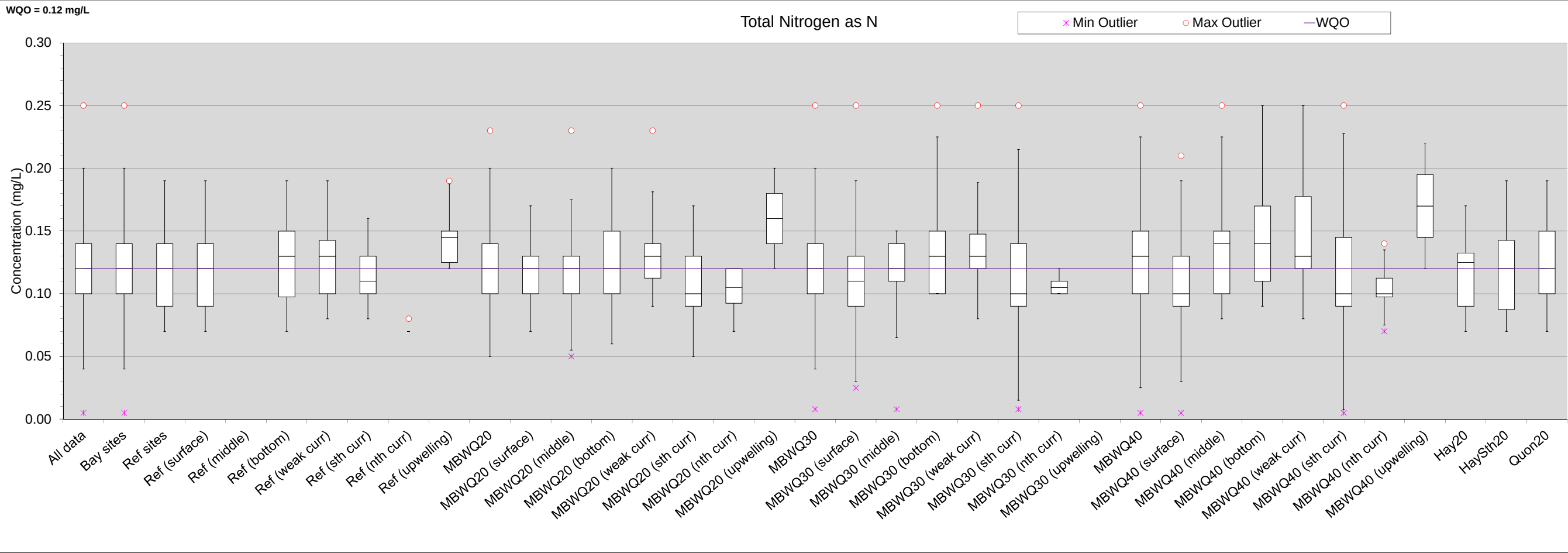


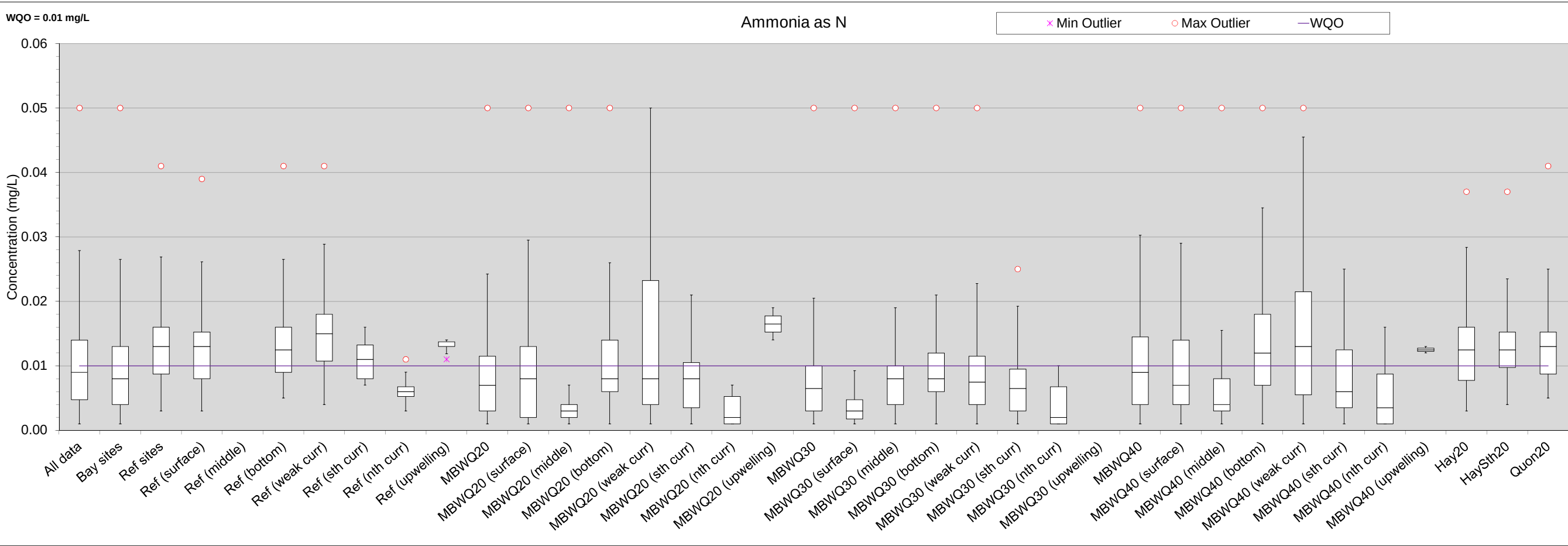
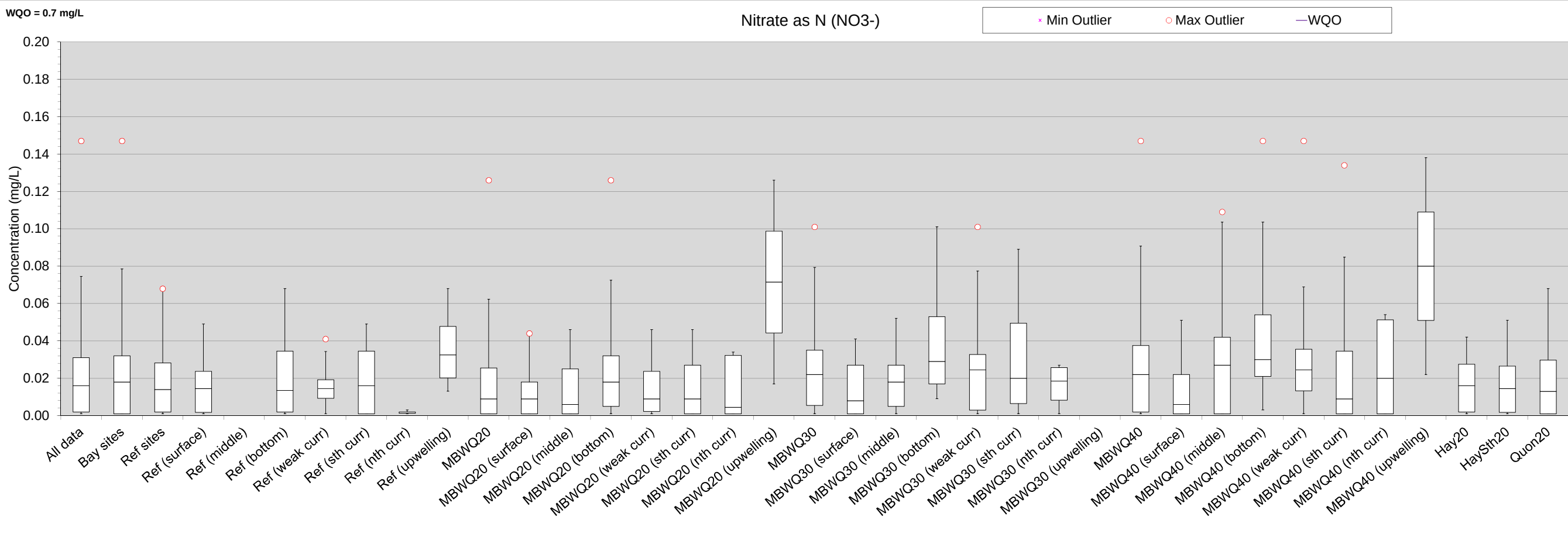


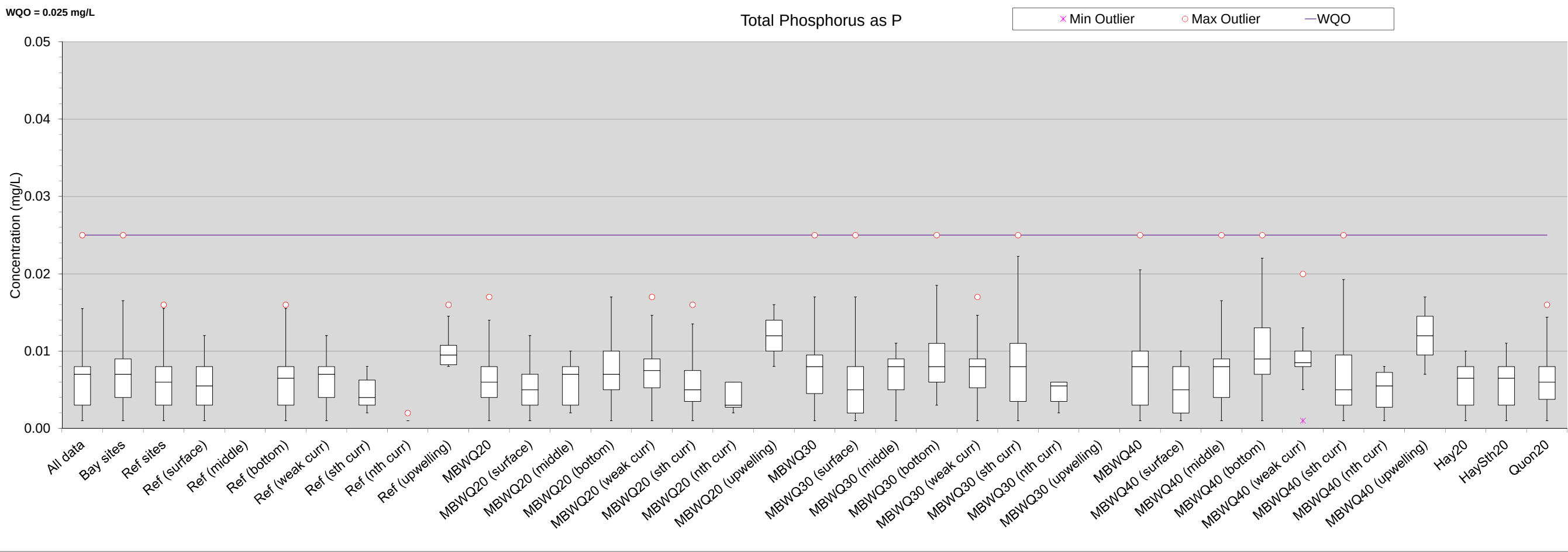
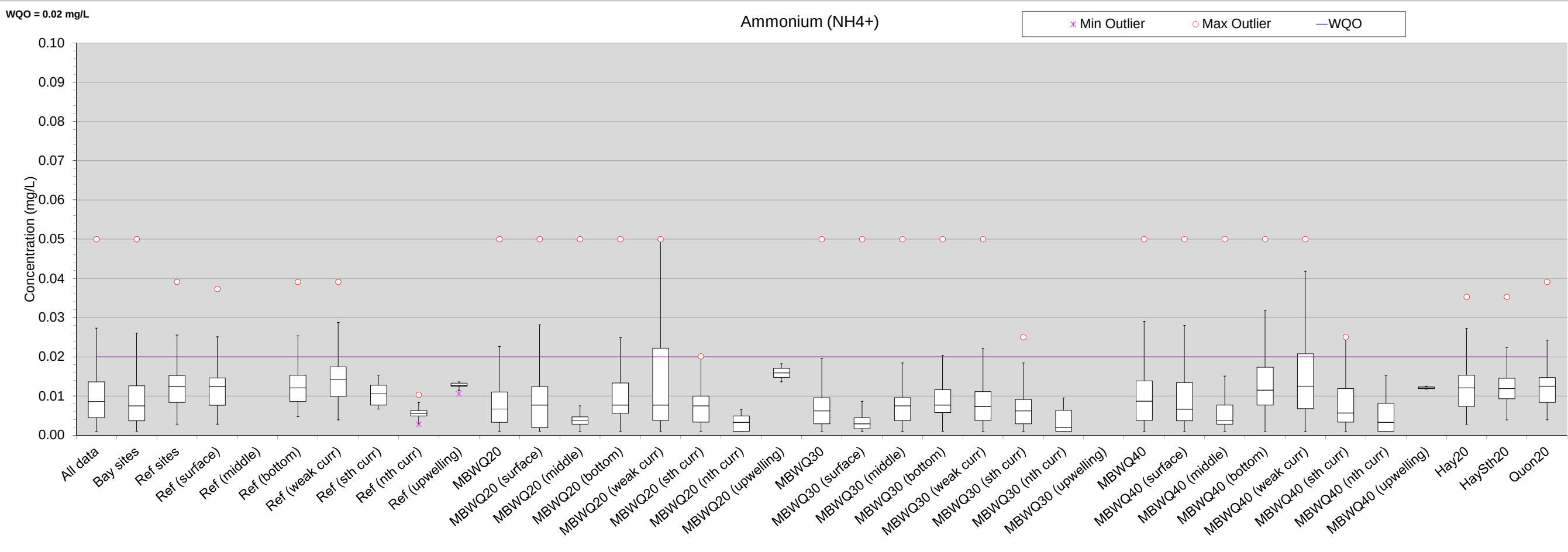


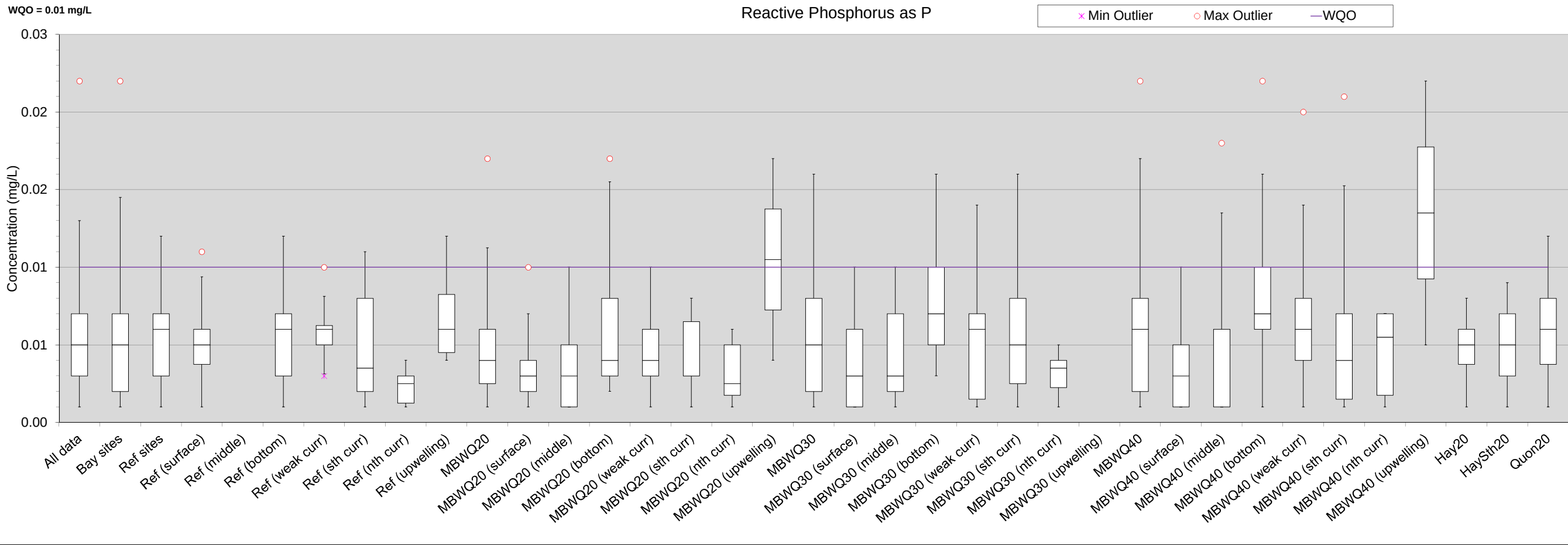
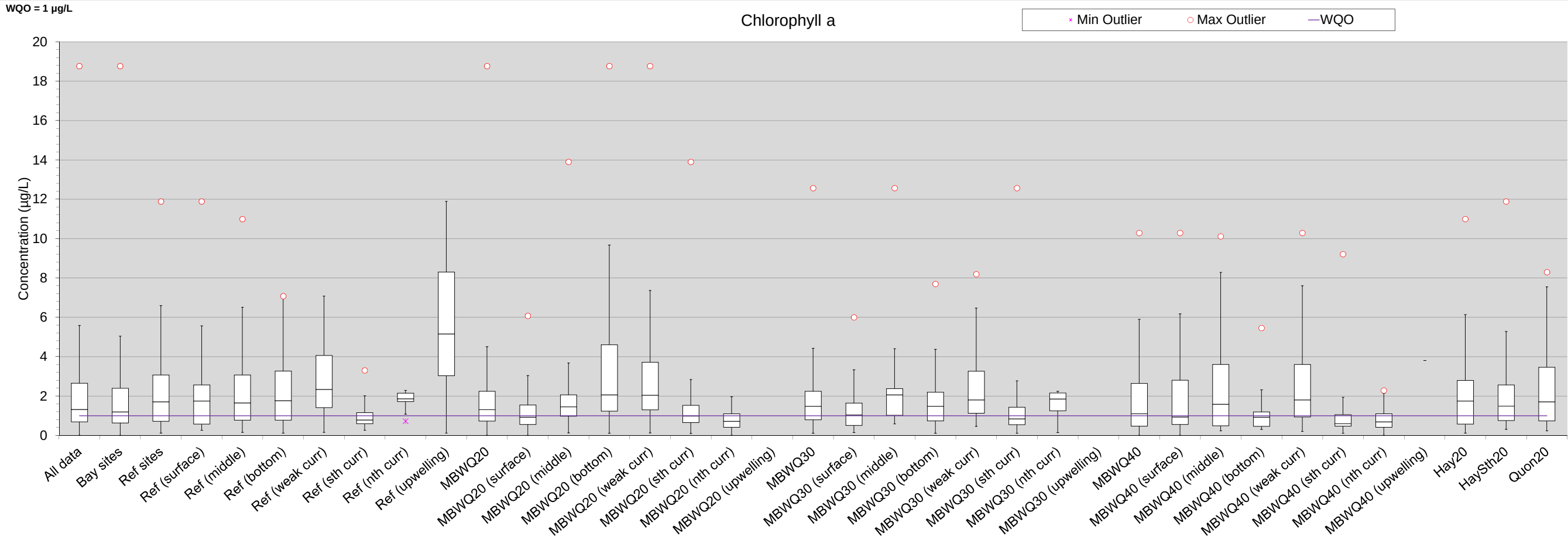


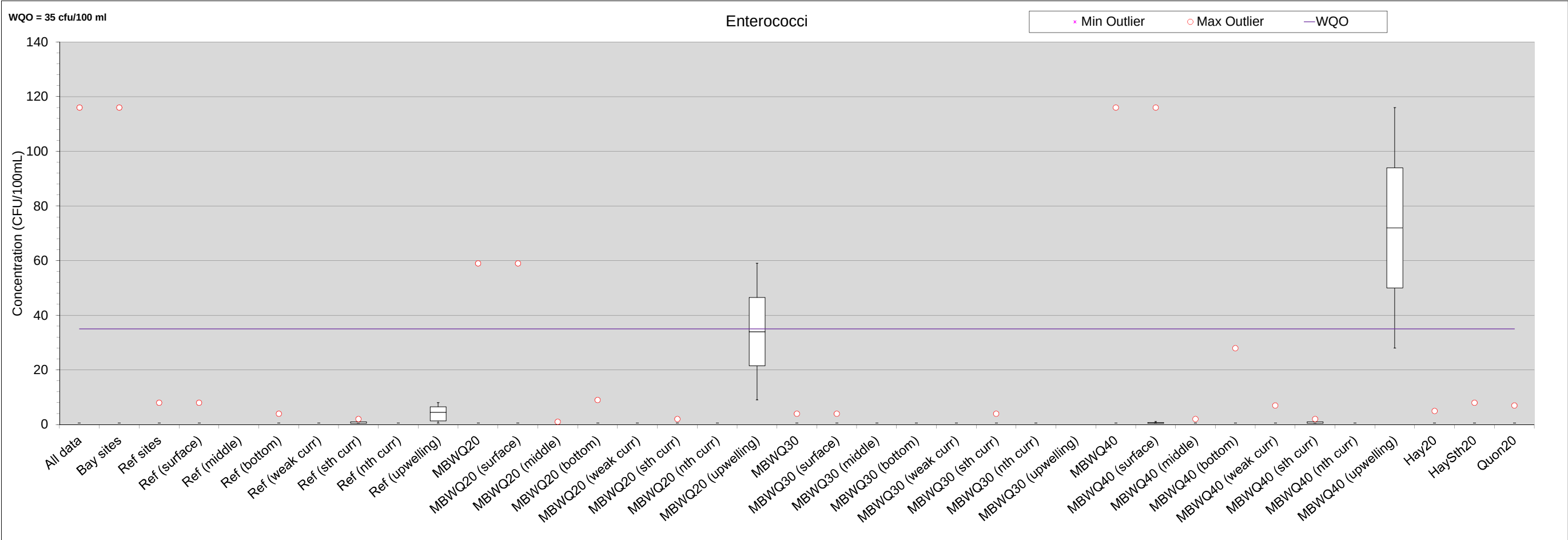
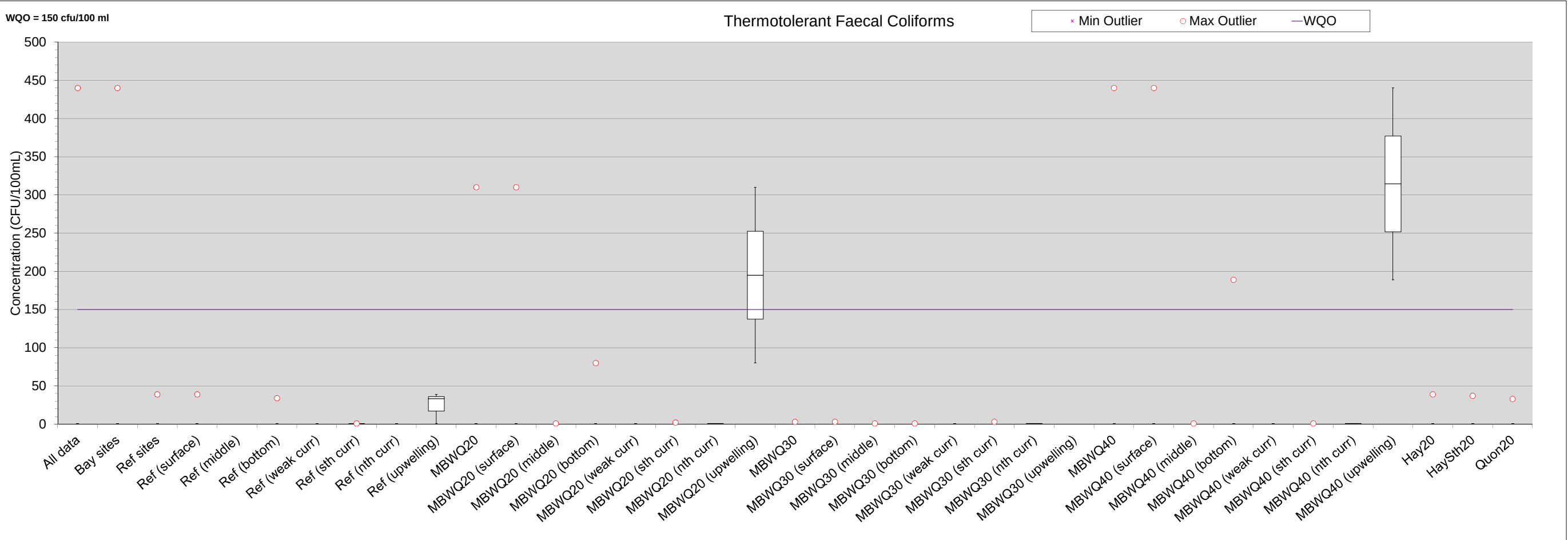












Attachment 2 – Ambient Water Quality Review

Table 9 Summary of ambient water quality analysis

Indicator	Units	Adopted Ambient Water Quality (AWQ)	Assumption	Number of samples AWQ based on	Observations
pH	pH units	8.17	Median of Bay sites	163	Median values were slightly higher for north current events but not a significant trend. Results generally within the bounds of the WQO lower and upper limits
Suspended solids	mg/L	12	Median of Bay sites excluding upwelling event samples	161	Median values were higher for the reference site and MBWQ20 upwelling events. Limited upwelling data available. Median values generally exceeded WQO
Turbidity	NTU	0.3	Median of Bay sites	184	Median values were higher in bottom waters at sites MBWQ20 and MBWQ30
Electrical Conductivity	µS/cm	53,408	Median of Bay sites	184	No obvious trend, relatively consistent
Dissolved Oxygen	mg/L	7.6	Median of Bay sites	178	Median values slightly higher for weak current events but trend not significant. All values were above and therefore did not exceed the WQO
Secchi depth	m	8.9	Median of Bay sites	58	Median values slightly higher for north current events. Trend was not significant
Total Nitrogen (TN)	mg/L	0.12	Median of Bay sites excluding upwelling event samples	161	Was equal to or exceeded WQO with exception of Reference sites (middle), MBWQ20 north and MBWQ30 north. Median highest for upwelling events
Oxides of Nitrogen (NO _x)	mg/L	0.017	Median of Bay sites excluding upwelling event samples	161	Obvious trend showing increases in concentration for upwelling event. Limited upwelling data available. Some median values above the WQO
Nitrate	mg/L	0.017	Median of Bay sites excluding upwelling event samples	161	Obvious trend showing increases in concentration for upwelling event. Limited upwelling data available. All

Indicator	Units	Adopted Ambient Water Quality (AWQ)	Assumption	Number of samples AWQ based on	Observations
					values below WQO
Ammonia	mg/L	0.008	Median of Bay sites	164	Weak current events tended to show slightly higher concentrations but median values showed no obvious trend. Some median values were above the WQO
Ammonium	mg/L	0.008	Median of Bay sites	164	No obvious trend, median values below WQO
Total Phosphorus	mg/L	0.007	Median of Bay sites excluding upwelling event samples	161	Median values higher for upwelling events. Concentrations typically below the WQO
Orthophosphate	mg/L	0.004	Median of Bay sites excluding upwelling event samples	161	Median values were higher for the MBWQ20 and MBWQ40 upwelling events although reference site upwelling events aligned with other events. Concentrations mostly below the WQO
Chlorophyll a	µg/L	1.2	Median of Bay sites excluding upwelling event samples	183	Upwelling monitoring only undertaken at reference site. Data typically above the WQO for all areas with the reference upwelling median being the most significant exceedance
Faecal coliforms	cfu/100 ml	0.5	Median of Bay sites excluding upwelling event samples	161	Limited data above LOR with the exception of upwelling events
Enterococci	cfu/100 ml	0.5	Median of Bay sites excluding upwelling event samples	143	Limited data above LOR with the exception of upwelling events
Aluminium	µg/L	4.5	Median of Bay sites	30	Median values were higher for the upwelling events but limited data available to confirm trend. No impact on median value if upwelling events excluded
Antimony	µg/L	0.25	Median of Bay sites	12	Limited data available to detect trends, all below the LOR and WQO
Arsenic	µg/L	1.8	Median of Bay sites	15	Limited data available to detect trends, median values below the WQO, no obvious trend
Barium	µg/L	5.9	Median of Bay sites	15	Limited data available to detect trends, median values below the WQO, no obvious trend
Boron	µg/L	4295	Median of Bay sites	12	Limited data available to detect trends, median values generally above the WQO. Only recreational WQO available for Boron, which does not consider higher values typically in the marine environment.
Cadmium	µg/L	0.1	Median of Bay sites	12	Limited data available to detect trends, all below LOR

Indicator	Units	Adopted Ambient Water Quality (AWQ)	Assumption	Number of samples AWQ based on	Observations
					and well below WQO
Chromium	µg/L	0.25	Median of Bay sites	15	Limited data available to detect trends, mostly below LOR and well below WQO
Cobalt	µg/L	0.025	Median of Bay sites	12	Limited data available to detect trends, mostly below LOR and well below WQO
Copper	µg/L	0.20	Median of Bay sites	36	Limited data available to detect trends. Some median values above WQO
Iron	µg/L	5	Median of Bay sites	30	Median values were slightly higher for upwelling events were slightly higher but limited data available to confirm trend. No impact on median value if upwelling events excluded.
Lead	µg/L	0.1	Median of Bay sites	30	Limited data available to detect trends, mostly below LOR and all below WQO
Manganese	µg/L	0.25	Median of Bay sites	30	Limited data available to detect trends, all below WQO
Mercury	µg/L	0.05	Median of Bay sites	30	Limited data available to detect trends, all below WQO
Nickel	µg/L	0.25	Median of Bay sites	12	Limited data available to detect trends, all below WQO
Selenium	µg/L	1	Median of Bay sites	12	Limited data available to detect trends, all below LOR and WQO
Silver	µg/L	0.35	Median of Bay sites	30	Limited data available to detect trends, typically below WQO
Zinc	µg/L	2.50	Median of Bay sites	36	Limited data available to detect trends, mostly below LOR and generally below WQO

Attachment 3 - Treated effluent water quality assumptions

Table 10 Treated effluent water quality assumptions

Indicator	Units	Treated effluent	Assumption
pH	pH units	6.5-8.5	Discharge criteria - 100 th percentile limit (AECOM, 2018)
Suspended solids	mg/L	30	Discharge criteria - 100 th percentile limit (AECOM, 2018)
Electrical Conductivity	µS/cm	874	90 th percentile of historical monitoring data
Dissolved Oxygen	mg/L	12.9	90 th percentile of historical monitoring data
Total Nitrogen	mg/L	15	Discharge criteria - 100 th percentile limit (AECOM, 2018)
Oxides of Nitrogen (NOx)	mg/L	8.06	90 th percentile of historical monitoring data
Ammonia	mg/L	5	Discharge criteria - 100 th percentile limit (AECOM, 2018)
Total Phosphorus	mg/L	13	Discharge criteria - 90 th percentile limit (AECOM, 2018)
Orthophosphate	mg/L	11	90 th percentile of historical monitoring data
Chlorophyll a	µg/L	68.8	90 th percentile of historical monitoring data
Faecal coliforms	cfu/100 ml	200	Discharge criteria - 90 th percentile limit (AECOM, 2018)
Enterococci	cfu/100 ml	188	90 th percentile of historical monitoring data
Aluminium	µg/L	74.6	90 th percentile of historical monitoring data
Antimony	µg/L	1.5	90 th percentile of historical monitoring data
Arsenic	µg/L	3	90 th percentile of historical monitoring data
Barium	µg/L	10.2	90 th percentile of historical monitoring data
Boron	µg/L	80	90 th percentile of historical monitoring data
Cadmium	µg/L	0.025	90 th percentile of historical monitoring data
Chromium (Total)	µg/L	1	90 th percentile of historical monitoring data
Cobalt	µg/L	0.5	90 th percentile of historical monitoring data
Copper	µg/L	272.2	90 th percentile of historical monitoring data
Iron	µg/L	706	90 th percentile of historical monitoring data
Lead	µg/L	5.6	90 th percentile of historical monitoring data
Manganese	µg/L	54.2	90 th percentile of historical monitoring data

Indicator	Units	Treated effluent	Assumption
Mercury	µg/L	0.05	90 th percentile of historical monitoring data
Nickel	µg/L	3	90 th percentile of historical monitoring data
Selenium	µg/L	7.8	90 th percentile of historical monitoring data
Silver	µg/L	0.5	90 th percentile of historical monitoring data
Zinc	µg/L	140.4	90 th percentile of historical monitoring data

ANNEXURE B

Table B1	Summary of laboratory analysis for Merimbula ocean outfall ambient WQ monitoring
Table B2	Summary of Task 2 – Post rainfall estuary WQ monitoring
Table B3	Ambient marine water quality data (2014-2017)
Table B4	Beachwatch data (2009-2020)
Table B5	Merimbula Lake (2012-2016)
Table B6	Pambula River estuary (2010-2016)

Table B1. Summary of laboratory analysis for Merimbula ocean outfall ambient WQ monitoring

Sample Round	Date	ALS Lab batch#	Routine Analytical Suite ¹	Total Metals ²	Sediment	Comments
1	28 Oct 2014	CA1403378	✓			
2	25 Nov 2014	CA1403766	✓	✓		
3	15 Dec 2014	CA1404151	✓			
4	7 Jan 2015	CA1500059	✓			
5	19 Feb 2015	CA1500637	✓			
6	11 Mar 2015	CA1500955	✓	✓		
7	28 Apr 2015	CA1501571	✓			
8	18 May 2015	CA1501865	✓			
9	11 Jun 2015	CA1502271	✓			Sampling conducted to coincide with MHL sampling.
10	21 Jul 2015	CA1202887_2	✓	✓		
11	11 Aug 2015	CA1503216	✓			
12	15 Sept 2015	CA1503729 ES1531417	✓	✓		QAQC samples collected for metals
13	14 Oct 2015	CA1504249 ES1533819	✓			Additional sampling round conducted to coincide with MHL sampling.
New monitoring program commenced in 2016, modified to include sites at Haycock Point and Quondolo. Monitoring at MBWQ30 discontinued.						
14	6 Apr 2016	CA1602105	✓	✓		Total metals at all depths
15	16 May 2016	CA1602818	✓	✓		Total metals mid-water depths only
16	29 Jun 2016	CA1603700	✓			
17	21 Jul 2016	CA1604118	✓			
18	17 Aug 2016	CA1604595	✓			
19	28 Sep 2016	CA1605519	✓	✓		Total metals mid-water depths only
20	19 Oct 2016	CA1605915	✓			
21	17 Nov 2016	CA1606486	✓			
22	12 Dec 2016	CA1607024	✓		✓	Total metals sediments
23	1 Feb 2017	CA1700618	✓			
24	21 Mar 2017	CA1701668 ES1706999	✓	✓		Total metals mid-water depths only
25	19 Apr 2017		✓	✓		Total metals mid-water depths only

Note

¹ Routine analytical suite includes: pH, TSS, nutrients (NH₃, NO₂, NO₃, NO_x, TN, TP, PO₄), and biological parameters (Chl *a*, faecal coliforms, *enterococci*)

² Total metals includes: Al, Be, As, Fe, Cr, Mn, Cu, Zn, Ni, Se, V, Sb, Ba, Cd, Co, Pb, Ag, and Hg

Table B2. Summary of Task 2 – Post rainfall event estuary WQ monitoring

Sample Round	Date	ALS Lab batch#	Rainfall intensity ²	Routine Analytical Suite ¹	Comments
1	9 Apr 2015	CA1501316	2mm/hr	✓	ARI event <1 year (AEP >63%)
2	31 Jan 2016	CA1600667	35 mm/hr	✓	ARI event 10 to 20 years (AEP 5 to 10%)
3	5 Jun 2016	CA1603240	4.36 mm/hr	✓	ARI event 1 to 2 years (AEP of 39 to 63%)
	6 Jun 2016		4.08 mm/hr	✓	ARI event 2 to 5 years (AEP of 18 to 39%)

Note

¹ Routine analytical suite includes: pH, TSS, nutrients (NH₃, NO₂, NO₃, NO_x, TN, TP, PO₄), and biological parameters (Chl *a*, faecal coliforms, *enterococci*)

² Rainfall analysis refer <http://www.bom.gov.au/hydro/has/cdirswebx/cdirswebx.shtml>

Table B3 - Merimbula Ambient Marine Water Quality (2014 - 2017)

Sample ID	Sample Type	Sample Date	Sample Time	FIELD PARAMETERS ⁵								LABORATORY PARAMETERS ⁶										
				DO	DO	Turbidity	Chlorophyll a (adjusted) ⁷	Salinity	Conductivity	Temperature	pH	Suspended Solids (SS)	Ammonia as N	Ammonium (NH ₄) ⁸	Nitrite as N	Nitrate as N	NOx (Nitrite + Nitrate) as N	Total Nitrogen as N	Total Phosphorus as P	Reactive Phosphorus as P	Chlorophyll a	
				%	mg/L	ntu	µg/L	ppt	µS/cm	°C	pH Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	
				-	-	-	-	-	-	-	0.01	2	0.002	0.002	0.002	0.002	0.002	0.05	0.002	0.002	0.02	
Limit of Reporting (LOR)				-	-	-	-	-	-	-	-	-	0.01	2	0.002	0.002	0.002	0.05	0.002	0.002	0.02	
Aquatic Ecosystems ¹				90 - 110	-	-	1	-	-	-	-	8.0 - 8.4	-	-	0.02	0.025	0.025	0.025	0.12	0.025	0.01	1
Toxicants in Marine Waters - 95% species protection ²				-	-	-	-	-	-	-	-	-	-	0.91	-	-	-	-	-	-	-	
ANZECC - Primary Contact Recreation ³				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
MBWQ20 1 28/10/14	WATER	28-Oct-14	11:55	109.7	8.71	0	1.67	34.62	52,495	16.36	8.20	6	<0.1	<0.1	<0.01	<0.05	<0.05	0.13	<0.01	<0.02	4.49	
MBWQ20 10 28/10/14	WATER	28-Oct-14	11:40	110.6	8.92	0	10.12	34.63	52,527	15.55	8.19	4	<0.1	<0.1	<0.01	<0.05	<0.05	0.15	0.01	<0.02	-	
MBWQ20 20 28/10/14	WATER	28-Oct-14	11:35	100.9	8.17	0	7.02	34.63	52,544	15.34	8.15	6	<0.1	<0.1	<0.01	<0.05	<0.05	0.16	0.01	<0.02	-	
MBWQ30 1 28/10/14	WATER	28-Oct-14	11:20	107.4	8.64	0	2.51	34.62	52,507	15.71	8.19	4	<0.1	<0.1	<0.01	<0.05	<0.05	0.13	<0.01	<0.02	-	
MBWQ30 15 28/10/14	WATER	28-Oct-14	11:10	106.4	8.59	0.1	8.19	34.61	52,515	15.49	8.17	3	<0.1	<0.1	<0.01	<0.05	<0.05	0.15	0.01	<0.02	-	
MBWQ30 30 28/10/14	WATER	28-Oct-14	11:00	92.9	7.6	0	3.51	34.6	52,530	14.88	8.13	4	<0.1	<0.1	<0.01	0.05	0.05	0.17	0.01	<0.02	-	
MBWQ40 1 28/10/14	WATER	28-Oct-14	9:50	104.9	8.45	3.4	10.29	34.62	52,511	15.63	8.18	4	<0.1	<0.1	<0.01	<0.05	<0.05	0.13	0.01	<0.02	-	
MBWQ40 20 28/10/14	WATER	28-Oct-14	9:40	95.4	7.83	0.1	4.18	34.56	52,473	14.71	8.12	4	<0.1	<0.1	<0.01	0.06	0.06	0.18	0.02	<0.02	-	
MBWQ40 40 28/10/14	WATER	28-Oct-14	9:30	79.3	6.69	0.3	0.42	34.47	52,418	13.36	8.09	7	<0.1	<0.1	<0.01	0.09	0.09	0.21	0.02	0.02	-	
MBWQ20 1 25/11/14	WATER	25-Nov-14	12:00	103.5	7.76	0	1.3	35.26	53,317	19.22	8.26	20	0.004	0.00375	<0.002	0.014	0.014	0.12	0.004	0.003	0.8	
MBWQ20 10 25/11/14	WATER	25-Nov-14	11:55	104	7.82	0	1.63	35.26	53,326	19	8.26	24	0.003	0.00281	<0.002	<0.002	<0.002	0.09	0.003	<0.002	-	
MBWQ20 20 25/11/14	WATER	25-Nov-14	11:50	102.7	7.83	0.1	5.04	35.25	53,317	18.27	8.28	24	0.005	0.00469	<0.002	<0.002	<0.002	0.1	0.005	0.003	-	
MBWQ30 1 25/11/14	WATER	25-Nov-14	11:15	105.6	7.94	0.3	1.04	35.3	53,379	19.02	8.29	10	0.004	0.00373	<0.002	<0.002	<0.002	0.08	0.002	<0.002	-	
MBWQ30 15 25/11/14	WATER	25-Nov-14	11:10	103.3	7.78	0	2.37	35.27	53,346	18.91	8.29	12	0.004	0.00373	<0.002	<0.002	<0.002	0.11	0.003	<0.002	-	
MBWQ30 30 25/11/14	WATER	25-Nov-14	11:05	93.5	7.3	0	7.7	35.23	53,312	17.05	8.25	13	0.004	0.00379	<0.002	0.009	0.009	0.1	0.006	0.003	-	
MBWQ40 1 25/11/14	WATER	25-Nov-14	10:10	105.4	7.93	0	0.94	35.28	53,345	19	8.29	10	0.004	0.00373	<0.002	<0.002	<0.002	0.08	0.002	0.002	-	
MBWQ40 20 25/11/14	WATER	25-Nov-14	10:05	102.7	7.77	0.1	3.85	35.26	53,326	18.71	8.28	22	0.004	0.00374	<0.002	<0.002	<0.002	0.09	0.003	<0.002	-	
MBWQ40 40 25/11/14	WATER	25-Nov-14	10:00	82.1	6.56	0.4	1.19	35.22	53,334	15.86	8.17	14	0.023	0.022	0.004	0.041	0.045	0.18	0.013	0.014	-	
MBWQ20 1 15/12/14	WATER	15-Dec-14	12:50	103.6	7.65	1	0.89	34.65	52,497	20.22	8.16	14	<0.002	<0.002	<0.002	0.016	0.016	0.08	0.009	0.003	1.17	
MBWQ20 10 15/12/14	WATER	15-Dec-14	12:45	91.1	6.97	0.6	1.37	35.05	53,053	18.2	8.14	6	0.004	0.0038	<0.002	0.016	0.016	0.05	0.006	0.004	-	
MBWQ20 20 15/12/14	WATER	15-Dec-14	12:40	83.1	6.49	0.9	0.64	35.09	53,115	17.04	8.12	8	0.010	0.0096	<0.002	0.035	0.035	0.06	0.009	0.008	-	
MBWQ30 1 15/12/14	WATER	15-Dec-14	12:05	104.5	7.67	0.6	1.19	34.42	52,195	20.58	8.18	8	<0.002	<0.002	<0.002	<0.002	<0.002	<0.05	0.004	<0.002	-	
MBWQ30 15 15/12/14	WATER	15-Dec-14	12:00	86.5	6.75	0.3	1.02	35.09	53,120	17.15	8.11	12	0.010	0.0096	<0.002	0.052	0.052	0.08	0.011	0.010	-	
MBWQ30 30 15/12/14	WATER	15-Dec-14	11:55	73	5.94	1.1	0.26	35.03	53,108	14.94	8.08	12	0.006	0.0058	0.003	0.089	0.092	0.1	0.016	0.016	-	
MBWQ40 1 15/12/14	WATER	15-Dec-14	11:05	105.1	7.73	0.6	0.89	34.3	52,034	20.57	8.21	8	<0.002	<0.002	<0.002	<0.002	<0.002	0.06	0.003	<0.002	-	
MBWQ40 20 15/12/14	WATER	15-Dec-14	11:00	75.3	6.16	0.4	0.47	35.04	53,120	14.68	8.06	12	0.004	0.0039	0.003	0.109	0.112	0.14	0.017	0.018	-	
MBWQ40 40 15/12/14	WATER	15-Dec-14	10:55	70.5	5.83	1	0.47	34.99	53,081	14.2	8.04	10	0.005	0.0049	0.002	0.134	0.136	0.15	0.020	0.021	-	
MBWQ20 1 7/1/15	WATER	7-Jan-15	9:35	104.1	7.54	0.2	0.38	35.24	53,300	21.1	8.14	15	<0.002	<0.002	<0.002	0.007	0.007	0.09	0.004	0.002	0.41	
MBWQ20 10 7/1/15	WATER	7-Jan-15	9:30	104.2	7.81	0.1	0.53	35.38	53,489	19.18	8.15	11	<0.002	<0.002	<0.002	<0.002	<0.002	0.09	0.003	0.003	-	
MBWQ20 20 7/1/15	WATER	7-Jan-15	9:25	99.5	7.56	0	0.93	35.36	53,470	18.48	8.14	11	<0.002	<0.002	<0.002	0.008	0.008	0.08	0.004	0.004	-	
MBWQ30 1 7/1/15	WATER	7-Jan-15	8:40	106.7	7.88	0.1	0.38	35.39	53,495	19.93	8.16	8	0.002	0.0019	<0.002	<0.002	<0.002	0.09	0.003	0.002	-	
MBWQ30 15 7/1/15	WATER	7-Jan-15	8:35	101.5	7.69	0	0.58	35.38	53,492	18.58	8.12	8	<0.002	<0.002	<0.002	0.008	0.008	0.12	0.01	0.003	-	
MBWQ30 30 7/1/15	WATER	7-Jan-15	8:30	87.6	6.82	0.1	0.6	35.37	53,506	17.12	8.08	14	0.006	0.0058	<0.002	0.029	0.029	0.1	0.008	0.008	-	
MBWQ40 1 7/1/15	WATER	7-Jan-15	7:30	105.9	7.84	0.1	0.38	35.45	53,578	19.82	8.15	11	0.002	0.0019	<0.002	<0.002	<0.002	0.09	0.002	<0.002	-	
MBWQ40 20 7/1/15	WATER	7-Jan-15	7:25	102.2	7.68	0	0.58	35.44	53,575	18.99	8.14	12	<0.002	<0.002	<0.002	<0.002	<0.002	0.08	0.003	0.002	-	
MBWQ40 40 7/1/15	WATER	7-Jan-15	7:20	82.4	6.51	0.2	0.46	35.41	53,579	16.41	8.08	12	0.009	0.0087	<0.002	0.039	0.039	0.12	0.009	0.009	-	
MBWQ20 1 19/2/15	WATER	19-Feb-15	8:55	111.6	8.12	0.3	0.88	35.34	53,438	20.78	8.21	9	0.004	0.0037	<0.002	<0.002	<0.002	0.13	0.002	<0.002	0.86	
MBWQ20 10 19/2/15	WATER	19-Feb-15	8:50	111.9	8.84	0.4	4.5	35.22	53,299	16.43	8.21	6	0.004	0.0038	<0.002	<0.002	<0.002	0.23	0.007	<0.002	-	
MBWQ20 20 19/2/15	WATER	19-Feb-15	8:45	97.1	7.82	0.5	4.63	35.16	53,261	15.43	8.12	9	0.009	0.0087	<0.002	0.031	0.031	0.19	0.017	0.004	-	
MBWQ30 1 19/2/15	WATER	19-Feb-15	8:25	111.1	8.09	0.5	0.85	35.38	53,491	20.76	8.22	11	0.004	0.0037	<0.002	<0.002	<0.002	0.1	<0.002	<0.002	-	
MBWQ30 15 19/2/15	WATER	19-Feb-15	8:20	90.3																		

Table B3 - Merimbula Ambient Marine Water Quality (2014 - 2017)

Sample ID	Sample Type	Sample Date	Sample Time	FIELD PARAMETERS ³								LABORATORY PARAMETERS ⁴												
				DO	DO	Turbidity	Chlorophyll a (adjusted) ²	Salinity	Conductivity	Temperature	pH	Suspended Solids (SS)	Ammonia as N	Ammonium (NH ₄) ⁶	Nitrite as N	Nitrate as N	NOx (Nitrite + Nitrate) as N	Total Nitrogen as N	Total Phosphorus as P	Reactive Phosphorus as P	Chlorophyll a			
				%	mg/L	ntu	µg/L	ppt	µS/cm	°C	pH Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L			
				Limit of Reporting (LOR)				-	-	-	-	-	-	0.01	2	0.002	0.002	0.002	0.002	0.002	0.05	0.002	0.002	0.02
				Aquatic Ecosystems ¹				90 - 110	-	-	1	-	-	-	8.0 - 8.4	-	-	0.02	0.025	0.025	0.025	0.12	0.025	0.01
Toxicants in Marine Waters - 95% species protection ²				-	-	-	-	-	-	-	-	-	0.91	-	-	-	-	-	-	-	-	-		
MBWQ20 1 18/5/15	WATER	18-May-15	9:40	96.7	7.43	0.5	0.96	35.2	53,252	17.84	8.21	10	<0.002	<0.002	<0.002	0.034	0.034	0.12	0.006	0.006	0.73			
MBWQ20 10 18/5/15	WATER	18-May-15	9:35	95.4	7.34	0.5	1.1	35.19	53,245	17.81	8.23	13	<0.002	<0.002	<0.002	0.033	0.033	0.12	0.006	0.005	-			
MBWQ20 20 18/5/15	WATER	18-May-15	9:30	93.7	7.23	0.7	0.41	35.18	53,231	17.68	8.22	16	<0.002	<0.002	<0.002	0.032	0.032	0.11	0.006	0.005	-			
MBWQ30 1 18/5/15	WATER	18-May-15	8:40	98.2	7.59	0.5	1.64	35.25	53,315	17.59	8.22	13	<0.002	<0.002	<0.002	0.027	0.027	0.11	0.006	0.005	-			
MBWQ30 15 18/5/15	WATER	18-May-15	8:35	96.1	7.43	0.7	2.06	35.2	53,264	17.55	8.22	12	<0.002	<0.002	<0.002	0.027	0.027	0.12	0.006	0.003	-			
MBWQ30 30 18/5/15	WATER	18-May-15	8:30	96	7.46	0.8	2.19	35.17	53,234	17.34	8.22	10	<0.002	<0.002	<0.002	0.022	0.022	0.1	0.005	0.004	-			
MBWQ40 1 18/5/15	WATER	18-May-15	7:30	93.2	7.17	0.6	1.1	35.29	53,369	17.8	8.16	14	<0.002	<0.002	<0.002	0.051	0.051	0.12	0.007	0.007	-			
MBWQ40 20 18/5/15	WATER	18-May-15	7:25	88.6	6.83	0.5	0.41	35.24	53,318	17.76	8.17	11	<0.002	<0.002	<0.002	0.052	0.052	0.1	0.007	0.006	-			
MBWQ40 40 18/5/15	WATER	18-May-15	7:20	82.1	6.25	1.8	0.69	35.22	53,298	17.54	8.17	12	<0.002	<0.002	<0.002	0.054	0.054	0.11	0.008	0.007	-			
MBWQ20 1 11/6/15	WATER	11-Jun-15	13:20	96.5	7.47	0.6	0.98	35.3	53,386	17.48	8.22	4	0.002	0.0019	<0.002	0.044	0.044	0.13	0.007	0.007	0.78			
MBWQ20 10 11/6/15	WATER	11-Jun-15	13:15	93.9	7.29	0.3	0.91	35.27	53,353	17.28	8.21	3	0.003	0.0029	<0.002	0.046	0.046	0.15	0.008	0.008	-			
MBWQ20 20 11/6/15	WATER	11-Jun-15	13:10	96	7.49	0.8	1.96	35.28	53,381	17.04	8.22	7	0.004	0.0038	<0.002	0.042	0.042	0.17	0.008	0.008	-			
MBWQ30 1 11/6/15	WATER	11-Jun-15	12:30	97.1	7.51	0.3	0.84	35.32	53,411	17.5	8.21	4	0.003	0.0029	<0.002	0.041	0.041	0.13	0.008	0.008	-			
MBWQ30 15 11/6/15	WATER	11-Jun-15	12:25	92.6	7.18	0.3	1.54	35.28	53,367	17.35	8.21	6	0.003	0.0029	<0.002	0.047	0.047	0.14	0.008	0.008	-			
MBWQ30 30 11/6/15	WATER	11-Jun-15	12:20	88	6.88	1.6	1.33	35.25	53,345	17.35	8.17	10	0.008	0.0076	<0.002	0.053	0.053	0.14	0.011	0.008	-			
MBWQ40 1 11/6/15	WATER	11-Jun-15	11:30	98.6	7.44	0.1	0.91	35.38	53,488	18.82	8.21	5	0.003	0.0028	<0.002	0.02	0.02	0.1	0.005	0.004	-			
MBWQ40 20 11/6/15	WATER	11-Jun-15	11:25	93.1	7.14	0.3	0.49	35.31	53,402	17.92	8.2	5	0.003	0.0028	<0.002	0.042	0.042	0.14	0.007	0.006	-			
MBWQ40 40 11/6/15	WATER	11-Jun-15	11:20	82.3	6.42	2	0.42	35.22	53,308	17.12	8.16	8	0.003	0.0029	<0.002	0.08	0.08	0.16	0.012	0.011	-			
MBWQ20 1 21/7/15	WATER	21-Jul-15	12:10	101.4	8.28	0.6	0.69	35.03	53,096	14.8	8.2	9	<0.002	<0.002	<0.002	0.032	0.032	0.12	0.008	0.006	0.99			
MBWQ20 10 21/7/15	WATER	21-Jul-15	12:05	99.7	8.13	0.7	2.06	35.16	53,278	14.82	8.21	15	0.003	0.0029	<0.002	0.033	0.033	0.12	0.008	0.006	-			
MBWQ20 20 21/7/15	WATER	21-Jul-15	12:00	97.8	7.98	1.4	2.16	35.16	53,280	14.82	8.21	10	<0.002	<0.002	<0.002	0.034	0.034	0.13	0.009	0.006	-			
MBWQ30 1 21/7/15	WATER	21-Jul-15	11:05	101.4	8.28	0.6	1.38	35.16	53,273	14.8	8.2	16	0.003	0.0029	<0.002	0.034	0.034	0.15	0.008	0.006	-			
MBWQ30 15 21/7/15	WATER	21-Jul-15	11:00	99.5	8.12	0.8	1.67	35.18	53,302	14.8	8.2	12	0.008	0.0079	<0.002	0.036	0.036	0.14	0.008	0.007	-			
MBWQ30 30 21/7/15	WATER	21-Jul-15	10:55	97.4	7.95	1.3	1.47	35.17	53,298	14.78	8.2	16	0.007	0.0069	<0.002	0.037	0.037	0.13	0.008	0.007	-			
MBWQ40 1 21/7/15	WATER	21-Jul-15	10:00	100.9	8.18	0.4	1.18	35.21	53,328	15.09	8.2	14	<0.002	<0.002	<0.002	0.038	0.038	0.13	0.008	0.006	-			
MBWQ40 20 21/7/15	WATER	21-Jul-15	9:55	97.9	7.95	0.6	1.77	35.21	53,341	15.01	8.19	17	<0.002	<0.002	<0.002	0.037	0.037	0.13	0.008	0.006	-			
MBWQ40 40 21/7/15	WATER	21-Jul-15	9:50	95.5	7.8	1	1.18	35.17	53,309	14.79	8.19	9	0.005	0.0079	<0.002	0.036	0.036	0.13	0.008	0.006	-			
MBWQ20 1 11/8/15	WATER	11-Aug-15	15:20	108.3	8.95	0.4	1.89	35.29	53,476	14.15	8.2	13	0.008	0.0077	<0.002	0.009	0.009	0.11	0.009	0.004	2.49			
MBWQ20 10 11/8/15	WATER	11-Aug-15	15:15	106.8	8.86	0.4	1.84	35.28	53,474	13.93	8.15	19	0.005	0.0048	<0.002	0.009	0.009	0.13	0.008	0.004	-			
MBWQ20 20 11/8/15	WATER	11-Aug-15	15:10	105.4	8.76	1.7	3.56	35.27	53,469	13.84	8.17	14	0.008	0.0077	<0.002	0.007	0.007	0.12	0.008	0.003	-			
MBWQ30 1 11/8/15	WATER	11-Aug-15	14:40	102.2	8.42	0.3	0.46	35.29	53,475	14.28	8.15	17	0.01	0.0097	<0.002	0.029	0.029	0.13	0.01	0.007	-			
MBWQ30 15 11/8/15	WATER	11-Aug-15	14:35	103.5	8.6	0.4	3.90	35.28	53,482	13.89	8.16	12	0.006	0.0058	<0.002	0.018	0.018	0.12	0.008	0.005	-			
MBWQ30 30 11/8/15	WATER	11-Aug-15	14:30	100.9	8.38	0.8	1.55	35.28	53,494	13.85	8.18	14	0.008	0.0077	<0.002	0.017	0.017	0.13	0.007	0.005	-			
MBWQ40 1 11/8/15	WATER	11-Aug-15	13:50	101.4	8.35	0.3	0.20	35.23	53,381	14.36	8.16	14	0.009	0.0087	<0.002	0.034	0.034	0.14	0.008	0.007	-			
MBWQ40 20 11/8/15	WATER	11-Aug-15	13:45	101.7	8.43	0.4	2.64	35.26	53,447	14.03	8.17	10	0.008	0.0077	<0.002	0.028	0.028	0.15	0.009	0.006	-			
MBWQ40 40 11/8/15	WATER	11-Aug-15	13:40	97.8	8.12	0.8	2.18	35.27	53,486	13.9	8.17	14	0.011	0.0106	<0.002	0.02	0.02	0.13	0.008	0.006	-			
MBWQ20 1 15/9/15	WATER	15-Sep-15	8:10	108.1	8.72	0.7	6.08	35.32	53,463	15.35	8.13	8	0.002	0.0019	<0.002	<0.002	<0.002	0.14	0.012	<0.002	7.82			
MBWQ20 10 15/9/15	WATER	15-Sep-15	8:05	102.4	8.31	0.3	2.05	35.38	53,564	15.02	8.08	6	<0.002	<0.002	<0.002	0.002	0.002	0.12	0.008	<0.002	-			
MBWQ20 20 15/9/15	WATER	15-Sep-15	8:00	98.3	7.99	0.7	2.46	35.37	53,566	14.93	8.05	4	0.006	0.0058	<0.002	0.018	0.018	0.13	0.010	0.006	-			
MBWQ30 1 15/9/15	WATER	15-Sep-15	7:30	106.9	8.62	0.5	6.00	35.37	53,538	15.35	8.01	26	<0.002	<0.002	<0.002	<0.002	<0.002	0.12	0.008	<0.002	-			
MBWQ30 15 15/9/15	WATER	15-Sep-15	7:25	100.2	8.14	0.3	0.99	35.39	53,591	14.92	8.07	10	0.014	0.0136	<0.002	0.024	0.024	0.13	0.009	0.006	-			
MBWQ30 30 15/9/15	WATER	15-Sep-15	7:20	94	7.69	0.8	0.74	35.37	53,581	14.61	8.05	5	0.012	0.0116	<0.002</									

Table B3 - Merimbula Ambient Marine Water Quality (2014 - 2017)

Sample ID	Sample Type	Sample Date	Sample Time	FIELD PARAMETERS ⁵								LABORATORY PARAMETERS ⁴										
				DO	DO	Turbidity	Chlorophyll a (adjusted) ²	Salinity	Conductivity	Temperature	pH	Suspended Solids (SS)	Ammonia as N	Ammonium (NH ₄) ⁶	Nitrite as N	Nitrate as N	NOx (Nitrite + Nitrate) as N	Total Nitrogen as N	Total Phosphorus as P	Reactive Phosphorus as P	Chlorophyll a	
				%	mg/L	ntu	µg/L	ppt	µS/cm	°C	pH Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	
				Limit of Reporting (LOR)								-	-	-	-	-	-	-	-	-	-	-
Aquatic Ecosystems ¹				90 - 110	-	-	1	-	-	-	-	8.0 - 8.4	-	-	0.02	0.025	0.025	0.025	0.12	0.025	0.01	1
Toxicants in Marine Waters - 95% species protection ³				-	-	-	-	-	-	-	-	-	-	0.91	-	-	-	-	-	-	-	
MBWQ40_40_6/4/16	WATER	6-Apr-16	9:25	88.1	6.54	0.4	2.29	35.64	53,856	19.61	8.24	15	0.011	0.0100	<0.002	0.01	0.01	0.09	0.003	0.005	-	
HAY20_1_6/4/16	WATER	6-Apr-16	8:50	100	7.35	0.2	1.86	35.69	53,903	20.13	8.25	11	0.003	0.0028	<0.002	0.002	0.002	0.07	<0.002	0.004	0.66	
HAY20_10_6/4/16	WATER	6-Apr-16	8:45	98.8	7.27	0.1	1.72	35.68	53,896	20.09	-	-	-	-	-	-	-	-	-	-	-	
HAY20_20_6/4/16	WATER	6-Apr-16	8:40	99.3	7.16	0.1	1.43	35.68	53,893	20.07	8.25	14	0.006	0.0056	<0.002	0.002	0.002	0.07	<0.002	0.003	-	
HAYSTH20_1_6/4/16	WATER	6-Apr-16	8:10	97.1	7.29	0.1	0.72	35.68	53,894	20.07	8.25	16	0.011	0.0103	<0.002	0.002	0.002	0.08	<0.002	<0.002	-	
HAYSTH20_10_6/4/16	WATER	6-Apr-16	8:05	98.3	7.23	0.1	1.86	35.68	53,889	20.08	-	-	-	-	-	-	-	-	-	-	-	
HAYSTH20_20_6/4/16	WATER	6-Apr-16	8:00	97	7.14	0	2.29	35.68	53,895	20.06	8.25	14	0.007	0.0065	<0.002	0.003	0.003	0.07	<0.002	0.003	-	
QUON20_1_6/4/16	WATER	6-Apr-16	7:25	99.6	7.32	0.1	2.15	35.6	53,785	20.09	8.25	17	0.006	0.0056	<0.002	<0.002	<0.002	0.07	0.002	0.002	-	
QUON20_10_6/4/16	WATER	6-Apr-16	7:22	98.7	7.26	0.1	2.15	35.62	53,814	20.12	-	-	-	-	-	-	-	-	-	-	-	
QUON20_20_6/4/16	WATER	6-Apr-16	7:20	97.4	7.17	0.1	1.72	35.64	53,845	20.09	8.26	15	0.005	0.0047	<0.002	<0.002	<0.002	0.07	<0.002	<0.002	-	
MBWQ20_1_16/5/16	WATER	16-May-16	13:00	-	-	0.20	0.09	35.40	53,523	17.80	8.16	17	0.011	0.0105	<0.002	0.028	0.028	0.13	0.007	0.007	0.62	
MBWQ20_10_16/5/16	WATER	16-May-16	12:55	-	-	0.30	1.03	35.39	53,517	17.64	8.17	-	-	-	-	-	-	-	-	-	-	
MBWQ20_20_16/5/16	WATER	16-May-16	12:50	-	-	0.30	1.31	35.39	53,525	17.57	8.18	16	0.009	0.0085	<0.002	0.023	0.023	0.14	0.007	0.006	-	
MBWQ40_1_16/5/16	WATER	16-May-16	12:20	-	-	0.30	0.21	35.40	53,521	17.72	8.15	39	0.014	0.0134	<0.002	0.028	0.028	0.14	0.008	0.007	-	
MBWQ40_20_16/5/16	WATER	16-May-16	12:15	-	-	0.40	0.56	35.39	53,512	17.66	8.15	-	-	-	-	-	-	-	-	-	-	
MBWQ40_40_16/5/16	WATER	16-May-16	12:10	-	-	0.50	0.73	35.39	53,524	17.66	8.15	16	0.015	0.0143	<0.002	0.027	0.027	0.15	0.007	0.007	-	
HAY20_1_16/5/16	WATER	16-May-16	11:35	-	-	1.00	0.30	35.39	53,514	17.68	8.15	30	0.016	0.0153	<0.002	0.032	0.032	0.13	0.007	0.007	0.36	
HAY20_10_16/5/16	WATER	16-May-16	11:30	-	-	0.50	0.47	35.39	53,513	17.62	8.15	-	-	-	-	-	-	-	-	-	-	
HAY20_20_16/5/16	WATER	16-May-16	11:25	-	-	0.30	0.43	35.39	53,521	17.60	8.15	16	0.016	0.0153	<0.002	0.031	0.031	0.16	0.008	0.008	-	
HAYSTH20_1_16/5/16	WATER	16-May-16	11:00	-	-	0.40	0.35	35.41	53,533	17.65	8.14	26	0.015	0.0143	<0.002	0.049	0.049	0.15	0.008	0.008	-	
HAYSTH20_10_16/5/16	WATER	16-May-16	10:55	-	-	0.30	0.43	35.39	53,514	17.62	8.14	-	-	-	-	-	-	-	-	-	-	
HAYSTH20_20_16/5/16	WATER	16-May-16	10:50	-	-	0.30	0.69	35.39	53,518	17.61	8.14	7	0.016	0.0153	<0.002	0.044	0.044	0.15	0.008	0.008	-	
QUON20_1_16/5/16	WATER	16-May-16	10:15	-	-	0.40	0.51	35.32	53,412	17.63	8.12	32	0.015	0.0144	<0.002	0.034	0.034	0.15	0.008	0.011	-	
QUON20_10_16/5/16	WATER	16-May-16	10:10	-	-	0.30	0.51	35.37	53,490	17.63	8.12	-	-	-	-	-	-	-	-	-	-	
QUON20_20_16/5/16	WATER	16-May-16	10:05	-	-	0.50	0.90	35.39	53,514	17.63	8.12	21	0.014	0.0134	<0.002	0.032	0.032	0.15	0.008	0.01	-	
MBWQ20_1_29/6/16	WATER	29-Jun-16	11:35	100.4	7.63	0.4	0.65	34.61	52,440	18.68	8.15	6	0.013	0.0124	<0.002	0.026	0.026	0.11	0.004	0.004	0.58	
MBWQ20_10_29/6/16	WATER	29-Jun-16	-	97.4	7.50	0.6	0.73	34.54	52,362	18.01	-	-	-	-	-	-	-	-	-	-	-	
MBWQ20_20_29/6/16	WATER	29-Jun-16	11:25	94.8	7.40	1.2	0.69	34.46	52,271	17.31	8.15	5	0.007	0.0067	<0.002	0.032	0.032	0.12	0.005	0.004	-	
MBWQ40_1_29/6/16	WATER	29-Jun-16	10:55	98.6	7.39	0.3	0.55	34.68	52,542	19.37	8.16	4	0.005	0.0047	<0.002	0.026	0.026	0.1	0.003	0.003	-	
MBWQ40_20_29/6/16	WATER	29-Jun-16	-	90.0	6.84	0.4	0.59	34.57	52,397	18.64	-	-	-	-	-	-	-	-	-	-	-	
MBWQ40_40_29/6/16	WATER	29-Jun-16	10:45	86.6	6.94	1.2	0.64	34.33	52,125	16.03	8.09	6	0.008	0.0077	<0.002	0.071	0.071	0.15	0.01	0.01	-	
HAY20_1_29/6/16	WATER	29-Jun-16	10:00	99.0	7.52	0.4	0.59	34.61	52,441	18.71	8.15	28	0.007	0.0067	<0.002	0.029	0.029	0.13	0.004	0.004	0.75	
HAY20_10_29/6/16	WATER	29-Jun-16	-	96.6	7.36	0.5	0.78	34.56	52,380	18.49	-	-	-	-	-	-	-	-	-	-	-	
HAY20_20_29/6/16	WATER	29-Jun-16	9:50	93.9	7.28	0.7	0.78	34.48	52,286	17.61	8.13	6	0.008	0.0077	<0.002	0.042	0.042	0.13	0.006	0.006	-	
HAYSTH20_1_29/6/16	WATER	29-Jun-16	9:25	99.2	7.58	0.4	0.78	34.63	52,472	18.37	8.18	11	0.013	0.0123	<0.002	0.028	0.028	0.12	0.004	0.006	-	
HAYSTH20_10_29/6/16	WATER	29-Jun-16	-	97.7	7.51	0.5	1.10	34.58	52,417	18.06	-	-	-	-	-	-	-	-	-	-	-	
HAYSTH20_20_29/6/16	WATER	29-Jun-16	9:15	91.7	7.33	1.0	0.73	34.34	52,130	16.10	8.13	11	0.013	0.0125	<0.002	0.036	0.036	0.13	0.006	0.007	-	
QUON20_1_29/6/16	WATER	29-Jun-16	8:40	98.0	7.55	0.5	0.82	34.49	52,288	17.97	8.08	17	0.009	0.0086	<0.002	0.037	0.037	0.12	0.005	0.008	-	
QUON20_10_29/6/16	WATER	29-Jun-16	-	96.5	7.44	0.5	0.87	34.51	52,320	17.95	-	-	-	-	-	-	-	-	-	-	-	
QUON20_20_29/6/16	WATER	29-Jun-16	8:30	92.8	7.35	1.1	0.59	34.35	52,126	16.62	8.1	21	0.013	0.0125	<0.002	0.038	0.038	0.13	0.006	0.009	-	
MBWQ20_1_21/7/16	WATER	21-Jul-16	10:30	109.0	9.01	1.6	1.51	35.11	53,226	14.16	8.09	7	0.005	0.0048	<0.002	<0.002	<0.002	0.10	0.005	0.002	2.34	
MBWQ20_10_21/7/16	WATER	21-Jul-16	-	103.4	8.54	0.4	2.01	35.37	53,586	14.13	-	-	-	-	-	-	-	-	-	-	-	
MBWQ20_20_21/7/16	WATER	21-Jul-16	10:20	93.8	7.76	0.9	1.28	35.39	53,626	14.04	8.05	8	0.004	0.0039	0.004	0.046	0.05	0.14	0.01	0.008	-	
MBWQ40_1_21/7/16	WATER	21-Jul-16	9:50	105.3	8.59	0.4	1.91	35.46	53,676	14.72	8.09	9	0.005	0.0048	<0.002	0.022	0.022	0.12	0.008	0.005	-	
MBWQ40_20_21/7/16	WATER	21-Jul-16	-	100.3	8.26	0.5	2.48	35.39	53,623	14.23	-	-	-	-	-	-	-	-	-	-	-	
MBWQ40_40_21/7/16	WATER	21-Jul-16	9:40	92.1	7.64	0.9	0.44	35.38	53,627	13.96	8.04	7	0.007	0.0068	<0.002	0.043	0.043	0.13	0.01	0.008	-	
HAY20_1_21/7/16	WATER	21-Jul-16	9:20	103.5	8.52	0.5	1.78	35.40	53,611	14.29	8.06											

Table B3 - Merimbula Ambient Marine Water Quality (2014 - 2017)

Sample ID	Sample Type	Sample Date	Sample Time	FIELD PARAMETERS ⁵								LABORATORY PARAMETERS ⁴											
				DO	DO	Turbidity	Chlorophyll a (adjusted) ²	Salinity	Conductivity	Temperature	pH	Suspended Solids (SS)	Ammonia as N	Ammonium (NH ₄) ³	Nitrite as N	Nitrate as N	NOx (Nitrite + Nitrate) as N	Total Nitrogen as N	Total Phosphorus as P	Reactive Phosphorus as P	Chlorophyll a		
				%	mg/L	ntu	µg/L	ppt	µS/cm	°C	pH Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L		
				Limit of Reporting (LOR)				-	-	-	-	-	0.01	2	0.002	0.002	0.002	0.002	0.002	0.05	0.002	0.002	0.02
				Aquatic Ecosystems ¹				90 - 110	-	-	1	-	-	-	8.0 - 8.4	-	-	0.02	0.025	0.025	0.025	0.12	0.025
Toxicants in Marine Waters - 95% species protection ²				-	-	-	-	-	-	-	-	-	0.91	-	-	-	-	-	-	-	-		
QUON20 10 17/8/16	WATER	17-Aug-16	-	104.2	8.69	0.3	6.66	35.00	53,101	13.79	-	-	-	-	-	-	-	-	-	-	-	-	
QUON20 20 17/8/16	WATER	17-Aug-16	8:05	103.2	8.60	0.3	7.08	35.00	53,114	13.79	8.10	8	0.018	0.0175	<0.002	0.012	0.012	0.14	0.008	0.005	-		
MBWQ20 1 28/9/16	WATER	28-Sep-16	11:30	105.2	8.36	0.2	0.71	35.21	53,291	16.14	8.24	9	0.011	0.0104	<0.002	0.009	0.009	0.17	0.006	0.003	1.07		
MBWQ20 10 28/9/16	WATER	28-Sep-16	11:25	103.5	8.28	0.2	1.53	35.19	53,286	15.79	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20 20 28/9/16	WATER	28-Sep-16	11:20	100.8	8.09	0.3	4.18	35.18	53,275	15.66	8.21	8	0.010	0.0096	<0.002	0.010	0.010	0.14	0.007	0.003	-		
MBWQ40 1 28/9/16	WATER	28-Sep-16	10:35	102.9	8.22	0.2	0.91	35.19	53,278	15.87	8.23	15	0.013	0.0124	<0.002	0.013	0.013	0.21	0.010	0.004	-		
MBWQ40 20 28/9/16	WATER	28-Sep-16	10:30	98.4	7.90	0.2	2.74	35.17	53,264	15.66	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40 40 28/9/16	WATER	28-Sep-16	10:25	92.4	7.43	0.3	1.18	35.17	53,283	15.52	8.22	18	0.014	0.0134	<0.002	0.021	0.021	0.17	0.010	0.006	-		
HAY20 1 28/9/16	WATER	28-Sep-16	9:50	100.5	8.06	0.2	0.52	35.17	53,246	15.70	8.21	8	0.015	0.0143	<0.002	0.018	0.018	0.17	0.008	0.005	0.98		
HAY20 10 28/9/16	WATER	28-Sep-16	9:45	98.0	7.87	0.2	2.74	35.16	53,241	15.60	-	-	-	-	-	-	-	-	-	-	-		
HAY20 20 28/9/16	WATER	28-Sep-16	9:40	98.6	7.92	0.2	4.44	35.16	53,251	15.61	8.21	15	0.017	0.0163	<0.002	0.016	0.016	0.17	0.008	0.005	-		
HAYSTH20 1 28/9/16	WATER	28-Sep-16	9:00	101.2	8.12	0.2	2.22	35.15	53,227	15.67	8.23	8	0.016	0.0152	<0.002	0.018	0.018	0.19	0.008	0.005	-		
HAYSTH20 10 28/9/16	WATER	28-Sep-16	8:55	100.6	8.08	0.2	4.31	35.14	53,224	15.63	-	-	-	-	-	-	-	-	-	-	-		
HAYSTH20 20 28/9/16	WATER	28-Sep-16	8:50	100.4	8.09	0.9	4.18	35.13	53,215	15.43	8.23	4	0.014	0.0134	<0.002	0.011	0.011	0.16	0.008	0.005	-		
QUON20 1 28/9/16	WATER	28-Sep-16	8:15	102.6	8.25	0.3	3.66	35.11	53,176	15.54	8.21	25	0.016	0.0153	<0.002	0.014	0.014	0.18	0.008	0.008	-		
QUON20 10 28/9/16	WATER	28-Sep-16	8:10	101.7	8.18	0.2	4.70	35.12	53,193	15.54	-	-	-	-	-	-	-	-	-	-	-		
QUON20 20 28/9/16	WATER	28-Sep-16	8:05	100.7	8.10	0.2	3.40	35.12	53,204	15.55	8.23	25	0.016	0.0153	<0.002	0.013	0.013	0.16	0.008	0.006	-		
MBWQ20 1 19/10/16	WATER	19-Oct-16	10:00	98.3	7.92	0.1	1.22	35.52	53,745	15.30	8.12	20	0.025	0.0241	<0.002	0.018	0.018	0.14	0.008	0.007	1.42		
MBWQ20 10 19/10/16	WATER	19-Oct-16	-	96.9	7.83	0.1	2.03	35.51	53,738	15.20	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20 20 19/10/16	WATER	19-Oct-16	9:50	92.9	7.53	0.0	18.76	35.50	53,739	15.00	8.11	23	0.026	0.0251	<0.002	0.020	0.020	0.15	0.012	0.008	-		
MBWQ40 1 19/10/16	WATER	19-Oct-16	7:30	98.4	7.95	0.1	3.41	35.50	53,713	15.19	8.12	16	0.022	0.0212	<0.002	0.017	0.017	0.15	0.008	0.008	-		
MBWQ40 20 19/10/16	WATER	19-Oct-16	-	95.5	7.73	0.1	10.11	35.50	53,724	15.11	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40 40 19/10/16	WATER	19-Oct-16	7:20	91.1	7.41	0.0	5.45	35.50	53,746	14.88	8.10	14	0.024	0.0232	<0.002	0.024	0.024	0.22	0.015	0.008	-		
HAY20 1 19/10/16	WATER	19-Oct-16	8:15	98.5	7.99	0.1	1.70	35.45	53,649	15.01	8.12	15	0.020	0.0193	<0.002	0.016	0.016	0.13	0.007	0.006	1.50		
HAY20 10 19/10/16	WATER	19-Oct-16	-	98.8	8.01	0.1	2.61	35.49	53,718	15.03	-	-	-	-	-	-	-	-	-	-	-		
HAY20 20 19/10/16	WATER	19-Oct-16	8:05	96.8	7.85	0.1	2.95	35.50	53,737	15.01	8.11	12	0.018	0.0193	<0.002	0.015	0.015	0.13	0.007	0.006	-		
HAYSTH20 1 19/10/16	WATER	19-Oct-16	8:50	99.6	8.08	0.1	1.93	35.51	53,734	15.00	8.11	12	0.018	0.0174	<0.002	0.019	0.019	0.14	0.008	0.007	-		
HAYSTH20 10 19/10/16	WATER	19-Oct-16	-	98.3	7.98	0.0	3.18	35.51	53,739	14.98	-	-	-	-	-	-	-	-	-	-	-		
HAYSTH20 20 19/10/16	WATER	19-Oct-16	8:40	96.2	7.82	0.2	1.93	35.51	53,750	14.88	8.12	14	0.018	0.0174	<0.002	0.020	0.020	0.13	0.008	0.007	-		
QUON20 1 19/10/16	WATER	19-Oct-16	9:20	100.4	8.12	0.1	0.34	35.49	53,702	15.16	8.10	14	0.017	0.0164	<0.002	0.022	0.022	0.12	0.006	0.006	-		
QUON20 10 19/10/16	WATER	19-Oct-16	-	99.4	8.04	0.1	1.59	35.52	53,745	15.13	-	-	-	-	-	-	-	-	-	-	-		
QUON20 20 19/10/16	WATER	19-Oct-16	9:10	98.1	7.95	0.1	1.82	35.52	53,756	15.06	8.12	16	0.015	0.0145	<0.002	0.020	0.020	0.17	0.008	0.006	-		
MBWQ20 1 17/11/16	WATER	17-Nov-16	9:15	105.3	8.25	0.3	0.32	35.87	54,168	16.68	8.16	11	0.011	0.0105	<0.002	<0.002	<0.002	0.09	0.003	<0.002	0.60		
MBWQ20 10 17/11/16	WATER	17-Nov-16	-	105.0	8.26	0.3	1.06	35.86	54,163	16.48	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20 20 17/11/16	WATER	17-Nov-16	9:05	103.4	8.17	0.8	1.71	35.85	54,163	16.20	8.15	5	0.012	0.0115	<0.002	<0.002	<0.002	0.10	0.004	0.003	-		
MBWQ40 1 17/11/16	WATER	17-Nov-16	7:00	104.4	8.12	0.0	0.78	35.88	54,181	17.08	8.18	9	0.011	0.0105	<0.002	<0.002	<0.002	0.09	0.002	<0.002	-		
MBWQ40 20 17/11/16	WATER	17-Nov-16	-	103.7	8.17	0.1	1.12	35.85	54,166	16.37	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40 40 17/11/16	WATER	17-Nov-16	6:45	99.0	7.90	0.2	1.34	35.84	54,171	15.76	8.14	13	0.010	0.0096	<0.002	0.004	0.004	0.09	0.004	0.002	-		
HAY20 1 17/11/16	WATER	17-Nov-16	8:40	104.8	8.15	0.0	0.25	35.83	54,114	17.03	8.18	21	0.008	0.0076	<0.002	<0.002	<0.002	0.10	0.003	<0.002	0.46		
HAY20 10 17/11/16	WATER	17-Nov-16	-	103.4	8.09	0.1	0.70	35.86	54,155	16.77	-	-	-	-	-	-	-	-	-	-	-		
HAY20 20 17/11/16	WATER	17-Nov-16	8:25	101.7	7.99	0.0	1.20	35.86	54,176	16.53	8.15	12	0.009	0.0086	<0.002	0.002	0.002	0.09	0.003	0.002	-		
HAYSTH20 1 17/11/16	WATER	17-Nov-16	8:10	104.1	8.14	0.1	1.23	35.86	54,152	16.77	8.19	8	0.011	0.0105	<0.002	<0.002	<0.002	0.08	0.002	0.002	-		
HAYSTH20 10 17/11/16	WATER	17-Nov-16	-	103.8	8.13	0.0	0.67	35.86	54,170	16.67	-	-	-	-	-	-	-	-	-	-	-		
HAYSTH20 20 17/11/16	WATER	17-Nov-16	8:00	102.1	8.04	0.1	1.12	35.85	54,165	16.39	8.18	9	0.012	0.0115	<0.002	<0.002	<0.002	0.09	0.003	0.002	-		
QUON20 1 17/11/16	WATER	17-Nov-16	7:45	104.5	8.18	0.0	0.70	35.88	54,182	16.68	8.12	10	0.013	0.0125	<0.002	0.004	0.004	0.10	0.003	0.002	-		
QUON20 10 17/11/16	WATER																						

Table B3 - Merimbula Ambient Marine Water Quality (2014 - 2017)

Sample ID	Sample Type	Sample Date	Sample Time	FIELD PARAMETERS ³								LABORATORY PARAMETERS ⁴												
				DO	DO	Turbidity	Chlorophyll a (adjusted) ⁵	Salinity	Conductivity	Temperature	pH	Suspended Solids (SS)	Ammonia as N	Ammonium (NH ₄) ⁶	Nitrite as N	Nitrate as N	NOx (Nitrite + Nitrate) as N	Total Nitrogen as N	Total Phosphorus as P	Reactive Phosphorus as P	Chlorophyll a			
				%	mg/L	ntu	µg/L	ppt	µS/cm	°C	pH Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L			
				Limit of Reporting (LOR)				-	-	-	-	-	-	0.01	2	0.002	0.002	0.002	0.002	0.002	0.05	0.002	0.002	0.02
				Aquatic Ecosystems ¹				90 - 110	-	-	1	-	-	-	8.0 - 8.4	-	-	0.02	0.025	0.025	0.025	0.12	0.025	0.01
Toxicants in Marine Waters - 95% species protection ²				-	-	-	-	-	-	-	-	-	0.91	-	-	-	-	-	-	-	-			
HAY20_1_1/2/17	WATER	1-Feb-17	8:50	102.4	7.40	0.7	2.09	36.27	54,689	20.88	8.14	16	0.015	0.0142	<0.002	<0.002	<0.002	0.08	0.003	0.004	1.77			
HAY20_10_1/2/17	WATER	1-Feb-17	-	101.9	7.42	0.8	3.70	36.23	54,632	20.44	-	-	-	-	-	-	-	-	-	-	-			
HAY20_20_1/2/17	WATER	1-Feb-17	8:40	97.9	7.24	0.9	5.79	36.16	54,544	19.63	8.13	19	0.011	0.01	<0.002	0.003	0.003	0.09	0.004	0.006	-			
HAYSTH20_1_1/2/17	WATER	1-Feb-17	8:20	103.5	7.59	0.8	5.31	36.23	54,632	20.09	8.14	17	0.011	0.01	<0.002	<0.002	<0.002	0.08	0.003	0.004	-			
HAYSTH20_10_1/2/17	WATER	1-Feb-17	-	101.5	7.35	0.7	1.45	36.27	54,685	20.77	-	-	-	-	-	-	-	-	-	-	-			
HAYSTH20_20_1/2/17	WATER	1-Feb-17	8:10	98.8	7.30	0.9	7.08	36.16	54,546	19.64	8.12	17	0.010	0.0095	<0.002	<0.002	<0.002	0.08	0.005	0.004	-			
QUON20_1_1/2/17	WATER	1-Feb-17	7:50	103.7	7.60	0.8	6.76	36.24	54,647	20.09	8.11	14	0.015	0.0143	<0.002	<0.002	<0.002	0.10	0.005	0.006	-			
QUON20_10_1/2/17	WATER	1-Feb-17	-	102.2	7.49	0.8	6.76	36.23	54,632	20.07	-	-	-	-	-	-	-	-	-	-	-			
QUON20_20_1/2/17	WATER	1-Feb-17	7:40	98.2	7.26	0.9	6.28	36.19	54,576	19.65	8.11	9	0.009	0.0086	<0.002	<0.002	<0.002	0.10	0.004	0.005	-			
MBWQ20_1_21/3/17	WATER	21-Mar-17	9:35	-	-	-	-	-	-	-	8.09	16	0.019	0.0182	<0.002	0.017	0.017	0.12	0.008	0.004	3.73			
MBWQ20_10_21/3/17	WATER	21-Mar-17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
MBWQ20_20_21/3/17	WATER	21-Mar-17	9:25	-	-	-	-	-	-	-	8.01	17	0.014	0.0136	<0.002	0.126	0.126	0.20	0.016	0.017	-			
MBWQ40_1_21/3/17	WATER	21-Mar-17	9:10	104.1	7.85	0.1	3.81	35.55	53,715	18.76	8.08	13	0.013	0.0125	<0.002	0.022	0.022	0.12	0.007	0.005	-			
MBWQ40_20_21/3/17	WATER	21-Mar-17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
MBWQ40_40_21/3/17	WATER	21-Mar-17	8:50	-	-	-	-	-	-	-	7.98	14	0.012	0.0117	<0.002	0.138	0.138	0.22	0.017	0.022	-			
HAY20_1_21/3/17	WATER	21-Mar-17	8:30	106.1	8.13	0.2	5.16	35.54	53,701	17.95	8.09	23	0.014	0.0134	<0.002	0.027	0.027	0.12	0.009	0.006	5.91			
HAY20_10_21/3/17	WATER	21-Mar-17	-	103.3	7.97	0.2	10.99	35.54	53,722	17.56	-	-	-	-	-	-	-	-	-	-	-			
HAY20_20_21/3/17	WATER	21-Mar-17	8:15	78.6	6.54	0.0	0.11	35.30	53,514	13.76	8.07	29	0.013	0.0128	<0.002	0.038	0.038	0.15	0.010	0.006	-			
HAYSTH20_1_21/3/17	WATER	21-Mar-17	7:50	107.3	8.18	0.3	11.89	35.57	53,741	18.17	8.09	34	0.013	0.0125	<0.002	0.018	0.018	0.14	0.008	0.004	-			
HAYSTH20_10_21/3/17	WATER	21-Mar-17	-	101.1	7.84	0.2	3.92	35.53	53,704	17.31	-	-	-	-	-	-	-	-	-	-	-			
HAYSTH20_20_21/3/17	WATER	21-Mar-17	7:40	88.1	7.08	0.5	1.12	35.44	53,633	15.53	8.05	17	0.013	0.0126	<0.002	0.051	0.051	0.15	0.011	0.009	-			
QUON20_1_21/3/17	WATER	21-Mar-17	7:20	108.8	8.27	0.3	8.30	35.52	53,669	18.39	8.07	16	0.011	0.0106	<0.002	0.013	0.013	0.12	0.008	0.004	-			
QUON20_10_21/3/17	WATER	21-Mar-17	-	96.9	7.56	0.1	3.03	35.51	53,681	16.97	-	-	-	-	-	-	-	-	-	-	-			
QUON20_20_21/3/17	WATER	21-Mar-17	7:10	86.4	6.98	1.0	5.16	35.38	53,570	15.21	8.03	25	0.014	0.0136	<0.002	0.068	0.068	0.19	0.016	0.012	-			
MBWQ20_1_19/4/17	WATER	19-Apr-17	11:00	102.1	7.59	0.4	0.61	35.70	53,910	19.48	8.12	26	0.025	0.0238	<0.002	0.006	0.006	0.10	<0.002	0.004	0.45			
MBWQ20_10_19/4/17	WATER	19-Apr-17	-	101.2	7.54	0.4	0.12	35.69	53,908	19.41	-	-	-	-	-	-	-	-	-	-	-			
MBWQ20_20_19/4/17	WATER	19-Apr-17	10:50	99.9	7.46	0.2	1.09	35.68	53,902	19.26	8.12	14	0.025	0.0238	<0.002	0.006	0.006	0.16	0.006	0.004	-			
MBWQ40_1_19/4/17	WATER	19-Apr-17	9:55	99.5	7.37	0.5	0.61	35.68	53,885	19.75	8.12	14	0.028	0.0266	<0.002	0.014	0.014	0.08	0.003	0.004	-			
MBWQ40_20_19/4/17	WATER	19-Apr-17	-	94.6	7.09	0.5	0.23	35.63	53,836	19.06	-	-	-	-	-	-	-	-	-	-	-			
MBWQ40_40_19/4/17	WATER	19-Apr-17	9:40	89.3	6.73	0.2	0.31	35.62	53,828	18.74	8.07	17	0.032	0.0307	<0.002	0.030	0.030	0.11	0.004	0.007	-			
HAY20_1_19/4/17	WATER	19-Apr-17	9:10	99.3	7.37	0.5	0.46	35.68	53,892	19.62	8.12	12	0.032	0.0305	<0.002	0.016	0.016	0.09	<0.002	0.005	0.29			
HAY20_10_19/4/17	WATER	19-Apr-17	-	97.8	7.28	0.5	0.15	35.66	53,863	19.44	-	-	-	-	-	-	-	-	-	-	-			
HAY20_20_19/4/17	WATER	19-Apr-17	9:00	94.4	7.06	0.3	0.27	35.66	53,865	19.18	8.11	17	0.037	0.0353	<0.002	0.018	0.018	0.09	0.003	0.007	-			
HAYSTH20_1_19/4/17	WATER	19-Apr-17	8:30	98.1	7.31	0.4	0.31	35.66	53,857	19.40	8.11	17	0.035	0.0334	<0.002	0.015	0.015	0.08	0.003	0.006	-			
HAYSTH20_10_19/4/17	WATER	19-Apr-17	-	97.5	7.28	0.5	0.53	35.65	53,857	19.27	-	-	-	-	-	-	-	-	-	-	-			
HAYSTH20_20_19/4/17	WATER	19-Apr-17	8:20	95.6	7.15	0.4	0.69	35.66	53,867	19.19	8.12	12	0.037	0.0353	<0.002	0.014	0.014	0.10	0.003	0.006	-			
QUON20_1_19/4/17	WATER	19-Apr-17	7:50	98.5	7.38	0.4	0.38	35.55	53,718	19.15	8.09	11	0.039	0.0373	<0.002	0.014	0.014	0.09	0.003	0.006	-			
QUON20_10_19/4/17	WATER	19-Apr-17	-	98.2	7.35	0.4	0.23	35.62	53,806	19.15	-	-	-	-	-	-	-	-	-	-	-			
QUON20_20_19/4/17	WATER	19-Apr-17	7:40	99.1	7.42	0.3	0.69	35.64	53,840	19.10	8.11	18	0.041	0.0391	<0.002	0.013	0.013	0.10	0.004	0.006	-			

Note¹ WQOs for protection of Marine Aquatic Ecosystems in South-East Australia (ANZECC/ARMCANZ 2000 - Table 3.3.2)² Toxicant guideline - 95% species protection in marine waters (ANZECC/ARMCANZ 2000 - Table 3.4.1)³ Field parameters measured *insitu* using YSI 6600 V2-4 sonde⁴ Laboratory parameters reported by ALS Canberra (nutrients and microbiological) and ALS Sydney (total metals)⁵ Chlorophyll a values adjusted by correction factor calculated from laboratory QC sample⁶ Ammonium (NH₄+) concentration determined by calculation

Shaded cells with bold text indicate guideline value has been exceeded. (Note - in few instances where LOR exceeds the guideline value resulting in a meaningless 'non-detect' result, a value of x0.5 the LOR is applied)

Table B3 - Merimbula Ambient Marine Water Quality (2014 - 2017)

Sample ID	Sample Type	Sample Date	Sample Time	Thermotolerant Faecal Coliforms (Confirmed)	Thermotolerant Faecal Coliforms (Presumptive)	Enterococci (Confirmed)	Enterococci (Presumptive)	Aluminium (Al)	Beryllium (Be)	Arsenic (As)	Iron (Fe)	Chromium (Cr)	Manganese (Mn)	Copper (Cu)	Zinc (Zn)	Nickel (Ni)	Selenium (Se)			
				CFU/100mL	CFU/100mL	CFU/100mL	CFU/100mL	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	
				1	1	1	1	5	0.1	0.5	5	0.5	0.5	1	5	0.5	2			
				Limit of Reporting (LOR)																
				Aquatic Ecosystems ¹																
Toxicants in Marine Waters - 95% species protection ²				-	-	-	-	-	-	-	-	-	-	-	-	-				
ANZECC - Primary Contact Recreation ³				150	150	35	35	-	-	-	-	-	-	-	-	-	-			
MBWQ20_1_28/10/14				WATER	28-Oct-14	11:55	<1	<1	-	-	-	-	-	-	-	-	-			
MBWQ20_10_28/10/14				WATER	28-Oct-14	11:40	<1	<1	-	-	-	-	-	-	-	-				
MBWQ20_20_28/10/14				WATER	28-Oct-14	11:35	<1	<1	-	-	-	-	-	-	-	-				
MBWQ30_1_28/10/14				WATER	28-Oct-14	11:20	<1	<1	-	-	-	-	-	-	-	-				
MBWQ30_15_28/10/14				WATER	28-Oct-14	11:10	<1	<1	-	-	-	-	-	-	-	-				
MBWQ30_30_28/10/14				WATER	28-Oct-14	11:00	<1	<1	-	-	-	-	-	-	-	-				
MBWQ40_1_28/10/14				WATER	28-Oct-14	9:50	<1	<1	-	-	-	-	-	-	-	-				
MBWQ40_20_28/10/14				WATER	28-Oct-14	9:40	<1	<1	-	-	-	-	-	-	-	-				
MBWQ40_40_28/10/14				WATER	28-Oct-14	9:30	<1	<1	-	-	-	-	-	-	-	-				
MBWQ20_1_25/11/14				WATER	25-Nov-14	12:00	<1	<1	<1	<1	-	-	-	-	9	-	-			
MBWQ20_10_25/11/14				WATER	25-Nov-14	11:55	<1	<1	<1	<1	<45	-	-	10	-	<2.5	-	<5	-	-
MBWQ20_20_25/11/14				WATER	25-Nov-14	11:50	<1	<1	<1	<1	-	-	-	-	-	<5	-	-		
MBWQ30_1_25/11/14				WATER	25-Nov-14	11:15	<1	<1	<1	<1	-	-	-	-	-	<5	-	-		
MBWQ30_15_25/11/14				WATER	25-Nov-14	11:10	<1	<1	<1	<1	<45	-	-	<10	-	<2.5	-	<5	-	-
MBWQ30_30_25/11/14				WATER	25-Nov-14	11:05	<1	<1	<1	<1	-	-	-	-	-	<5	-	-		
MBWQ40_1_25/11/14				WATER	25-Nov-14	10:10	<1	<1	<1	<1	-	-	-	-	-	<5	-	-		
MBWQ40_20_25/11/14				WATER	25-Nov-14	10:05	<1	<1	<1	<1	<45	-	-	10	-	<2.5	-	<5	-	-
MBWQ40_40_25/11/14				WATER	25-Nov-14	10:00	<1	<1	<1	<1	-	-	-	-	-	10	-	-		
MBWQ20_1_15/12/14				WATER	15-Dec-14	12:50	<1	<1	<1	<1	-	-	-	-	-	-	-	-		
MBWQ20_10_15/12/14				WATER	15-Dec-14	12:45	<1	<1	<1	<1	-	-	-	-	-	-	-			
MBWQ20_20_15/12/14				WATER	15-Dec-14	12:40	<1	<1	<1	<1	-	-	-	-	-	-	-			
MBWQ30_1_15/12/14				WATER	15-Dec-14	12:05	<1	<1	<1	<1	-	-	-	-	-	-	-			
MBWQ30_15_15/12/14				WATER	15-Dec-14	12:00	<1	<1	<1	<1	-	-	-	-	-	-	-			
MBWQ30_30_15/12/14				WATER	15-Dec-14	11:55	<1	<1	<1	<1	-	-	-	-	-	-	-			
MBWQ40_1_15/12/14				WATER	15-Dec-14	11:05	<1	<1	1	1	-	-	-	-	-	-	-			
MBWQ40_20_15/12/14				WATER	15-Dec-14	11:00	<1	<1	<1	<1	-	-	-	-	-	-	-			
MBWQ40_40_15/12/14				WATER	15-Dec-14	10:55	<1	<1	2	2	-	-	-	-	-	-	-			
MBWQ20_1_7/1/15				WATER	7-Jan-15	9:35	<1	<1	<1	<1	-	-	-	-	-	-	-			
MBWQ20_10_7/1/15				WATER	7-Jan-15	9:30	<1	<1	<1	<1	-	-	-	-	-	-	-			
MBWQ20_20_7/1/15				WATER	7-Jan-15	9:25	<1	<1	<1	<1	-	-	-	-	-	-	-			
MBWQ30_1_7/1/15				WATER	7-Jan-15	8:40	<1	<1	<1	<1	-	-	-	-	-	-	-			
MBWQ30_15_7/1/15				WATER	7-Jan-15	8:35	<1	<1	<1	<1	-	-	-	-	-	-	-			
MBWQ30_30_7/1/15				WATER	7-Jan-15	8:30	<1	<1	<1	<1	-	-	-	-	-	-	-			
MBWQ40_1_7/1/15				WATER	7-Jan-15	7:30	<1	<1	<1	<1	-	-	-	-	-	-	-			
MBWQ40_20_7/1/15				WATER	7-Jan-15	7:25	<1	<1	<1	<1	-	-	-	-	-	-	-			
MBWQ40_40_7/1/15				WATER	7-Jan-15	7:20	<1	<1	<1	<1	-	-	-	-	-	-	-			
MBWQ20_1_19/2/15				WATER	19-Feb-15	8:55	<1	<1	<1	<1	-	-	-	-	-	-	-			
MBWQ20_10_19/2/15				WATER	19-Feb-15	8:50	<1	<1	<1	<1	-	-	-	-	-	-	-			
MBWQ20_20_19/2/15				WATER	19-Feb-15	8:45	<1	<1	<1	<1	-	-	-	-	-	-	-			
MBWQ30_1_19/2/15				WATER	19-Feb-15	8:25	<1	<1	<1	<1	-	-	-	-	-	-	-			
MBWQ30_15_19/2/15				WATER	19-Feb-15	8:20	<1	<1	<1	<1	-	-	-	-	-	-	-			
MBWQ30_30_19/2/15				WATER	19-Feb-15	8:15	<1	<1	<1	<1	-	-	-	-	-	-	-			
MBWQ40_1_19/2/15				WATER	19-Feb-15	7:05	<1	<1	7	7	-	-	-	-	-	-	-			
MBWQ40_20_19/2/15				WATER	19-Feb-15	7:00	<1	<1	2	2	-	-	-	-	-	-	-			
MBWQ40_40_19/2/15				WATER	19-Feb-15	6:50	<1	<1	<1	<1	-	-	-	-	-	-	-			
MBWQ20_1_11/3/15				WATER	11-Mar-15	10:50	<2	<2	<1	<1	-	-	-	-	-	-	-			
MBWQ20_10_11/3/15				WATER	11-Mar-15	10:45	<2	<2	<1	<1	<9	-	-	<10	<0.002	0.6	-	-	-	
MBWQ20_20_11/3/15				WATER	11-Mar-15	10:40	<2	<2	<1	<1	-	-	-	-	-	-	-	-		
MBWQ30_1_11/3/15				WATER	11-Mar-15	10:10	<2	<2	<1	<1	-	-	-	-	-	-	-	-		
MBWQ30_15_11/3/15				WATER	11-Mar-15	10:05	<2	<2	<1	<1	<9	-	-	<10	<0.002	0.5	-	-	-	
MBWQ30_30_11/3/15				WATER	11-Mar-15	10:00	<2	<2	<1	<1	-	-	-	-	-	-	-	-		
MBWQ40_1_11/3/15				WATER	11-Mar-15	8:40	<2	<2	<1	<1	-	-	-	-	-	-	-	-		
MBWQ40_20_11/3/15				WATER	11-Mar-15	8:35	<2	<2	<1	<1	<9	-	-	<10	<0.002	0.6	-	-	-	
MBWQ40_40_11/3/15				WATER	11-Mar-15	8:30	<2	<2	<1	<1	-	-	-	-	-	-	-	-		
MBWQ20_1_28/4/15				WATER	28-Apr-15	10:50	2	2	2	2	-	-	-	-	-	-	-	-		
MBWQ20_10_28/4/15				WATER	28-Apr-15	10:45	<1	<1	1	1	-	-	-	-	-	-	-	-		
MBWQ20_20_28/4/15				WATER	28-Apr-15	10:40	<1	<1	<1	<1	-	-	-	-	-	-	-	-		
MBWQ30_1_28/4/15				WATER	28-Apr-15	10:10	3	3	4	4	-	-	-	-	-	-	-	-		
MBWQ30_15_28/4/15				WATER	28-Apr-15	10:05	<1	<1	<1	<1	-	-	-	-	-	-	-	-		
MBWQ30_30_28/4/15				WATER	28-Apr-15	10:00	1	1	<1	<1	-	-	-	-	-	-	-	-		
MBWQ40_1_28/4/15				WATER	28-Apr-15	8:40	<2	<2	<1	<1	-	-	-	-	-	-	-	-		
MBWQ40_20_28/4/15				WATER	28-Apr-15	8:35	<1	<1	<1	<1	-	-	-	-	-	-	-	-		
MBWQ40_40_28/4/15				WATER	28-Apr-15	8:30	<1	<1	<1	<1	-	-	-	-	-	-	-	-		

Table B3 - Merimbula Ambient Marine Water Quality (2014 - 2017)

Sample ID	Sample Type	Sample Date	Sample Time	Thermotolerant Faecal Coliforms (Confirmed)	Thermotolerant Faecal Coliforms (Presumptive)	Enterococci (Confirmed)	Enterococci (Presumptive)	Aluminium (Al)	Beryllium (Be)	Arsenic (As)	Iron (Fe)	Chromium (Cr)	Manganese (Mn)	Copper (Cu)	Zinc (Zn)	Nickel (Ni)	Selenium (Se)
				CFU/100mL	CFU/100mL	CFU/100mL	CFU/100mL	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
				1	1	1	1	5	0.1	0.5	5	0.5	0.5	1	5	0.5	2
				Limit of Reporting (LOR)	Limit of Reporting (LOR)	Limit of Reporting (LOR)	Limit of Reporting (LOR)	Limit of Reporting (LOR)	Limit of Reporting (LOR)	Limit of Reporting (LOR)	Limit of Reporting (LOR)	Limit of Reporting (LOR)	Limit of Reporting (LOR)	Limit of Reporting (LOR)	Limit of Reporting (LOR)	Limit of Reporting (LOR)	Limit of Reporting (LOR)
				Aquatic Ecosystems ¹	-	-	-	-	-	-	-	-	-	-	-	-	-
				Toxicants in Marine Waters - 95% species protection ²	-	-	-	-	-	-	-	27.4	-	1.3	15	70	-
MBWQ20 1 18/5/15	WATER	18-May-15	9:40	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20 10 18/5/15	WATER	18-May-15	9:35	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20 20 18/5/15	WATER	18-May-15	9:30	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ30 1 18/5/15	WATER	18-May-15	8:40	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ30 15 18/5/15	WATER	18-May-15	8:35	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ30 30 18/5/15	WATER	18-May-15	8:30	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40 1 18/5/15	WATER	18-May-15	7:30	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40 20 18/5/15	WATER	18-May-15	7:25	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40 40 18/5/15	WATER	18-May-15	7:20	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20 1 11/6/15	WATER	11-Jun-15	13:20	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-
MBWQ20 10 11/6/15	WATER	11-Jun-15	13:15	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-
MBWQ20 20 11/6/15	WATER	11-Jun-15	13:10	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-
MBWQ30 1 11/6/15	WATER	11-Jun-15	12:30	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-
MBWQ30 15 11/6/15	WATER	11-Jun-15	12:25	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-
MBWQ30 30 11/6/15	WATER	11-Jun-15	12:20	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-
MBWQ40 1 11/6/15	WATER	11-Jun-15	11:30	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-
MBWQ40 20 11/6/15	WATER	11-Jun-15	11:25	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-
MBWQ40 40 11/6/15	WATER	11-Jun-15	11:20	<1	<1	-	-	-	-	-	-	-	-	-	-	-	-
MBWQ20 1 21/7/15	WATER	21-Jul-15	12:10	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20 10 21/7/15	WATER	21-Jul-15	12:05	<1	<1	<1	<1	15	-	-	10	-	<0.5	-	<5	-	-
MBWQ20 20 21/7/15	WATER	21-Jul-15	12:00	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ30 1 21/7/15	WATER	21-Jul-15	11:05	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ30 15 21/7/15	WATER	21-Jul-15	11:00	<1	<1	<1	<1	13	-	-	<10	-	<0.5	-	<5	-	-
MBWQ30 30 21/7/15	WATER	21-Jul-15	10:55	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40 1 21/7/15	WATER	21-Jul-15	10:00	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40 20 21/7/15	WATER	21-Jul-15	9:55	<1	<1	<1	<1	10	-	-	<10	-	<0.5	-	<5	-	-
MBWQ40 40 21/7/15	WATER	21-Jul-15	9:50	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20 1 11/8/15	WATER	11-Aug-15	15:20	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20 10 11/8/15	WATER	11-Aug-15	15:15	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20 20 11/8/15	WATER	11-Aug-15	15:10	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ30 1 11/8/15	WATER	11-Aug-15	14:40	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ30 15 11/8/15	WATER	11-Aug-15	14:35	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ30 30 11/8/15	WATER	11-Aug-15	14:30	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40 1 11/8/15	WATER	11-Aug-15	13:50	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40 20 11/8/15	WATER	11-Aug-15	13:45	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40 40 11/8/15	WATER	11-Aug-15	13:40	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20 1 15/9/15	WATER	15-Sep-15	8:10	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20 10 15/9/15	WATER	15-Sep-15	8:05	<1	<1	<1	<1	<9	-	-	<10	-	<0.5	-	<5	-	-
MBWQ20 20 15/9/15	WATER	15-Sep-15	8:00	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ30 1 15/9/15	WATER	15-Sep-15	7:30	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ30 15 15/9/15	WATER	15-Sep-15	7:25	<1	<1	<1	<1	<9	-	-	<10	-	<0.5	-	<5	-	-
MBWQ30 30 15/9/15	WATER	15-Sep-15	7:20	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40 1 15/9/15	WATER	15-Sep-15	6:50	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40 20 15/9/15	WATER	15-Sep-15	6:45	<1	<1	<1	<1	<9	-	-	<10	-	<0.5	-	<5	-	-
MBWQ40 40 15/9/15	WATER	15-Sep-15	6:40	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
QC01 15/9/15 (MBWQ20 10)	WATER	15-Sep-15	11:00	-	-	-	-	<9	-	-	<10	-	<0.5	-	<5	-	-
QC02 15/9/15 (MBWQ30 15)	WATER	15-Sep-15	11:00	-	-	-	-	<9	-	-	<10	-	<0.5	-	<5	-	-
QC03 15/9/15 (MBWQ40 20)	WATER	15-Sep-15	11:00	-	-	-	-	<5	-	-	<10	-	<0.5	-	<5	-	-
QC04 15/9/15 (MBWQ20 10)	WATER	15-Sep-15	11:00	-	-	-	-	<5	-	2.1	<5	-	<0.5	-	<5	-	-
QC05 15/9/15 (MBWQ30 15)	WATER	15-Sep-15	11:00	-	-	-	-	<5	-	2.2	<5	-	<0.5	-	<5	-	-
QC06 15/9/15 (MBWQ40 20)	WATER	15-Sep-15	11:00	-	-	-	-	<5	-	2	<5	-	<0.5	-	<5	-	-
MBWQ20 1 14/10/15	WATER	14-Oct-15	10:15	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20 10 14/10/15	WATER	14-Oct-15	10:10	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20 20 14/10/15	WATER	14-Oct-15	10:05	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ30 1 14/10/15	WATER	14-Oct-15	9:30	<1	-	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ30 15 14/10/15	WATER	14-Oct-15	9:25	<1	-	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ30 30 14/10/15	WATER	14-Oct-15	9:20	<1	-	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40 1 14/10/15	WATER	14-Oct-15	8:30	<1	-	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40 20 14/10/15	WATER	14-Oct-15	8:25	<1	-	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40 40 14/10/15	WATER	14-Oct-15	8:20	<1	-	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20 1 6/4/16	WATER	6-Apr-16	10:25	<1	<1	<1	<1	8	<0.1	1.8	9	<0.5	0.6	0.3	<5	<0.5	<2
MBWQ20 10 6/4/16	WATER	6-Apr-16	10:20	-	-	-	-	<5	<0.1	1.7	6	<0.5	<0.5	0.6	<5	<0.5	<2
MBWQ20 20 6/4/16	WATER	6-Apr-16	10:15	<1	<1	<1	<1	<5	<0.1	1.7	<5	<0.5	<0.5	0.5	<5	<0.5	<2
MBWQ40 1 6/4/16	WATER	6-Apr-16	9:35	<1	<1	<1	<1	<5	<0.1	1.8	7	0.6	<0.5	2.4	<5	<0.5	<2
MBWQ40 20 6/4/16	WATER	6-Apr-16	9:30	-	-	-	-	<5	<0.1	1.7	<5	<0.5	<0.5	1	<5	<0.5	<2

Table B3 - Merimbula Ambient Marine Water Quality (2014 - 2017)

Sample ID	Sample Type	Sample Date	Sample Time	Thermotolerant Faecal Coliforms (Confirmed)	Thermotolerant Faecal Coliforms (Presumptive)	Enterococci (Confirmed)	Enterococci (Presumptive)	Aluminium (Al)	Beryllium (Be)	Arsenic (As)	Iron (Fe)	Chromium (Cr)	Manganese (Mn)	Copper (Cu)	Zinc (Zn)	Nickel (Ni)	Selenium (Se)
				CFU/100mL	CFU/100mL	CFU/100mL	CFU/100mL	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
				1	1	1	1	5	0.1	0.5	5	0.5	0.5	1	5	0.5	2
				Limit of Reporting (LOR)													
				Aquatic Ecosystems ¹	-	-	-	-	-	-	-	-	-	-	-	-	-
				Toxicants in Marine Waters - 95% species protection ²	-	-	-	-	-	-	-	27.4	-	1.3	15	70	-
MBWQ40_40_6/4/16	WATER	6-Apr-16	9:25	<1	<1	<1	<1	<5	<0.1	1.8	6	<0.5	<0.5	3.9	<5	<0.5	<2
HAY20_1_6/4/16	WATER	6-Apr-16	8:50	<1	<1	<1	<1	<5	<0.1	1.7	19	0.7	3.7	2.2	<5	<0.5	<2
HAY20_10_6/4/16	WATER	6-Apr-16	8:45	-	-	-	-	<5	<0.1	1.9	5	<0.5	<0.5	0.3	<5	<0.5	<2
HAY20_20_6/4/16	WATER	6-Apr-16	8:40	<1	<1	<1	<1	<5	<0.1	1.8	15	1	<0.5	0.7	<5	<0.5	<2
HAYSTH20_1_6/4/16	WATER	6-Apr-16	8:10	<1	<1	<1	<1	<5	<0.1	1.8	8	0.6	<0.5	2.8	<5	<0.5	<2
HAYSTH20_10_6/4/16	WATER	6-Apr-16	8:05	-	-	-	-	<5	<0.1	1.6	7	<0.5	<0.5	1.7	<5	0.6	<2
HAYSTH20_20_6/4/16	WATER	6-Apr-16	8:00	<1	<1	<1	<1	<5	<0.1	1.8	<5	<0.5	<0.5	1	<5	<0.5	<2
QUON20_1_6/4/16	WATER	6-Apr-16	7:25	<1	<1	<1	<1	<5	<0.1	1.8	<5	<0.5	<0.5	0.7	<5	0.7	<2
QUON20_10_6/4/16	WATER	6-Apr-16	7:22	-	-	-	-	<5	<0.1	1.8	6	<0.5	<0.5	0.8	<5	<0.5	<2
QUON20_20_6/4/16	WATER	6-Apr-16	7:20	<1	<1	<1	<1	<5	<0.1	1.7	7	<0.5	0.6	2.8	<5	<0.5	<2
MBWQ20_1_16/5/16	WATER	16-May-16	13:00	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20_10_16/5/16	WATER	16-May-16	12:55	-	-	-	-	<5	<0.1	1.5	<5	<0.5	<0.5	<0.2	<5	<0.5	<2
MBWQ20_20_16/5/16	WATER	16-May-16	12:50	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40_1_16/5/16	WATER	16-May-16	12:20	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40_20_16/5/16	WATER	16-May-16	12:15	-	-	-	-	<5	<0.1	1.7	<5	<0.5	<0.5	<0.2	<5	<0.5	<2
MBWQ40_40_16/5/16	WATER	16-May-16	12:10	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAY20_1_16/5/16	WATER	16-May-16	11:35	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAY20_10_16/5/16	WATER	16-May-16	11:30	-	-	-	-	<5	<0.1	1.7	<5	<0.5	<0.5	<0.2	<5	<0.5	<2
HAY20_20_16/5/16	WATER	16-May-16	11:25	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAYSTH20_1_16/5/16	WATER	16-May-16	11:00	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAYSTH20_10_16/5/16	WATER	16-May-16	10:55	-	-	-	-	<5	<0.1	1.6	<5	<0.5	<0.5	<0.2	<5	<0.5	<2
HAYSTH20_20_16/5/16	WATER	16-May-16	10:50	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
QUON20_1_16/5/16	WATER	16-May-16	10:15	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
QUON20_10_16/5/16	WATER	16-May-16	10:10	-	-	-	-	<5	<0.1	1.8	<5	<0.5	<0.5	<0.2	<5	<0.5	<2
QUON20_20_16/5/16	WATER	16-May-16	10:05	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20_1_29/6/16	WATER	29-Jun-16	11:35	<2	<2	<2	<2	-	-	-	-	-	-	-	-	-	-
MBWQ20_10_29/6/16	WATER	29-Jun-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBWQ20_20_29/6/16	WATER	29-Jun-16	11:25	<2	<2	<2	<2	-	-	-	-	-	-	-	-	-	-
MBWQ40_1_29/6/16	WATER	29-Jun-16	10:55	<2	<2	<2	<2	-	-	-	-	-	-	-	-	-	-
MBWQ40_20_29/6/16	WATER	29-Jun-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBWQ40_40_29/6/16	WATER	29-Jun-16	10:45	<2	<2	<2	<2	-	-	-	-	-	-	-	-	-	-
HAY20_1_29/6/16	WATER	29-Jun-16	10:00	<2	<2	<2	<2	-	-	-	-	-	-	-	-	-	-
HAY20_10_29/6/16	WATER	29-Jun-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAY20_20_29/6/16	WATER	29-Jun-16	9:50	<2	<2	2	2	-	-	-	-	-	-	-	-	-	-
HAYSTH20_1_29/6/16	WATER	29-Jun-16	9:25	<2	<2	<2	<2	-	-	-	-	-	-	-	-	-	-
HAYSTH20_10_29/6/16	WATER	29-Jun-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAYSTH20_20_29/6/16	WATER	29-Jun-16	9:15	<2	<2	<2	<2	-	-	1.8	-	-	-	-	-	-	-
QUON20_1_29/6/16	WATER	29-Jun-16	8:40	<2	<2	<2	<2	-	-	-	-	-	-	-	-	-	-
QUON20_10_29/6/16	WATER	29-Jun-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QUON20_20_29/6/16	WATER	29-Jun-16	8:30	<2	<2	<2	<2	-	-	-	-	-	-	-	-	-	-
MBWQ20_1_21/7/16	WATER	21-Jul-16	10:30	<1	<1	<1	1	-	-	-	-	-	-	-	-	-	-
MBWQ20_10_21/7/16	WATER	21-Jul-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBWQ20_20_21/7/16	WATER	21-Jul-16	10:20	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40_1_21/7/16	WATER	21-Jul-16	9:50	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40_20_21/7/16	WATER	21-Jul-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBWQ40_40_21/7/16	WATER	21-Jul-16	9:40	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAY20_1_21/7/16	WATER	21-Jul-16	9:20	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAY20_10_21/7/16	WATER	21-Jul-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAY20_20_21/7/16	WATER	21-Jul-16	9:10	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAYSTH20_1_21/7/16	WATER	21-Jul-16	8:45	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAYSTH20_10_21/7/16	WATER	21-Jul-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAYSTH20_20_21/7/16	WATER	21-Jul-16	8:35	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
QUON20_1_21/7/16	WATER	21-Jul-16	7:55	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
QUON20_10_21/7/16	WATER	21-Jul-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QUON20_20_21/7/16	WATER	21-Jul-16	7:45	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20_1_17/8/16	WATER	17-Aug-16	11:40	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20_10_17/8/16	WATER	17-Aug-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBWQ20_20_17/8/16	WATER	17-Aug-16	11:30	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40_1_17/8/16	WATER	17-Aug-16	10:55	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40_20_17/8/16	WATER	17-Aug-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBWQ40_40_17/8/16	WATER	17-Aug-16	10:45	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAY20_1_17/8/16	WATER	17-Aug-16	10:05	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAY20_10_17/8/16	WATER	17-Aug-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAY20_20_17/8/16	WATER	17-Aug-16	9:55	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAYSTH20_1_17/8/16	WATER	17-Aug-16	9:15	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAYSTH20_10_17/8/16	WATER	17-Aug-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAYSTH20_20_17/8/16	WATER	17-Aug-16	9:05	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
QUON20_1_17/8/16	WATER	17-Aug-16	8:15	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-

Table B3 - Merimbula Ambient Marine Water Quality (2014 - 2017)

Sample ID	Sample Type	Sample Date	Sample Time	Thermotolerant Faecal Coliforms (Confirmed)	Thermotolerant Faecal Coliforms (Presumptive)	Enterococci (Confirmed)	Enterococci (Presumptive)	Aluminium (Al)	Beryllium (Be)	Arsenic (As)	Iron (Fe)	Chromium (Cr)	Manganese (Mn)	Copper (Cu)	Zinc (Zn)	Nickel (Ni)	Selenium (Se)
				CFU/100mL	CFU/100mL	CFU/100mL	CFU/100mL	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
				1	1	1	1	5	0.1	0.5	5	0.5	0.5	1	5	0.5	2
				Limit of Reporting (LOR)	Limit of Reporting (LOR)	Limit of Reporting (LOR)	Limit of Reporting (LOR)	Limit of Reporting (LOR)	Limit of Reporting (LOR)	Limit of Reporting (LOR)	Limit of Reporting (LOR)	Limit of Reporting (LOR)	Limit of Reporting (LOR)	Limit of Reporting (LOR)	Limit of Reporting (LOR)	Limit of Reporting (LOR)	Limit of Reporting (LOR)
				Aquatic Ecosystems ¹	-	-	-	-	-	-	-	-	-	-	-	-	-
				Toxicants in Marine Waters - 95% species protection ²	-	-	-	-	-	-	-	27.4	-	1.3	15	70	-
QUON20_10_17/8/16	WATER	17-Aug-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QUON20_20_17/8/16	WATER	17-Aug-16	8:05	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20_1_28/9/16	WATER	28-Sep-16	11:30	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20_10_28/9/16	WATER	28-Sep-16	11:25	-	-	-	-	<5	<0.1	2.1	7	<0.5	<0.5	<0.2	<5	0.6	<2
MBWQ20_20_28/9/16	WATER	28-Sep-16	11:20	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40_1_28/9/16	WATER	28-Sep-16	10:35	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40_20_28/9/16	WATER	28-Sep-16	10:30	-	-	-	-	<5	<0.1	2.2	9	<0.5	<0.5	<0.2	<5	0.6	<2
MBWQ40_40_28/9/16	WATER	28-Sep-16	10:25	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAY20_1_28/9/16	WATER	28-Sep-16	9:50	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAY20_10_28/9/16	WATER	28-Sep-16	9:45	-	-	-	-	<5	<0.1	2.0	9	<0.5	<0.5	<0.2	<5	<0.5	<2
HAY20_20_28/9/16	WATER	28-Sep-16	9:40	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAYSTH20_1_28/9/16	WATER	28-Sep-16	9:00	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAYSTH20_10_28/9/16	WATER	28-Sep-16	8:55	-	-	-	-	<5	<0.1	2.1	8	<0.5	<0.5	<0.2	<5	<0.5	<2
HAYSTH20_20_28/9/16	WATER	28-Sep-16	8:50	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
QUON20_1_28/9/16	WATER	28-Sep-16	8:15	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
QUON20_10_28/9/16	WATER	28-Sep-16	8:10	-	-	-	-	<5	<0.1	2.0	8	<0.5	<0.5	<0.2	<5	<0.5	<2
QUON20_20_28/9/16	WATER	28-Sep-16	8:05	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20_1_19/10/16	WATER	19-Oct-16	10:00	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20_10_19/10/16	WATER	19-Oct-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBWQ20_20_19/10/16	WATER	19-Oct-16	9:50	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40_1_19/10/16	WATER	19-Oct-16	7:30	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40_20_19/10/16	WATER	19-Oct-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBWQ40_40_19/10/16	WATER	19-Oct-16	7:20	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAY20_1_19/10/16	WATER	19-Oct-16	8:15	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAY20_10_19/10/16	WATER	19-Oct-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAY20_20_19/10/16	WATER	19-Oct-16	8:05	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAYSTH20_1_19/10/16	WATER	19-Oct-16	8:50	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAYSTH20_10_19/10/16	WATER	19-Oct-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAYSTH20_20_19/10/16	WATER	19-Oct-16	8:40	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
QUON20_1_19/10/16	WATER	19-Oct-16	9:20	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
QUON20_10_19/10/16	WATER	19-Oct-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QUON20_20_19/10/16	WATER	19-Oct-16	9:10	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20_1_17/11/16	WATER	17-Nov-16	9:15	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20_10_17/11/16	WATER	17-Nov-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBWQ20_20_17/11/16	WATER	17-Nov-16	9:05	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40_1_17/11/16	WATER	17-Nov-16	7:00	<1	<1	2	2	-	-	-	-	-	-	-	-	-	-
MBWQ40_20_17/11/16	WATER	17-Nov-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBWQ40_40_17/11/16	WATER	17-Nov-16	6:45	<1	<1	1	1	-	-	-	-	-	-	-	-	-	-
HAY20_1_17/11/16	WATER	17-Nov-16	8:40	<1	<1	2	2	-	-	-	-	-	-	-	-	-	-
HAY20_10_17/11/16	WATER	17-Nov-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAY20_20_17/11/16	WATER	17-Nov-16	8:25	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAYSTH20_1_17/11/16	WATER	17-Nov-16	8:10	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAYSTH20_10_17/11/16	WATER	17-Nov-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAYSTH20_20_17/11/16	WATER	17-Nov-16	8:00	<1	<1	1	1	-	-	-	-	-	-	-	-	-	-
QUON20_1_17/11/16	WATER	17-Nov-16	7:45	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
QUON20_10_17/11/16	WATER	17-Nov-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QUON20_20_17/11/16	WATER	17-Nov-16	7:30	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20_1_12/12/16	WATER	12-Dec-16	13:40	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20_10_12/12/16	WATER	12-Dec-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBWQ20_20_12/12/16	WATER	12-Dec-16	13:30	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40_1_12/12/16	WATER	12-Dec-16	12:30	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40_20_12/12/16	WATER	12-Dec-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBWQ40_40_12/12/16	WATER	12-Dec-16	12:20	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAY20_1_12/12/16	WATER	12-Dec-16	11:30	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAY20_10_12/12/16	WATER	12-Dec-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAY20_20_12/12/16	WATER	12-Dec-16	11:20	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAYSTH20_1_12/12/16	WATER	12-Dec-16	10:45	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAYSTH20_10_12/12/16	WATER	12-Dec-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAYSTH20_20_12/12/16	WATER	12-Dec-16	10:35	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
QUON20_1_12/12/16	WATER	12-Dec-16	9:55	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
QUON20_10_12/12/16	WATER	12-Dec-16	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QUON20_20_12/12/16	WATER	12-Dec-16	9:45	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20_1_1/2/17	WATER	1-Feb-17	10:10	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20_10_1/2/17	WATER	1-Feb-17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBWQ20_20_1/2/17	WATER	1-Feb-17	10:00	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40_1_1/2/17	WATER	1-Feb-17	9:30	<1	<1	1	1	-	-	-	-	-	-	-	-	-	-
MBWQ40_20_1/2/17	WATER	1-Feb-17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBWQ40_40_1/2/17	WATER	1-Feb-17	9:20	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-

Table B3 - Merimbula Ambient Marine Water Quality (2014 - 2017)

Sample ID	Sample Type	Sample Date	Sample Time	Thermotolerant Faecal Coliforms (Confirmed)	Thermotolerant Faecal Coliforms (Presumptive)	Enterococci (Confirmed)	Enterococci (Presumptive)	Aluminium (Al)	Beryllium (Be)	Arsenic (As)	Iron (Fe)	Chromium (Cr)	Manganese (Mn)	Copper (Cu)	Zinc (Zn)	Nickel (Ni)	Selenium (Se)
				CFU/100mL	CFU/100mL	CFU/100mL	CFU/100mL	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
				1	1	1	1	5	0.1	0.5	5	0.5	0.5	1	5	0.5	2
				Limit of Reporting (LOR)													
				Aquatic Ecosystems ¹	-	-	-	-	-	-	-	-	-	-	-	-	-
				Toxicants in Marine Waters - 95% species protection ²	-	-	-	-	-	-	-	27.4	-	1.3	15	70	-
HAY20_1_1/2/17	WATER	1-Feb-17	8:50	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAY20_10_1/2/17	WATER	1-Feb-17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAY20_20_1/2/17	WATER	1-Feb-17	8:40	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAYSTH20_1_1/2/17	WATER	1-Feb-17	8:20	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAYSTH20_10_1/2/17	WATER	1-Feb-17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAYSTH20_20_1/2/17	WATER	1-Feb-17	8:10	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
QUON20_1_1/2/17	WATER	1-Feb-17	7:50	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
QUON20_10_1/2/17	WATER	1-Feb-17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QUON20_20_1/2/17	WATER	1-Feb-17	7:40	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20_1_21/3/17	WATER	21-Mar-17	9:35	310	310	59	59	-	-	-	-	-	-	-	-	-	-
MBWQ20_10_21/3/17	WATER	21-Mar-17	-	-	-	-	-	15	<0.1	2.2	9	<0.5	<0.5	<0.2	<5	<0.5	<2
MBWQ20_20_21/3/17	WATER	21-Mar-17	9:25	80	80	9	9	-	-	-	-	-	-	-	-	-	-
MBWQ40_1_21/3/17	WATER	21-Mar-17	9:10	440	440	116	116	-	-	-	-	-	-	-	-	-	-
MBWQ40_20_21/3/17	WATER	21-Mar-17	-	-	-	-	-	12	<0.1	2.0	11	<0.5	<0.5	<0.2	<5	<0.5	<2
MBWQ40_40_21/3/17	WATER	21-Mar-17	8:50	189	189	28	28	-	-	-	-	-	-	-	-	-	-
HAY20_1_21/3/17	WATER	21-Mar-17	8:30	39	39	5	5	-	-	-	-	-	-	-	-	-	-
HAY20_10_21/3/17	WATER	21-Mar-17	-	-	-	-	-	192	<0.1	1.9	18	<0.5	0.6	1.8	<5	0.7	<2
HAY20_20_21/3/17	WATER	21-Mar-17	8:15	12	12	<1	<1	-	-	-	-	-	-	-	-	-	-
HAYSTH20_1_21/3/17	WATER	21-Mar-17	7:50	37	37	8	8	-	-	-	-	-	-	-	-	-	-
HAYSTH20_10_21/3/17	WATER	21-Mar-17	-	-	-	-	-	13	<0.1	2.0	16	<0.5	<0.5	<0.2	<5	<0.5	<2
HAYSTH20_20_21/3/17	WATER	21-Mar-17	7:40	34	34	4	4	-	-	-	-	-	-	-	-	-	-
QUON20_1_21/3/17	WATER	21-Mar-17	7:20	33	33	7	7	-	-	-	-	-	-	-	-	-	-
QUON20_10_21/3/17	WATER	21-Mar-17	-	-	-	-	-	9	<0.1	2.0	13	<0.5	<0.5	0.4	<5	<0.5	<2
QUON20_20_21/3/17	WATER	21-Mar-17	7:10	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20_1_19/4/17	WATER	19-Apr-17	11:00	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ20_10_19/4/17	WATER	19-Apr-17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBWQ20_20_19/4/17	WATER	19-Apr-17	10:50	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40_1_19/4/17	WATER	19-Apr-17	9:55	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
MBWQ40_20_19/4/17	WATER	19-Apr-17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MBWQ40_40_19/4/17	WATER	19-Apr-17	9:40	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAY20_1_19/4/17	WATER	19-Apr-17	9:10	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAY20_10_19/4/17	WATER	19-Apr-17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAY20_20_19/4/17	WATER	19-Apr-17	9:00	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAYSTH20_1_19/4/17	WATER	19-Apr-17	8:30	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
HAYSTH20_10_19/4/17	WATER	19-Apr-17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HAYSTH20_20_19/4/17	WATER	19-Apr-17	8:20	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
QUON20_1_19/4/17	WATER	19-Apr-17	7:50	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-
QUON20_10_19/4/17	WATER	19-Apr-17	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QUON20_20_19/4/17	WATER	19-Apr-17	7:40	<1	<1	<1	<1	-	-	-	-	-	-	-	-	-	-

Note¹ WQOs for protection of Marine Aquatic Ecosystems in South-East Australia (ANZECC/² Toxicant guideline - 95% species protection in marine waters (ANZECC/ARMCANZ 20)³ Field parameters measured *insitu* using YSI 6600 V2-4 sonde⁴ Laboratory parameters reported by ALS Canberra (nutrients and microbiological) and⁵ Chlorophyll *a* values adjusted by correction factor calculated from laboratory QC sar⁶ Ammonium (NH₄⁺) concentration determined by calculation

Shaded cells with bold text indicate guideline value has been exceeded. (Note - in few

Table B3 - Merimbula Ambient Marine Water Quality (2014 - 2017)

Sample ID	Sample Type	Sample Date	Sample Time												OBSERVATIONS					
				Vanadium (V)	Antimony (Sb)	Barium (Ba)	Boron (B)	Cadmium (Cd)	Cobalt (Co)	Lead (Pb)	Molybdenum (Mo)	Silver (Ag)	Tin (Sn)	Mercury (Hg)	SECCHI DEPTH	Water Color	Surface Current	IMOS Current Chart shows		
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L						
				Limit of Reporting (LOR)			0.5	3	0.5	100	0.05	0.2	0.2	1	1	5	0.1			
				Aquatic Ecosystems ¹			-	-	-	-	-	-	-	-	-	-	-			
Toxicants in Marine Waters - 95% species protection ²			100	-	-	-	5.5	1	4.4	-	1.4	-	0.4							
ANZECC - Primary Contact Recreation ³			-	-	-	-	-	-	-	-	-	-	-							
MBWQ20_1_28/10/14	WATER	28-Oct-14	11:55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_10_28/10/14	WATER	28-Oct-14	11:40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_20_28/10/14	WATER	28-Oct-14	11:35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_1_28/10/14	WATER	28-Oct-14	11:20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_15_28/10/14	WATER	28-Oct-14	11:10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_30_28/10/14	WATER	28-Oct-14	11:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_1_28/10/14	WATER	28-Oct-14	9:50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_20_28/10/14	WATER	28-Oct-14	9:40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_40_28/10/14	WATER	28-Oct-14	9:30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_1_25/11/14	WATER	25-Nov-14	12:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_10_25/11/14	WATER	25-Nov-14	11:55	-	-	<2.5	-	-	-	1.3	<5	<5	-	<0.5	-	-	-	-		
MBWQ20_20_25/11/14	WATER	25-Nov-14	11:50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_1_25/11/14	WATER	25-Nov-14	11:15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_15_25/11/14	WATER	25-Nov-14	11:10	-	-	<2.5	-	-	-	<1	<5	<5	-	<0.5	-	-	-	-		
MBWQ30_30_25/11/14	WATER	25-Nov-14	11:05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_1_25/11/14	WATER	25-Nov-14	10:10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_20_25/11/14	WATER	25-Nov-14	10:05	-	-	<2.5	-	-	-	<1	<5	<5	-	<0.5	-	-	-	-		
MBWQ40_40_25/11/14	WATER	25-Nov-14	10:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_1_15/12/14	WATER	15-Dec-14	12:50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_10_15/12/14	WATER	15-Dec-14	12:45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_20_15/12/14	WATER	15-Dec-14	12:40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_1_15/12/14	WATER	15-Dec-14	12:05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_15_15/12/14	WATER	15-Dec-14	12:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_30_15/12/14	WATER	15-Dec-14	11:55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_1_15/12/14	WATER	15-Dec-14	11:05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_20_15/12/14	WATER	15-Dec-14	11:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_40_15/12/14	WATER	15-Dec-14	10:55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_1_7/1/15	WATER	7-Jan-15	9:35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_10_7/1/15	WATER	7-Jan-15	9:30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_20_7/1/15	WATER	7-Jan-15	9:25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_1_7/1/15	WATER	7-Jan-15	8:40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_15_7/1/15	WATER	7-Jan-15	8:35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_30_7/1/15	WATER	7-Jan-15	8:30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_1_7/1/15	WATER	7-Jan-15	7:30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_20_7/1/15	WATER	7-Jan-15	7:25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_40_7/1/15	WATER	7-Jan-15	7:20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_1_19/2/15	WATER	19-Feb-15	8:55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_10_19/2/15	WATER	19-Feb-15	8:50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_20_19/2/15	WATER	19-Feb-15	8:45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_1_19/2/15	WATER	19-Feb-15	8:25	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_15_19/2/15	WATER	19-Feb-15	8:20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_30_19/2/15	WATER	19-Feb-15	8:15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_1_19/2/15	WATER	19-Feb-15	7:05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_20_19/2/15	WATER	19-Feb-15	7:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_40_19/2/15	WATER	19-Feb-15	6:50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_1_11/3/15	WATER	11-Mar-15	10:50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_10_11/3/15	WATER	11-Mar-15	10:45	-	-	5.7	-	-	-	<0.2	12	<1	-	<0.1	-	-	-	-		
MBWQ20_20_11/3/15	WATER	11-Mar-15	10:40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_1_11/3/15	WATER	11-Mar-15	10:10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_15_11/3/15	WATER	11-Mar-15	10:05	-	-	5.9	-	-	-	<0.2	13	<1	-	<0.1	-	-	-	-		
MBWQ30_30_11/3/15	WATER	11-Mar-15	10:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_1_11/3/15	WATER	11-Mar-15	8:40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_20_11/3/15	WATER	11-Mar-15	8:35	-	-	5.9	-	-	-	<0.2	13	<1	-	<0.1	-	-	-	-		
MBWQ40_40_11/3/15	WATER	11-Mar-15	8:30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_1_28/4/15	WATER	28-Apr-15	10:50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_10_28/4/15	WATER	28-Apr-15	10:45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_20_28/4/15	WATER	28-Apr-15	10:40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_1_28/4/15	WATER	28-Apr-15	10:10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_15_28/4/15	WATER	28-Apr-15	10:05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_30_28/4/15	WATER	28-Apr-15	10:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_1_28/4/15	WATER	28-Apr-15	8:40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_20_28/4/15	WATER	28-Apr-15	8:35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_40_28/4/15	WATER	28-Apr-15	8:30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_1_28/4/15	WATER	28-Apr-15	10:50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_10_28/4/15	WATER	28-Apr-15	10:45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_20_28/4/15	WATER	28-Apr-15	10:40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_1_28/4/15	WATER	28-Apr-15	10:10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_15_28/4/15	WATER	28-Apr-15	10:05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_30_28/4/15	WATER	28-Apr-15	10:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_1_28/4/15	WATER	28-Apr-15	8:40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_20_28/4/15	WATER	28-Apr-15	8:35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_40_28/4/15	WATER	28-Apr-15	8:30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_1_28/4/15	WATER	28-Apr-15	10:50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_10_28/4/15	WATER	28-Apr-15	10:45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_20_28/4/15	WATER	28-Apr-15	10:40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_1_28/4/15	WATER	28-Apr-15	10:10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_15_28/4/15	WATER	28-Apr-15	10:05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_30_28/4/15	WATER	28-Apr-15	10:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_1_28/4/15	WATER	28-Apr-15	8:40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_20_28/4/15	WATER	28-Apr-15	8:35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_40_28/4/15	WATER	28-Apr-15	8:30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_1_28/4/15	WATER	28-Apr-15	10:50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_10_28/4/15	WATER	28-Apr-15	10:45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ20_20_28/4/15	WATER	28-Apr-15	10:40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_1_28/4/15	WATER	28-Apr-15	10:10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_15_28/4/15	WATER	28-Apr-15	10:05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ30_30_28/4/15	WATER	28-Apr-15	10:00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_1_28/4/15	WATER	28-Apr-15	8:40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_20_28/4/15	WATER	28-Apr-15	8:35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
MBWQ40_40_28/4/15	WATER	28-Apr-15	8:30	-	-	-	-	-	-	-	-	-	-							

Table B3 - Merimbula Ambient Marine Water Quality (2014 - 2017)

Sample ID	Sample Type	Sample Date	Sample Time												OBSERVATIONS													
				Vanadium (V)	Antimony (Sb)	Barium (Ba)	Boron (B)	Cadmium (Cd)	Cobalt (Co)	Lead (Pb)	Molybdenum (Mo)	Silver (Ag)	Tin (Sn)	Mercury (Hg)	SECCHI DEPTH	Water Color	Surface Current	IMOS Current Chart shows										
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L														
				Limit of Reporting (LOR)											0.5	3	0.5	100	0.05	0.2	0.2	1	1	5	0.1			
				Aquatic Ecosystems ¹											-	-	-	-	-	-	-	-	-	-	-			
Toxicants in Marine Waters - 95% species protection ²											100	-	-	-	5.5	1	4.4	-	1.4	-	0.4							
MBWQ20 1 18/5/15				WATER	18-May-15	9:40	-	-	-	-	-	-	-	-	-	-	10.1	Green	Not apparent	N flowing current offshore								
MBWQ20 10 18/5/15				WATER	18-May-15	9:35	-	-	-	-	-	-	-	-	-													
MBWQ20 20 18/5/15				WATER	18-May-15	9:30	-	-	-	-	-	-	-	-	-													
MBWQ30 1 18/5/15				WATER	18-May-15	8:40	-	-	-	-	-	-	-	-	-	8	Green	Not apparent	N flowing current offshore									
MBWQ30 15 18/5/15				WATER	18-May-15	8:35	-	-	-	-	-	-	-	-														
MBWQ30 30 18/5/15				WATER	18-May-15	8:30	-	-	-	-	-	-	-	-														
MBWQ40 1 18/5/15				WATER	18-May-15	7:30	-	-	-	-	-	-	-	-	-	9.4	Green	Not apparent	N flowing current offshore									
MBWQ40 20 18/5/15				WATER	18-May-15	7:25	-	-	-	-	-	-	-	-														
MBWQ40 40 18/5/15				WATER	18-May-15	7:20	-	-	-	-	-	-	-	-														
MBWQ20 1 11/6/15				WATER	11-Jun-15	13:20	-	-	-	-	-	-	-	-	-	12.5	Greenish	Not apparent	S flowing current offshore, counterclockwise eddy									
MBWQ20 10 11/6/15				WATER	11-Jun-15	13:15	-	-	-	-	-	-	-	-														
MBWQ20 20 11/6/15				WATER	11-Jun-15	13:10	-	-	-	-	-	-	-	-														
MBWQ30 1 11/6/15				WATER	11-Jun-15	12:30	-	-	-	-	-	-	-	-	-	13	Greenish	Not apparent	S flowing current offshore, counterclockwise eddy									
MBWQ30 15 11/6/15				WATER	11-Jun-15	12:25	-	-	-	-	-	-	-	-														
MBWQ30 30 11/6/15				WATER	11-Jun-15	12:20	-	-	-	-	-	-	-	-														
MBWQ40 1 11/6/15				WATER	11-Jun-15	11:30	-	-	-	-	-	-	-	-	-	23	Blue	Very strong S flowing current	S flowing current offshore, counterclockwise eddy									
MBWQ40 20 11/6/15				WATER	11-Jun-15	11:25	-	-	-	-	-	-	-	-														
MBWQ40 40 11/6/15				WATER	11-Jun-15	11:20	-	-	-	-	-	-	-	-														
MBWQ20 1 21/7/15				WATER	21-Jul-15	12:10	-	-	-	-	-	-	-	-	-	6.3	Green	Not apparent	Weak N flowing offshore currents									
MBWQ20 10 21/7/15				WATER	21-Jul-15	12:05	-	-	5.2	-	-	<0.2	11	<1	<0.1													
MBWQ20 20 21/7/15				WATER	21-Jul-15	12:00	-	-	-	-	-	-	-	-	-													
MBWQ30 1 21/7/15				WATER	21-Jul-15	11:05	-	-	-	-	-	-	-	-	-	8	Green	Not apparent	Weak N flowing offshore currents									
MBWQ30 15 21/7/15				WATER	21-Jul-15	11:00	-	-	5.1	-	-	<0.2	11	<1	<0.1													
MBWQ30 30 21/7/15				WATER	21-Jul-15	10:55	-	-	-	-	-	-	-	-	-													
MBWQ40 1 21/7/15				WATER	21-Jul-15	10:00	-	-	-	-	-	-	-	-	-	9	Green	Not apparent	Weak N flowing offshore currents									
MBWQ40 20 21/7/15				WATER	21-Jul-15	9:55	-	-	5	-	-	<0.2	11	<1	<0.1													
MBWQ40 40 21/7/15				WATER	21-Jul-15	9:50	-	-	-	-	-	-	-	-	-													
MBWQ20 1 11/8/15				WATER	11-Aug-15	15:20	-	-	-	-	-	-	-	-	-	8.2	Green	Not apparent	Weak N flowing offshore currents									
MBWQ20 10 11/8/15				WATER	11-Aug-15	15:15	-	-	-	-	-	-	-	-	-													
MBWQ20 20 11/8/15				WATER	11-Aug-15	15:10	-	-	-	-	-	-	-	-	-													
MBWQ30 1 11/8/15				WATER	11-Aug-15	14:40	-	-	-	-	-	-	-	-	-	10.2	Green	Not apparent	Weak N flowing offshore currents									
MBWQ30 15 11/8/15				WATER	11-Aug-15	14:35	-	-	-	-	-	-	-	-	-													
MBWQ30 30 11/8/15				WATER	11-Aug-15	14:30	-	-	-	-	-	-	-	-	-													
MBWQ40 1 11/8/15				WATER	11-Aug-15	13:50	-	-	-	-	-	-	-	-	-	11.8	Green	Not apparent	Weak N flowing offshore currents									
MBWQ40 20 11/8/15				WATER	11-Aug-15	13:45	-	-	-	-	-	-	-	-	-													
MBWQ40 40 11/8/15				WATER	11-Aug-15	13:40	-	-	-	-	-	-	-	-	-													
MBWQ20 1 15/9/15				WATER	15-Sep-15	8:10	-	-	-	-	-	-	-	-	-	5.1	Green	Not apparent	Weak S flowing offshore currents									
MBWQ20 10 15/9/15				WATER	15-Sep-15	8:05	-	-	6.2	-	-	<0.2	12	<1	<0.1													
MBWQ20 20 15/9/15				WATER	15-Sep-15	8:00	-	-	-	-	-	-	-	-	-													
MBWQ30 1 15/9/15				WATER	15-Sep-15	7:30	-	-	-	-	-	-	-	-	-	5.1	Green	Not apparent	Weak S flowing offshore currents									
MBWQ30 15 15/9/15				WATER	15-Sep-15	7:25	-	-	6.1	-	-	<0.2	14	<1	<0.1													
MBWQ30 30 15/9/15				WATER	15-Sep-15	7:20	-	-	-	-	-	-	-	-	-													
MBWQ40 1 15/9/15				WATER	15-Sep-15	6:50	-	-	-	-	-	-	-	-	-	5.1	Green	Not apparent	Weak S flowing offshore currents									
MBWQ40 20 15/9/15				WATER	15-Sep-15	6:45	-	-	6.1	-	-	<0.2	13	<1	<0.1													
MBWQ40 40 15/9/15				WATER	15-Sep-15	6:40	-	-	-	-	-	-	-	-	-													
QC01 15/9/15 (MBWQ20 10)				WATER	15-Sep-15	11:00	-	-	6.2	-	-	<0.2	13	<1	<0.1	-	-	-	-									
QC02 15/9/15 (MBWQ30 15)				WATER	15-Sep-15	11:00	-	-	6.3	-	-	<0.2	13	<1	<0.1	-	-	-	-									
QC03 15/9/15 (MBWQ40 20)				WATER	15-Sep-15	11:00	-	-	6.2	-	-	<0.2	13	<1	<0.1	-	-	-	-									
QC04 15/9/15 (MBWQ20 10)				WATER	15-Sep-15	11:00	-	-	-	-	-	<0.2	12.4	<0.1	<0.1	-	-	-	-									
QC05 15/9/15 (MBWQ30 15)				WATER	15-Sep-15	11:00	-	-	-	-	-	<0.2	12.2	<0.1	<0.1	-	-	-	-									
QC06 15/9/15 (MBWQ40 20)				WATER	15-Sep-15	11:00	-	-	-	-	-	0.3	12.2	<0.1	<0.1	-	-	-	-									
MBWQ20 1 14/10/15				WATER	14-Oct-15	10:15	-	-	-	-	-	-	-	-	-	6.9	Green	Not apparent	Weak N flowing offshore currents									
MBWQ20 10 14/10/15				WATER	14-Oct-15	10:10	-	-	-	-	-	-	-	-	-													
MBWQ20 20 14/10/15				WATER	14-Oct-15	10:05	-	-	-	-	-	-	-	-	-													
MBWQ30 1 14/10/15				WATER	14-Oct-15	9:30	-	-	-	-	-	-	-	-	-	6.9	Green	Not apparent	Weak N flowing offshore currents									
MBWQ30 15 14/10/15				WATER	14-Oct-15	9:25	-	-	-	-	-	-	-	-	-													
MBWQ30 30 14/10/15				WATER	14-Oct-15	9:20	-	-	-	-	-	-	-	-	-													
MBWQ40 1 14/10/15				WATER	14-Oct-15	8:30	-	-	-	-	-	-	-	-	-	6.9	Green	Not apparent	Weak N flowing offshore currents									
MBWQ40 20 14/10/15				WATER	14-Oct-15	8:25	-	-	-	-	-	-	-	-	-													
MBWQ40 40 14/10/15				WATER	14-Oct-15	8:20	-	-	-	-	-	-	-	-	-													
MBWQ20 1 6/4/16				WATER	6-Apr-16	10:25	-	<0.5	-	4680	<0.2	<0.05	<0.2	11.6	<0.1	<5	<0.04	9.8	Blue	Not apparent	Strong N flowing offshore currents							
MBWQ20 10 6/4/16				WATER	6-Apr-16	10:20	-	<0.5	-	4610	<0.2	<0.05	<0.2	11.6	<0.1	<5	<0.04											
MBWQ20 20 6/4/16				WATER	6-Apr-16	10:15	-	<0.5	-	4550	<0.2	<0.05	<0.2	11.5	<0.1	<5	<0.04											
MBWQ40 1 6/4/16				WATER	6-Apr-16	9:35	-	<0.5	-	4730	<0.2	<0.05	<0.2	12	<0.1	<5	<0.04	12.8	Blue	Not apparent	Strong N flowing offshore currents							
MBWQ40 20 6/4/16				WATER	6-Apr-16	9:30	-	<0.5	-	4520	<0.2	<0.05	<0.2	11	<0.1	<5	<0.04											

Table B3 - Merimbula Ambient Marine Water Quality (2014 - 2017)

Sample ID	Sample Type		Sample Date	Sample Time												OBSERVATIONS			
					Vanadium (V)	Antimony (Sb)	Barium (Ba)	Boron (B)	Cadmium (Cd)	Cobalt (Co)	Lead (Pb)	Molybdenum (Mo)	Silver (Ag)	Tin (Sn)	Mercury (Hg)	SECCHI DEPTH	Water Color	Surface Current	IMOS Current Chart shows
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L								
	Limit of Reporting (LOR)				0.5	3	0.5	100	0.05	0.2	0.2	1	1	5	0.1				
	Aquatic Ecosystems ¹				-	-	-	-	-	-	-	-	-	-	-				
Toxicants in Marine Waters - 95% species protection ²				100	-	-	-	5.5	1	4.4	-	1.4	-	0.4					
MBWQ40_40_6/4/16	WATER	6-Apr-16	9:25	-	<0.5	-	4730	<0.2	<0.05	<0.2	12.1	<0.1	<5	<0.04					
HAY20_1_6/4/16	WATER	6-Apr-16	8:50	-	<0.5	-	4650	<0.2	<0.05	<0.2	11.8	<0.1	<5	<0.04					
HAY20_10_6/4/16	WATER	6-Apr-16	8:45	-	<0.5	-	4700	<0.2	<0.05	<0.2	11.9	<0.1	<5	<0.04	11	Blue	Not apparent	Strong N flowing offshore currents	
HAY20_20_6/4/16	WATER	6-Apr-16	8:40	-	<0.5	-	4740	<0.2	<0.05	<0.2	11.8	<0.1	<5	<0.04					
HAYSTH20_1_6/4/16	WATER	6-Apr-16	8:10	-	<0.5	-	4540	<0.2	<0.05	<0.2	11.2	<0.1	<5	<0.04					
HAYSTH20_10_6/4/16	WATER	6-Apr-16	8:05	-	<0.5	-	4600	<0.2	<0.05	<0.2	11.3	<0.1	<5	<0.04	11	Blue	Not apparent	Strong N flowing offshore currents	
HAYSTH20_20_6/4/16	WATER	6-Apr-16	8:00	-	<0.5	-	4760	<0.2	<0.05	<0.2	12.2	<0.1	<5	<0.04					
QUON20_1_6/4/16	WATER	6-Apr-16	7:25	-	<0.5	-	4840	<0.2	<0.05	<0.2	12.1	<0.1	<5	<0.04					
QUON20_10_6/4/16	WATER	6-Apr-16	7:22	-	<0.5	-	4670	<0.2	<0.05	<0.2	11.5	<0.1	<5	<0.04	7.5	Blue	Not apparent	Strong N flowing offshore currents	
QUON20_20_6/4/16	WATER	6-Apr-16	7:20	-	<0.5	-	4490	<0.2	<0.05	<0.2	11.5	<0.1	<5	<0.04					
MBWQ20_1_16/5/16	WATER	16-May-16	13:00	-	-	-	-	-	-	-	-	-	-	-					
MBWQ20_10_16/5/16	WATER	16-May-16	12:55	-	<0.5	-	3730	<0.2	<0.05	<0.2	12.2	<0.1	<5	0.01	9	Green-blue	Not apparent	S flowing current offshore, counterclockwise eddy	
MBWQ20_20_16/5/16	WATER	16-May-16	12:50	-	-	-	-	-	-	-	-	-	-	-					
MBWQ40_1_16/5/16	WATER	16-May-16	12:20	-	-	-	-	-	-	-	-	-	-	-					
MBWQ40_20_16/5/16	WATER	16-May-16	12:15	-	<0.5	-	3670	<0.2	0.08	1.3	12.1	<0.1	<5	<0.01	8	Green-blue	Surface current not apparent. North flowing current detected below	S flowing current offshore, counterclockwise eddy	
MBWQ40_40_16/5/16	WATER	16-May-16	12:10	-	-	-	-	-	-	-	-	-	-	-					
HAY20_1_16/5/16	WATER	16-May-16	11:35	-	-	-	-	-	-	-	-	-	-	-					
HAY20_10_16/5/16	WATER	16-May-16	11:30	-	<0.5	-	3560	<0.2	0.06	<0.2	11.8	<0.1	<5	<0.01	11	Green-blue	Surface current not apparent. North flowing current detected below	S flowing current offshore, counterclockwise eddy	
HAY20_20_16/5/16	WATER	16-May-16	11:25	-	-	-	-	-	-	-	-	-	-	-					
HAYSTH20_1_16/5/16	WATER	16-May-16	11:00	-	-	-	-	-	-	-	-	-	-	-					
HAYSTH20_10_16/5/16	WATER	16-May-16	10:55	-	<0.5	-	3620	<0.2	0.09	<0.2	12.3	<0.1	<5	<0.01	12	Green-blue	Not apparent at surface or	S flowing current offshore, counterclockwise eddy	
HAYSTH20_20_16/5/16	WATER	16-May-16	10:50	-	-	-	-	-	-	-	-	-	-	-					
QUON20_1_16/5/16	WATER	16-May-16	10:15	-	-	-	-	-	-	-	-	-	-	-					
QUON20_10_16/5/16	WATER	16-May-16	10:10	-	<0.5	-	3540	<0.2	0.09	<0.2	12.2	<0.1	<5	<0.01	9	Green-blue	Not apparent at surface or	S flowing current offshore, counterclockwise eddy	
QUON20_20_16/5/16	WATER	16-May-16	10:05	-	-	-	-	-	-	-	-	-	-	-					
MBWQ20_1_29/6/16	WATER	29-Jun-16	11:35	-	-	-	-	-	-	-	-	-	-	-					
MBWQ20_10_29/6/16	WATER	29-Jun-16	-	-	-	-	-	-	-	-	-	-	-	-	10.5	Green	Not apparent	S flowing current offshore, counterclockwise eddy	
MBWQ20_20_29/6/16	WATER	29-Jun-16	11:25	-	-	-	-	-	-	-	-	-	-	-					
MBWQ40_1_29/6/16	WATER	29-Jun-16	10:55	-	-	-	-	-	-	-	-	-	-	-					
MBWQ40_20_29/6/16	WATER	29-Jun-16	-	-	-	-	-	-	-	-	-	-	-	-	20	Green	South flowing current detected at surface and at depth.	S flowing current offshore, counterclockwise eddy	
MBWQ40_40_29/6/16	WATER	29-Jun-16	10:45	-	-	-	-	-	-	-	-	-	-	-					
HAY20_1_29/6/16	WATER	29-Jun-16	10:00	-	-	-	-	-	-	-	-	-	-	-					
HAY20_10_29/6/16	WATER	29-Jun-16	-	-	-	-	-	-	-	-	-	-	-	-	-	Green	South flowing current detected at surface and at depth.	S flowing current offshore, counterclockwise eddy	
HAY20_20_29/6/16	WATER	29-Jun-16	9:50	-	-	-	-	-	-	-	-	-	-	-					
HAYSTH20_1_29/6/16	WATER	29-Jun-16	9:25	-	-	-	-	-	-	-	-	-	-	-					
HAYSTH20_10_29/6/16	WATER	29-Jun-16	-	-	-	-	-	-	-	-	-	-	-	-	10.5	Green	Not apparent	S flowing current offshore, counterclockwise eddy	
HAYSTH20_20_29/6/16	WATER	29-Jun-16	9:15	-	-	-	-	-	-	-	-	-	-	-					
QUON20_1_29/6/16	WATER	29-Jun-16	8:40	-	-	-	-	-	-	-	-	-	-	-					
QUON20_10_29/6/16	WATER	29-Jun-16	-	-	-	-	-	-	-	-	-	-	-	-	9	Green	Not apparent	S flowing current offshore, counterclockwise eddy	
QUON20_20_29/6/16	WATER	29-Jun-16	8:30	-	-	-	-	-	-	-	-	-	-	-					
MBWQ20_1_21/7/16	WATER	21-Jul-16	10:30	-	-	-	-	-	-	-	-	-	-	-					
MBWQ20_10_21/7/16	WATER	21-Jul-16	-	-	-	-	-	-	-	-	-	-	-	-	5.5	Green	Not apparent	S flowing current offshore, counterclockwise eddy	
MBWQ20_20_21/7/16	WATER	21-Jul-16	10:20	-	-	-	-	-	-	-	-	-	-	-					
MBWQ40_1_21/7/16	WATER	21-Jul-16	9:50	-	-	-	-	-	-	-	-	-	-	-					
MBWQ40_20_21/7/16	WATER	21-Jul-16	-	-	-	-	-	-	-	-	-	-	-	-	9	Green	Not apparent	S flowing current offshore, counterclockwise eddy	
MBWQ40_40_21/7/16	WATER	21-Jul-16	9:40	-	-	-	-	-	-	-	-	-	-	-					
HAY20_1_21/7/16	WATER	21-Jul-16	9:20	-	-	-	-	-	-	-	-	-	-	-					
HAY20_10_21/7/16	WATER	21-Jul-16	-	-	-	-	-	-	-	-	-	-	-	-	8	Green	Not apparent	S flowing current offshore, counterclockwise eddy	
HAY20_20_21/7/16	WATER	21-Jul-16	9:10	-	-	-	-	-	-	-	-	-	-	-					
HAYSTH20_1_21/7/16	WATER	21-Jul-16	8:45	-	-	-	-	-	-	-	-	-	-	-					
HAYSTH20_10_21/7/16	WATER	21-Jul-16	-	-	-	-	-	-	-	-	-	-	-	-	7.5	Green	Not apparent	S flowing current offshore, counterclockwise eddy	
HAYSTH20_20_21/7/16	WATER	21-Jul-16	8:35	-	-	-	-	-	-	-	-	-	-	-					
QUON20_1_21/7/16	WATER	21-Jul-16	7:55	-	-	-	-	-	-	-	-	-	-	-					
QUON20_10_21/7/16	WATER	21-Jul-16	-	-	-	-	-	-	-	-	-	-	-	-	8	Green	Not apparent	S flowing current offshore, counterclockwise eddy	
QUON20_20_21/7/16	WATER	21-Jul-16	7:45	-	-	-	-	-	-	-	-	-	-	-					
MBWQ20_1_17/8/16	WATER	17-Aug-16	11:40	-	-	-	-	-	-	-	-	-	-	-					
MBWQ20_10_17/8/16	WATER	17-Aug-16	-	-	-	-	-	-	-	-	-	-	-	-	9.5	Green-Blue	Not apparent	weak S flowing current offshore, leading edge of counterclockwise eddy located east of Merimbula	
MBWQ20_20_17/8/16	WATER	17-Aug-16	11:30	-	-	-	-	-	-	-	-	-	-	-					
MBWQ40_1_17/8/16	WATER	17-Aug-16	10:55	-	-	-	-	-	-	-	-	-	-	-	7	Green-Blue	Not apparent	weak S flowing current offshore, leading edge of counterclockwise eddy located east of Merimbula	
MBWQ40_20_17/8/16	WATER	17-Aug-16	-	-	-	-	-	-	-	-	-	-	-	-					
MBWQ40_40_17/8/16	WATER	17-Aug-16	10:45	-	-	-	-	-	-	-	-	-	-	-					
HAY20_1_17/8/16	WATER	17-Aug-16	10:05	-	-	-	-	-	-	-	-	-	-	-	8.75	Green-Blue	Not apparent	weak S flowing current offshore, leading edge of counterclockwise eddy located east of Merimbula	
HAY20_10_17/8/16	WATER	17-Aug-16	-	-	-	-	-	-	-	-	-	-	-	-					
HAY20_20_17/8/16	WATER	17-Aug-16	9:55	-	-	-	-	-	-	-	-	-	-	-					
HAYSTH20_1_17/8/16	WATER	17-Aug-16	9:15	-	-	-	-	-	-	-	-	-	-	-					
HAYSTH20_10_17/8/16	WATER	17-Aug-16	-	-	-	-	-	-	-	-	-	-	-	-	8.5	Green-Blue	Not apparent	weak S flowing current offshore, leading edge of counterclockwise eddy located east of Merimbula	
HAYSTH20_20_17/8/16	WATER	17-Aug-16	9:05	-	-	-	-	-	-	-	-	-	-	-					
QUON20_1_17/8/16	WATER	17-Aug-16	8:15	-	-	-	-	-	-	-	-	-	-	-			weak S flowing current offshore, leading edge of counterclockwise		

Table B3 - Merimbula Ambient Marine Water Quality (2014 - 2017)

Sample ID	Sample Type	Sample Date	Sample Time												OBSERVATIONS			
				Vanadium (V)	Antimony (Sb)	Barium (Ba)	Boron (B)	Cadmium (Cd)	Cobalt (Co)	Lead (Pb)	Molybdenum (Mo)	Silver (Ag)	Tin (Sn)	Mercury (Hg)	SECCHI DEPTH	Water Color	Surface Current	IMOS Current Chart shows
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L							
	Limit of Reporting (LOR)	0.5	3	0.5	100	0.05	0.2	0.2	1	1	5	0.1						
Aquatic Ecosystems ¹	-	-	-	-	-	-	-	-	-	-	-							
Toxicants in Marine Waters - 95% species protection ²	100	-	-	-	5.5	1	4.4	-	1.4	-	0.4							
QUON20_10_17/8/16	WATER	17-Aug-16	-	-	-	-	-	-	-	-	-	-	9	Green-Blue	Not apparent	Weak S flowing current offshore, leading edge of counterclockwise eddy located east of Merimbula		
QUON20_20_17/8/16	WATER	17-Aug-16	8:05	-	-	-	-	-	-	-	-	-						
MBWQ20_1_28/9/16	WATER	28-Sep-16	11:30	-	-	-	-	-	-	-	-	-	9	Green-Blue	Not apparent	Weak S flowing current offshore, western flank of counterclockwise eddy located east of Merimbula		
MBWQ20_10_28/9/16	WATER	28-Sep-16	11:25	-	<0.5	-	3450	<0.2	<0.05	<0.2	12.2	<0.1	<5	<0.001				
MBWQ20_20_28/9/16	WATER	28-Sep-16	11:20	-	-	-	-	-	-	-	-	-						
MBWQ40_1_28/9/16	WATER	28-Sep-16	10:35	-	-	-	-	-	-	-	-	-						
MBWQ40_20_28/9/16	WATER	28-Sep-16	10:30	-	<0.5	-	3500	<0.2	<0.05	<0.2	12.1	<0.1	<5	<0.001	11.5	Green-Blue	Not apparent	Weak S flowing current offshore, western flank of counterclockwise eddy located east of Merimbula
MBWQ40_40_28/9/16	WATER	28-Sep-16	10:25	-	-	-	-	-	-	-	-	-						
HAY20_1_28/9/16	WATER	28-Sep-16	9:50	-	-	-	-	-	-	-	-	-						
HAY20_10_28/9/16	WATER	28-Sep-16	9:45	-	<0.5	-	3460	<0.2	<0.05	<0.2	12.2	<0.1	<5	<0.001	11.5	Green-Blue	Not apparent	Weak S flowing current offshore, western flank of counterclockwise eddy located east of Merimbula
HAY20_20_28/9/16	WATER	28-Sep-16	9:40	-	-	-	-	-	-	-	-	-						
HAYSTH20_1_28/9/16	WATER	28-Sep-16	9:00	-	-	-	-	-	-	-	-	-						
HAYSTH20_10_28/9/16	WATER	28-Sep-16	8:55	-	<0.5	-	3500	<0.2	<0.05	<0.2	12.2	<0.1	<5	<0.001	11.5	Green-Blue	Not apparent	Weak S flowing current offshore, western flank of counterclockwise eddy located east of Merimbula
HAYSTH20_20_28/9/16	WATER	28-Sep-16	8:50	-	-	-	-	-	-	-	-	-						
QUON20_1_28/9/16	WATER	28-Sep-16	8:15	-	-	-	-	-	-	-	-	-						
QUON20_10_28/9/16	WATER	28-Sep-16	8:10	-	<0.5	-	3430	<0.2	<0.05	<0.2	12.0	<0.1	<5	0.001	10.5	Green-Blue	Not apparent	Weak S flowing current offshore, western flank of counterclockwise eddy located east of Merimbula
QUON20_20_28/9/16	WATER	28-Sep-16	8:05	-	-	-	-	-	-	-	-	-						
MBWQ20_1_19/10/16	WATER	19-Oct-16	10:00	-	-	-	-	-	-	-	-	-						
MBWQ20_10_19/10/16	WATER	19-Oct-16	-	-	-	-	-	-	-	-	-	-	11	Green-Blue	Not apparent	Suspended macroalgae in water column and at surface. Benthic rafts visible in water depths <10m. Weak north flowing cool water current offshore, western edge of clockwise eddy east of Merimbula.		
MBWQ20_20_19/10/16	WATER	19-Oct-16	9:50	-	-	-	-	-	-	-	-	-						
MBWQ40_1_19/10/16	WATER	19-Oct-16	7:30	-	-	-	-	-	-	-	-	-	11.5	Green-Blue	Not apparent	Suspended macroalgae in water column and at surface (photos recorded). Weak north flowing cool water current offshore, western edge of clockwise eddy east of Merimbula.		
MBWQ40_20_19/10/16	WATER	19-Oct-16	-	-	-	-	-	-	-	-	-	-						
MBWQ40_40_19/10/16	WATER	19-Oct-16	7:20	-	-	-	-	-	-	-	-	-						
HAY20_1_19/10/16	WATER	19-Oct-16	8:15	-	-	-	-	-	-	-	-	-	12.5	Green-Blue	Not apparent	Weak north flowing cool water current offshore, western edge of clockwise eddy east of Merimbula.		
HAY20_10_19/10/16	WATER	19-Oct-16	-	-	-	-	-	-	-	-	-	-						
HAY20_20_19/10/16	WATER	19-Oct-16	8:05	-	-	-	-	-	-	-	-	-						
HAYSTH20_1_19/10/16	WATER	19-Oct-16	8:50	-	-	-	-	-	-	-	-	-	12	Green-Blue	Not apparent	Weak north flowing cool water current offshore, western edge of clockwise eddy east of Merimbula.		
HAYSTH20_10_19/10/16	WATER	19-Oct-16	-	-	-	-	-	-	-	-	-	-						
HAYSTH20_20_19/10/16	WATER	19-Oct-16	8:40	-	-	-	-	-	-	-	-	-						
QUON20_1_19/10/16	WATER	19-Oct-16	9:20	-	-	-	-	-	-	-	-	-	20.5	Green-Blue	Not apparent	Weak north flowing cool water current offshore, western edge of clockwise eddy east of Merimbula.		
QUON20_10_19/10/16	WATER	19-Oct-16	-	-	-	-	-	-	-	-	-	-						
QUON20_20_19/10/16	WATER	19-Oct-16	9:10	-	-	-	-	-	-	-	-	-						
MBWQ20_1_17/11/16	WATER	17-Nov-16	9:15	-	-	-	-	-	-	-	-	-	6.5	Green-Blue	Not apparent	Jellyfish, Cyanea sp., abundant at surface. South flowing current offshore with counterclockwise eddy east of Merimbula.		
MBWQ20_10_17/11/16	WATER	17-Nov-16	-	-	-	-	-	-	-	-	-	-						
MBWQ20_20_17/11/16	WATER	17-Nov-16	9:05	-	-	-	-	-	-	-	-	-	8.75	Green-Blue	Not apparent	Jellyfish, Cyanea sp., abundant at surface. South flowing current offshore with counterclockwise eddy east of Merimbula.		
MBWQ40_1_17/11/16	WATER	17-Nov-16	7:00	-	-	-	-	-	-	-	-	-						
MBWQ40_20_17/11/16	WATER	17-Nov-16	-	-	-	-	-	-	-	-	-	-						
MBWQ40_40_17/11/16	WATER	17-Nov-16	6:45	-	-	-	-	-	-	-	-	-	8.95	Green-Blue	Not apparent	Jellyfish, Cyanea sp., abundant at surface. South flowing current offshore with counterclockwise eddy east of Merimbula.		
HAY20_1_17/11/16	WATER	17-Nov-16	8:40	-	-	-	-	-	-	-	-	-						
HAY20_10_17/11/16	WATER	17-Nov-16	-	-	-	-	-	-	-	-	-	-						
HAY20_20_17/11/16	WATER	17-Nov-16	8:25	-	-	-	-	-	-	-	-	-	11.4	Green-Blue	Not apparent	Jellyfish, Cyanea sp., abundant at surface. Scum on water surface thought to be remains of whale faeces. South flowing current offshore with counterclockwise eddy east of Merimbula.		
HAYSTH20_1_17/11/16	WATER	17-Nov-16	8:10	-	-	-	-	-	-	-	-	-						
HAYSTH20_10_17/11/16	WATER	17-Nov-16	-	-	-	-	-	-	-	-	-	-						
HAYSTH20_20_17/11/16	WATER	17-Nov-16	8:00	-	-	-	-	-	-	-	-	-	9.25	Green-Blue	Not apparent	Jellyfish, Cyanea sp., abundant at surface. South flowing current offshore with counterclockwise eddy east of Merimbula.		
QUON20_1_17/11/16	WATER	17-Nov-16	7:45	-	-	-	-	-	-	-	-	-						
QUON20_10_17/11/16	WATER	17-Nov-16	-	-	-	-	-	-	-	-	-	-						
QUON20_20_17/11/16	WATER	17-Nov-16	7:30	-	-	-	-	-	-	-	-	-						
MBWQ20_1_12/12/16	WATER	12-Dec-16	13:40	-	-	-	-	-	-	-	-	-	10.5	Blue	Not apparent	Strong south flowing current offshore east of Merimbula. EAC running close to the coast.		
MBWQ20_10_12/12/16	WATER	12-Dec-16	-	-	-	-	-	-	-	-	-	-						
MBWQ20_20_12/12/16	WATER	12-Dec-16	13:30	-	-	-	-	-	-	-	-	-						
MBWQ40_1_12/12/16	WATER	12-Dec-16	12:30	-	-	-	-	-	-	-	-	-	10	Blue	weak south flowing current	Strong south flowing current offshore east of Merimbula. EAC running close to the coast.		
MBWQ40_20_12/12/16	WATER	12-Dec-16	-	-	-	-	-	-	-	-	-	-						
MBWQ40_40_12/12/16	WATER	12-Dec-16	12:20	-	-	-	-	-	-	-	-	-						
HAY20_1_12/12/16	WATER	12-Dec-16	11:30	-	-	-	-	-	-	-	-	-	10	Blue	weak south flowing current	Strong south flowing current offshore east of Merimbula. EAC running close to the coast.		
HAY20_10_12/12/16	WATER	12-Dec-16	-	-	-	-	-	-	-	-	-	-						
HAY20_20_12/12/16	WATER	12-Dec-16	11:20	-	-	-	-	-	-	-	-	-						
HAYSTH20_1_12/12/16	WATER	12-Dec-16	10:45	-	-	-	-	-	-	-	-	-	8.2	Blue	Not apparent	Strong south flowing current offshore east of Merimbula. EAC running close to the coast.		
HAYSTH20_10_12/12/16	WATER	12-Dec-16	-	-	-	-	-	-	-	-	-	-						
HAYSTH20_20_12/12/16	WATER	12-Dec-16	10:35	-	-	-	-	-	-	-	-	-						
QUON20_1_12/12/16	WATER	12-Dec-16	9:55	-	-	-	-	-	-	-	-	-	7.2	Blue	Not apparent	Strong south flowing current offshore east of Merimbula. EAC running close to the coast.		
QUON20_10_12/12/16	WATER	12-Dec-16	-	-	-	-	-	-	-	-	-	-						
QUON20_20_12/12/16	WATER	12-Dec-16	9:45	-	-	-	-	-	-	-	-	-						
MBWQ20_1_1/2/17	WATER	1-Feb-17	10:10	-	-	-	-	-	-	-	-	-	7	Green	Not apparent	Weak currents offshore east of Merimbula.		
MBWQ20_10_1/2/17	WATER	1-Feb-17	-	-	-	-	-	-	-	-	-	-						
MBWQ20_20_1/2/17	WATER	1-Feb-17	10:00	-	-	-	-	-	-	-	-	-						
MBWQ40_1_1/2/17	WATER	1-Feb-17	9:30	-	-	-	-	-	-	-	-	-	8	Green	Not apparent	Weak currents offshore east of Merimbula.		
MBWQ40_20_1/2/17	WATER	1-Feb-17	-	-	-	-	-	-	-	-	-	-						
MBWQ40_40_1/2/17	WATER	1-Feb-17	9:20	-	-	-	-	-	-	-	-	-						

Table B3 - Merimbula Ambient Marine Water Quality (2014 - 2017)

Sample ID	Sample Type	Sample Date	Sample Time												OBSERVATIONS				
				Vanadium (V)	Antimony (Sb)	Barium (Ba)	Boron (B)	Cadmium (Cd)	Cobalt (Co)	Lead (Pb)	Molybdenum (Mo)	Silver (Ag)	Tin (Sn)	Mercury (Hg)	SECCHI DEPTH	Water Color	Surface Current	IMOS Current Chart shows	
				µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L					
				0.5	3	0.5	100	0.05	0.2	0.2	1	1	5	0.1					
Limit of Reporting (LOR)				0.5	3	0.5	100	0.05	0.2	0.2	1	1	5	0.1					
Aquatic Ecosystems ¹				-	-	-	-	-	-	-	-	-	-	-					
Toxicants in Marine Waters - 95% species protection ²				100	-	-	-	5.5	1	4.4	-	1.4	-	0.4					
HAY20_1_1/2/17		WATER	1-Feb-17	8:50	-	-	-	-	-	-	-	-	-	-	-	8	Green	Not apparent	Weak currents offshore east of Merimbula.
HAY20_10_1/2/17		WATER	1-Feb-17	-	-	-	-	-	-	-	-	-	-	-					
HAY20_20_1/2/17		WATER	1-Feb-17	8:40	-	-	-	-	-	-	-	-	-	-					
HAYSTH20_1_1/2/17		WATER	1-Feb-17	8:20	-	-	-	-	-	-	-	-	-	-					
HAYSTH20_10_1/2/17		WATER	1-Feb-17	-	-	-	-	-	-	-	-	-	-	-	9.5	Green	Not apparent	Weak currents offshore east of Merimbula.	
HAYSTH20_20_1/2/17		WATER	1-Feb-17	8:10	-	-	-	-	-	-	-	-	-	-					
QUON20_1_1/2/17		WATER	1-Feb-17	7:50	-	-	-	-	-	-	-	-	-	-	6	Green	Not apparent	Weak currents offshore east of Merimbula.	
QUON20_10_1/2/17		WATER	1-Feb-17	-	-	-	-	-	-	-	-	-	-	-					
QUON20_20_1/2/17		WATER	1-Feb-17	7:40	-	-	-	-	-	-	-	-	-	-					
MBWQ20_1_21/3/17		WATER	21-Mar-17	9:35	-	-	-	-	-	-	-	-	-	-	6	Green	Not apparent	Inshore waters influenced by upwelling of cool waters and weak north flowing current. Main flow of EAC located well offshore and northeast of Merimbula.	
MBWQ20_10_21/3/17		WATER	21-Mar-17	-	<0.5	-	4070	<0.2	<0.05	<0.2	12.4	0.2	<5	<0.04					
MBWQ20_20_21/3/17		WATER	21-Mar-17	9:25	-	-	-	-	-	-	-	-	-	-					
MBWQ40_1_21/3/17		WATER	21-Mar-17	9:10	-	-	-	-	-	-	-	-	-	-					
MBWQ40_20_21/3/17		WATER	21-Mar-17	-	<0.5	-	3940	<0.2	<0.05	<0.2	11.8	<0.1	<5	<0.04	5.25	Green	Not apparent	Inshore waters influenced by upwelling of cool waters and weak north flowing current. Main flow of EAC located well offshore and northeast of Merimbula.	
MBWQ40_40_21/3/17		WATER	21-Mar-17	8:50	-	-	-	-	-	-	-	-	-	-					
HAY20_1_21/3/17		WATER	21-Mar-17	8:30	-	-	-	-	-	-	-	-	-	-	6	Green	Not apparent	Inshore waters influenced by upwelling of cool waters and weak north flowing current. Main flow of EAC located well offshore and northeast of Merimbula.	
HAY20_10_21/3/17		WATER	21-Mar-17	-	<0.5	-	3770	<0.2	<0.05	0.4	11.2	<0.1	<5	<0.04					
HAY20_20_21/3/17		WATER	21-Mar-17	8:15	-	-	-	-	-	-	-	-	-	-					
HAYSTH20_1_21/3/17		WATER	21-Mar-17	7:50	-	-	-	-	-	-	-	-	-	-					
HAYSTH20_10_21/3/17		WATER	21-Mar-17	-	<0.5	-	3820	<0.2	<0.05	<0.2	11.6	<0.1	<5	<0.04	6.25	Green	Not apparent	Inshore waters influenced by upwelling of cool waters and weak north flowing current. Main flow of EAC located well offshore and northeast of Merimbula.	
HAYSTH20_20_21/3/17		WATER	21-Mar-17	7:40	-	-	-	-	-	-	-	-	-	-					
QUON20_1_21/3/17		WATER	21-Mar-17	7:20	-	-	-	-	-	-	-	-	-	-	6	Green	Not apparent	Inshore waters influenced by upwelling of cool waters and weak north flowing current. Main flow of EAC located well offshore and northeast of Merimbula.	
QUON20_10_21/3/17		WATER	21-Mar-17	-	<0.5	-	3870	<0.2	<0.05	<0.2	11.4	<0.1	<5	<0.04					
QUON20_20_21/3/17		WATER	21-Mar-17	7:10	-	-	-	-	-	-	-	-	-	-					
MBWQ20_1_19/4/17		WATER	19-Apr-17	11:00	-	-	-	-	-	-	-	-	-	-	-	Blue	Not apparent	Weak currents offshore east of Merimbula.	
MBWQ20_10_19/4/17		WATER	19-Apr-17	-	-	-	-	-	-	-	-	-	-	-					
MBWQ20_20_19/4/17		WATER	19-Apr-17	10:50	-	-	-	-	-	-	-	-	-	-					
MBWQ40_1_19/4/17		WATER	19-Apr-17	9:55	-	-	-	-	-	-	-	-	-	-					
MBWQ40_20_19/4/17		WATER	19-Apr-17	-	-	-	-	-	-	-	-	-	-	-	-	Blue	Not apparent	Weak currents offshore east of Merimbula.	
MBWQ40_40_19/4/17		WATER	19-Apr-17	9:40	-	-	-	-	-	-	-	-	-	-					
HAY20_1_19/4/17		WATER	19-Apr-17	9:10	-	-	-	-	-	-	-	-	-	-					
HAY20_10_19/4/17		WATER	19-Apr-17	-	-	-	-	-	-	-	-	-	-	-					
HAY20_20_19/4/17		WATER	19-Apr-17	9:00	-	-	-	-	-	-	-	-	-	-	-	Blue	Not apparent	Weak currents offshore east of Merimbula.	
HAYSTH20_1_19/4/17		WATER	19-Apr-17	8:30	-	-	-	-	-	-	-	-	-	-					
HAYSTH20_10_19/4/17		WATER	19-Apr-17	-	-	-	-	-	-	-	-	-	-	-					
HAYSTH20_20_19/4/17		WATER	19-Apr-17	8:20	-	-	-	-	-	-	-	-	-	-					
QUON20_1_19/4/17		WATER	19-Apr-17	7:50	-	-	-	-	-	-	-	-	-	-	15	Blue	Not apparent	Weak currents offshore east of Merimbula.	
QUON20_10_19/4/17		WATER	19-Apr-17	-	-	-	-	-	-	-	-	-	-	-					
QUON20_20_19/4/17		WATER	19-Apr-17	7:40	-	-	-	-	-	-	-	-	-	-					

Note¹ WQOs for protection of Marine Aquatic Ecosystems in South-East Australia (ANZECC/² Toxicant guideline - 95% species protection in marine waters (ANZECC/ARMCANZ 20)³ Field parameters measured *insitu* using YSI 6600 V2-4 sonde⁴ Laboratory parameters reported by ALS Canberra (nutrients and microbiological) and⁵ Chlorophyll *a* values adjusted by correction factor calculated from laboratory QC sar⁶ Ammonium (NH₄⁺) concentration determined by calculation

Shaded cells with bold text indicate guideline value has been exceeded. (Note - in few

Table B4 Merimbula and Pambula Beachwatch Data (2009-2020)

Download from <https://www.environment.nsw.gov.au/topics/water/beaches/beachwatch-water-quality-program>.

BeachId	Region	Council	Site	Longitude	Latitude	Date	Enterococci (cfu/100ml)
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	14/1/20	0
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	29/1/20	3
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	21/1/20	6
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	21/1/20	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	14/1/20	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	29/1/20	2
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	29/1/20	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	21/1/20	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	14/1/20	0
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	14/1/20	0
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	21/1/20	2
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	29/1/20	3
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	14/1/20	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	21/1/20	1
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	29/1/20	4
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	6/3/19	2
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	5/2/19	3
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	5/11/19	3
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	20/11/19	3
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	12/11/19	1
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	27/11/19	9
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	3/12/19	2
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	22/1/19	2
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	16/1/19	0
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	3/1/19	77
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	8/1/19	0
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	30/1/19	8
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	13/2/19	4
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	19/2/19	2
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	11/12/19	1
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	17/12/19	6
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	19/2/19	2
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	26/2/19	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	30/1/19	1
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	20/11/19	1
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	27/11/19	2
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	6/3/19	2
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	11/12/19	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	17/12/19	1
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	3/1/19	3
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	8/1/19	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	16/1/19	1
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	22/1/19	2
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	5/11/19	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	3/12/19	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	12/11/19	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	5/2/19	2
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	13/2/19	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	13/2/19	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	12/11/19	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	3/12/19	1
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	20/11/19	11
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	5/11/19	2
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	30/1/19	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	16/1/19	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	8/1/19	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	3/1/19	7
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	22/1/19	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	11/12/19	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	17/12/19	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	6/3/19	32
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	27/11/19	1
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	5/2/19	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	26/2/19	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	19/2/19	6
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	19/2/19	10
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	5/2/19	0
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	27/11/19	13
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	6/3/19	32
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	17/12/19	0
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	11/12/19	1
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	22/1/19	22
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	3/1/19	11
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	8/1/19	2

Table B4 Merimbula and Pambula Beachwatch Data (2009-2020)

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BeachId	Region	Council	Site	Longitude	Latitude	Date	Enterococci (cfu/100ml)
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	16/1/19	2
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	30/1/19	5
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	5/11/19	1
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	20/11/19	17
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	3/12/19	1
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	12/11/19	4
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	13/2/19	0
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	26/2/19	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	19/2/19	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	6/3/19	1
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	5/2/19	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	27/11/19	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	20/11/19	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	12/11/19	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	16/1/19	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	22/1/19	2
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	8/1/19	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	3/1/19	109
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	11/12/19	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	17/12/19	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	3/12/19	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	5/11/19	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	30/1/19	1
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	13/2/19	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	26/2/19	52
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	21/2/18	24
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	13/2/18	24
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	31/1/18	1
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	27/11/18	1
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	18/12/18	29
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	11/12/18	40
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	6/2/18	3
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	9/1/18	13
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	16/1/18	38
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	23/1/18	8
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	3/1/18	14
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	21/11/18	501
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	27/2/18	18
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	4/12/18	23
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	21/2/18	9
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	21/11/18	4
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	11/12/18	22
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	16/1/18	21
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	3/1/18	6
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	27/11/18	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	4/12/18	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	18/12/18	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	6/2/18	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	13/2/18	9
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	27/2/18	22
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	31/1/18	3
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	23/1/18	4
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	9/1/18	7
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	4/12/18	1
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	27/11/18	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	18/12/18	2
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	27/2/18	8
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	13/2/18	12
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	6/2/18	3
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	23/1/18	1
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	31/1/18	5
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	3/1/18	17
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	16/1/18	40
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	9/1/18	4
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	11/12/18	4
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	21/11/18	9
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	21/2/18	4
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	21/2/18	14
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	11/12/18	5
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	31/1/18	10
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	9/1/18	1
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	16/1/18	59
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	3/1/18	4
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	23/1/18	6

Table B4 Merimbula and Pambula Beachwatch Data (2009-2020)

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BeachId	Region	Council	Site	Longitude	Latitude	Date	Enterococci (cfu/100ml)
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	6/2/18	9
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	13/2/18	1
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	27/2/18	1
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	21/11/18	40
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	18/12/18	1
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	27/11/18	1
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	4/12/18	2
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	11/12/18	10
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	21/2/18	2
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	31/1/18	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	6/2/18	7
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	23/1/18	11
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	3/1/18	24
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	16/1/18	34
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	9/1/18	14
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	18/12/18	35
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	13/2/18	1
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	27/2/18	7
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	21/11/18	501
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	27/11/18	5
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	4/12/18	1
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	31/1/17	28
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	4/1/17	26
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	28/2/17	7
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	13/12/17	0
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	22/2/17	2
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	18/1/17	1
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	25/1/17	7
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	8/2/17	1
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	14/2/17	0
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	11/1/17	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	14/2/17	2
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	8/2/17	6
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	25/1/17	1
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	11/1/17	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	28/2/17	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	5/12/17	45
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	22/2/17	40
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	13/12/17	1
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	4/1/17	2
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	18/1/17	1
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	31/1/17	3
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	5/12/17	25
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	22/2/17	1
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	14/2/17	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	31/1/17	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	11/1/17	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	4/1/17	4
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	13/12/17	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	28/2/17	9
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	25/1/17	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	18/1/17	1
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	8/2/17	4
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	8/2/17	73
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	11/1/17	3
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	18/1/17	1
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	25/1/17	5
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	28/2/17	13
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	14/2/17	15
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	4/1/17	1
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	31/1/17	36
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	22/2/17	7
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	5/12/17	30
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	13/12/17	1
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	19/12/17	14
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	8/2/17	4
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	14/2/17	3
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	18/1/17	3
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	25/1/17	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	11/1/17	8
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	28/2/17	2
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	22/2/17	1
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	13/12/17	3
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	31/1/17	29

Table B4 Merimbula and Pambula Beachwatch Data (2009-2020)

Download from <https://www.environment.nsw.gov.au/topics/water/beaches/beachwatch-water-quality-program>.

BeachId	Region	Council	Site	Longitude	Latitude	Date	Enterococci (cfu/100ml)
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	4/1/17	0
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	22/2/16	8
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	5/1/16	11
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	20/12/16	0
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	29/11/16	2
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	6/12/16	65
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	1/2/16	368
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	8/2/16	21
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	15/2/16	30
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	12/1/16	7
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	18/1/16	38
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	25/1/16	52
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	13/12/16	23
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	13/12/16	6
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	20/12/16	3
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	25/1/16	20
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	12/1/16	8
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	18/1/16	1
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	1/2/16	96
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	15/2/16	8
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	8/2/16	23
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	6/12/16	9
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	5/1/16	3
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	22/2/16	12
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	20/12/16	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	13/12/16	2
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	18/1/16	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	12/1/16	7
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	8/2/16	13
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	6/12/16	2
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	29/11/16	1
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	5/1/16	15
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	1/2/16	44
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	25/1/16	14
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	15/2/16	9
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	22/2/16	5
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	15/2/16	10
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	25/1/16	71
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	12/1/16	12
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	6/12/16	4
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	13/12/16	51
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	8/2/16	35
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	22/2/16	18
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	29/11/16	4
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	18/1/16	11
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	5/1/16	41
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	20/12/16	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	13/12/16	13
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	6/12/16	21
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	12/1/16	3
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	25/1/16	7
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	15/2/16	29
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	1/2/16	520
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	20/12/16	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	8/2/16	14
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	29/11/16	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	18/1/16	79
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	5/1/16	31
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	22/2/16	16
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	16/2/15	38
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	27/1/15	28
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	12/1/15	5
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	23/2/15	58
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	30/11/15	31
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	7/12/15	118
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	15/12/15	3
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	3/2/15	2
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	9/2/15	72
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	20/1/15	14
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	5/1/15	92
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	21/12/15	2
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	21/12/15	1
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	5/1/15	4
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	12/1/15	7

Table B4 Merimbula and Pambula Beachwatch Data (2009-2020)

Download from <https://www.environment.nsw.gov.au/topics/water/beaches/beachwatch-water-quality-program>.

BeachId	Region	Council	Site	Longitude	Latitude	Date	Enterococci (cfu/100ml)
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	9/2/15	5
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	3/2/15	10
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	30/11/15	7
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	7/12/15	46
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	15/12/15	5
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	23/2/15	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	20/1/15	152
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	27/1/15	16
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	16/2/15	5
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	12/1/15	3
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	27/1/15	21
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	9/2/15	5
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	30/11/15	11
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	23/2/15	18
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	16/2/15	8
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	21/12/15	1
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	15/12/15	1
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	5/1/15	4
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	3/2/15	1
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	20/1/15	18
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	7/12/15	19
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	7/12/15	38
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	23/2/15	66
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	30/11/15	13
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	20/1/15	36
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	3/2/15	5
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	5/1/15	120
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	15/12/15	31
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	21/12/15	10
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	16/2/15	45
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	9/2/15	45
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	27/1/15	31
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	12/1/15	3
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	20/1/15	8
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	3/2/15	3
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	23/2/15	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	30/11/15	49
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	7/12/15	71
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	5/1/15	2
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	15/12/15	6
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	21/12/15	1
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	9/2/15	80
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	12/1/15	4
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	27/1/15	2
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	16/2/15	0
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	13/2/14	20
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	17/2/14	58
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	21/1/14	8
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	24/2/14	22
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	9/12/14	180
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	16/12/14	8
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	6/1/14	8
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	14/1/14	18
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	4/2/14	29
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	29/1/14	17
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	1/12/14	4
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	1/12/14	5
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	24/2/14	5
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	4/2/14	4
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	13/2/14	6
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	29/1/14	1
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	6/1/14	9
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	14/1/14	46
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	16/12/14	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	9/12/14	260
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	17/2/14	16
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	21/1/14	26
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	9/12/14	92
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	24/2/14	10
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	1/12/14	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	13/2/14	8
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	29/1/14	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	15/12/14	4
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	17/2/14	2

Table B4 Merimbula and Pambula Beachwatch Data (2009-2020)

Download from <https://www.environment.nsw.gov.au/topics/water/beaches/beachwatch-water-quality-program>.

BeachId	Region	Council	Site	Longitude	Latitude	Date	Enterococci (cfu/100ml)
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	4/2/14	4
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	21/1/14	32
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	14/1/14	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	6/1/14	5
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	6/1/14	12
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	21/1/14	296
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	4/2/14	11
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	17/2/14	6
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	29/1/14	17
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	15/12/14	2
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	1/12/14	5
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	14/1/14	14
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	13/2/14	0
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	24/2/14	16
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	9/12/14	50
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	16/12/14	2
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	1/12/14	1
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	21/1/14	2
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	4/2/14	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	29/1/14	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	6/1/14	3
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	9/12/14	78
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	24/2/14	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	13/2/14	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	17/2/14	2
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	14/1/14	2
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	2/12/13	2
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	16/12/13	17
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	26/2/13	11
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	19/2/13	13
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	21/1/13	5
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	30/1/13	52
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	7/1/13	18
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	15/1/13	3
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	5/2/13	2
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	12/2/13	10
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	9/12/13	75
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	9/12/13	4
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	16/12/13	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	5/2/13	3
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	7/1/13	4
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	12/2/13	2
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	15/1/13	1
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	21/1/13	3
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	30/1/13	2
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	26/2/13	5
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	19/2/13	1
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	2/12/13	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	16/12/13	7
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	9/12/13	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	5/2/13	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	12/2/13	2
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	26/2/13	30
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	19/2/13	8
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	15/1/13	3
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	7/1/13	2
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	21/1/13	2
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	30/1/13	194
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	2/12/13	0
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	2/12/13	0
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	9/12/13	1
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	30/1/13	39
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	7/1/13	2
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	15/1/13	0
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	21/1/13	6
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	19/2/13	4
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	26/2/13	10
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	12/2/13	4
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	5/2/13	5
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	16/12/13	2
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	16/12/13	1
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	2/12/13	1
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	9/12/13	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	12/2/13	2

Table B4 Merimbula and Pambula Beachwatch Data (2009-2020)

Download from <https://www.environment.nsw.gov.au/topics/water/beaches/beachwatch-water-quality-program>.

BeachId	Region	Council	Site	Longitude	Latitude	Date	Enterococci (cfu/100ml)
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	26/2/13	4
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	19/2/13	4
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	21/1/13	2
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	7/1/13	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	15/1/13	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	30/1/13	28
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	5/2/13	0
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	11/1/12	400
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	1/2/12	0
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	5/12/12	21
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	18/12/12	0
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	25/1/12	0
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	18/1/12	0
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	4/1/12	0
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	10/12/12	2
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	5/12/12	4
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	10/12/12	2
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	11/1/12	13
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	18/1/12	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	25/1/12	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	18/12/12	5
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	1/2/12	8
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	4/1/12	1
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	10/12/12	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	18/1/12	1
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	25/1/12	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	4/1/12	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	18/12/12	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	1/2/12	1
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	5/12/12	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	11/1/12	2
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	11/1/12	151
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	25/1/12	0
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	5/12/12	4
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	4/1/12	10
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	1/2/12	1
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	18/1/12	0
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	10/12/12	0
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	18/12/12	4
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	18/12/12	2
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	1/2/12	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	4/1/12	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	5/12/12	23
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	10/12/12	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	25/1/12	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	18/1/12	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	11/1/12	0
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	16/2/11	1
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	9/2/11	3
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	25/1/11	2
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	12/1/11	7
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	4/1/11	14
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	2/2/11	2
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	19/1/11	19
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	12/12/11	200
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	23/2/11	140
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	20/12/11	1
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	7/12/11	2
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	12/1/11	1
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	19/1/11	43
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	4/1/11	1
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	16/2/11	2
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	9/2/11	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	25/1/11	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	2/2/11	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	12/12/11	8
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	23/2/11	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	20/12/11	1
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	7/12/11	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	9/2/11	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	25/1/11	1
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	16/2/11	3
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	4/1/11	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	12/1/11	0

Table B4 Merimbula and Pambula Beachwatch Data (2009-2020)

Download from <https://www.environment.nsw.gov.au/topics/water/beaches/beachwatch-water-quality-program>.

BeachId	Region	Council	Site	Longitude	Latitude	Date	Enterococci (cfu/100ml)
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	19/1/11	3
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	2/2/11	1
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	12/12/11	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	23/2/11	20
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	20/12/11	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	7/12/11	1
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	7/12/11	0
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	23/2/11	20
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	12/12/11	1
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	20/12/11	0
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	2/2/11	0
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	19/1/11	1
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	12/1/11	2
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	4/1/11	11
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	16/2/11	1
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	25/1/11	0
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	9/2/11	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	9/2/11	1
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	25/1/11	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	16/2/11	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	2/2/11	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	4/1/11	1
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	12/1/11	1
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	19/1/11	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	20/12/11	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	7/12/11	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	12/12/11	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	23/2/11	0
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	11/1/10	0
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	20/1/10	89
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	3/2/10	73
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	17/2/10	1
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	6/1/10	0
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	25/1/10	0
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	10/2/10	1
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	8/12/10	0
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	21/12/10	150
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	1/12/10	0
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	15/12/10	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	10/2/10	1
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	25/1/10	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	6/1/10	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	20/1/10	3
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	3/2/10	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	11/1/10	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	17/2/10	15
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	8/12/10	1
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	21/12/10	72
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	15/12/10	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	1/12/10	1
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	3/2/10	1
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	17/2/10	3
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	20/1/10	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	11/1/10	1
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	10/2/10	13
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	25/1/10	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	6/1/10	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	8/12/10	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	15/12/10	1
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	21/12/10	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	1/12/10	1
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	1/12/10	0
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	21/12/10	75
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	8/12/10	0
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	15/12/10	0
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	6/1/10	0
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	25/1/10	1
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	10/2/10	0
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	17/2/10	4
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	11/1/10	1
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	20/1/10	1
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	3/2/10	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	3/2/10	1
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	20/1/10	3

Table B4 Merimbula and Pambula Beachwatch Data (2009-2020)

Download from <https://www.environment.nsw.gov.au/topics/water/beaches/beachwatch-water-quality-program>.

BeachId	Region	Council	Site	Longitude	Latitude	Date	Enterococci (cfu/100ml)
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	11/1/10	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	17/2/10	3
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	10/2/10	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	25/1/10	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	6/1/10	1
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	15/12/10	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	8/12/10	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	21/12/10	1
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	1/12/10	0
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	7/12/09	0
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	20/1/09	
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	28/1/09	
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	14/12/09	0
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	7/1/09	
772	South Coast	Bega Valley Shire Council	Bar Beach (Merimbula)	149.924	-36.8956	14/1/09	
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	7/12/09	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	14/12/09	0
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	7/1/09	
781	South Coast	Bega Valley Shire Council	Main Beach (Merimbula)	149.9142	-36.8992	4/2/09	
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	28/1/09	
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	14/1/09	
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	14/12/09	0
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	7/12/09	1
784	South Coast	Bega Valley Shire Council	Pambula Beach	149.9099	-36.9407	4/2/09	
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	7/12/09	1
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	14/12/09	0
785	South Coast	Bega Valley Shire Council	Pambula River Mouth	149.9144	-36.9476	14/1/09	
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	28/1/09	
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	14/12/09	0
786	South Coast	Bega Valley Shire Council	Short Point Beach	149.9308	-36.8828	7/12/09	1

Table B5. Merimbula Lake water quality data

Sample ID	Sample Type	Estuary Region	Sample Date	Rainfall Intensity/ Duration ¹⁰	Rainfall ARI ¹⁰	AEP ¹⁰	Sample Time	FIELD PARAMETERS ⁶							LABORATORY PARAMETERS ⁷						
								DO	DO	Turbidity	Chlorophyll a (probe) ⁸	Salinity	Conductivity	Temperature	pH	Suspended Solids (SS)	Ammonia as N	Ammonium (NH ₄) ⁹	Nitrite as N	Nitrate as N	NOx (Nitrite + Nitrate) as N
								%	mg/L	ntu	µg/L	ppt	µS/cm	°C	pH Unit	mg/L	mg/L	mg/L	mg/L	mg/L	
Limit of Reporting (LOR)								-	-	-	-	-	-	-	0.01	2	0.002	0.002	0.002	0.002	0.002
ANZECC - Protection of Aquatic Ecosystems ¹								80 - 110	-	-	4	-	-	-	7.0 - 8.5	-	-	0.015	0.015	0.015	0.015
ANZECC - Primary Contact Recreation ²								-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANZECC - Aquatic Foods ³								-	>5	-	-	-	-	-	6.0-9.0	10	0.1	-	-	100	-
Toxicants in Marine Waters - 95% species protection ⁴								-	-	-	-	-	-	-	-	-	0.91	-	-	-	-
MER estuary trigger value - Coastal Lake ⁵								-	-	6	5	-	-	-	-	-	-	-	-	-	-
POST-EVENT DATA																					
MER-1_9/4/15	WATER	Lower	9/4/15	2mm/hr	<1 yr	>63%	8:45	84.7	6.77	0.1	0.61	33.7	51,288	16.3	7.92	4	0.011	0.011	<0.002	0.062	0.062
MER-2_9/4/15	WATER	Lower	9/4/15	2mm/hr	<1 yr	>63%	9:10	86.5	6.87	0.13	1.07	33.8	51,469	16.6	7.92	6	0.023	0.022	<0.002	0.009	0.009
MER03_AM_31/1/16	WATER	Lower	31/1/16	35mm/hr	10 to 20 yr	5-10%	8:50	80	7.17	34	-	18.3	29,548	25.2	7.36	36	0.025	0.025	<0.002	0.09	0.09
MER03_PM_31/1/16	WATER	Lower	31/1/16	35mm/hr	10 to 20 yr	5-10%	19:30	108	7.94	9.4	-	19.8	31,860	25.6	7.9	16	0.031	0.030	<0.002	0.009	0.009
MER03_5/6/16	WATER	Lower	5/6/16	4.36mm/hr	1-2 yr	39-63%	14:25	-	-	1.9	-	28.83	44,550	15.99	7.96	16	0.016	0.0156	<0.002	0.022	0.022
MER03_6/6/16	WATER	Lower	6/6/16	4.08mm/hr	2-5 yr	18-39%	11:50	-	-	18.8	-	20.91	33,310	15.95	7.89	23	0.04	0.039	<0.002	0.207	0.207
NORMAL CONDITION DATA																					
MER_T1-1_6/2/12	Water	Basin	6/2/12	-	-	-		92		0.5	1.9	37.8	55121	23.3	8.1		0.01	0.01			0.009
MER_T2-1_6/2/12	Water	Basin	6/2/12	-	-	-		91		0.3	1.5	37.8	55072	23.0	8.1		-	-			-
MER_T3-1_6/2/12	Water	Basin	6/2/12	-	-	-		92		0.7	1.8	37.8	55065	23.1	8.1		0.09	0.01			0.004
MER_T1-2_17/4/12	Water	Basin	17/4/12	-	-	-		103		0.3	1.0	32.0	48845	18.6	8.2		0.08	0.01			0.047
MER_T2-2_17/4/12	Water	Basin	17/4/12	-	-	-		101		0.1	1.1	31.9	48757	18.2	8.2		-	-			-
MER_T3-2_17/4/12	Water	Basin	17/4/12	-	-	-		103		0.2	0.9	31.9	48688	18.3	8.2		0.01	0.01			0.056
MER_T1-3_27/7/12	Water	Basin	27/7/12	-	-	-		106		0.1	0.4	34.9	53009	12.5	8.2		<0.002	<0.002			0.002
MER_T2-3_27/7/12	Water	Basin	27/7/12	-	-	-		103		0.1	0.4	34.9	53009	12.3	8.2		-	-			-
MER_T3-3_27/7/12	Water	Basin	27/7/12	-	-	-		103		0.1	0.4	34.9	53012	12.2	8.2		<0.002	<0.002			0.002
MER_T1-4_19/10/12	Water	Basin	19/10/12	-	-	-		106		0.1	0.7	35.5	53719	17.3	8.1		<0.002	<0.002			0.009
MER_T2-4_19/10/12	Water	Basin	19/10/12	-	-	-		106		0.1	0.5	35.5	53673	17.3	8.1		-	-			-
MER_T3-4_19/10/12	Water	Basin	19/10/12	-	-	-		103		0.2	0.7	35.5	53645	17.2	8.1		0.00	0.00			0.006
MER_T1-5_28/1/13	Water	Basin	28/1/13	-	-	-		80		0.3	4.8	36.9	55531	23.9	8.0		0.01	0.00			0.007
MER_T2-5_28/1/13	Water	Basin	28/1/13	-	-	-		84		0.3	3.0	36.9	55590	24.0	8.0		-	-			-
MER_T3-5_28/1/13	Water	Basin	28/1/13	-	-	-		88		0.3	3.2	36.9	55612	24.1	8.0		0.01	0.01			0.002
MER_T1-6_25/4/13	Water	Basin	25/4/13	-	-	-		100		0.2	1.0	35.4	53486	17.8	8.1		-	-			-
MER_T2-6_25/4/13	Water	Basin	25/4/13	-	-	-		96		0.3	0.9	35.4	53493	17.7	8.1		<0.002	<0.002			<0.002
MER_T3-6_25/4/13	Water	Basin	25/4/13	-	-	-		92		0.8	1.7	35.4	53503	17.3	8.1		<0.002	<0.002			0.017
MER_T1-7_26/7/13	Water	Basin	26/7/13	-	-	-		105		0.2	0.1	34.0	51745	12.4	8.3		0.00	0.00			0.004
MER_T2-7_26/7/13	Water	Basin	26/7/13	-	-	-		103		0.4	0.3	33.9	51705	12.1	8.3		-	-			-
MER_T3-7_26/7/13	Water	Basin	26/7/13	-	-	-		103		0.4	0.3	33.9	51706	12.1	8.3		0.01	0.01			0.003
MER_T1-8_23/10/13	Water	Basin	23/10/13	-	-	-		101		0.4	0.9	35.2	53196	18.9	8.1		<0.002	<0.002			<0.002
MER_T2-8_23/10/13	Water	Basin	23/10/13	-	-	-		97		0.5	0.7	35.1	53149	18.5	8.1		-	-			-
MER_T3-8_23/10/13	Water	Basin	23/10/13	-	-	-		94		0.2	0.9	35.2	53175	18.2	8.1		0.00	0.00			<0.002
MBL_1	Water	Basin	18/11/14	-	-	-											0.00				0.000
MBL_2	Water	Basin	18/11/14	-	-	-											-				-

Sample ID	Sample Type	Estuary Region	Sample Date	Rainfall Intensity/ Duration ¹⁰	Rainfall ARI ¹⁰	AEP ¹⁰	Sample Time	FIELD PARAMETERS ⁶							LABORATORY PARAMETERS ⁷						
								DO	DO	Turbidity	Chlorophyll a (probe) ⁸	Salinity	Conductivity	Temperature	pH	Suspended Solids (SS)	Ammonia as N	Ammonium (NH ₄ ⁺) ⁹	Nitrite as N	Nitrate as N	NOx (Nitrite + Nitrate) as N
								%	mg/L	ntu	µg/L	ppt	µS/cm	°C	pH Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
								Limit of Reporting (LOR)							-	-	-	-	-	-	0.01
	ANZECC - Protection of Aquatic Ecosystems ¹							80 - 110	-	-	4	-	-	-	7.0 - 8.5	-	-	0.015	0.015	0.015	0.015
	ANZECC - Primary Contact Recreation ²							-	-	-	-	-	-	-	-	-	-	-	-	-	-
	ANZECC - Aquatic Foods ³							-	>5	-	-	-	-	-	6.0-9.0	10	0.1	-	-	100	-
	Toxicants in Marine Waters - 95% species protection ⁴							-	-	-	-	-	-	-	-	-	0.91	-	-	-	-
	MER estuary trigger value - Coastal Lake ⁵							-	-	6	5	-	-	-	-	-	-	-	-	-	-
MBL_1	Water	Basin	16/12/14	-	-	-	12:19:24	116	8.3	2.6	6.7	26.3	41107	24.6	9.0		0.01				0.002
MBL_2	Water	Basin	16/12/14	-	-	-	12:30:16	113	8.2	1.7	7.5	26.3	41034	24.1	9.1		-				-
MBL_1	Water	Basin	13/1/15	-	-	-	9:10:20	99	6.8	0.6	1.8	34.6	52557	24.1	8.8		0.00				0.000
MBL_2	Water	Basin	13/1/15	-	-	-	9:25:10	100	6.8	0.4	0.4	34.9	52873	24.4	8.9		-				-
MBL_1	Water	Basin	3/2/15	-	-	-	8:28:20	90	6.6	0.8	2.0	35.6	53771	20.1	8.1		0.00				0.000
MBL_2	Water	Basin	3/2/15	-	-	-	8:46:22	87	6.4	0.5	1.3	-	53908	20.0	8.1		-				-
MBL_1	Water	Basin	25/2/15	-	-	-	10:11:36	86	5.9	0.6	3.5	36.1	54501	23.7	8.1		0.00				0.002
MBL_2	Water	Basin	25/2/15	-	-	-	10:27:46	84	5.8	0.5	2.9	36.1	54518	23.4	8.1		-				-
MBL_1	Water	Basin	18/3/15	-	-	-	11:31:15	84	6.1	0.3	0.3	36.6	55074	20.7	8.2		0.01				0.003
MBL_2	Water	Basin	18/3/15	-	-	-	11:49:05	0	6.3	0.3	0.3	36.5	54680	20.9	8.2		-				-

Note

Shaded cells with bold text indicate guideline value has been exceeded

¹ WQOs for protection of Estuarine Aquatic Ecosystems in South-East Australia (ANZECC/ARMCANZ 2000 - Table 3.3.2)

² Primary Contact Recreation guideline in fresh and marine waters (ANZECC/ARMCANZ 2000 - Section 5.2.3.1)

³ Aquatic Foods guideline for saltwater aquaculture species (ANZECC/ARMCANZ 2000 - Tables 4.4.2 and 4.4.3)

⁴ Toxicant guideline - 95% species protection in marine waters (ANZECC/ARMCANZ 2000 - Table 3.4.1)

⁵ MER trigger values adopted by the NSW MER program (OEI 2016)

⁶ Field parameters represent mean WQ data measured *in situ* using YSI 6600 V2-4 sonde

⁷ Laboratory parameters reported by ALS Canberra or DPIE

⁸ Chlorophyll a (probe) values adjusted by correction factor calculated from laboratory QC sample

⁹ Ammonium (NH₄⁺) concentration determined by calculation

¹⁰ Rainfall analysis refer <http://www.bom.gov.au/hydro/has/cdirswebx/cdirswebx.shtml>

Table B5. Merimbula Lake water quality data

Sample ID	Sample Type	Estuary Region	Sample Date	Rainfall Intensity/ Duration ¹⁰	Rainfall ARI ¹⁰	AEP ¹⁰	Sample Time									
								TKN	Total Nitrogen as N	Total Phosphorus as P	Reactive Phosphorus as P	Chlorophyll a (Lab)	Thermotolerant Faecal Coliforms (Confirmed)	Thermotolerant Faecal Coliforms (Presumptive)	Enterococci (Confirmed)	Enterococci (Presumptive)
								mg/L	mg/L	mg/L	mg/L	µg/L	CFU/100mL	CFU/100mL	CFU/100mL	CFU/100mL
Limit of Reporting (LOR)									0.05	0.002	0.002	0.02	1	1	1	1
ANZECC - Protection of Aquatic Ecosystems ¹								-	0.3	0.03	0.005	4	-	-	-	-
ANZECC - Primary Contact Recreation ²								-	-	-	-	-	150	150	35	35
ANZECC - Aquatic Foods ³								-	-	-	-	-	-	-	-	
Toxicants in Marine Waters - 95% species protection ⁴								-	-	-	-	-	-	-	-	
MER estuary trigger value - Coastal Lake ⁵								-	-	-	-	5	-	-	-	-
POST-EVENT DATA																
MER-1_9/4/15	WATER	Lower	9/4/15	2mm/hr	<1 yr	>63%	8:45		0.22	0.003	<0.002	-	8	8	62	62
MER-2_9/4/15	WATER	Lower	9/4/15	2mm/hr	<1 yr	>63%	9:10		0.23	0.002	<0.002	1.61	14	14	82	82
MER03_AM_31/1/16	WATER	Lower	31/1/16	35mm/hr	10 to 20 yr	5-10%	8:50		0.65	0.05	0.007	-	3900	3900	24600	24600
MER03_PM_31/1/16	WATER	Lower	31/1/16	35mm/hr	10 to 20 yr	5-10%	19:30		0.51	0.034	0.004	-	1190	1190	1200	1200
MER03_5/6/16	WATER	Lower	5/6/16	4.36mm/hr	1-2 yr	39-63%	14:25		0.24	0.008	0.003	-	74	74	238	238
MER03_6/6/16	WATER	Lower	6/6/16	4.08mm/hr	2-5 yr	18-39%	11:50		0.68	0.043	0.016	-	656	820	3000	3000
NORMAL CONDITION DATA																
MER_T1-1_6/2/12	Water	Basin	6/2/12	-	-	-		0.20	0.25	0.01	0.00	-				
MER_T2-1_6/2/12	Water	Basin	6/2/12	-	-	-		-	-	-	-	-				
MER_T3-1_6/2/12	Water	Basin	6/2/12	-	-	-		0.20	0.21	0.01	0.00	1.90				
MER_T1-2_17/4/12	Water	Basin	17/4/12	-	-	-		0.20	0.26	0.01	<0.002	-				
MER_T2-2_17/4/12	Water	Basin	17/4/12	-	-	-		-	-	-	-	-				
MER_T3-2_17/4/12	Water	Basin	17/4/12	-	-	-		0.20	0.27	0.01	<0.002	1.10				
MER_T1-3_27/7/12	Water	Basin	27/7/12	-	-	-		0.10	0.11	0.01	0.00	-				
MER_T2-3_27/7/12	Water	Basin	27/7/12	-	-	-		-	-	-	-	-				
MER_T3-3_27/7/12	Water	Basin	27/7/12	-	-	-		0.10	0.07	0.01	0.00	0.62				
MER_T1-4_19/10/12	Water	Basin	19/10/12	-	-	-		0.20	0.19	0.01	0.00	-				
MER_T2-4_19/10/12	Water	Basin	19/10/12	-	-	-		-	-	-	-	-				
MER_T3-4_19/10/12	Water	Basin	19/10/12	-	-	-		0.20	0.21	0.01	<0.002	0.69				
MER_T1-5_28/1/13	Water	Basin	28/1/13	-	-	-		0.23	0.24	0.01	<0.002	-				
MER_T2-5_28/1/13	Water	Basin	28/1/13	-	-	-		-	-	-	-	-				
MER_T3-5_28/1/13	Water	Basin	28/1/13	-	-	-		0.22	0.22	0.01	<0.002	3.50				
MER_T1-6_25/4/13	Water	Basin	25/4/13	-	-	-		-	-	-	-	-				
MER_T2-6_25/4/13	Water	Basin	25/4/13	-	-	-		0.18	0.18	0.01	<0.002	1.70				
MER_T3-6_25/4/13	Water	Basin	25/4/13	-	-	-		0.23	0.25	0.02	0.00	-				
MER_T1-7_26/7/13	Water	Basin	26/7/13	-	-	-		0.12	0.12	0.00	<0.002	-				
MER_T2-7_26/7/13	Water	Basin	26/7/13	-	-	-		-	-	-	-	-				
MER_T3-7_26/7/13	Water	Basin	26/7/13	-	-	-		0.11	0.11	0.01	<0.002	1.10				
MER_T1-8_23/10/13	Water	Basin	23/10/13	-	-	-		0.24	0.24	0.01	<0.002	-				
MER_T2-8_23/10/13	Water	Basin	23/10/13	-	-	-		-	-	-	-	-				
MER_T3-8_23/10/13	Water	Basin	23/10/13	-	-	-		0.19	0.19	0.01	0.00	1.40				
MBL_1	Water	Basin	18/11/14	-	-	-			0.20	0.02	0.00	2.50				
MBL_2	Water	Basin	18/11/14	-	-	-			-	-	-	2.10				

Sample ID	Sample Type	Estuary Region	Sample Date	Rainfall Intensity/ Duration ¹⁰	Rainfall ARI ¹⁰	AEP ¹⁰	Sample Time									
								TKN	Total Nitrogen as N	Total Phosphorus as P	Reactive Phosphorus as P	Chlorophyll a (Lab)	Thermotolerant Faecal Coliforms (Confirmed)	Thermotolerant Faecal Coliforms (Presumptive)	Enterococci (Confirmed)	Enterococci (Presumptive)
	mg/L	mg/L	mg/L	mg/L	µg/L	CFU/100mL	CFU/100mL	CFU/100mL	CFU/100mL							
	Limit of Reporting (LOR)							0.05	0.002	0.002	0.02	1	1	1	1	
	ANZECC - Protection of Aquatic Ecosystems ¹							-	0.3	0.03	0.005	4	-	-	-	
	ANZECC - Primary Contact Recreation ²							-	-	-	-	-	150	150	35	35
	ANZECC - Aquatic Foods ³							-	-	-	-	-	-	-	-	-
Toxicants in Marine Waters - 95% species protection ⁴							-	-	-	-	-	-	-	-	-	
MER estuary trigger value - Coastal Lake ⁵							-	-	-	-	5	-	-	-	-	
MBL_1	Water	Basin	16/12/14	-	-	-	12:19:24	0.36	0.02	0.00	10.60					
MBL_2	Water	Basin	16/12/14	-	-	-	12:30:16	-	-	-	10.50					
MBL_1	Water	Basin	13/1/15	-	-	-	9:10:20	0.19	0.01	0.00	2.80					
MBL_2	Water	Basin	13/1/15	-	-	-	9:25:10	-	-	-	1.50					
MBL_1	Water	Basin	3/2/15	-	-	-	8:28:20	0.19	0.02	0.00	2.60					
MBL_2	Water	Basin	3/2/15	-	-	-	8:46:22	-	-	-	2.10					
MBL_1	Water	Basin	25/2/15	-	-	-	10:11:36	0.20	0.02	0.00	4.10					
MBL_2	Water	Basin	25/2/15	-	-	-	10:27:46	-	-	-	4.10					
MBL_1	Water	Basin	18/3/15	-	-	-	11:31:15	0.19	0.01	0.00	1.60					
MBL_2	Water	Basin	18/3/15	-	-	-	11:49:05	-	-	-	1.40					

Note

Shaded cells with bold text indicate guideline value has been exceeded

¹ WQOs for protection of Estuarine Aquatic Ecosystems in South-East Australia (ANZECC/ARMCANZ 2000 - Table 3.3.2)

² Primary Contact Recreation guideline in fresh and marine waters (ANZECC/ARMCANZ 2000 - Section 5.2.3.1)

³ Aquatic Foods guideline for saltwater aquaculture species (ANZECC/ARMCANZ 2000 - Tables 4.4.2 and 4.4.3)

⁴ Toxicant guideline - 95% species protection in marine waters (ANZECC/ARMCANZ 2000 - Table 3.4.1)

⁵ MER trigger values adopted by the NSW MER program (OEH 2016)

⁶ Field parameters represent mean WQ data measured *in situ* using YSI 6600 V2-4 sonde

⁷ Laboratory parameters reported by ALS Canberra or DPIE

⁸ Chlorophyll a (probe) values adjusted by correction factor calculated from laboratory QC sample

⁹ Ammonium (NH4+) concentration determined by calculation

¹⁰ Rainfall analysis refer <http://www.bom.gov.au/hydro/has/cdirswebx/cdirswebx.shtml>

Table B6. Pambula River water quality data

Sample ID	Sample Type	Estuary Region	Sample Date	Rainfall Intensity/ Duration ¹⁰	Rainfall ARI ¹⁰	AEP ¹⁰	Sample Time	FIELD PARAMETERS ⁶							LABORATORY PARAMETERS ⁷						
								DO	DO	Turbidity	Chlorophyll a (probe) ⁸	Salinity	Conductivity	Temperature	pH	Suspended Solids (SS)	Ammonia as N	Ammonium (NH ₄ ⁺) ⁹	Nitrite as N	Nitrate as N	
								%	mg/L	ntu	µg/L	ppt	µS/cm	°C	pH Unit	mg/L	mg/L	mg/L	mg/L	mg/L	
								Limit of Reporting (LOR)							-	-	-	-	-	-	0.01
	ANZECC - Protection of Aquatic Ecosystems ¹							80 - 110	-	-	4	-	-	-	7.0 - 8.5	-	-	0.015	0.015	0.015	
	ANZECC - Primary Contact Recreation ²							-	-	-	-	-	-	-	-	-	-	-	-	-	
	ANZECC - Aquatic Foods ³							-	>5	-	-	-	-	-	6.0-9.0	10	0.1	-	-	100	
	Toxicants in Marine Waters - 95% species protection ⁴							-	-	-	-	-	-	-	-	-	0.91	-	-	-	
	MER estuary trigger value - Riverine Estuary ⁵							-	-	2.8	2.3	-	-	-	-	-	-	-	-	-	
POST-EVENT DATA																					
PAM-1_9/4/15	WATER	Basin	9/4/15	2mm/hr	<1 yr	>63%	10:10	90.8	7.43	3.87	0.92	27.5	42,719	17.05	7.94	8	0.026	0.025	<0.002	0.064	
PAM-2_9/4/15	WATER	Middle	9/4/15	2mm/hr	<1 yr	>63%	10:35	92.2	9.04	12.9	1.98	3.11	5,700	15.4	7.68	8	0.022	0.022	<0.002	0.191	
PAM03_AM_31/1/16	WATER	Lower	31/1/16	35mm/hr	10 to 20 yr	5-10%	9:20	83.8	7.32	51.5		19.5	31,280	21.2	6.73	70	0.029	0.029	<0.002	0.104	
PAM03_PM_31/1/16	WATER	Lower	31/1/16	35mm/hr	10 to 20 yr	5-10%	20:00	90.4	7.8	50.8		10.01	17,120	21.5	7.8	35	0.037	0.036	<0.002	0.139	
PAM04_AM_31/1/16	WATER	Middle	31/1/16	35mm/hr	10 to 20 yr	5-10%	9:40	100.8	8.6	71.8		0.2	426	20.8	6.39	56	0.018	0.018	0.006	0.245	
PAM04_PM_31/1/16	WATER	Middle	31/1/16	35mm/hr	10 to 20 yr	5-10%	20:30	91.3	8.1	53.1		0.27	545	21.2	8.23	16	0.016	0.015	0.005	0.158	
PAM03_5/6/16	WATER	Lower	5/6/16	4.36mm/hr	1-2 yr	39-63%	14:00			11.06		24.12	37,920	15.75	7.74	47	0.025	0.025	<0.002	0.142	
PAM03_6/6/16	WATER	Lower	6/6/16	4.08mm/hr	2-5 yr	18-39%	12:10			55.3		1.96	3,700	15.37	7.6	66	0.023	0.023	0.004	0.274	
PAM04_5/6/16	WATER	Middle	5/6/16	4.36mm/hr	1-2 yr	39-63%	13:30			26.79		6.2	10,560	14.69	7.22	23	0.033	0.033	0.005	0.539	
PAM04_6/6/16	WATER	Middle	6/6/16	4.08mm/hr	2-5 yr	18-39%	13:00			67.7		0.07	140	14.79	6.7	62	0.019	0.019	0.003	0.234	
PAM_T1-7_23/4/12	WATER	Basin	23/4/12					67		10.5	0.91	8.8	14,987	17.8	7.5		0.045	0.0445			
PAM_T2-7_23/4/12	WATER	Basin	23/4/12					80		11.2	0.89	7	12,165	17.2	7.4						
PAM_T3-7_23/4/12	WATER	Basin	23/4/12					82		9.5	0.8	8	13,761	17.1	7.6		0.047	0.0464			
PAM_T4-7_23/4/12	WATER	Middle	23/4/12					85		10	0.85	0.8	1,477	15.8	7.3						
NORMAL CONDITION DATA																					
Pam_T1-1_28/10/10	WATER	Basin	28/10/10					99.2		1.2	0.6		52,872	18.4	8.0		0.09	0.087			
Pam_T2-1_28/10/10	WATER	Basin	28/10/10					102.8		1.3	0.7		53,023	18.2	8.0		0.09	0.087			
Pam_T3-1_28/10/10	WATER	Basin	28/10/10					104.6		1.3	0.6		53,094	18.1	8.1						
Pam_T1-2_13/01/11	WATER	Basin	13/1/11					98.6		1.1	1.9		53,792	23.5	8.0		<0.01				
Pam_T2-2_13/01/11	WATER	Basin	13/1/11					95.8		1.7	2.6		52,654	23.5	7.9		<0.01				
Pam_T3-2_13/01/11	WATER	Basin	13/1/11					97.5		1.6	2.7		53,469	23.4	8.0						
Pam_T1-3_7/04/11	WATER	Basin	7/4/11					98.5		0.8	1.8		45,330	19.2	8.1						
Pam_T2-3_7/04/11	WATER	Basin	7/4/11					100		0.8	2		45,359	19.4	8.2		<0.01				
Pam_T3-3_7/04/11	WATER	Basin	7/4/11					99.8		0.7	2		46,163	19.6	8.2		<0.01				
Pam_T1-4_6/07/11	WATER	Basin	6/7/11					96		1.2	0.7		52,439	13.2	8.0		<0.01				
Pam_T2-4_6/07/11	WATER	Basin	6/7/11					96		1.2	0.8		52,356	13.1	8.0		<0.01				
Pam_T3-4_6/07/11	WATER	Basin	6/7/11					95		1.9	1		52,263	12.85	8.1						
Pam_T1-5_26/10/11	WATER	Basin	26/10/11					95.9		1.3	0.98	34.8	52,793	17.3	8.0		0.008	0.0078			
Pam_T2-5_26/10/11	WATER	Basin	26/10/11					97		1.3	0.88	34.9	52,928	17.4	8.1		0.009	0.0086			
Pam_T3-5_26/10/11	WATER	Basin	26/10/11					100.5		1.4	0.84	34.9	52,986	17.2	8.1						
PAM_T1-6_8/2/12	WATER	Basin	8/2/12					97		2.4	2.4	37.4	55,034	21.5	8.1		0.007	0.0066			
PAM_T2-6_8/2/12	WATER	Basin	8/2/12					96		2.1	1.9	37.5	55,070	21.4	8.1						
PAM_T3-6_8/2/12	WATER	Basin	8/2/12					97		2.4	3	37.5	55,073	21.5	8.1		0.007	0.0066			
PAM_T4-6_8/2/12	WATER	Middle	8/2/12					89		1.1	2.1	37.2	54,696	22.5	8.0						
PAM_T1-8_27/7/12	WATER	Basin	27/7/12					104		0.7	0.5	33.9	51,620	13.1	8.1		0.007	0.0068			

Sample ID	Sample Type	Estuary Region	Sample Date	Rainfall Intensity/ Duration ¹⁰	Rainfall ARI ¹⁰	AEP ¹⁰	Sample Time	FIELD PARAMETERS ⁶							LABORATORY PARAMETERS ⁷					
								DO	DO	Turbidity	Chlorophyll a (probe) ⁸	Salinity	Conductivity	Temperature	pH	Suspended Solids (SS)	Ammonia as N	Ammonium (NH ₄ ⁺) ⁹	Nitrite as N	Nitrate as N
								%	mg/L	ntu	µg/L	ppt	µS/cm	°C	pH Unit	mg/L	mg/L	mg/L	mg/L	mg/L
								Limit of Reporting (LOR)							-	-	-	-	-	-
	ANZECC - Protection of Aquatic Ecosystems ¹							80 - 110	-	-	4	-	-	-	7.0 - 8.5	-	-	0.015	0.015	0.015
	ANZECC - Primary Contact Recreation ²							-	-	-	-	-	-	-	-	-	-	-	-	-
	ANZECC - Aquatic Foods ³							-	>5	-	-	-	-	-	6.0-9.0	10	0.1	-	-	100
	Toxicants in Marine Waters - 95% species protection ⁴							-	-	-	-	-	-	-	-	-	0.91	-	-	-
	MER estuary trigger value - Riverine Estuary ⁵							-	-	2.8	2.3	-	-	-	-	-	-	-	-	-
PAM_T2-8_27/7/12	WATER	Basin	27/7/12					103		1.4	0.7	34.2	52,101	13.3	8.1					
PAM_T3-8_27/7/12	WATER	Basin	27/7/12					105		0.96	0.9	34.5	52,368	13.4	8.2					
PAM_T4-8_27/7/12	WATER	Middle	27/7/12					103		0.8	0.7	33.6	51,127	13.8	8.1		0.004	0.0039		
PAM_T1-9_28/11/12	WATER	Basin	28/11/12					94.7		0.8	1.4	34.8	52,748	20.5	7.9		<0.002	<0.002		
PAM_T2-9_28/11/12	WATER	Basin	28/11/12					89.6		1.1	1.7	34.8	52,744	20.3	7.9					
PAM_T3-9_28/11/12	WATER	Basin	28/11/12					92.5		1	1.6	34.8	52,672	20.5	7.9					
PAM_T4-9_28/11/12	WATER	Middle	28/11/12					78.8		1.2	1.6	34.2	51,868	20.8	7.8		0.01	0.0097		
PAM_T1-10_30/1/13	WATER	Basin	30/1/13					93		1.8	2.4	35	53,422	21.7	8.0		0.005	0.0048		
PAM_T2-10_30/1/13	WATER	Basin	30/1/13					93		1.5	1.6	36	53,770	21.6	8.0					
PAM_T3-10_30/1/13	WATER	Basin	30/1/13					99		1.3	1.5	36	54,053	20.9	8.1					
PAM_T4-10_30/1/13	WATER	Middle	30/1/13					82		1.1	2.5	34.8	52,733	21.7	7.9		0.007	0.0068		
PAM_T1-11_25/4/13	WATER	Basin	25/4/13					102		1.2	2.3	34.8	53,730	18.5	8.1		<0.002	<0.002		
PAM_T2-11_25/4/13	WATER	Basin	25/4/13					100.4		1.7	2.1	34.8	52,668	18.4	8.1					
PAM_T3-11_25/4/13	WATER	Basin	25/4/13					98		1.7	2.1	34.8	52,644	18.5	8.1					
PAM_T4-11_25/4/13	WATER	Middle	25/4/13					97		0.8	1.7	32.7	49,867	17.8	7.9		0.003	0.0029		
PAM_T1-12_28/7/13	WATER	Basin	28/7/13					103		0.8	1.39	33.5	51,200	12.1	8.2		0.006	0.0058		
PAM_T2-12_28/7/13	WATER	Basin	28/7/13					104		0.9	1.6	33.7	51,364	12.3	8.2					
PAM_T3-12_28/7/13	WATER	Basin	28/7/13					106		0.9	1.4	33.6	51,312	12.3	8.2					
PAM_T4-12_28/7/13	WATER	Middle	28/7/13					102		0.6	0.9	32.8	50,148	11.9	8.2		0.01	0.0097		
PAM_1	WATER	Basin	3/12/08				8:45:00													
PAM_2	WATER	Basin	3/12/08				8:50:00													
PAM_3	WATER	Basin	3/12/08				9:00:00													
PAM_1	WATER	Basin	15/12/08				8:09:51			4.8		35.60	53809	17.7						
PAM_2	WATER	Basin	15/12/08				8:27:54			2.4		35.70	53927	16.5						
PAM_3	WATER	Basin	15/12/08				8:43:56			1.8		35.70	53891	16.6						
PAM_1	WATER	Basin	14/1/09				10:07:04			1.7		35.70	53975	22.5						
PAM_2	WATER	Basin	14/1/09				10:28:49			2.0		35.90	54157	22.5						
PAM_3	WATER	Basin	14/1/09				10:45:35			1.8		35.80	54108	22.6						
PAM_1	WATER	Basin	4/2/09				9:38:58			1.8		36.00	54364	24.8						
PAM_2	WATER	Basin	4/2/09				9:55:21			1.9		36.00	54429	24.9						
PAM_3	WATER	Basin	4/2/09				10:15:21			1.1		36.60	55273	25.9						
PAM_1	WATER	Basin	26/2/09				9:43:53			2.9		36.30	54679	21.4						
PAM_2	WATER	Basin	26/2/09				9:59:42			3.0		36.20	54642	21.2						
PAM_3	WATER	Basin	26/2/09				10:16:24			2.4		36.10	54513	20.7						
PAM_1	WATER	Basin	17/3/09				15:09:24			2.9		35.60	53799	20.3						
PAM_2	WATER	Basin	17/3/09				15:20:57			1.8		35.60	53831	20.2						
PAM_3	WATER	Basin	17/3/09				15:33:17			1.7		35.80	54005	21.2						
PAM_2	WATER	Basin	25/10/17				10:34:54	101.3	7.7	0.8	1.5	35.50	53609	18.4	8.2					
PAM_1	WATER	Basin	25/10/17				10:42:55	91.4	6.8	1.3	2.5	35.80	54097	19.8	8.0		0.004			

Sample ID	Sample Type	Estuary Region	Sample Date	Rainfall Intensity/ Duration ¹⁰	Rainfall ARI ¹⁰	AEP ¹⁰	Sample Time	FIELD PARAMETERS ⁶							LABORATORY PARAMETERS ⁷										
								DO	DO	Turbidity	Chlorophyll a (probe) ⁸	Salinity	Conductivity	Temperature	pH	Suspended Solids (SS)	Ammonia as N	Ammonium (NH ₄ ⁺) ⁹	Nitrite as N	Nitrate as N					
								%	mg/L	ntu	µg/L	ppt	µS/cm	°C	pH Unit	mg/L	mg/L	mg/L	mg/L	mg/L					
								Limit of Reporting (LOR)							-	-	-	-	-	-	-	-	-	-	-
								ANZECC - Protection of Aquatic Ecosystems ¹							80 - 110	-	-	4	-	-	-	7.0 - 8.5	-	-	0.015
ANZECC - Primary Contact Recreation ²							-	-	-	-	-	-	-	-	-	-	-	-	-						
ANZECC - Aquatic Foods ³							-	>5	-	-	-	-	-	6.0-9.0	10	0.1	-	-	100						
Toxicants in Marine Waters - 95% species protection ⁴							-	-	-	-	-	-	-	-	-	0.91	-	-	-						
MER estuary trigger value - Riverine Estuary ⁵							-	-	2.8	2.3	-	-	-	-	-	-	-	-	-						
PAM_2	WATER	Basin	21/11/17				12:35:24	100.5	7.3	1.2	0.9	35.20	53232	21.1	8.1										
PAM_1	WATER	Basin	21/11/17				12:42:02	97.4	6.8	0.8	1.7	34.90	52913	23.1	8.0										
PAM_2	WATER	Basin	12/12/17				10:32:21	97.5	7.2	0.4	1.7	33.70	51180	20.4	8.0										
PAM_1	WATER	Basin	12/12/17				10:39:36	80.9	6.1	0.7	4.6	30.90	47399	21.1	7.8		0.003								
PAM_2	WATER	Basin	17/1/18				15:02:57	104.2	7.4	1.5	0.5	35.30	53362	22.2	8.0										
PAM_1	WATER	Basin	17/1/18				15:11:34	99.4	6.9	1.0	1.4	34.70	52666	23.7	7.8										
PAM_2	WATER	Basin	13/2/18				11:40:18	98.4	6.9	1.0	1.9	35.60	53828	23.0	8.1										
PAM_1	WATER	Basin	13/2/18				11:48:01	85.1	5.9	0.9	3.2	35.80	54143	23.8	7.9										
PAM_2	WATER	Basin	7/3/18				10:13:18	100.7	7.3	1.0	2.2	35.30	53358	20.9	8.1										
PAM_1	WATER	Basin	7/3/18				10:19:43	86.9	6.3	0.7	2.3	34.80	52693	21.5	7.9										

Note

Shaded cells with bold text indicate guideline value has been exceeded

¹ WQOs for protection of Estuarine Aquatic Ecosystems in South-East Australia (ANZECC/ARMCANZ 2000 - Table 3.3.2)

² Primary Contact Recreation guideline in fresh and marine waters (ANZECC/ARMCANZ 2000 - Section 5.2.3.1)

³ Aquatic Foods guideline for saltwater aquaculture species (ANZECC/ARMCANZ 2000 - Tables 4.4.2 and 4.4.3)

⁴ Toxicant guideline - 95% species protection in marine waters (ANZECC/ARMCANZ 2000 - Table 3.4.1)

⁵ MER trigger values adopted by the NSW MER program (OEH 2016)

⁶ Field parameters represent mean WQ data measured *in situ* using YSI 6600 V2-4 sonde

⁷ Laboratory parameters reported by ALS Canberra or DPIE

⁸ Chlorophyll a (probe) values adjusted by correction factor calculated from laboratory QC sample

⁹ Ammonium (NH₄⁺) concentration determined by calculation

¹⁰ Rainfall analysis refer <http://www.bom.gov.au/hydro/has/cdirswebx/cdirswebx.shtml>

Table B6. Pambula River water quality data

Sample ID	Sample Type	Estuary Region	Sample Date	Rainfall Intensity/ Duration ¹⁰	Rainfall ARI ¹⁰	AEP ¹⁰	Sample Time	NOx (Nitrite + Nitrate) as N	TKN	Total Nitrogen as N	Total Phosphorus as P	Reactive Phosphorus as P	Chlorophyll a (Lab)	Thermotolerant Faecal Coliforms (Confirmed)	Thermotolerant Faecal Coliforms (Presumptive)	Enterococci (Confirmed)	Enterococci (Presumptive)
								mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	CFU/100mL	CFU/100mL	CFU/100mL	CFU/100mL
	Limit of Reporting (LOR)							0.002		0.05	0.002	0.002	0.02	1	1	1	1
	ANZECC - Protection of Aquatic Ecosystems ¹							0.015	-	0.3	0.03	0.005	4	-	-	-	-
	ANZECC - Primary Contact Recreation ²							-	-	-	-	-	-	150	150	35	35
	ANZECC - Aquatic Foods ³							-	-	-	-	-	-	-	-	-	-
	Toxicants in Marine Waters - 95% species protection ⁴							-	-	-	-	-	-	-	-	-	-
MER estuary trigger value - Riverine Estuary ⁵							-	-	-	-	-	2.3	-	-	-	-	
POST-EVENT DATA																	
PAM-1_9/4/15	WATER	Basin	9/4/15	2mm/hr	<1 yr	>63%	10:10	0.064		0.27	0.013	0.006		340	340	1120	1120
PAM-2_9/4/15	WATER	Middle	9/4/15	2mm/hr	<1 yr	>63%	10:35	0.191		0.48	0.015	0.006	1.7	940	940	1920	1920
PAM03_AM_31/1/16	WATER	Lower	31/1/16	35mm/hr	10 to 20 yr	5-10%	9:20	0.104		0.68	0.066	0.008		4000	4000	9700	9700
PAM03_PM_31/1/16	WATER	Lower	31/1/16	35mm/hr	10 to 20 yr	5-10%	20:00	0.139		0.83	0.06	0.009		3600	3600	9400	9400
PAM04_AM_31/1/16	WATER	Middle	31/1/16	35mm/hr	10 to 20 yr	5-10%	9:40	0.245		1.19	0.078	0.005		6000	6000	6500	6500
PAM04_PM_31/1/16	WATER	Middle	31/1/16	35mm/hr	10 to 20 yr	5-10%	20:30	0.158		0.91	0.058	0.007		1890	1890	2300	2300
PAM03_5/6/16	WATER	Lower	5/6/16	4.36mm/hr	1-2 yr	39-63%	14:00	0.142		0.42	0.025	0.012		350	350	2300	2300
PAM03_6/6/16	WATER	Lower	6/6/16	4.08mm/hr	2-5 yr	18-39%	12:10	0.278		0.96	0.07	0.012		608	760	8800	7040
PAM04_5/6/16	WATER	Middle	5/6/16	4.36mm/hr	1-2 yr	39-63%	13:30	0.544		1.13	0.039	0.005		760	760	4400	4400
PAM04_6/6/16	WATER	Middle	6/6/16	4.08mm/hr	2-5 yr	18-39%	13:00	0.237		0.85	0.055	0.006		480	480	527	1320
PAM_T1-7_23/4/12	WATER	Basin	23/4/12					0.13	0.3	0.47	0.021	0.008	0.78				
PAM_T2-7_23/4/12	WATER	Basin	23/4/12										-				
PAM_T3-7_23/4/12	WATER	Basin	23/4/12					0.13	0.4	0.5	0.022	0.009	-				
PAM_T4-7_23/4/12	WATER	Middle	23/4/12										-				
NORMAL CONDITION DATA																	
Pam_T1-1_28/10/10	WATER	Basin	28/10/10					<0.01	0.1	0.15	0.01	0.01	0.74				
Pam_T2-1_28/10/10	WATER	Basin	28/10/10					<0.01	0.1	0.15	0.01	0.01					
Pam_T3-1_28/10/10	WATER	Basin	28/10/10										-				
Pam_T1-2_13/01/11	WATER	Basin	13/1/11					0.05	0.2	0.21	0.01	<0.01	1.9				
Pam_T2-2_13/01/11	WATER	Basin	13/1/11					0.11	0.2	0.29	0.02	<0.01	-				
Pam_T3-2_13/01/11	WATER	Basin	13/1/11										-				
Pam_T1-3_7/04/11	WATER	Basin	7/4/11										-				
Pam_T2-3_7/04/11	WATER	Basin	7/4/11					<0.01	0.1	0.06	0.01	0.01	2.5				
Pam_T3-3_7/04/11	WATER	Basin	7/4/11					<0.01	0.1	0.06	0.01	0.01	-				
Pam_T1-4_6/07/11	WATER	Basin	6/7/11					0.05	0.2	0.22	0.01	<0.01	1.5				
Pam_T2-4_6/07/11	WATER	Basin	6/7/11					0.05	0.2	0.32	0.01	<0.01	-				
Pam_T3-4_6/07/11	WATER	Basin	6/7/11										-				
Pam_T1-5_26/10/11	WATER	Basin	26/10/11					0.004	0.2	0.2	0.013	0.003	-				
Pam_T2-5_26/10/11	WATER	Basin	26/10/11					0.003	0.2	0.17	0.013	0.006	1.2				
Pam_T3-5_26/10/11	WATER	Basin	26/10/11										-				
PAM_T1-6_8/2/12	WATER	Basin	8/2/12					0.004	0.2	0.19	0.02	0.006	2.9				
PAM_T2-6_8/2/12	WATER	Basin	8/2/12										-				
PAM_T3-6_8/2/12	WATER	Basin	8/2/12					0.038	0.2	0.23	0.02	0.015	-				
PAM_T4-6_8/2/12	WATER	Middle	8/2/12										-				
PAM_T1-8_27/7/12	WATER	Basin	27/7/12					0.005	0.1	0.06	0.01	0.007	-				

Sample ID	Sample Type	Estuary Region	Sample Date	Rainfall Intensity/ Duration ¹⁰	Rainfall ARI ¹⁰	AEP ¹⁰	Sample Time										
								NOx (Nitrite + Nitrate) as N	TKN	Total Nitrogen as N	Total Phosphorus as P	Reactive Phosphorus as P	Chlorophyll a (Lab)	Thermotolerant Faecal Coliforms (Confirmed)	Thermotolerant Faecal Coliforms (Presumptive)	Enterococci (Confirmed)	Enterococci (Presumptive)
								mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	CFU/100mL	CFU/100mL	CFU/100mL	CFU/100mL
	Limit of Reporting (LOR)							0.002		0.05	0.002	0.002	0.02	1	1	1	1
	ANZECC - Protection of Aquatic Ecosystems ¹							0.015	-	0.3	0.03	0.005	4	-	-	-	-
	ANZECC - Primary Contact Recreation ²							-	-	-	-	-	-	150	150	35	35
	ANZECC - Aquatic Foods ³							-	-	-	-	-	-	-	-	-	-
	Toxicants in Marine Waters - 95% species protection ⁴							-	-	-	-	-	-	-	-	-	-
	MER estuary trigger value - Riverine Estuary ⁵							-	-	-	-	-	2.3	-	-	-	-
PAM_T2-8_27/7/12	WATER	Basin	27/7/12										-				
PAM_T3-8_27/7/12	WATER	Basin	27/7/12										-				
PAM_T4-8_27/7/12	WATER	Middle	27/7/12					0.037	0.1	0.11	0.009	0.006	0.65				
PAM_T1-9_28/11/12	WATER	Basin	28/11/12					0.029	0.2	0.21	0.014	0.004	1.6				
PAM_T2-9_28/11/12	WATER	Basin	28/11/12										-				
PAM_T3-9_28/11/12	WATER	Basin	28/11/12										-				
PAM_T4-9_28/11/12	WATER	Middle	28/11/12					0.02	0.2	0.18	0.012	0.007	-				
PAM_T1-10_30/1/13	WATER	Basin	30/1/13					0.022	0.16	0.18	0.02	0.01	1.9				
PAM_T2-10_30/1/13	WATER	Basin	30/1/13										-				
PAM_T3-10_30/1/13	WATER	Basin	30/1/13										-				
PAM_T4-10_30/1/13	WATER	Middle	30/1/13					0.029	0.16	0.19	0.017	0.008	-				
PAM_T1-11_25/4/13	WATER	Basin	25/4/13					0.03	0.14	0.56	0.027	0.006	2.3				
PAM_T2-11_25/4/13	WATER	Basin	25/4/13										-				
PAM_T3-11_25/4/13	WATER	Basin	25/4/13										-				
PAM_T4-11_25/4/13	WATER	Middle	25/4/13					0.008	0.14	0.15	0.012	0.005	-				
PAM_T1-12_28/7/13	WATER	Basin	28/7/13					0.004	0.08	0.08	0.006	0.003	1.3				
PAM_T2-12_28/7/13	WATER	Basin	28/7/13										-				
PAM_T3-12_28/7/13	WATER	Basin	28/7/13										-				
PAM_T4-12_28/7/13	WATER	Middle	28/7/13					0.007	0.09	0.1	0.006	0.004	-				
PAM_1	WATER	Basin	3/12/08				8:45:00						0.9				
PAM_2	WATER	Basin	3/12/08				8:50:00						1.0				
PAM_3	WATER	Basin	3/12/08				9:00:00						1.2				
PAM_1	WATER	Basin	15/12/08				8:09:51						2.8				
PAM_2	WATER	Basin	15/12/08				8:27:54						1.8				
PAM_3	WATER	Basin	15/12/08				8:43:56						1.4				
PAM_1	WATER	Basin	14/1/09				10:07:04						1.4				
PAM_2	WATER	Basin	14/1/09				10:28:49						2.2				
PAM_3	WATER	Basin	14/1/09				10:45:35						1.6				
PAM_1	WATER	Basin	4/2/09				9:38:58						1.7				
PAM_2	WATER	Basin	4/2/09				9:55:21						2.3				
PAM_3	WATER	Basin	4/2/09				10:15:21						1.5				
PAM_1	WATER	Basin	26/2/09				9:43:53						1.2				
PAM_2	WATER	Basin	26/2/09				9:59:42						1.7				
PAM_3	WATER	Basin	26/2/09				10:16:24						1.1				
PAM_1	WATER	Basin	17/3/09				15:09:24						1.5				
PAM_2	WATER	Basin	17/3/09				15:20:57						1.5				
PAM_3	WATER	Basin	17/3/09				15:33:17						1.6				
PAM_2	WATER	Basin	25/10/17				10:34:54						1.1				
PAM_1	WATER	Basin	25/10/17				10:42:55	0.0003		0.14	0.0153	0.0049	1.5				

Sample ID	Sample Type	Estuary Region	Sample Date	Rainfall Intensity/ Duration ¹⁰	Rainfall ARI ¹⁰	AEP ¹⁰	Sample Time	NOx (Nitrite + Nitrate) as N	TKN	Total Nitrogen as N	Total Phosphorus as P	Reactive Phosphorus as P	Chlorophyll a (Lab)	Thermotolerant Faecal Coliforms (Confirmed)	Thermotolerant Faecal Coliforms (Presumptive)	Enterococci (Confirmed)	Enterococci (Presumptive)		
								mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	CFU/100mL	CFU/100mL	CFU/100mL	CFU/100mL		
								Limit of Reporting (LOR)										0.002	
	ANZECC - Protection of Aquatic Ecosystems ¹							0.015	-	0.3	0.03	0.005	4	-	-	-	-		
	ANZECC - Primary Contact Recreation ²							-	-	-	-	-	-	150	150	35	35		
	ANZECC - Aquatic Foods ³							-	-	-	-	-	-	-	-	-	-		
	Toxicants in Marine Waters - 95% species protection ⁴							-	-	-	-	-	-	-	-	-	-		
	MER estuary trigger value - Riverine Estuary ⁵							-	-	-	-	-	2.3	-	-	-	-		
PAM_2	WATER	Basin	21/11/17				12:35:24						1.9						
PAM_1	WATER	Basin	21/11/17				12:42:02						1.5						
PAM_2	WATER	Basin	12/12/17				10:32:21						1.4						
PAM_1	WATER	Basin	12/12/17				10:39:36	0.0057		0.13	0.0043	0.0042	3.2						
PAM_2	WATER	Basin	17/1/18				15:02:57						1.5						
PAM_1	WATER	Basin	17/1/18				15:11:34						1.7						
PAM_2	WATER	Basin	13/2/18				11:40:18						3.8						
PAM_1	WATER	Basin	13/2/18				11:48:01						3.0						
PAM_2	WATER	Basin	7/3/18				10:13:18						2.3						
PAM_1	WATER	Basin	7/3/18				10:19:43						2.5						

Note

Shaded cells with bold text indicate guideline value has been exceeded

¹ WQOs for protection of Estuarine Aquatic Ecosystems in South-East Australia (ANZECC/ARMCANZ 2000 - Table 3.3.2)

² Primary Contact Recreation guideline in fresh and marine waters (ANZECC/ARMCANZ 2000 - Section 5.2.3.1)

³ Aquatic Foods guideline for saltwater aquaculture species (ANZECC/ARMCANZ 2000 - Tables 4.4.2 and 4.4.3)

⁴ Toxicant guideline - 95% species protection in marine waters (ANZECC/ARMCANZ 2000 - Table 3.4.1)

⁵ MER trigger values adopted by the NSW MER program (OE 2016)

⁶ Field parameters represent mean WQ data measured *in situ* using YSI 6600 V2-4 sonde

⁷ Laboratory parameters reported by ALS Canberra or DPIE

⁸ Chlorophyll a (probe) values adjusted by correction factor calculated from laboratory QC sample

⁹ Ammonium (NH₄⁺) concentration determined by calculation

¹⁰ Rainfall analysis refer <http://www.bom.gov.au/hydro/has/cdirswebx/cdirswebx.shtml>

ANNEXURE C

Table C1 Merimbula STP influent quality data (2004-2017)

Table C2 Merimbula STP effluent quality data (2004-2016)

Table C3 Merimbula STP effluent quality data (2014-2016)

BVSC Merimbula STP Influent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	Susp.Solids	BOD	COD	Bicarb Alkalinity	Carb Alkanity	Hydrox Alkalinity	Total Alkalinity	Total Nitrogen	Ammonia (asN)	Tot.Phosp (asP)
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
394961	BVSP44	Merimbula STP - Influent	15-Apr-04	83	130	320	270	<2	<2	270	50	41	11
399383	BVSP44	Merimbula STP - Influent	19-May-04	110	130	320	275	<2	<2	275	47	38	10
403354	BVSP44	Merimbula STP - Influent	16-Jun-04	230	260	510	283	<2	<2	283	58	42	13
407847	BVSP44	Merimbula STP - Influent	21-Jul-04	160	140	410	256	<2	<2	256	48	39	11
411661	BVSP44	Merimbula STP - Influent	18-Aug-04	250	220	510	250	<2	<2	250	57	41	11
415612	BVSP44	Merimbula STP - Influent	15-Sep-04	470	400	860	333	<2	<2	333	75	58	15
420401	BVSP44	Merimbula STP - Influent	18-Oct-04	120	180	300	245	<2	<2	245	51	41	9.6
424656	BVSP44	Merimbula STP - Influent	17-Nov-04	66	140	310	236	<2	<2	236	42	34	9.9
429357	BVSP44	Merimbula STP - Influent	15-Dec-04	70	140	300	248	<2	<2	248	44	37	9.2
434191	BVSP44	Merimbula STP - Influent	19-Jan-05	140	300	460	284	<2	<2	284	62	46	12
437811	BVSP44	Merimbula STP - Influent	16-Feb-05	250	7	350	273	<2	<2	273	50	41	12
442237	BVSP44	Merimbula STP - Influent	16-Mar-05	230	240	530	276	<2	<2	276	53	42	12
446641	BVSP44	Merimbula STP - Influent	20-Apr-05	330	290	690	296	<2	<2	296	65	43	14
450250	BVSP44	Merimbula STP - Influent	18-May-05	180	260	500	288	<2	<2	288	55	44	11
453964	BVSP44	Merimbula STP - Influent	15-Jun-05	300	250	590	339	<2	<2	339	73	66	12
459046	BVSP44	Merimbula STP - Influent	20-Jul-05	140	190	370	258	<2	<2	258	51	40	10
463569	BVSP44	Merimbula STP - Influent	17-Aug-05	99	180	400	257	<2	<2	257	55	42	11
468216	BVSP44	Merimbula STP - Influent	21-Sep-05	87	180	360	281	<2	<2	281	56	46	11
472198	BVSP44	Merimbula STP - Influent	19-Oct-05	250	300	400	290	<2	<2	290	56	45	11
476722	BVSP44	Merimbula STP - Influent	17-Nov-05	330	300	470	270	<2	<2	270	59	48	10
482836	BVSP44	Merimbula STP - Influent	21-Dec-05	200	310	560	250	<2	<2	250	47	36	11
486690	BVSP44	Merimbula STP - Influent	18-Jan-06	410	450	490				270	50	47	9.2
492084	BVSP44	Merimbula STP - Influent	15-Feb-06	250	260	540	240	<2	<2	240	50	40	11
497809	BVSP44	Merimbula STP - Influent	15-Mar-06	220	260	380	250	<2	<2	250	51	42	9.4
503595	BVSP44	Merimbula STP - Influent	19-Apr-06	410	400	730	290	<2	<2	290	61	43	13
508007	BVSP44	Merimbula STP - Influent	17-May-06	170	200	470	300	<2	<2	300	55	45	12
513533	BVSP44	Merimbula STP - Influent	21-Jun-06	290	280	460	250	<2	<2	250	52	41	10
517919	BVSP44	Merimbula STP - Influent	18-Jul-06	140	100	260	140	<2	<2	140	28	20	4.2
522220	BVSP44	Merimbula STP - Influent	16-Aug-06	250	340	550	280	<2	<2	280	58	45	12
528071	BVSP44	Merimbula STP - Influent	20-Sep-06	260	370	640	290	<2	<2	290	60	47	12
532851	BVSP44	Merimbula STP - Influent	18-Oct-06	230	280	610	290	<2	<2	290	58	46	13
537457	BVSP44	Merimbula STP - Influent	15-Nov-06	440	490	1100	260	<2	<2	260	61	41	14
543585	BVSP44	Merimbula STP - Influent	20-Dec-06	280	470	360	270	<2	<2	270	52	46	10
547108	BVSP44	Merimbula STP - Influent	17-Jan-07	280	270	770	270	<2	<2	270	53	44	11
553497	BVSP44	Merimbula STP - Influent	21-Feb-07	250	280	550	270	<2	<2	270	54	44	11
558721	BVSP44	Merimbula STP - Influent	21-Mar-07	190	280	570	280	<2	<2	280	58	47	11
563422	BVSP44	Merimbula STP - Influent	18-Apr-07	710	510	850	410	<2	<2	410	84	67	15
568661	BVSP44	Merimbula STP - Influent	16-May-07	290	290	500	340	<2	<2	340	68	58	14
574717	BVSP44	Merimbula STP - Influent	20-Jun-07	71	40	120	78	<2	<2	78	13	8.4	1.7
579558	BVSP44	Merimbula STP - Influent	18-Jul-07	360	250	480	310	<2	<2	310	56	41	11
584897	BVSP44	Merimbula STP - Influent	15-Aug-07	240	210	440	220	<2	<2	220	43	31	8.9
590553	BVSP44	Merimbula STP - Influent	19-Sep-07	200	400	470	270	<2	<2	270	55	46	11
594851	BVSP44	Merimbula STP - Influent	17-Oct-07	230	210	410	290	<2	<2	290	56	46	14
600645	BVSP44	Merimbula STP - Influent	21-Nov-07	320	400	590	320	<2	<2	320	64	50	14
606418	BVSP44	Merimbula STP - Influent	19-Dec-07	250	310	580	290	<2	<2	290	51	40	12
610455	BVSP44	Merimbula STP - Influent	16-Jan-08	290	300	650	300	<2	<2	300	58	51	13
617308	BVSP44	Merimbula STP - Influent	20-Feb-08	350	320	520	290	<2	<2	290	54	48	9.7
622712	BVSP44	Merimbula STP - Influent	19-Mar-08	370	580	730	390	<2	<2	390	83	73	15
628125	BVSP44	Merimbula STP - Influent	16-Apr-08	210	260	540	300	<2	<2	300	59	47	11
634279	BVSP44	Merimbula STP - Influent	21-May-08	300	390	600	290	<2	<2	290	56	47	12
638693	BVSP44	Merimbula STP - Influent	18-Jun-08	940	340	870	300	<2	<2	300	56	45	14

BVSC Merimbula STP Influent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	Susp.Solids	BOD	COD	Bicarb Alkalinity	Carb Alkanity	Hydrox Alkalinity	Total Alkalinity	Total Nitrogen	Ammonia (asN)	Tot.Phosp (asP)
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
642817	BVSP44	Merimbula STP - Influent	16-Jul-08	340	320	680	300	<2	<2	300	70	53	12
648393	BVSP44	Merimbula STP - Influent	20-Aug-08	400	350	680	330	<2	<2	330	64	54	13
652685	BVSP44	Merimbula STP - Influent	17-Sep-08	260	360	710	320	<2	<2	320	71	53	12
656948	BVSP44	Merimbula STP - Influent	15-Oct-08	320	300	420	350	<2	<2	350	76	60	14
663322	BVSP44	Merimbula STP - Influent	19-Nov-08	270	340	430	300	<2	<2	300	66	52	10
668836	BVSP44	Merimbula STP - Influent	17-Dec-08	260	390	620	320	<2	<2	320	58	46	12
673504	BVSP44	Merimbula STP - Influent	21-Jan-09	340	370	550	270	<2	<2	270	62	46	9.9
678894	BVSP44	Merimbula STP - Influent	18-Feb-09	220	210	500	300	<2	<2	300	54	40	13
683478	BVSP44	Merimbula STP - Influent	18-Mar-09	260	270	460	360	<2	<2	360	74	57	11
688407	BVSP44	Merimbula STP - Influent	15-Apr-09	380	260	630	210	<2	<2	210	52	35	9.1
694471	BVSP44	Merimbula STP - Influent	20-May-09	240	230	540	350	<2	<2	350	69	55	11
698912	BVSP44	Merimbula STP - Influent	17-Jun-09	360	290	630	270	<2	<2	270	66	47	10
703143	BVSP44	Merimbula STP - Influent	15-Jul-09	370	340	710	290	<2	<2	290	60	44	14
706967	BVSP44	Merimbula STP - Influent	05-Aug-09	310	360	640	350	<2	<2	350	84	66	14
711772	BVSP44	Merimbula STP - Influent	02-Sep-09	220	240	420	270	<2	<2	270	55	44	9.1
716823	BVSP44	Merimbula STP - Influent	07-Oct-09	280	240	590	268	<0.1	<0.1	268	59	45	10
721679	BVSP44	Merimbula STP - Influent	04-Nov-09	130	250	480	277	<0.1	<0.1	277	62	51	10
726490	BVSP44	Merimbula STP - Influent	02-Dec-09	380	350	680	295	<0.1	<0.1	295	70	50	12
731869	BVSP44	Merimbula STP - Influent	06-Jan-10	500	380	840	591	68.4	<0.1	660	140	130	22
737336	BVSP44	Merimbula STP - Influent	02-Feb-10	230	290	580	315	<0.1	<0.1	315	64	50	12
743304	BVSP44	Merimbula STP - Influent	03-Mar-10	720	520	780	299	<0.1	<0.1	299	65	47	13
749229	BVSP44	Merimbula STP - Influent	07-Apr-10	320	300	690	349	<0.1	<0.1	349	75	60	12
753900	BVSP44	Merimbula STP - Influent	05-May-10	230	320	630	299	<0.1	<0.1	299	61	50	11
759457	BVSP44	Merimbula STP - Influent	02-Jun-10	240	68	280	167	<0.1	<0.1	167	27	19	7.9
764964	BVSP44	Merimbula STP - Influent	07-Jul-10	250	330	600	255	<0.1	<0.1	255	58	45	10
796921	BVSP44	Merimbula STP - Influent	04-Aug-10	190	210	420	282	<0.1	<0.1	282	55	45	9.7
800785	BVSP44	Merimbula STP - Influent	01-Sep-10	270	280	510	319	<0.1	<0.1	319	70	51	13
804827	BVSP44	Merimbula STP - Influent	06-Oct-10	280	420	630	266	<0.1	<0.1	266	55	38	10
808945	BVSP44	Merimbula STP - Influent	03-Nov-10	260	270	600	305	<0.1	<0.1	305	63	51	13
813018	BVSP44	Merimbula STP - Influent	01-Dec-10	75	61	110	91.9	<0.1	<0.1	92	18	11	1.6
817849	BVSP44	Merimbula STP - Influent	05-Jan-11	320	490	720	279	<0.1	<0.1	279	67	54	11
821869	BVSP44	Merimbula STP - Influent	02-Feb-11	280	280	520	267	<0.1	<0.1	267	54	42	12
826940	BVSP44	Merimbula STP - Influent	02-Mar-11	360	280	430	278	<0.1	<0.1	278	65	50	10
832657	BVSP44	Merimbula STP - Influent	06-Apr-11	240	260	520	260	<0.1	<0.1	260	56	43	12
836331	BVSP44	Merimbula STP - Influent	04-May-11	250	390	630	264	<0.1	<0.1	264	60	46	11
840300	BVSP44	Merimbula STP - Influent	01-Jun-11	340	350	690	341	<0.1	<0.1	341	80	65	12
845135	BVSP44	Merimbula STP - Influent	06-Jul-11	270	340	620	244	<0.1	<0.1	244	60	44	11
848680	BVSP44	Merimbula STP - Influent	03-Aug-11	280	400	730	312	<0.1	<0.1	312	76	57	13
853394	BVSP44	Merimbula STP - Influent	07-Sep-11	270	410	750	266	<0.1	<0.1	266	67	50	11
856686	BVSP44	Merimbula STP - Influent	05-Oct-11	670	590	1000	247	<0.1	<0.1	247	65	48	11
860673	BVSP44	Merimbula STP - Influent	02-Nov-11	140	300	480	254	<0.1	<0.1	254	53	39	8.9
865801	BVSP44	Merimbula STP - Influent	07-Dec-11	350	290	580	247	<0.1	<0.1	247	51	37	8.2
869321	BVSP44	Merimbula STP - Influent	04-Jan-12	280	410	700	303	<0.1	<0.1	303	71	57	11
873263	BVSP44	Merimbula STP - Influent	01-Feb-12	320	260	710	266	<0.1	<0.1	266	61	45	12
878963	BVSP44	Merimbula STP - Influent	07-Mar-12	250	280	520	194	<0.1	<0.1	194	44	33	7.5
883404	BVSP44	Merimbula STP - Influent	03-Apr-12	230	310	570	280	<0.1	<0.1	280	53	42	9.6
886989	BVSP44	Merimbula STP - Influent	02-May-12	150	170	350	212	<0.1	<0.1	212	41	32	7.5
892183	BVSP44	Merimbula STP - Influent	06-Jun-12	200	130	370	467	<0.1	<0.1	467	99	86	12
895750	BVSP44	Merimbula STP - Influent	04-Jul-12	310	410	680	257	<0.1	<0.1	257	50	35	8.9
899436	BVSP44	Merimbula STP - Influent	01-Aug-12	290	320	640	257	<0.1	<0.1	257	71	51	9.7

BVSC Merimbula STP Influent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	Susp.Solids	BOD	COD	Bicarb Alkalinity	Carb Alkanity	Hydrox Alkalinity	Total Alkalinity	Total Nitrogen	Ammonia (asN)	Tot.Phosp (asP)
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
904221	BVSP44	Merimbula STP - Influent	05-Sep-12	110	270	420	250	<0.1	<0.1	250	50	41	7.6
907887	BVSP44	Merimbula STP - Influent	03-Oct-12	290	340	680	273	<0.1	<0.1	273	67	52	11
912932	BVSP44	Merimbula STP - Influent	07-Nov-12	380	460	830	312	<0.1	<0.1	312	77	57	11
917408	BVSP44	Merimbula STP - Influent	05-Dec-12	250	320	630	285	<0.1	<0.1	285	65	52	11
920830	BVSP44	Merimbula STP - Influent	02-Jan-13	330	440	710	329	<0.1	<0.1	329	83	67	13
925709	BVSP44	Merimbula STP - Influent	06-Feb-13	320	310	670	263	<0.1	<0.1	263	64	50	10
929778	BVSP44	Merimbula STP - Influent	06-Mar-13	400	380	700	265	<0.1	<0.1	265	61	44	11
933369	BVSP44	Merimbula STP - Influent	03-Apr-13	350	340	690	244	<0.1	<0.1	244	60	45	9.5
937100	BVSP44	Merimbula STP - Influent	01-May-13	250	260	530	284	<0.1	<0.1	284	63	50	12
942463	BVSP44	Merimbula STP - Influent	06-Jun-13	1100	790	1400	316	<0.1	<0.1	316	79	51	14
945979	BVSP44	Merimbula STP - Influent	03-Jul-13	280	420	630	270	<0.1	<0.1	270	65	49	10
950613	BVSP44	Merimbula STP - Influent	07-Aug-13	420	350	740	370	<0.1	<0.1	370	86	69	13
954050	BVSP44	Merimbula STP - Influent	04-Sep-13	250	280	670	288	<0.1	<0.1	288	77	61	11
958145	BVSP44	Merimbula STP - Influent	02-Oct-13	310	390	580	278	<0.1	<0.1	278	71	55	11
962736	BVSP44	Merimbula STP - Influent	06-Nov-13	290	260	610	279	<0.1	<0.1	279	60	46	10
	BVSP44	Merimbula STP - Influent	05-Dec-13	332	349	670	242	<0.1	<0.1	242	63.6	47.4	10.3
CA1400009-005	BVSP44	Merimbula STP - Influent	01-Jan-14	416	368	795	331	<0.1	<0.1	331	89	72.3	13.5
CA1400376-005	BVSP44	Merimbula STP - Influent	05-Feb-14	276	292	478	259	<0.1	<0.1	259	67.3	47.4	10.3
CA1400376005	BVSP44	Merimbula STP - Influent	05-Mar-14	293	385	636	307	<0.1	<0.1	307	73.5	53.9	11.6
CA1401020005	BVSP44	Merimbula STP - Influent	02-Apr-14	230	352	632	230	<0.1	<0.1	230	56	41.7	8.61
CA1401377005	BVSP44	Merimbula STP - Influent	07-May-14	246	393	553	257	<0.1	<0.1	257	63.6	46.4	10.4
CA1401693005	BVSP44	Merimbula STP - Influent	04-Jun-14	177	186	418	185	<0.1	<0.1	185	36.3	27.3	6.3
CA1401982005	BVSP44	Merimbula STP - Influent	02-Jul-14	270	280	679	256	<0.1	<0.1	256	56	43.5	9.4
CA1402316005	BVSP44	Merimbula STP - Influent	06-Aug-14	258	234	608	276	<0.1	<0.1	276	66.2	52.9	9.06
CA1402656005	BVSP44	Merimbula STP - Influent	03-Sep-14	234	270	515	218	<0.1	<0.1	218	48	37	7.56
CA1403044005	BVSP44	Merimbula STP - Influent	01-Oct-14	295	320	710	250	<0.1	<0.1	250	58.6	43.9	9.18
CA1403467005	BVSP44	Merimbula STP - Influent	05-Nov-14	296	308	647	264	<0.1	<0.1	264	66.2	50.3	9.76
CA1403879005	BVSP44	Merimbula STP - Influent	03-Dec-14	200	289	529	255	<0.1	<0.1	255	53.8	41.9	8.76
CA1500057-005	BVSP44	Merimbula STP - Influent	07-Jan-15	282	272	608	344	<0.1	<0.1	344	42	68.8	6.05
CA1500414-005	BVSP44	Merimbula STP - Influent	04-Feb-15	222	224	478	253	<0.1	<0.1	253	59.6	44.5	8.88
CA1500805-005	BVSP44	Merimbula STP - Influent	04-Mar-15	301	274	634	290	<0.1	<0.1	290	71	51.6	10.7
CA1501219-004	BVSP44	Merimbula STP - Influent	01-Apr-15	265	258	426	344	<0.1	<0.1	344	87.4	71	11.6
CA1501690-004	BVSP44	Merimbula STP - Influent	06-May-15	194	200	448	279	<0.1	<0.1	279	58.8	48	9.14
CA1502104-004	BVSP44	Merimbula STP - Influent	03-Jun-15	257	305	584	285	<0.1	<0.1	285	59.2	48.3	8.86
CA1502606-004	BVSP44	Merimbula STP - Influent	30-Jun-15	291	294	577	317	<0.1	<0.1	317	78.4	64.5	10.4
CA1503134-004	BVSP44	Merimbula STP - Influent	05-Aug-15	217	288	472	262	<0.1	<0.1	262	60.4	46.3	9.78
CA1503555-004	BVSP44	Merimbula STP - Influent	02-Sep-15	105	94	236	196	<0.1	<0.1	196	36.8	28.5	5.56
CA1504057-004	BVSP44	Merimbula STP - Influent	07-Oct-15	284	329	522	304	<0.1	<0.1	304	67.8	50.3	10.4
CA1504684-004	BVSP44	Merimbula STP - Influent	04-Nov-15	262	174	327	182	<0.1	<0.1	182	44	33.5	5.1
CA1505359-004	BVSP44	Merimbula STP - Influent	02-Dec-15	293	322	464	245	<0.1	<0.1	245	52	45.1	7.66
CA1600093-004	BVSP44	Merimbula STP - Influent	06-Jan-16	217	197	356	189	<0.1	<0.1	189	42.8	33.6	5.88
CA1600696-004	BVSP44	Merimbula STP - Influent	03-Feb-16	934	285	857	196	<0.1	<0.1	196	47.4	26.6	8.84
CA1601333-004	BVSP44	Merimbula STP - Influent	02-Mar-16	294	358	726	284	<0.1	<0.1	284	69.1	47.4	10.7
CA1602082-004	BVSP44	Merimbula STP - Influent	06-Apr-16	306	315	597	253	<0.1	<0.1	253	56.4	44.4	8.78
CA1602620-004	BVSP44	Merimbula STP - Influent	04-May-16	274	314	573	274	<0.1	<0.1	274	65.5	44.9	9.05
CA1603138-004	BVSP44	Merimbula STP - Influent	01-Jun-16	317	314	369	256	<0.1	<0.1	256	55.4	42.1	7.5
CA1603811-004	BVSP44	Merimbula STP - Influent	06-Jul-16	220	250	455	218	<0.1	<0.1	218	50.9	35.8	6.97
CA1604353-004	BVSP44	Merimbula STP - Influent	03-Aug-16	250	288	569	280	<0.1	<0.1	280	65	52.8	9.72
CA1605098-004	BVSP44	Merimbula STP - Influent	07-Sep-16	272	208	553	249	<0.1	<0.1	249	58	44.5	8.34
CA1605624-004	BVSP44	Merimbula STP - Influent	05-Oct-16	214	277	512	232	<0.1	<0.1	232	59.5	43.7	8.38

BVSC Merimbula STP Influent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	Susp.Solids	BOD	COD	Bicarb Alkalinity	Carb Alkanity	Hydrox Alkalinity	Total Alkalinity	Total Nitrogen	Ammonia (asN)	Tot.Phosp (asP)
				mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
CA1606126-004	BVSP44	Merimbula STP - Influent	02-Nov-16	474	332	692	328	<0.1	<0.1	328	78.4	64.7	10.2
CA1606890-004	BVSP44	Merimbula STP - Influent	07-Dec-16	258	204	580	267	<0.1	<0.1	267	56.8	44.6	8.65
CA1700032-004	BVSP44	Merimbula STP - Influent	04-Jan-17	289	308	646	284	<0.1	<0.1	284	72.9	52.7	9.65
CA1700600-004	BVSP44	Merimbula STP - Influent	01-Feb-17	302	301	674	274	<0.1	<0.1	274	64.8	46.2	11
CA1701211-004	BVSP44	Merimbula STP - Influent	01-Mar-17	293	325	577	308	<0.1	<0.1	308	59.4	50.2	8.6
CA1702059-004	BVSP44	Merimbula STP - Influent	05-Apr-17	288	238	596	227	<0.1	<0.1	227	65.2	42.3	8.24
CA1702504-004	BVSP44	Merimbula STP - Influent	03-May-17	295	311	639	272	<0.1	<0.1	272	65.7	49	7.85

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	pH	Susp.Solid s	BOD	COD	Total Nitrogen	Ammonia (asN)	T.Oxid Nit (asN)	Tot.Phosp (asP)	Orth.Phosp (asP)	Chlorophyl l "a"	EC	DO
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	us/cm	mg/L
394970	BVSP40	Merimbula STP - Effluent (comp)	15-Apr-04	8.2	9	7	26	10	0.17	8.9	9.7		45		
396033	BVSP40	Merimbula STP - Effluent (comp)	21-Apr-04	8.7	14	5	28	7.7	0.14	6.1	10				
396505	BVSP40	Merimbula STP - Effluent (comp)	27-Apr-04												
396847	BVSP40	Merimbula STP - Effluent (comp)	29-Apr-04	8.4	14	12	32	9.4	0.07	7.4	11				
397539	BVSP40	Merimbula STP - Effluent (comp)	5-May-04	8.2	12	10	74	11	0.07	9.4	11		40		
398641	BVSP40	Merimbula STP - Effluent (comp)	13-May-04	7.8	4	3	20	15	0.08	14	10				
399389	BVSP40	Merimbula STP - Effluent (comp)	19-May-04	7.7	5	3	30	17	0.1	15	10				
400614	BVSP40	Merimbula STP - Effluent (comp)	27-May-04	7.8	3	3	20	14	0.12	13	11				
401627	BVSP40	Merimbula STP - Effluent (comp)	2-Jun-04	7.4	13	11	33	11	0.23	9.2	11		0.26		
402725	BVSP40	Merimbula STP - Effluent (comp)	10-Jun-04	7.9	2	2	18	7.8	0.15	6.1	11				
403360	BVSP40	Merimbula STP - Effluent (comp)	16-Jun-04	7.9	3	2	22	8	0.12	6.2	10				
404516	BVSP40	Merimbula STP - Effluent (comp)	24-Jun-04	8.7	6	4	27	11	0.02	9.4	10				
405208	BVSP40	Merimbula STP - Effluent (comp)	30-Jun-04	7.9	5	2	41	7.9	0.25	6.7	11				
406068	BVSP40	Merimbula STP - Effluent (comp)	7-Jul-04	7.8	3	2	0.5	5.7	0.24	4.3	11		1.6		
407242	BVSP40	Merimbula STP - Effluent (comp)	15-Jul-04	7.8	4	2	22	8.9	0.24	8	10				
407853	BVSP40	Merimbula STP - Effluent (comp)	22-Jul-04	7.8	3	2	29	11	0.25	9.5	9.4				
409229	BVSP40	Merimbula STP - Effluent (comp)	29-Jul-04	7.7	3	2	19	12	0.17	12	9.4				
409816	BVSP40	Merimbula STP - Effluent (comp)	4-Aug-04	7.7	3	2	16	11	0.21	9.9	10		1.5		
410948	BVSP40	Merimbula STP - Effluent (comp)	12-Aug-04	8	2	2	24	4.9	0.17	3.6	10				
411647	BVSP40	Merimbula STP - Effluent (comp)	18-Aug-04	8	2	2	23	2.9	0.18	1.6	9.9				
412806	BVSP40	Merimbula STP - Effluent (comp)	26-Aug-04	8	2	2	25	3.2	0.19	1.6	10				
413570	BVSP40	Merimbula STP - Effluent (comp)	1-Sep-04	8	3	2	29	2.6	0.23	1.1	10		0.97		
414736	BVSP40	Merimbula STP - Effluent (comp)	10-Sep-04	8.1	2	2	24	2.7	0.28	1.3	7.9				
415604	BVSP40	Merimbula STP - Effluent (comp)	15-Sep-04	8.2	3	2	23	2.6	0.2	1.3	7.7				
416766	BVSP40	Merimbula STP - Effluent (comp)	23-Sep-04	8.2	3	2	24	2.6	0.21	1.4	8.4				
417542	BVSP40	Merimbula STP - Effluent (comp)	29-Sep-04	7.8	2	2	26	2.9	0.4	1.5	9.6				
418380	BVSP40	Merimbula STP - Effluent (comp)	6-Oct-04	7.8	2	2	22	3.7	0.57	1.9	10		3		
419575	BVSP40	Merimbula STP - Effluent (comp)	14-Oct-04	8.5	8	2	21	4.5	0.22	3.1	11				
420411	BVSP40	Merimbula STP - Effluent (comp)	20-Oct-04	8.7	12	3	31	4.4	0.06	2.8	12				
421596	BVSP40	Merimbula STP - Effluent (comp)	28-Oct-04	8.2	10	2	26	3.4	0.17	1.8	11				
422570	BVSP40	Merimbula STP - Effluent (comp)	3-Nov-04	8.1	7	3	28	2.3	0.34	0.92	11		10		
423597	BVSP40	Merimbula STP - Effluent (comp)	11-Nov-04	8	6	2	3	2.4	0.73	0.6	9.9				
424662	BVSP40	Merimbula STP - Effluent (comp)	17-Nov-04	8	6	3	30	3	0.83	0.81	8.4				
426101	BVSP40	Merimbula STP - Effluent (comp)	26-Nov-04	8.3	8	3	27	2.2	0.39	0.65	8.7				
427156	BVSP40	Merimbula STP - Effluent (comp)	1-Dec-04	8.7	16	5	29	1.8	0.25	0.39	8.5		34		
428196	BVSP40	Merimbula STP - Effluent (comp)	9-Dec-04	7.9	7	3	29	2.4	0.83	0.6	9.1				
429351	BVSP40	Merimbula STP - Effluent (comp)	15-Dec-04	7.7	7	2	25	2.8	1.7	0.31	9.4		7.7		
430945	BVSP40	Merimbula STP - Effluent (comp)	23-Dec-04	8.1	6	3	22	2.2	0.2	0.92	7.6		11		
431330	BVSP40	Merimbula STP - Effluent (comp)	29-Dec-04	8	7	5	28	3.5	0.35	1.5	6.1				
431791	BVSP40	Merimbula STP - Effluent (comp)	5-Jan-05	7.9	8	4	26	5.2	0.7	3.4	7.4		14		
433147	BVSP40	Merimbula STP - Effluent (comp)	13-Jan-05	8.3	7	3	28	4.8	2.1	1.3	10				
434178	BVSP40	Merimbula STP - Effluent (comp)	19-Jan-05	7.8	6	3	27	2.9	0.42	1.1	10				
435343	BVSP40	Merimbula STP - Effluent (comp)	27-Jan-05	8.5	15	7	30	3.2	0.29	1.5	11				
435856	BVSP40	Merimbula STP - Effluent (comp)	2-Feb-05	7.9	15	2	33	5.1	0.95	1.5	11		24		
437023	BVSP40	Merimbula STP - Effluent (comp)	10-Feb-05	8.5	14	6	28	6.2	0.22	4	11		67		
437832	BVSP40	Merimbula STP - Effluent (comp)	16-Feb-05	8.2	8	4	43	4.7	0.31	2.7	10				
439041	BVSP40	Merimbula STP - Effluent (comp)	24-Feb-05	7.8	19	15	28	3	0.38	0.5	14				
440079	BVSP40	Merimbula STP - Effluent (comp)	2-Mar-05	8.2	10	4	25	1.7	0.18	0.51	12		12		
441484	BVSP40	Merimbula STP - Effluent (comp)	10-Mar-05	7.7	6	8	28	3.8	0.39	1.3	13				
442249	BVSP40	Merimbula STP - Effluent (comp)	16-Mar-05	7.9	4	17	17	3	0.37	1.7	13				
443206	BVSP40	Merimbula STP - Effluent (comp)	24-Mar-05	8.1	13	4	25	5	0.03	3.9	12				
443668	BVSP40	Merimbula STP - Effluent (comp)	28-Mar-05												
443806	BVSP40	Merimbula STP - Effluent (comp)	30-Mar-05	7.9	12	9	24	9.1	0.21	6.4	11				

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	pH	Susp.Solid s	BOD	COD	Total Nitrogen	Ammonia (asN)	T.Oxid Nit (asN)	Tot.Phosp (asP)	Orth.Phosp (asP)	Chlorophyl l "a"	EC	DO
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	us/cm	mg/L
444986	BVSP40	Merimbula STP - Effluent (comp)	7-Apr-05	7.9	4	2	21	14	0.08	12	10		6.2		
445977	BVSP40	Merimbula STP - Effluent (comp)	14-Apr-05	7.9	5	2	17	15	0.06	14	11				
446634	BVSP40	Merimbula STP - Effluent (comp)	20-Apr-05	7.9	6	4	18	13	0.15	10	12				
447560	BVSP40	Merimbula STP - Effluent (comp)	28-Apr-05	7.8	8	5	52	14	0.27	10	13				
448474	BVSP40	Merimbula STP - Effluent (comp)	4-May-05	8	7	3	19	12	0.1	9.8	13		1.9		
449604	BVSP40	Merimbula STP - Effluent (comp)	12-May-05	8	4	4	20	10	0.08	7.6	12				
450256	BVSP40	Merimbula STP - Effluent (comp)	19-May-05	8.2	2	2	20	8.4	0.09	5.9	11				
451433	BVSP40	Merimbula STP - Effluent (comp)	26-May-05	8.2	3	2	29	4.8	0.06	3.3	10				
452352	BVSP40	Merimbula STP - Effluent (comp)	1-Jun-05	8.3	3	2	23	5.3	0.01	4	9.7		4.2		
453323	BVSP40	Merimbula STP - Effluent (comp)	9-Jun-05	8.1	3	2	20	8.7	0.12	7.3	9.1				
453970	BVSP40	Merimbula STP - Effluent (comp)	15-Jun-05	8	2	2	22	8.2	0.17	6.5	9.2				
455222	BVSP40	Merimbula STP - Effluent (comp)	23-Jun-05	8.1	5	2	25	5.9	0.15	4.3	9.6				
456037	BVSP40	Merimbula STP - Effluent (comp)	29-Jun-05	7.9	5	3	21	4.9	0.25	2.7	10				
457014	BVSP40	Merimbula STP - Effluent (comp)	6-Jul-05	7.8	2	3	25	3	0.52	1.3	8.4		0.3		
458241	BVSP40	Merimbula STP - Effluent (comp)	14-Jul-05	7.4	6	3	39	7	2.1	3.6	5.3				
459051	BVSP40	Merimbula STP - Effluent (comp)	20-Jul-05	7.9	2	2	19	7	0.21	5.4	6				
460420	BVSP40	Merimbula STP - Effluent (comp)	28-Jul-05	7.9	3	2	17	9.8	0.15	8.6	7.4				
461259	BVSP40	Merimbula STP - Effluent (comp)	3-Aug-05	7.1	2	2	19	7.2	0.12	6.1	8.4		4.4		
462391	BVSP40	Merimbula STP - Effluent (comp)	11-Aug-05	8.2	2	2	21	6.7	0.12	5.6	8.7				
463575	BVSP40	Merimbula STP - Effluent (comp)	17-Aug-05	8.2	2	2	22	6.5	0.25	5.3	9.2				
464579	BVSP40	Merimbula STP - Effluent (comp)	25-Aug-05	8.1	5	4	55	4	0.33	2	10				
465385	BVSP40	Merimbula STP - Effluent (comp)	31-Aug-05	8.2	5	2	33	3.6	0.33	1.9	11				
466459	BVSP40	Merimbula STP - Effluent (comp)	7-Sep-05	8.1	5	2	22	3.8	0.34	1.9	10		0.57		
467486	BVSP40	Merimbula STP - Effluent (comp)	15-Sep-05	8	3	2	26	2.3	0.5	0.73	9.2				
468233	BVSP40	Merimbula STP - Effluent (comp)	21-Sep-05	8.2	2	2	18	2.1	0.65	0.63	7.8				
469440	BVSP40	Merimbula STP - Effluent (comp)	29-Sep-05	8.3	6	3	18	2.4	0.48	0.96	8.2				
470064	BVSP40	Merimbula STP - Effluent (comp)	5-Oct-05	8.5	4	2	28	2.1	0.36	0.99	8.1		5.6		
471344	BVSP40	Merimbula STP - Effluent (comp)	13-Oct-05	9	8	2	31	1.7	0.03	0.74	8.2				
472191	BVSP40	Merimbula STP - Effluent (comp)	19-Oct-05	8.6	7	2	29	1.8	0.14	0.71	9.3				
473781	BVSP40	Merimbula STP - Effluent (comp)	27-Oct-05	8	8	2	29	2.1	0.4	0.62	9.6				
474581	BVSP40	Merimbula STP - Effluent (comp)	2-Nov-05	7.4	4	2	31	5.8	0.81	2.8	6.1		4		
475848	BVSP40	Merimbula STP - Effluent (comp)	10-Nov-05	8.2	6	3	33	3.4	0.17	2.1	8.6				
476731	BVSP40	Merimbula STP - Effluent (comp)	16-Nov-05	7.9	6	2	24	3.2	0.87	0.94	8.8				
477981	BVSP40	Merimbula STP - Effluent (comp)	24-Nov-05	8.1	5	2	20	3.8	0.14	2.7	7.4				
479086	BVSP40	Merimbula STP - Effluent (comp)	30-Nov-05	7.9	0	2	21	5.4	0.17	4.4	8.4				
480372	BVSP40	Merimbula STP - Effluent (comp)	7-Dec-05	8.1	13	3	31	2.7	0.11	1.4	9.2		27		
481875	BVSP40	Merimbula STP - Effluent (comp)	15-Dec-05	7.9	6	4	23	1.9	0.51	0.17	10				
482842	BVSP40	Merimbula STP - Effluent (comp)	21-Dec-05	8.3	12	5	34	1.8	0.27	0.04	11				
483528	BVSP40	Merimbula STP - Effluent (comp)	29-Dec-05	8.3	7	5	32	3.2	0.61	1.2	6.4				
484286	BVSP40	Merimbula STP - Effluent (comp)	4-Jan-06	7.9	4	2	31	4.1	0.93	1.9	9.5		10		
485682	BVSP40	Merimbula STP - Effluent (comp)	12-Jan-06	8.2	12	6	36	2.4	0.54	0.36	11		55		
486678	BVSP40	Merimbula STP - Effluent (comp)	18-Jan-06	8.1	17	6	39	2.9	0.19	1.1	14		150		
488072	BVSP40	Merimbula STP - Effluent (comp)	25-Jan-06	8.6	19	11	47	3.4	0.6	0.35	12		42		
489635	BVSP40	Merimbula STP - Effluent (comp)	1-Feb-06	8.3	12	17	86	4.6	0.43	1.6	9.2		210		
490994	BVSP40	Merimbula STP - Effluent (comp)	9-Feb-06	8.4	20	14	50	4.4	0.83	1.1	7.9		300		
492099	BVSP40	Merimbula STP - Effluent (comp)	15-Feb-06	8.3	10	5	32	9.8	0.33	7.7	9.5				
493935	BVSP40	Merimbula STP - Effluent (comp)	23-Feb-06	8.2	14	8	39	7.2	0.41	4.5	9.7		50		
495008	BVSP40	Merimbula STP - Effluent (comp)	1-Mar-06	9.2	37	10	50	6.1	0.16	2.9	9.6				
496575	BVSP40	Merimbula STP - Effluent (comp)	9-Mar-06	9.1	12	14	48	7.7	0.14	3.8	8.8				
497782	BVSP40	Merimbula STP - Effluent (comp)	15-Mar-06	7.8	10	7	35	7.8	0.98	4	11				
499140	BVSP40	Merimbula STP - Effluent (comp)	23-Mar-06	8.3	9	4	33	6.4	0.2	4.4	12				
500044	BVSP40	Merimbula STP - Effluent (comp)	29-Mar-06	8.4	17	12	50	7.9	0.41	5.1	11		130		
501344	BVSP40	Merimbula STP - Effluent (comp)	5-Apr-06	8.7	14	6	35	7.3	0.44	5.4	9.8		11		

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	pH	Susp.Solid s	BOD	COD	Total Nitrogen	Ammonia (asN)	T.Oxid Nit (asN)	Tot.Phosph (asP)	Orth.Phosph (asP)	Chlorophyl l "a"	EC	DO
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	us/cm	mg/L
502622	BVSP40	Merimbula STP - Effluent (comp)	13-Apr-06	9	29	9	93	10	0.02	8.5	9.9				
503601	BVSP40	Merimbula STP - Effluent (comp)	19-Apr-06	8.7	19	8	39	13	0.42	12	8.9		38		
504867	BVSP40	Merimbula STP - Effluent (comp)	27-Apr-06	7.7	8	2	16	16	0.06	13	11				
505863	BVSP40	Merimbula STP - Effluent (comp)	3-May-06	7.4	3	2	24	19	0.21	16	9.7		1.7		
507204	BVSP40	Merimbula STP - Effluent (comp)	11-May-06	7.6	3	2	20	20	0.15	17	9				
507991	BVSP40	Merimbula STP - Effluent (comp)	17-May-06	7.6	3	2	21	17	0.18	16	9.2				
509294	BVSP40	Merimbula STP - Effluent (comp)	25-May-06	7.6	4	2	27	12	0.12	11	9.8				
510461	BVSP40	Merimbula STP - Effluent (comp)	31-May-06	7.6	3	2	23	13	0.12	12	9				
511689	BVSP40	Merimbula STP - Effluent (comp)	7-Jun-06	7.6	5	2	28	4.5	0.49	2.9	7.8		0.24		
512778	BVSP40	Merimbula STP - Effluent (comp)	15-Jun-06	7.8	3	2	32	4.9	0.37	3.4	7.5				
513518	BVSP40	Merimbula STP - Effluent (comp)	21-Jun-06	7.7	2	2	28	6.7	0.21	5.2	7.3				
514580	BVSP40	Merimbula STP - Effluent (comp)	29-Jun-06	7.7	4	2	23	2.4	0.28	1.1	7.1				
515546	BVSP40	Merimbula STP - Effluent (comp)	5-Jul-06	7.8	4	2	27	2.4	0.29	1.1	7		0.6		
517048	BVSP40	Merimbula STP - Effluent (comp)	13-Jul-06	8	3	2	25	2	0.15	0.76	7.2				
517926	BVSP40	Merimbula STP - Effluent (comp)	19-Jul-06	7.6	10	2	29	4.6	0.7	2.4	5.6				
519189	BVSP40	Merimbula STP - Effluent (comp)	27-Jul-06	7.6	3	2	31	4.3	0.83	2	5.5				
520019	BVSP40	Merimbula STP - Effluent (comp)	2-Aug-06	7.8	4	2	30	2.7	0.17	1.5	5.9		2.6		
521440	BVSP40	Merimbula STP - Effluent (comp)	10-Aug-06	7.8	10	2	36	2.3	0.3	0.87	8.2				
522226	BVSP40	Merimbula STP - Effluent (comp)	16-Aug-06	7.8	9	2	30	2.6	0.39	1	8.5				
523737	BVSP40	Merimbula STP - Effluent (comp)	24-Aug-06	8.1	2	2	35	2.1	0.24	0.87	9.1				
524679	BVSP40	Merimbula STP - Effluent (comp)	30-Aug-06	8.2	2	2	27	1.8	0.22	0.67	9.4				
525872	BVSP40	Merimbula STP - Effluent (comp)	6-Sep-06	7.9	2	2	28	2	0.29	0.73	9.6		1.9		
527216	BVSP40	Merimbula STP - Effluent (comp)	14-Sep-06	8	3	3	26	2.2	0.31	0.88	9.4				
528081	BVSP40	Merimbula STP - Effluent (comp)	20-Sep-06	8	4	2	28	2	0.38	0.7	9.3				
529438	BVSP40	Merimbula STP - Effluent (comp)	28-Sep-06	8.1	11	8	29	4.6	2.2	0.6	8.6				
530279	BVSP40	Merimbula STP - Effluent (comp)	4-Oct-06	8	7	8	32	4.3	1.8	0.89	8.5		3.6		
531935	BVSP40	Merimbula STP - Effluent (comp)	12-Oct-06	8	4	2	24	3.2	0.83	0.88	9.7				
532842	BVSP40	Merimbula STP - Effluent (comp)	18-Oct-06	8.1	4	2	28	2.4	0.63	1.1	10				
534242	BVSP40	Merimbula STP - Effluent (comp)	26-Oct-06	7.8	9	2	32	2.1	0.6	0.39	10				
535359	BVSP40	Merimbula STP - Effluent (comp)	1-Nov-06	8.3	12	3	33	2.1	0.16	0.56	10		11		
536610	BVSP40	Merimbula STP - Effluent (comp)	9-Nov-06	7.8	14	4	26	2.9	0.86	0.55	10				
537448	BVSP40	Merimbula STP - Effluent (comp)	15-Nov-06	7.9	2	2	23	2	0.43	0.66	9.9				
539128	BVSP40	Merimbula STP - Effluent (comp)	23-Nov-06	7.8	3	2	23	2.1	0.51	0.55	9.7				
539902	BVSP40	Merimbula STP - Effluent (comp)	29-Nov-06	7.9	10	2	28	4.8	2.9	0.36	11				
541297	BVSP40	Merimbula STP - Effluent (comp)	6-Dec-06	7.9	7	3	40	3.1	1.5	0.22	9.9		5.6		
542562	BVSP40	Merimbula STP - Effluent (comp)	14-Dec-06	7.8	22	4	30	2.7	0.67	0.86	9.4				
543591	BVSP40	Merimbula STP - Effluent (comp)	20-Dec-06	7.5	7	4	35	5	0.21	3.1	12				
544392	BVSP40	Merimbula STP - Effluent (comp)	28-Dec-06	7.9	9	2	26	7.9	0.93	5.8	9.1				
544907	BVSP40	Merimbula STP - Effluent (comp)	3-Jan-07	7.6	4	2	18	9.6	2	6.3	8.3		4.8		
546046	BVSP40	Merimbula STP - Effluent (comp)	11-Jan-07	7.6	15	10	51	5.7	1.4	1.2	12				
547120	BVSP40	Merimbula STP - Effluent (comp)	17-Jan-07	8.4	11	4	51	2.7	0.37	0.98	10				
548490	BVSP40	Merimbula STP - Effluent (comp)	24-Jan-07	7.9	10	3	33	3.3	0.68	1.3	13				
549824	BVSP40	Merimbula STP - Effluent (comp)	31-Jan-07	8.1	6	2	29	2.9	0.3	1.5	13				
550931	BVSP40	Merimbula STP - Effluent (comp)	7-Feb-07	9	17	6	28	3.9	0.36	1.9	8.2		44		
552402	BVSP40	Merimbula STP - Effluent (comp)	15-Feb-07	8.2	12	4	37	4.9	0.19	3.3	11				
553508	BVSP40	Merimbula STP - Effluent (comp)	21-Feb-07	8.8	26	7	45	3	0.38	0.49	11		42		
555220	BVSP40	Merimbula STP - Effluent (comp)	1-Mar-07	7.5	8	3	35	5.8	3	1.4	9.5				
556242	BVSP40	Merimbula STP - Effluent (comp)	7-Mar-07	7.9	15	13	51	3.1	0.33	0.36	11		220		
557611	BVSP40	Merimbula STP - Effluent (comp)	15-Mar-07	8.4	8	5	34	1.5	0.1	<0.01	9.3		32		
558712	BVSP40	Merimbula STP - Effluent (comp)	21-Mar-07	7.6	3	4	59	1.9	0.72	0.27	11				
560375	BVSP40	Merimbula STP - Effluent (comp)	29-Mar-07	8.4	11	5	31	1.7	0.17	0.22	9.1				
561101	BVSP40	Merimbula STP - Effluent (comp)	4-Apr-07	7.7	5	4	33	2.6	0.4	0.71	10		6.4		
562402	BVSP40	Merimbula STP - Effluent (comp)	12-Apr-07	7.7	7	6	42	9.5	6.5	0.75	15				

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	pH	Susp.Solid s	BOD	COD	Total Nitrogen	Ammonia (asN)	T.Oxid Nit (asN)	Tot.Phosph (asP)	Orth.Phosph (asP)	Chlorophyl l "a"	EC	DO
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	us/cm	mg/L
563428	BVSP40	Merimbula STP - Effluent (comp)	18-Apr-07	7.7	3	2	36	5.8	3.5	0.96	9.6				
564618	BVSP40	Merimbula STP - Effluent (comp)	26-Apr-07	7.6	4	2	27	6.2	0.47	4.7	11				
565674	BVSP40	Merimbula STP - Effluent (comp)	2-May-07	6.8	7	4	34	9.6	0.3	8	11		1.2		
567501	BVSP40	Merimbula STP - Effluent (comp)	10-May-07	7.8	6	2	11	5.2	0.36	4.1	12				
568639	BVSP40	Merimbula STP - Effluent (comp)	16-May-07	7.7	12	6	43	7.8	0.22	6.6	11				
569938	BVSP40	Merimbula STP - Effluent (comp)	24-May-07	7.9	6	3	23	7.2	0.22	6.2	11				
570830	BVSP40	Merimbula STP - Effluent (comp)	30-May-07	7.8	5	2	27	6.2	0.4	4.9	11				
572380	BVSP40	Merimbula STP - Effluent (comp)	6-Jun-07	7.8	5	3	29	6.6	0.3	4.9	11		1.1		
573836	BVSP40	Merimbula STP - Effluent (comp)	14-Jun-07	7.7	6	2	34	8.8	0.4	6.1	9.6				
574666	BVSP40	Merimbula STP - Effluent (comp)	20-Jun-07	7.5	8	5	33	8.7	0.63	5.7	8.4				
576022	BVSP40	Merimbula STP - Effluent (comp)	28-Jun-07	7.1	9	2	34	11	0.45	8.6	5.6				
577296	BVSP40	Merimbula STP - Effluent (comp)	4-Jul-07	7.3	3	2	54	7.2	0.5	5.2	6.5		0.33		
578670	BVSP40	Merimbula STP - Effluent (comp)	13-Jul-07	7.5	4	2	31	7.6	0.4	5.5	8				
579542	BVSP40	Merimbula STP - Effluent (comp)	18-Jul-07	7.7	5	2	30	5.6	0.43	3.9	8.4		2.1		
581164	BVSP40	Merimbula STP - Effluent (comp)	26-Jul-07	7.8	2	2	28	8.9	0.28	7.3	8.5				
582455	BVSP40	Merimbula STP - Effluent (comp)	1-Aug-07	7.6	6	5	36	8.3	0.47	5.8	8.9		0.69		
583943	BVSP40	Merimbula STP - Effluent (comp)	9-Aug-07	8	3	3	30	4.8	0.29	3.6	8.7				
584858	BVSP40	Merimbula STP - Effluent (comp)	15-Aug-07	8	4	3	27	3.8	0.39	2.3	8.9				
586298	BVSP40	Merimbula STP - Effluent (comp)	23-Aug-07	7.7	6	4	29	2.9	0.42	1.1	9.4				
587405	BVSP40	Merimbula STP - Effluent (comp)	29-Aug-07	7.7	12	6	51	3.2	0.56	0.79	11				
588540	BVSP40	Merimbula STP - Effluent (comp)	5-Sep-07	7.7	7	6	32	3.7	1.5	0.5	12		1.1		
589664	BVSP40	Merimbula STP - Effluent (comp)	13-Sep-07	7.6	16	6	50	9.5	4	0.43	12				
590576	BVSP40	Merimbula STP - Effluent (comp)	19-Sep-07	7.6	5	5	52	3.8	1.6	0.72	9.6				
591872	BVSP40	Merimbula STP - Effluent (comp)	27-Sep-07	7.8	4	6	30	4	1.2	0.43	10				
592649	BVSP40	Merimbula STP - Effluent (comp)	3-Oct-07	7.8	4	2	29	5.2	3.4	0.69	11		3.2		
593947	BVSP40	Merimbula STP - Effluent (comp)	11-Oct-07	7.7	6	3	26	3.6	1.9	0.37	11				
594819	BVSP40	Merimbula STP - Effluent (comp)	17-Oct-07	7.7	7	2	19	3.3	1.4	0.59	11				
596281	BVSP40	Merimbula STP - Effluent (comp)	25-Oct-07	7.8	5	2	27	2.8	0.59	0.9	10				
597129	BVSP40	Merimbula STP - Effluent (comp)	31-Oct-07	8.3	13	4	30	2.4	0.41	0.23	10		33		
598097	BVSP40	Merimbula STP - Effluent (comp)	7-Nov-07	7.7	15	9	34	2.9	1.3	0.28	8.1		7.1		
599512	BVSP40	Merimbula STP - Effluent (comp)	15-Nov-07	7.9	8	2	26	2.2	0.94	0.28	10				
600625	BVSP40	Merimbula STP - Effluent (comp)	21-Nov-07	7.7	2	2	38	3.6	2.4	0.44	12				
602062	BVSP40	Merimbula STP - Effluent (comp)	29-Nov-07	8.1	2	2	33	6.5	5.3	0.42	14				
603205	BVSP40	Merimbula STP - Effluent (comp)	5-Dec-07	7.8	4	4	27	8	4.7	2.6	13		1.1		
605254	BVSP40	Merimbula STP - Effluent (comp)	13-Dec-07	8.2	5	2	36	5.5	4.2	0.13	11				
606428	BVSP40	Merimbula STP - Effluent (comp)	19-Dec-07	8.1	3	2	26	4.6	2.8	0.75	11				
607456	BVSP40	Merimbula STP - Effluent (comp)	27-Dec-07	7.7	4	3	28	3.8	2	1.2	11				
607909	BVSP40	Merimbula STP - Effluent (comp)	2-Jan-08	8.1	23	6	42	5.6	2.2	1.6	11		68		
609653	BVSP40	Merimbula STP - Effluent (comp)	10-Jan-08	7.8	3	5	32	13	7.9	3.9	11				
610464	BVSP40	Merimbula STP - Effluent (comp)	16-Jan-08	7.9	10	5	49	14	12	0.94	7.7				
612112	BVSP40	Merimbula STP - Effluent (comp)	24-Jan-08	7.9	7	4	32	6.4	3.3	1.7	6.8		100		
612871	BVSP40	Merimbula STP - Effluent (comp)	30-Jan-08	7.9	3	2	26	3.2	0.23	1.8	8.2		99		
614285	BVSP40	Merimbula STP - Effluent (comp)	6-Feb-08	7.8	13	4	29	2.5	0.11	1.3	10		5.9		
616197	BVSP40	Merimbula STP - Effluent (comp)	14-Feb-08	7.9	2	2	32	1.9	0.05	1.1	8.3				
617314	BVSP40	Merimbula STP - Effluent (comp)	20-Feb-08	8.2	6	2	31	1.6	0.23	0.55	9.8				
618895	BVSP40	Merimbula STP - Effluent (comp)	28-Feb-08	8.1	4	3	28	1.5	0.3	0.2	9.7				
619938	BVSP40	Merimbula STP - Effluent (comp)	5-Mar-08	8	4	2	32	1.5	0.47	0.1	8.8		5.7		
621406	BVSP40	Merimbula STP - Effluent (comp)	13-Mar-08	8.1	3	2	19	1.4	0.23	0.4	10				
622721	BVSP40	Merimbula STP - Effluent (comp)	19-Mar-08	8	5	6	26	1.8	0.49	0.45	13				
624222	BVSP40	Merimbula STP - Effluent (comp)	27-Mar-08	8	3	2	25	1.9	0.22	0.66	12				
625369	BVSP40	Merimbula STP - Effluent (comp)	2-Apr-08	8	8	2	27	4.1	1.2	1.8	7.5		12	1500	
627096	BVSP40	Merimbula STP - Effluent (comp)	10-Apr-08	8.1	3	2	27	2	0.15	1.1	7.5			1000	
628115	BVSP40	Merimbula STP - Effluent (comp)	16-Apr-08	8.2	3	2	23	1.6	0.16	0.47	7.4			820	

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	pH	Susp.Solid s	BOD	COD	Total Nitrogen	Ammonia (asN)	T.Oxid Nit (asN)	Tot.Phosp (asP)	Orth.Phosp (asP)	Chlorophyl l "a"	EC	DO
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	us/cm	mg/L
629618	BVSP40	Merimbula STP - Effluent (comp)	24-Apr-08	7.8	6	4	25	6.9	3.5	2.2	14			760	
630284	BVSP40	Merimbula STP - Effluent (comp)	30-Apr-08	8.1	8	3	31	2.8	0.11	1.4	9.1			710	
631810	BVSP40	Merimbula STP - Effluent (comp)	7-May-08	7.8	4	3	30	3.3	0.28	2	9.6		3.4	710	
633470	BVSP40	Merimbula STP - Effluent (comp)	15-May-08	7.6	56	7	33	5.9	0.94	2.6	13			800	
634289	BVSP40	Merimbula STP - Effluent (comp)	21-May-08	8	45	31	30	6.4	0.75	4.1	13			740	
635707	BVSP40	Merimbula STP - Effluent (comp)	29-May-08	7.6	4	2	31	13	0.38	11	9.9				
636545	BVSP40	Merimbula STP - Effluent (comp)	4-Jun-08	7.7	2	2	9	9.1	0.23	7.7	9.8		0.83		
637914	BVSP40	Merimbula STP - Effluent (comp)	12-Jun-08	7.6	5	2	13	12	0.33	11	10				
638703	BVSP40	Merimbula STP - Effluent (comp)	18-Jun-08	7.7	2	2	22	12	0.22	10	11				
639991	BVSP40	Merimbula STP - Effluent (comp)	26-Jun-08	7.7	2	2	20	13	0.15	11	10				
640834	BVSP40	Merimbula STP - Effluent (comp)	2-Jul-08	7.7	3	2	17	16	0.18	14	9.7		2		
641954	BVSP40	Merimbula STP - Effluent (comp)	10-Jul-08	7.7	4	2	16	12	0.23	9.8	10				
642827	BVSP40	Merimbula STP - Effluent (comp)	16-Jul-08	7.8	3	2	20	15	0.26	13	9.4				
644050	BVSP40	Merimbula STP - Effluent (comp)	24-Jul-08	7.7	3	2	21	14	0.08	11	9				
645330	BVSP40	Merimbula STP - Effluent (comp)	30-Jul-08	7.8	3	2	19	13	0.11	12	8.8				
646397	BVSP40	Merimbula STP - Effluent (comp)	6-Aug-08	7.8	10	2	23	10	0.15	8.5	9		6.3		
647549	BVSP40	Merimbula STP - Effluent (comp)	14-Aug-08	8	38	2	25	5.5	0.03	4.4	9				
648381	BVSP40	Merimbula STP - Effluent (comp)	20-Aug-08	8.2	10	2	27	4.2	0.07	3.1	9.3				
649727	BVSP40	Merimbula STP - Effluent (comp)	28-Aug-08	8.3	5	2	20	2	0.1	0.91	9.5				
650481	BVSP40	Merimbula STP - Effluent (comp)	3-Sep-08	8.6	12	4	28	1.8	0.15	0.23	9.8		21		
651710	BVSP40	Merimbula STP - Effluent (comp)	11-Sep-08	8	9	2	25	1.9	0.16	0.68	8.6				
652695	BVSP40	Merimbula STP - Effluent (comp)	17-Sep-08	8.3	13	6	41	1.6	0.13	0.06	9.3				
654163	BVSP40	Merimbula STP - Effluent (comp)	25-Sep-08	8	12	5	40	2.6	0.32	0.94	14				
655023	BVSP40	Merimbula STP - Effluent (comp)	1-Oct-08	7.8	8	2	23	3	1.2	0.34	13		2.9		
655916	BVSP40	Merimbula STP - Effluent (comp)	9-Oct-08	7.9	7	2	18	4.6	3.3	0.44	7.2				
656958	BVSP40	Merimbula STP - Effluent (comp)	15-Oct-08	7.7	9	2	31	11	8.6	0.2	17				
658416	BVSP40	Merimbula STP - Effluent (comp)	24-Oct-08	7.8	17	10	57	21	17	0.15	18				
659434	BVSP40	Merimbula STP - Effluent (comp)	29-Oct-08	8	12	9	48	13	9.8	0.29	8				
660452	BVSP40	Merimbula STP - Effluent (comp)	5-Nov-08	7.8	13	3	34	12	8.4	0.13	10		2.4		
662023	BVSP40	Merimbula STP - Effluent (comp)	13-Nov-08	7.6	3	2	16	13	0.71	11	7.7				
663332	BVSP40	Merimbula STP - Effluent (comp)	19-Nov-08	7.7	17	6	37	7.3	1.5	4.1	8.4				
664833	BVSP40	Merimbula STP - Effluent (comp)	27-Nov-08	7.5	9	2	28	10	1.9	7	9.6				
665741	BVSP40	Merimbula STP - Effluent (comp)	3-Dec-08	7.9	8	2	23	7.3	2.4	3.2	13		6.8		
667609	BVSP40	Merimbula STP - Effluent (comp)	11-Dec-08	7.7	5	2	31	7.7	3	3.4	16				
668860	BVSP40	Merimbula STP - Effluent (comp)	17-Dec-08	7.9	6	2	21	8	2.6	4	13				
669580	BVSP40	Merimbula STP - Effluent (comp)	22-Dec-08	7.9	5	3	29	9.6	1.7	6.1	12				
670375	BVSP40	Merimbula STP - Effluent (comp)	30-Dec-08	7.9	7	3	31	7.9	2.6	3.6	14				
671280	BVSP40	Merimbula STP - Effluent (comp)	7-Jan-09	8.1	5	3	34	7.3	4.6	1.2	10		11		
672342	BVSP40	Merimbula STP - Effluent (comp)	14-Jan-09	8	4	2	20	4.3	1.9	1.2	6.1				
673494	BVSP40	Merimbula STP - Effluent (comp)	21-Jan-09	8	3	3	4	2.8	0.23	1.4	8				
674859	BVSP40	Merimbula STP - Effluent (comp)	29-Jan-09	8	4	2	52	2.1	0.15	0.91	11				
675900	BVSP40	Merimbula STP - Effluent (comp)	4-Feb-09	8	4	2	23	2.2	0.16	0.86	13		5		
677795	BVSP40	Merimbula STP - Effluent (comp)	12-Feb-09	8	8	5	23	2.4	0.24	0.81	12				
678907	BVSP40	Merimbula STP - Effluent (comp)	19-Feb-09	8.3	15	3	25	2.1	0.25	0.51	10				
680574	BVSP40	Merimbula STP - Effluent (comp)	26-Feb-09	8.1	4	4	25	2	0.21	0.45	10				
681458	BVSP40	Merimbula STP - Effluent (comp)	4-Mar-09	7.7	4	2	23	4	2.7	0.25	12		1.1	710	
682668	BVSP40	Merimbula STP - Effluent (comp)	12-Mar-09	8.2	3	2	23	2.8	0.47	1.1	9.3			740	
683489	BVSP40	Merimbula STP - Effluent (comp)	18-Mar-09	8	3	2	29	2.6	0.3	1	12			710	
685790	BVSP40	Merimbula STP - Effluent (comp)	26-Mar-09	7.7	2	2	27	3.1	0.62	1.3	13			720	
686431	BVSP40	Merimbula STP - Effluent (comp)	1-Apr-09	7.9	3	2	34	2.2	0.51	0.64	11		2.2		
687639	BVSP40	Merimbula STP - Effluent (comp)	8-Apr-09	7.9	6	2	24	2.8	0.74	0.74	11			680	
688418	BVSP40	Merimbula STP - Effluent (comp)	15-Apr-09	7.9	6	2	12	3.6	1.6	0.93	11			650	
689868	BVSP40	Merimbula STP - Effluent (comp)	23-Apr-09	7.8	3	2	21	2.6	0.73	0.74	8.1			680	

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	pH	Susp.Solid s	BOD	COD	Total Nitrogen	Ammonia (asN)	T.Oxid Nit (asN)	Tot.Phosp (asP)	Orth.Phosp (asP)	Chlorophyl l "a"	EC	DO
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	us/cm	mg/L
690787	BVSP40	Merimbula STP - Effluent (comp)	29-Apr-09	7.9	3	2	21	3.4	0.63	1.6	8.4			680	
692345	BVSP40	Merimbula STP - Effluent (comp)	6-May-09	7.7	2	2	62	4.8	0.82	3	8.2		0.26		
693554	BVSP40	Merimbula STP - Effluent (comp)	14-May-09	8	2	2	18	4.6	0.37	3	9.9			720	
694492	BVSP40	Merimbula STP - Effluent (comp)	20-May-09	7.8	2	2	23	6.1	0.31	5	9.6			720	
696277	BVSP40	Merimbula STP - Effluent (comp)	28-May-09	7.9	2	2	7	4.3	0.19	3.1	9.8			710	
697071	BVSP40	Merimbula STP - Effluent (comp)	3-Jun-09	7.8	3	2	24	6	0.17	4.8	11		0.91		
698051	BVSP40	Merimbula STP - Effluent (comp)	11-Jun-09	7.9	8	2	24	7.9	0.29	6.2	7.8			690	
698892	BVSP40	Merimbula STP - Effluent (comp)	17-Jun-09	7.8	3	2	32	11	0.12	9.2	7.4			680	
700668	BVSP40	Merimbula STP - Effluent (comp)	25-Jun-09	7.7	8	2	25	12	0.18	9.5	7.9			690	
701345	BVSP40	Merimbula STP - Effluent (comp)	1-Jul-09	7.7	3	2	35	9.6	0.31	7.7	8.8		0.37		
702425	BVSP40	Merimbula STP - Effluent (comp)	9-Jul-09	7.8	3	2	28	6.2	0.39	4.2	9.7			760	
703155	BVSP40	Merimbula STP - Effluent (comp)	15-Jul-09	7.6	3	2	26	5	0.36	3.4	9.7	9.1		750	
704827	BVSP40	Merimbula STP - Effluent (comp)	23-Jul-09		0	0									
706256	BVSP40	Merimbula STP - Effluent (comp)	29-Jul-09	7.8	3	2	18	5.6	0.32	3.7	9.6	9.1		770	8.6
706977	BVSP40	Merimbula STP - Effluent (comp)	5-Aug-09	7.8	4	2	23	5.2	0.19	3.6	9.4	9		760	8.9
708179	BVSP40	Merimbula STP - Effluent (comp)	13-Aug-09	7.7	5	2	18	4.8	1.6	1.9	9.9	9.8		720	7
709292	BVSP40	Merimbula STP - Effluent (comp)	19-Aug-09	7.8	4	2	26	3.4	1.2	1	9.7	9.1		720	7.4
710877	BVSP40	Merimbula STP - Effluent (comp)	27-Aug-09	8	4	2	22	2.4	0.24	0.93	8.5	7.8		740	9.2
711746	BVSP40	Merimbula STP - Effluent (comp)	2-Sep-09	8	5	2	14	1.8	0.12	0.65	8.6	8.2		750	12.4
712994	BVSP40	Merimbula STP - Effluent (comp)	10-Sep-09	7.8	3	2	19	2.9	0.41	1.1	9.8	9		760	10.2
713744	BVSP40	Merimbula STP - Effluent (comp)	16-Sep-09	7.9	4	2	31	2.6	0.33	1.2	9.6	9.3		750	12.3
715028	BVSP40	Merimbula STP - Effluent (comp)	24-Sep-09	8	4	2	24	2.5	0.45	0.96	9	8.4		750	17.8
716044	BVSP40	Merimbula STP - Effluent (comp)	30-Sep-09	8.1	4	2	27	3	0.85	0.98	8.4	8.1		780	6.2
716788	BVSP40	Merimbula STP - Effluent (comp)	7-Oct-09	7.9	6	2	22	2.9	0.81	0.98	8.6	8.2		800	8.2
718341	BVSP40	Merimbula STP - Effluent (comp)	15-Oct-09	7.9	9	4	13	3.9	0.43	0.97	8.3	7.2		720	12.8
719062	BVSP40	Merimbula STP - Effluent (comp)	21-Oct-09	8.1	6	2	19	2	0.3	0.69	7.5	6.6		710	20.7
720550	BVSP40	Merimbula STP - Effluent (comp)	29-Oct-09	7.9	7	4	32	1.9	0.4	0.38	9	8.6		720	
721647	BVSP40	Merimbula STP - Effluent (comp)	4-Nov-09	7.8	2	2	25	2.1	0.53	0.58	9.3	8.9		680	3.2
723144	BVSP40	Merimbula STP - Effluent (comp)	12-Nov-09	7.9	8	3	45	5.3	2.5	1.2	9.1	8.3		720	3.8
724061	BVSP40	Merimbula STP - Effluent (comp)	18-Nov-09	7.7	5	6	20	9.6	6.4	0.5	13	12		770	1.7
725353	BVSP40	Merimbula STP - Effluent (comp)	26-Nov-09	7.7	3	2	22	5.8	2.6	1.8	13	13		730	10.8
726500	BVSP40	Merimbula STP - Effluent (comp)	2-Dec-09	7.7	2	2	31	4	1.2	1.5	13	13		730	6.2
727874	BVSP40	Merimbula STP - Effluent (comp)	10-Dec-09	7.8	3	2	30	4.4	0.46	2.6	12	11		770	4.6
729006	BVSP40	Merimbula STP - Effluent (comp)	16-Dec-09	8.4	6	2	24	2.7	0.21	1.4	11	9.1		780	13.4
730325	BVSP40	Merimbula STP - Effluent (comp)	23-Dec-09	8	5	2	30	4.1	0.37	2.4	13	13		810	7
730876	BVSP40	Merimbula STP - Effluent (comp)	30-Dec-09	7.9	4	2	24	5.5	0.71	3.5	14	13		800	7.8
731858	BVSP40	Merimbula STP - Effluent (comp)	6-Jan-10	8.7	24	7	40	5.6	2	1.2	9.2	7.7	120	780	13.8
733305	BVSP40	Merimbula STP - Effluent (comp)	14-Jan-10	7.7	16	8	28	3.9	1.3	1	9	8.6		780	3.2
734786	BVSP40	Merimbula STP - Effluent (comp)	20-Jan-10	8.1	4	2	28	2.9	0.34	1.6	9.1	8.6		780	8.5
736349	BVSP40	Merimbula STP - Effluent (comp)	28-Jan-10	8.2	7	7	46	6.5	0.73	3.9	8.5	8.1		770	5.5
737346	BVSP40	Merimbula STP - Effluent (comp)	3-Feb-10	8.6	9	6	29	5.7	0.21	3.6	9.6	8.1		650	12.1
738883	BVSP40	Merimbula STP - Effluent (comp)	11-Feb-10	8.6	8	2	29	6	0.22	4.5	7.9	6.6		760	9.7
740166	BVSP40	Merimbula STP - Effluent (comp)	17-Feb-10	7.4	7	2	40	9.1	4.1	3.4	5.6	5.3		630	4
742191	BVSP40	Merimbula STP - Effluent (comp)	25-Feb-10	7.8	4	3	41	6.6	0.2	4.9	5.6	5.3		640	6.7
743319	BVSP40	Merimbula STP - Effluent (comp)	3-Mar-10	8.4	4	2	34	6.3	0.23	4.6	7.3	6.7		710	14
744688	BVSP40	Merimbula STP - Effluent (comp)	11-Mar-10	8.6	12	4	22	7.7	0.13	5.9	8.9	7.1		740	11
745996	BVSP40	Merimbula STP - Effluent (comp)	17-Mar-10	9	12	4	25	5.7	0.26	4.1	6.9	5.9		720	13.2
747581	BVSP40	Merimbula STP - Effluent (comp)	25-Mar-10	8.5	7	2	30	9.1	0.18	6.3	11	8.6		770	11.3
749246	BVSP40	Merimbula STP - Effluent (comp)	7-Apr-10	8.1	4	3	37	8.4	0.19	7.2	11	10		750	9.8
750784	BVSP40	Merimbula STP - Effluent (comp)	15-Apr-10	8.7	6	5	31	4	0.14	2.5	10	8.4		750	15.2
751852	BVSP40	Merimbula STP - Effluent (comp)	21-Apr-10	8.6	8	2	28	6.1	0.1	4.9	9.7	8.1		750	24
753093	BVSP40	Merimbula STP - Effluent (comp)	29-Apr-10	8.5	9	3	32	9.8	0.12	8.2	10	9.2		750	14.9
753912	BVSP40	Merimbula STP - Effluent (comp)	5-May-10	8.5	7	3	28	12	0.07	11	11	9		760	15.5

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	pH	Susp.Solid s	BOD	COD	Total Nitrogen	Ammonia (asN)	T.Oxid Nit (asN)	Tot.Phosp (asP)	Orth.Phosp (asP)	Chlorophyl l "a"	EC	DO
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	us/cm	mg/L
755203	BVSP40	Merimbula STP - Effluent (comp)	13-May-10	8.2	4	3	27	16	0.06	15	12	12		790	12
756211	BVSP40	Merimbula STP - Effluent (comp)	19-May-10	7.8	6	5	24	16	0.1	15	11	9.8		780	13.2
757932	BVSP40	Merimbula STP - Effluent (comp)	27-May-10	7.6	6	2	36	10	0.17	8.6	9.8	9.2		660	10.8
759439	BVSP40	Merimbula STP - Effluent (comp)	2-Jun-10	7.7	5	2	18	4.2	0.6	2.7	8.6	7.9		660	9.1
760928	BVSP40	Merimbula STP - Effluent (comp)	10-Jun-10	8	2	2	5	3.2	0.06	2.4	7.9	7.3		700	13.8
761830	BVSP40	Merimbula STP - Effluent (comp)	16-Jun-10	7.9	2	2	37	7.9	0.05	6.3	8.2	7.4		750	13.4
763216	BVSP40	Merimbula STP - Effluent (comp)	24-Jun-10	8.6	2	2	27	3.8	0.02	2.9	8	7.4		750	16
763960	BVSP40	Merimbula STP - Effluent (comp)	30-Jun-10	8.5	7	2	27	2.2	0.02	1.2	8	7.4		730	16.3
764951	BVSP40	Merimbula STP - Effluent (comp)	7-Jul-10	8.2	6	2	29	3.5	0.06	2.5	9	8.4		720	13.7
766109	BVSP40	Merimbula STP - Effluent (comp)	15-Jul-10	8.4	5	2	23	2.5	0.07	1.5	9	8.1		710	15.4
766766	BVSP40	Merimbula STP - Effluent (comp)	21-Jul-10	8.4	3	2	38	1.8	0.08	0.94	8	7		730	14.7
767822	BVSP40	Merimbula STP - Effluent (comp)	29-Jul-10	8.5	2	2	24	1.6	0.03	0.88	6.6	6.4		710	13.4
796898	BVSP40	Merimbula STP - Effluent (comp)	4-Aug-10	8.3	4	2	17	1.7	0.07	0.8	6.8	6.4		690	11.7
797999	BVSP40	Merimbula STP - Effluent (comp)	12-Aug-10	8.1	2	2	30	1.7	0.09	0.77	6.8	6.4		670	10.8
798907	BVSP40	Merimbula STP - Effluent (comp)	18-Aug-10	8.5	3	2	26	1.3	0.14	0.41	6.4	5.6		660	11.8
800062	BVSP40	Merimbula STP - Effluent (comp)	26-Aug-10	8.6	2	2	13	1.3	0.15	0.42	5.6	5		700	12
800817	BVSP40	Merimbula STP - Effluent (comp)	1-Sep-10	8.3	3	2	26	1.6	0.13	0.53	5.2	4.6		710	11.7
801807	BVSP40	Merimbula STP - Effluent (comp)	9-Sep-10	8.3	3	2	23	1.7	0.15	0.54	6.3	5.4		690	11.4
802584	BVSP40	Merimbula STP - Effluent (comp)	15-Sep-10	8.3	3	2	24	1.4	0.16	0.39	7.1	6.4		730	12.1
804181	BVSP40	Merimbula STP - Effluent (comp)	29-Sep-10	8	12	10	43	2.3	0.71	0.35	8.8	8.1		740	1.7
804813	BVSP40	Merimbula STP - Effluent (comp)	6-Oct-10	7.8	10	6	32	6.7	4.2	0.32	9	7.7		750	7
806075	BVSP40	Merimbula STP - Effluent (comp)	14-Oct-10	7.8	3	2	41	6.7	4.9	0.21	8.8	8.3		740	4.8
806999	BVSP40	Merimbula STP - Effluent (comp)	20-Oct-10	7.7	6	4	23	4	2.5	0.26	7.8	7.3		720	4.8
808255	BVSP40	Merimbula STP - Effluent (comp)	28-Oct-10	7.6	4	2	30	2.9	1.7	0.12	8.9	7.8		750	3
808914	BVSP40	Merimbula STP - Effluent (comp)	3-Nov-10	7.5	4	4	30	2.7	1.3	0.23	9.6	8.8		730	4.2
810097	BVSP40	Merimbula STP - Effluent (comp)	11-Nov-10	8	30	4	34	2.2	0.62	0.18	9.4	8.7	5.8	710	8.1
810843	BVSP40	Merimbula STP - Effluent (comp)	17-Nov-10	7.5	5	3	30	2.8	1.7	0.06	13	11		700	1.8
812276	BVSP40	Merimbula STP - Effluent (comp)	25-Nov-10	7.9	8	3	36	2	0.39	0.19	11	8.9		690	1.9
813006	BVSP40	Merimbula STP - Effluent (comp)	1-Dec-10	7.6	10	3	37	3	1.4	0.21	10	9.2		650	3.1
814530	BVSP40	Merimbula STP - Effluent (comp)	9-Dec-10	7.9	7	2	34	2.2	0.91	0.28	8.6	7.8		630	3.6
815428	BVSP40	Merimbula STP - Effluent (comp)	15-Dec-10	7.8	8	3	32	1.7	0.4	0.17	8	7.2		690	5.5
816553	BVSP40	Merimbula STP - Effluent (comp)	22-Dec-10	8.5	18	6	38	2.3	0.13	0.37	6.4	5.2		720	9.2
	BVSP40	Merimbula STP - Effluent (comp)	29-Dec-10	8.4	11	5	31	4.2	0.33	2.2	8.5	7.4		780	8.6
817832	BVSP40	Merimbula STP - Effluent (comp)	5-Jan-11	7.8	8	4	34	10	7.9	0.47	14	13		810	5.9
818723	BVSP40	Merimbula STP - Effluent (comp)	12-Jan-11	7.6	7	4	37	4.8	2.6	0.74	13	12		740	3.2
819829	BVSP40	Merimbula STP - Effluent (comp)	19-Jan-11	7.8	4	3	20	3.1	0.8	1.1	12	12		740	0.7
820877	BVSP40	Merimbula STP - Effluent (comp)	27-Jan-11	7.5	9	4	36	2.7	1	0.3	14	13		780	2.1
821833	BVSP40	Merimbula STP - Effluent (comp)	2-Feb-11	8.3	16	9	38	2.8	0.36	0.38	13	11		760	6.7
822917	BVSP40	Merimbula STP - Effluent (comp)	9-Feb-11	8.1	20	7	54	2.8	0.2	0.54	12	11	160	750	9.2
824415	BVSP40	Merimbula STP - Effluent (comp)	17-Feb-11	8.1	19	11	41	5.5	0.64	2.6	11	9.3		730	5.7
825680	BVSP40	Merimbula STP - Effluent (comp)	23-Feb-11	8.2		6		6.3	0.28	4.2	11	9.4		730	
826926	BVSP40	Merimbula STP - Effluent (comp)	2-Mar-11	7.7	7	4	26	12	0.2	11	10	9.1		750	5.7
828160	BVSP40	Merimbula STP - Effluent (comp)	9-Mar-11	7.7	7	4	30	13	0.35	10	9.3	8		780	3
829420	BVSP40	Merimbula STP - Effluent (comp)	17-Mar-11	7.4	9	8	45	19	0.28	16	12	11		740	7.2
830548	BVSP40	Merimbula STP - Effluent (comp)	23-Mar-11	6.9	6	2	22	18	0.49	17	8.7	8.2		590	5.1
831904	BVSP40	Merimbula STP - Effluent (comp)	31-Mar-11					14	0.16	13	8.3	7.8			
832624	BVSP40	Merimbula STP - Effluent (comp)	7-Apr-11	7.2	7	5	33	20	0.1	18	9.8	8.8		720	7.4
834037	BVSP40	Merimbula STP - Effluent (comp)	14-Apr-11	7	9	3	32	23	0.27	21	12	11		700	8.3
834847	BVSP40	Merimbula STP - Effluent (comp)	20-Apr-11	6.7	4	3	33	23	0.16	21	13	13			6.5
835505	BVSP40	Merimbula STP - Effluent (comp)	28-Apr-11		5	3	34	13	0.53	11	12	12			7.4
836287	BVSP40	Merimbula STP - Effluent (comp)	4-May-11	7.28	3	2	29	11	0.21	9.2	12	11			7.8
837463	BVSP40	Merimbula STP - Effluent (comp)	12-May-11	7.2	2	2	20	20	0.15	19	13	12			9.2

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	pH	Susp.Solid s	BOD	COD	Total Nitrogen	Ammonia (asN)	T.Oxid Nit (asN)	Tot.Phosph (asP)	Orth.Phosph (asP)	Chlorophyl l "a"	EC	DO
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	us/cm	mg/L
838322	BVSP40	Merimbula STP - Effluent (comp)	18-May-11	6.67	3	2	35	30	0.63	29	13	13			8.1
839671	BVSP40	Merimbula STP - Effluent (comp)	26-May-11	7.06	2	2	30	19	0.14	17	11	10			8.6
840338	BVSP40	Merimbula STP - Effluent (comp)	1-Jun-11	7.57	4	3	34	9.1	0.01	7.5	9.6	9		557	11.6
841502	BVSP40	Merimbula STP - Effluent (comp)	9-Jun-11	7.82	2	2	20	4.9	0.02	3.8	9.4	9		485	12.3
842170	BVSP40	Merimbula STP - Effluent (comp)	15-Jun-11	7.74	2	2	29	7.9	0.1	6.3	8.9	8.1		532	12.8
843430	BVSP40	Merimbula STP - Effluent (comp)	23-Jun-11	7.85	2	2	31	5.1	0.05	3.5	9.1	8.8		489	12.3
844119	BVSP40	Merimbula STP - Effluent (comp)	29-Jun-11	7.74	3	2	29	5	0.05	3.8	8.9	8.4		519	12.4
845111	BVSP40	Merimbula STP - Effluent (comp)	6-Jul-11	7.87	4	2	39	7.4	0.03	5.8	9.6	9.2		511	11
846118	BVSP40	Merimbula STP - Effluent (comp)	14-Jul-11	7.7	13	5	25	6.3	0.06	4.9	9.5	9.1		578	11.4
847082	BVSP40	Merimbula STP - Effluent (comp)	20-Jul-11	7.76	10	5	46	5.1	0.14	4	8.9	8.6		585	11.3
848099	BVSP40	Merimbula STP - Effluent (comp)	28-Jul-11	7.66	9	3	24	4.9	0.08	4	8.7	8.2		495	11.4
848666	BVSP40	Merimbula STP - Effluent (comp)	3-Aug-11	7.63	3	2	24	6.6	0.07	5.6	9	8.2		545	11.2
849797	BVSP40	Merimbula STP - Effluent (comp)	11-Aug-11	7.57	8	2	14	3.1	0.1	1.9	8.7	8.5		515	13.5
850641	BVSP40	Merimbula STP - Effluent (comp)	17-Aug-11	7.68	4	2	33	2.9	0.11	2	8.2	7.6		527	14
851833	BVSP40	Merimbula STP - Effluent (comp)	25-Aug-11	7.91	8	4	32	2.9	0.04	1.9	7.6	7.3		525	13.5
852505	BVSP40	Merimbula STP - Effluent (comp)	31-Aug-11	8.03	5	2	24	2.8	0.02	1.9	7.4	7.1		535	14.1
853375	BVSP40	Merimbula STP - Effluent (comp)	7-Sep-11	7.95	2	2	29	3	0.1	1.8	8.2	7.3		684	12.7
854490	BVSP40	Merimbula STP - Effluent (comp)	15-Sep-11	8.6	5	2	29	2.9	0.1	1.4	8.4	7.8		573	12
855223	BVSP40	Merimbula STP - Effluent (comp)	21-Sep-11	7.98	5	2	26	3.1	0.2	1.7	9.1	8.4		597	10.6
856100	BVSP40	Merimbula STP - Effluent (comp)	29-Sep-11	8.02	4	2	34	4.1	0.3	1.8	9.4	8.9		604	11.4
856714	BVSP40	Merimbula STP - Effluent (comp)	5-Oct-11	7.76	4	2	30	3.3	0.8	1.4	8.7	8.2		609	9.7
857732	BVSP40	Merimbula STP - Effluent (comp)	13-Oct-11	7.97	10	4	40	4.8	2.5	0.74	7.3	6.8		602	10.3
858517	BVSP40	Merimbula STP - Effluent (comp)	19-Oct-11	8.3	6	4	52	4.1	0.8	1.8	7.8	7.6		608	10.3
859971	BVSP40	Merimbula STP - Effluent (comp)	27-Oct-11	7.64	15	13	35	3	1	0.83	11	9.8		627	5.8
860659	BVSP40	Merimbula STP - Effluent (comp)	2-Nov-11	7.86	6	3	38	3.5	1.1	1.1	10	9.3		643	7.6
861723	BVSP40	Merimbula STP - Effluent (comp)	10-Nov-11	9.44	25	11	45	2.6	0.1	0.15	7.8	5.4	27	658	14.8
862556	BVSP40	Merimbula STP - Effluent (comp)	16-Nov-11	8.91	34	26	86	7.7	0.8	0.3	8.6	8	4	651	7.7
864014	BVSP40	Merimbula STP - Effluent (comp)	24-Nov-11	9.2	20	14	58	5	0.5	1	9.2	6.8	5.4	637	16.3
864773	BVSP40	Merimbula STP - Effluent (comp)	30-Nov-11	8.81	12	7	29	5.4	0.3	3.5	9.5	8.3		638	11.4
865787	BVSP40	Merimbula STP - Effluent (comp)	7-Dec-11	8.42	5	3	33	3.7	0.6	2.1	9.7	9.3		613	13.5
867007	BVSP40	Merimbula STP - Effluent (comp)	15-Dec-11	8.13	14	10	38	4.4	1.2	1.2	12	11		647	7.6
868029	BVSP40	Merimbula STP - Effluent (comp)	21-Dec-11	8.5	14	11	33	4.8	0.9	1.5	11	9.6		686	10.8
868696	BVSP40	Merimbula STP - Effluent (comp)	29-Dec-11	8.64	7	3	32	4.2	1.1	2.1	9.9	9.1		703	12.3
869309	BVSP40	Merimbula STP - Effluent (comp)	4-Jan-12	7.71	7	5	42	4.5	2.2	0.99	11	11		781	7.7
870643	BVSP40	Merimbula STP - Effluent (comp)	12-Jan-12	7.44	5	2	35	5.3	2.6	1.6	9.8	9.2		726	2.2
871465	BVSP40	Merimbula STP - Effluent (comp)	18-Jan-12	7.6	13	8	41	4.5	1.4	1.2	8.9	8.3		765	4.5
872380	BVSP40	Merimbula STP - Effluent (comp)	24-Jan-12	7.84	8	4	37	3.4	0.8	1	9.4	9		733	6.8
873226	BVSP40	Merimbula STP - Effluent (comp)	1-Feb-12	7.33	8	4	37	4.7	0.3	3	11	10		724	8.1
874719	BVSP40	Merimbula STP - Effluent (comp)	9-Feb-12	8.09	7	3	35	5.2	0.3	3.6	11	9.8		753	7.5
875499	BVSP40	Merimbula STP - Effluent (comp)	15-Feb-12	7.67	15	6	37	4.6	0.2	2.8	9.3	8.4		642	13.2
876844	BVSP40	Merimbula STP - Effluent (comp)	23-Feb-12	8.34	10	6	43	2.5	0.3	0.53	10	9.3		711	11.4
877570	BVSP40	Merimbula STP - Effluent (comp)	29-Feb-12	7.6	7	3	35	2.4	0.5	0.44	8.7	8		710	6.1
878943	BVSP40	Merimbula STP - Effluent (comp)	7-Mar-12	6.99	6	2	37	3.1	0.8	1.2	3.2	3		588	7.6
880262	BVSP40	Merimbula STP - Effluent (comp)	15-Mar-12	7.09	8	5	47	3	0.7	0.96	4.3	3.6		535	8.4
881130	BVSP40	Merimbula STP - Effluent (comp)	21-Mar-12	7.72	8	6	43	2.4	0.1	0.9	5.8	5.6		694	11
882515	BVSP40	Merimbula STP - Effluent (comp)	30-Mar-12	7.72	6	2	33	3.1	0.1	1.8	6.7	5.8		700	9
883417	BVSP40	Merimbula STP - Effluent (comp)	4-Apr-12	8.27	4	5	29	2.6	0.3	0.94	8	7.5		680	10.5
884182	BVSP40	Merimbula STP - Effluent (comp)	12-Apr-12	7	4	2	28	8.2	2.5	4.4	10	9.8		767	7.5
884864	BVSP40	Merimbula STP - Effluent (comp)	18-Apr-12	6.16	11	2	31	8.6	0.3	7	12	11		747	9.1
886221	BVSP40	Merimbula STP - Effluent (comp)	26-Apr-12	7.6	3	2	32	4.5	0.3	3	8.1	7.7		596	9.4

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	pH	Susp.Solid s	BOD	COD	Total Nitrogen	Ammonia (asN)	T.Oxid Nit (asN)	Tot.Phosph (asP)	Orth.Phosph (asP)	Chlorophyll l "a"	EC	DO
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	us/cm	mg/L
886974	BVSP40	Merimbula STP - Effluent (comp)	2-May-12	7.8	4	2	34	3.7	0.3	2.5	7.1	6.7		640	10.5
888274	BVSP40	Merimbula STP - Effluent (comp)	10-May-12	7.43	3	2	30	4.5	0.1	3.5	9.1	8.2		711	12.4
889009	BVSP40	Merimbula STP - Effluent (comp)	16-May-12	7.8	2	2	32	4	0.1	3.1	8.9	8.6		753	13.8
890296	BVSP40	Merimbula STP - Effluent (comp)	24-May-12	7.71	4	2	34	4.1	0.1	2.8	8.8	8.2		731	12.9
891021	BVSP40	Merimbula STP - Effluent (comp)	30-May-12	8.08	2	2	30	2.9	0.1	1.8	6.5	6.2		750	13.2
892163	BVSP40	Merimbula STP - Effluent (comp)	6-Jun-12	7.56	6	2	29	5.8	0.4	4.1	6.5	6		642	9.6
893223	BVSP40	Merimbula STP - Effluent (comp)	14-Jun-12	7.3	4	2	27	4.5	0.3	3.2	5.6	4.8		660	11.5
893970	BVSP40	Merimbula STP - Effluent (comp)	20-Jun-12	7.66	3	2	30	3.2	0.1	2.2	5.4	5		619	11.9
894961	BVSP40	Merimbula STP - Effluent (comp)	28-Jun-12	7.57	2	2	8	4.6	0.1	3.4	6.9	6		740	10
895733	BVSP40	Merimbula STP - Effluent (comp)	4-Jul-12	7.98	5	3	37	6.4	0.3	4.7	9.5	8.8		688	12.5
896946	BVSP40	Merimbula STP - Effluent (comp)	12-Jul-12	7.73	7	4	32	6.1	1.6	3	11	10		663	11.1
897838	BVSP40	Merimbula STP - Effluent (comp)	18-Jul-12	7.6	6	3	48	8.7	1.3	5.7	10	9.1		687	10.5
898820	BVSP40	Merimbula STP - Effluent (comp)	26-Jul-12	7.45	5	2	38	15	1	13	9.9	9.2		717	10.5
899425	BVSP40	Merimbula STP - Effluent (comp)	1-Aug-12	7.7	4	2	34	14	0.7	12	11	10		722	11.2
900474	BVSP40	Merimbula STP - Effluent (comp)	9-Aug-12	7.7	2	2	25	5	0.6	3.1	11	9.6		696	9.7
901326	BVSP40	Merimbula STP - Effluent (comp)	15-Aug-12	7.8	4	2	25	3.9	0.5	2.1	9.1	8.7		670	11.4
902501	BVSP40	Merimbula STP - Effluent (comp)	23-Aug-12	7.9	3	2	32	3.1	0.4	1.5	7.5	6.7		652	13
903358	BVSP40	Merimbula STP - Effluent (comp)	29-Aug-12	8	4	2	31	2.8	0.4	1.3	7.5	7		650	13.3
904242	BVSP40	Merimbula STP - Effluent (comp)	5-Sep-12	7.59	3	2	28	2.6	0.3	1.2	6.4	6.1		680	12.7
905425	BVSP40	Merimbula STP - Effluent (comp)	13-Sep-12	8.08	5	2	33	3.3	1.1	0.79	7.4	6.7		709	12.3
906059	BVSP40	Merimbula STP - Effluent (comp)	19-Sep-12	7.51	5	2	31	3	0.7	1.2	6.3	5.9		570	9.8
907390	BVSP40	Merimbula STP - Effluent (comp)	27-Sep-12	7.5	6	2	28	2.8	0.2	1.4	8	7.5		567	11
907874	BVSP40	Merimbula STP - Effluent (comp)	3-Oct-12	7.54	7	3	33	3.3	0.3	1.5	9.6	9.1		566	11.8
909045	BVSP40	Merimbula STP - Effluent (comp)	11-Oct-12	7.4	4	2	31	3.2	0.6	1.4	9.4	8.6		632	10.2
909804	BVSP40	Merimbula STP - Effluent (comp)	17-Oct-12	7.35	5	2	28	4	0.7	2.2	9.5	9.1		623	8.4
911226	BVSP40	Merimbula STP - Effluent (comp)	25-Oct-12	8	18	6	42	2.8	0.1	1	9	7.5		630	13.7
911916	BVSP40	Merimbula STP - Effluent (comp)	31-Oct-12	7.78	8	3	32	3.8	0.7	1	8.2	7.4		640	10.9
912921	BVSP40	Merimbula STP - Effluent (comp)	07-Nov-12	7.75	10	5	36	2.3	0.5	0.43	8.2	7.4		674	9.2
914459	BVSP40	Merimbula STP - Effluent (comp)	15-Nov-12	7.66	10	4	41	5	2.9	0.37	6.4	5.9		659	7
915168	BVSP40	Merimbula STP - Effluent (comp)	21-Nov-12	7.52	5	2	32	5.2	3.7	0.23	6.3	6		720	4.6
916618	BVSP40	Merimbula STP - Effluent (comp)	30-Nov-12	7.58	6	3	36	10	7.6	0.65	7.9	7.4		758	6.6
917392	BVSP40	Merimbula STP - Effluent (comp)	5-Dec-12	8.06	12	5	41	7.2	4.7	0.78	7.5	6.7		753	9.1
918869	BVSP40	Merimbula STP - Effluent (comp)	13-Dec-12	7.98	9	4	36	3	0.5	0.89	6.4	5.7		759	6.7
919697	BVSP40	Merimbula STP - Effluent (comp)	19-Dec-12	8.1	13	6	42	2.9	0.4	0.69	8.7	7.9		779	10.4
920441	BVSP40	Merimbula STP - Effluent (comp)	27-Dec-12	7.71	6	2	35	2.9	0.7	0.79	12	11		1574	6.9
920907	BVSP40	Merimbula STP - Effluent (comp)	2-Jan-13	7.96	8	4	34	5.1	2.2	1.5	13	11		741	8.5
921928	BVSP40	Merimbula STP - Effluent (comp)	10-Jan-13	7.5	4	2	34	8.4	5.7	1.4	11	11		791	2.2
922560	BVSP40	Merimbula STP - Effluent (comp)	16-Jan-13	7.46	8	4	38	9.5	6.2	1.8	12	11		892	5.7
923990	BVSP40	Merimbula STP - Effluent (comp)	24-Jan-13	7.75	8	7	39	5	1.8	1.5	13	11		843	7.1
924639	BVSP40	Merimbula STP - Effluent (comp)	30-Jan-13	7.37	4	2	27	8.3	2.3	5	14	13		817	5.9
925720	BVSP40	Merimbula STP - Effluent (comp)	06-Feb-13	9.04	36	15	45	9.9	0.1	7.7	9.5	6.6		753	15.1
926908	BVSP40	Merimbula STP - Effluent (comp)	14-Feb-13	8.38	15	6	40	6.6	0.4	4.8	14	13		790	12.3
927721	BVSP40	Merimbula STP - Effluent (comp)	20-Feb-13	8.42	21	4	45	4.1	0.3	2	17	15	85	788	8.9
928979	BVSP40	Merimbula STP - Effluent (comp)	28-Feb-13	7.66	4	2	25	2.1	0.8	0.33	16	14		729	5.3
929764	BVSP40	Merimbula STP - Effluent (comp)	06-Mar-13	8.12	13	7	36	2.4	0.1	1.1	10	9.6		685	9.4
930959	BVSP40	Merimbula STP - Effluent (comp)	14-Mar-13	7.77	7	4	37	1.5	0.2	0.53	12	11		751	6.1
931727	BVSP40	Merimbula STP - Effluent (comp)	20-Mar-13	7.8	7	4	31	2.9	0.2	1.2	9.2	8.5		770	9.1
932793	BVSP40	Merimbula STP - Effluent (comp)	27-Mar-13	8.47	14	6	39	2.4	0.1	0.56	9.1	8.2		754	11.4
933383	BVSP40	Merimbula STP - Effluent (comp)	03-Apr-13	7.97	14	6	37	4.9	1.3	1.7	8.2	7.8		749	10.3
934677	BVSP40	Merimbula STP - Effluent (comp)	11-Apr-13	7.66	6	4	30	3.7	0.3	2	9.3	8.9		726	9.7

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	pH	Susp.Solid s	BOD	COD	Total Nitrogen	Ammonia (asN)	T.Oxid Nit (asN)	Tot.Phosp (asP)	Orth.Phosp (asP)	Chlorophyl l "a"	EC	DO
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	us/cm	mg/L
935457	BVSP40	Merimbula STP - Effluent (comp)	17-Apr-13	7.47	4	3	30	3	0.4	1.5	11	11		742	7
936256	BVSP40	Merimbula STP - Effluent (comp)	23-Apr-13	7.8	10	2	31	3.8	0.1	2.2	11	10		744	10.5
937088	BVSP40	Merimbula STP - Effluent (comp)	01-May-13	7.58	7	2	29	4.5	0.3	2.9	8.4	7.8		799	8
938349	BVSP40	Merimbula STP - Effluent (comp)	09-May-13	7.76	4	2	27	5.4	0.4	3.8	8.5	7.7		833	10.1
939271	BVSP40	Merimbula STP - Effluent (comp)	15-May-13	7.8	7	2	32	3.8	0.1	2.3	8.2	7.5		857	10.1
940544	BVSP40	Merimbula STP - Effluent (comp)	23-May-13	7.95	2	2	24	4.2	0.2	3	6.4	5.9		779	10.3
941492	BVSP40	Merimbula STP - Effluent (comp)	31-May-13	7.71	2	2	25	4.9	0.6	3.5	6.1	5.8		761	
942448	BVSP40	Merimbula STP - Effluent (comp)	06-Jun-13	7.98	2	2	24	4.3	0.3	3	6.4	5.9		831	11.4
943242	BVSP40	Merimbula STP - Effluent (comp)	13-Jun-13	7.75	2	2	30	5.4	0.9	3.8	6.1	5.5		983	10.6
944251	BVSP40	Merimbula STP - Effluent (comp)	20-Jun-13	7.82	2	4	24	7.3	0.2	6	6.4	5.8		937	11.9
945244	BVSP40	Merimbula STP - Effluent (comp)	27-Jun-13	7.35	2	2	27	12	0.4	11	8.1	7.8		874	10.1
945998	BVSP40	Merimbula STP - Effluent (comp)	03-Jul-13	7.67	4	2	30	6.6	0.3	5.4	6.8	6.4		690	10.6
947096	BVSP40	Merimbula STP - Effluent (comp)	11-Jul-13	7.93	2	2	30	5.4	0.2	4.4	6.7	6.2		722	12.9
947701	BVSP40	Merimbula STP - Effluent (comp)	17-Jul-13	7.8	2	2	21	6.6	0.2	5.8	8.7	8.4		710	13
948954	BVSP40	Merimbula STP - Effluent (comp)	25-Jul-13	7.72	2	2	30	4.3	0.2	3.3	12	11		759	12
949594	BVSP40	Merimbula STP - Effluent (comp)	31-Jul-13	7.95	2	4	26	3.5	0.2	2.3	11	10		805	12.8
950628	BVSP40	Merimbula STP - Effluent (comp)	07-Aug-13	7.83	2	2	29	3.2	0.3	2	11	10		766	11.4
951714	BVSP40	Merimbula STP - Effluent (comp)	15-Aug-13	7.99	2	2	25	3	0.3	1.8	11	9.6		759	11.6
952460	BVSP40	Merimbula STP - Effluent (comp)	21-Aug-13	8.05	3	2	24	3.3	0.2	1.9	11	11		783	12
953561	BVSP40	Merimbula STP - Effluent (comp)	29-Aug-13	8.07	2	2	38	3.4	0.3	2	12	11		831	11.1
954061	BVSP40	Merimbula STP - Effluent (comp)	04-Sep-13	8.04	3	2	24	2.6	0.3	1.1	13	12		824	11.7
955023	BVSP40	Merimbula STP - Effluent (comp)	12-Sep-13	7.91	5	2	21	2.6	0.3	0.93	12	12		762	10.7
956005	BVSP40	Merimbula STP - Effluent (comp)	18-Sep-13	7.59	4	2	32	3.4	0.5	1.5	10	9.5		677	8.3
957449	BVSP40	Merimbula STP - Effluent (comp)	26-Sep-13	7.87	8	3	32	2.7	0.6	1.1	7.9	7.7		648	9.9
958123	BVSP40	Merimbula STP - Effluent (comp)	02-Oct-13	8.01	3	2	17	2.7	0.9	0.47	8	7.5		704	9.1
959140	BVSP40	Merimbula STP - Effluent (comp)	10-Oct-13	7.79	2	2	25	2.6	1.2	0.25	4.4	4.1		699	8.4
960005	BVSP40	Merimbula STP - Effluent (comp)	16-Oct-13	7.97	4	2	24	2	0.7	0.16	4.7	4.6		749	8.6
961163	BVSP40	Merimbula STP - Effluent (comp)	24-Oct-13	7.89	8	3	30	1.7	0.4	0.09	4.6	4.2		664.4	8.5
961755	BVSP40	Merimbula STP - Effluent (comp)	30-Oct-13	7.6	9	4	36	1.9	0.4	0.17	5	4.7		708.6	8.8
962763	BVSP40	Merimbula STP - Effluent (comp)	06-Nov-13	7.6	4	2	33	2.6	1.2	0.2	6.6	6.1		717	7.2
964035	BVSP40	Merimbula STP - Effluent (comp)	14-Nov-13	7.56	4	3	28	5.2	3.7	0.21	6.5	5.9		652	6.3
964921	BVSP40	Merimbula STP - Effluent (comp)	20-Nov-13	7.4	4	2	30	4.3	2.9	0.2	5.6	5		626	5.6
	BVSP40	Merimbula STP - Effluent (comp)	27-Nov-13	7.41	4	2	27	3.5	1.9	0.59	6.7	5.99		653	5.6
	BVSP40	Merimbula STP - Effluent (comp)	05-Dec-13		8	3	25	3.32	0.4	1.69	9.89	8.93			
CA1300296-005	BVSP40	Merimbula STP - Effluent (comp)	12-Dec-13	7.74	5	2	25	4.4	0.4	1.59	13.6	11.2		737	8
CA1300368-005	BVSP40	Merimbula STP - Effluent (comp)	18-Dec-13	7.53	5	2	34	4.39	0.9	2.26	16.4	14.6		720	9.9
CA1300423-006	BVSP40	Merimbula STP - Effluent (comp)	23-Dec-13	7.42	3	2	27	3.67	0.4	2.03	15	13.5		757	3.8
CA1400008-005	BVSP40	Merimbula STP - Effluent (comp)	02-Jan-14	7.8	3	2	34	3.16	0.6	1.38	10.7	9.97		715	5.8
CA1400075-005	BVSP40	Merimbula STP - Effluent (comp)	09-Jan-14	7.38	11	2	35	3.62	1.5	0.8	8.82	8.09		818	6
CA1400140-005	BVSP40	Merimbula STP - Effluent (comp)	15-Jan-14	8.05	6	2	33	2.53	1	0.21	9.7	8.87		753	4.2
CA1400242-005	BVSP40	Merimbula STP - Effluent (comp)	23-Jan-14	7.56	6	2	30	2.08	0.5	0.32	7.82	6.96		747	6.2
CA1400303-005	BVSP40	Merimbula STP - Effluent (comp)	29-Jan-14	7.44	8	2	27	2.01	0.5	0.33	8.64	7.56		727	4.3
CA1400377005	BVSP40	Merimbula STP - Effluent (comp)	05-Feb-14	7.69	3	2	11	1.43	0.2	0.25	11.1	10.3		796	6.1
CA1400491005	BVSP40	Merimbula STP - Effluent (comp)	13-Feb-14	7.68	5	3	29	2.68	0.3	1.38	13.6	12.3		801	6.9
CA1400546005	BVSP40	Merimbula STP - Effluent (comp)	19-Feb-14	8.18	7	3	32	4.02	0.1	2.53	15.5	14.5		822	9.8
CA1400635005	BVSP40	Merimbula STP - Effluent (comp)	27-Feb-14	7.94	6	2	25	2.27	0.3	0.74	14.3	13.4		816	7.6
CA1400709005	BVSP40	Merimbula STP - Effluent (comp)	05-Mar-14	8.09	2	2	22	2.22	0.1	0.92	9.84	8.97		752	10.1
CA1400809005	BVSP40	Merimbula STP - Effluent (comp)	13-Mar-14	8.49	6	3	38	1.87	0.2	0.38	8.73	8.01		708	9
CA1400875005	BVSP40	Merimbula STP - Effluent (comp)	19-Mar-14	8.18	5	3	23	1.93	0.1	0.6	8.03	7.55		765	9.8
CA1400962005	BVSP40	Merimbula STP - Effluent (comp)	27-Mar-14	7.65	7	2	27	2.78	0.7	1.46	7.22	6.62		647	7.1

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	pH	Susp.Solid s	BOD	COD	Total Nitrogen	Ammonia (asN)	T.Oxid Nit (asN)	Tot.Phosp (asP)	Orth.Phosp (asP)	Chlorophyl l "a"	EC	DO
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	us/cm	mg/L
CA1401022005	BVSP40	Merimbula STP - Effluent (comp)	02-Apr-14	7.5	3	2	35	3.78	0.8	1.85	8.11	7.77		639	8.2
CA1401113005	BVSP40	Merimbula STP - Effluent (comp)	10-Apr-14	7.3	2	2	17	5.14	0.3	3.57	8.58	7.72		645	7.4
CA1401186005	BVSP40	Merimbula STP - Effluent (comp)	16-Apr-14	7.33	3	3	33	5.75	2.8	1.71	9.32	8.85		699	7.4
CA1401252005	BVSP40	Merimbula STP - Effluent (comp)	23-Apr-14	7.66	15	2	27	4.6	1.1	2.2	6.59	6.13		684	9.9
CA1401305005	BVSP40	Merimbula STP - Effluent (comp)	30-Apr-14	7.95	3	2	27	2.64	0.3	1.18	6.05	5.52		745	10.8
CA1401379005	BVSP40	Merimbula STP - Effluent (comp)	07-May-14	8.02	2	2	22	3.61	0.2	2.41	6.59	6.45		721	10.9
CA1401494005	BVSP40	Merimbula STP - Effluent (comp)	15-May-14	8	2	2	21	3.85	0.3	2.65	8.2	7.62		770	11.4
CA1401537005	BVSP40	Merimbula STP - Effluent (comp)	21-May-14	7.73	2	2	25	3.92	0.3	2.65	9.48	8.93		813	10.7
CA1401641005	BVSP40	Merimbula STP - Effluent (comp)	29-May-14	7.96	3	2	30	2.96	0.3	1.66	8.23	7.81		792	10.8
CA1401692005	BVSP40	Merimbula STP - Effluent (comp)	04-Jun-14	7.54	3	2	24	3.69	0.3	2.4	7.19	6.74		699	9.8
CA1401783005	BVSP40	Merimbula STP - Effluent (comp)	12-Jun-14	7.68	3	2	17	3.65	0.3	2.76	7.21	6.57		742	10.7
CA1401838005	BVSP40	Merimbula STP - Effluent (comp)	18-Jun-14	7.57	4	2	28	3.93	0.4	2.81	6.32	5.82		709	10
CA1401935005	BVSP40	Merimbula STP - Effluent (comp)	26-Jun-14	7.52	5	4	36	8.33	2.6	4.54	9.13	8.42		767	11.6
CA1401980005	BVSP40	Merimbula STP - Effluent (comp)	02-Jul-14	7.52	2	2	32	11.4	0.4	9.93	9.88	9.25		863	10.9
CA1402083005	BVSP40	Merimbula STP - Effluent (comp)	10-Jul-14	7.42	2	2	26	15.8	0.2	14.5	11.3	10.8		942	11.3
CA1402128005	BVSP40	Merimbula STP - Effluent (comp)	16-Jul-14	7.57	4	2	22	11	0.2	9.55	11.1	10.5		919	11.6
CA1402182005	BVSP40	Merimbula STP - Effluent (comp)	24-Jul-14	7.75	4	2	23	4.76	0.2	3.55	9.8	9.12		834	12.1
CA1402250006	BVSP40	Merimbula STP - Effluent (comp)	30-Jul-14	7.72	2	2	10	4.46	0.1	3.2	9.61	8.74		826	12.2
CA1402313005	BVSP40	Merimbula STP - Effluent (comp)	06-Aug-14	7.84	3	2	34	3.37	0.3	2.07	8.22	7.79		789	12.4
CA1402419005	BVSP40	Merimbula STP - Effluent (comp)	14-Aug-14	8.31	4	2	29	2.77	0.1	1.64	6.57	6.14		826	13
CA1402485005	BVSP40	Merimbula STP - Effluent (comp)	20-Aug-14	7.62	6	2	26	3.25	0.4		5.85	5.44		677	10
CA1402592005	BVSP40	Merimbula STP - Effluent (comp)	28-Aug-14	7.63	4	2	27	3.94	0.4	2.52	6.39	5.81		699	10.9
CA1402654005	BVSP40	Merimbula STP - Effluent (comp)	03-Sep-14	7.87	2	2	29	2.52	0.3	1.1	6.26	5.85		737	10.7
CA1402779005	BVSP40	Merimbula STP - Effluent (comp)	11-Sep-14	7.82	3	2	21	2.24	0.4	0.9	8.22	7.72		750	10.9
CA1402877005	BVSP40	Merimbula STP - Effluent (comp)	17-Sep-14	7.75	7	2	19	2.43	0.8	0.51	8.64	7.97		736	9.7
CA1402978005	BVSP40	Merimbula STP - Effluent (comp)	25-Sep-14	8.27	8	6	34	3.21	0.4	1.07	7.62	6.12		746	14.2
CA1403040005	BVSP40	Merimbula STP - Effluent (comp)	01-Oct-14	8.26	13	7	39	4.85	2	0.74	7.88	7.06		751	11.2
CA1403128005	BVSP40	Merimbula STP - Effluent (comp)	09-Oct-14	7.38	4	2	10	6.68	4.3	0.92	13	11.9		828	6.8
CA1403186005	BVSP40	Merimbula STP - Effluent (comp)	15-Oct-14	7.51	6	2	31	4.96	2.9	0.96	11.5	10.9		795	7.1
CA1403310005	BVSP40	Merimbula STP - Effluent (comp)	23-Oct-14	7.69	5	2	21	4.28	0.5	2.26	8.61	8.08		741	10.4
CA1403388005	BVSP40	Merimbula STP - Effluent (comp)	29-Oct-14	7.67	7	4	28	3.59	0.6	1.58	13.2	12.5		808	10.2
CA1403466005	BVSP40	Merimbula STP - Effluent (comp)	05-Nov-14	8.52	21	6	47	4.25	1.1	0.92	12.5	10.3	169	813	12.6
CA1403629005	BVSP40	Merimbula STP - Effluent (comp)	13-Nov-14	7.58	4	2	29	2.83	1	0.7	10.2	9.4		833	4.7
CA1403700005	BVSP40	Merimbula STP - Effluent (comp)	19-Nov-14	7.84	4	2	22	3.65	1	1.7	6.28	6.09		850	8.9
CA1403802005	BVSP40	Merimbula STP - Effluent (comp)	27-Nov-14	7.7	4	2	26	3.82	0.8	1.83	8.36	7.67		818	7.1
CA1403882005	BVSP40	Merimbula STP - Effluent (comp)	03-Dec-14	7.66	3	3	26	3.36	1.2	1.06	9.78	9.36		850	7.2
CA1404101005	BVSP40	Merimbula STP - Effluent (comp)	11-Dec-14	7.32	3	2	24	5.39	1.7	2.98	8.25	8.01		710	5.5
CA1404179005	BVSP40	Merimbula STP - Effluent (comp)	17-Dec-14	7.51	2	2	29	5.26	0.7	3.8	7.5	7.06		700	6.7
CA1404234005	BVSP40	Merimbula STP - Effluent (comp)	22-Dec-14	7.77	2	2	33	3.77	0.5	2.27	7.91	7.63		690	8.3
CA1404278005	BVSP40	Merimbula STP - Effluent (comp)	29-Dec-14	7.67	4	2	20	7.94	1.5	5.19	8.07	7.68		764	7.5
CA1500055006	BVSP40	Merimbula STP - Effluent (comp)	07-Jan-15	7.4	5	2	24	6.39	1.4	3.78	7.55	7.24		703	6.8
CA1500199005	BVSP40	Merimbula STP - Effluent (comp)	15-Jan-15	7.8	3	2	23	6.61	0.2	5.79	8.1	7.63		719	7.7
CA1500257005	BVSP40	Merimbula STP - Effluent (comp)	21-Jan-15	7.9	3	2	32	2.95	0.9	1.33	9.53	8.81		691	7.8
CA1500310005	BVSP40	Merimbula STP - Effluent (comp)	29-Jan-15	7.85	4	2	16	1.64	0.4	0.85	5.17	4.81		428	8.2
CA1500392-005	BVSP40	Merimbula STP - Effluent (comp)	04-Feb-15	7.22	3	2	20	6.55	0.2	5.6	5.33	5.11		552	7.9
CA1500461-005	BVSP40	Merimbula STP - Effluent (comp)	12-Feb-15	8.15	5	2	26	3.72	0.1	2.69	7.42	6.59		612	7.7
CA1500605-005	BVSP40	Merimbula STP - Effluent (comp)	18-Feb-15	7.17	4	2	12	3.16	0.1	2.22	7.26	6.55		593	7.1
CA1500733-005	BVSP40	Merimbula STP - Effluent (comp)	26-Feb-15	8.06	6	2	18	1.95	0.1	1.13	8.34	7.59		560	8.4
CA1500803-005	BVSP40	Merimbula STP - Effluent (comp)	04-Mar-15	7.77	5	2	13	2.08	0.2	1.17	7.07	6.56		483	7.9
CA1500968-005	BVSP40	Merimbula STP - Effluent (comp)	12-Mar-15	8.07	4	2	17	1.91	0.2	1.15	5.57	5.32		484	8

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	pH	Susp.Solid s	BOD	COD	Total Nitrogen	Ammonia (asN)	T.Oxid Nit (asN)	Tot.Phosp (asP)	Orth.Phosp (asP)	Chlorophyl l "a"	EC	DO
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	us/cm	mg/L
CA1501035-005	BVSP40	Merimbula STP - Effluent (comp)	18-Mar-15	8.22	4	2	19	1.09	0.1	0.47	5.95	5.61		522	8.2
CA1501134-005	BVSP40	Merimbula STP - Effluent (comp)	26-Mar-15	7.94	2	2	13	1.87	0.2	0.99	6.65	6.2		607	8.4
CA1501217-004	BVSP40	Merimbula STP - Effluent (comp)	01-Apr-15	7.96	2	2	19	2.87	0.2	2.06	5.88	5.59		656	8.6
CA1501298-005	BVSP40	Merimbula STP - Effluent (comp)	09-Apr-15	7.9	2	2	11	1.6	0.6	0.89	3.99	3.78		594	9
CA1501395-004	BVSP40	Merimbula STP - Effluent (comp)	15-Apr-15	7.64	2	2	15	4.16	0.4	3.21	4.68	4.56		677	8.4
CA1501508-004	BVSP40	Merimbula STP - Effluent (comp)	23-Apr-15	7.86	2	2	13	4.24	0.1	3.84	3.93	3.89		520	8.9
CA1501585-005	BVSP40	Merimbula STP - Effluent (comp)	29-Apr-15	7.58	2	2	18	4.42	0.2	3.94	3.28	3.16		415	8.9
CA1501687-004	BVSP40	Merimbula STP - Effluent (comp)	06-May-15	7.61	2	2	21	4.74	0.1	4.01	3.84	3.74		479	8.9
CA1501833-004	BVSP40	Merimbula STP - Effluent (comp)	14-May-15	7.5	2	2	12	3.61	0.1	3.07	2.82	2.62		446	9.4
CA1501909-004	BVSP40	Merimbula STP - Effluent (comp)	20-May-15	7.69	2	2	20	6.45	0.3	5.65	4.75	4.34		597	9.8
CA1501990-004	BVSP40	Merimbula STP - Effluent (comp)	28-May-15	7.81	2	2	11	5.74	0.3	5.38	4.4	4.38	0.23	566	10.4
CA1502101-004	BVSP40	Merimbula STP - Effluent (comp)	03-Jun-15	7.57	2	2	21	7.92	0.2	7.25	5.29	5.09	5.5	696	10.7
CA1502263-004	BVSP40	Merimbula STP - Effluent (comp)	11-Jun-15	7.61	2	2	15	8.47	0.3	7.71	5.11	4.72	0.22	612	10.9
CA1502357-004	BVSP40	Merimbula STP - Effluent (comp)	17-Jun-15	7.89	2	2	16	6.62	0.2	5.51	5.94	5.62	0.36	635	9.7
CA1502525-004	BVSP40	Merimbula STP - Effluent (comp)	25-Jun-15	8.12	2	2	18	5.79	0.5	4.48	7.37	7.22	0.67	826	10.8
CA1502599-004	BVSP40	Merimbula STP - Effluent (comp)	01-Jul-15	8.09	3	2	20	5.22	0.4	4.39	5.9	5.54	0.82	672	10.7
CA1502713-004	BVSP40	Merimbula STP - Effluent (comp)	09-Jul-15	7.6	2	2	10	3.76	0.2	2.92	4.23	3.94	0.31	614	10.4
CA1502822-004	BVSP40	Merimbula STP - Effluent (comp)	15-Jul-15	7.59	3	2	14	2.79	0.3	1.97	3.75	3.53	0.42	680	8.9
CA1502951-004	BVSP40	Merimbula STP - Effluent (comp)	23-Jul-15	7.84	2	2	21	4.83	0.4	3.34	6.65	6.01	1.23	797	11.5
CA1503020-007	BVSP40	Merimbula STP - Effluent (comp)	29-Jul-15	7.84	2	2	17	3.26	0.2	2.31	5.16	4.97	0.26	708	10.9
CA1503137-008	BVSP40	Merimbula STP - Effluent (comp)	05-Aug-15	7.75	2	2	23	5.35	0.4	4.14	7.93	7.15	0.7	842	11.6
CA1503271-008	BVSP40	Merimbula STP - Effluent (comp)	13-Aug-15	7.61	3	104	138	5.83	0.5	4.59	8.58	7.42	1.78	925	10.8
CA1503372-008	BVSP40	Merimbula STP - Effluent (comp)	19-Aug-15	7.58	3	2	25	3.95	0.5	2.25	8.91	8.49	1.57	922	11.4
CA1503478-007	BVSP40	Merimbula STP - Effluent (comp)	27-Aug-15	7.36	3	2	24	3.34	0.5	1.88	6.96	6.79	1.63	803	9
CA1503553-007	BVSP40	Merimbula STP - Effluent (comp)	02-Sep-15	7.72	3	29	59	2.99	0.4	1.71	4.4	3.95	1.7	685	9.6
CA1503650-007	BVSP40	Merimbula STP - Effluent (comp)	10-Sep-15	7.7	2	2	25	2.88	0.3	1.41	5.31	5.03	2.08	689	10.4
CA1503778-007	BVSP40	Merimbula STP - Effluent (comp)	16-Sep-15	7.98	4	2	22	2.96	0.5	1.23	6.39	5.8	3.01	857	9.8
CA1503898-007	BVSP40	Merimbula STP - Effluent (comp)	24-Sep-15	8.47	6	2	26	3.11	0.3	1.45	6.79	6.45	29.7	810	11.6
CA1503969-007	BVSP40	Merimbula STP - Effluent (comp)	30-Sep-15	7.74	9	4	24	3.64	0.8	1.37	7.95	7.22	44.9	758	11.2
CA1504055-007	BVSP40	Merimbula STP - Effluent (comp)	07-Oct-15	8.31	22	8	41	4.25	1	0.83	7.9	6.62	110	786	11.7
CA1504251-007	BVSP40	Merimbula STP - Effluent (comp)	15-Oct-15	7.17	8	2	24	2.84	1.1	0.52	9.39	8.65	22.8	830	6.7
CA1504374-007	BVSP40	Merimbula STP - Effluent (comp)	21-Oct-15	7.41	6	2	31	2.83	0.9	0.78	11.1	10.2	17	846	7.8
CA1504553-007	BVSP40	Merimbula STP - Effluent (comp)	29-Oct-15	7.53	4	7	32	3.28	0.6	1.5	10.9	10.2	8.66	794	8.7
CA1504683-007	BVSP40	Merimbula STP - Effluent (comp)	04-Nov-15	7.22	4	2	24	3.23	0.9	1.19	9.16	8.87	3.15	808	6.6
CA1504913-007	BVSP40	Merimbula STP - Effluent (comp)	12-Nov-15	7.23	10	31	66	3.99	1.3	1.7	8.72	8.16	3.46	637	6
CA1505084-007	BVSP40	Merimbula STP - Effluent (comp)	18-Nov-15	7.24	3	2	29	6.21	1.2	4.26	5.98	5.98	2.32	614	5.9
CA1505244-007	BVSP40	Merimbula STP - Effluent (comp)	26-Nov-15	7.17	6	4	30	4.39	1.3	2.01	8.84	8.01	26.9	693	6.4
CA1505358-007	BVSP40	Merimbula STP - Effluent (comp)	02-Dec-15	7.13	3	2	28	5.74	2	2.87	8.66	8.56	9.64	833	6.4
CA1505576-007	BVSP40	Merimbula STP - Effluent (comp)	10-Dec-15	7.49	4	2	28	7.18	2.2	4.32	8.24	7.85	4.26	883	6.5
CA1505716-007	BVSP40	Merimbula STP - Effluent (comp)	16-Dec-15	7.57	6	3	29	11	1	8.66	9.23	8.01	18.5	869	8.2
CA1505804-007	BVSP40	Merimbula STP - Effluent (comp)	21-Dec-15	7.42	5	2	24	7.11	1.7	3.98	12.7	12	18.4	937	7.5
CA1505927-007	BVSP40	Merimbula STP - Effluent (comp)	29-Dec-15	8.47	6	4	31	8.21	1.1	5.75	10.7	9.7	37.8	816	11.4
CA1600092-007	BVSP40	Merimbula STP - Effluent (comp)	06-Jan-16	7.5	3	31	54	7.32	2.5	3.72	9.02	8.17	1.5	740	4.5
CA1600295-008	BVSP40	Merimbula STP - Effluent (comp)	14-Jan-16	8.31	7	5	28	4.11	0.5	2.31	9.38	8.56	47.8	700	8.1
CA1600444-006	BVSP40	Merimbula STP - Effluent (comp)	20-Jan-16	7.91	5	2	23	5.73	0.2	4.75	8.43	7.47	15.4	857	9.4
CA1600561-007	BVSP40	Merimbula STP - Effluent (comp)	28-Jan-16	7.15	6	3	21	5.99	0.9	4.22	10.5	10.1	45.8	781	6.7
CA1600694-007	BVSP40	Merimbula STP - Effluent (comp)	03-Feb-16	7.41	11	6	36	6.09	2.3	2.23	9.01	8.53	76.4	645	8.4
CA1600905-007	BVSP40	Merimbula STP - Effluent (comp)	11-Feb-16	7.54	6	3	32	7.3	0.7	5.32	8.89	8.73	38.6	770	8.3
CA1600996-007	BVSP40	Merimbula STP - Effluent (comp)	17-Feb-16	8.3	9	3	19	8.3	0.4	6.81	10.2	9.27	58.2	863	8.9
CA1601225-007	BVSP40	Merimbula STP - Effluent (comp)	25-Feb-16	8.2	16	5	24	7.54	0.2	5.67	9.35	6.92	91.8	895	10.6

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	pH	Susp.Solid s	BOD	COD	Total Nitrogen	Ammonia (asN)	T.Oxid Nit (asN)	Tot.Phosp (asP)	Orth.Phosp (asP)	Chlorophyl l "a"	EC	DO
					mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	ug/L	us/cm	mg/L
CA1601328-007	BVSP40	Merimbula STP - Effluent (comp)	02-Mar-16	8	7	4	29	7.05	0.3	5.64	11.4	9.5	47.9	903	10.2
CA1601515-007	BVSP40	Merimbula STP - Effluent (comp)	10-Mar-16	8.23	12	6	30	6.17	0.2	4.93	10.4	8.78	61.5	930	10.8
CA1601624-007	BVSP40	Merimbula STP - Effluent (comp)	16-Mar-16	7.56	5	3	28	7.41	0.3	6.27	12.2	11.4	51.1	932	6.1
CA1601828-007	BVSP40	Merimbula STP - Effluent (comp)	24-Mar-16	7.86	10	5	32	13.9	0.1	12.2	9.49	8.58	78.3	887	11.2
CA1601911-007	BVSP40	Merimbula STP - Effluent (comp)	30-Mar-16	7.44	3	2	25	8.51	0.9	5.99	8.83	7.69	7.37	823	5.4
CA1602080-007	BVSP40	Merimbula STP - Effluent (comp)	06-Apr-16	7.66	4	2	27	4.08	0.4	2.67	9.71	9.16	18.4	825	9.6
CA1602269-007	BVSP40	Merimbula STP - Effluent (comp)	14-Apr-16	7.64	3	2	25	3.55	0.5	1.93	9.1	8.61	6.45	949	8.2
CA1602350-007	BVSP40	Merimbula STP - Effluent (comp)	20-Apr-16	7.48	3	2	28	3.15	0.4	1.75	7.32	6.63	5.99	991	7
CA1602467-007	BVSP40	Merimbula STP - Effluent (comp)	28-Apr-16	7.53	3	2	28	4.95	0.4	3.69	8.39	7.55	7.28	986	7.9
CA1602602-007	BVSP40	Merimbula STP - Effluent (comp)	04-May-16	7.61	4	3	24	5.46	0.3	4.14	9.29	8.61	5.99	976	9.1
CA1602773-007	BVSP40	Merimbula STP - Effluent (comp)	12-May-16	7.48	2	2	19	8.26	0.2	6.93	8.96	8.75	7.52	1050	8.4
CA1602896-007	BVSP40	Merimbula STP - Effluent (comp)	18-May-16	7.46	2	2	23	7.94	0.1	6.68	9.38	8.9	1.83	1200	8.8
CA1603029-007	BVSP40	Merimbula STP - Effluent (comp)	26-May-16	7.43	2	2	23	5.82	0.8	4.26	9.89	9.63	0.52	1300	10.2
CA1603137-007	BVSP40	Merimbula STP - Effluent (comp)	01-Jun-16	7.63	2	3	23	7.11	0.1	6.1	8.84	8.19	0.18	1230	10.3
CA1603302-007	BVSP40	Merimbula STP - Effluent (comp)	09-Jun-16	7.1	4	2	36	5.11	1.1	2.99	3.75	3.6	1.83	713	5.6
CA1603375-007	BVSP40	Merimbula STP - Effluent (comp)	15-Jun-16	7.27	2	2	27	4.72	0.4	3.59	3.34	3.12	0.69	794	8.2
CA1603569-007	BVSP40	Merimbula STP - Effluent (comp)	23-Jun-16	7.44	2	2	26	4.46	0.2	3.57	4.82	4.66	0.27	838	8.8
CA1603694-007	BVSP40	Merimbula STP - Effluent (comp)	29-Jun-16	7.51	2	3	28	5.87	0.2	5.05	5.63	5.22	0.63	935	10
CA1603818-007	BVSP40	Merimbula STP - Effluent (comp)	06-Jul-16	7.49	2	2	24	4.59	0.1	3.78	6.26	5.55	0.54	932	9.8
CA1603972-007	BVSP40	Merimbula STP - Effluent (comp)	14-Jul-16	7.85	2	2	27	3.51	0.1	2.69	6.11	5.96	1.14	990	11.1
CA1604091-007	BVSP40	Merimbula STP - Effluent (comp)	20-Jul-16	7.42	2	2	19	5.17	0.3	4.13	6.74	6.4	0.15	993	11.3
CA1604251-007	BVSP40	Merimbula STP - Effluent (comp)	28-Jul-16	7.43	2	2	27	4.71	0.5	3.57	7.12	6.92	0.29	1020	9.2
CA1604346-007	BVSP40	Merimbula STP - Effluent (comp)	03-Aug-16	7.55	4	2	26	5.05	0.1	4.44	6.61	6.26	0.26	1100	10.8
CA1604486-007	BVSP40	Merimbula STP - Effluent (comp)	11-Aug-16	7.67	2	2	25	6.28	0.1	5.26	6.96	6.63	0.17	1070	11.4
CA1604582-007	BVSP40	Merimbula STP - Effluent (comp)	17-Aug-16	7.45	2	2	25	6.07	0.1	5.4	7.87	7.55	0.39	1030	10.5
CA1604791-007	BVSP40	Merimbula STP - Effluent (comp)	25-Aug-16	7.51	3	3	15	5.32	0.1	4.59	8.5	8.2	0.87	2140	10.5
CA1604879-007	BVSP40	Merimbula STP - Effluent (comp)	31-Aug-16	7.51	3	4	28	5.28	0.1	4.32	8.68	8.51	0.41		10.9
CA1605091-007	BVSP40	Merimbula STP - Effluent (comp)	07-Sep-16	7.67	4	2	30	3.96	0.1	3.05	8.32	8.06	0.53	983	11.6
CA1605260-007	BVSP40	Merimbula STP - Effluent (comp)	15-Sep-16	7.31	6	3	39	5.85	1	3.57	9.07	8.94	3.03	1010	9.1
CA1605391-007	BVSP40	Merimbula STP - Effluent (comp)	21-Sep-16	7.65	3	2	24	3.13	0.1	2.05	4.9	4.76	2.37	986	10.9
CA1605534-007	BVSP40	Merimbula STP - Effluent (comp)	29-Sep-16	7.83	3	2	30	2.7	0.1	1.48	4.28	3.97	3.2	988	10.8

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	Cl-Combined	Cl-Free	Cl-Total
				mg/L	mg/L	mg/L
394970	BVSP40	Merimbula STP - Effluent (comp)	15-Apr-04			
396033	BVSP40	Merimbula STP - Effluent (comp)	21-Apr-04			
396505	BVSP40	Merimbula STP - Effluent (comp)	27-Apr-04			
396847	BVSP40	Merimbula STP - Effluent (comp)	29-Apr-04			
397539	BVSP40	Merimbula STP - Effluent (comp)	5-May-04			
398641	BVSP40	Merimbula STP - Effluent (comp)	13-May-04			
399389	BVSP40	Merimbula STP - Effluent (comp)	19-May-04			
400614	BVSP40	Merimbula STP - Effluent (comp)	27-May-04			
401627	BVSP40	Merimbula STP - Effluent (comp)	2-Jun-04			
402725	BVSP40	Merimbula STP - Effluent (comp)	10-Jun-04			
403360	BVSP40	Merimbula STP - Effluent (comp)	16-Jun-04			
404516	BVSP40	Merimbula STP - Effluent (comp)	24-Jun-04			
405208	BVSP40	Merimbula STP - Effluent (comp)	30-Jun-04			
406068	BVSP40	Merimbula STP - Effluent (comp)	7-Jul-04			
407242	BVSP40	Merimbula STP - Effluent (comp)	15-Jul-04			
407853	BVSP40	Merimbula STP - Effluent (comp)	22-Jul-04			
409229	BVSP40	Merimbula STP - Effluent (comp)	29-Jul-04			
409816	BVSP40	Merimbula STP - Effluent (comp)	4-Aug-04			
410948	BVSP40	Merimbula STP - Effluent (comp)	12-Aug-04			
411647	BVSP40	Merimbula STP - Effluent (comp)	18-Aug-04			
412806	BVSP40	Merimbula STP - Effluent (comp)	26-Aug-04			
413570	BVSP40	Merimbula STP - Effluent (comp)	1-Sep-04			
414736	BVSP40	Merimbula STP - Effluent (comp)	10-Sep-04			
415604	BVSP40	Merimbula STP - Effluent (comp)	15-Sep-04			
416766	BVSP40	Merimbula STP - Effluent (comp)	23-Sep-04			
417542	BVSP40	Merimbula STP - Effluent (comp)	29-Sep-04			
418380	BVSP40	Merimbula STP - Effluent (comp)	6-Oct-04			
419575	BVSP40	Merimbula STP - Effluent (comp)	14-Oct-04			
420411	BVSP40	Merimbula STP - Effluent (comp)	20-Oct-04			
421596	BVSP40	Merimbula STP - Effluent (comp)	28-Oct-04			
422570	BVSP40	Merimbula STP - Effluent (comp)	3-Nov-04			
423597	BVSP40	Merimbula STP - Effluent (comp)	11-Nov-04			
424662	BVSP40	Merimbula STP - Effluent (comp)	17-Nov-04			
426101	BVSP40	Merimbula STP - Effluent (comp)	26-Nov-04			
427156	BVSP40	Merimbula STP - Effluent (comp)	1-Dec-04			
428196	BVSP40	Merimbula STP - Effluent (comp)	9-Dec-04			
429351	BVSP40	Merimbula STP - Effluent (comp)	15-Dec-04			
430945	BVSP40	Merimbula STP - Effluent (comp)	23-Dec-04			
431330	BVSP40	Merimbula STP - Effluent (comp)	29-Dec-04			
431791	BVSP40	Merimbula STP - Effluent (comp)	5-Jan-05			
433147	BVSP40	Merimbula STP - Effluent (comp)	13-Jan-05			
434178	BVSP40	Merimbula STP - Effluent (comp)	19-Jan-05			
435343	BVSP40	Merimbula STP - Effluent (comp)	27-Jan-05			
435856	BVSP40	Merimbula STP - Effluent (comp)	2-Feb-05			
437023	BVSP40	Merimbula STP - Effluent (comp)	10-Feb-05			
437832	BVSP40	Merimbula STP - Effluent (comp)	16-Feb-05			
439041	BVSP40	Merimbula STP - Effluent (comp)	24-Feb-05			
440079	BVSP40	Merimbula STP - Effluent (comp)	2-Mar-05			
441484	BVSP40	Merimbula STP - Effluent (comp)	10-Mar-05			
442249	BVSP40	Merimbula STP - Effluent (comp)	16-Mar-05			
443206	BVSP40	Merimbula STP - Effluent (comp)	24-Mar-05			
443668	BVSP40	Merimbula STP - Effluent (comp)	28-Mar-05			
443806	BVSP40	Merimbula STP - Effluent (comp)	30-Mar-05			

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	Cl-Combined	Cl-Free	Cl-Total
				mg/L	mg/L	mg/L
444986	BVSP40	Merimbula STP - Effluent (comp)	7-Apr-05			
445977	BVSP40	Merimbula STP - Effluent (comp)	14-Apr-05			
446634	BVSP40	Merimbula STP - Effluent (comp)	20-Apr-05			
447560	BVSP40	Merimbula STP - Effluent (comp)	28-Apr-05			
448474	BVSP40	Merimbula STP - Effluent (comp)	4-May-05			
449604	BVSP40	Merimbula STP - Effluent (comp)	12-May-05			
450256	BVSP40	Merimbula STP - Effluent (comp)	19-May-05			
451433	BVSP40	Merimbula STP - Effluent (comp)	26-May-05			
452352	BVSP40	Merimbula STP - Effluent (comp)	1-Jun-05			
453323	BVSP40	Merimbula STP - Effluent (comp)	9-Jun-05			
453970	BVSP40	Merimbula STP - Effluent (comp)	15-Jun-05			
455222	BVSP40	Merimbula STP - Effluent (comp)	23-Jun-05			
456037	BVSP40	Merimbula STP - Effluent (comp)	29-Jun-05			
457014	BVSP40	Merimbula STP - Effluent (comp)	6-Jul-05			
458241	BVSP40	Merimbula STP - Effluent (comp)	14-Jul-05			
459051	BVSP40	Merimbula STP - Effluent (comp)	20-Jul-05			
460420	BVSP40	Merimbula STP - Effluent (comp)	28-Jul-05			
461259	BVSP40	Merimbula STP - Effluent (comp)	3-Aug-05			
462391	BVSP40	Merimbula STP - Effluent (comp)	11-Aug-05			
463575	BVSP40	Merimbula STP - Effluent (comp)	17-Aug-05			
464579	BVSP40	Merimbula STP - Effluent (comp)	25-Aug-05			
465385	BVSP40	Merimbula STP - Effluent (comp)	31-Aug-05			
466459	BVSP40	Merimbula STP - Effluent (comp)	7-Sep-05			
467486	BVSP40	Merimbula STP - Effluent (comp)	15-Sep-05			
468233	BVSP40	Merimbula STP - Effluent (comp)	21-Sep-05			
469440	BVSP40	Merimbula STP - Effluent (comp)	29-Sep-05			
470064	BVSP40	Merimbula STP - Effluent (comp)	5-Oct-05			
471344	BVSP40	Merimbula STP - Effluent (comp)	13-Oct-05			
472191	BVSP40	Merimbula STP - Effluent (comp)	19-Oct-05			
473781	BVSP40	Merimbula STP - Effluent (comp)	27-Oct-05			
474581	BVSP40	Merimbula STP - Effluent (comp)	2-Nov-05			
475848	BVSP40	Merimbula STP - Effluent (comp)	10-Nov-05			
476731	BVSP40	Merimbula STP - Effluent (comp)	16-Nov-05			
477981	BVSP40	Merimbula STP - Effluent (comp)	24-Nov-05			
479086	BVSP40	Merimbula STP - Effluent (comp)	30-Nov-05			
480372	BVSP40	Merimbula STP - Effluent (comp)	7-Dec-05			
481875	BVSP40	Merimbula STP - Effluent (comp)	15-Dec-05			
482842	BVSP40	Merimbula STP - Effluent (comp)	21-Dec-05			
483528	BVSP40	Merimbula STP - Effluent (comp)	29-Dec-05			
484286	BVSP40	Merimbula STP - Effluent (comp)	4-Jan-06			
485682	BVSP40	Merimbula STP - Effluent (comp)	12-Jan-06			
486678	BVSP40	Merimbula STP - Effluent (comp)	18-Jan-06			
488072	BVSP40	Merimbula STP - Effluent (comp)	25-Jan-06			
489635	BVSP40	Merimbula STP - Effluent (comp)	1-Feb-06			
490994	BVSP40	Merimbula STP - Effluent (comp)	9-Feb-06			
492099	BVSP40	Merimbula STP - Effluent (comp)	15-Feb-06			
493935	BVSP40	Merimbula STP - Effluent (comp)	23-Feb-06			
495008	BVSP40	Merimbula STP - Effluent (comp)	1-Mar-06			
496575	BVSP40	Merimbula STP - Effluent (comp)	9-Mar-06			
497782	BVSP40	Merimbula STP - Effluent (comp)	15-Mar-06			
499140	BVSP40	Merimbula STP - Effluent (comp)	23-Mar-06			
500044	BVSP40	Merimbula STP - Effluent (comp)	29-Mar-06			
501344	BVSP40	Merimbula STP - Effluent (comp)	5-Apr-06			

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	Cl-Combined	Cl-Free	Cl-Total
				mg/L	mg/L	mg/L
502622	BVSP40	Merimbula STP - Effluent (comp)	13-Apr-06			
503601	BVSP40	Merimbula STP - Effluent (comp)	19-Apr-06			
504867	BVSP40	Merimbula STP - Effluent (comp)	27-Apr-06			
505863	BVSP40	Merimbula STP - Effluent (comp)	3-May-06			
507204	BVSP40	Merimbula STP - Effluent (comp)	11-May-06			
507991	BVSP40	Merimbula STP - Effluent (comp)	17-May-06			
509294	BVSP40	Merimbula STP - Effluent (comp)	25-May-06			
510461	BVSP40	Merimbula STP - Effluent (comp)	31-May-06			
511689	BVSP40	Merimbula STP - Effluent (comp)	7-Jun-06			
512778	BVSP40	Merimbula STP - Effluent (comp)	15-Jun-06			
513518	BVSP40	Merimbula STP - Effluent (comp)	21-Jun-06			
514580	BVSP40	Merimbula STP - Effluent (comp)	29-Jun-06			
515546	BVSP40	Merimbula STP - Effluent (comp)	5-Jul-06			
517048	BVSP40	Merimbula STP - Effluent (comp)	13-Jul-06			
517926	BVSP40	Merimbula STP - Effluent (comp)	19-Jul-06			
519189	BVSP40	Merimbula STP - Effluent (comp)	27-Jul-06			
520019	BVSP40	Merimbula STP - Effluent (comp)	2-Aug-06			
521440	BVSP40	Merimbula STP - Effluent (comp)	10-Aug-06			
522226	BVSP40	Merimbula STP - Effluent (comp)	16-Aug-06			
523737	BVSP40	Merimbula STP - Effluent (comp)	24-Aug-06			
524679	BVSP40	Merimbula STP - Effluent (comp)	30-Aug-06			
525872	BVSP40	Merimbula STP - Effluent (comp)	6-Sep-06			
527216	BVSP40	Merimbula STP - Effluent (comp)	14-Sep-06			
528081	BVSP40	Merimbula STP - Effluent (comp)	20-Sep-06			
529438	BVSP40	Merimbula STP - Effluent (comp)	28-Sep-06			
530279	BVSP40	Merimbula STP - Effluent (comp)	4-Oct-06			
531935	BVSP40	Merimbula STP - Effluent (comp)	12-Oct-06			
532842	BVSP40	Merimbula STP - Effluent (comp)	18-Oct-06			
534242	BVSP40	Merimbula STP - Effluent (comp)	26-Oct-06			
535359	BVSP40	Merimbula STP - Effluent (comp)	1-Nov-06			
536610	BVSP40	Merimbula STP - Effluent (comp)	9-Nov-06			
537448	BVSP40	Merimbula STP - Effluent (comp)	15-Nov-06			
539128	BVSP40	Merimbula STP - Effluent (comp)	23-Nov-06			
539902	BVSP40	Merimbula STP - Effluent (comp)	29-Nov-06			
541297	BVSP40	Merimbula STP - Effluent (comp)	6-Dec-06			
542562	BVSP40	Merimbula STP - Effluent (comp)	14-Dec-06			
543591	BVSP40	Merimbula STP - Effluent (comp)	20-Dec-06			
544392	BVSP40	Merimbula STP - Effluent (comp)	28-Dec-06			
544907	BVSP40	Merimbula STP - Effluent (comp)	3-Jan-07			
546046	BVSP40	Merimbula STP - Effluent (comp)	11-Jan-07			
547120	BVSP40	Merimbula STP - Effluent (comp)	17-Jan-07			
548490	BVSP40	Merimbula STP - Effluent (comp)	24-Jan-07			
549824	BVSP40	Merimbula STP - Effluent (comp)	31-Jan-07			
550931	BVSP40	Merimbula STP - Effluent (comp)	7-Feb-07			
552402	BVSP40	Merimbula STP - Effluent (comp)	15-Feb-07			
553508	BVSP40	Merimbula STP - Effluent (comp)	21-Feb-07			
555220	BVSP40	Merimbula STP - Effluent (comp)	1-Mar-07			
556242	BVSP40	Merimbula STP - Effluent (comp)	7-Mar-07			
557611	BVSP40	Merimbula STP - Effluent (comp)	15-Mar-07			
558712	BVSP40	Merimbula STP - Effluent (comp)	21-Mar-07			
560375	BVSP40	Merimbula STP - Effluent (comp)	29-Mar-07			
561101	BVSP40	Merimbula STP - Effluent (comp)	4-Apr-07			
562402	BVSP40	Merimbula STP - Effluent (comp)	12-Apr-07			

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	Cl-Combined	Cl-Free	Cl-Total
				mg/L	mg/L	mg/L
563428	BVSP40	Merimbula STP - Effluent (comp)	18-Apr-07			
564618	BVSP40	Merimbula STP - Effluent (comp)	26-Apr-07			
565674	BVSP40	Merimbula STP - Effluent (comp)	2-May-07			
567501	BVSP40	Merimbula STP - Effluent (comp)	10-May-07			
568639	BVSP40	Merimbula STP - Effluent (comp)	16-May-07			
569938	BVSP40	Merimbula STP - Effluent (comp)	24-May-07			
570830	BVSP40	Merimbula STP - Effluent (comp)	30-May-07			
572380	BVSP40	Merimbula STP - Effluent (comp)	6-Jun-07			
573836	BVSP40	Merimbula STP - Effluent (comp)	14-Jun-07			
574666	BVSP40	Merimbula STP - Effluent (comp)	20-Jun-07			
576022	BVSP40	Merimbula STP - Effluent (comp)	28-Jun-07			
577296	BVSP40	Merimbula STP - Effluent (comp)	4-Jul-07			
578670	BVSP40	Merimbula STP - Effluent (comp)	13-Jul-07			
579542	BVSP40	Merimbula STP - Effluent (comp)	18-Jul-07			
581164	BVSP40	Merimbula STP - Effluent (comp)	26-Jul-07			
582455	BVSP40	Merimbula STP - Effluent (comp)	1-Aug-07			
583943	BVSP40	Merimbula STP - Effluent (comp)	9-Aug-07			
584858	BVSP40	Merimbula STP - Effluent (comp)	15-Aug-07			
586298	BVSP40	Merimbula STP - Effluent (comp)	23-Aug-07			
587405	BVSP40	Merimbula STP - Effluent (comp)	29-Aug-07			
588540	BVSP40	Merimbula STP - Effluent (comp)	5-Sep-07			
589664	BVSP40	Merimbula STP - Effluent (comp)	13-Sep-07			
590576	BVSP40	Merimbula STP - Effluent (comp)	19-Sep-07			
591872	BVSP40	Merimbula STP - Effluent (comp)	27-Sep-07			
592649	BVSP40	Merimbula STP - Effluent (comp)	3-Oct-07			
593947	BVSP40	Merimbula STP - Effluent (comp)	11-Oct-07			
594819	BVSP40	Merimbula STP - Effluent (comp)	17-Oct-07			
596281	BVSP40	Merimbula STP - Effluent (comp)	25-Oct-07			
597129	BVSP40	Merimbula STP - Effluent (comp)	31-Oct-07			
598097	BVSP40	Merimbula STP - Effluent (comp)	7-Nov-07			
599512	BVSP40	Merimbula STP - Effluent (comp)	15-Nov-07			
600625	BVSP40	Merimbula STP - Effluent (comp)	21-Nov-07			
602062	BVSP40	Merimbula STP - Effluent (comp)	29-Nov-07			
603205	BVSP40	Merimbula STP - Effluent (comp)	5-Dec-07			
605254	BVSP40	Merimbula STP - Effluent (comp)	13-Dec-07			
606428	BVSP40	Merimbula STP - Effluent (comp)	19-Dec-07			
607456	BVSP40	Merimbula STP - Effluent (comp)	27-Dec-07			
607909	BVSP40	Merimbula STP - Effluent (comp)	2-Jan-08			
609653	BVSP40	Merimbula STP - Effluent (comp)	10-Jan-08			
610464	BVSP40	Merimbula STP - Effluent (comp)	16-Jan-08			
612112	BVSP40	Merimbula STP - Effluent (comp)	24-Jan-08			
612871	BVSP40	Merimbula STP - Effluent (comp)	30-Jan-08			
614285	BVSP40	Merimbula STP - Effluent (comp)	6-Feb-08			
616197	BVSP40	Merimbula STP - Effluent (comp)	14-Feb-08			
617314	BVSP40	Merimbula STP - Effluent (comp)	20-Feb-08			
618895	BVSP40	Merimbula STP - Effluent (comp)	28-Feb-08			
619938	BVSP40	Merimbula STP - Effluent (comp)	5-Mar-08			
621406	BVSP40	Merimbula STP - Effluent (comp)	13-Mar-08			
622721	BVSP40	Merimbula STP - Effluent (comp)	19-Mar-08			
624222	BVSP40	Merimbula STP - Effluent (comp)	27-Mar-08			
625369	BVSP40	Merimbula STP - Effluent (comp)	2-Apr-08			
627096	BVSP40	Merimbula STP - Effluent (comp)	10-Apr-08			
628115	BVSP40	Merimbula STP - Effluent (comp)	16-Apr-08			

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	Cl-Combined	Cl-Free	Cl-Total
				mg/L	mg/L	mg/L
629618	BVSP40	Merimbula STP - Effluent (comp)	24-Apr-08			
630284	BVSP40	Merimbula STP - Effluent (comp)	30-Apr-08			
631810	BVSP40	Merimbula STP - Effluent (comp)	7-May-08			
633470	BVSP40	Merimbula STP - Effluent (comp)	15-May-08			
634289	BVSP40	Merimbula STP - Effluent (comp)	21-May-08			
635707	BVSP40	Merimbula STP - Effluent (comp)	29-May-08			
636545	BVSP40	Merimbula STP - Effluent (comp)	4-Jun-08			
637914	BVSP40	Merimbula STP - Effluent (comp)	12-Jun-08			
638703	BVSP40	Merimbula STP - Effluent (comp)	18-Jun-08			
639991	BVSP40	Merimbula STP - Effluent (comp)	26-Jun-08			
640834	BVSP40	Merimbula STP - Effluent (comp)	2-Jul-08			
641954	BVSP40	Merimbula STP - Effluent (comp)	10-Jul-08			
642827	BVSP40	Merimbula STP - Effluent (comp)	16-Jul-08			
644050	BVSP40	Merimbula STP - Effluent (comp)	24-Jul-08			
645330	BVSP40	Merimbula STP - Effluent (comp)	30-Jul-08			
646397	BVSP40	Merimbula STP - Effluent (comp)	6-Aug-08			
647549	BVSP40	Merimbula STP - Effluent (comp)	14-Aug-08			
648381	BVSP40	Merimbula STP - Effluent (comp)	20-Aug-08			
649727	BVSP40	Merimbula STP - Effluent (comp)	28-Aug-08			
650481	BVSP40	Merimbula STP - Effluent (comp)	3-Sep-08			
651710	BVSP40	Merimbula STP - Effluent (comp)	11-Sep-08			
652695	BVSP40	Merimbula STP - Effluent (comp)	17-Sep-08			
654163	BVSP40	Merimbula STP - Effluent (comp)	25-Sep-08			
655023	BVSP40	Merimbula STP - Effluent (comp)	1-Oct-08			
655916	BVSP40	Merimbula STP - Effluent (comp)	9-Oct-08			
656958	BVSP40	Merimbula STP - Effluent (comp)	15-Oct-08			
658416	BVSP40	Merimbula STP - Effluent (comp)	24-Oct-08			
659434	BVSP40	Merimbula STP - Effluent (comp)	29-Oct-08			
660452	BVSP40	Merimbula STP - Effluent (comp)	5-Nov-08			
662023	BVSP40	Merimbula STP - Effluent (comp)	13-Nov-08			
663332	BVSP40	Merimbula STP - Effluent (comp)	19-Nov-08			
664833	BVSP40	Merimbula STP - Effluent (comp)	27-Nov-08			
665741	BVSP40	Merimbula STP - Effluent (comp)	3-Dec-08			
667609	BVSP40	Merimbula STP - Effluent (comp)	11-Dec-08			
668860	BVSP40	Merimbula STP - Effluent (comp)	17-Dec-08			
669580	BVSP40	Merimbula STP - Effluent (comp)	22-Dec-08			
670375	BVSP40	Merimbula STP - Effluent (comp)	30-Dec-08			
671280	BVSP40	Merimbula STP - Effluent (comp)	7-Jan-09			
672342	BVSP40	Merimbula STP - Effluent (comp)	14-Jan-09			
673494	BVSP40	Merimbula STP - Effluent (comp)	21-Jan-09			
674859	BVSP40	Merimbula STP - Effluent (comp)	29-Jan-09			
675900	BVSP40	Merimbula STP - Effluent (comp)	4-Feb-09			
677795	BVSP40	Merimbula STP - Effluent (comp)	12-Feb-09			
678907	BVSP40	Merimbula STP - Effluent (comp)	19-Feb-09			
680574	BVSP40	Merimbula STP - Effluent (comp)	26-Feb-09			
681458	BVSP40	Merimbula STP - Effluent (comp)	4-Mar-09			
682668	BVSP40	Merimbula STP - Effluent (comp)	12-Mar-09			
683489	BVSP40	Merimbula STP - Effluent (comp)	18-Mar-09			
685790	BVSP40	Merimbula STP - Effluent (comp)	26-Mar-09			
686431	BVSP40	Merimbula STP - Effluent (comp)	1-Apr-09			
687639	BVSP40	Merimbula STP - Effluent (comp)	8-Apr-09			
688418	BVSP40	Merimbula STP - Effluent (comp)	15-Apr-09			
689868	BVSP40	Merimbula STP - Effluent (comp)	23-Apr-09			

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	CI-Combined	CI-Free	CI-Total
				mg/L	mg/L	mg/L
690787	BVSP40	Merimbula STP - Effluent (comp)	29-Apr-09			
692345	BVSP40	Merimbula STP - Effluent (comp)	6-May-09			
693554	BVSP40	Merimbula STP - Effluent (comp)	14-May-09			
694492	BVSP40	Merimbula STP - Effluent (comp)	20-May-09			
696277	BVSP40	Merimbula STP - Effluent (comp)	28-May-09			
697071	BVSP40	Merimbula STP - Effluent (comp)	3-Jun-09			
698051	BVSP40	Merimbula STP - Effluent (comp)	11-Jun-09			
698892	BVSP40	Merimbula STP - Effluent (comp)	17-Jun-09			
700668	BVSP40	Merimbula STP - Effluent (comp)	25-Jun-09			
701345	BVSP40	Merimbula STP - Effluent (comp)	1-Jul-09			
702425	BVSP40	Merimbula STP - Effluent (comp)	9-Jul-09			
703155	BVSP40	Merimbula STP - Effluent (comp)	15-Jul-09			
704827	BVSP40	Merimbula STP - Effluent (comp)	23-Jul-09	0.03	0.06	0.09
706256	BVSP40	Merimbula STP - Effluent (comp)	29-Jul-09	<0.01	0.06	0.06
706977	BVSP40	Merimbula STP - Effluent (comp)	5-Aug-09			
708179	BVSP40	Merimbula STP - Effluent (comp)	13-Aug-09	<0.01	0.19	0.19
709292	BVSP40	Merimbula STP - Effluent (comp)	19-Aug-09	0.07	0.05	0.12
710877	BVSP40	Merimbula STP - Effluent (comp)	27-Aug-09	0.05	0.04	0.09
711746	BVSP40	Merimbula STP - Effluent (comp)	2-Sep-09	<0.01	0.08	0.08
712994	BVSP40	Merimbula STP - Effluent (comp)	10-Sep-09	<0.01	0.08	0.08
713744	BVSP40	Merimbula STP - Effluent (comp)	16-Sep-09	0.08	0.08	0.16
715028	BVSP40	Merimbula STP - Effluent (comp)	24-Sep-09	0.02	0.06	0.08
716044	BVSP40	Merimbula STP - Effluent (comp)	30-Sep-09	0.21	0.04	0.25
716788	BVSP40	Merimbula STP - Effluent (comp)	7-Oct-09	0.01	0.09	0.1
718341	BVSP40	Merimbula STP - Effluent (comp)	15-Oct-09	0.09	0.12	0.21
719062	BVSP40	Merimbula STP - Effluent (comp)	21-Oct-09	0.1	0.04	0.14
720550	BVSP40	Merimbula STP - Effluent (comp)	29-Oct-09	<0.01	0.04	0.04
721647	BVSP40	Merimbula STP - Effluent (comp)	4-Nov-09	0.04	0.08	0.12
723144	BVSP40	Merimbula STP - Effluent (comp)	12-Nov-09	0.13	0.05	0.18
724061	BVSP40	Merimbula STP - Effluent (comp)	18-Nov-09	0.03	0.11	0.14
725353	BVSP40	Merimbula STP - Effluent (comp)	26-Nov-09	0.07	0.05	0.12
726500	BVSP40	Merimbula STP - Effluent (comp)	2-Dec-09	0.06	0.05	0.11
727874	BVSP40	Merimbula STP - Effluent (comp)	10-Dec-09	0.05	0.06	0.11
729006	BVSP40	Merimbula STP - Effluent (comp)	16-Dec-09	0.01	0.05	0.06
730325	BVSP40	Merimbula STP - Effluent (comp)	23-Dec-09	0.02	0.06	0.08
730876	BVSP40	Merimbula STP - Effluent (comp)	30-Dec-09	0.02	0.09	0.11
731858	BVSP40	Merimbula STP - Effluent (comp)	6-Jan-10	0.04	0.01	0.05
733305	BVSP40	Merimbula STP - Effluent (comp)	14-Jan-10			
734786	BVSP40	Merimbula STP - Effluent (comp)	20-Jan-10			
736349	BVSP40	Merimbula STP - Effluent (comp)	28-Jan-10	0.37	0.04	0.41
737346	BVSP40	Merimbula STP - Effluent (comp)	3-Feb-10			
738883	BVSP40	Merimbula STP - Effluent (comp)	11-Feb-10	0.06	0.03	0.09
740166	BVSP40	Merimbula STP - Effluent (comp)	17-Feb-10	0.04	0.09	0.13
742191	BVSP40	Merimbula STP - Effluent (comp)	25-Feb-10	0.06	0.05	0.11
743319	BVSP40	Merimbula STP - Effluent (comp)	3-Mar-10	0.01	0.1	0.11
744688	BVSP40	Merimbula STP - Effluent (comp)	11-Mar-10	<0.01	0.04	0.04
745996	BVSP40	Merimbula STP - Effluent (comp)	17-Mar-10	0.2	0.03	0.23
747581	BVSP40	Merimbula STP - Effluent (comp)	25-Mar-10	0.05	0.04	0.09
749246	BVSP40	Merimbula STP - Effluent (comp)	7-Apr-10	0.01	0.08	0.09
750784	BVSP40	Merimbula STP - Effluent (comp)	15-Apr-10			
751852	BVSP40	Merimbula STP - Effluent (comp)	21-Apr-10	0.02	0.06	0.08
753093	BVSP40	Merimbula STP - Effluent (comp)	29-Apr-10			
753912	BVSP40	Merimbula STP - Effluent (comp)	5-May-10	0.04	0	0.04

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	CI-Combined	CI-Free	CI-Total
				mg/L	mg/L	mg/L
755203	BVSP40	Merimbula STP - Effluent (comp)	13-May-10	0.02	0.06	0.08
756211	BVSP40	Merimbula STP - Effluent (comp)	19-May-10			
757932	BVSP40	Merimbula STP - Effluent (comp)	27-May-10	0.09	0.16	0.25
759439	BVSP40	Merimbula STP - Effluent (comp)	2-Jun-10	0.02	0.14	0.16
760928	BVSP40	Merimbula STP - Effluent (comp)	10-Jun-10			
761830	BVSP40	Merimbula STP - Effluent (comp)	16-Jun-10			
763216	BVSP40	Merimbula STP - Effluent (comp)	24-Jun-10	0.03	0.08	0.11
763960	BVSP40	Merimbula STP - Effluent (comp)	30-Jun-10			
764951	BVSP40	Merimbula STP - Effluent (comp)	7-Jul-10	0.13	0.04	0.17
766109	BVSP40	Merimbula STP - Effluent (comp)	15-Jul-10	0.09	0.08	0.17
766766	BVSP40	Merimbula STP - Effluent (comp)	21-Jul-10	0.04	0.08	0.12
767822	BVSP40	Merimbula STP - Effluent (comp)	29-Jul-10	0.08	0.03	0.11
796898	BVSP40	Merimbula STP - Effluent (comp)	4-Aug-10	0.06	0	0.06
797999	BVSP40	Merimbula STP - Effluent (comp)	12-Aug-10			
798907	BVSP40	Merimbula STP - Effluent (comp)	18-Aug-10	0.04	0.05	0.09
800062	BVSP40	Merimbula STP - Effluent (comp)	26-Aug-10	<0.01	0.04	0.04
800817	BVSP40	Merimbula STP - Effluent (comp)	1-Sep-10	0.04	0.05	0.09
801807	BVSP40	Merimbula STP - Effluent (comp)	9-Sep-10	0.04	0.08	0.12
802584	BVSP40	Merimbula STP - Effluent (comp)	15-Sep-10	0.04	0.05	0.09
804181	BVSP40	Merimbula STP - Effluent (comp)	29-Sep-10	0.02	0.03	0.05
804813	BVSP40	Merimbula STP - Effluent (comp)	6-Oct-10	0.04	0.06	0.1
806075	BVSP40	Merimbula STP - Effluent (comp)	14-Oct-10	<0.01	0.04	0.04
806999	BVSP40	Merimbula STP - Effluent (comp)	20-Oct-10	<0.01	0.04	0.04
808255	BVSP40	Merimbula STP - Effluent (comp)	28-Oct-10	0.01	0.02	0.03
808914	BVSP40	Merimbula STP - Effluent (comp)	3-Nov-10	0.01	0.02	0.03
810097	BVSP40	Merimbula STP - Effluent (comp)	11-Nov-10	0.05	0.03	0.08
810843	BVSP40	Merimbula STP - Effluent (comp)	17-Nov-10	0.01	0.03	0.04
812276	BVSP40	Merimbula STP - Effluent (comp)	25-Nov-10	0.01	0.05	0.05
813006	BVSP40	Merimbula STP - Effluent (comp)	1-Dec-10	0.03	0.01	0.04
814530	BVSP40	Merimbula STP - Effluent (comp)	9-Dec-10	0.09	0.01	0.1
815428	BVSP40	Merimbula STP - Effluent (comp)	15-Dec-10	0.03	0.08	0.11
816553	BVSP40	Merimbula STP - Effluent (comp)	22-Dec-10	0.03	0	0.03
	BVSP40	Merimbula STP - Effluent (comp)	29-Dec-10	0.04	0	0.04
817832	BVSP40	Merimbula STP - Effluent (comp)	5-Jan-11	0.03	0.05	0.08
818723	BVSP40	Merimbula STP - Effluent (comp)	12-Jan-11	0.01	0.01	0.02
819829	BVSP40	Merimbula STP - Effluent (comp)	19-Jan-11	0.03	0.02	0.05
820877	BVSP40	Merimbula STP - Effluent (comp)	27-Jan-11	0.03	0	0.03
821833	BVSP40	Merimbula STP - Effluent (comp)	2-Feb-11	0.02	0	0.02
822917	BVSP40	Merimbula STP - Effluent (comp)	9-Feb-11	0.08	0.01	0.09
824415	BVSP40	Merimbula STP - Effluent (comp)	17-Feb-11	0.08	0.05	0.13
825680	BVSP40	Merimbula STP - Effluent (comp)	23-Feb-11			
826926	BVSP40	Merimbula STP - Effluent (comp)	2-Mar-11	0.08	0.09	0.17
828160	BVSP40	Merimbula STP - Effluent (comp)	9-Mar-11	0.13	0.01	0.14
829420	BVSP40	Merimbula STP - Effluent (comp)	17-Mar-11	0.04	0.08	0.12
830548	BVSP40	Merimbula STP - Effluent (comp)	23-Mar-11	0.24	0.04	0.28
831904	BVSP40	Merimbula STP - Effluent (comp)	31-Mar-11			
832624	BVSP40	Merimbula STP - Effluent (comp)	7-Apr-11	0.13	0.05	0.18
834037	BVSP40	Merimbula STP - Effluent (comp)	14-Apr-11	0.15	0.09	0.24
834847	BVSP40	Merimbula STP - Effluent (comp)	20-Apr-11	0.12	0.06	0.18
835505	BVSP40	Merimbula STP - Effluent (comp)	28-Apr-11	0.08	0.04	0.12
836287	BVSP40	Merimbula STP - Effluent (comp)	4-May-11	0.11	0.05	0.16
837463	BVSP40	Merimbula STP - Effluent (comp)	12-May-11	0.14	0.04	0.18

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	CI-Combined	CI-Free	CI-Total
				mg/L	mg/L	mg/L
838322	BVSP40	Merimbula STP - Effluent (comp)	18-May-11	0.19	0.08	0.27
839671	BVSP40	Merimbula STP - Effluent (comp)	26-May-11	0.29	0	0.29
840338	BVSP40	Merimbula STP - Effluent (comp)	1-Jun-11	0.41	0.04	0.45
841502	BVSP40	Merimbula STP - Effluent (comp)	9-Jun-11	0.09	0.05	0.14
842170	BVSP40	Merimbula STP - Effluent (comp)	15-Jun-11	0.1	0.05	0.15
843430	BVSP40	Merimbula STP - Effluent (comp)	23-Jun-11	0.14	0.04	0.18
844119	BVSP40	Merimbula STP - Effluent (comp)	29-Jun-11	0.11	0.08	0.19
845111	BVSP40	Merimbula STP - Effluent (comp)	6-Jul-11	0.09	0.08	0.17
846118	BVSP40	Merimbula STP - Effluent (comp)	14-Jul-11	0.18	0.08	0.26
847082	BVSP40	Merimbula STP - Effluent (comp)	20-Jul-11	0.09	0.1	0.19
848099	BVSP40	Merimbula STP - Effluent (comp)	28-Jul-11	0.1	0.13	0.23
848666	BVSP40	Merimbula STP - Effluent (comp)	3-Aug-11	0.05	0	0.05
849797	BVSP40	Merimbula STP - Effluent (comp)	11-Aug-11	0.09	0.09	0.18
850641	BVSP40	Merimbula STP - Effluent (comp)	17-Aug-11	0.05	0.01	0.06
851833	BVSP40	Merimbula STP - Effluent (comp)	25-Aug-11	0.02	0.09	0.11
852505	BVSP40	Merimbula STP - Effluent (comp)	31-Aug-11	0.09	0.02	0.11
853375	BVSP40	Merimbula STP - Effluent (comp)	7-Sep-11	0.09	0.19	0.28
854490	BVSP40	Merimbula STP - Effluent (comp)	15-Sep-11	0.1	0.06	0.16
855223	BVSP40	Merimbula STP - Effluent (comp)	21-Sep-11	0.06	0.03	0.09
856100	BVSP40	Merimbula STP - Effluent (comp)	29-Sep-11	0.06	0.02	0.08
856714	BVSP40	Merimbula STP - Effluent (comp)	5-Oct-11	0.08	0.05	0.13
857732	BVSP40	Merimbula STP - Effluent (comp)	13-Oct-11	0.02	0.03	0.05
858517	BVSP40	Merimbula STP - Effluent (comp)	19-Oct-11	0.05	0.05	0.1
859971	BVSP40	Merimbula STP - Effluent (comp)	27-Oct-11	0.01	0	0
860659	BVSP40	Merimbula STP - Effluent (comp)	2-Nov-11	0.04	0.06	0.1
861723	BVSP40	Merimbula STP - Effluent (comp)	10-Nov-11	0.01	0	0
862556	BVSP40	Merimbula STP - Effluent (comp)	16-Nov-11	0.05	0	0.05
864014	BVSP40	Merimbula STP - Effluent (comp)	24-Nov-11	0.01	0	0
864773	BVSP40	Merimbula STP - Effluent (comp)	30-Nov-11	0.01	0	0
865787	BVSP40	Merimbula STP - Effluent (comp)	7-Dec-11	0.07	0.04	0.11
867007	BVSP40	Merimbula STP - Effluent (comp)	15-Dec-11	0.04	0.1	0.14
868029	BVSP40	Merimbula STP - Effluent (comp)	21-Dec-11	0.08	0.03	0.08
868696	BVSP40	Merimbula STP - Effluent (comp)	29-Dec-11	0.05	0.03	0.05
869309	BVSP40	Merimbula STP - Effluent (comp)	4-Jan-12	0.05	0.03	0.05
870643	BVSP40	Merimbula STP - Effluent (comp)	12-Jan-12	0.03	0.05	0.08
871465	BVSP40	Merimbula STP - Effluent (comp)	18-Jan-12	0.03	0.03	0.04
872380	BVSP40	Merimbula STP - Effluent (comp)	24-Jan-12	0.04	0.03	0.04
873226	BVSP40	Merimbula STP - Effluent (comp)	1-Feb-12	0.03	0.03	0.03
874719	BVSP40	Merimbula STP - Effluent (comp)	9-Feb-12	0.06	0.04	0.1
875499	BVSP40	Merimbula STP - Effluent (comp)	15-Feb-12	0.08	0.03	0.11
876844	BVSP40	Merimbula STP - Effluent (comp)	23-Feb-12	0.06	0.06	0.12
877570	BVSP40	Merimbula STP - Effluent (comp)	29-Feb-12	0.08	0.03	0.08
878943	BVSP40	Merimbula STP - Effluent (comp)	7-Mar-12	0.06	0.03	0.06
880262	BVSP40	Merimbula STP - Effluent (comp)	15-Mar-12	0.03	0.05	0.08
881130	BVSP40	Merimbula STP - Effluent (comp)	21-Mar-12	0.09	0.04	0.13
882515	BVSP40	Merimbula STP - Effluent (comp)	30-Mar-12	0.03	0.07	0.1
883417	BVSP40	Merimbula STP - Effluent (comp)	4-Apr-12	0.06	0.05	0.11
884182	BVSP40	Merimbula STP - Effluent (comp)	12-Apr-12	0.13	0.39	0.52
884864	BVSP40	Merimbula STP - Effluent (comp)	18-Apr-12	0.17	0.14	0.31
886221	BVSP40	Merimbula STP - Effluent (comp)	26-Apr-12	0.2	0.33	0.53

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	CI-Combined	CI-Free	CI-Total
				mg/L	mg/L	mg/L
886974	BVSP40	Merimbula STP - Effluent (comp)	2-May-12	0.35	0.34	0.69
888274	BVSP40	Merimbula STP - Effluent (comp)	10-May-12	0.38	0.11	0.49
889009	BVSP40	Merimbula STP - Effluent (comp)	16-May-12	0.53	0.3	0.83
890296	BVSP40	Merimbula STP - Effluent (comp)	24-May-12	0.39	0.31	0.7
891021	BVSP40	Merimbula STP - Effluent (comp)	30-May-12	1	0.55	1.55
892163	BVSP40	Merimbula STP - Effluent (comp)	6-Jun-12	0.41	0.33	0.74
893223	BVSP40	Merimbula STP - Effluent (comp)	14-Jun-12	0.52	0.6	1.12
893970	BVSP40	Merimbula STP - Effluent (comp)	20-Jun-12	0.04	0.03	0.07
894961	BVSP40	Merimbula STP - Effluent (comp)	28-Jun-12	0.6	0.4	1
895733	BVSP40	Merimbula STP - Effluent (comp)	4-Jul-12	0.27	0.34	0.61
896946	BVSP40	Merimbula STP - Effluent (comp)	12-Jul-12	0.36	0.57	0.93
897838	BVSP40	Merimbula STP - Effluent (comp)	18-Jul-12	0.37	0.35	0.72
898820	BVSP40	Merimbula STP - Effluent (comp)	26-Jul-12	0.36	0.28	0.64
899425	BVSP40	Merimbula STP - Effluent (comp)	1-Aug-12	0.44	0.4	0.84
900474	BVSP40	Merimbula STP - Effluent (comp)	9-Aug-12	0.44	0.54	0.98
901326	BVSP40	Merimbula STP - Effluent (comp)	15-Aug-12	0.28	0.27	0.55
902501	BVSP40	Merimbula STP - Effluent (comp)	23-Aug-12	0.32	0.28	0.6
903358	BVSP40	Merimbula STP - Effluent (comp)	29-Aug-12	0.33	0.24	0.57
904242	BVSP40	Merimbula STP - Effluent (comp)	5-Sep-12	0.15	0.1	0.25
905425	BVSP40	Merimbula STP - Effluent (comp)	13-Sep-12	0.3	0.11	0.41
906059	BVSP40	Merimbula STP - Effluent (comp)	19-Sep-12	0.38	0.1	0.48
907390	BVSP40	Merimbula STP - Effluent (comp)	27-Sep-12	0.18	0.13	0.31
907874	BVSP40	Merimbula STP - Effluent (comp)	3-Oct-12	0.2	0.1	0.3
909045	BVSP40	Merimbula STP - Effluent (comp)	11-Oct-12	0.21	0.09	0.3
909804	BVSP40	Merimbula STP - Effluent (comp)	17-Oct-12	0.29	0.09	0.38
911226	BVSP40	Merimbula STP - Effluent (comp)	25-Oct-12	0.2	0.18	0.38
911916	BVSP40	Merimbula STP - Effluent (comp)	31-Oct-12	0.32	0.21	0.53
912921	BVSP40	Merimbula STP - Effluent (comp)	07-Nov-12	0.18	0.09	0.27
914459	BVSP40	Merimbula STP - Effluent (comp)	15-Nov-12	0.03	0.06	0.08
915168	BVSP40	Merimbula STP - Effluent (comp)	21-Nov-12	0.05	0.09	0.14
916618	BVSP40	Merimbula STP - Effluent (comp)	30-Nov-12	0.08	0.1	0.18
917392	BVSP40	Merimbula STP - Effluent (comp)	5-Dec-12	0.05	0.03	0.08
918869	BVSP40	Merimbula STP - Effluent (comp)	13-Dec-12	0.05	0.03	0.08
919697	BVSP40	Merimbula STP - Effluent (comp)	19-Dec-12	0.07	0.07	0.14
920441	BVSP40	Merimbula STP - Effluent (comp)	27-Dec-12	0.13	0.03	0.13
920907	BVSP40	Merimbula STP - Effluent (comp)	2-Jan-13	0.03	0.07	0.09
921928	BVSP40	Merimbula STP - Effluent (comp)	10-Jan-13	0.09	0.03	0.09
922560	BVSP40	Merimbula STP - Effluent (comp)	16-Jan-13	0.03	0.03	0.06
923990	BVSP40	Merimbula STP - Effluent (comp)	24-Jan-13	0.03	0.23	0.26
924639	BVSP40	Merimbula STP - Effluent (comp)	30-Jan-13	0.06	0.09	0.15
925720	BVSP40	Merimbula STP - Effluent (comp)	06-Feb-13	0.03	0.03	0.03
926908	BVSP40	Merimbula STP - Effluent (comp)	14-Feb-13	0.09	0.03	0.09
927721	BVSP40	Merimbula STP - Effluent (comp)	20-Feb-13	0.11	0.13	0.24
928979	BVSP40	Merimbula STP - Effluent (comp)	28-Feb-13	0.12	0.1	0.22
929764	BVSP40	Merimbula STP - Effluent (comp)	06-Mar-13	0.03	0.08	0.11
930959	BVSP40	Merimbula STP - Effluent (comp)	14-Mar-13	0.16	0.23	0.39
931727	BVSP40	Merimbula STP - Effluent (comp)	20-Mar-13	0.15	0.08	0.23
932793	BVSP40	Merimbula STP - Effluent (comp)	27-Mar-13	0.13	0.03	0.13
933383	BVSP40	Merimbula STP - Effluent (comp)	03-Apr-13	0.1	0.16	0.26
934677	BVSP40	Merimbula STP - Effluent (comp)	11-Apr-13	0.07	0.03	0.1

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	CI-Combined	CI-Free	CI-Total
				mg/L	mg/L	mg/L
935457	BVSP40	Merimbula STP - Effluent (comp)	17-Apr-13	0.12	0.03	0.15
936256	BVSP40	Merimbula STP - Effluent (comp)	23-Apr-13	0.18	0.34	0.52
937088	BVSP40	Merimbula STP - Effluent (comp)	01-May-13	0.16	0.22	0.38
938349	BVSP40	Merimbula STP - Effluent (comp)	09-May-13	0.22	0.16	0.38
939271	BVSP40	Merimbula STP - Effluent (comp)	15-May-13	0.38	0.12	0.5
940544	BVSP40	Merimbula STP - Effluent (comp)	23-May-13	0.29	0.44	0.73
941492	BVSP40	Merimbula STP - Effluent (comp)	31-May-13	0.22	0.37	0.59
942448	BVSP40	Merimbula STP - Effluent (comp)	06-Jun-13	0.25	0.62	0.87
943242	BVSP40	Merimbula STP - Effluent (comp)	13-Jun-13	0.17	0.26	0.43
944251	BVSP40	Merimbula STP - Effluent (comp)	20-Jun-13	0.16	0.25	0.41
945244	BVSP40	Merimbula STP - Effluent (comp)	27-Jun-13	0.19	0.03	0.22
945998	BVSP40	Merimbula STP - Effluent (comp)	03-Jul-13	0.17	0.11	0.28
947096	BVSP40	Merimbula STP - Effluent (comp)	11-Jul-13	0.19	0.22	0.41
947701	BVSP40	Merimbula STP - Effluent (comp)	17-Jul-13	0.11	0.12	0.23
948954	BVSP40	Merimbula STP - Effluent (comp)	25-Jul-13	0.09	0.15	0.24
949594	BVSP40	Merimbula STP - Effluent (comp)	31-Jul-13	0.1	0.19	0.29
950628	BVSP40	Merimbula STP - Effluent (comp)	07-Aug-13	0.14	0.1	0.24
951714	BVSP40	Merimbula STP - Effluent (comp)	15-Aug-13	0.12	0.11	0.23
952460	BVSP40	Merimbula STP - Effluent (comp)	21-Aug-13	0.17	0.12	0.29
953561	BVSP40	Merimbula STP - Effluent (comp)	29-Aug-13	0.13	0.24	0.37
954061	BVSP40	Merimbula STP - Effluent (comp)	04-Sep-13	0.17	0.15	0.32
955023	BVSP40	Merimbula STP - Effluent (comp)	12-Sep-13	0.05	0.22	0.27
956005	BVSP40	Merimbula STP - Effluent (comp)	18-Sep-13	0.07	0.04	0.11
957449	BVSP40	Merimbula STP - Effluent (comp)	26-Sep-13	0.03	0.19	0.21
958123	BVSP40	Merimbula STP - Effluent (comp)	02-Oct-13	0.11	0.15	0.26
959140	BVSP40	Merimbula STP - Effluent (comp)	10-Oct-13	0.05	0.27	0.32
960005	BVSP40	Merimbula STP - Effluent (comp)	16-Oct-13	0.12	0.1	0.22
961163	BVSP40	Merimbula STP - Effluent (comp)	24-Oct-13	0.11	0.1	0.21
961755	BVSP40	Merimbula STP - Effluent (comp)	30-Oct-13	0.05	0.09	0.14
962763	BVSP40	Merimbula STP - Effluent (comp)	06-Nov-13	0.12	0.13	0.25
964035	BVSP40	Merimbula STP - Effluent (comp)	14-Nov-13	0.04	0.03	0.07
964921	BVSP40	Merimbula STP - Effluent (comp)	20-Nov-13	0.03	0.04	0.07
	BVSP40	Merimbula STP - Effluent (comp)	27-Nov-13	0.08	0.11	0.19
	BVSP40	Merimbula STP - Effluent (comp)	05-Dec-13			
CA1300296-005	BVSP40	Merimbula STP - Effluent (comp)	12-Dec-13	0.03	0.04	0.07
CA1300368-005	BVSP40	Merimbula STP - Effluent (comp)	18-Dec-13	0.03	0.09	0.11
CA1300423-006	BVSP40	Merimbula STP - Effluent (comp)	23-Dec-13	0.03	0.05	0.07
CA1400008-005	BVSP40	Merimbula STP - Effluent (comp)	02-Jan-14	0.04	0.03	0.07
CA1400075-005	BVSP40	Merimbula STP - Effluent (comp)	09-Jan-14	0.08	0.05	0.13
CA1400140-005	BVSP40	Merimbula STP - Effluent (comp)	15-Jan-14	0.1	0.09	0.19
CA1400242-005	BVSP40	Merimbula STP - Effluent (comp)	23-Jan-14	0.11	0.1	0.21
CA1400303-005	BVSP40	Merimbula STP - Effluent (comp)	29-Jan-14	0.04	0.05	0.09
CA1400377005	BVSP40	Merimbula STP - Effluent (comp)	05-Feb-14	0.06	0.04	0.1
CA1400491005	BVSP40	Merimbula STP - Effluent (comp)	13-Feb-14	0.06	0.03	0.09
CA1400546005	BVSP40	Merimbula STP - Effluent (comp)	19-Feb-14	0.16	0.08	0.24
CA1400635005	BVSP40	Merimbula STP - Effluent (comp)	27-Feb-14	0.03	0.03	0.03
CA1400709005	BVSP40	Merimbula STP - Effluent (comp)	05-Mar-14	0.09	0.03	0.12
CA1400809005	BVSP40	Merimbula STP - Effluent (comp)	13-Mar-14	0.09	0.07	0.16
CA1400875005	BVSP40	Merimbula STP - Effluent (comp)	19-Mar-14	0.04	0.03	0.07
CA1400962005	BVSP40	Merimbula STP - Effluent (comp)	27-Mar-14	0.04	0.03	0.04

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	CI-Combined	CI-Free	CI-Total
				mg/L	mg/L	mg/L
CA1401022005	BVSP40	Merimbula STP - Effluent (comp)	02-Apr-14	0.03	0.03	0.03
CA1401113005	BVSP40	Merimbula STP - Effluent (comp)	10-Apr-14	0.05	0.07	0.12
CA1401186005	BVSP40	Merimbula STP - Effluent (comp)	16-Apr-14	0.05	0.05	0.1
CA1401252005	BVSP40	Merimbula STP - Effluent (comp)	23-Apr-14	0.3	0.11	0.41
CA1401305005	BVSP40	Merimbula STP - Effluent (comp)	30-Apr-14	0.14	0.04	0.18
CA1401379005	BVSP40	Merimbula STP - Effluent (comp)	07-May-14	0.15	0.17	0.32
CA1401494005	BVSP40	Merimbula STP - Effluent (comp)	15-May-14	0.1	0.18	0.28
CA1401537005	BVSP40	Merimbula STP - Effluent (comp)	21-May-14	0.28	0.11	0.39
CA1401641005	BVSP40	Merimbula STP - Effluent (comp)	29-May-14	0.2	0.44	0.64
CA1401692005	BVSP40	Merimbula STP - Effluent (comp)	04-Jun-14	0.18	0.1	0.28
CA1401783005	BVSP40	Merimbula STP - Effluent (comp)	12-Jun-14	0.12	0.14	0.26
CA1401838005	BVSP40	Merimbula STP - Effluent (comp)	18-Jun-14	0.13	0.25	0.12
CA1401935005	BVSP40	Merimbula STP - Effluent (comp)	26-Jun-14	0.39	0.52	0.13
CA1401980005	BVSP40	Merimbula STP - Effluent (comp)	02-Jul-14	0.25	0.36	0.11
CA1402083005	BVSP40	Merimbula STP - Effluent (comp)	10-Jul-14	0.37	0.08	0.45
CA1402128005	BVSP40	Merimbula STP - Effluent (comp)	16-Jul-14	0.37	0.3	0.67
CA1402182005	BVSP40	Merimbula STP - Effluent (comp)	24-Jul-14	0.36	0.1	0.46
CA1402250006	BVSP40	Merimbula STP - Effluent (comp)	30-Jul-14	0.21	0.11	0.32
CA1402313005	BVSP40	Merimbula STP - Effluent (comp)	06-Aug-14	0.27	0.15	0.42
CA1402419005	BVSP40	Merimbula STP - Effluent (comp)	14-Aug-14	0.35	0.12	0.47
CA1402485005	BVSP40	Merimbula STP - Effluent (comp)	20-Aug-14	0.17	0.12	0.29
CA1402592005	BVSP40	Merimbula STP - Effluent (comp)	28-Aug-14	0.32	0.14	0.46
CA1402654005	BVSP40	Merimbula STP - Effluent (comp)	03-Sep-14	0.23	0.18	0.41
CA1402779005	BVSP40	Merimbula STP - Effluent (comp)	11-Sep-14	0.21	0.1	0.31
CA1402877005	BVSP40	Merimbula STP - Effluent (comp)	17-Sep-14	0.17	0.1	0.27
CA1402978005	BVSP40	Merimbula STP - Effluent (comp)	25-Sep-14	0.09	0.03	0.09
CA1403040005	BVSP40	Merimbula STP - Effluent (comp)	01-Oct-14	0.07	0.04	0.11
CA1403128005	BVSP40	Merimbula STP - Effluent (comp)	09-Oct-14	0.1	0.19	0.29
CA1403186005	BVSP40	Merimbula STP - Effluent (comp)	15-Oct-14	0.31	0.17	0.48
CA1403310005	BVSP40	Merimbula STP - Effluent (comp)	23-Oct-14	0.14	0.06	0.2
CA1403388005	BVSP40	Merimbula STP - Effluent (comp)	29-Oct-14	0.16	0.03	0.19
CA1403466005	BVSP40	Merimbula STP - Effluent (comp)	05-Nov-14	0.04	0.03	0.04
CA1403629005	BVSP40	Merimbula STP - Effluent (comp)	13-Nov-14	0.05	0.17	0.22
CA1403700005	BVSP40	Merimbula STP - Effluent (comp)	19-Nov-14	0.29	0.18	0.47
CA1403802005	BVSP40	Merimbula STP - Effluent (comp)	27-Nov-14	0.03	0.07	0.1
CA1403882005	BVSP40	Merimbula STP - Effluent (comp)	03-Dec-14	0.08	0.07	0.15
CA1404101005	BVSP40	Merimbula STP - Effluent (comp)	11-Dec-14	0.06	0.03	0.06
CA1404179005	BVSP40	Merimbula STP - Effluent (comp)	17-Dec-14			
CA1404234005	BVSP40	Merimbula STP - Effluent (comp)	22-Dec-14	0.07	0.03	0.07
CA1404278005	BVSP40	Merimbula STP - Effluent (comp)	29-Dec-14	0.07	0.03	0.1
CA1500055006	BVSP40	Merimbula STP - Effluent (comp)	07-Jan-15	0.04	0.1	0.14
CA1500199005	BVSP40	Merimbula STP - Effluent (comp)	15-Jan-15	0.1	0.07	0.17
CA1500257005	BVSP40	Merimbula STP - Effluent (comp)	21-Jan-15	0.05	0.05	0.1
CA1500310005	BVSP40	Merimbula STP - Effluent (comp)	29-Jan-15	0.04	0.06	0.1
CA1500392-005	BVSP40	Merimbula STP - Effluent (comp)	04-Feb-15	0.05	0.04	0.09
CA1500461-005	BVSP40	Merimbula STP - Effluent (comp)	12-Feb-15	0.07	0.04	0.11
CA1500605-005	BVSP40	Merimbula STP - Effluent (comp)	18-Feb-15	0.14	0.11	0.25
CA1500733-005	BVSP40	Merimbula STP - Effluent (comp)	26-Feb-15	0.07	0.1	0.17
CA1500803-005	BVSP40	Merimbula STP - Effluent (comp)	04-Mar-15	0.11	0.04	0.15
CA1500968-005	BVSP40	Merimbula STP - Effluent (comp)	12-Mar-15	0.1	0.05	0.15

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	CI-Combined	CI-Free	CI-Total
				mg/L	mg/L	mg/L
CA1501035-005	BVSP40	Merimbula STP - Effluent (comp)	18-Mar-15	0.14	0.09	0.23
CA1501134-005	BVSP40	Merimbula STP - Effluent (comp)	26-Mar-15	0.04	0.08	0.12
CA1501217-004	BVSP40	Merimbula STP - Effluent (comp)	01-Apr-15	0.07	0.04	0.11
CA1501298-005	BVSP40	Merimbula STP - Effluent (comp)	09-Apr-15	0.07	0.04	0.11
CA1501395-004	BVSP40	Merimbula STP - Effluent (comp)	15-Apr-15	0.1	0.2	0.3
CA1501508-004	BVSP40	Merimbula STP - Effluent (comp)	23-Apr-15	0.12	0.06	0.18
CA1501585-005	BVSP40	Merimbula STP - Effluent (comp)	29-Apr-15	0.07	0.09	0.16
CA1501687-004	BVSP40	Merimbula STP - Effluent (comp)	06-May-15	0.06	0.13	0.19
CA1501833-004	BVSP40	Merimbula STP - Effluent (comp)	14-May-15	0.07	0.1	0.17
CA1501909-004	BVSP40	Merimbula STP - Effluent (comp)	20-May-15	0.07	0.08	0.15
CA1501990-004	BVSP40	Merimbula STP - Effluent (comp)	28-May-15	0.16	0.27	0.43
CA1502101-004	BVSP40	Merimbula STP - Effluent (comp)	03-Jun-15	0.14	0.11	0.25
CA1502263-004	BVSP40	Merimbula STP - Effluent (comp)	11-Jun-15	0.1	0.11	0.21
CA1502357-004	BVSP40	Merimbula STP - Effluent (comp)	17-Jun-15	0.1	0.03	0.1
CA1502525-004	BVSP40	Merimbula STP - Effluent (comp)	25-Jun-15	0.08	0.1	0.18
CA1502599-004	BVSP40	Merimbula STP - Effluent (comp)	01-Jul-15	0.13	0.17	0.3
CA1502713-004	BVSP40	Merimbula STP - Effluent (comp)	09-Jul-15	0.06	0.1	0.16
CA1502822-004	BVSP40	Merimbula STP - Effluent (comp)	15-Jul-15	0.08	0.19	0.27
CA1502951-004	BVSP40	Merimbula STP - Effluent (comp)	23-Jul-15	0.11	0.14	0.25
CA1503020-007	BVSP40	Merimbula STP - Effluent (comp)	29-Jul-15	0.28	0.42	0.7
CA1503137-008	BVSP40	Merimbula STP - Effluent (comp)	05-Aug-15	0.32	0.15	0.47
CA1503271-008	BVSP40	Merimbula STP - Effluent (comp)	13-Aug-15	0.2	0.1	0.3
CA1503372-008	BVSP40	Merimbula STP - Effluent (comp)	19-Aug-15	0.23	0.15	0.38
CA1503478-007	BVSP40	Merimbula STP - Effluent (comp)	27-Aug-15	0.1	0.15	0.25
CA1503553-007	BVSP40	Merimbula STP - Effluent (comp)	02-Sep-15	0.11	0.19	0.3
CA1503650-007	BVSP40	Merimbula STP - Effluent (comp)	10-Sep-15	0.58	0.79	1.37
CA1503778-007	BVSP40	Merimbula STP - Effluent (comp)	16-Sep-15	0.06	0.26	0.32
CA1503898-007	BVSP40	Merimbula STP - Effluent (comp)	24-Sep-15	0.1	0.2	0.3
CA1503969-007	BVSP40	Merimbula STP - Effluent (comp)	30-Sep-15	0.04	0.18	0.22
CA1504055-007	BVSP40	Merimbula STP - Effluent (comp)	07-Oct-15	0.04	0.13	0.17
CA1504251-007	BVSP40	Merimbula STP - Effluent (comp)	15-Oct-15	0.05	0.07	0.12
CA1504374-007	BVSP40	Merimbula STP - Effluent (comp)	21-Oct-15	0.05	0.06	0.11
CA1504553-007	BVSP40	Merimbula STP - Effluent (comp)	29-Oct-15	0.09	0.19	0.28
CA1504683-007	BVSP40	Merimbula STP - Effluent (comp)	04-Nov-15	0.03	0.07	0.09
CA1504913-007	BVSP40	Merimbula STP - Effluent (comp)	12-Nov-15	0.03	0.12	0.15
CA1505084-007	BVSP40	Merimbula STP - Effluent (comp)	18-Nov-15	0.07	0.23	0.3
CA1505244-007	BVSP40	Merimbula STP - Effluent (comp)	26-Nov-15	0.05	0.19	0.24
CA1505358-007	BVSP40	Merimbula STP - Effluent (comp)	02-Dec-15	0.05	0.14	0.19
CA1505576-007	BVSP40	Merimbula STP - Effluent (comp)	10-Dec-15	0.04	0.11	0.15
CA1505716-007	BVSP40	Merimbula STP - Effluent (comp)	16-Dec-15	0.04	0.16	0.2
CA1505804-007	BVSP40	Merimbula STP - Effluent (comp)	21-Dec-15	0.05	0.04	0.09
CA1505927-007	BVSP40	Merimbula STP - Effluent (comp)	29-Dec-15	0.04	0.08	0.12
CA1600092-007	BVSP40	Merimbula STP - Effluent (comp)	06-Jan-16	0.03	0.07	0.1
CA1600295-008	BVSP40	Merimbula STP - Effluent (comp)	14-Jan-16	0.06	0.18	0.24
CA1600444-006	BVSP40	Merimbula STP - Effluent (comp)	20-Jan-16	0.2	1.03	1.23
CA1600561-007	BVSP40	Merimbula STP - Effluent (comp)	28-Jan-16	0.06	0.17	0.23
CA1600694-007	BVSP40	Merimbula STP - Effluent (comp)	03-Feb-16	0.03	0.15	0.17
CA1600905-007	BVSP40	Merimbula STP - Effluent (comp)	11-Feb-16	0.03	0.05	0.08
CA1600996-007	BVSP40	Merimbula STP - Effluent (comp)	17-Feb-16	0.06	0.2	0.26
CA1601225-007	BVSP40	Merimbula STP - Effluent (comp)	25-Feb-16	0.07	0.03	0.1

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	Cl-Combined	Cl-Free	Cl-Total
				mg/L	mg/L	mg/L
CA1601328-007	BVSP40	Merimbula STP - Effluent (comp)	02-Mar-16	0.06	0.11	0.17
CA1601515-007	BVSP40	Merimbula STP - Effluent (comp)	10-Mar-16	0.09	0.03	0.09
CA1601624-007	BVSP40	Merimbula STP - Effluent (comp)	16-Mar-16	0.06	0.13	0.19
CA1601828-007	BVSP40	Merimbula STP - Effluent (comp)	24-Mar-16	0.06	0.05	0.11
CA1601911-007	BVSP40	Merimbula STP - Effluent (comp)	30-Mar-16	0.05	0.11	0.16
CA1602080-007	BVSP40	Merimbula STP - Effluent (comp)	06-Apr-16	0.07	0.05	0.12
CA1602269-007	BVSP40	Merimbula STP - Effluent (comp)	14-Apr-16	0.08	0.12	0.2
CA1602350-007	BVSP40	Merimbula STP - Effluent (comp)	20-Apr-16	0.08	0.18	0.26
CA1602467-007	BVSP40	Merimbula STP - Effluent (comp)	28-Apr-16	0.1	0.09	0.19
CA1602602-007	BVSP40	Merimbula STP - Effluent (comp)	04-May-16	0.12	0.24	0.36
CA1602773-007	BVSP40	Merimbula STP - Effluent (comp)	12-May-16	0.11	0.22	0.33
CA1602896-007	BVSP40	Merimbula STP - Effluent (comp)	18-May-16	0.27	0.24	0.51
CA1603029-007	BVSP40	Merimbula STP - Effluent (comp)	26-May-16	0.22	0.67	0.89
CA1603137-007	BVSP40	Merimbula STP - Effluent (comp)	01-Jun-16	0.25	0.27	0.52
CA1603302-007	BVSP40	Merimbula STP - Effluent (comp)	09-Jun-16	0.04	0.1	0.14
CA1603375-007	BVSP40	Merimbula STP - Effluent (comp)	15-Jun-16	0.15	0.3	0.45
CA1603569-007	BVSP40	Merimbula STP - Effluent (comp)	23-Jun-16	0.17	0.11	0.28
CA1603694-007	BVSP40	Merimbula STP - Effluent (comp)	29-Jun-16	0.26	0.21	0.47
CA1603818-007	BVSP40	Merimbula STP - Effluent (comp)	06-Jul-16	0.19	0.11	0.3
CA1603972-007	BVSP40	Merimbula STP - Effluent (comp)	14-Jul-16	0.37	0.16	0.53
CA1604091-007	BVSP40	Merimbula STP - Effluent (comp)	20-Jul-16	0.68	0.65	1.33
CA1604251-007	BVSP40	Merimbula STP - Effluent (comp)	28-Jul-16	0.28	0.21	0.49
CA1604346-007	BVSP40	Merimbula STP - Effluent (comp)	03-Aug-16	0.31	0.26	0.57
CA1604486-007	BVSP40	Merimbula STP - Effluent (comp)	11-Aug-16	0.25	0.21	0.46
CA1604582-007	BVSP40	Merimbula STP - Effluent (comp)	17-Aug-16	0.32	0.22	0.54
CA1604791-007	BVSP40	Merimbula STP - Effluent (comp)	25-Aug-16	0.22	0.41	0.63
CA1604879-007	BVSP40	Merimbula STP - Effluent (comp)	31-Aug-16	0.32	0.23	0.55
CA1605091-007	BVSP40	Merimbula STP - Effluent (comp)	07-Sep-16	0.22	0.24	0.46
CA1605260-007	BVSP40	Merimbula STP - Effluent (comp)	15-Sep-16	0.17	0.08	0.25
CA1605391-007	BVSP40	Merimbula STP - Effluent (comp)	21-Sep-16	0.12	0.18	0.3
CA1605534-007	BVSP40	Merimbula STP - Effluent (comp)	29-Sep-16	0.16	0.26	0.42

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	Enterococci	Faecal Coliform	E_Coli	Total Calcium	Total Magnesium	Total Potassium	Total Sodium	Aluminium	Antimony	Arsenic
				CFU/100mL	CFU/100mL	CFU/100mL	mg/L	mg/L	mg/L	mg/L	ug/L	ug/L	ug/L
CA1403330001	BVSP40	Merimbula STP - Effluent (comp)	23-Oct-14				25.1	9.66	20.6	110	50	<3	2
CA1403470001	BVSP40	Merimbula STP - Effluent (comp)	05-Nov-14				20.5	10.3	24.1	119	116	<3	1
CA1403632001	BVSP40	Merimbula STP - Effluent (comp)	13-Nov-14				21	9.92	25.4	122	23	<3	1
CA1403706001	BVSP40	Merimbula STP - Effluent (comp)	19-Nov-14				20.1	9.32	22.6	122	42	<3	2
CA1403805001	BVSP40	Merimbula STP - Effluent (comp)	27-Nov-14				20.2	9.87	23.5	118	69	<3	2
CA1403883001	BVSP40	Merimbula STP - Effluent (comp)	03-Dec-14				21.8	10.4	26.5	133	43	<3	2
CA1404099001	BVSP40	Merimbula STP - Effluent (comp)	11-Dec-14				19.9	8.85	19.6	98.9	65	<3	2
CA1404180001	BVSP40	Merimbula STP - Effluent (comp)	17-Dec-14				19.8	8.66	17.1	95.9	31	<3	2
CA1404237001	BVSP40	Merimbula STP - Effluent (comp)	22-Dec-14				18	8.43	19	97.8	56	<3	2
CA1404281001	BVSP40	Merimbula STP - Effluent (comp)	29-Dec-14				20.5	8.82	24.5	107	31	<3	2
CA1500058-001	BVSP40	Merimbula STP - Effluent (comp)	07-Jan-15				17.8	7.92	24.5	95	26	<3	1
CA1500200-001	BVSP40	Merimbula STP - Effluent (comp)	15-Jan-15				17.4	7.96	23.2	90.8	10	<3	2
CA1500260-001	BVSP40	Merimbula STP - Effluent (comp)	21-Jan-15	<2	910	910	19.8	8.76	24.6	99.7	59	<3	2
CA1500356-001	BVSP40	Merimbula STP - Effluent (comp)	29-Jan-15	<2	<1	<2	17.9	5.69	11	46.4	22	<3	<1
CA1500395-001	BVSP40	Merimbula STP - Effluent (comp)	04-Feb-15	<1	<1	<1	18.9	7.19	15	64.8	28	<3	2
CA1500464-001	BVSP40	Merimbula STP - Effluent (comp)	12-Feb-15	25	17	17	18	8.44	20.1	83.1	20	<3	2
CA1500606-001	BVSP40	Merimbula STP - Effluent (comp)	18-Feb-15	<2	8	6	18	6.75	13.8	58.8	18	<3	2
CA1500737-001	BVSP40	Merimbula STP - Effluent (comp)	26-Feb-15	30	6	6	16.6	7.38	16.8	69.4	35	<3	2
CA1500802-001	BVSP40	Merimbula STP - Effluent (comp)	04-Mar-15	2	<2	<2	18.6	7.00	14.2	62.0	20	<3	1
CA1500965-001	BVSP40	Merimbula STP - Effluent (comp)	12-Mar-15	<1	<2	<2	17.3	6.01	13	59.3	23	<3	1
CA1501041-001	BVSP40	Merimbula STP - Effluent (comp)	18-Mar-15	2	<2	<2	18	6.54	12.8	59.5	15	<3	1
CA1501136-001	BVSP40	Merimbula STP - Effluent (comp)	26-Mar-15	8	<2	<2	19.5	7.24	15.5	72.9	17	<3	2
CA1501220-001	BVSP40	Merimbula STP - Effluent (comp)	01-Apr-15	<2	<2	<2	18.9	7.46	16.2	76.2	57	<3	1
CA1501297-001	BVSP40	Merimbula STP - Effluent (comp)	09-Apr-15	<2	<2	<2	18.3	5.08	10.1	43.4	24	<3	<1
CA1501393-001	BVSP40	Merimbula STP - Effluent (comp)	15-Apr-15	<2	<2	<2	19.5	6.81	12.4	62.1	15	<3	1
CA1501514-001	BVSP40	Merimbula STP - Effluent (comp)	23-Apr-15	<2	<2	<2	19.6	5.81	11.2	64.8	18	<3	1
CA1501587-001	BVSP40	Merimbula STP - Effluent (comp)	29-Apr-15	2	180	180	19.8	5.51	9.2	40.4	57	<3	1
CA1501688-001	BVSP40	Merimbula STP - Effluent (comp)	06-May-15	2	56	56	19.3	5.91	9.9	51.9	49	<3	1
CA1501836-001	BVSP40	Merimbula STP - Effluent (comp)	14-May-15	<2	<2	<2	20.3	5.54	9.3	45.7	29	<3	1
CA1501910-001	BVSP40	Merimbula STP - Effluent (comp)	20-May-15	<2	<2	<2	20.7	7.81	13.6	77.5	73	<3	1
CA1501992-001	BVSP40	Merimbula STP - Effluent (comp)	28-May-15	<2	<2	<2	18	7.32	12	72.9	30	<3	1
CA1502103-001	BVSP40	Merimbula STP - Effluent (comp)	03-Jun-15	<2	<2	<2	18.2	7.95	13.5	72	29	<3	2
CA1502266-001	BVSP40	Merimbula STP - Effluent (comp)	11-Jun-15	8	<2	<2	18.4	8.15	13.9	74.9	22	<3	1
CA1502358-001	BVSP40	Merimbula STP - Effluent (comp)	17-Jun-15	<2	<2	<2	17.7	8.36	15.1	83.4	29	<3	1
CA1502523-001	BVSP40	Merimbula STP - Effluent (comp)	25-Jun-15	<2	<2	<2	18.6	9.79	16.7	91.6	62	<3	1
CA1502605-001	BVSP40	Merimbula STP - Effluent (comp)	01-Jul-15	<2	2	<2	19.4	8.98	15.4	87.0	39	<3	1
CA1502714-001	BVSP40	Merimbula STP - Effluent (comp)	09-Jul-15	<2	<2	<2	18.2	7.34	11.7	59.9	32	<3	1
CA1502827-001	BVSP40	Merimbula STP - Effluent (comp)	15-Jul-15	<2	<2	<2	17.7	6.94	11.3	59.5	106	<3	<1
CA1502953-001	BVSP40	Merimbula STP - Effluent (comp)	23-Jul-15	<2	<2	<2	19.8	10.7	18.4	101	71	<3	1
CA1503021-001	BVSP40	Merimbula STP - Effluent (comp)	29-Jul-15	<2	<2	<2	19.6	8.95	14.3	84.4	40	<3	1
CA1503138-001	BVSP40	Merimbula STP - Effluent (comp)	05-Aug-15	<2	<2	<2	20.8	11.4	21.5	115	44	<3	2
CA1503274-001	BVSP40	Merimbula STP - Effluent (comp)	13-Aug-15	<2	<2	<2	21.7	11.2	22.6	120	40	<3	2
CA1503366-001	BVSP40	Merimbula STP - Effluent (comp)	19-Aug-15	<2	<2	<2	21.5	12.5	23.8	130	41	<3	2
CA1503479-001	BVSP40	Merimbula STP - Effluent (comp)	27-Aug-15	8	<2	<2	18.4	10.4	20.2	106	101	<3	1
CA1503556-001	BVSP40	Merimbula STP - Effluent (comp)	02-Sep-15	<2	<2	<2	19.3	8.78	13.4	89.2	81	<3	1
CA1503652-001	BVSP40	Merimbula STP - Effluent (comp)	10-Sep-15	<2	<2	<2	20.0	9.18	15.8	97.8	55	<3	2
CA1503782-001	BVSP40	Merimbula STP - Effluent (comp)	16-Sep-15	<2	<2	<2	21.3	9.55	19.6	112	177	<3	1
CA1503900-001	BVSP40	Merimbula STP - Effluent (comp)	24-Sep-15	<2	<2	<2	20.7	9.58	21.4	119	66	<3	1
CA1503970-001	BVSP40	Merimbula STP - Effluent (comp)	30-Sep-15	<2	14	14	19	8.58	22.1	102	73	<3	1
CA1504058-001	BVSP40	Merimbula STP - Effluent (comp)	07-Oct-15	14	12	8	19.7	8.24	23	111	97	<3	1
CA1504256-001	BVSP40	Merimbula STP - Effluent (comp)	16-Oct-15	122	250		20.3	8.29	21.6	117	66	<3	2

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	Enterococci	Faecal Coliform	E_Coli	Total Calcium	Total Magnesium	Total Potassium	Total Sodium	Aluminium	Antimony	Arsenic
				CFU/100mL	CFU/100mL	CFU/100mL	mg/L	mg/L	mg/L	mg/L	ug/L	ug/L	ug/L
CA1504372-001	BVSP40	Merimbula STP - Effluent (comp)	21-Oct-15	116	130	130	22.1	9.79	25.2	119	72	<3	2
CA1504557-001	BVSP40	Merimbula STP - Effluent (comp)	29-Oct-15	26	36	36	21	10.4	23.3	113	90	<3	3
CA1504688-001	BVSP40	Merimbula STP - Effluent (comp)	05-Nov-15	108	10	10	21.4	10.2	22.6	115	75	<3	2
CA1504916-001	BVSP40	Merimbula STP - Effluent (comp)	13-Nov-15	188	284	284	17.7	8.36	17.6	84.6	128	<3	2
CA1505078-001	BVSP40	Merimbula STP - Effluent (comp)	18-Nov-15	<2	<2	<2	20.4	8.03	11.5	78.9	56	<3	<1
CA1505255-001	BVSP40	Merimbula STP - Effluent (comp)	26-Nov-15	24	10	8	21.6	9.17	17.7	95.9	40	<3	<1
CA1505370-001	BVSP40	Merimbula STP - Effluent (comp)	02-Dec-15	4	4	4	22.9	10.4	21.4	114	34	<3	2
CA1505585-001	BVSP40	Merimbula STP - Effluent (comp)	10-Dec-15	204	28	28	25.6	11.7	24.4	124	52	<3	3
CA1505717-001	BVSP40	Merimbula STP - Effluent (comp)	16-Dec-15	6	40	30	23.4	11.4	24.7	121	40	<3	3
CA1505806-001	BVSP40	Merimbula STP - Effluent (comp)	21-Dec-15	146	1200	1200	23.9	12.1	27.5	126	57	<3	3
CA1505923-001	BVSP40	Merimbula STP - Effluent (comp)	29-Dec-15	86	70	70	20.4	10.7	23.9	114	30	<3	<1
CA1600097-001	BVSP40	Merimbula STP - Effluent (comp)	06-Jan-16	46	4		19.2	9.12	22.3	92.9	41	<3	<1
CA1600299-001	BVSP40	Merimbula STP - Effluent (comp)	15-Jan-16	298	117	117	19.7	9.42	22	101	33	<3	2
CA1600451-001	BVSP40	Merimbula STP - Effluent (comp)	20-Jan-16	<2	<2	<2	20.4	10.1	23.8	119	32	<3	2
CA1600558-001	BVSP40	Merimbula STP - Effluent (comp)	28-Jan-16	36	86	69	22.5	10.4	23.8	114	54	<3	2
CA1600713-001	BVSP40	Merimbula STP - Effluent (comp)	03-Feb-16	580	148	59	20.0	8.82	16.8	86.4	87	<3	2
CA1600907-001	BVSP40	Merimbula STP - Effluent (comp)	11-Feb-16	4080	148	89	21.1	9.86	19.5	109	41	<3	2
CA1600999-001	BVSP40	Merimbula STP - Effluent (comp)	18-Feb-16	260	86	69	22.4	11	23	117	33	<3	3
CA1601229-001	BVSP40	Merimbula STP - Effluent (comp)	26-Feb-16	1400	1320	1320	21.3	11.6	25.1	134	33	<3	2
CA1601335-001	BVSP40	Merimbula STP - Effluent (comp)	02-Mar-16	94	90	72	21.9	12	25.5	136	22	<3	3
CA1601525-001	BVSP40	Merimbula STP - Effluent (comp)	10-Mar-16	312	320	320	20.1	12	25.5	138	30	<3	3
CA1601628-001	BVSP40	Merimbula STP - Effluent (comp)	16-Mar-16	870	990	594	25.0	12.6	26.4	142	18	<3	2
CA1601832-001	BVSP40	Merimbula STP - Effluent (comp)	24-Mar-16	98	360	360	23.4	11.9	23.1	116	32	<3	2
CA1601915-001	BVSP40	Merimbula STP - Effluent (comp)	30-Mar-16	140	8	8	21.6	11.4	23.5	128	45	<3	3
CA1602083-001	BVSP40	Merimbula STP - Effluent (comp)	06-Apr-16	84	72	58	20.3	10.5	22.2	114	27	<3	2
CA1602272-001	BVSP40	Merimbula STP - Effluent (comp)	14-Apr-16	12	34	34	23.0	12	25.2	152	29	<3	2
CA1602353-001	BVSP40	Merimbula STP - Effluent (comp)	20-Apr-16	<2	<2	<2	23.6	12.6	23.3	146	45	<3	2
CA1602466-001	BVSP40	Merimbula STP - Effluent (comp)	29-Apr-16	<2	<2	<2	22.4	11.7	21.8	146	30	<3	2
CA1602608-001	BVSP40	Merimbula STP - Effluent (comp)	04-May-16	6	<2	<2	22.2	12.4	23.1	157	30	<3	3
CA1602775-001	BVSP40	Merimbula STP - Effluent (comp)	12-May-16	<2	<2	<2	24.4	14	26.6	173	40	<3	3
CA1602897-001	BVSP40	Merimbula STP - Effluent (comp)	18-May-16	4	<2	<2	24.9	16.2	25.7	168	40	<3	4
CA1603032-001	BVSP40	Merimbula STP - Effluent (comp)	26-May-16	2	<2	<2	23.8	15.9	25.8	176	50	<3	4
CA1603145-001	BVSP40	Merimbula STP - Effluent (comp)	01-Jun-16	<2	<2	<2	23.5	15.8	24.6	158	50	<3	3
CA1603303-001	BVSP40	Merimbula STP - Effluent (comp)	09-Jun-16	<1	3	1	19.5	9.06	9.8	72.7	33	<3	3
CA1603382-001	BVSP40	Merimbula STP - Effluent (comp)	15-Jun-16	<1	<1	<1	19.9	9.54	12.1	93.9	14	<3	3
CA1603574-001	BVSP40	Merimbula STP - Effluent (comp)	23-Jun-16	<1	<1	<1	20.6	10.7	17.3	105	60	<3	3
CA1603696-001	BVSP40	Merimbula STP - Effluent (comp)	29-Jun-16	<1	<1	<1	21.6	12.4	19.5	129	40	<3	4
CA1603813-001	BVSP40	Merimbula STP - Effluent (comp)	06-Jul-16	1	<1	<1	22.2	12.6	20.3	124	50	<3	3
CA1603973-001	BVSP40	Merimbula STP - Effluent (comp)	14-Jul-16	<1	<1	<1	22.2	12.8	19.5	118	60	<3	2
CA1604093-001	BVSP40	Merimbula STP - Effluent (comp)	20-Jul-16	<1	<1	<1	21.6	12.8	21.3	147	50	<3	3
CA1604252-001	BVSP40	Merimbula STP - Effluent (comp)	28-Jul-16	<1	<1	<1	22.2	13.6	22.1	154	40	<3	2
CA1604351-001	BVSP40	Merimbula STP - Effluent (comp)	03-Aug-16	<1	<1	<1	21.1	13.7	20.8	159	30	<3	3
CA1604488-001	BVSP40	Merimbula STP - Effluent (comp)	11-Aug-16	2	<1	<1	21.3	13.4	23.0	166	30	<3	3
CA1604588-001	BVSP40	Merimbula STP - Effluent (comp)	17-Aug-16	<1	<1	<1	21.2	13.8	22.6	156	30	<3	2
CA1604790-001	BVSP40	Merimbula STP - Effluent (comp)	25-Aug-16	<1	<1	<1	20.1	13.2	22.4	138	40	<3	3
CA1604882-001	BVSP40	Merimbula STP - Effluent (comp)	31-Aug-16	<1	<1	<1	21.3	14.3	23.8	163	40	<3	2
CA1605094-001	BVSP40	Merimbula STP - Effluent (comp)	07-Sep-16	<1	<1	<1	19.4	15.0	33.3	184	60	<3	2
CA1605261-001	BVSP40	Merimbula STP - Effluent (comp)	15-Sep-16	<1	<1	<1	20.2	13.5	24.6	150	40	<3	3
CA1605388-001	BVSP40	Merimbula STP - Effluent (comp)	21-Sep-16	1	23	23	19.6	12.1	19.6	142	40	<3	2
CA1605536-001	BVSP40	Merimbula STP - Effluent (comp)	29-Sep-16	<1	2	2	20.0	11.8	20.4	144	40	<3	2

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	Barium	Beryllium	Total Boron	Cadmium	Chromium	Cobalt	Copper	Total Iron	Lead	Manganese
				ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
CA1403330001	BVSP40	Merimbula STP - Effluent (comp)	23-Oct-14	6.5	<0.1	70	<0.05	<2	0.3	13	160	<0.2	34.1
CA1403470001	BVSP40	Merimbula STP - Effluent (comp)	05-Nov-14	7	<0.1	60	<0.05	<2	0.4	7	240	0.4	57.6
CA1403632001	BVSP40	Merimbula STP - Effluent (comp)	13-Nov-14	9.1	<0.1	60	<0.05	<2	0.2	4	310	<0.2	82.8
CA1403706001	BVSP40	Merimbula STP - Effluent (comp)	19-Nov-14	9.4	<0.1	60	<0.05	<2	0.2	6	230	0.3	44
CA1403805001	BVSP40	Merimbula STP - Effluent (comp)	27-Nov-14	9.7	<0.1	80	<0.05	<2	0.4	8	190	0.4	48
CA1403883001	BVSP40	Merimbula STP - Effluent (comp)	03-Dec-14	9.2	<0.1	70	<0.05	<2	0.4	5	240	<0.2	40.7
CA1404099001	BVSP40	Merimbula STP - Effluent (comp)	11-Dec-14	8.5	<0.1	60	<0.05	<2	0.4	10	200	0.3	38.3
CA1404180001	BVSP40	Merimbula STP - Effluent (comp)	17-Dec-14	6.7	<0.1	60	<0.05	<2	0.6	11	100	0.2	25.5
CA1404237001	BVSP40	Merimbula STP - Effluent (comp)	22-Dec-14	6	<0.1	60	<0.05	<2	1	12	120	0.2	29
CA1404281001	BVSP40	Merimbula STP - Effluent (comp)	29-Dec-14	5.5	<0.1	60	<0.05	<2	0.7	12	100	0.2	26.5
CA1500058-001	BVSP40	Merimbula STP - Effluent (comp)	07-Jan-15	6.3	<0.1	50	<0.05	<2	0.2	28	50	0.2	47.4
CA1500200-001	BVSP40	Merimbula STP - Effluent (comp)	15-Jan-15	6.2	0.1	60	<0.05	<2	0.3	26	50	<0.2	37.5
CA1500260-001	BVSP40	Merimbula STP - Effluent (comp)	21-Jan-15	31.4	<0.1	80	<0.05	<2	0.3	23	150	0.4	42
CA1500356-001	BVSP40	Merimbula STP - Effluent (comp)	29-Jan-15	12.7	0.3	40	<0.05	<2	0.2	224	1230	4.8	91.4
CA1500395-001	BVSP40	Merimbula STP - Effluent (comp)	04-Feb-15	10	<0.1	140	<0.05	<2	0.2	269	710	5.2	68.4
CA1500464-001	BVSP40	Merimbula STP - Effluent (comp)	12-Feb-15	20.3	<0.1	60	<0.05	<2	0.2	130	380	2.4	32.6
CA1500606-001	BVSP40	Merimbula STP - Effluent (comp)	18-Feb-15	9.8	<0.1	40	<0.05	<2	0.2	165	810	3.7	52.6
CA1500737-001	BVSP40	Merimbula STP - Effluent (comp)	26-Feb-15	10.7	<0.1	50	<0.05	<2	0.4	257	1020	8.2	65.5
CA1500802-001	BVSP40	Merimbula STP - Effluent (comp)	04-Mar-15	9.1	<0.1	50	<0.05	<2	0.2	361	870	11.8	56.4
CA1500965-001	BVSP40	Merimbula STP - Effluent (comp)	12-Mar-15	9.0	<0.1	40	<0.05	<2	0.2	249	520	6	43.4
CA1501041-001	BVSP40	Merimbula STP - Effluent (comp)	18-Mar-15	8.9	<0.1	60	<0.05	<2	0.2	273	720	7.7	51.4
CA1501136-001	BVSP40	Merimbula STP - Effluent (comp)	26-Mar-15	9.2	<0.1	70	<0.05	<2	0.2	354	760	11	53.3
CA1501220-001	BVSP40	Merimbula STP - Effluent (comp)	01-Apr-15	9.4	<0.1	50	0.19	2	0.4	199	320	4.2	50.7
CA1501297-001	BVSP40	Merimbula STP - Effluent (comp)	09-Apr-15	9.6	<0.1	30	<0.05	<2	<0.2	228	680	5.7	53.9
CA1501393-001	BVSP40	Merimbula STP - Effluent (comp)	15-Apr-15	8.9	<0.1	40	<0.05	<2	0.2	335	500	11.6	48.1
CA1501514-001	BVSP40	Merimbula STP - Effluent (comp)	23-Apr-15	8.7	<0.1	40	<0.05	<2	<0.2	248	380	5.4	35.3
CA1501587-001	BVSP40	Merimbula STP - Effluent (comp)	29-Apr-15	10.8	<0.1	40	<0.05	<2	<0.2	294	370	4.5	42.2
CA1501688-001	BVSP40	Merimbula STP - Effluent (comp)	06-May-15	10.3	<0.1	50	<0.05	<2	<0.2	188	190	2.0	33.8
CA1501836-001	BVSP40	Merimbula STP - Effluent (comp)	14-May-15	10.5	<0.1	40	0.06	<2	<0.2	433	540	8	48.2
CA1501910-001	BVSP40	Merimbula STP - Effluent (comp)	20-May-15	11.0	<0.1	50	<0.05	<2	0.2	320	300	4.6	40.0
CA1501992-001	BVSP40	Merimbula STP - Effluent (comp)	28-May-15	8.5	<0.1	40	<0.05	<2	<0.2	201	150	2	26.9
CA1502103-001	BVSP40	Merimbula STP - Effluent (comp)	03-Jun-15	8.5	<0.1	50	0.06	<2	<0.2	181	150	1.8	22.7
CA1502266-001	BVSP40	Merimbula STP - Effluent (comp)	11-Jun-15	8.0	<0.1	50	<0.05	<2	<0.2	213	130	1.9	21.2
CA1502358-001	BVSP40	Merimbula STP - Effluent (comp)	17-Jun-15	7.6	<0.1	50	<0.05	<2	<0.2	677	130	3.3	20.7
CA1502523-001	BVSP40	Merimbula STP - Effluent (comp)	25-Jun-15	7.2	<0.1	50	<0.05	<2	0.3	97	100	0.3	18.7
CA1502605-001	BVSP40	Merimbula STP - Effluent (comp)	01-Jul-15	6.9	<0.1	50	<0.05	<2	0.2	162	690	2.5	22.0
CA1502714-001	BVSP40	Merimbula STP - Effluent (comp)	09-Jul-15	9.2	<0.1	30	0.05	<2	<0.2	273	1910	5.9	44.8
CA1502827-001	BVSP40	Merimbula STP - Effluent (comp)	15-Jul-15	10.5	<0.1	30	<0.05	<2	0.2	353	1660	7.7	44.4
CA1502953-001	BVSP40	Merimbula STP - Effluent (comp)	23-Jul-15	6.0	<0.1	70	<0.05	<2	0.3	60	130	0.4	25.6
CA1503021-001	BVSP40	Merimbula STP - Effluent (comp)	29-Jul-15	7.5	<0.1	40	<0.05	<2	0.3	179	860	4.8	52.9
CA1503138-001	BVSP40	Merimbula STP - Effluent (comp)	05-Aug-15	5.9	<0.1	60	<0.05	<2	0.4	46	120	0.3	26.0
CA1503274-001	BVSP40	Merimbula STP - Effluent (comp)	13-Aug-15	5.6	<0.1	60	<0.05	<2	0.4	22	130	0.2	22.9
CA1503366-001	BVSP40	Merimbula STP - Effluent (comp)	19-Aug-15	4.9	<0.1	70	<0.05	<2	0.4	24	130	0.3	28.6
CA1503479-001	BVSP40	Merimbula STP - Effluent (comp)	27-Aug-15	5.0	<0.1	60	<0.05	<2	0.4	18	160	0.3	28.9
CA1503556-001	BVSP40	Merimbula STP - Effluent (comp)	02-Sep-15	5.2	<0.1	50	<0.05	<2	0.3	15	150	0.2	25.7
CA1503652-001	BVSP40	Merimbula STP - Effluent (comp)	10-Sep-15	5.1	<0.1	50	<0.05	<2	0.4	15	130	0.2	25.1
CA1503782-001	BVSP40	Merimbula STP - Effluent (comp)	16-Sep-15	7.2	<0.1	60	<0.05	<2	0.5	27	280	0.6	36.9
CA1503900-001	BVSP40	Merimbula STP - Effluent (comp)	24-Sep-15	6.3	<0.1	50	<0.05	<2	0.4	20	160	0.3	28.8
CA1503970-001	BVSP40	Merimbula STP - Effluent (comp)	30-Sep-15	5.8	<0.1	60	<0.05	<2	0.5	15	150	0.3	36.6
CA1504058-001	BVSP40	Merimbula STP - Effluent (comp)	07-Oct-15	9.5	<0.1	60	<0.05	<2	0.5	18	300	0.4	45.1
CA1504256-001	BVSP40	Merimbula STP - Effluent (comp)	16-Oct-15	9.9	<0.1	50	<0.05	<2	0.3	10	330	0.3	58.4

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	Barium	Beryllium	Total Boron	Cadmium	Chromium	Cobalt	Copper	Total Iron	Lead	Manganese
				ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
CA1504372-001	BVSP40	Merimbula STP - Effluent (comp)	21-Oct-15	10.8	<0.1	70	<0.05	<2	0.4	9	350	0.3	69.0
CA1504557-001	BVSP40	Merimbula STP - Effluent (comp)	29-Oct-15	6.7	<0.1	70	<0.05	<2	0.5	10	170	0.2	39.3
CA1504688-001	BVSP40	Merimbula STP - Effluent (comp)	05-Nov-15	6.0	<0.1	70	<0.05	<2	0.4	9	170	0.3	41.7
CA1504916-001	BVSP40	Merimbula STP - Effluent (comp)	13-Nov-15	5.9	<0.1	60	<0.05	<2	0.3	10	380	0.3	52.4
CA1505078-001	BVSP40	Merimbula STP - Effluent (comp)	18-Nov-15	5.2	<0.1	60	<0.05	<2	0.3	17	310	0.2	54.2
CA1505255-001	BVSP40	Merimbula STP - Effluent (comp)	26-Nov-15	5.4	<0.1	60	<0.05	<2	0.4	11	270	<0.2	54.1
CA1505370-001	BVSP40	Merimbula STP - Effluent (comp)	02-Dec-15	6.3	<0.1	70	<0.05	<2	0.4	12	200	<0.2	50.7
CA1505585-001	BVSP40	Merimbula STP - Effluent (comp)	10-Dec-15	6.6	<0.1	70	<0.05	<2	0.4	12	170	0.3	45.5
CA1505717-001	BVSP40	Merimbula STP - Effluent (comp)	16-Dec-15	5.0	<0.1	80	<0.05	<2	0.4	17	130	0.3	34.1
CA1505806-001	BVSP40	Merimbula STP - Effluent (comp)	21-Dec-15	5.1	<0.1	80	<0.05	<2	0.5	19	170	0.4	26.2
CA1505923-001	BVSP40	Merimbula STP - Effluent (comp)	29-Dec-15	3.9	<0.1	60	<0.05	<2	0.4	18	80	0.2	18.6
CA1600097-001	BVSP40	Merimbula STP - Effluent (comp)	06-Jan-16	5.2	<0.1	60	<0.05	<2	0.3	15	150	0.2	35.1
CA1600299-001	BVSP40	Merimbula STP - Effluent (comp)	15-Jan-16	3.6	<0.1	60	<0.05	<2	0.3	18	100	<0.2	19.2
CA1600451-001	BVSP40	Merimbula STP - Effluent (comp)	20-Jan-16	3.7	<0.1	70	<0.05	<2	0.2	17	70	<0.2	16.2
CA1600558-001	BVSP40	Merimbula STP - Effluent (comp)	28-Jan-16	5.0	<0.1	60	<0.05	<2	0.2	13	120	0.2	27.6
CA1600713-001	BVSP40	Merimbula STP - Effluent (comp)	03-Feb-16	6.3	<0.1	60	0.07	<2	0.3	13	220	0.3	47.2
CA1600907-001	BVSP40	Merimbula STP - Effluent (comp)	11-Feb-16	6.1	<0.1	70	<0.05	3	0.4	13	140	0.2	23.4
CA1600999-001	BVSP40	Merimbula STP - Effluent (comp)	18-Feb-16	4.6	<0.1	80	<0.05	<2	0.4	16	90	0.2	16.3
CA1601229-001	BVSP40	Merimbula STP - Effluent (comp)	26-Feb-16	3.7	<0.1	80	<0.05	<2	0.2	16	80	<0.2	13.2
CA1601335-001	BVSP40	Merimbula STP - Effluent (comp)	02-Mar-16	3.7	<0.1	80	<0.05	<2	0.4	17	50	<0.2	10.2
CA1601525-001	BVSP40	Merimbula STP - Effluent (comp)	10-Mar-16	3.2	<0.1	80	<0.05	<2	0.4	18	60	<0.2	10.5
CA1601628-001	BVSP40	Merimbula STP - Effluent (comp)	16-Mar-16	4.7	<0.1	80	<0.05	<2	0.3	17	60	<0.2	15.7
CA1601832-001	BVSP40	Merimbula STP - Effluent (comp)	24-Mar-16	4.7	<0.1	70	0.32	3	0.4	26	70	<0.2	15.2
CA1601915-001	BVSP40	Merimbula STP - Effluent (comp)	30-Mar-16	4.9	<0.1	70	<0.05	<2	<0.2	30	100	<0.2	16.2
CA1602083-001	BVSP40	Merimbula STP - Effluent (comp)	06-Apr-16	4.2	<0.1	60	<0.05	<2	0.3	23	90	<0.2	18.1
CA1602272-001	BVSP40	Merimbula STP - Effluent (comp)	14-Apr-16	4.6	<0.1	80	<0.05	<2	0.4	27	130	<0.2	41.1
CA1602353-001	BVSP40	Merimbula STP - Effluent (comp)	20-Apr-16	5.3	<0.1	70	<0.05	<2	0.4	23	140	0.2	47.5
CA1602466-001	BVSP40	Merimbula STP - Effluent (comp)	29-Apr-16	4.8	<0.1	60	<0.05	<1	0.3	18	90	<0.2	25.6
CA1602608-001	BVSP40	Merimbula STP - Effluent (comp)	04-May-16	4.4	<0.1	70	<0.05	<1	0.3	30	80	<0.2	22.4
CA1602775-001	BVSP40	Merimbula STP - Effluent (comp)	12-May-16	4.2	<0.1	80	<0.05	<1	0.3	27	70	<0.2	18.3
CA1602897-001	BVSP40	Merimbula STP - Effluent (comp)	18-May-16	4.5	<0.1	80	<0.05	<1	0.3	32	70	<0.2	17.1
CA1603032-001	BVSP40	Merimbula STP - Effluent (comp)	26-May-16	4.5	<0.1	80	0.05	<1	0.3	28	90	<0.2	17.8
CA1603145-001	BVSP40	Merimbula STP - Effluent (comp)	01-Jun-16	3.7	<0.1	80	<0.05	<1	0.3	23	60	<0.2	16.3
CA1603303-001	BVSP40	Merimbula STP - Effluent (comp)	09-Jun-16	6.8	0.1	50	<0.05	<2	0.5	16	340	0.4	64.3
CA1603382-001	BVSP40	Merimbula STP - Effluent (comp)	15-Jun-16	5.2	<0.1	50	<0.05	<1	0.4	13	170	<0.2	38.8
CA1603574-001	BVSP40	Merimbula STP - Effluent (comp)	23-Jun-16	4.2	<0.1	60	<0.05	<1	0.4	17	110	<0.2	29.4
CA1603696-001	BVSP40	Merimbula STP - Effluent (comp)	29-Jun-16	4.4	<0.1	80	0.13	<1	0.4	24	90	<0.2	25.0
CA1603813-001	BVSP40	Merimbula STP - Effluent (comp)	06-Jul-16	3.9	<0.1	70	<0.05	<1	0.4	18	80	<0.2	25.2
CA1603973-001	BVSP40	Merimbula STP - Effluent (comp)	14-Jul-16	4.0	<0.1	60	<0.05	<1	0.3	19	90	<0.2	24.8
CA1604093-001	BVSP40	Merimbula STP - Effluent (comp)	20-Jul-16	4.2	<0.1	70	<0.05	1	0.3	21	100	<0.2	24.3
CA1604252-001	BVSP40	Merimbula STP - Effluent (comp)	28-Jul-16	4.4	<0.1	70	<0.05	<1	0.4	22	90	<0.2	26.9
CA1604351-001	BVSP40	Merimbula STP - Effluent (comp)	03-Aug-16	3.5	<0.1	70	<0.05	<1	0.3	18	60	<0.2	17.0
CA1604488-001	BVSP40	Merimbula STP - Effluent (comp)	11-Aug-16	3.8	<0.1	100	<0.05	<1	0.3	21	60	<0.2	16.6
CA1604588-001	BVSP40	Merimbula STP - Effluent (comp)	17-Aug-16	3.5	<0.1	80	<0.05	1	0.3	21	60	<0.2	14.4
CA1604790-001	BVSP40	Merimbula STP - Effluent (comp)	25-Aug-16	4.1	<0.1	70	<0.05	<1	0.4	24	70	<0.2	16.2
CA1604882-001	BVSP40	Merimbula STP - Effluent (comp)	31-Aug-16	4.0	<0.1	70	<0.05	<1	0.3	25	80	<0.2	16.0
CA1605094-001	BVSP40	Merimbula STP - Effluent (comp)	07-Sep-16	3.4	<0.1	60	<0.05	2	0.4	20	80	<0.2	19.4
CA1605261-001	BVSP40	Merimbula STP - Effluent (comp)	15-Sep-16	4.1	<0.1	70	<0.05	<1	0.4	18	110	<0.2	40.0
CA1605388-001	BVSP40	Merimbula STP - Effluent (comp)	21-Sep-16	4.7	<0.1	60	<0.05	<1	0.5	13	70	<0.2	41.7
CA1605536-001	BVSP40	Merimbula STP - Effluent (comp)	29-Sep-16	4.6	0.1	60	<0.05	<1	0.5	14	90	<0.2	36.6

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
				ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
CA1403330001	BVSP40	Merimbula STP - Effluent (comp)	23-Oct-14	<0.1	<1	2	3	<1	31
CA1403470001	BVSP40	Merimbula STP - Effluent (comp)	05-Nov-14	<0.1	<1	2	4	<1	35
CA1403632001	BVSP40	Merimbula STP - Effluent (comp)	13-Nov-14	<0.1	<1	2	3	<1	25
CA1403706001	BVSP40	Merimbula STP - Effluent (comp)	19-Nov-14	<0.1	<1	2	4	<1	16
CA1403805001	BVSP40	Merimbula STP - Effluent (comp)	27-Nov-14	<0.1	<1	3	4	<1	30
CA1403883001	BVSP40	Merimbula STP - Effluent (comp)	03-Dec-14	<0.1	<1	2	3	<1	<5
CA1404099001	BVSP40	Merimbula STP - Effluent (comp)	11-Dec-14	<0.1	<1	3	3	<1	28
CA1404180001	BVSP40	Merimbula STP - Effluent (comp)	17-Dec-14	<0.1	<1	2	2	<1	7
CA1404237001	BVSP40	Merimbula STP - Effluent (comp)	22-Dec-14	<0.1	<1	2	2	<1	27
CA1404281001	BVSP40	Merimbula STP - Effluent (comp)	29-Dec-14	<0.1	<1	4	3	<1	17
CA1500058-001	BVSP40	Merimbula STP - Effluent (comp)	07-Jan-15	<0.1	<1	2	2	<1	60
CA1500200-001	BVSP40	Merimbula STP - Effluent (comp)	15-Jan-15	<0.1	<1	3	3	<1	51
CA1500260-001	BVSP40	Merimbula STP - Effluent (comp)	21-Jan-15	<0.1	<1	2	3	<1	48
CA1500356-001	BVSP40	Merimbula STP - Effluent (comp)	29-Jan-15	0.1	<1	2	<1	<1	123
CA1500395-001	BVSP40	Merimbula STP - Effluent (comp)	04-Feb-15	<0.1	<1	2	2	<1	107
CA1500464-001	BVSP40	Merimbula STP - Effluent (comp)	12-Feb-15	<0.1	<1	2	3	<1	130
CA1500606-001	BVSP40	Merimbula STP - Effluent (comp)	18-Feb-15	<0.1	<1	2	2	<1	110
CA1500737-001	BVSP40	Merimbula STP - Effluent (comp)	26-Feb-15	0.2	<1	2	2	<1	148
CA1500802-001	BVSP40	Merimbula STP - Effluent (comp)	04-Mar-15	<0.1	<1	2	2	<1	138
CA1500965-001	BVSP40	Merimbula STP - Effluent (comp)	12-Mar-15	<0.1	<1	2	2	<1	99
CA1501041-001	BVSP40	Merimbula STP - Effluent (comp)	18-Mar-15	<0.1	<1	2	1	<1	128
CA1501136-001	BVSP40	Merimbula STP - Effluent (comp)	26-Mar-15	<0.1	1	2	3	<1	121
CA1501220-001	BVSP40	Merimbula STP - Effluent (comp)	01-Apr-15	<0.1	<1	3	3	<1	129
CA1501297-001	BVSP40	Merimbula STP - Effluent (comp)	09-Apr-15	<0.1	<1	2	2	<1	121
CA1501393-001	BVSP40	Merimbula STP - Effluent (comp)	15-Apr-15	<0.1	<1	3	2	<1	141
CA1501514-001	BVSP40	Merimbula STP - Effluent (comp)	23-Apr-15	<0.1	<1	2	2	<1	113
CA1501587-001	BVSP40	Merimbula STP - Effluent (comp)	29-Apr-15	<0.1	<1	2	1	<1	161
CA1501688-001	BVSP40	Merimbula STP - Effluent (comp)	06-May-15	<0.1	<1	2	1	<1	129
CA1501836-001	BVSP40	Merimbula STP - Effluent (comp)	14-May-15	<0.1	<1	3	1	<1	227
CA1501910-001	BVSP40	Merimbula STP - Effluent (comp)	20-May-15	<0.1	<1	2	2	<1	168
CA1501992-001	BVSP40	Merimbula STP - Effluent (comp)	28-May-15	<0.1	<1	2	2	<1	128
CA1502103-001	BVSP40	Merimbula STP - Effluent (comp)	03-Jun-15	<0.1	<1	2	2	<1	129
CA1502266-001	BVSP40	Merimbula STP - Effluent (comp)	11-Jun-15	<0.1	<1	2	1	<1	142
CA1502358-001	BVSP40	Merimbula STP - Effluent (comp)	17-Jun-15	<0.1	<1	2	2	<1	197
CA1502523-001	BVSP40	Merimbula STP - Effluent (comp)	25-Jun-15	<0.1	<1	2	2	<1	71
CA1502605-001	BVSP40	Merimbula STP - Effluent (comp)	01-Jul-15	<0.1	<1	2	2	<1	121
CA1502714-001	BVSP40	Merimbula STP - Effluent (comp)	09-Jul-15	<0.1	<1	2	2	<1	228
CA1502827-001	BVSP40	Merimbula STP - Effluent (comp)	15-Jul-15	<0.1	<1	2	1	<1	248
CA1502953-001	BVSP40	Merimbula STP - Effluent (comp)	23-Jul-15	<0.1	<1	2	2	<1	64
CA1503021-001	BVSP40	Merimbula STP - Effluent (comp)	29-Jul-15	<0.1	<1	2	2	<1	158
CA1503138-001	BVSP40	Merimbula STP - Effluent (comp)	05-Aug-15	<0.1	<1	2	2	<1	59
CA1503274-001	BVSP40	Merimbula STP - Effluent (comp)	13-Aug-15	<0.1	<1	2	2	<1	48
CA1503366-001	BVSP40	Merimbula STP - Effluent (comp)	19-Aug-15	<0.1	<1	2	3	<1	49
CA1503479-001	BVSP40	Merimbula STP - Effluent (comp)	27-Aug-15	<0.1	<1	2	2	<1	50
CA1503556-001	BVSP40	Merimbula STP - Effluent (comp)	02-Sep-15	<0.1	<1	2	<1	<1	41
CA1503652-001	BVSP40	Merimbula STP - Effluent (comp)	10-Sep-15	<0.1	<1	2	5	<1	64
CA1503782-001	BVSP40	Merimbula STP - Effluent (comp)	16-Sep-15	<0.1	<1	2	1	<1	60
CA1503900-001	BVSP40	Merimbula STP - Effluent (comp)	24-Sep-15	<0.1	<1	2	4	<1	42
CA1503970-001	BVSP40	Merimbula STP - Effluent (comp)	30-Sep-15	<0.1	<1	2	1	<1	46
CA1504058-001	BVSP40	Merimbula STP - Effluent (comp)	07-Oct-15	<0.1	<1	2	3	<1	38
CA1504256-001	BVSP40	Merimbula STP - Effluent (comp)	16-Oct-15	<0.1	<1	2	4	<1	22

BVSC Merimbula STP Effluent Monitoring Data

Sample No.	Sample ID	Sample Description	Sample Date	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
				ug/L	ug/L	ug/L	ug/L	ug/L	ug/L
CA1504372-001	BVSP40	Merimbula STP - Effluent (comp)	21-Oct-15	<0.1	<1	2	3	<1	34
CA1504557-001	BVSP40	Merimbula STP - Effluent (comp)	29-Oct-15	<0.1	<1	3	5	<1	34
CA1504688-001	BVSP40	Merimbula STP - Effluent (comp)	05-Nov-15	<0.1	<1	2	2	<1	35
CA1504916-001	BVSP40	Merimbula STP - Effluent (comp)	13-Nov-15	0.1	1	2	2	<1	24
CA1505078-001	BVSP40	Merimbula STP - Effluent (comp)	18-Nov-15	<0.1	1	2	2	<1	28
CA1505255-001	BVSP40	Merimbula STP - Effluent (comp)	26-Nov-15	<0.1	<1	2	<1	<1	26
CA1505370-001	BVSP40	Merimbula STP - Effluent (comp)	02-Dec-15	<0.1	<1	3	3	<1	23
CA1505585-001	BVSP40	Merimbula STP - Effluent (comp)	10-Dec-15	<0.1	1	3	4	<1	33
CA1505717-001	BVSP40	Merimbula STP - Effluent (comp)	16-Dec-15	<0.1	1	3	5	<1	39
CA1505806-001	BVSP40	Merimbula STP - Effluent (comp)	21-Dec-15	<0.1	<1	3	4	<1	35
CA1505923-001	BVSP40	Merimbula STP - Effluent (comp)	29-Dec-15	<0.1	<1	3	5	<1	32
CA1600097-001	BVSP40	Merimbula STP - Effluent (comp)	06-Jan-16	<0.1	<1	2	3	<1	33
CA1600299-001	BVSP40	Merimbula STP - Effluent (comp)	15-Jan-16	<0.1	<1	2	3	<1	27
CA1600451-001	BVSP40	Merimbula STP - Effluent (comp)	20-Jan-16	<0.1	<1	2	5	<1	28
CA1600558-001	BVSP40	Merimbula STP - Effluent (comp)	28-Jan-16	<0.1	<1	2	4	<1	37
CA1600713-001	BVSP40	Merimbula STP - Effluent (comp)	03-Feb-16	<0.1	<1	2	3	<1	36
CA1600907-001	BVSP40	Merimbula STP - Effluent (comp)	11-Feb-16	<0.1	1	4	3	<1	26
CA1600999-001	BVSP40	Merimbula STP - Effluent (comp)	18-Feb-16	<0.1	<1	3	5	<1	31
CA1601229-001	BVSP40	Merimbula STP - Effluent (comp)	26-Feb-16	<0.1	<1	3	5	<1	30
CA1601335-001	BVSP40	Merimbula STP - Effluent (comp)	02-Mar-16	<0.1	<1	3	6	<1	30
CA1601525-001	BVSP40	Merimbula STP - Effluent (comp)	10-Mar-16	<0.1	<1	3	6	<1	28
CA1601628-001	BVSP40	Merimbula STP - Effluent (comp)	16-Mar-16	<0.1	<1	3	4	<1	35
CA1601832-001	BVSP40	Merimbula STP - Effluent (comp)	24-Mar-16	<0.1	<1	4	3	<1	88
CA1601915-001	BVSP40	Merimbula STP - Effluent (comp)	30-Mar-16	<0.1	<1	<1	7	<1	60
CA1602083-001	BVSP40	Merimbula STP - Effluent (comp)	06-Apr-16	<0.1	<1	3	5	<1	53
CA1602272-001	BVSP40	Merimbula STP - Effluent (comp)	14-Apr-16	<0.1	<1	3	6	<1	44
CA1602353-001	BVSP40	Merimbula STP - Effluent (comp)	20-Apr-16	<0.1	<1	3	7	<1	47
CA1602466-001	BVSP40	Merimbula STP - Effluent (comp)	29-Apr-16	<0.1	<1	3	6	<1	51
CA1602608-001	BVSP40	Merimbula STP - Effluent (comp)	04-May-16	<0.1	<1	3	7	<1	43
CA1602775-001	BVSP40	Merimbula STP - Effluent (comp)	12-May-16	<0.1	<1	3	8	<1	54
CA1602897-001	BVSP40	Merimbula STP - Effluent (comp)	18-May-16	0.2	<1	3	10	<1	54
CA1603032-001	BVSP40	Merimbula STP - Effluent (comp)	26-May-16	<0.1	<1	2	11	<1	54
CA1603145-001	BVSP40	Merimbula STP - Effluent (comp)	01-Jun-16	<0.1	<1	3	9	<1	53
CA1603303-001	BVSP40	Merimbula STP - Effluent (comp)	09-Jun-16	<0.1	<1	3	5	<1	54
CA1603382-001	BVSP40	Merimbula STP - Effluent (comp)	15-Jun-16	<0.1	<1	2	6	<1	53
CA1603574-001	BVSP40	Merimbula STP - Effluent (comp)	23-Jun-16	<0.1	<1	3	7	<1	45
CA1603696-001	BVSP40	Merimbula STP - Effluent (comp)	29-Jun-16	<0.1	<1	<1	14	<1	59
CA1603813-001	BVSP40	Merimbula STP - Effluent (comp)	06-Jul-16	<0.1	<1	3	9	<1	53
CA1603973-001	BVSP40	Merimbula STP - Effluent (comp)	14-Jul-16	<0.1	<1	3	6	<1	44
CA1604093-001	BVSP40	Merimbula STP - Effluent (comp)	20-Jul-16	<0.1	<1	3	7	<1	51
CA1604252-001	BVSP40	Merimbula STP - Effluent (comp)	28-Jul-16	<0.1	<1	3	8	<1	56
CA1604351-001	BVSP40	Merimbula STP - Effluent (comp)	03-Aug-16	0.1	<1	2	8	<1	50
CA1604488-001	BVSP40	Merimbula STP - Effluent (comp)	11-Aug-16	<0.1	<1	3	8	<1	50
CA1604588-001	BVSP40	Merimbula STP - Effluent (comp)	17-Aug-16	<0.1	<1	2	6	<1	53
CA1604790-001	BVSP40	Merimbula STP - Effluent (comp)	25-Aug-16	<0.1	<1	3	7	<1	49
CA1604882-001	BVSP40	Merimbula STP - Effluent (comp)	31-Aug-16	<0.1	<1	3	6	<1	51
CA1605094-001	BVSP40	Merimbula STP - Effluent (comp)	07-Sep-16	<0.1	<1	3	6	<1	49
CA1605261-001	BVSP40	Merimbula STP - Effluent (comp)	15-Sep-16	<0.1	<1	3	6	<1	34
CA1605388-001	BVSP40	Merimbula STP - Effluent (comp)	21-Sep-16	<0.1	<1	3	8	<1	38
CA1605536-001	BVSP40	Merimbula STP - Effluent (comp)	29-Sep-16	<0.1	<1	3	7	<1	40

ANNEXURE D

Table D1 Sediment Chemistry Analytical Results

Certificate of Analysis – PSD results

Excerpt from Marine and Earth Sciences (2018)

Table D1 Sediment Analytical Results

Sample ID	Sample Type	Sample Date	FIELD PARAMETERS ²		LABORATORY PARAMETERS ³											
			pH	Redox	Median particle size	Ammonia as N	Nitrite as N	Nitrate as N	NOx (Nitrite + Nitrate) as N	Total Kjeldahl Nitrogen as N	Total Nitrogen as N	Total Phosphorus as P	Reactive Phosphorus as P	Total Organic Carbon	Aluminium (Al)	Arsenic (As)
			pH unit	mV	um	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	mg/kg	mg/kg
Sample ID	Limit of Reporting (LOR)		-	-		0.2	0.1	0.1	0.1	20	20	2	0.1	0.02	50	1
	ISQG-Low ¹		-	-	-	-	-	-	-		-	-	-	-	-	20
	ISQG-High ¹		-	-	-	-	-	-	-		-	-	-	-	-	70
	Other Background Data - Benthic Sediments Wonthaggi, Vic (Bass Strait) - Wonthaggi Desal Plant EES 2008					<0.2	<0.1	<0.1-0.546	<0.1-0.546		100-280		0.177-0.922	0.06-0.09		4.4-15
MBWQ20_12/12/16	SEDIMENT	12-Dec-16	8.4	-12	203	<0.2	<0.1	<0.1	<0.1	-	230	147	5.8	<0.5	421	3
MBWQ40_12/12/16	SEDIMENT	12-Dec-16	8.1	-65	218	<0.2	<0.1	0.1	0.1	-	660	247	1.3	<0.5	1900	4
HAY20_12/12/16	SEDIMENT	12-Dec-16	8.0	137	360	<0.2	<0.1	0.2	0.2	-	70	38	0.9	<0.5	104	2
HAYSTH20_12/12/16	SEDIMENT	12-Dec-16	7.7	190	517	<0.2	<0.1	0.3	0.3	-	90	41	0.8	<0.5	102	2
QUON20_12/12/16	SEDIMENT	12-Dec-16	7.6	120	452	<0.2	<0.1	0.3	0.3	-	70	48	1.1	<0.5	117	1
SIS01_9/11/17	SEDIMENT	9-Nov-17	7.3	215	363	<0.2	<0.1	<0.1	<0.1	80	80	91	3.2	0.08	150	1.52
SIS02_10/11/17	SEDIMENT	10-Nov-17	7.5	200	337	<0.2	<0.1	0.7	0.7	150	150	154	2.6	0.07	200	1.92
SIS03_10/11/17	SEDIMENT	10-Nov-17	7.4	116	332	<0.2	<0.1	<0.1	<0.1	90	90	106	3.1	0.06	190	1.53
SIS04_10/11/17	SEDIMENT	10-Nov-17	7.8	145	336	<0.2	<0.1	<0.1	<0.1	130	130	102	2.9	0.05	180	1.52
SIS05_10/11/17	SEDIMENT	10-Nov-17	7.9	164	642	<0.2	<0.1	<0.1	<0.1	100	100	274	1.4	0.07	560	10.5
SIS06_10/11/17	SEDIMENT	10-Nov-17	7.8	174	707	<0.2	<0.1	<0.1	<0.1	50	50	250	1	0.05	470	8.51
SIS07_10/11/17	SEDIMENT	10-Nov-17	8	171	1200	<0.2	<0.1	0.2	0.2	140	140	278	1.5	0.06	500	12.9
SIS08_10/11/17	SEDIMENT	10-Nov-17	7.8	160	1010	<0.2	<0.1	0.5	0.5	90	90	249	1.2	0.06	510	14.4
S0_3/10/19	SEDIMENT	3-Oct-19	7.69	18	536	12.9	<0.1	0.3	0.3	100	100	279	1.6	—	720	3.61
S0_15/4/20	SEDIMENT	15-Apr-20	8.4	-	513	2.5	<0.1	0.2	0.2	110	110	310	2	0.08	490	11.3
D0_15/4/20	SEDIMENT	15-Apr-20	8.5	-	742	11	<0.1	0.3	0.3	140	140	214	1.2	0.09	460	11.4

Table D1 Sediment Analytical Results

Sample ID	Sample Type	Sample Date	FIELD PARAMETERS ²		LABORATORY PARAMETERS ³											
			pH	Redox	Median particle size	Ammonia as N	Nitrite as N	Nitrate as N	NOx (Nitrite + Nitrate) as N	Total Kjeldahl Nitrogen as N	Total Nitrogen as N	Total Phosphorus as P	Reactive Phosphorus as P	Total Organic Carbon	Aluminium (Al)	Arsenic (As)
			pH unit	mV	um	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	mg/kg	mg/kg
	Limit of Reporting (LOR)		-	-		0.2	0.1	0.1	0.1	20	20	2	0.1	0.02	50	1
	ISQG-Low ¹		-	-	-	-	-	-	-		-	-	-	-	-	20
	ISQG-High ¹		-	-	-	-	-	-	-		-	-	-	-	-	70
	Other Background Data - Benthic Sediments Wonthaggi, Vic (Bass Strait) - Wonthaggi Desal Plant EES 2008					<0.2	<0.1	<0.1-0.546	<0.1-0.546		100-280		0.177-0.922	0.06-0.09		4.4-15
S1_21/10/19	SEDIMENT	21-Oct-19	7.77	-9	168	12.6	<0.1	0.3	0.3	470	470	286	0.6	0.19	1830	5.25
S1_17/3/20	SEDIMENT	17-Mar-20	7.8	121	474	4.6	<0.1	0.6	0.6	140	140	174	1.6	0.1	530	9.01
S2_22/10/19	SEDIMENT	22-Oct-19	6.82	47	657	25.1	<0.1	0.5	0.5	170	170	233	1.1	0.2	920	11.7
S2_15/4/20	SEDIMENT	15-Apr-20	8.5	-	571	4.8	<0.1	0.2	0.2	110	110	254	2	0.09	490	11.2
S3_21/10/19	SEDIMENT	21-Oct-19	7.58	45	688	5.3	<0.1	0.2	0.2	50	50	141	0.8	0.03	490	10.7
S3_17/3/20	SEDIMENT	17-Mar-20	7.8	110	740	5.9	<0.1	0.4	0.4	140	140	250	1.1	0.08	540	16.2
S4_22/10/19	SEDIMENT	22-Oct-19	7.32	-5	897	54.1	<0.1	0.2	0.2	180	180	145	1.1	0.04	730	11.2
S4_15/4/20	SEDIMENT	15-Apr-20	8.6	-	686	0.3	<0.1	0.6	0.6	80	80	207	1.1	0.05	490	15.7
S5_21/10/19	SEDIMENT	21-Oct-19	7.26	107	498	2.3	<0.1	0.5	0.5	30	30	186	0.9	0.02	310	6.49
S5_17/3/20	SEDIMENT	17-Mar-20	7.8	111	524	4.5	<0.1	0.6	0.6	150	150	170	1.3	0.07	300	7.33
S6_22/10/19	SEDIMENT	22-Oct-19	7.08	19	468	8.9	<0.1	0.3	0.3	60	60	171	1.2	0.03	550	7.74
S6_17/3/20	SEDIMENT	17-Mar-20	8.2	104	460	8.7	<0.1	0.1	0.1	150	150	213	5.5	0.07	390	6.75
S7_21/10/19	SEDIMENT	21-Oct-19	6.87	110	405	7.2	<0.1	0.3	0.3	70	70	85	1.1	0.03	210	2.96
S7_17/3/20	SEDIMENT	17-Mar-20	8.2	100	478	16.5	<0.1	0.3	0.3	310	310	212	2.2	0.1	260	3.71
S8_22/10/19	SEDIMENT	22-Oct-19	7.32	76	258	7.4	<0.1	0.3	0.3	100	100	153	3	<0.02	670	3.7
S8_17/3/20	SEDIMENT	17-Mar-20	8.1	101	214	1.7	<0.1	0.6	0.6	450	450	337	2.8	0.17	920	3.82

Table D1 Sediment Analytical Results

Sample ID	Sample Type	Sample Date	FIELD PARAMETERS ²		LABORATORY PARAMETERS ³											
			pH	Redox	Median particle size	Ammonia as N	Nitrite as N	Nitrate as N	NOx (Nitrite + Nitrate) as N	Total Kjeldahl Nitrogen as N	Total Nitrogen as N	Total Phosphorus as P	Reactive Phosphorus as P	Total Organic Carbon	Aluminium (Al)	Arsenic (As)
			pH unit	mV	um	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	mg/kg	mg/kg
	Limit of Reporting (LOR)		-	-		0.2	0.1	0.1	0.1	20	20	2	0.1	0.02	50	1
	ISQG-Low ¹		-	-	-	-	-	-	-		-	-	-	-	-	20
ISQG-High ¹		-	-	-	-	-	-	-		-	-	-	-	-	70	
Other Background Data - Benthic Sediments Wonthaggi, Vic (Bass Strait) - Wonthaggi Desal Plant EES 2008					<0.2	<0.1	<0.1-0.546	<0.1-0.546		100-280		0.177-0.922	0.06-0.09		4.4-15	
S9_3/10/19	SEDIMENT	3-Oct-19	7.9	-26	399	6	<0.1	0.2	0.2	30	30	54	0.6	---	120	2.98
S9_15/4/20	SEDIMENT	15-Apr-20	8.3	-	397	0.6	<0.1	0.4	0.4	70	70	68	0.8	0.05	160	3.69
S10_3/10/19	SEDIMENT	3-Oct-19	6.8	55	259	14.7	<0.1	0.5	0.5	120	120	178	3.7	---	380	3.93
S10_15/4/20	SEDIMENT	15-Apr-20	8.5	-	262	3.1	<0.1	<0.1	<0.1	460	460	175	0.4	0.15	1740	4.39

Note

Shaded cells with bold text indicate guideline value has been exceeded.

¹ Interim Sediment Quality Guidelines (ANZECC/ARMCANZ 2000, CSIRO 2005)² Field parameters measured *in situ* using field-chem kit³ Laboratory parameters reported by ALS Sydney

Table D1 Sediment Analytical Results

Sample ID	Sample Type	Sample Date														
			Iron (Fe)	Chromium (Cr)	Manganese (Mn)	Copper (Cu)	Zinc (Zn)	Nickel (Ni)	Selenium (Se)	Vanadium (V)	Antimony (Sb)	Cadmium (Cd)	Cobalt (Co)	Lead (Pb)	Silver (Ag)	Mercury (Hg)
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
	Limit of Reporting (LOR)		50	1	10	1	1	1	0.1	2	0.5	0.1	0.5	1	0.1	0.01
	ISQG-Low ¹		-	80	-	65	200	21	-	-	2	1.5	-	50	1	0.15
	ISQG-High ¹		-	370	-	270	410	52	-	-	25	10	-	220	3.7	1
	Other Background Data - Benthic Sediments Wonthaggi, Vic (Bass Strait) - Wonthaggi Desal Plant EES 2008			<1-3.8		4.8-5.5	9.6-11.4	<1-1.3				<0.1		<1.0-1.3		<0.01-0.01
MBWQ20_12/12/16	SEDIMENT	12-Dec-16	1630	4	6	<1	2	4	<1	4	<5	<0.1	<1	0.9	<1	<0.1
MBWQ40_12/12/16	SEDIMENT	12-Dec-16	3880	7	17	2	8	10	1	9	<5	<0.1	1	2.4	<1	<0.1
HAY20_12/12/16	SEDIMENT	12-Dec-16	616	1	<1	<1	<1	<1	<1	2	<5	<0.1	<1	0.3	<1	<0.1
HAYSTH20_12/12/16	SEDIMENT	12-Dec-16	677	1	<1	<1	<1	1	<1	3	<5	<0.1	<1	0.3	<1	<0.1
QUON20_12/12/16	SEDIMENT	12-Dec-16	868	2	4	<1	<1	2	<1	3	<5	<0.1	<1	0.6	<1	<0.1
SIS01_9/11/17	SEDIMENT	9-Nov-17	800	2.5	<10	<1.0	<1.0	<1.0	<0.1	2.3	<0.50	<0.1	<0.5	<1.0	<0.1	<0.01
SIS02_10/11/17	SEDIMENT	10-Nov-17	980	2.7	<10	<1.0	<1.0	<1.0	0.1	3.2	<0.50	<0.1	<0.5	<1.0	<0.1	<0.01
SIS03_10/11/17	SEDIMENT	10-Nov-17	900	2.4	<10	<1.0	<1.0	<1.0	<0.1	2.6	<0.50	<0.1	<0.5	<1.0	<0.1	<0.01
SIS04_10/11/17	SEDIMENT	10-Nov-17	960	2.4	<10	<1.0	<1.0	<1.0	<0.1	2.5	<0.50	<0.1	<0.5	<1.0	<0.1	<0.01
SIS05_10/11/17	SEDIMENT	10-Nov-17	4720	5.8	<10	<1.0	2	<1.0	<0.1	12.5	<0.50	<0.1	<0.5	1.3	<0.1	<0.01
SIS06_10/11/17	SEDIMENT	10-Nov-17	4030	5	<10	<1.0	1.4	<1.0	<0.1	11	<0.50	<0.1	<0.5	<1.0	<0.1	<0.01
SIS07_10/11/17	SEDIMENT	10-Nov-17	4650	4.7	<10	<1.0	6.7	<1.0	<0.1	14.1	<0.50	<0.1	<0.5	<1.0	<0.1	<0.01
SIS08_10/11/17	SEDIMENT	10-Nov-17	4960	5	<10	<1.0	1.7	<1.0	<0.1	14.4	0.88	<0.1	<0.5	1.1	0.6	<0.01
S0_3/10/19	SEDIMENT	3-Oct-19	5250	5.7	<10	<1.0	2.2	<1.0	0.1	14.4	<0.50	<0.1	<0.5	1.3	<0.1	<0.01
S0_15/4/20	SEDIMENT	15-Apr-20	4260	5.3	<10	<1.0	1.5	1	0.2	10.7	<0.50	<0.1	0.5	1.7	<0.1	<0.01
D0_15/4/20	SEDIMENT	15-Apr-20	4470	5.9	<10	<1.0	1.3	1.2	0.2	11.9	<0.50	<0.1	0.5	1.4	<0.1	<0.01

Table D1 Sediment Analytical Results

Sample ID	Sample Type	Sample Date														
			Iron (Fe)	Chromium (Cr)	Manganese (Mn)	Copper (Cu)	Zinc (Zn)	Nickel (Ni)	Selenium (Se)	Vanadium (V)	Antimony (Sb)	Cadmium (Cd)	Cobalt (Co)	Lead (Pb)	Silver (Ag)	Mercury (Hg)
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
	Limit of Reporting (LOR)		50	1	10	1	1	1	0.1	2	0.5	0.1	0.5	1	0.1	0.01
	ISQG-Low ¹		-	80	-	65	200	21	-	-	2	1.5	-	50	1	0.15
	ISQG-High ¹		-	370	-	270	410	52	-	-	25	10	-	220	3.7	1
	Other Background Data - Benthic Sediments Wonthaggi, Vic (Bass Strait) - Wonthaggi Desal Plant EES 2008			<1-3.8		4.8-5.5	9.6-11.4	<1-1.3				<0.1		<1.0-1.3		<0.01-0.01
S1_21/10/19	SEDIMENT	21-Oct-19	3980	7.7	15	1	5.9	2.6	0.3	9.4	<0.50	<0.1	0.6	2.3	<0.1	0.01
S1_17/3/20	SEDIMENT	17-Mar-20	5010	4.6	<10	<1.0	2.6	<1.0	0.2	9.4	<0.50	<0.1	<0.5	1.1	0.2	<0.01
S2_22/10/19	SEDIMENT	22-Oct-19	4790	5.7	<10	<1.0	2.6	1.1	0.1	13.9	<0.50	<0.1	<0.5	1.5	<0.1	<0.01
S2_15/4/20	SEDIMENT	15-Apr-20	4220	5.5	<10	<1.0	1.4	1.1	0.2	10.8	<0.50	<0.1	0.5	1.5	<0.1	<0.01
S3_21/10/19	SEDIMENT	21-Oct-19	3650	4.6	<10	<1.0	1.5	<1.0	<0.1	10.9	<0.50	<0.1	<0.5	<1.0	<0.1	<0.01
S3_17/3/20	SEDIMENT	17-Mar-20	7120	4.7	10	<1.0	1.9	<1.0	<0.1	14.8	<0.50	<0.1	<0.5	1.1	0.1	<0.01
S4_22/10/19	SEDIMENT	22-Oct-19	4850	5	<10	<1.0	1.8	<1.0	0.1	13.9	<0.50	<0.1	<0.5	1	<0.1	<0.01
S4_15/4/20	SEDIMENT	15-Apr-20	5800	5.8	<10	<1.0	1.2	1.1	0.2	15.9	<0.50	<0.1	0.5	1.5	<0.1	<0.01
S5_21/10/19	SEDIMENT	21-Oct-19	2250	3.3	<10	<1.0	1.1	<1.0	<0.1	7.1	<0.50	<0.1	<0.5	<1.0	<0.1	<0.01
S5_17/3/20	SEDIMENT	17-Mar-20	3380	3.2	<10	<1.0	1.5	<1.0	0.2	7.5	<0.50	<0.1	<0.5	1	0.1	<0.01
S6_22/10/19	SEDIMENT	22-Oct-19	3350	4.4	<10	<1.0	1.6	<1.0	<0.1	9.6	<0.50	<0.1	<0.5	1	<0.1	<0.01
S6_17/3/20	SEDIMENT	17-Mar-20	3910	3.8	<10	<1.0	1.6	<1.0	<0.1	7.5	<0.50	<0.1	<0.5	<1.0	<0.1	<0.01
S7_21/10/19	SEDIMENT	21-Oct-19	1420	2.6	<10	<1.0	1	<1.0	<0.1	4.5	<0.50	<0.1	<0.5	<1.0	<0.1	<0.01
S7_17/3/20	SEDIMENT	17-Mar-20	2260	2.5	<10	<1.0	1.3	<1.0	0.3	5.2	<0.50	<0.1	<0.5	<1.0	<0.1	<0.01
S8_22/10/19	SEDIMENT	22-Oct-19	2240	5.3	<10	<1.0	2	<1.0	0.1	5.1	<0.50	<0.1	<0.5	<1.0	<0.1	<0.01
S8_17/3/20	SEDIMENT	17-Mar-20	3470	6.2	10	<1.0	3.6	1.5	0.5	4.8	<0.50	<0.1	<0.5	1.3	0.1	<0.01

Table D1 Sediment Analytical Results

Sample ID	Sample Type	Sample Date														
			Iron (Fe)	Chromium (Cr)	Manganese (Mn)	Copper (Cu)	Zinc (Zn)	Nickel (Ni)	Selenium (Se)	Vanadium (V)	Antimony (Sb)	Cadmium (Cd)	Cobalt (Co)	Lead (Pb)	Silver (Ag)	Mercury (Hg)
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
	Limit of Reporting (LOR)		50	1	10	1	1	1	0.1	2	0.5	0.1	0.5	1	0.1	0.01
	ISQG-Low ¹		-	80	-	65	200	21	-	-	2	1.5	-	50	1	0.15
ISQG-High ¹		-	370	-	270	410	52	-	-	25	10	-	220	3.7	1	
Other Background Data - Benthic Sediments Wonthaggi, Vic (Bass Strait) - Wonthaggi Desal Plant EES 2008			<1-3.8		4.8-5.5	9.6-11.4	<1-1.3				<0.1		<1.0-1.3		<0.01-0.01	
S9_3/10/19	SEDIMENT	3-Oct-19	1020	1.9	<10	<1.0	<1.0	<1.0	<0.1	3.6	<0.50	<0.1	<0.5	<1.0	<0.1	<0.01
S9_15/4/20	SEDIMENT	15-Apr-20	1140	2.6	<10	<1.0	<1.0	<1.0	0.1	4	<0.50	<0.1	<0.5	<1.0	<0.1	<0.01
S10_3/10/19	SEDIMENT	3-Oct-19	2100	4.4	<10	<1.0	1.5	<1.0	0.1	5	<0.50	<0.1	<0.5	<1.0	<0.1	<0.01
S10_15/4/20	SEDIMENT	15-Apr-20	3510	7.2	14	<1.0	2.8	3.6	0.5	7.9	<0.50	<0.1	1	2.8	<0.1	<0.01

Note

Shaded cells with bold text indicate guideline value has

¹ Interim Sediment Quality Guidelines (ANZECC/ARMC).² Field parameters measured *in situ* using field-chem kit³ Laboratory parameters reported by ALS Sydney

Certificate of Analysis

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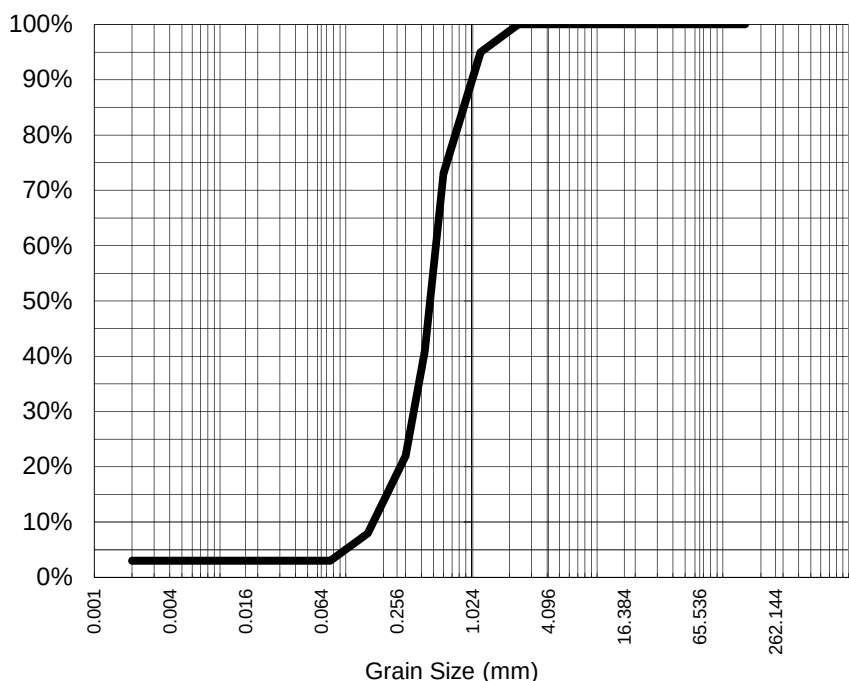
ALS Environmental

Newcastle, NSW



CLIENT: NICK YEE **DATE REPORTED:** 27-Mar-2020
COMPANY: ELGIN ASSOCIATES PTY LTD **DATE RECEIVED:** 19-Mar-2020
ADDRESS: PO Box 829 **REPORT NO:** ES2009483-001 / PSD
Bega
NSW, Australia
PROJECT: JN19231 MERIMBULA DEEP **SAMPLE ID:** S1_17/3/20
OCEAN OUTFALL - BENTHIC

Particle Size Distribution



Particle Size (mm)	% Passing
2.36	100%
1.18	95%
0.600	73%
0.425	41%
0.300	22%
0.150	8%
0.075	3%
Particle Size (microns)	
58	3%
41	3%
29	3%
20	3%
15	3%
11	3%
7	3%
5	3%
2	3%

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75µm). Results should be assessed accordingly

Loss on Pretreatment NA

Sample Description: SAND

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.64

NATA Accreditation: 825 Site: Newcastle
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Analysed: 25-Mar-20

Limit of Reporting: 1%

Dispersion Method Shaker

Aleksandar Vujkovic
Laboratory Supervisor
Authorised Signatory

Certificate of Analysis

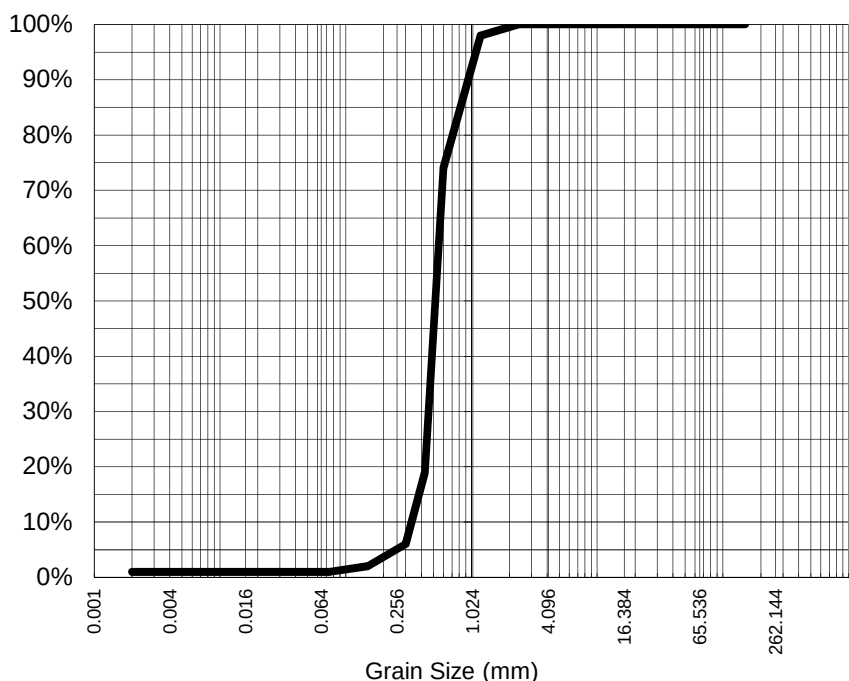
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Newcastle, NSW



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COMPANY: ELGIN ASSOCIATES PTY LTD **DATE RECEIVED:** 19-Mar-2020
ADDRESS: PO Box 829 **REPORT NO:** ES2009483-002 / PSD
Bega
NSW, Australia
PROJECT: JN19231 MERIMBULA DEEP **SAMPLE ID:** S5_17/3/20
OCEAN OUTFALL - BENTHIC

Particle Size Distribution



Particle Size (mm)	% Passing
2.36	100%
1.18	98%
0.600	74%
0.425	19%
0.300	6%
0.150	2%
0.075	1%
Particle Size (microns)	
58	1%
41	1%
29	1%
20	1%
15	1%
11	1%
7	1%
5	1%
2	1%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	0.524
----------------------------	-------

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75µm). Results should be assessed accordingly

Loss on Pretreatment NA

Sample Description: SAND

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.63

Analysed: 25-Mar-20

Limit of Reporting: 1%

Dispersion Method Shaker

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Laboratory Supervisor
Authorised Signatory

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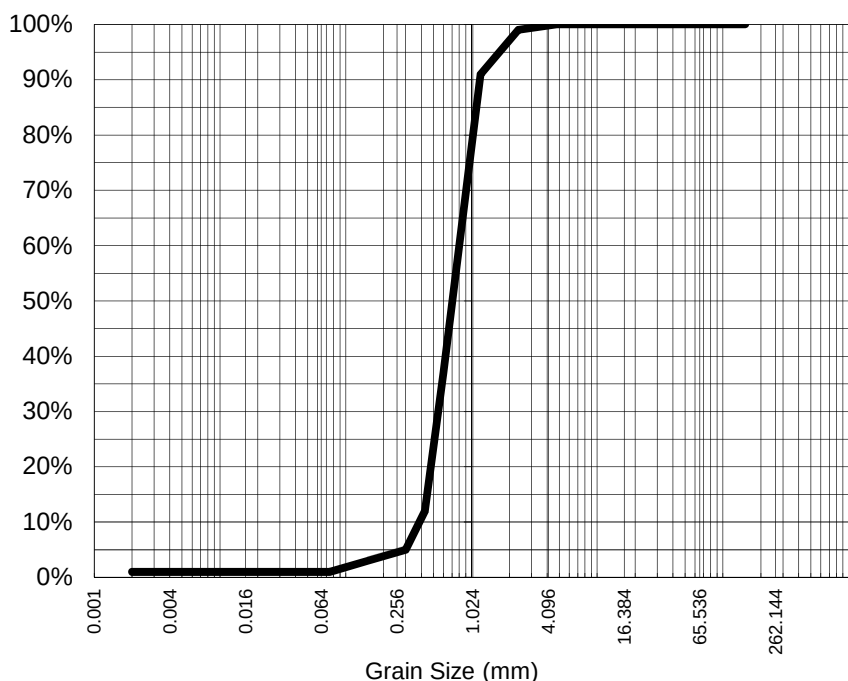
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samples.newcastle@alsenviro.com

ALS Environmental
Newcastle, NSW



CLIENT: NICK YEE **DATE REPORTED:** 27-Mar-2020
COMPANY: ELGIN ASSOCIATES PTY LTD **DATE RECEIVED:** 19-Mar-2020
ADDRESS: PO Box 829 **REPORT NO:** ES2009483-003 / PSD
Bega
NSW, Australia
PROJECT: JN19231 MERIMBULA DEEP **SAMPLE ID:** S3_17/3/20
OCEAN OUTFALL - BENTHIC

Particle Size Distribution



Particle Size (mm)	% Passing
4.75	100%
2.36	99%
1.18	91%
0.600	37%
0.425	12%
0.300	5%
0.150	3%
0.075	1%
Particle Size (microns)	
58	1%
41	1%
29	1%
20	1%
15	1%
11	1%
7	1%
5	1%
2	1%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	0.740
----------------------------	-------

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75µm). Results should be assessed accordingly

Loss on Pretreatment NA

Sample Description: SAND

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.63

Analysed: 25-Mar-20

Limit of Reporting: 1%

Dispersion Method Shaker

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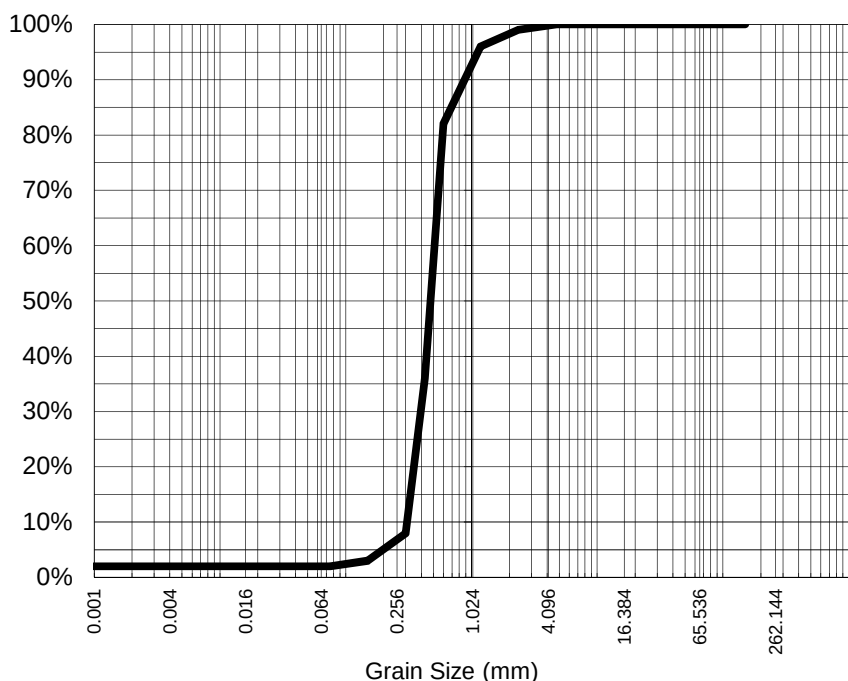
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Newcastle, NSW



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COMPANY: ELGIN ASSOCIATES PTY LTD **DATE RECEIVED:** 19-Mar-2020
ADDRESS: PO Box 829 **REPORT NO:** ES2009483-004 / PSD
Bega
NSW, Australia
PROJECT: JN19231 MERIMBULA DEEP **SAMPLE ID:** S7_17/3/20
OCEAN OUTFALL - BENTHIC

Particle Size Distribution



Particle Size (mm)	% Passing
4.75	100%
2.36	99%
1.18	96%
0.600	82%
0.425	36%
0.300	8%
0.150	3%
0.075	2%
Particle Size (microns)	
56	2%
40	2%
28	2%
20	2%
14	2%
10	2%
7	2%
5	2%
1	2%

Median Particle Size (mm)*	0.478
----------------------------	-------

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75µm). Results should be assessed accordingly

Loss on Pretreatment NA

Sample Description: SAND

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.71

Analysed: 25-Mar-20

Limit of Reporting: 1%

Dispersion Method Shaker

NATA Accreditation: 825 Site: Newcastle
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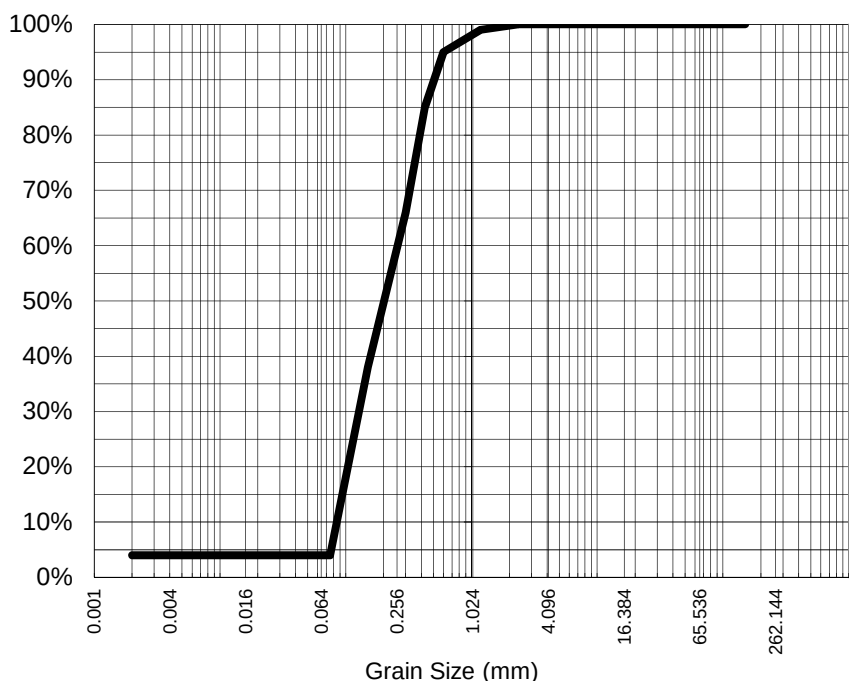
ALS Laboratory Group Pty Ltd
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CLIENT: NICK YEE **DATE REPORTED:** 27-Mar-2020
COMPANY: ELGIN ASSOCIATES PTY LTD **DATE RECEIVED:** 19-Mar-2020
ADDRESS: PO Box 829 **REPORT NO:** ES2009483-005 / PSD
Bega
NSW, Australia
PROJECT: JN19231 MERIMBULA DEEP **SAMPLE ID:** S8_17/3/20
OCEAN OUTFALL - BENTHIC

Particle Size Distribution



Particle Size (mm)	% Passing
2.36	100%
1.18	99%
0.600	95%
0.425	85%
0.300	66%
0.150	38%
0.075	4%
Particle Size (microns)	
58	4%
41	4%
29	4%
20	4%
15	4%
11	4%
7	4%
5	4%
2	4%

Median Particle Size (mm)*	0.214
----------------------------	-------

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly

Loss on Pretreatment NA

Sample Description: SAND

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.62

Analysed: 25-Mar-20

Limit of Reporting: 1%

Dispersion Method Shaker

NATA Accreditation: 825 Site: Newcastle
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Aleksandar Vujkovic
Laboratory Supervisor
Authorised Signatory

Certificate of Analysis

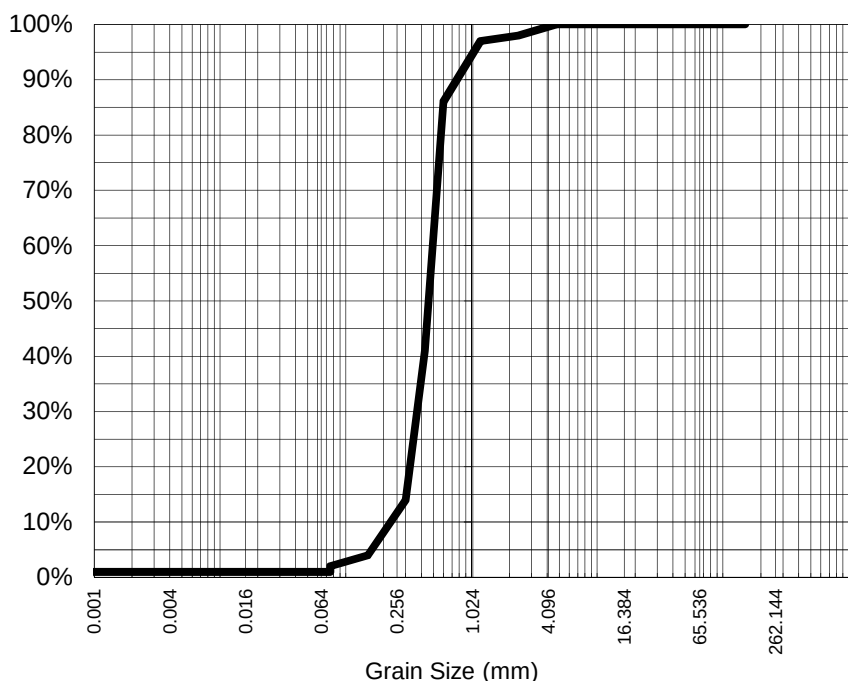
ALS Laboratory Group Pty Ltd
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Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental
Newcastle, NSW



CLIENT: NICK YEE **DATE REPORTED:** 27-Mar-2020
COMPANY: ELGIN ASSOCIATES PTY LTD **DATE RECEIVED:** 19-Mar-2020
ADDRESS: PO Box 829 **REPORT NO:** ES2009483-006 / PSD
Bega
NSW, Australia
PROJECT: JN19231 MERIMBULA DEEP **SAMPLE ID:** S6_17/3/20
OCEAN OUTFALL - BENTHIC

Particle Size Distribution



Particle Size (mm)	% Passing
4.75	100%
2.36	98%
1.18	97%
0.600	86%
0.425	41%
0.300	14%
0.150	4%
0.075	2%
Particle Size (microns)	
57	1%
40	1%
28	1%
20	1%
15	1%
10	1%
7	1%
5	1%
1	1%

Median Particle Size (mm)*	0.460
----------------------------	-------

Analysis Notes

Samples analysed as received.

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75µm). Results should be assessed accordingly

Loss on Pretreatment NA

Sample Description: SAND

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.65

Analysed: 25-Mar-20

Limit of Reporting: 1%

Dispersion Method Shaker

Aleksandar Vujkovic
Laboratory Supervisor
Authorised Signatory



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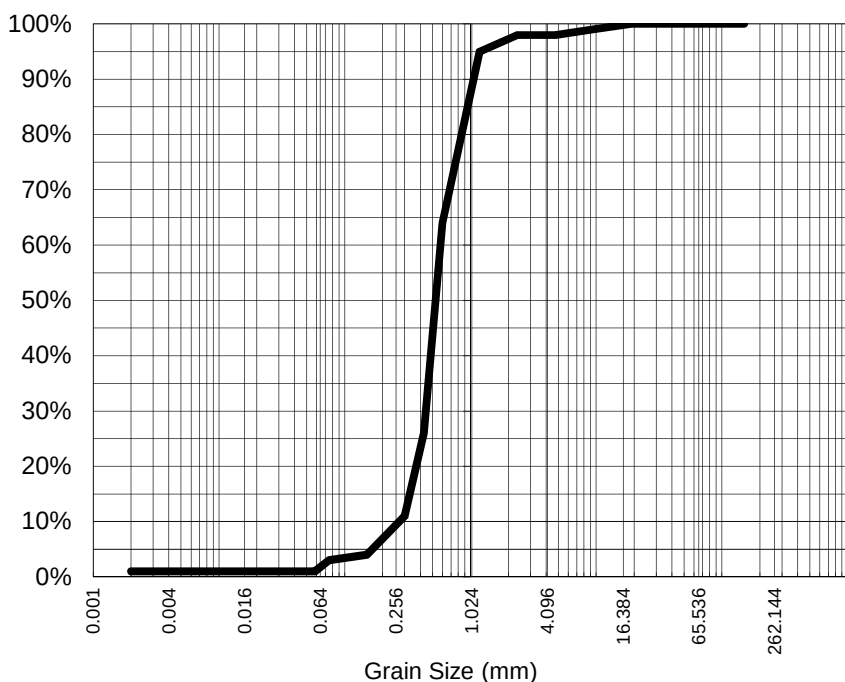
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pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental
Newcastle, NSW



CLIENT: NICK YEE **DATE REPORTED:** 22-Nov-2019
COMPANY: ELGIN ASSOCIATES PTY LTD **DATE RECEIVED:** 14-Nov-2019
ADDRESS: PO Box 829 **REPORT NO:** ES1937617-001 / PSD
Bega
NSW, Australia
PROJECT: JN19231 MERIMBULA DEEP **SAMPLE ID:** S0_3/10/19
OCEAN OUTFALL - BENTHIC

Particle Size Distribution



Analysis Notes

Samples analysed as received.

Particle Size (mm)	% Passing
19.0	100%
9.50	99%
4.75	98%
2.36	98%
1.18	95%
0.600	64%
0.425	26%
0.300	11%
0.150	4%
0.075	3%
Particle Size (microns)	
58	1%
41	1%
29	1%
20	1%
15	1%
11	1%
7	1%
5	1%
2	1%

Median Particle Size (mm)*	0.536
----------------------------	-------

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly

Loss on Pretreatment NA

Sample Description: SAND, SHELL

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.63

Analysed: 19-Nov-19

Limit of Reporting: 1%

Dispersion Method Shaker

Peter Keyte
Technical Manager Air
Authorised Signatory

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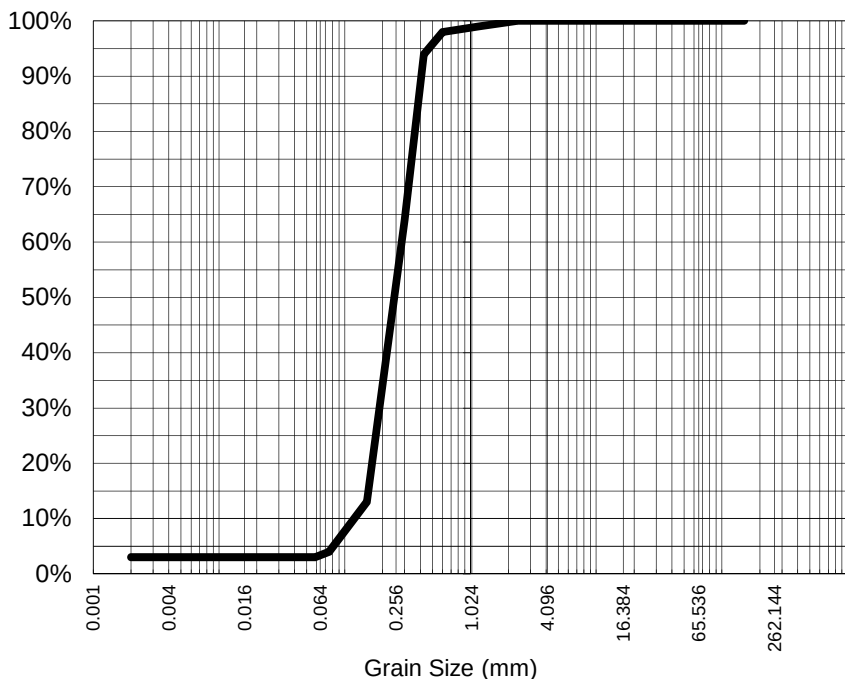
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pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental
Newcastle, NSW



CLIENT: NICK YEE **DATE REPORTED:** 22-Nov-2019
COMPANY: ELGIN ASSOCIATES PTY LTD **DATE RECEIVED:** 14-Nov-2019
ADDRESS: PO Box 829 **REPORT NO:** ES1937617-002 / PSD
Bega
NSW, Australia
PROJECT: JN19231 MERIMBULA DEEP **SAMPLE ID:** S10_3/10/19
OCEAN OUTFALL - BENTHIC

Particle Size Distribution



Particle Size (mm)	% Passing
2.36	100%
1.18	99%
0.600	98%
0.425	94%
0.300	64%
0.150	13%
0.075	4%
Particle Size (microns)	
58	3%
41	3%
29	3%
20	3%
15	3%
11	3%
7	3%
5	3%
2	3%

Analysis Notes

Samples analysed as received.

Median Particle Size (mm)*	0.259
----------------------------	-------

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly

Loss on Pretreatment NA

Sample Description: SAND, SHELL

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.63

Analysed: 19-Nov-19

Limit of Reporting: 1%

Dispersion Method Shaker

Peter Keyte
Technical Manager Air
Authorised Signatory

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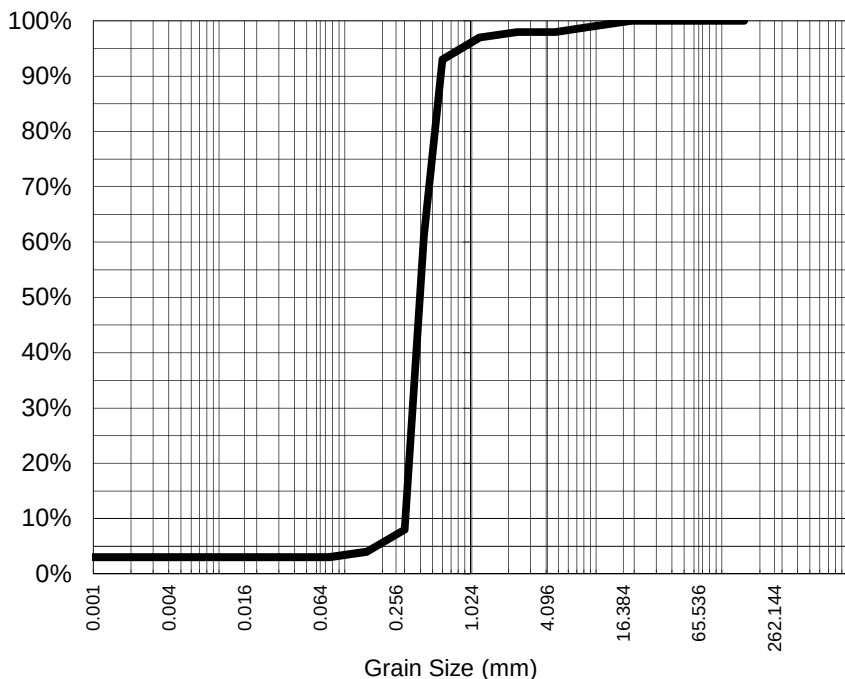
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fax 02 4968 0349
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ALS Environmental
Newcastle, NSW



CLIENT: NICK YEE **DATE REPORTED:** 22-Nov-2019
COMPANY: ELGIN ASSOCIATES PTY LTD **DATE RECEIVED:** 14-Nov-2019
ADDRESS: PO Box 829 **REPORT NO:** ES1937617-003 / PSD
Bega
NSW, Australia
PROJECT: JN19231 MERIMBULA DEEP **SAMPLE ID:** S9_3/10/19
OCEAN OUTFALL - BENTHIC

Particle Size Distribution



Analysis Notes

Samples analysed as received.

Particle Size (mm)	% Passing
19.0	100%
9.50	99%
4.75	98%
2.36	98%
1.18	97%
0.600	93%
0.425	61%
0.300	8%
0.150	4%
0.075	3%
Particle Size (microns)	
57	3%
40	3%
28	3%
20	3%
15	3%
10	3%
7	3%
5	3%
1	3%

Median Particle Size (mm)*	0.399
----------------------------	-------

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly

Loss on Pretreatment NA

Sample Description: SAND, SHELL

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.68

Analysed: 19-Nov-19

Limit of Reporting: 1%

Dispersion Method Shaker

Peter Keyte
Technical Manager Air
Authorised Signatory

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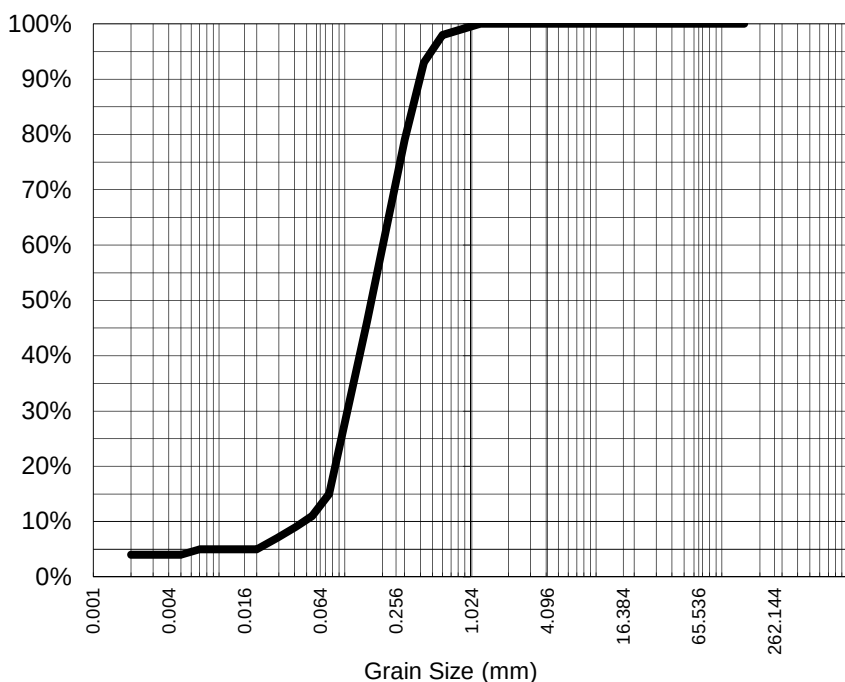
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Mayfield West, NSW 2304
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samples.newcastle@alsenviro.com

ALS Environmental
Newcastle, NSW



CLIENT: NICK YEE **DATE REPORTED:** 22-Nov-2019
COMPANY: ELGIN ASSOCIATES PTY LTD **DATE RECEIVED:** 14-Nov-2019
ADDRESS: PO Box 829 **REPORT NO:** ES1937617-004 / PSD
Bega
NSW, Australia
PROJECT: JN19231 MERIMBULA DEEP **SAMPLE ID:** S1_21/10/19
OCEAN OUTFALL - BENTHIC

Particle Size Distribution



Analysis Notes

Samples analysed as received.

Particle Size (mm)	% Passing
1.18	100%
0.600	98%
0.425	93%
0.300	79%
0.150	46%
0.075	15%
Particle Size (microns)	
55	11%
41	9%
29	7%
20	5%
15	5%
11	5%
7	5%
5	4%
2	4%

Median Particle Size (mm)*	0.168
----------------------------	-------

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments:

Analysed: 19-Nov-19

Loss on Pretreatment NA

Limit of Reporting: 1%

Sample Description: SAND, SHELL

Dispersion Method Shaker

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.63

Peter Keyte
Technical Manager Air
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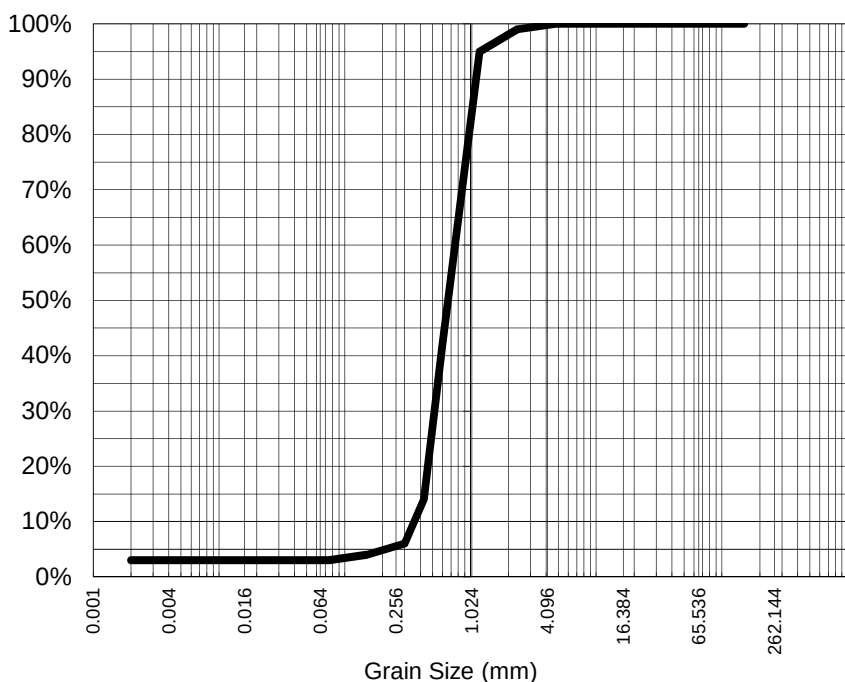
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samples.newcastle@alsenviro.com

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Newcastle, NSW



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COMPANY: ELGIN ASSOCIATES PTY LTD **DATE RECEIVED:** 14-Nov-2019
ADDRESS: PO Box 829 **REPORT NO:** ES1937617-005 / PSD
Bega
NSW, Australia
PROJECT: JN19231 MERIMBULA DEEP **SAMPLE ID:** S3_21/10/19
OCEAN OUTFALL - BENTHIC

Particle Size Distribution



Analysis Notes

Samples analysed as received.

Particle Size (mm)	% Passing
4.75	100%
2.36	99%
1.18	95%
0.600	42%
0.425	14%
0.300	6%
0.150	4%
0.075	3%
Particle Size (microns)	
58	3%
41	3%
29	3%
20	3%
15	3%
11	3%
7	3%
5	3%
2	3%

Median Particle Size (mm)*	0.688
----------------------------	-------

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly

Loss on Pretreatment NA

Sample Description: SAND, SHELL

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.64

Analysed: 19-Nov-19

Limit of Reporting: 1%

Dispersion Method Shaker

Peter Keyte
Technical Manager Air
Authorised Signatory

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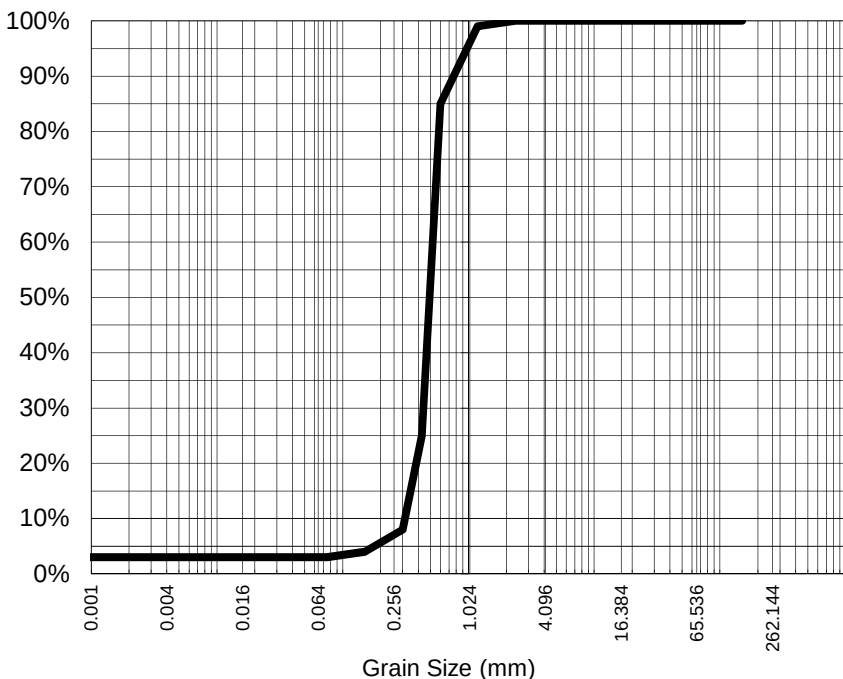
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fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental
Newcastle, NSW



CLIENT: NICK YEE **DATE REPORTED:** 22-Nov-2019
COMPANY: ELGIN ASSOCIATES PTY LTD **DATE RECEIVED:** 14-Nov-2019
ADDRESS: PO Box 829 **REPORT NO:** ES1937617-006 / PSD
Bega
NSW, Australia
PROJECT: JN19231 MERIMBULA DEEP **SAMPLE ID:** S5_21/10/19
OCEAN OUTFALL - BENTHIC

Particle Size Distribution



Analysis Notes

Samples analysed as received.

Particle Size (mm)	% Passing
2.36	100%
1.18	99%
0.600	85%
0.425	25%
0.300	8%
0.150	4%
0.075	3%
Particle Size (microns)	
57	3%
40	3%
28	3%
20	3%
15	3%
10	3%
7	3%
5	3%
1	3%

Median Particle Size (mm)*	0.498
----------------------------	-------

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly

Loss on Pretreatment NA

Sample Description: SAND, SHELL

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.66

Analysed: 19-Nov-19

Limit of Reporting: 1%

Dispersion Method Shaker

Peter Keyte
Technical Manager Air
Authorised Signatory

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Certificate of Analysis

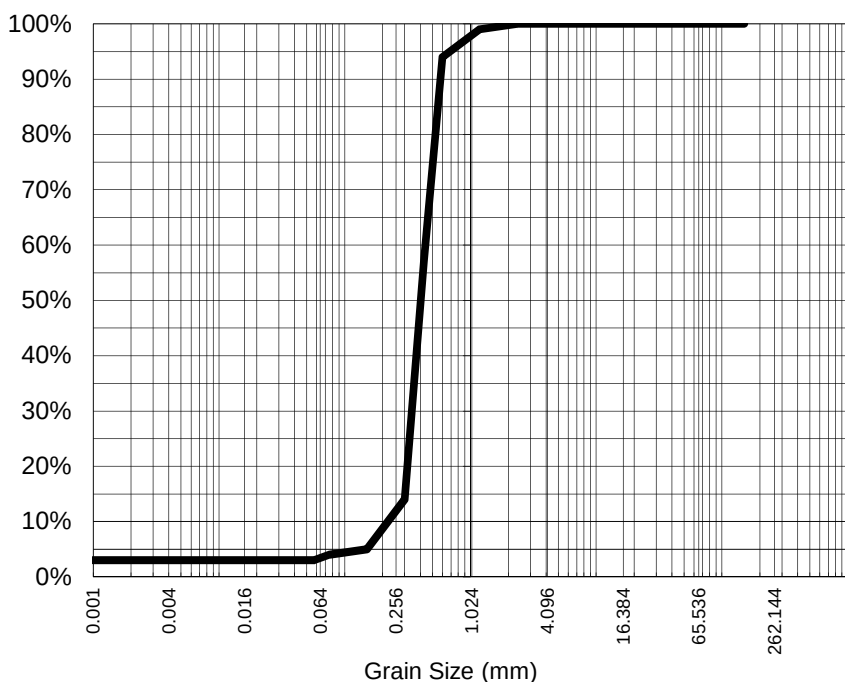
ALS Laboratory Group Pty Ltd
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
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samples.newcastle@alsenviro.com

ALS Environmental
Newcastle, NSW



CLIENT: NICK YEE **DATE REPORTED:** 22-Nov-2019
COMPANY: ELGIN ASSOCIATES PTY LTD **DATE RECEIVED:** 14-Nov-2019
ADDRESS: PO Box 829 **REPORT NO:** ES1937617-007 / PSD
Bega
NSW, Australia
PROJECT: JN19231 MERIMBULA DEEP **SAMPLE ID:** S7_21/10/19
OCEAN OUTFALL - BENTHIC

Particle Size Distribution



Analysis Notes

Samples analysed as received.

Particle Size (mm)	% Passing
2.36	100%
1.18	99%
0.600	94%
0.425	57%
0.300	14%
0.150	5%
0.075	4%
Particle Size (microns)	
57	3%
40	3%
28	3%
20	3%
15	3%
10	3%
7	3%
5	3%
1	3%

Median Particle Size (mm)*	0.405
----------------------------	-------

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly

Loss on Pretreatment NA

Sample Description: SAND, SHELL

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.65

Analysed: 19-Nov-19

Limit of Reporting: 1%

Dispersion Method Shaker

Peter Keyte
Technical Manager Air
Authorised Signatory

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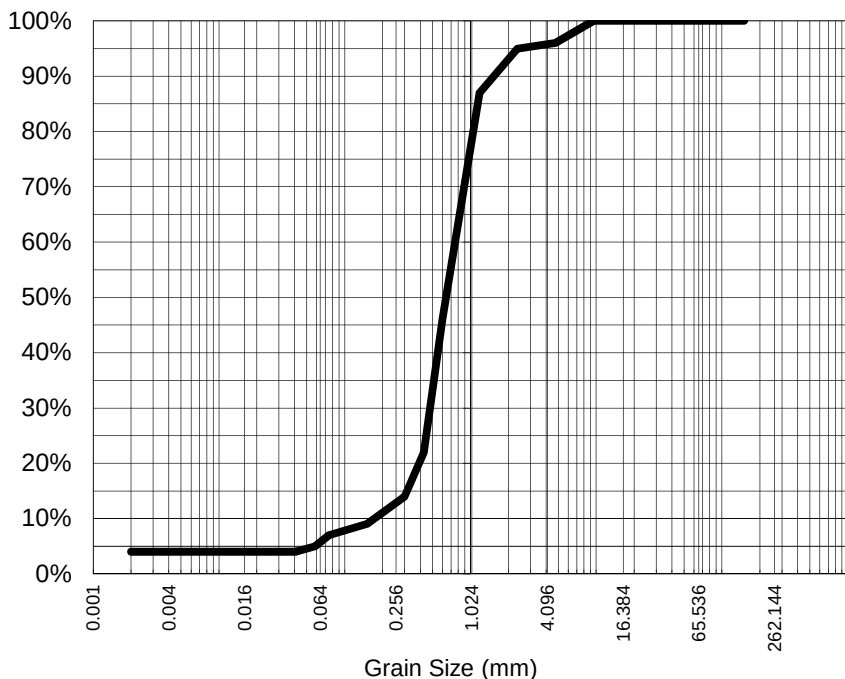
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5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental
Newcastle, NSW



CLIENT: NICK YEE **DATE REPORTED:** 22-Nov-2019
COMPANY: ELGIN ASSOCIATES PTY LTD **DATE RECEIVED:** 14-Nov-2019
ADDRESS: PO Box 829 **REPORT NO:** ES1937617-008 / PSD
Bega
NSW, Australia
PROJECT: JN19231 MERIMBULA DEEP **SAMPLE ID:** S2_22/10/19
OCEAN OUTFALL - BENTHIC

Particle Size Distribution



Analysis Notes

Samples analysed as received.

Particle Size (mm)	% Passing
9.50	100%
4.75	96%
2.36	95%
1.18	87%
0.600	46%
0.425	22%
0.300	14%
0.150	9%
0.075	7%
Particle Size (microns)	
58	5%
41	4%
29	4%
20	4%
15	4%
11	4%
7	4%
5	4%
2	4%

Median Particle Size (mm)*	0.657
----------------------------	-------

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly

Loss on Pretreatment NA

Sample Description: SAND, SHELL

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.64

Analysed: 19-Nov-19

Limit of Reporting: 1%

Dispersion Method Shaker

Peter Keyte
Technical Manager Air
Authorised Signatory

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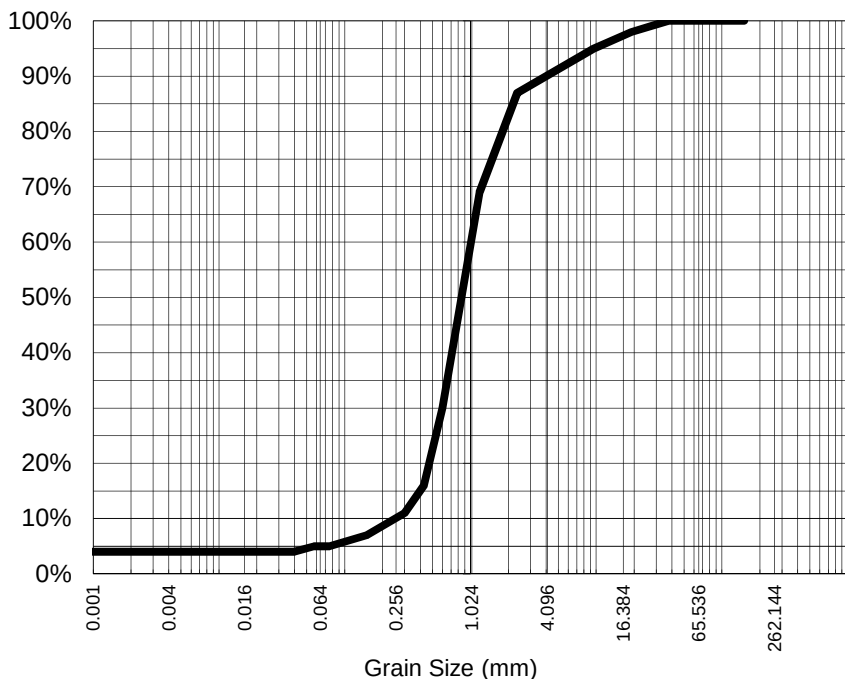
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Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental
Newcastle, NSW



CLIENT: NICK YEE **DATE REPORTED:** 22-Nov-2019
COMPANY: ELGIN ASSOCIATES PTY LTD **DATE RECEIVED:** 14-Nov-2019
ADDRESS: PO Box 829 **REPORT NO:** ES1937617-009 / PSD
Bega
NSW, Australia
PROJECT: JN19231 MERIMBULA DEEP **SAMPLE ID:** S4_22/10/19
OCEAN OUTFALL - BENTHIC

Particle Size Distribution



Analysis Notes

Samples analysed as received.

Particle Size (mm)	% Passing
37.5	100%
19.0	98%
9.50	95%
4.75	91%
2.36	87%
1.18	69%
0.600	30%
0.425	16%
0.300	11%
0.150	7%
0.075	5%
Particle Size (microns)	
57	5%
40	4%
28	4%
20	4%
15	4%
10	4%
7	4%
5	4%
1	4%

Median Particle Size (mm)*	0.897
----------------------------	-------

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75µm). Results should be assessed accordingly

Loss on Pretreatment NA

Sample Description: SAND, SHELL

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.65

Analysed: 19-Nov-19

Limit of Reporting: 1%

Dispersion Method Shaker

Peter Keyte
Technical Manager Air
Authorised Signatory

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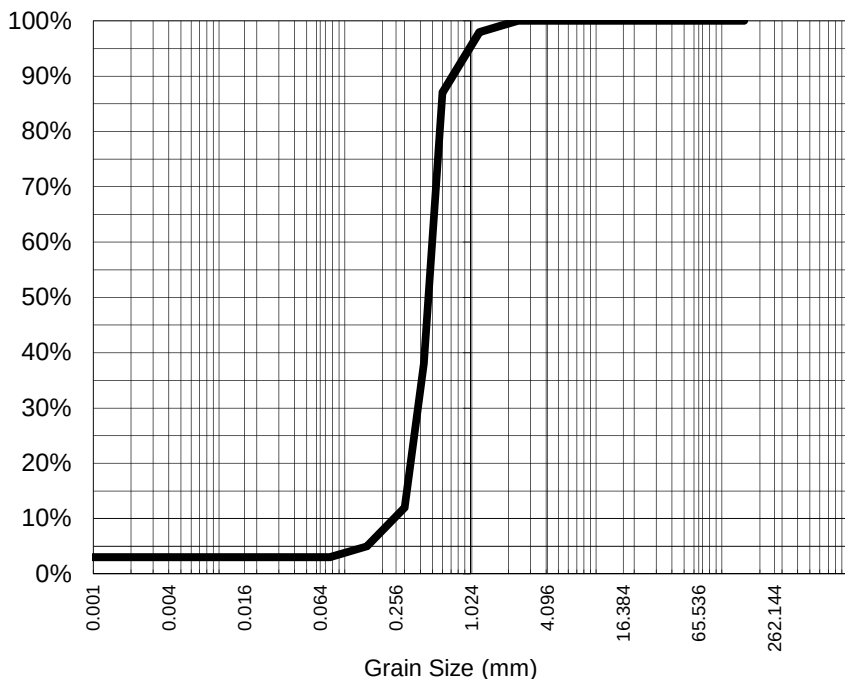
ALS Laboratory Group Pty Ltd
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

ALS Environmental
Newcastle, NSW



CLIENT: NICK YEE **DATE REPORTED:** 22-Nov-2019
COMPANY: ELGIN ASSOCIATES PTY LTD **DATE RECEIVED:** 14-Nov-2019
ADDRESS: PO Box 829 **REPORT NO:** ES1937617-010 / PSD
Bega
NSW, Australia
PROJECT: JN19231 MERIMBULA DEEP **SAMPLE ID:** S6_22/10/19
OCEAN OUTFALL - BENTHIC

Particle Size Distribution



Analysis Notes

Samples analysed as received.

Particle Size (mm)	% Passing
2.36	100%
1.18	98%
0.600	87%
0.425	38%
0.300	12%
0.150	5%
0.075	3%
Particle Size (microns)	
57	3%
40	3%
28	3%
20	3%
15	3%
10	3%
7	3%
5	3%
1	3%

Median Particle Size (mm)*	0.468
----------------------------	-------

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly

Loss on Pretreatment NA

Sample Description: SAND, SHELL

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.67

Analysed: 19-Nov-19

Limit of Reporting: 1%

Dispersion Method Shaker

Peter Keyte
Technical Manager Air
Authorised Signatory

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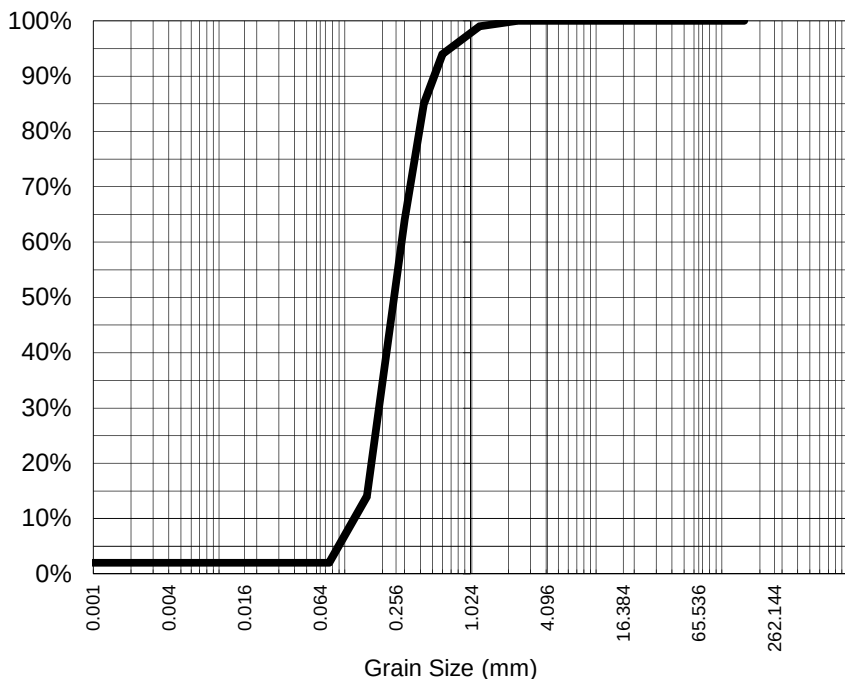
ALS Laboratory Group Pty Ltd
5/585 Maitland Road
Mayfield West, NSW 2304
pH 02 4014 2500
fax 02 4968 0349
samples.newcastle@alsenviro.com

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Newcastle, NSW



CLIENT: NICK YEE **DATE REPORTED:** 22-Nov-2019
COMPANY: ELGIN ASSOCIATES PTY LTD **DATE RECEIVED:** 14-Nov-2019
ADDRESS: PO Box 829 **REPORT NO:** ES1937617-011 / PSD
Bega
NSW, Australia
PROJECT: JN19231 MERIMBULA DEEP **SAMPLE ID:** S8_22/10/19
OCEAN OUTFALL - BENTHIC

Particle Size Distribution



Analysis Notes

Samples analysed as received.

Particle Size (mm)	% Passing
2.36	100%
1.18	99%
0.600	94%
0.425	85%
0.300	64%
0.150	14%
0.075	2%
Particle Size (microns)	
57	2%
40	2%
28	2%
20	2%
15	2%
10	2%
7	2%
5	2%
1	2%

Median Particle Size (mm)*	0.258
----------------------------	-------

Median Particle Size is not covered under the current scope of ALS's NATA accreditation.

Sample Comments: AS1289.3.6.3 states that hydrometer analysis is not applicable for samples containing <10% fines (<75um). Results should be assessed accordingly

Loss on Pretreatment NA

Sample Description: SAND, SHELL

Test Method: AS1289.3.6.2/AS1289.3.6.3

Soil Particle Density (<2.36mm) 2.67

Analysed: 19-Nov-19

Limit of Reporting: 1%

Dispersion Method Shaker

Peter Keyte
Technical Manager Air
Authorised Signatory

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Environmental Division

Work Order: ES1628837

Client: ALS WATER RESOURCES GROUP

Address: P O BOX 1834,
16B Lithgow Street,
FYSHWICK ACT,
AUSTRALIA 2609

Contact: RESULTS ADDRESS (Fyshwick)

Project: CA1607024

Report Date: 22/12/2016

Samples Submitted: 14/12/2016

Report:

The particle size distribution of these samples was determined by Light-Scattering using a Mastersizer 3000 instrument. This report contains data only for the fraction below 2mm. Any particles greater than 2mm were removed prior to analysis and are reported as a percentage of total mass in the table below.

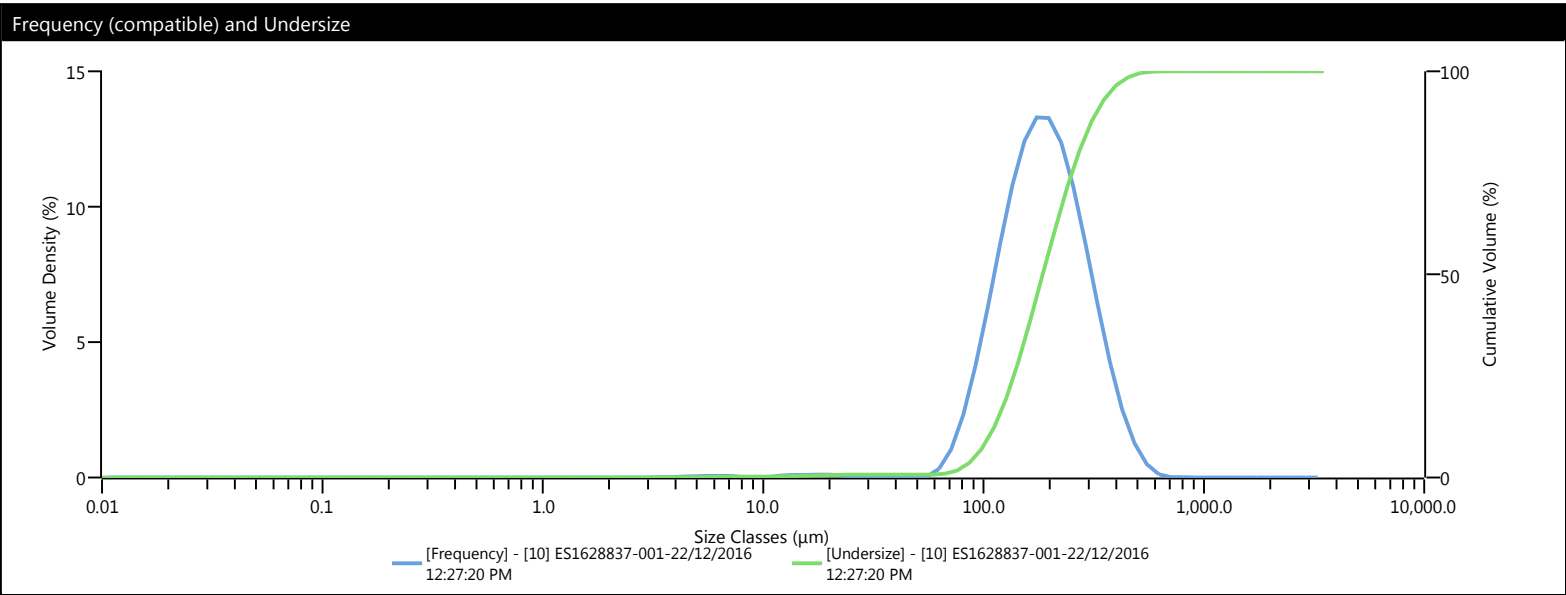
Lab ID	Client ID		>2mm % Mass
ES1628837-001	CA1607024-011	MBWQ20	0.01
ES1628837-002	CA1607024-012	MBWQ40	0.58
ES1628837-003	CA1607024-013	QUON20	0.13
ES1628837-004	CA1607024-014	HAYSTH20	0.93
ES1628837-005	CA1607024-015	HAY20	0.11

A detailed report for each sample is attached.
Sampled by ALS WATER RESOURCES GROUP; analysed as received.

Gerrad Morgan
Laboratory Analyst
Soils and Sizings.

Measurement Details	Measurement Details
Operator Name gerrad.morgan	Analysis Date Time 22/12/2016 12:27:20 PM
Sample Name ES1628837-001 MBWQ20	Measurement Date Time 22/12/2016 12:27:20 PM
SOP File Name HydroLV.cfg	Result Source Averaged

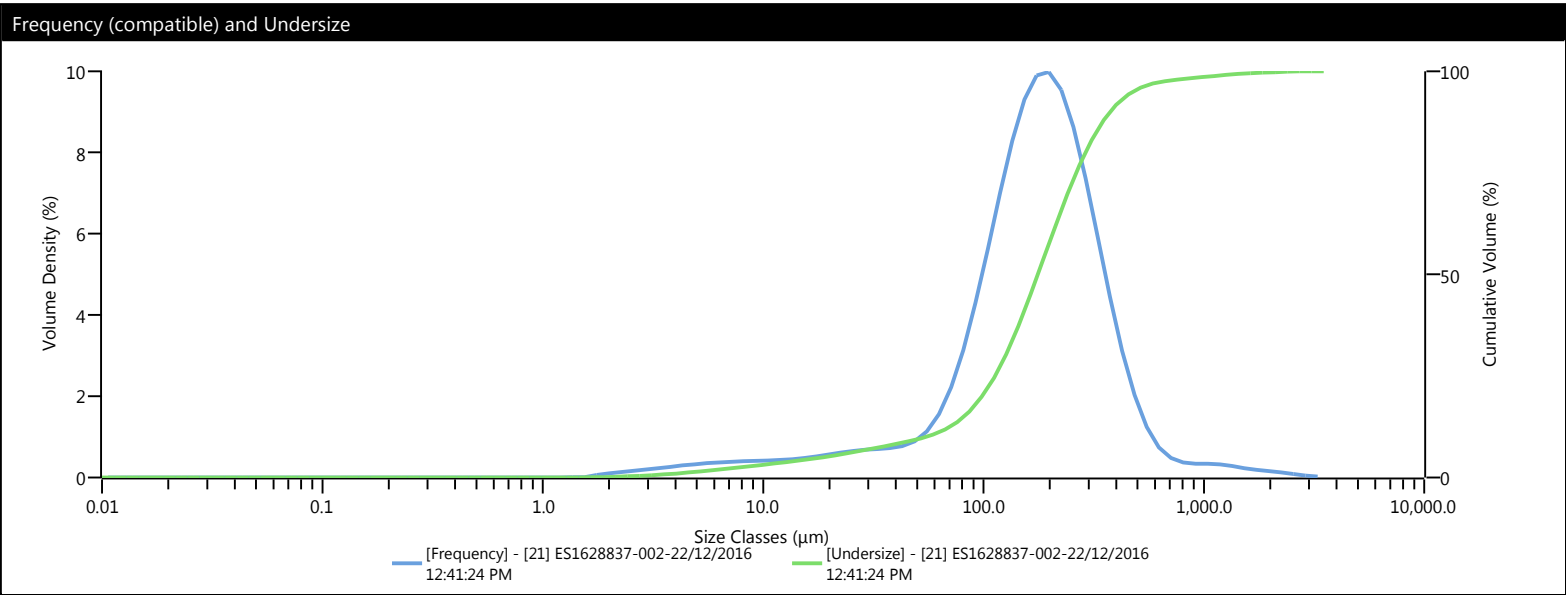
Analysis	Result
Particle Name ALS	Span 1.195
Particle Refractive Index 1.550	Uniformity 0.372
Particle Absorption Index 0.100	Specific Surface Area 38.59 m ² /kg
Dispersant Name Water	D [3,2] 155 µm
Dispersant Refractive Index 1.330	D [4,3] 203 µm
Scattering Model Mie	Dv (10) 106 µm
Analysis Model General Purpose	Dv (50) 186 µm
Weighted Residual 0.36 %	Dv (90) 328 µm
Laser Obscuration 8.16 %	



Result											
Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0100	0.00	0.0552	0.00	0.305	0.00	1.68	0.00	9.30	0.20	51.4	0.65
0.0113	0.00	0.0624	0.00	0.345	0.00	1.90	0.00	10.5	0.20	58.0	0.65
0.0128	0.00	0.0705	0.00	0.389	0.00	2.15	0.00	11.9	0.23	65.6	0.84
0.0144	0.00	0.0796	0.00	0.440	0.00	2.43	0.00	13.4	0.29	74.1	1.54
0.0163	0.00	0.0900	0.00	0.497	0.00	2.74	0.00	15.2	0.36	83.7	3.13
0.0184	0.00	0.102	0.00	0.561	0.00	3.10	0.00	17.1	0.44	94.6	6.02
0.0208	0.00	0.115	0.00	0.634	0.00	3.50	0.00	19.3	0.52	107	10.50
0.0235	0.00	0.130	0.00	0.717	0.00	3.96	0.00	21.9	0.59	121	16.74
0.0266	0.00	0.147	0.00	0.810	0.00	4.47	0.02	24.7	0.65	136	24.69
0.0300	0.00	0.166	0.00	0.915	0.00	5.05	0.06	27.9	0.65	154	34.05
0.0339	0.00	0.187	0.00	1.03	0.00	5.71	0.10	31.5	0.65	174	44.36
0.0383	0.00	0.211	0.00	1.17	0.00	6.45	0.14	35.6	0.65	197	55.01
0.0433	0.00	0.239	0.00	1.32	0.00	7.29	0.18	40.2	0.65	222	65.33
0.0489	0.00	0.270	0.00	1.49	0.00	8.23	0.20	45.5	0.65	251	74.73
										284	82.74
										321	89.10
										362	93.76
										409	96.86
										462	98.68
										522	99.59
										590	99.93
										667	100.00
										753	100.00
										851	100.00
										962	100.00
										1090	100.00
										1230	100.00
										1390	100.00

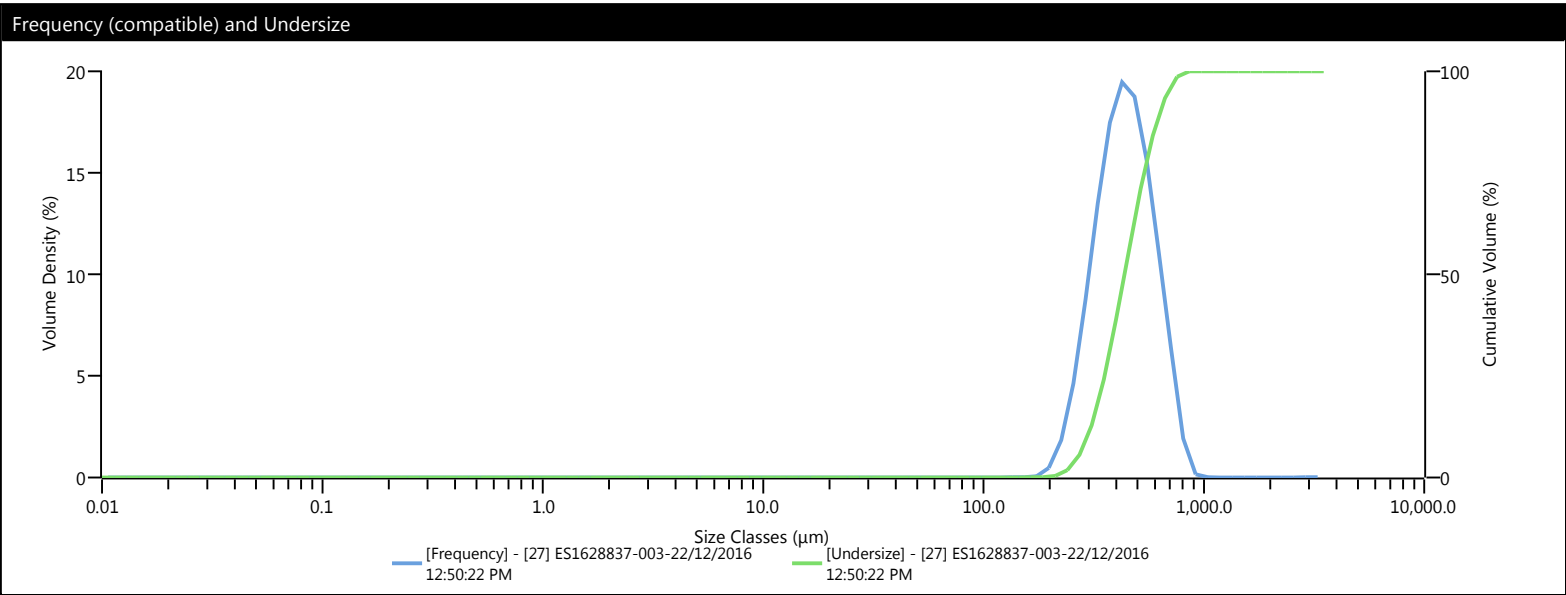
Measurement Details	Measurement Details
Operator Name gerrad.morgan	Analysis Date Time 22/12/2016 12:41:24 PM
Sample Name ES1628837-002 MBWQ40	Measurement Date Time 22/12/2016 12:41:24 PM
SOP File Name HydroLV.cfg	Result Source Averaged

Analysis	Result
Particle Name ALS	Span 1.825
Particle Refractive Index 1.550	Uniformity 0.647
Particle Absorption Index 0.100	Specific Surface Area 90.46 m ² /kg
Dispersant Name Water	D [3,2] 66.3 μm
Dispersant Refractive Index 1.330	D [4,3] 218 μm
Scattering Model Mie	Dv (10) 54.9 μm
Analysis Model General Purpose	Dv (50) 176 μm
Weighted Residual 0.27 %	Dv (90) 377 μm
Laser Obscuration 11.01 %	



Result													
Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under
0.0100	0.00	0.0552	0.00	0.305	0.00	1.68	0.01	9.30	2.89	51.4	9.54	284	78.86
0.0113	0.00	0.0624	0.00	0.345	0.00	1.90	0.06	10.5	3.22	58.0	10.41	321	84.41
0.0128	0.00	0.0705	0.00	0.389	0.00	2.15	0.14	11.9	3.55	65.6	11.59	362	88.84
0.0144	0.00	0.0796	0.00	0.440	0.00	2.43	0.24	13.4	3.90	74.1	13.26	409	92.17
0.0163	0.00	0.0900	0.00	0.497	0.00	2.74	0.37	15.2	4.27	83.7	15.59	462	94.51
0.0184	0.00	0.102	0.00	0.561	0.00	3.10	0.53	17.1	4.66	94.6	18.76	522	96.05
0.0208	0.00	0.115	0.00	0.634	0.00	3.50	0.70	19.3	5.08	107	22.93	590	96.99
0.0235	0.00	0.130	0.00	0.717	0.00	3.96	0.91	21.9	5.54	121	28.14	667	97.57
0.0266	0.00	0.147	0.00	0.810	0.00	4.47	1.14	24.7	6.03	136	34.36	753	97.94
0.0300	0.00	0.166	0.00	0.915	0.00	5.05	1.39	27.9	6.55	154	41.44	851	98.23
0.0339	0.00	0.187	0.00	1.03	0.00	5.71	1.66	31.5	7.10	174	49.13	962	98.50
0.0383	0.00	0.211	0.00	1.17	0.00	6.45	1.95	35.6	7.66	197	57.09	1090	98.76
0.0433	0.00	0.239	0.00	1.32	0.00	7.29	2.25	40.2	8.23	222	64.93	1230	99.02
0.0489	0.00	0.270	0.00	1.49	0.00	8.23	2.57	45.5	8.84	251	72.29	1390	99.25

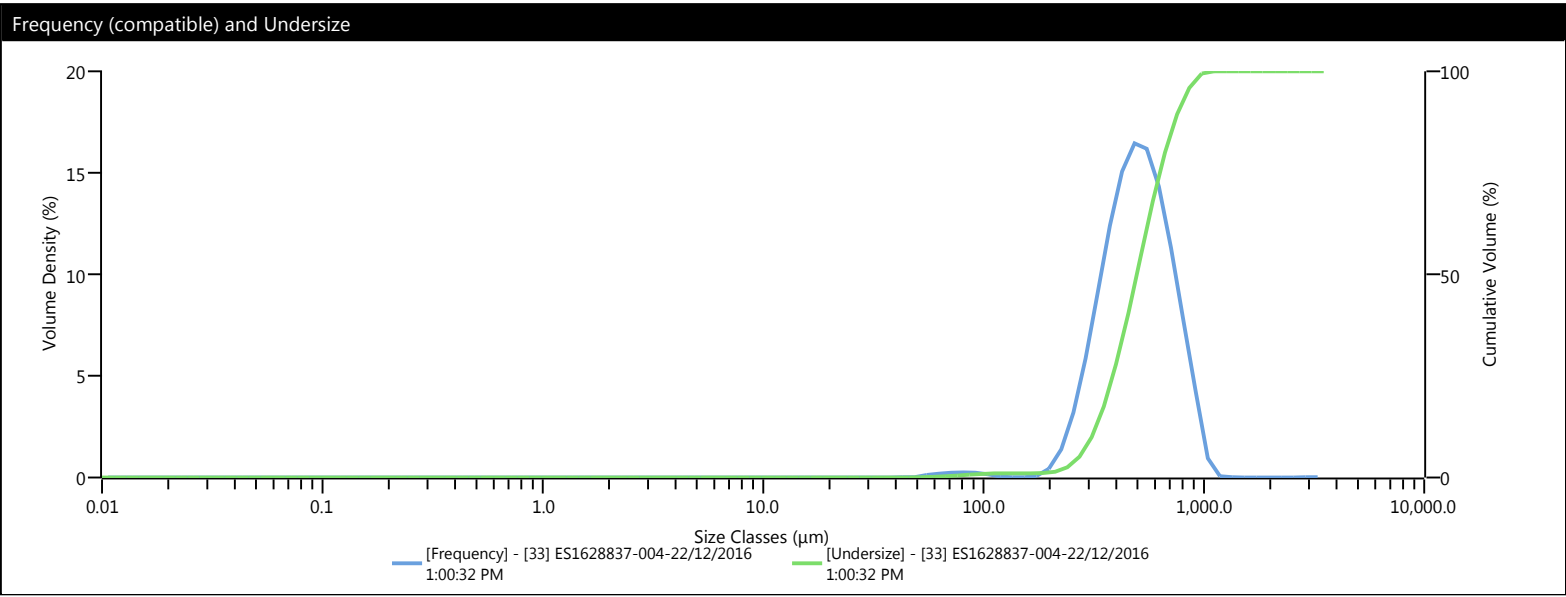
Measurement Details	Measurement Details
Operator Name gerrad.morgan	Analysis Date Time 22/12/2016 12:50:22 PM
Sample Name ES1628837-003 QUON20	Measurement Date Time 22/12/2016 12:50:22 PM
SOP File Name HydroLV.cfg	Result Source Averaged
Analysis	Result
Particle Name ALS	Span 0.782
Particle Refractive Index 1.550	Uniformity 0.237
Particle Absorption Index 0.100	Specific Surface Area 14.41 m ² /kg
Dispersant Name Water	D [3,2] 416 μm
Dispersant Refractive Index 1.330	D [4,3] 452 μm
Scattering Model Mie	Dv (10) 295 μm
Analysis Model General Purpose	Dv (50) 436 μm
Weighted Residual 0.59 %	Dv (90) 636 μm
Laser Obscuration 4.60 %	



Result											
Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under
0.0100	0.00	0.0552	0.00	0.305	0.00	1.68	0.00	9.30	0.00	51.4	0.00
0.0113	0.00	0.0624	0.00	0.345	0.00	1.90	0.00	10.5	0.00	58.0	0.00
0.0128	0.00	0.0705	0.00	0.389	0.00	2.15	0.00	11.9	0.00	65.6	0.00
0.0144	0.00	0.0796	0.00	0.440	0.00	2.43	0.00	13.4	0.00	74.1	0.00
0.0163	0.00	0.0900	0.00	0.497	0.00	2.74	0.00	15.2	0.00	83.7	0.00
0.0184	0.00	0.102	0.00	0.561	0.00	3.10	0.00	17.1	0.00	94.6	0.00
0.0208	0.00	0.115	0.00	0.634	0.00	3.50	0.00	19.3	0.00	107	0.00
0.0235	0.00	0.130	0.00	0.717	0.00	3.96	0.00	21.9	0.00	121	0.00
0.0266	0.00	0.147	0.00	0.810	0.00	4.47	0.00	24.7	0.00	136	0.00
0.0300	0.00	0.166	0.00	0.915	0.00	5.05	0.00	27.9	0.00	154	0.00
0.0339	0.00	0.187	0.00	1.03	0.00	5.71	0.00	31.5	0.00	174	0.01
0.0383	0.00	0.211	0.00	1.17	0.00	6.45	0.00	35.6	0.00	197	0.17
0.0433	0.00	0.239	0.00	1.32	0.00	7.29	0.00	40.2	0.00	222	0.92
0.0489	0.00	0.270	0.00	1.49	0.00	8.23	0.00	45.5	0.00	251	3.13
										1390	100.00

Measurement Details	Measurement Details
Operator Name gerrad.morgan	Analysis Date Time 22/12/2016 1:00:32 PM
Sample Name ES1628837-004 HAYSTH20	Measurement Date Time 22/12/2016 1:00:32 PM
SOP File Name HydroLV.cfg	Result Source Averaged

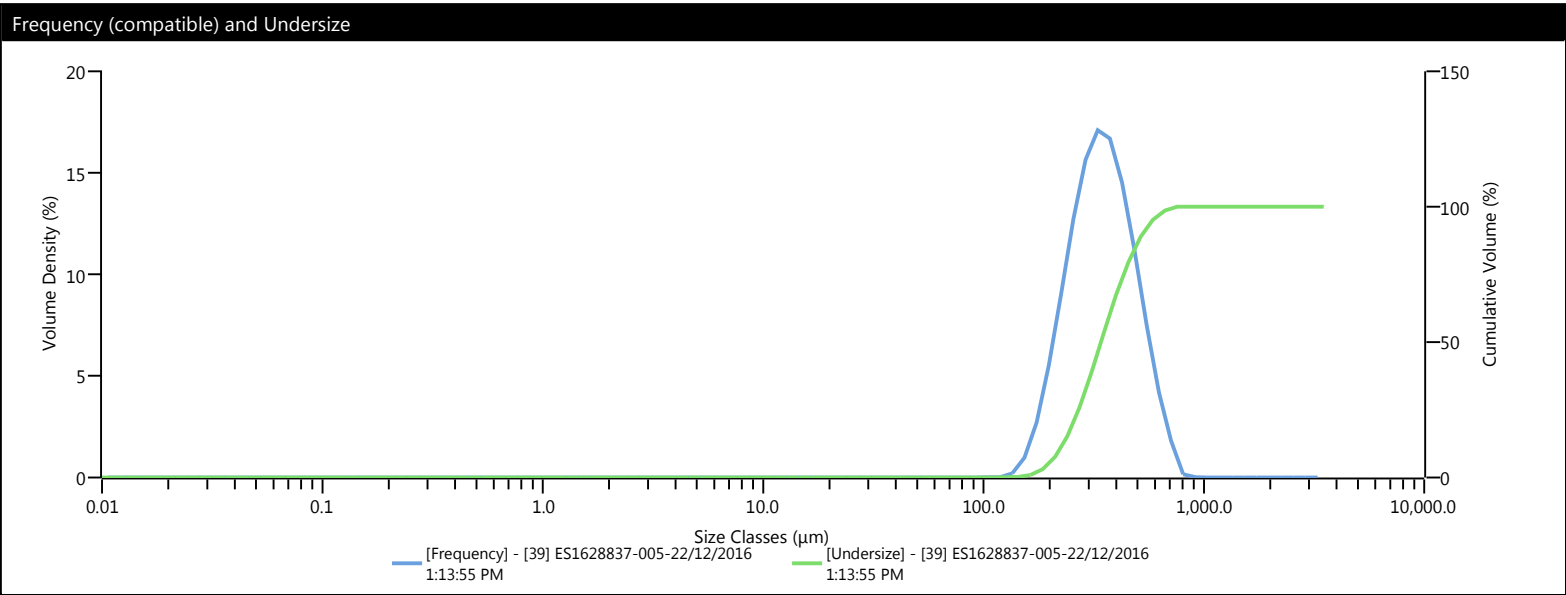
Analysis	Result
Particle Name ALS	Span 0.919
Particle Refractive Index 1.550	Uniformity 0.285
Particle Absorption Index 0.100	Specific Surface Area 13.52 m ² /kg
Dispersant Name Water	D [3,2] 444 µm
Dispersant Refractive Index 1.330	D [4,3] 517 µm
Scattering Model Mie	Dv (10) 310 µm
Analysis Model General Purpose	Dv (50) 496 µm
Weighted Residual 0.71 %	Dv (90) 765 µm
Laser Obscuration 5.61 %	



Result											
Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under	Size (µm)	% Volume Under
0.0100	0.00	0.0552	0.00	0.305	0.00	1.68	0.00	9.30	0.00	51.4	0.00
0.0113	0.00	0.0624	0.00	0.345	0.00	1.90	0.00	10.5	0.00	58.0	0.09
0.0128	0.00	0.0705	0.00	0.389	0.00	2.15	0.00	11.9	0.00	65.6	0.23
0.0144	0.00	0.0796	0.00	0.440	0.00	2.43	0.00	13.4	0.00	74.1	0.41
0.0163	0.00	0.0900	0.00	0.497	0.00	2.74	0.00	15.2	0.00	83.7	0.61
0.0184	0.00	0.102	0.00	0.561	0.00	3.10	0.00	17.1	0.00	94.6	0.80
0.0208	0.00	0.115	0.00	0.634	0.00	3.50	0.00	19.3	0.00	107	0.94
0.0235	0.00	0.130	0.00	0.717	0.00	3.96	0.00	21.9	0.00	121	1.00
0.0266	0.00	0.147	0.00	0.810	0.00	4.47	0.00	24.7	0.00	136	1.01
0.0300	0.00	0.166	0.00	0.915	0.00	5.05	0.00	27.9	0.00	154	1.01
0.0339	0.00	0.187	0.00	1.03	0.00	5.71	0.00	31.5	0.00	174	1.03
0.0383	0.00	0.211	0.00	1.17	0.00	6.45	0.00	35.6	0.00	197	1.18
0.0433	0.00	0.239	0.00	1.32	0.00	7.29	0.00	40.2	0.00	222	1.80
0.0489	0.00	0.270	0.00	1.49	0.00	8.23	0.00	45.5	0.00	251	3.39
										1390	100.00

Measurement Details	Measurement Details
Operator Name gerrad.morgan	Analysis Date Time 22/12/2016 1:13:55 PM
Sample Name ES1628837-005 HAY20	Measurement Date Time 22/12/2016 1:13:55 PM
SOP File Name HydroLV.cfg	Result Source Averaged

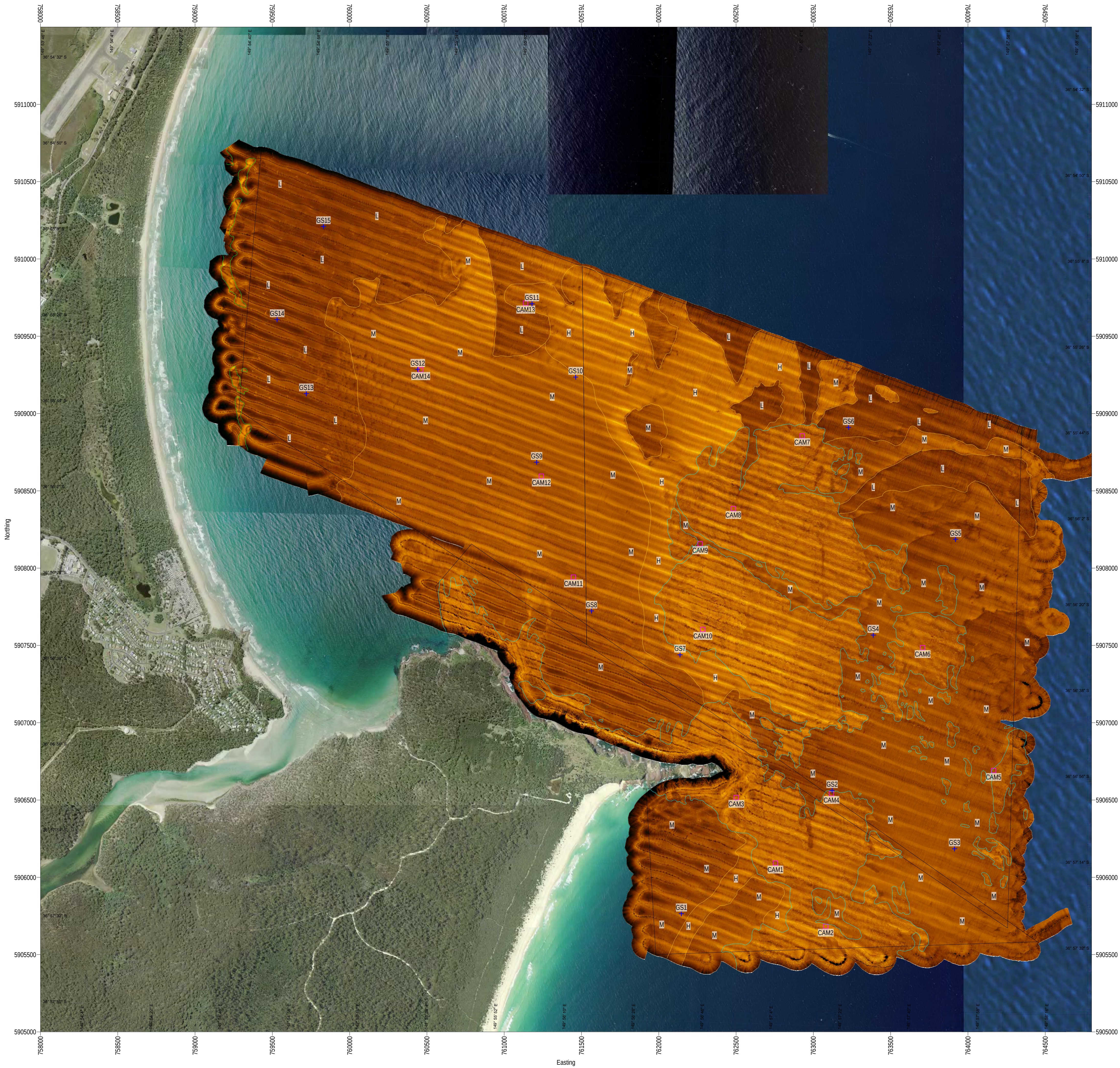
Analysis	Result
Particle Name ALS	Span 0.902
Particle Refractive Index 1.550	Uniformity 0.277
Particle Absorption Index 0.100	Specific Surface Area 18.57 m ² /kg
Dispersant Name Water	D [3,2] 323 μm
Dispersant Refractive Index 1.330	D [4,3] 360 μm
Scattering Model Mie	Dv (10) 220 μm
Analysis Model General Purpose	Dv (50) 341 μm
Weighted Residual 0.44 %	Dv (90) 528 μm
Laser Obscuration 10.55 %	



Result											
Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under	Size (μm)	% Volume Under
0.0100	0.00	0.0552	0.00	0.305	0.00	1.68	0.00	9.30	0.00	51.4	0.00
0.0113	0.00	0.0624	0.00	0.345	0.00	1.90	0.00	10.5	0.00	58.0	0.00
0.0128	0.00	0.0705	0.00	0.389	0.00	2.15	0.00	11.9	0.00	65.6	0.00
0.0144	0.00	0.0796	0.00	0.440	0.00	2.43	0.00	13.4	0.00	74.1	0.00
0.0163	0.00	0.0900	0.00	0.497	0.00	2.74	0.00	15.2	0.00	83.7	0.00
0.0184	0.00	0.102	0.00	0.561	0.00	3.10	0.00	17.1	0.00	94.6	0.00
0.0208	0.00	0.115	0.00	0.634	0.00	3.50	0.00	19.3	0.00	107	0.00
0.0235	0.00	0.130	0.00	0.717	0.00	3.96	0.00	21.9	0.00	121	0.00
0.0266	0.00	0.147	0.00	0.810	0.00	4.47	0.00	24.7	0.00	136	0.07
0.0300	0.00	0.166	0.00	0.915	0.00	5.05	0.00	27.9	0.00	154	0.52
0.0339	0.00	0.187	0.00	1.03	0.00	5.71	0.00	31.5	0.00	174	1.94
0.0383	0.00	0.211	0.00	1.17	0.00	6.45	0.00	35.6	0.00	197	5.09
0.0433	0.00	0.239	0.00	1.32	0.00	7.29	0.00	40.2	0.00	222	10.65
0.0489	0.00	0.270	0.00	1.49	0.00	8.23	0.00	45.5	0.00	251	18.99
										1390	100.00

Table 1. Grab Sample Descriptions and Associated Sonar Character

Sample ID	Description	Dominant Grain Shape	Approximate Shell Content	Minor Components	Colour	Interpreted Sonar Reflectivity Level
GS1	Coarse Sand	Sub Rounded	<5%		Light Brown- Grey	High
GS2	Silty Sand	Sub Rounded	<5%	Benthic Organisms/Organics	Light Brown- Grey	Moderate
GS3	Silty Sand	Sub Rounded	<5%	Benthic Organisms/Organics	Dark Green- Light Brown	Moderate
GS4	Silty Sand	Sub Rounded	<5%		Light Brown- Light Grey	Moderate
GS5	Sandy Silt	Sub Angular	<5%	Benthic Organisms	Brown Grey	Low-Moderate
GS6	Sandy Silt	Sub Rounded	<5%	Benthic Organisms	Grey	Low
GS7	Coarse Sand	Angular	70-80%		Grey- Light Brown	High
GS8	Silty Sand	Sub Angular	<5%		Light Brown	Moderate
GS9	Silty Sand	Sub Angular	<5%		Light Brown	Moderate
GS10	Coarse Sand	Angular	30-40%		Light Brown	Moderate-High
GS11	Silty Sand	Sub Rounded	<5%		Grey- Brown	Low-Moderate
GS12	Silty Sand	Sub Rounded	30-40%		Light Brown	Moderate
GS13	Fine Sand	Sub Rounded	<5%		Grey	Low
GS14	Fine Sand	Sub Rounded	<5%		Light Grey	Low
GS15	Fine Sand	Sub Rounded	<5%		Light Grey	Low



LEGEND

Project Boundary

Grab Sample Location

Camera Drop Location

Rock Outcrop

Seagrass

Sand

GS1

Grab Sample ID

CAM1

Camera Drop ID

L

Low Reflectivity

M

Moderate Reflectivity

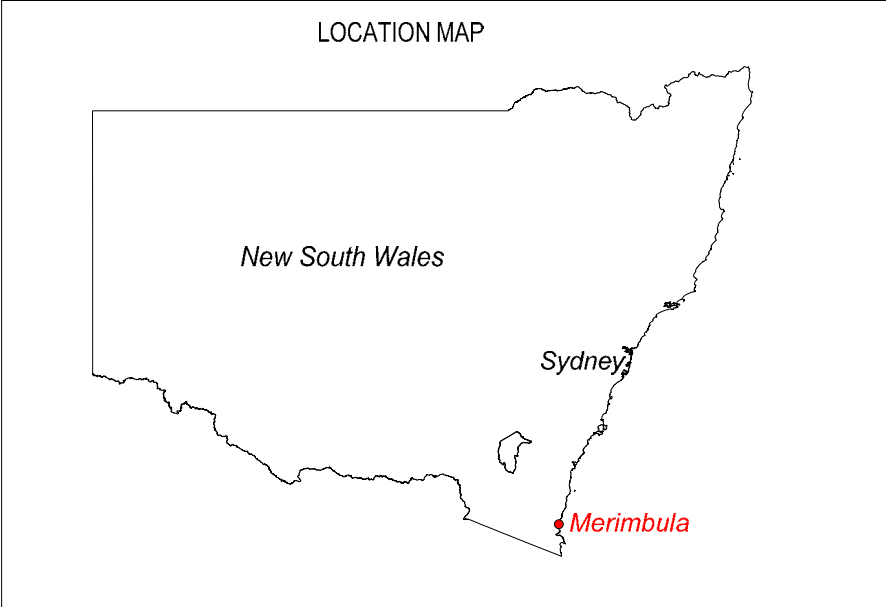
H

High Reflectivity

GEODETTIC INFORMATION
Horizontal Datum: MGA/GDA 94 Zone 55 Sth
Vertical Datum: Australian Height datum (AHD) Metres

NOTES

DISCLAIMER
This plan should be read in conjunction with the accompanying report
Not to be used for navigation purposes



CLIENT DETAILS

AECOM

marine&earthsciences

geophysical consultants and contractors

email: info@marineandearth.com web: marineandearth.com phone: +61 7 3899 1159

MERIMBULA OCEAN OUTFALL PROJECT
MARINE GEOPHYSIAL SURVEYS
SIDE SCAN SONAR (SSS) MOSAIC AND SEAFLOOR
INTERPRETATION, GRAB SAMPLE
AND CAMERA DROP LOCATIONS

SCALE: 1:12,500
(A1)

Survey Date: DEC 2017		Project Ref: 581				
Issue No.	Date:	Description	Surv.	Interp.	Drawn	Appr.
1	21/12/17	SSS, CAM and GS Prelim				
2	01/02/18	SSS, CAM and GS				

Client Drawing No.

Figure No. 2

Sheet No.