Appendix L

Baseline Water Quality Monitoring Plan

Trinity Consultants

VISION ENVIRONMENT

OCTOBER 2025

Calvale to Calliope River Transmission Line Reinforcement Project: Baseline Water Quality Monitoring Program

+61 7.4972.7530
Unit 3, 165 Auckland St, Gladstone
PO BOX 1267, GLADSTONE QLD 4680
office@visionenvironment.com.au
www.visionenvironment.com.au

CITATION

This document should be cited as:

Vision Environment (2025). *Calvale to Calliope River Transmission Line Reinforcement Project: Baseline Water Quality Monitoring Program*. Vision Environment ANZ, A Trinity Consultants Australia Company, Gladstone Australia.

RECORD OF ISSUE

Document draft	***Originated by***	***Edit and review***	***Date***
Draft issued to Client	FM	MJ	4/10/2025
Draft 2 issued to Client	Powerlink	FM	15/10/2025
Final issued to Client	Powerlink	FM	23/10/2025

DISCLAIMER

FILE REFERENCE

23102025 FINAL Baseline WQMP Calvale to Calliope Project_VE

TABLE OF CONTENTS

ACRONYMS

ANZG	Australian and New Zealand Guidelines
APHA	American Public Health Association
AS/NZS	Australian and New Zealand Standards
AWQG	Australian Water Quality Guidelines
BACI	Before-After-Control-Impact
BOM	Bureau of Meteorology
DEHP	Department of Environment and Heritage Protection
DERM	Department of Environment and Resource Management
DES	Department of Environment and Science
DETSI	Department of the Environment, Tourism, Science and Innovation
DNRMMRRD	Department of Natural Resources and Mines, Manufacturing and Regional and Rural Development
DOC	Dissolved organic carbon
DSITIA	Department of Science, Information Technology, Innovation and the Arts
EMP	Environmental Management Plan
EPBC	Environment Protection and Biodiversity Conservation
EPP	Environmental Protection Policy
EV	Environmental Values
FB	Field Blank
FRP	Filterable reactive phosphorus
GBR	Great Barrier Reef
GBRMPA	Great Barrier Reef Marine Park Authority
GHHP	Gladstone Healthy Harbour Partnership
GRC	Gladstone Regional Council
LOR	Limits of reporting
MNES	Matters of National Environmental Significance
NATA	National Association of Testing Authorities
NOx	Nitrogen oxides
PCIMP	Port Curtis Integrated Monitoring Program
PER	Public Environment Report
PI	Potential Impact
QA	Quality Assurance
QC	Quality Control
QWQG	Queensland Water Quality Guideline
SDA	State Development Area
TB	Trip Blank
TCA	Trinity Consultants Australia
TKN	Total Kjeldahl nitrogen
TOC	Total organic carbon
TSS	Total Suspended Solids
WHA	World Heritage Area
WQMP	Water Quality Monitoring Program
WQO	Water Quality Objectives

1. INTRODUCTION

1.1 Project Description

Powerlink Queensland is undertaking the *Calvale to Calliope River Transmission Line Reinforcement Project* (the 'Project') to strengthen the electricity supply to Gladstone and enhance network capacity and reliability in support of the region's growing renewable energy industry.

The transmission line will extend 87 km, from east of Biloela from the Calvale Substation to the Calliope River Substation at Gladstone. It is divided into five sub-sections, with Section E being of relevance to this Baseline Water Quality Monitoring Program (WQMP).

Section E forms the focus of this WQMP as it encompasses the Calliope River lower estuary, which represents the receiving environment for any potential downstream effects of the Project. The lower estuary provides the most relevant location to detect and assess changes to water quality that could influence the Great Barrier Reef (GBR) World Heritage Area (WHA).

In contrast, surface water features within the upstream project corridor are primarily ephemeral and only convey flow following rainfall events. The few perennial reaches that occur further inland are difficult to access for regular monitoring and have limited hydrological connectivity to the estuary. Any localised impacts in these upper catchment areas would undergo significant dilution and attenuation before reaching the Calliope River estuary and are therefore unlikely to measurably affect the GBRWHA.

Works in Section E will involve vegetation clearing and ground disturbance. In addition, the existing Calliope River Substation will be expanded (Figure 1). Construction of the transmission line is scheduled to commence in June 2026 and expected to conclude by late 2028.

Figure 1. Location of proposed alignment and Calliope River Substation expansion.

1.2 Project Area

Section E of the Project area extends from coordinates -23.8484, 151.1754 to -23.8580, 151.1943, covering approximately 2 km. This section encompasses the Calliope River, Calliope River Island and the inlet to Gladstone Harbour. The land is primarily zoned Rural under the Gladstone Regional Council (GRC) Planning Scheme and lies within the Gladstone State Development Area (SDA) precinct for port related industry, environmental management and high impact industry.

Currently, this area accommodates existing Powerlink infrastructure, including two 275 kV lines and the Calliope River Substation. Other land uses include conservation area and Gladstone Port activities, such as a coal conveyor belt.

Calliope River Island lies within the GBRWHA. While the Island already contains the Calliope River Substation, transmission lines and cleared lands from previous activities, large portions remain in a relatively natural coastal estuarine state, supporting mangrove and saltpan vegetation. The adjacent marine waterways will not be developed, except for the stringing of transmission lines across the waterway, aligned with existing infrastructure.

Under the *Environmental Protection (Water and Wetland Biodiversity) Policy 2019* (EPP Water), the Environmental Values (EV) designated for the Calliope River lower estuary include (DEHP 2014):

- Aquatic ecosystem health
- Human consumption of aquatic foods
- Recreational use (secondary and visual)
- Industrial use
- Cultural and spiritual values

The management intent, or designated level of protection, for the Calliope River lower estuary is classified as ‘Moderately Disturbed’.

1.3 Regulatory Conditions

The Project has been identified as a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) due to its potential impacts on *Matters of National Environmental Significance (MNES)*.

For Section E, the most relevant potential impacts on the GBR WHA during both construction and decommissioning include:

- Changes to water quality within, upstream and downstream of the Project area.
- Increased nutrient enrichment and eutrophication in water bodies.
- Higher sediment loads entering waterways.

According to the *Guidelines for the Content of a Draft Public Environment Report (PER)* for the Project (EPBC 2024/10044), a Baseline WQMP must be developed where suitable existing data is not available. This program will:

- Establish baseline data to inform Construction Water Quality Objectives (WQO).

- Support the development of relevant environmental management plans.
- Consider local hydrology, soil types, and topography.
- Provide a benchmark for distinguishing Project-related impacts on water quality from natural variability.

This Baseline WQMP aligns with the following legislation, policies and frameworks:

- *EPBC Act (1999)* which provides a national framework for protecting significant species, habitats and heritage places.
- *Environmental Protection Act (1994)* which regulates activities that may harm the environment within Queensland.
- *Fisheries Act (1994)* which governs the use, conservation and protection of fish resources and habitats in Queensland.
- *Reef 2050 Water Quality Improvement Plan (2017 - 2022)* which sets water quality targets and benchmarks to protect the GBR (Commonwealth of Australia 2018).
- *Reef 2050 Long-Term Sustainability Plan (2021 - 2025)* which provides the overarching framework for GBR protection and monitoring (Commonwealth of Australia 2023).
- *EPP (Water and Wetland Biodiversity) 2019* (EPP Water) which establishes EV and WQO for Queensland waterways (Queensland Government 2019).
- *Water Plan (Calliope River Basin) 2006* which defines water management objectives for the Basin, including water quality considerations (State of Queensland 2017).
- *Water Quality Guidelines for the Capricorn Curtis Coast* (DSITIA 2014) which set EV and WQO for the Calliope River (DEHP 2014).

The Project Environmental Management Plan (EMP) identifies the objective of ensuring no adverse impacts on water bodies as a result of soil disturbing activities (Powerlink Queensland 2025). Construction works upstream of the GBRWHA will apply industry standard erosion and sediment control measures to protect water quality. Following construction, disturbed areas will be rehabilitated and stabilised to minimise long-term water quality impacts.

1.4 Existing Water Quality Information

Regular water quality monitoring is undertaken within Gladstone Harbour by a range of industries to meet compliance obligations and due diligence requirements. Publicly available information is reported annually by the Gladstone Healthy Harbour Partnership (GHHP), established in 2013, which brings together 22 partner organisations from government, industry, research, Traditional Owner groups, and the community.

The most recent Gladstone Harbour Report Card (GHHP 2024) includes water quality results from three sites in the lower Calliope River, with data provided by the Port Curtis Integrated Monitoring Program (PCIMP). Monitoring results are assessed against the Capricorn Curtis Coast WQO set by the Department of the Environment, Tourism, Science and Innovation (DETSI), formerly known as the Department of Environment and Heritage Protection (DEHP 2014), and the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018, 2021, 2025c, a, d, e, b) . Report card scores range from 0 (very poor) to 1 (very good).

In 2024, Gladstone Harbour recorded an overall water quality score of 0.83, corresponding to a Good (B) grade (GHHP 2024). The Calliope River achieved a similar score (0.82) and has consistently maintained comparable grades in 2023 (0.81) and 2022 (0.81) (GHHP 2022, 2023).

Although PCIMP conducts quarterly monitoring in the Calliope River, the monitoring sites are not necessarily located within the Project's potential impact area, and the range of parameters monitored do not fully align with those required for the Project. Parameters reported in the GHHP Report Card (2024) include:

- Physicochemical: pH, turbidity
- Nutrients: total nitrogen, total phosphorus, chlorophyll-a
- Dissolved metals: aluminium, copper, lead, manganese, nickel and zinc

Importantly, the GHHP Report Card only publishes aggregated scores and grades, rather than providing access to the underlying raw water quality data.

As a result, the collection of baseline water quality data within the Project area is required, with monitoring tailored to assess the specific parameters of interest relevant to potential Project impacts.

2. BASELINE WQMP OBJECTIVES

The Project EMP sets the overarching objective of achieving no adverse impacts on water bodies as a result of soil disturbing activities, supported by detailed requirements within the Project Erosion and Sediment Control Plan.

The primary objective of the Baseline WQMP is to establish site-specific water quality conditions within the potential impact area of the Calliope River and Anabranch, prior to vegetation clearing. Establishing baseline conditions will enable clear differentiation between Project-related impacts and natural variability in water quality during Project construction and operation.

Specific monitoring objectives are to:

- Collect pre-construction water quality data to characterise existing conditions in the Calliope River and associated waterways.
- Ensure baseline data is robust enough to distinguish Project impacts from natural influences such as rainfall, tidal cycles and upstream inputs, during the construction phase.
- Demonstrate alignment with the *Reef 2050 Water Quality Improvement Plan* (Commonwealth of Australia 2018) and the *Reef 2050 Long-Term Sustainability Plan* (Commonwealth of Australia 2023).
- Assess baseline water quality data against the WQO defined for the Calliope River (DEHP 2014).
- Provide data to inform the development of Construction WQO and support the implementation of site-specific management plans.

2.1 Calliope River Lower Estuary WQO

Under the EPP Water, WQO have been established for a range of physicochemical parameters and nutrient concentrations in the Calliope River lower estuary (Table 1). Where local WQOs are unavailable, the relevant Queensland Water Quality Guideline (QWQG) are applied. For the Calliope River lower estuary, the applicable QWQG are those developed for the Central Coast Queensland Region '*Mid-estuarine and tidal canals, constructed estuaries, marinas and boat harbours*' (DERM 2009).

For metals and organic compounds, the Australian Water Quality Guidelines (AWQG) are applied in accordance with the EPP Water (GBRMPA 2010, DEHP 2014, ANZG 2018). These guidelines provide values at different levels of species protection:

- 99% species protection - recommended for pristine waters.
- 95%, 90%, or 80% protection - used in moderately to highly disturbed systems.

As the Calliope River lower estuary is designated as 'Moderately Disturbed', the 95% species protection AWQG values are considered appropriate.

AWQG are available for several metals and organic compounds. It is important to note that most AWQG are derived from laboratory toxicity testing on temperate species, with limited data available for tropical and subtropical organisms. As a result, AWQG values serve as a default standard, but may not always provide accurate protection thresholds for local ecosystems (Chapman et al. 2006, Kwok et al. 2007). Where AWQG are lacking, benchmark values can be

derived from local reference data, using the recommended percentile-based approaches outlined in ANZG (2018).

Table 1 Calliope River lower estuary water quality objectives.
No WQO available for dissolved arsenic, molybdenum or tin, or for multiple herbicides and pesticides.

Parameter	WQO	Description
pH	7.4 – 8.3	20th - 80th percentile (DEHP 2014)
TSS (mg/L)	20	QWQG (DERM 2009)
Turbidity Wet Season (NTU)	6 - 11 - 24	20th - 50th- 80th percentile (DEHP 2014)
Turbidity Dry Season (NTU)	5 - 11 - 21	
Dissolved Oxygen (% saturation)	91 - 95 - 100	
Total Nitrogen (µg/L)	140 - 175 - 210	
Ammonia (µg/L)	3 - 6 – 10	
Nitrogen Oxides (µg/L)	3 - 3 -10	
Total Phosphorus (µg/L)	17 - 22 - 25	
Filterable Reactive Phosphorus (µg/L)	2 - 4 - 6	
Chlorophyll-a (µg/L)	1.0 - 1.7 - 2.7	
Dissolved Aluminium (µg/L)	37	95% species protection AWQG (ANZG 2018, 2021, 2025c)
Dissolved Cadmium (µg/L)	5.5	
Dissolved Chromium (µg/L)	27 (CrIII), 4.4 (CrVI)	
Dissolved Cobalt (µg/L)	1	
Dissolved Lead (µg/L)	4.4	
Dissolved Mercury (µg/L)	0.4	
Dissolved Silver (µg/L)	1.4	
Dissolved Vanadium (µg/L)	100	
Dissolved Zinc (µg/L)	8.0	
Dissolved Copper (µg/L)	0.6 (when DOC ≤ 0.5 mg/L)	95% species protection AWQG Dependent on DOC concentrations (ANZG 2025d). WQO = 1.24* (DOC - 0.5) + 0.55
Weak-acid Extractable Iron (µg/L)	540	95% species protection AWQG (ANZG 2025e)
Dissolved Manganese (µg/L)	300	Draft 95% species protection AWQG (ANZG 2025a)
Dissolved Nickel (µg/L)	5.8	Draft 95% species protection AWQG (ANZG 2025b)
Endosulfan (µg/L)	0.01	95% species protection AWQG (ANZG 2018)
Endrin (µg/L)	0.008	
Aldrin (µg/L)	0.003	Unknown level of species protection (ANZG 2018)
Chlordane (µg/L)	0.001	
DDT (µg/L)	0.0004	
Heptachlor (µg/L)	0.0004	
Methoxychlor (µg/L)	0.004	
Chlorpyrifos (µg/L)	0.009	95% species protection AWQG (GBRMPA 2010, ANZG 2018)
Diazinon (µg/L)	0.01	

3. MONITORING DESIGN

The monitoring program follows a BACI (Before-After-Control-Impact) design. This framework ensures that both potential impact sites and reference ('control') sites are systematically monitored before, during, and after vegetation clearing and construction activities. By comparing results across these time periods and locations, the BACI design helps distinguish Project-related impacts from natural variability, such as changes caused by rainfall, tidal cycles, or upstream inputs.

3.1 Monitoring Sites

For the Baseline WQMP, monitoring at six water quality sites has been deemed sufficient to characterise baseline conditions in the Calliope River over the expected nine-month pre-construction monitoring period. While the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018) recommend best practice as monthly collection of reference site or baseline data for a minimum of two years prior to any disturbance, the BACI design incorporated into this program will ensure appropriate spatial coverage across both the potential impact area and suitable reference or lesser-impact locations, during both Wet and Dry Season periods (Table 2, Figure 2). Additional monitoring sites within the potential impact and reference/lesser-impact areas are likely to be recommended as part of the Construction WQMP.

Table 2 Baseline water quality monitoring sites and locations

Site Name	GPS Location	Description
PI -1	23°51.2345'S 151°11.0443'E	Potential impact site, river crossing
P1-2	23°51.7920'S 151°11.9340'E	Potential impact site, Substation land clearing
DPI -1	23°50.8793'S 151°12.7019'E	Downstream (Gladstone Harbour) inputs
DP1-2	23°49.1820'S 151°13.2798'E	Downstream (Gladstone Harbour) inputs
UPI -1	23°52.7298'S 151°11.7168'E	Upstream inputs
UP1-2	23°54.0972'S 151°11.0148'E	Upstream inputs

Two potential impact (PI) monitoring sites have been selected. The first is located in the Calliope River Anabranch, where it may be affected by land-clearing associated with the transmission line crossing. This site will only be accessible by vessel during periods outside of low tide. The second PI site is situated in the main channel of the Calliope River and may be affected by runoff from land-clearing activities associated with the Calliope River Substation expansion.

In addition, four reference/lesser impact sites have been selected. The downstream reference sites, located adjacent to the Port Curtis Way road bridge and at the mouth of the Calliope River, will provide information on potential influences from Gladstone Harbour and surrounding industry, including the Gladstone Power Station and Wiggins Island Coal Export Terminal. The upstream reference sites will help assess any potential upstream contributions.

3.2 Monitoring Frequency

Water quality monitoring will be undertaken on a monthly basis from October 2025 until the commencement of clearing activities (anticipated mid-2026). This schedule will ensure coverage of both the Wet Season (November to April) and Dry Season (May to October).

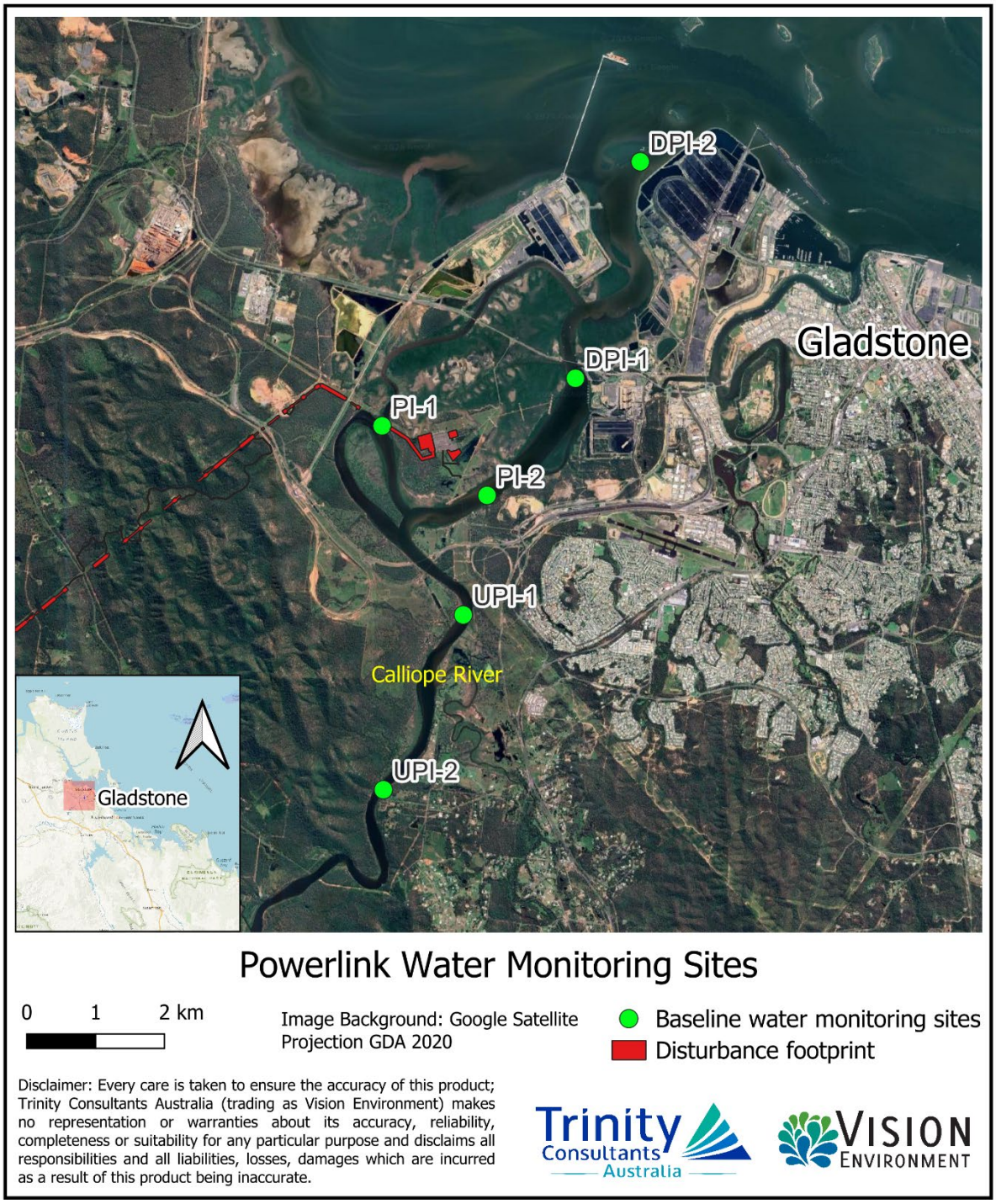

Figure 2. Location of Baseline water quality monitoring sites in relation to Project disturbance area.

In addition to the routine monthly monitoring, targeted event-based sampling will be undertaken following significant rainfall events (≥25 mm in 24 hours or ≥50 mm over three days), as per the *Reef 2050 Water Quality Improvement Plan* (Commonwealth of Australia 2018). Event-based sampling is critical to capture potential episodic pulses of sediment and nutrient loads entering the waterways. This data will complement the routine monthly monitoring and improve the assessment of potential construction-related impacts.

3.3 Monitoring Indicators

To meet the requirements of the regulatory conditions and monitoring objectives, the Baseline WQMP will focus on the following key parameter groups:

- Turbidity and total suspended solids (TSS) to assess sediment runoff into the waterway.
- Nutrients, with emphasis on nitrogen, phosphorus and carbon in both particulate and dissolved inorganic forms.
- Potential contaminants, including metal(loid)s and organic compounds (e.g. herbicides and pesticides).

Although the focus of this Baseline WQMP is on water physical and chemical indicators, the program acknowledges the value of biological indicators (e.g. macroinvertebrate assemblages, fish communities) for detecting ecological responses to water quality change. These indicators can be readily integrated into the program at a later stage to strengthen the assessment of potential impacts to MNES.

Key monitoring indicators for the Baseline WQMP are described below:

- ***Total Suspended Solids (TSS)*** and ***Turbidity:*** Both parameters measure aspects of water clarity. TSS represents suspended organic and inorganic particles, while turbidity measures the scattering of light caused by these particles (APHA 2017). Soil disturbance during construction may lead to increased sediment runoff, resulting in higher TSS and turbidity, reduced water clarity, lower photosynthesis in the water column, and consequently reduced dissolved oxygen production.
- ***pH:*** Indicates the acidity or alkalinity of the water and influences toxicity in aquatic organisms (APHA 2017). Shifts in pH can directly harm aquatic biota and alter contaminant bioavailability (ANZG 2018). In estuarine areas, disturbance of acid sulfate soils during construction poses a risk, with acidic runoff potentially affecting nearby waterways.
- ***Dissolved Oxygen:*** Measured in both mg/L and % saturation, dissolved oxygen is essential for aquatic life. Reduced water clarity diminishes photosynthesis by aquatic plants and algae, lowering oxygen concentrations. Sediment runoff may also introduce organic material, increasing biological oxygen demand and reducing oxygen levels further. Low DO can result in hypoxia, threatening the survival of aquatic organisms (APHA 2017, ANZG 2018).
- ***Nutrients:*** Forms of carbon, nitrogen and phosphorus are essential for aquatic plant and algal growth (APHA 2017, ANZG 2018). Elevated nutrient inputs from sediment runoff can cause eutrophication, excessive algal growth or blooms, and reduced oxygen concentrations, leading to ecosystem imbalance.
- ***Chlorophyll-a:*** An indicator of microalgal biomass (APHA 2017), chlorophyll-a reflects the abundance of primary producers in aquatic systems. Elevated concentrations generally correspond to increased nutrient levels and may signal early stages of eutrophication.
- ***Metal(loids):*** While some metal(loid)s are essential micronutrients, elevated concentrations can be toxic (ANZG 2018). Soil disturbance and runoff are expected to increase total metal loads in waterways. Additionally, disturbance of acid sulfate soils can lower pH and increase the dissolved (bioavailable) fraction, heightening ecological risk to aquatic organisms.

- ***Organochlorine*** and ***Organophosphate Pesticides:*** These synthetic agricultural chemicals are persistent in the environment, capable of accumulating in sediments and causing long-term ecological impacts (GBRMPA 2010, ANZG 2018). Monitoring for these compounds is important in the Calliope River catchment, where agriculture is a major land use (APHA 2017).
- ***Herbicides:*** Used in agriculture, these synthetic chemicals can harm non-target aquatic plants, reduce primary productivity and alter ecosystem balance even at low concentrations (ANZG 2018). Monitoring is important in catchments draining to sensitive environments such as the GBR WHA (GBRMPA 2010).

4. MONITORING METHODOLOGY

Sampling will be undertaken in accordance with established protocols consistent with internationally recognised standards and guidelines, including:

- *Australian and New Zealand Standards for water quality sampling* (AS/NZS 1998a, b)
- *Standard Methods for the Examination of Water and Wastewater* (APHA 2017)
- *Australian and New Zealand Water Quality Guidelines* (ANZG 2018, 2021, 2025c, a, d, e, b)
- *Queensland Water Quality Guidelines* (DERM 2009)
- *Monitoring and Sampling Manual* (DES 2018).
- *Water Quality Guidelines for the Great Barrier Reef Marine Park* (GBRMPA 2010)

Adherence to these protocols will ensure the collection of high-quality, defensible data, consistent with best practices in both national and international environmental monitoring.

All monitoring activities will be conducted using commercial in-survey vessels, operated by qualified commercial coxswains.

4.1 Metocean Data Collection

Meteorological and hydrological data for the study will be sourced from established government monitoring stations and used to determine any environmental influences on water quality data. Rainfall, wind and temperature records will be obtained from the Gladstone Radar Bureau of Meteorology station (BOM 2025a), while Calliope River flow data measured at Castlehope will be accessed through the Department of Natural Resources and Mines, Manufacturing and Regional and Rural Development (DNRMMRRD 2025). In addition, tidal data for the Gladstone region will be acquired from the Bureau of Meteorology (BOM 2025b).

4.2 *In-situ* Measurements

Physicochemical parameters (temperature, electrical conductivity, pH, turbidity and dissolved oxygen) will be measured *in situ* using a calibrated multiparameter water quality meter. Readings will be taken at approximately 0.5 to 1.0 m depth intervals at each site and logged at each depth through to the benthos.

4.3 Water Sample Collection

Sub-surface (0.5 m depth) water samples will be collected using pre-acid washed Nalgene bottles (triple rinsed in Milli-Q and site water) and a Perspex pole sampler for analysis of the following:

- Total suspended solids (TSS)
- Nutrient suite: total organic carbon (TOC), dissolved organic carbon (DOC), total nitrogen, total Kjeldahl nitrogen (TKN), ammonia, nitrogen oxides (NOx), total phosphorus and filterable reactive phosphorus (FRP)
- Chlorophyll-a
- Total and dissolved metal(loid)s: aluminium, arsenic, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, silver, tin, vanadium and zinc

- Organochlorine and organophosphate pesticide suite of 40 individual pesticides
- Herbicide suite of 16 individual herbicides

Samples not requiring filtration will be decanted directly into the laboratory-provided sample bottles. Samples requiring filtration will be filtered *in situ* through a 0.45 µm sterile syringe filter into the sample bottles. At more turbid sites, 1.2 µm cellulose acetate pre-filters will be used in conjunction with the 0.45 µm filters to aid processing.

All syringes and filters will be individually packaged by the supplier and pre-rinsed with site water before use. Powder-free gloves will be worn throughout sampling to minimise contamination risk.

4.4 Sample Preparation and Analysis

Samples will be kept cool in the field and transported to a NATA-accredited analytical laboratory for analysis within the recommended holding periods, following standard Chain of Custody procedures.

To extend the holding time for chlorophyll-a, samples will be filtered within 24 hours of collection at the Trinity Consultants Australia (TCA) laboratory, with filters to be analysed stored frozen in accordance with *APHA Method 12000H* (APHA 2017).

4.5 Quality Assurance (QA) and Quality Control (QC)

To ensure data quality, field replicates will be collected at 10% of sites (equivalent to one sample per survey). In addition, a Trip Blank (TB) and a Field Blank (FB) will be collected during each survey.

- Trip Blank (TB): Prepared at the analytical laboratory using certified Milli-Q water, sent to TCA, remain unopened and stored cool, and are then returned to the laboratory for analysis. Concentrations > laboratory limits of reporting (LOR) in TB samples indicate potential contamination originating from the Milli-Q water, sample bottles, or laboratory analytical processes.
- Field Blank (FB): Prepared by bringing a complete set of empty sample bottles and certified Milli-Q water (in acid-washed Nalgene bottles) into the field. The Milli-Q water is processed in the same way as field samples (including filtration where required). Concentrations > LOR in FB samples, but absent from TB samples, indicate contamination likely introduced during field sampling practices.

QA/QC measures undertaken at the analytical laboratory will include:

- Laboratory duplicates
- Method blanks
- Laboratory control samples
- Matrix spike samples

5. OUTCOMES

A Baseline water quality monitoring report will be submitted one month after the completion of the Baseline WQMP. The report will include:

- Executive Summary outlining objectives and findings of the Baseline WQMP.
- Introduction, including program objectives.
- Methodology, including site locations and maps, outline of methodology utilised and analytical activities undertaken.
- Results, including graphs and tables of the monitoring results and metocean conditions, comparison of water quality results with relevant WQO. Univariate and multivariate BACI-appropriate statistical analyses of data may be undertaken to elucidate spatial and temporal variation in monitoring parameters. Analyses may include ANOVA, PERMANOVA, and where appropriate generalised linear models (GLMs), to account for temporal and spatial variability as well as covariates such as rainfall and tidal range. If possible, comparison with regional datasets will be undertaken to identify any broader environmental or anthropogenic influences.
- Discussion, including an interpretation of the results, assessment of potential influences of metocean conditions, and assessment of the suitability of the monitoring sites and parameters for the Construction WQMP.
- Conclusions and recommendations for potential program improvements, including monitoring sites, parameters and water quality targets during the Construction phase.
- Appendices, including laboratory reports, field logs (with environmental conditions, observations, and sampling notes) and a QA/QC summary.

6. REFERENCES

ANZG. 2018. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra, Australia.

ANZG. 2021. Toxicant default guideline values for aquatic ecosystem protection: Zinc in marine water. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Governments and Australian state and territory governments, Canberra, Australia.

ANZG. 2025a. DRAFT Toxicant default guideline values for aquatic ecosystem protection: Manganese in marine water. Australian and New Zealand Governments and Australian state and territory governments, Canberra, Australia.

ANZG. 2025b. DRAFT Toxicant default guideline values for aquatic ecosystem protection: Nickel in marine water. Australian and New Zealand Governments and Australian state and territory governments, Canberra, Australia.

ANZG. 2025c. Toxicant default guideline values for aquatic ecosystem protection: Aluminium in marine water. Australian and New Zealand Governments and Australian state and territory governments, Canberra, Australia.

ANZG. 2025d. Toxicant default guideline values for aquatic ecosystem protection: Copper in marine water. Australian and New Zealand Governments and Australian state and territory governments, Canberra, Australia.

ANZG. 2025e. Toxicant default guideline values for aquatic ecosystem protection: Iron in marine water. Australian and New Zealand Governments and Australian state and territory governments, Canberra, Australia.

APHA. 2017. Standard Methods for the Examination of Water and Wastewater. 21st edition. American Public Health Association, Washington, USA.

AS/NZS. 1998a. 5667.1:1998 Water Quality - Sampling. Part 1: Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples. Joint Standards Australia/Standards New Zealand, Canberra, Australia.

AS/NZS. 1998b. 5667.6:1998 Water Quality - Sampling. Part 6: Guidance on sampling of rivers and streams. Joint Standards Australia/Standards New Zealand, Canberra, Australia.

BOM. 2025a. Climate statistics for Australian locations. Bureau of Meterology, Commonwealth of Australia, Canberra, Australia.

BOM. 2025b. Tide Predictions for Australia, South Pacific and Antarctica. Bureau of Meterology, Commonwealth of Australia, Canberra, Australia.

Chapman, P. M., B. G. McDonald, P. E. Kickham, and S. McKinnon. 2006. Global geographic differences in marine metals toxicity. Marine Pollution Bulletin **52**:1081-1084.

Commonwealth of Australia. 2018. Reef 2050 Water Quality Improvement Plan 2017 - 2022. Department of Agriculture, Water and the Environment, Canberra, Australia.

Commonwealth of Australia. 2023. Reef 2050 Long-Term Sustainability Plan 2021 - 2025. Department of Agriculture, Water and the Environment, Canberra, Australia.

DEHP. 2014. Environmental Protection (Water) Policy 2009. Curtis Island, Calliope River and Boyne River Basins Environmental Values and Water Quality Objectives. Department of Environment and Heritage Protection, Brisbane, Australia.

DERM. 2009. Queensland Water Quality Guidelines, Version 3. ISBN 978-0-9806986-0-2, Department of Environment and Resource Management, Brisbane, Australia.

DES. 2018. Monitoring and Sampling Manual: Environmental Protection (Water) Policy 2009. Department of Environment and Science, Brisbane, Australia.

DNRMMRRD. 2025. Calliope Basin Streamflow Data. Department of Natural Resources and Mines, Manufacturing and Regional and Rural Development, Brisbane, Australia.

DSITIA. 2014. Report on draft aquatic ecosystem water quality guidelines for the Capricorn Curtis Coast (draft). Department of Science, Information Technology, Innovation and the Arts, Queensland Brisbane, Australia.

GBRMPA. 2010. Water quality guidelines for the Great Barrier Reef Marine Park. Revised Edition. Great Barrier Reef Marine Park Authority, Townsville, Australia.

GHHP. 2022. Technical Report, Gladstone Harbour Report Card 2022. Gladstone Healthy Harbour Partnership, Gladstone, Australia.

GHHP. 2023. Technical Report, Gladstone Harbour Report Card 2023. Gladstone Healthy Harbour Partnership, Gladstone, Australia.

GHHP. 2024. Technical Report, Gladstone Harbour Report Card 2024. Gladstone Healthy Harbour Partnership, Gladstone, Australia.

Kwok, K. W., K. M. Leung, G. S. Lui, V. K. Chu, P. K. Lam, D. Morritt, L. Maltby, T. C. Brock, P. J. Van den Brink, M. S. J. Warne, and M. Crane. 2007. Comparison of Tropical and Temperate Freshwater Animal Species' Acute Sensitivities to Chemicals: Implications for Deriving Safe Extrapolation Factors. Integrated Environmental Assessment and Management:49-67.

Powerlink Queensland. 2025. Environmental Management Plan: CP.02897 Calvale to Calliope River Reinforcement Project. . Virginia, Australia.

Queensland Government. 2019. Environmental Protection (Water and Wetland Biodiversity) Policy 2019. t, Brisbane, Australia.

State of Queensland. 2017. Water Plan (Calliope River Basin) 2006 *in* P. C. o. Queensland, editor.