# CAIRNS SHIPPING DEVELOPMENT PROJECT

## Revised Draft Environmental Impact Statement

## Supplementary Report

## Appendix G: BMT-WBM Additional Field Studies Marine Water Quality

A part of BMT in Energy and Environment

BMT WBM

# Cairns Shipping Development EIS – Additional Field Studies - Marine Water Quality

Reference: R.B22074.001.04.Marine Water Quality Baseline
Date: October 2017
Confidential

# Document Control Sheet

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**Synopsis:** **This report presents the findings of additional field surveys undertaken to support existing baseline data for the revised Cairns Shipping Development (CSD) Environmental Impact Statement (EIS).**

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# 1 Introduction

This report presents the findings of additional field surveys undertaken to support existing baseline data for the revised Cairns Shipping Development (CSD) Environmental Impact Statement (EIS). The key findings from these additional field surveys, along with previous studies and supporting background literature, will be presented in the Marine Water Quality chapter of the EIS.

The revised CSD EIS now includes land placement of all dredge material in a dredge material placement area (DMPA) at the Northern Sands void (soft material), with a small proportion of stiff clays to be placed on Ports North land at Tingira Street. As tailwater discharges will occur from the Northern Sands DMPA, further water quality data was required for areas potentially impacted by tailwater discharges.

Note that discharge from the Tingira Street DMPA is not predicted due to the nature of the material to be placed and placement methods.

The baseline water quality monitoring program comprised the following components:

- Logger-based *in-situ* measurements of various parameters.
- Grab samples collected for the analytical measurement of water chemistry.

## 1.1 Study Aim and Objectives

The broad aim of this study is to collect additional baseline marine water quality data for the CSD EIS. The specific objectives include the following:

- Collect further marine water quality data in areas not previously studied as part of the original draft EIS. These areas include:
    - The Barron River, where tailwater discharges for the placed dredge material are proposed.
    - Thomatis / Richters Creek, where tailwater discharges could become mobilised.
- Collect further marine water quality data in areas of key sensitive ecological receptors, in similar locations where data was collected as part of the original EIS. The purpose of this was to supplement the existing dataset for these important areas.
- Undertake an historical assessment of turbidity in the study area using data derived from satellite imagery from the previous 10-year period.
- Assess historical data previously collected by third parties in the above areas of interest.
- Address relevant feedback from regulators on the Draft EIS.

## 1.2 Terms of Reference/EIS Guidelines

This marine water quality baseline study addresses the requirements contained in the State Terms of Reference (TOR) and the Commonwealth EIS Guidelines developed for the CSD EIS.

The relevant sections of these documents include:

- Section 5.3.2 (Water Quality) of the State TOR.

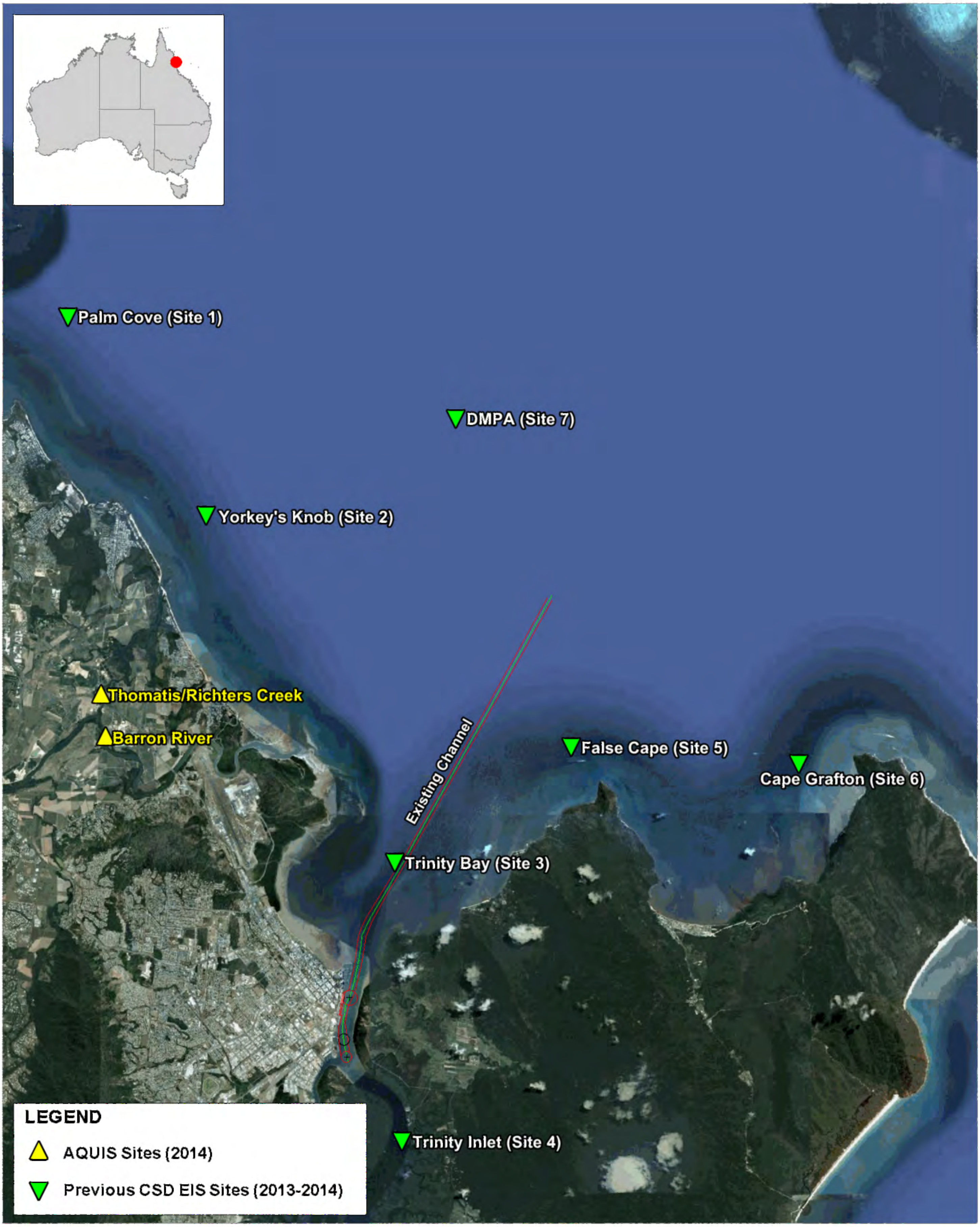
- Section 5.9 (Existing Environment) of the Commonwealth EIS Guidelines.

## 1.3 Previous Data Collection and Other Data Sources

12 months of continuous water quality data (July 2013 to July 2014) has previously been collected for the CSD EIS at six locations as indicated in Figure 1-1 (red triangles). An additional six months (approximately) of water quality data (Jan 2014 to July 2014) has also been collected by BMT WBM (and made available to the Project) for the AQUIS project at two relevant locations indicated in Figure 1-1 (yellow triangles). The Barron River location (from the AQUIS data set) collected two months of data during the dry season (July 2014 to September 2014), while the Thomatis/Richters Creek location collected 14 months of data (Dec 2013 to Feb 2015).

Further to this, previous water quality data has been collected by third parties at:

- The Northern Sands void (collected by the Landline Consulting on behalf of the operator) - 2010 to 2016.
- The Barron River (collected by Cairns Regional Council) - 2009 to 2016.




Title:

**Previous Water Quality Logger Sites**

Figure: 1-1

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# 2 Methodology

## 2.1 Data Collection Program

The marine water quality data collection program to collect additional baseline data was comprised of the following:

- Water quality grab samples collected during the dry season at the Northern Sands void at locations shown in Figure 2-1.
- Deployment of water quality loggers at four locations (shown in Figure 2-2) to supplement existing long term continuous data sets. These loggers were deployed for various periods, depending on the baseline data gaps, with the Barron River instrument deployed for an extended period of 12 months.
- Water quality depth profiling in the Barron River, Trinity Inlet and the Northern Sands void.

This data collection program, combined with the existing baseline data for the Cairns area, is compliant with the requirements of the Terms of Reference and EIS Guidelines for the Project (Section 1.2).

## 2.2 Timing of Field Work

Water quality grab samples were collected and instruments were deployed in the period between 22 July 2016 and 29 July 2016. The exception to this was the Palm Cove (Double Island) instrument which was deployed on 8 August 2016.

## 2.3 Equipment and Methods

### 2.3.1 Deployed Instrumentation

Water quality data at all sites were recorded using either a YSI 6600V2 water quality instrument, a McVann NEP495 turbidity sensor and/or an Aquatroll 200 conductivity temperature depth (CTD) logger. These instruments were secured to bottom-mounted on frames.

These instruments continuously logged data in 10 minute intervals. All sites had a combination of instruments that measured temperature, conductivity, depth and turbidity. The exception to this was Palm Cove (Double Island), where only turbidity was measured.

### 2.3.2 Water Quality Grab Samples

Water quality grab samples were collected in accordance with the Queensland Monitoring and Sampling Guidelines (DERM 2009) and/or relevant Australian standards (AS/NZS 5667.1:1998 Water Quality Sampling).

Water samples were collected at each monitoring site using clean, sterile sample containers supplied by NATA-accredited Australian Laboratory Services (ALS) in Brisbane. Sample water was taken from a representative area of the water body using an extendable sample pole with a wide mouthed container attached to the end. The sample pole was utilised to ensure water was taken about 10-20cm below the water surface in an area away from the bank of the waterway.

For the Northern Sands void, water samples were also collected at various depths through the water column using a Van Dorn sampler.

Water samples were kept chilled (and in the dark) in the field using insulated portable containers with ice bricks, and then placed into a refrigerator until ready for shipment. Samples were shipped in insulated portable containers with ice bricks to ALS in Brisbane for analysis.

All dissolved components were field-filtered at the time of collection using a syringe and a 0.45 μm filter.

Grab samples were analysed for the following parameters:

- TSS.
- Major ions.
- Total and dissolved metals (Al, Ag, As, Cd, Cr, Cu, Fe, Hg, Pb, Mn, Ni, Zn).
- Nutrients (TN, TP, ammonia, nitrite, nitrate, NOx, and reactive phosphorus).
- Hydrocarbons (TPH/TRH, PAH and BTEX) – *Northern Sands DMPA only.*

### 2.3.3 Water Quality Depth Profiling

During the July 2016 field survey (dry season), water quality depth profiling was undertaken at three sites in the Northern Sands void, ten sites in the Barron River and one site in Trinity Inlet. More sites were profiled in the Barron River than Trinity Inlet as the salt wedge characteristics in the Barron River are more pronounced.

Profiling was undertaken at the ten sites in the Barron River again during the March 2017 field survey (wet season).

Profiles were undertaken by deploying a water quality instrument (YSI 6600V2) from a boat. The instrument was lowered slowly to the bottom, with *in-situ* measurements of turbidity, pH, conductivity and dissolved oxygen recorded in one second intervals.

### 2.3.4 Historic Satellite-Based Water Quality Assessment

Historic water quality assessment was undertaken for the study area using satellite imagery (MODIS sensors) from a 10-year period (2005-2015). This satellite imagery was calibrated to turbidity data collected during the 12-month monitoring campaign (2013-2014), and was further processed using regional algorithm parameterisation adjustments and other post-processing quality control procedures.

The output from this was georeferenced maps showing spatial trends in turbidity over a 10-year period. These maps were analysed using GIS mapping software to produce turbidity statistics (for surface waters) at select areas of interest (Section 3.6).

## 2.4 Monitoring Sites

### 2.4.1 Grab Sample Sites

A range of water quality data (*in situ* readings and laboratory analysis) were collected at the existing Northern Sands void, with samples collected at surface, mid-way and near the bottom at three within the void.

Refer to Figure 2-1 for grab sample locations.

### 2.4.2 Deployed Instrumentation

Instruments were deployed at the following locations:

(1) **Barron River** – in the general vicinity of the potential tailwater discharge point. Measuring temperature, depth, turbidity and EC/salinity.

(2) **Trinity Inlet** – near the proposed inner harbour dredging areas. Measuring temperature, depth, turbidity and EC/salinity.

(3) **Smiths Creek** (otherwise known as Chinamans Creek) – near to the proposed dredge material placement area at Tingira Street.

(4) **Palm Cove (Double Island)** – near to the previously monitored site (2013-2014). Measuring turbidity only.

(5) **Thomatis / Richters Creek** – in the upper reaches near the confluence with the Barron River. Measuring temperature, depth, turbidity and EC/salinity.

Refer to Figure 2-2 for locations.

### 2.4.3 Water Quality Profiling Sites

Water quality depth profiling was undertaken at three sites in the Northern Sands void, ten sites in the Barron River and one site in Trinity Inlet. The Northern Sands void profiling sites are the same as the grab sample locations sites shown in Figure 2-1, while the profiling sites in the Barron River and Trinity Inlet are shown in Figure 2-3.


Title:

Northern Sands Void Sample Locations

Figure: 2-1

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Title:

**Deployed Instrument Sites**

Figure: **2-2**

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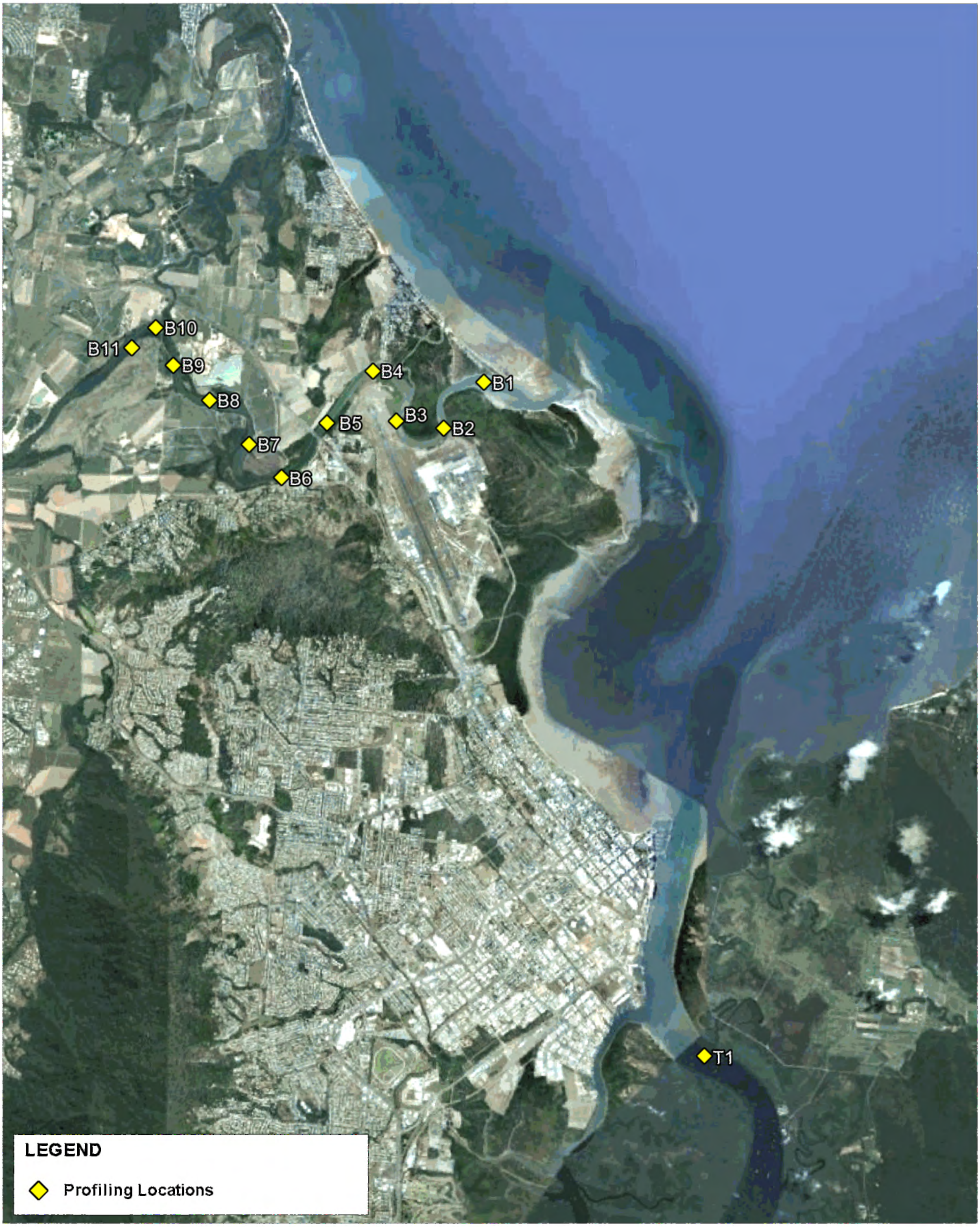


Title:
## Water Quality Profiling Sites

Figure: 2-3

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## 2.5 Data Quality – QA/QC Procedures

### 2.5.1 Quality Assurance (QA) Procedures

#### *2.5.1.1 Deployed Instruments*

The following QA procedures were in place for the instrument deployments:

- All instruments were calibrated as recommended by the manufacturer using standard solutions prepared from National Institute of Standards and Technology (NIST) traceable reagents.
- New Energizer 'ProCell' batteries were used throughout the campaign.
- An in-house checklist was followed for programming instruments. The checklist prescribed:
    - Download data file from instrument to PC
    - Verify data file is complete and without error. Reattempt download if data file is incomplete
    - Download calibration file to PC
    - Delete all files from instrument
    - Synchronise instrument time to 'real' time (obtainable from PC connected to internet)
    - Check sensor wiping is on and set to correct interval (5)
    - Check correct sensors are enabled
    - Check correct reporting fields are selected
    - Set start time and date. Ensure logging date is correct and period is set to '365' days
    - Ensure battery voltage is >12.0 v
    - Ensure battery life and free memory exceed the expected duration of sampling
    - Commence logging
    - Verify instrument is logging in 'Status' screen
    - Verify instrument is logging just prior to deployment by observing wiper on optical sensor.

#### *2.5.1.2 Water Quality Grab Samples*

The following QA procedures were followed during water quality grab sampling:

- Proper training and supervision of field staff.
- Use and maintenance of appropriate sampling equipment, and implementation of appropriate calibration procedures (including use of controlled standard solution supplied by ALS in Brisbane).
- Proper sampling techniques were utilised in accordance with relevant water quality sampling guidelines and standards (e.g. AS/NZS 5667.1:1998).
- Sample containers were clearly and accurately labelled and a log of collected samples was maintained and updated.

- Chain of custody forms were maintained and included with samples.
- Data validation included cross check by a second scientist after entry into the database.
- Water sample preservation and handling procedures were followed.

### 2.5.2 Quality Control (QC) Procedures

#### *2.5.2.1 Deployed Instrumentation*

Water quality instruments in the marine environment are subjected to harsh conditions so it is necessary to check data for quality and rigour to ensure only reliable data is retained. To do this, it must be determined whether recorded data are real and representative of actual conditions, or whether they may be affected by instrument anomalies or non-representative outlier events. Data anomalies may be caused by, for example:

- Temporary spikes created by drifting material or animals, or disturbance of sediments by boats, animals or humans.
- Sensor malfunction.
- Sensor siltation.
- Invertebrate/algal fouling of sensors.
- Human error (e.g. calibration error).

The following quality control procedures were implemented following download of data:

- Raw data were plotted as a time series and suspected outliers investigated with the following process:
  - Suspected outliers were compared to data within the same instrument dataset from a similar period of time to determine if data were correct. For example, if human or animal interaction is suspected in the event of short-term, single event turbidity spikes when turbidity readings either side of these spikes were >10% lower.
  - Data was then examined with consideration to the meteorological conditions at the time (with data from Bureau of Meteorology) to determine whether rainfall or wind conditions may have affected the measurements in question. If high rainfall or strong winds did not accompany spikes in turbidity, the data was considered potentially erroneous and subjected to further scrutiny.
  - Any questionable data was also compared with trends in data from other deployed instruments. If other instruments did not show similar patterns, the data was considered potentially erroneous.
- Any potentially erroneous data was quarantined from the data set.

#### *2.5.2.2 Water Quality Grab Samples*

Most of the QC procedures regarding water grab samples were implemented by the analytical laboratory. These included:

- Intra-sample duplicates.
- Blank samples.
- Spiked samples.

Laboratory reports indicated no quality issues within the laboratory methods. BMT WBM internal QC procedures for water grab samples included:

- Examination of laboratory results for erroneous data such as high readings, or discrepancies between dissolved and total fractions.
- Examination of laboratory quality reports to check duplicate, blank and spike samples were within guideline levels.

# 3 Findings

## 3.1 Northern Sands DMPA

### 3.1.1 Overview

The proposed Northern Sands DMPA is currently an existing mining void used as part of a sand extraction operation located on the Barron River Delta.

The proposed layout of the site is shown in Figure 3-1. Tailwater is proposed to be discharged adjacent to site in the Barron River or pumped to a location further downstream at the Barron River highway bridge.

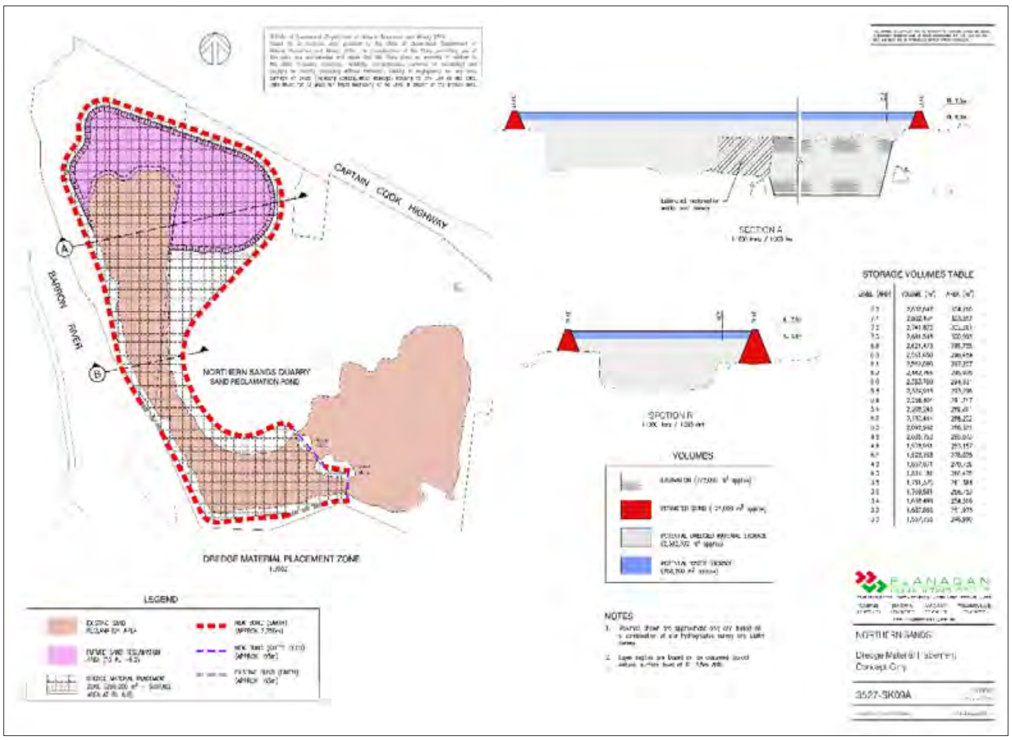



**Figure 3-1 Northern Sands DMPA Concept Design**

### 3.1.2 Grab Samples

Water grab samples and *in-situ* measurements were collected at the existing Northern Sands void on 26 July 2016. Samples and measurements were taken through the water column from surface to bottom at each location. Laboratory data is included in Appendix A.

The data are presented in Table 3-1, and have been compared to water quality guideline values sourced from ANZECC/ARMCANZ (2000) and the Queensland Water Quality Guidelines (QWQG 2009). Exceedances of these guideline values have been highlighted in Table 3-1.

The data indicate the following:

- Electrical conductivity (EC) measurements indicated the void waters were relatively fresh, with EC levels between 700 and 800 μs/cm, and salinity around 0.4 ppt.
- pH levels were neutral, with pH values just above 7.
- Turbidity was elevated above the QWQG guideline level (10 NTU) throughout the water column.
- Concentrations of dissolved metals/metalloids were all below ANZECC/ARMCANZ (2000) trigger levels, except for some minor exceedances of copper and manganese.
- Nutrients were elevated in void waters, with ammonia, NOx, total nitrogen and total phosphorus elevated above the QWQG guideline levels at most sites. Of note are the NOx levels, which were significantly elevated above guideline values.
- Hydrocarbon levels (TPH/TRH, PAH and BTEX) were all below laboratory limit of reporting (LOR) throughout the void water. The exception to this was a slight detection above the LOR for TPH/TRH in the bottom waters at Void 1.

**Table 3-1 Northern Sands Void Data (26/7/16)**

| Parameter | Guideline Value | Void 1 | | | Void 2 | | Void 3 | |
|---|---|---|---|---|---|---|---|---|
| | | Surface | Mid-way | Bottom | Surface | Bottom | Surface | Bottom |
| Temperature (°C) | - | 24.5 | 23.4 | 23.3 | 24.5 | 23.1 | 24.5 | 23.8 |
| Electrical Conductivity (µs/cm) | - | 782 | 790 | 790 | 784 | 799 | 785 | 798 |
| Salinity (ppt) | - | 0.39 | 0.40 | 0.40 | 0.39 | 0.41 | 0.39 | 0.40 |
| pH | 6.4 - 8.4 | 7.77 | 7.36 | 7.82 | 7.91 | 7.14 | 7.75 | 7.24 |
| Turbidity (NTU) | 10 | 26 | 50 | 67 | - | - | - | - |
| Dissolved Oxygen (mg/L) | - | 100.1 | 65.4 | 64.7 | 103.4 | 40.9 | 100.6 | 80.8 |
| Total Suspended Solids (mg/L) | - | 16 | 34 | 50 | 12 | 28 | 9 | 22 |
| **Major Ions (mg/L)** | | | | | | | | |
| Calcium | - | 24 | 25 | 24 | 24 | 24 | 24 | 25 |
| Magnesium | - | 14 | 14 | 15 | 14 | 15 | 14 | 15 |
| Sodium | - | 93 | 92 | 96 | 91 | 93 | 92 | 96 |
| Potassium | - | 8 | 7 | 8 | 8 | 8 | 7 | 8 |
| Sulfate | - | 70 | 72 | 70 | 68 | 68 | 69 | 68 |
| Chloride | - | 161 | 153 | 162 | 159 | 161 | 158 | 160 |
| Total Alkalinity | - | 56 | 68 | 56 | 58 | 60 | 58 | 58 |
| Hardness | - | 118 | 120 | 122 | 118 | 122 | 118 | 124 |
| **Dissolved Metals/Metalloids (mg/L)[1]** | | | | | | | | |
| Aluminium | 0.0005 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Arsenic | 0.0023 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Cadmium | 0.0007 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Chromium | 0.0044 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Copper | 0.0013 | 0.002 | <0.001 | 0.002 | <0.001 | 0.002 | <0.001 | 0.001 |
| Lead | 0.0044 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Manganese | 0.08 | 0.003 | 0.015 | 0.011 | 0.002 | 0.094 | 0.002 | 0.002 |
| Nickel | 0.007 | 0.002 | 0.002 | 0.002 | 0.002 | 0.002 | 0.001 | 0.002 |
| Silver | 0.0014 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Zinc | 0.015 | 0.010 | 0.007 | 0.009 | <0.005 | 0.006 | <0.005 | <0.005 |
| Iron | 0.3 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| Mercury | 0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| **Total Metals/Metalloids (mg/L)** | | | | | | | | |
| Aluminium | - | 0.48 | 0.97 | 1.28 | 0.81 | 1.68 | 0.77 | 1.10 |
| Arsenic | - | <0.001 | 0.001 | 0.001 | <0.001 | 0.001 | <0.001 | 0.001 |
| Cadmium | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Chromium | - | 0.001 | 0.002 | 0.003 | 0.002 | 0.004 | 0.002 | 0.003 |
| Copper | - | 0.002 | 0.002 | 0.005 | 0.002 | 0.003 | 0.001 | 0.003 |
| Lead | - | <0.001 | <0.001 | 0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Manganese | - | 0.020 | 0.046 | 0.061 | 0.018 | 0.141 | 0.021 | 0.039 |
| Nickel | - | 0.002 | 0.003 | 0.004 | 0.002 | 0.003 | 0.002 | 0.003 |
| Silver | - | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Zinc | - | 0.010 | 0.011 | 0.022 | 0.024 | 0.010 | <0.005 | 0.006 |
| Iron | - | 0.56 | 1.26 | 1.93 | 0.86 | 1.95 | 0.94 | 1.48 |
| Mercury | - | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| **Nutrients (mg/L)[2]** | | | | | | | | |
| Ammonia | 0.015/0.46[#] | 0.04 | <0.01 | <0.01 | 0.06 | 0.03 | 0.12 | 0.08 |
| NOx | 0.03 | 0.56 | 0.63 | 0.62 | 0.59 | 0.60 | 0.63 | 0.65 |
| Total-N | 0.25 | 1.2 | 1.2 | 1.2 | 1.2 | 1.3 | 1.5 | 1.6 |
| Total-P | 0.02 | 0.02 | 0.04 | 0.05 | 0.02 | 0.04 | 0.03 | 0.05 |
| Reactive phosphorus | 0.007 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| **Polynuclear Aromatic Hydrocarbons (µg/L)** | | | | | | | | |
| Naphthalene | - | <1.0 | ---- | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |

| Parameter | Guideline Value | Void 1 | | | Void 2 | | Void 3 | |
|---|---|---|---|---|---|---|---|---|
| | | Surface | Mid-way | Bottom | Surface | Bottom | Surface | Bottom |
| Acenaphthylene | - | <1.0 | ---- | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Acenaphthene | - | <1.0 | ---- | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Fluorene | - | <1.0 | ---- | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Phenanthrene | - | <1.0 | ---- | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Anthracene | - | <1.0 | ---- | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Fluoranthene | - | <1.0 | ---- | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Pyrene | - | <1.0 | ---- | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Benz(a)anthracene | - | <1.0 | ---- | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Chrysene | - | <1.0 | ---- | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Benzo(b+j)fluoranthene | - | <1.0 | ---- | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Benzo(k)fluoranthene | - | <1.0 | ---- | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Benzo(a)pyrene | - | <0.5 | ---- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Indeno(1.2.3.cd)pyrene | - | <1.0 | ---- | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Dibenz(a.h)anthracene | - | <1.0 | ---- | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Benzo(g.h.i)perylene | - | <1.0 | ---- | <1.0 | <1.0 | <1.0 | <1.0 | <1.0 |
| Sum of polycyclic aromatic hydrocarbons | - | <0.5 | ---- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| Benzo(a)pyrene TEQ (zero) | - | <0.5 | ---- | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| **Total Petroleum Hydrocarbons (µg/L)** | | | | | | | | |
| C6 - C9 Fraction | - | <20 | ---- | <20 | <20 | <20 | <20 | <20 |
| C10 - C14 Fraction | - | <50 | ---- | <50 | <50 | <50 | <50 | <50 |
| C15 - C28 Fraction | - | <100 | ---- | **120** | <100 | <100 | <100 | <100 |
| C29 - C36 Fraction | - | <50 | ---- | <50 | <50 | <50 | <50 | <50 |
| C10 - C36 Fraction (sum) | - | <50 | ---- | **120** | <50 | <50 | <50 | <50 |
| **Total Recoverable Hydrocarbons (µg/L)** | | | | | | | | |
| C6 - C10 Fraction | - | <20 | ---- | <20 | <20 | <20 | <20 | <20 |
| C6 - C10 Fraction minus BTEX (F1) | - | <20 | ---- | <20 | <20 | <20 | <20 | <20 |
| >C10 - C16 Fraction | - | <100 | ---- | <100 | <100 | <100 | <100 | <100 |
| >C16 - C34 Fraction | - | <100 | ---- | **110** | <100 | <100 | <100 | <100 |
| >C34 - C40 Fraction | - | <100 | ---- | <100 | <100 | <100 | <100 | <100 |
| >C10 - C40 Fraction (sum) | - | <100 | ---- | **110** | <100 | <100 | <100 | <100 |
| >C10 - C16 Fraction minus Naphthalene (F2) | - | <100 | ---- | <100 | <100 | <100 | <100 | <100 |
| **BTEX (µg/L)** | | | | | | | | |
| Benzene | - | <1 | ---- | <1 | <1 | <1 | <1 | <1 |
| Toluene | - | <2 | ---- | <2 | <2 | <2 | <2 | <2 |
| Ethylbenzene | - | <2 | ---- | <2 | <2 | <2 | <2 | <2 |
| meta- & para-Xylene | - | <2 | ---- | <2 | <2 | <2 | <2 | <2 |
| ortho-Xylene | - | <2 | ---- | <2 | <2 | <2 | <2 | <2 |
| Total Xylenes | - | <2 | ---- | <2 | <2 | <2 | <2 | <2 |
| Sum of BTEX | - | <1 | ---- | <1 | <1 | <1 | <1 | <1 |
| Naphthalene | - | <5 | ---- | <5 | <5 | <5 | <5 | <5 |

[1] ANZECC/ARMCANZ (2000) Toxicant Trigger Values (Based on 95% protection level)
[2] QLD Water Quality Guidelines (DEHP 2009) - Mid-Estuary
[#] Ammonia TTV based on Batley and Simpson (2009)

### 3.1.3 Water Quality Profiling Data

Water quality profiling was undertaken in the existing Northern Sands void on 26 July 2016. The data are presented in Figure 3-2.

Historic *in-situ* monitoring data (for surface waters only) for the void (2010 to 2016) was also provided by Northern Sands (Landline Consulting). These data are presented in Figure 3-3.

The data indicate the following:

- The void water has historically been relatively fresh (electrical conductivity between 200 and 1,000 µs/cm - Figure 3-3) and on 26/7/16 the salinity was consistent around 0.4 ppt through the water column (Figure 3-2).
- On 26/7/16, turbidity was 25 NTU at the surface and increased to approximately 70 NTU near the bottom (Figure 3-2).
- Dissolved oxygen (DO) levels have historically fluctuated significantly, with levels between 0 mg/L and 9 mg/L (Figure 3-3). On 26/7/16, DO was approximately 100 % saturation at the surface and decreased to approximately 40-60 % saturation near the bottom (Figure 3-2).
- Historically pH has been relatively neutral, with levels maintained between 6.5 and 8.0 (Figure 3-3). On 26/7/16, pH generally decreased with depth, and was between 7 and 8 (Figure 3-2).

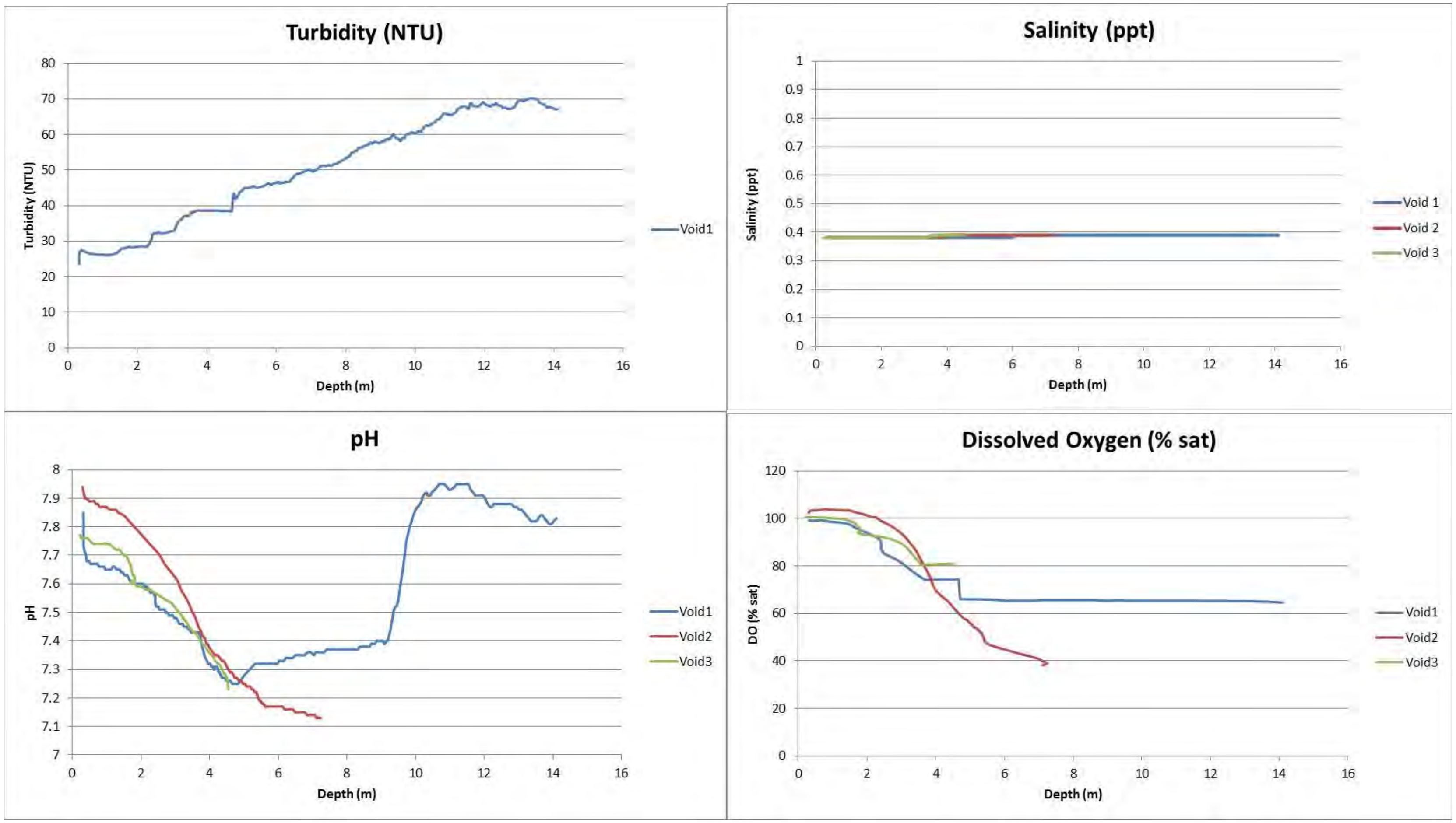



**Figure 3-2 Northern Sands Void Profiling Data (26 July 2016)**

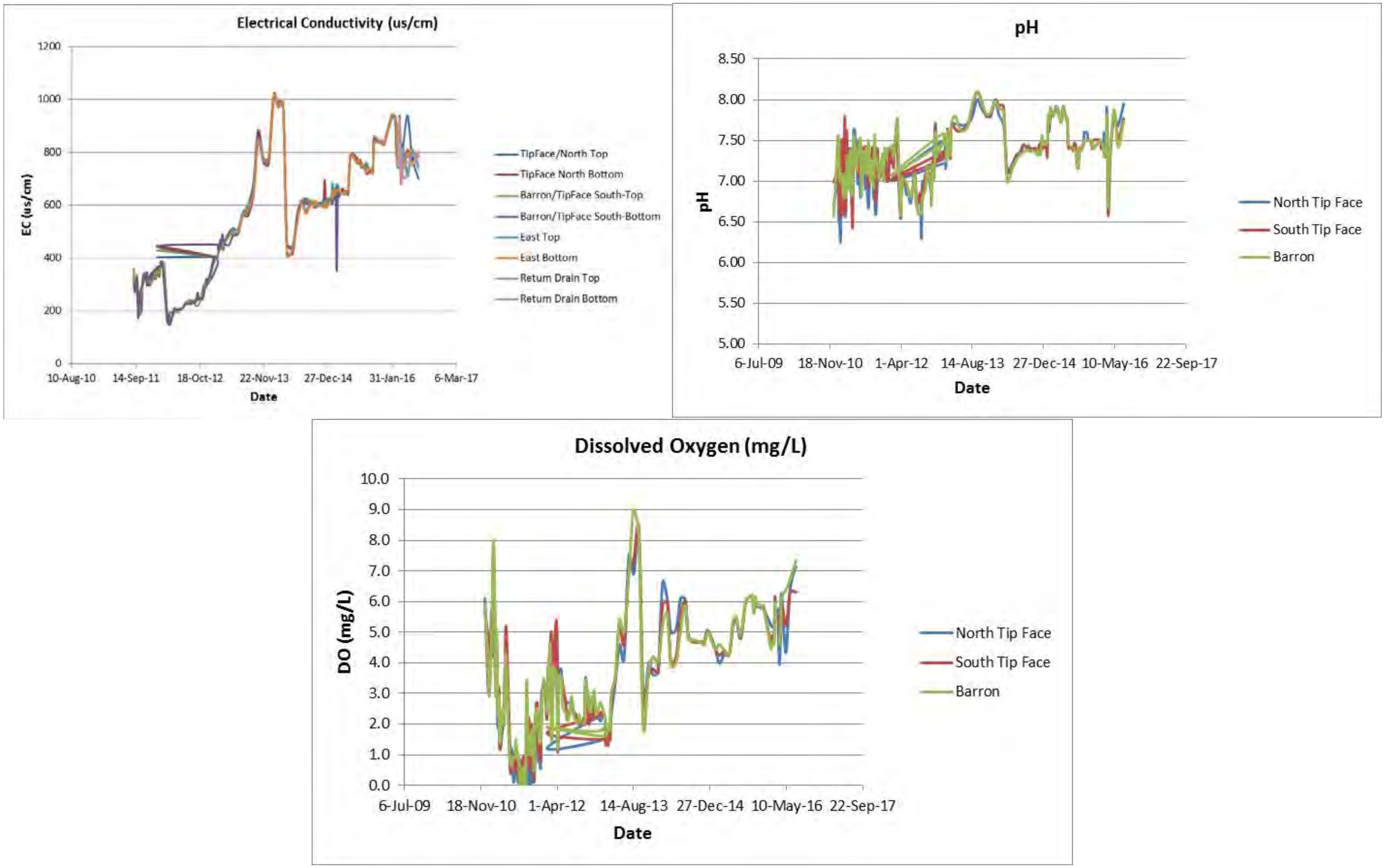



**Figure 3-3 Northern Sands (Landline Consulting) Historic Data (Surface Waters)**

## 3.2 Barron River

### 3.2.1 Overview

The Barron River with its headwater located at the Atherton Tablelands has a contributing area of 217,500 ha and drains into Trinity Bay north of Cairns.

The Barron River catchment contains five major dams and/or weir(s) with an extensive irrigation network located in the upper reaches, before the river drops through the Barron Gorge and forms the Barron River Delta. The irrigation network supports a significant area of agricultural use, predominately cane farming. The delta is also predominately developed with agricultural activities and cane farming with fringing residential development. The tidal limit in the Barron River is generally located at Kamerunga near where the Cairns Western Arterial Road crosses the river.

The proposed dredge material placement at Northern Sands DMPA may potentially impact upon the Barron River water quality through the action of tailwater discharge.

### 3.2.2 Water Quality Profiling Data

Water quality depth profiling was undertaken at ten sites in the Barron River on two separate field surveys, once during the dry season (July 2016) and again in the wet season (March 2017).

Key findings from the profiling data, presented in Figure 3-4 to Figure 3-6, include the following:

- During the dry season and wet season surveys, surface water layers (top 2 m of water) in the Barron River were brackish (5 to 20 ppt), with an increase in salinity with water depth. Salinity in waters below 2 m was fairly saline, with salinity up to 30 ppt (seawater is typically ~35 ppt) during both the dry season and wet season surveys.
- Temperature was relatively consistent through the water column at each site, with a slight decrease in temperature with increasing water depth. Water temperature was approximately 1-2 degrees warmer during the dry season survey compared to the wet season survey.
- pH was fairly consistent through the water column, with a slight increase in pH with increasing water depth. Values were similar between the dry season and wet season surveys, with pH ranging between 7 and 8.
- Turbidity remained approximately 10 NTU throughout the water column during the dry season survey. During the wet season survey, turbidity was slightly higher (~10 to 15 NTU), with an increase in turbidity with increasing water depth at some locations.
- Dissolved oxygen was consistently between about 80% and 120% during both surveys. There was a slight decrease in dissolved oxygen with increasing water depth, especially during the wet season survey.

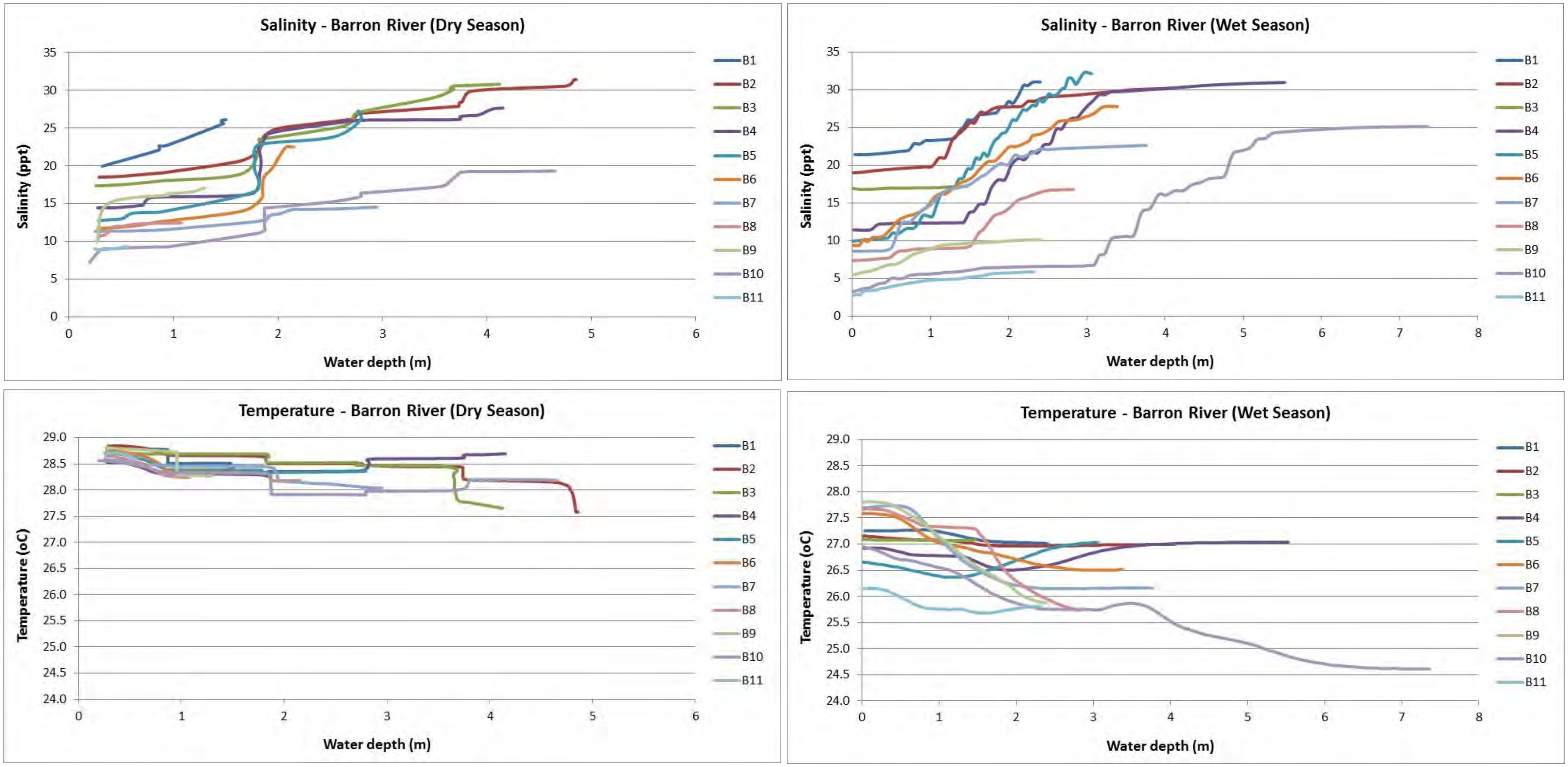



**Figure 3-4 Barron River Profiling Data – Salinity and Temperature – Dry Season and Wet Season**

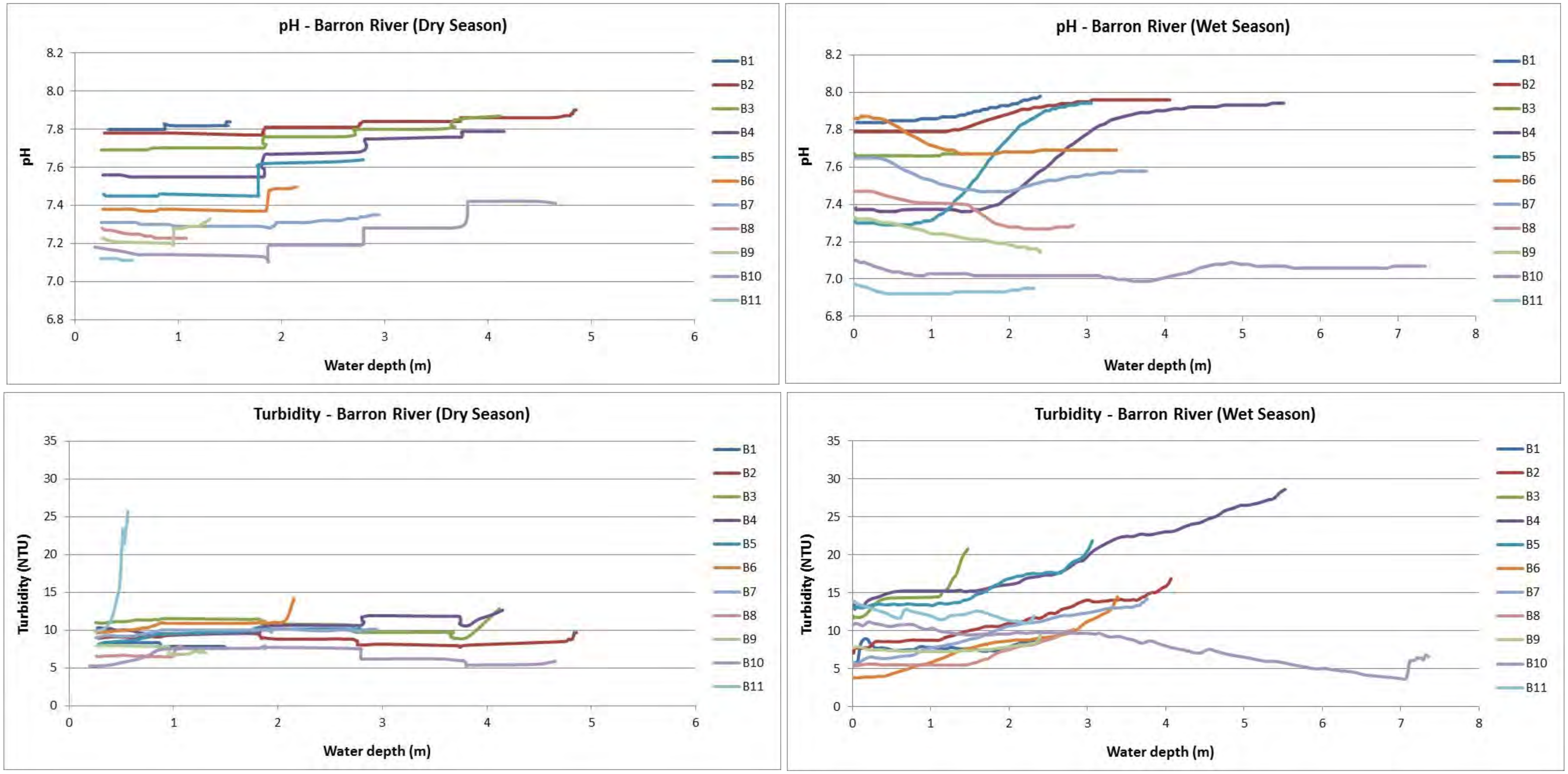
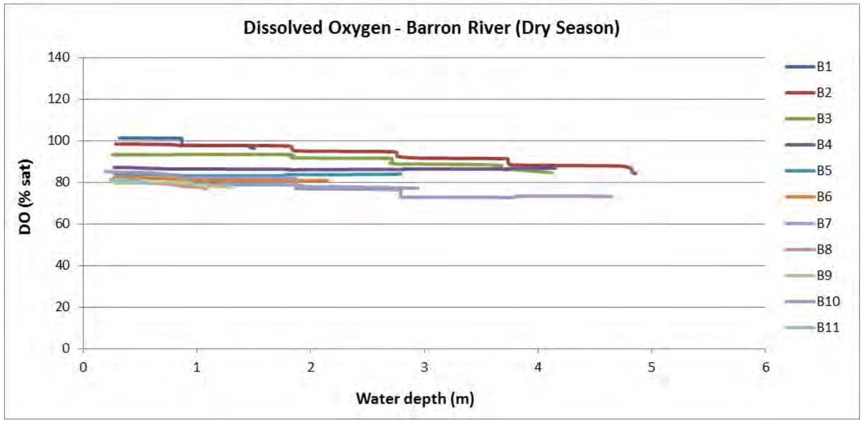



**Figure 3-5 Barron River Profiling Data – pH and Turbidity – Dry Season and Wet Season**



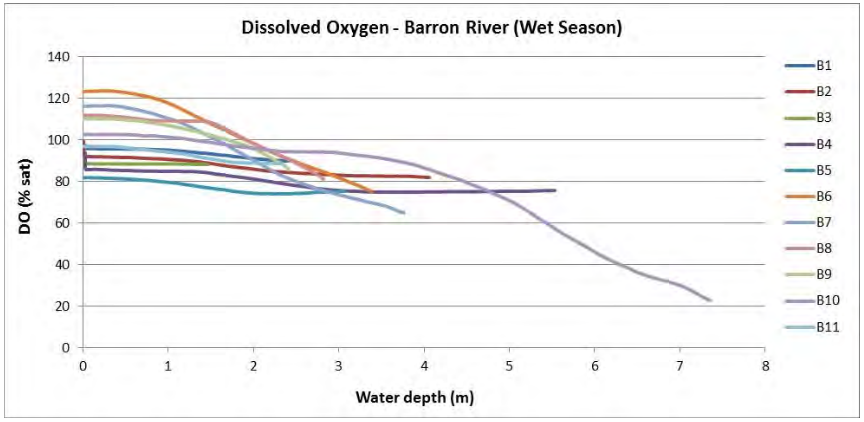




Figure 3-6 Barron River Profiling Data – Dissolved Oxygen – Dry Season and Wet Season

### 3.2.3 Deployed Instrument Data

A water quality instrument was deployed in the Barron River in July 2016 and retrieved in July 2017 (refer to Figure 2-2 for location). Data from this deployment is presented in Figure 3-7.

A water quality instrument was also previously deployed by BMT WBM as part of the AQUIS project (location in Figure 1-1), and collected two months of data during the dry season (July 2014 to September 2014). Data from this deployment is presented in Figure 3-8.

This data indicates:

- Turbidity in 2016/2017 was mostly below 100 NTU, with a larger spike up to 400 - 500 NTU coincident with a significant rainfall event (Figure 3-7). In contrast, turbidity during the two-month deployment in 2014 was mostly below 6 NTU, with some minor spikes up to 12 NTU (Figure 3-8). Turbidity was likely lower during the 2014 deployment period as rainfall was minimal during this period (few days of less than 10 mm rainfall).
- Salinity in the Barron River fluctuated in response to tidal cycles and rainfall events. Similar to the profiling data (Section 3.2.2), salinity ranged between about 5 ppt and 30 ppt. Higher salinities (~30 ppt) were generally coincident with spring tides (Figure 3-7 and Figure 3-8), while lower salinities (~5 ppt) were generally coincident with neap tides when freshwater flows appeared to dominate the salinity regime in the Barron River. During a large rainfall event in January 2017, salinity in the Barron River decreased to about 0.2 ppt for a brief period of time. However, in general the Barron River is brackish with salinity typically around 20 ppt for most of the time (refer to Section 3.2.5).
- Temperature was relatively consistent during both deployment periods, with temperature between 25°C and 30°C during the 2016/2017 deployment, and 20°C to 25°C during the 2014 winter deployment.

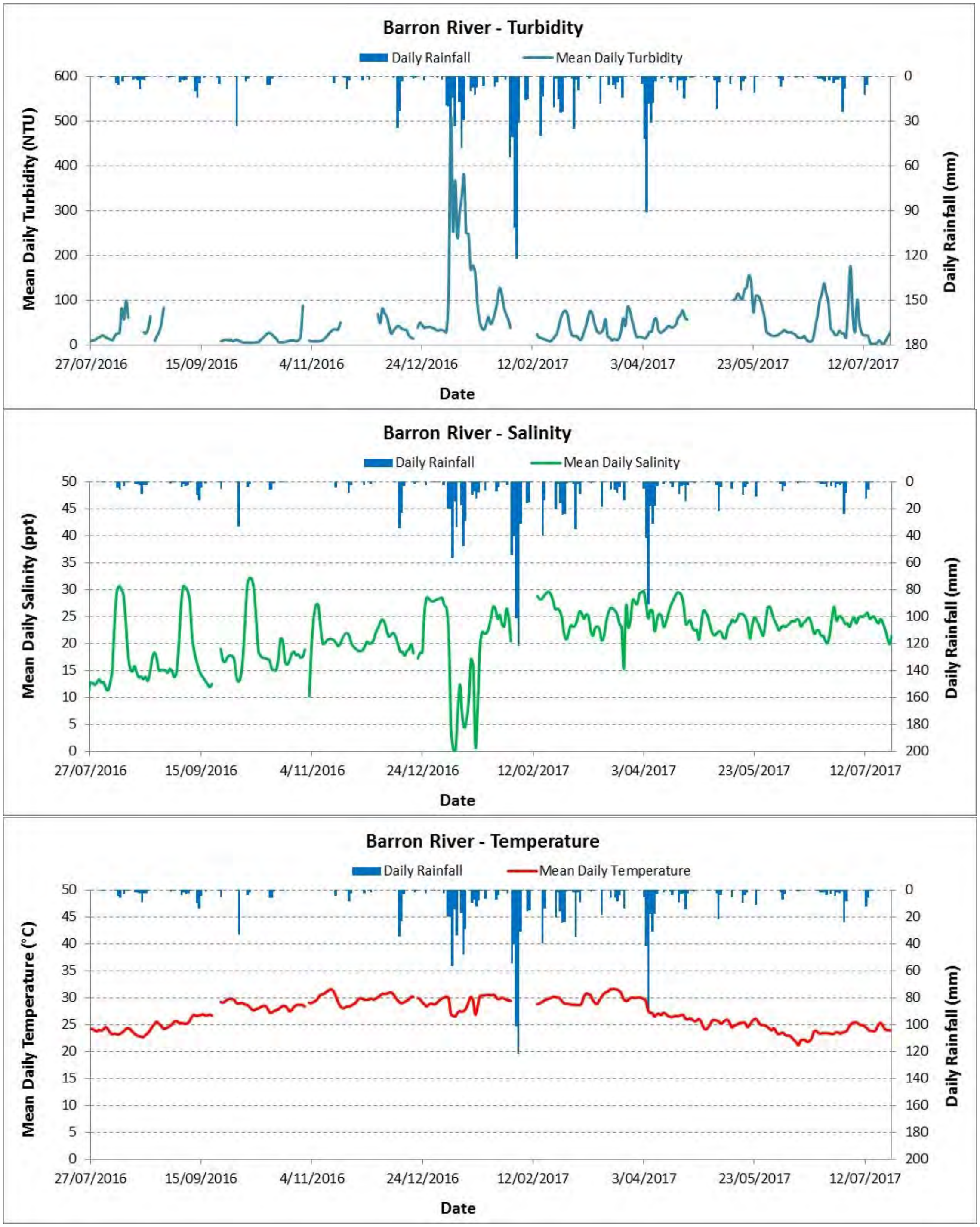



**Figure 3-7 Barron River Deployed Instrument Data – July 2016 to July 2017**

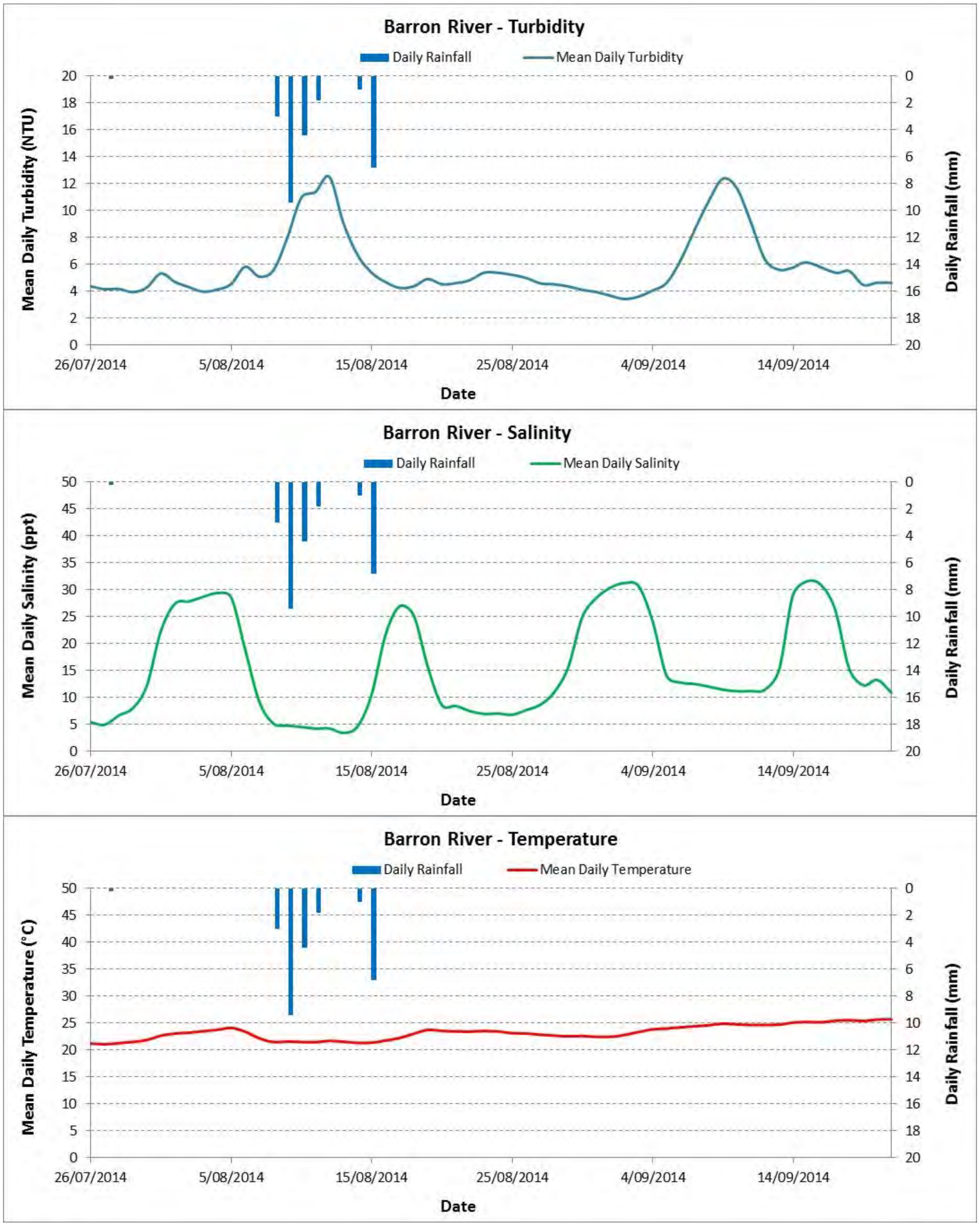



**Figure 3-8 Barron River Deployed Instrument Data – July 2014 to Sept 2014 (AQUIS)**

### 3.2.4 Cairns Regional Council data

Cairns Regional Council (CRC) undertakes routine monthly water quality sampling at a number of sites in the Barron River (Figure 3-9).

Monthly monitoring data (including salinity, temperature and turbidity) between 2009 and 2016 was provided by CRC. Site 2 is the closest site to the Northern Sands DMPA (and proposed tailwater discharge locations), and data from this site is presented in Figure 3-10.

The salinity data collected by CRC over a number of years has a similar range of salinity as collected by the deployed instruments (Section 3.2.3), with salinity ranging between 5 ppt and 30 ppt, with a median of approximately 17 ppt. Turbidity was mostly below 20 NTU, with a larger spike up to 50 NTU in March 2011. Median turbidity is approximately 7 NTU. Over the years, temperature has fluctuated between 21°C and 32°C.


**Figure 3-9 Cairns Regional Council Monitoring Sites**

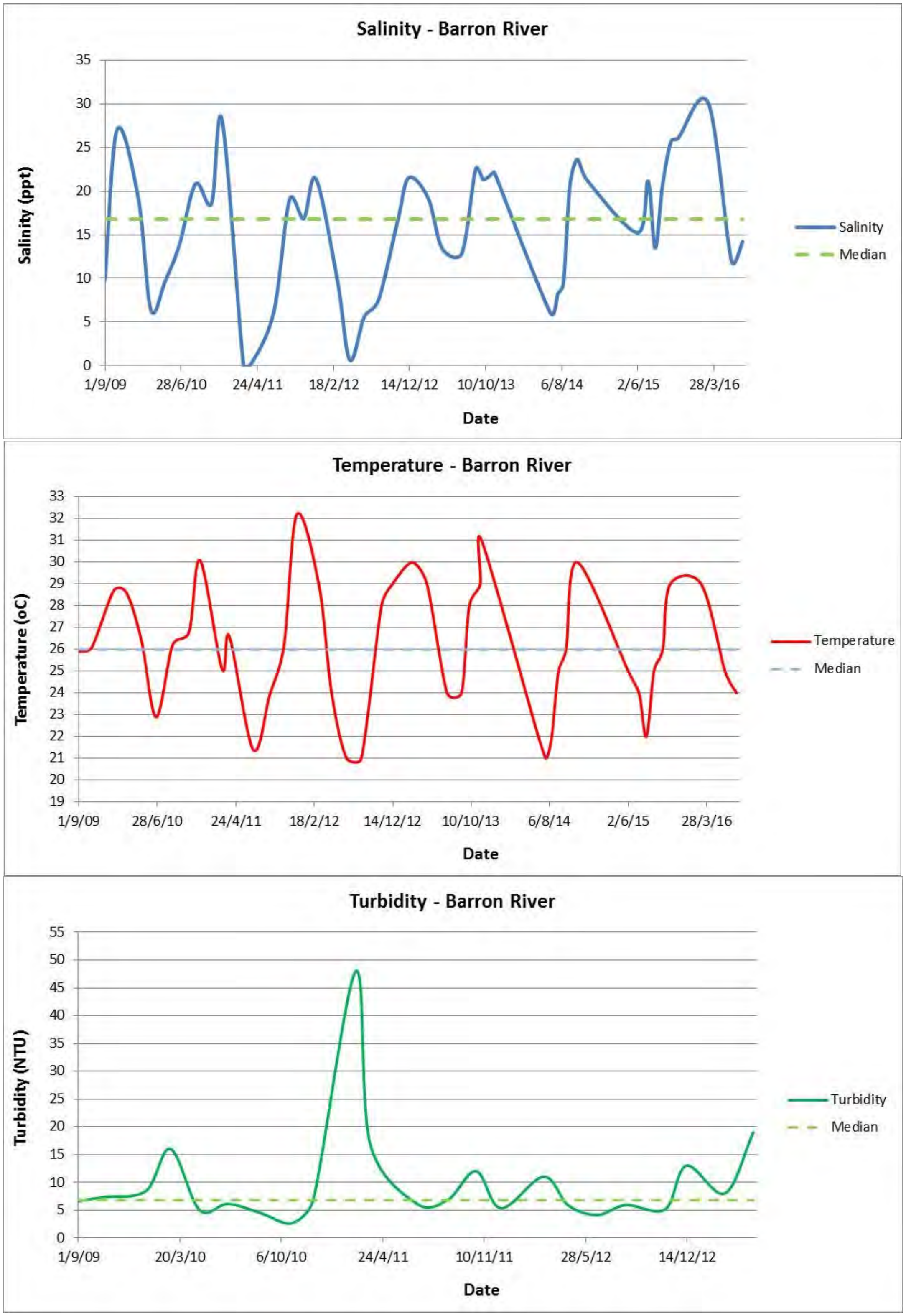



**Figure 3-10 Cairns Regional Council - Barron River Data (Barron River Site 2)**

### 3.2.5 Summary of Barron River Data

The water quality data collected in the Barron River (discussed in preceding sections, excluding the water quality profiling data) was collated and summary statistics produced. The summary statistics for each deployment period and data source is presented in Table 3-2, with summary statistics for the combined data set at the bottom of this table.

To provide a comparison of the different data sets, box and whisker plots of this data are presented in Figure 3-11. This indicates that salinity was generally similar across data sets, with slightly lower median salinity during the two-month deployment in 2014. Figure 3-11 also shows that turbidity and temperature was lower during the 2014 winter deployment, as mentioned previously.

**Table 3-2 Summary Statistics of Barron River Data**

| Deployment Period | Summary Statistic | Salinity | Turbidity | Temperature |
|---|---|---|---|---|
| | | ppt | NTU | °C |
| July 14 – Sept 14 (AQUIS) | Minimum | 3.5 | 3.4 | 21.0 |
| | 20th Percentile | 7.0 | 4.3 | 21.7 |
| | Median | 12.3 | 4.8 | 23.3 |
| | 80th Percentile | 27.3 | 6.4 | 24.7 |
| | 95th Percentile | 30.8 | 11.5 | 25.5 |
| | Maximum | 31.6 | 12.5 | 25.7 |
| July 16 – July 17 (BMT WBM) | Minimum | 0.1 | 2.1 | 21.2 |
| | 20th Percentile | 17.2 | 11.7 | 24.3 |
| | Median | 22.5 | 28.5 | 27.4 |
| | 80th Percentile | 25.5 | 67.0 | 29.8 |
| | 95th Percentile | 29.1 | 138.9 | 30.8 |
| | Maximum | 32.2 | 508.9 | 31.7 |
| Sept 09 – April 13 (CRC) | Minimum | 0.1 | 2.6 | 21.0 |
| | 20th Percentile | 8.6 | 5.2 | 23.9 |
| | Median | 16.8 | 6.8 | 26.0 |
| | 80th Percentile | 21.7 | 12.6 | 29.0 |
| | 95th Percentile | 26.9 | 18.8 | 30.1 |
| | Maximum | 30.0 | 48.0 | 32.2 |
| Combined Data | Minimum | 0.1 | 2.1 | 21.0 |
| | 20th Percentile | 14.2 | 6.5 | 23.8 |
| | Median | 21.7 | 20.8 | 26.4 |
| | 80th Percentile | 25.5 | 57.3 | 29.6 |
| | 95th Percentile | 29.3 | 122.7 | 30.7 |
| | Maximum | 32.2 | 508.9 | 32.2 |

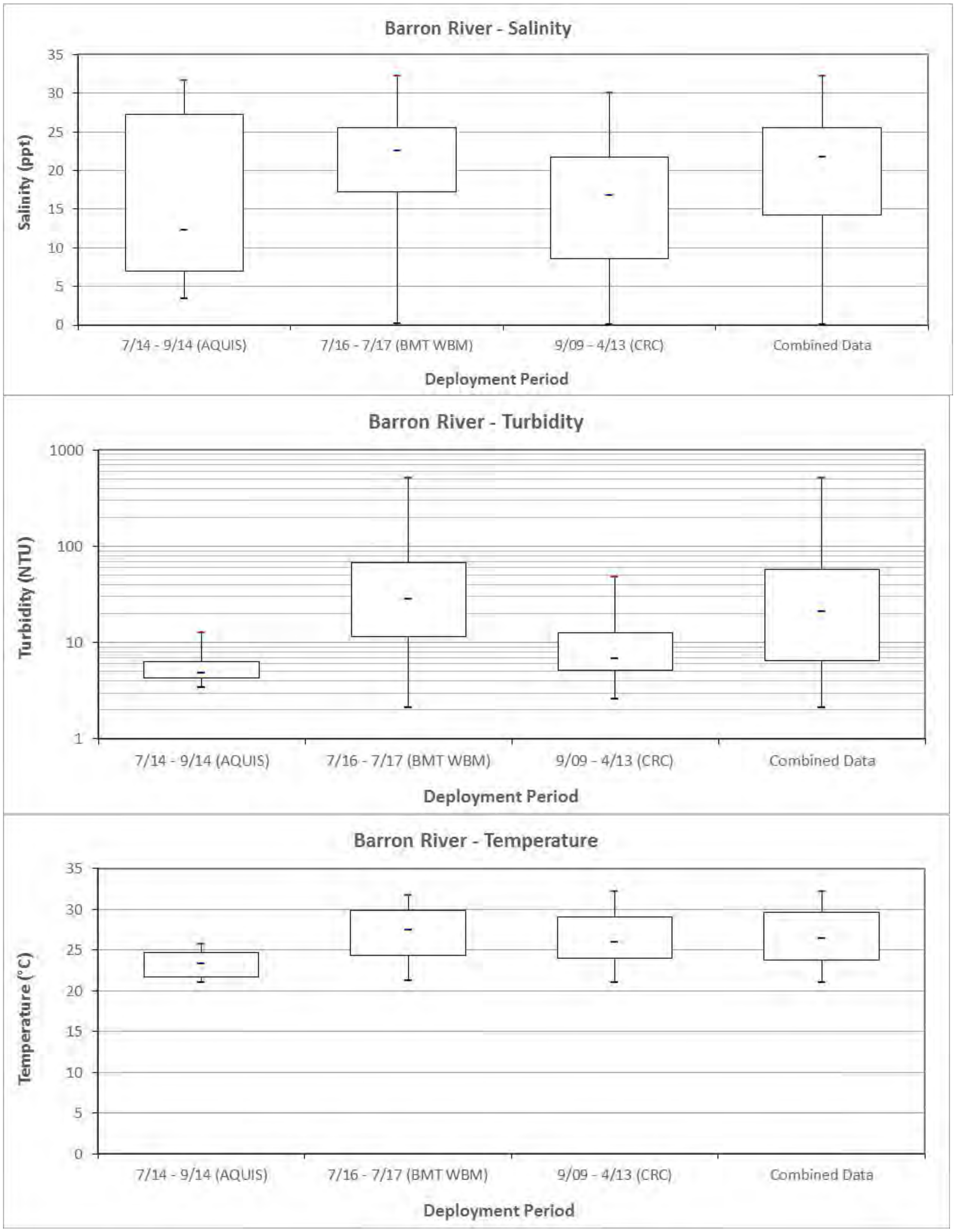



**Figure 3-11 Comparison of Barron River Data Sets**

## 3.3 Thomatis / Richters Creek

### 3.3.1 Overview

Thomatis / Richters Creek is located in the Barron River delta. Thomatis Creek is the tidal reach that commences at the confluence of the Barron River and joins Richters Creek approximately 2.7 km downstream. Richters Creek is also tidal; however the creek receives runoff from a large predominantly agricultural area with a catchment area of 449 ha.

Richters Creek is largely tidal up to Yorkeys Knob road. Richters Creek continues east from the confluence with Thomatis Creek and ultimately discharges into Trinity Bay approximately 5.6km north of the Barron River and adjacent to Yorkeys Creek mouth.

The proposed dredge material placement at Northern Sands DMPA does not directly impact upon Thomatis / Richters Creek, however tailwater discharges mobilised upstream on flooding tides may affect water quality in Thomatis / Richters Creek under certain conditions.

### 3.3.2 Deployed Instrument Data

A water quality instrument was deployed in Thomatis/Richters Creek in September 2016 and retrieved in February 2017 (refer to Figure 2-2 for location). Data from this deployment is presented in Figure 3-7.

A water quality instrument was also previously deployed in Thomatis/Richters Creek by BMT WBM as part of the AQUIS project (location in Figure 1-1), and collected 14 months of data (Dec 2013 to Feb 2015).

This data indicates:

- Turbidity during both deployments was mostly below 50 NTU, with some larger spikes of approximately 200 - 350 NTU coincident with rainfall events (Figure 3-12 and Figure 3-13).
- Salinity in Thomatis/Richters Creek was mostly around 30 ppt during both deployments. Salinity only decreased during large rainfall events when freshwater flows in the Barron River were large enough to push into Thomatis/Richters Creek. During these periods, salinity would decrease to about 0.1 ppt for short periods of time.
- Temperature was relatively consistent during both deployment periods, with temperature between 25°C and 30°C during the 2016/2017 deployment, and 20°C to 30°C during the 2013 to 2015 deployment.

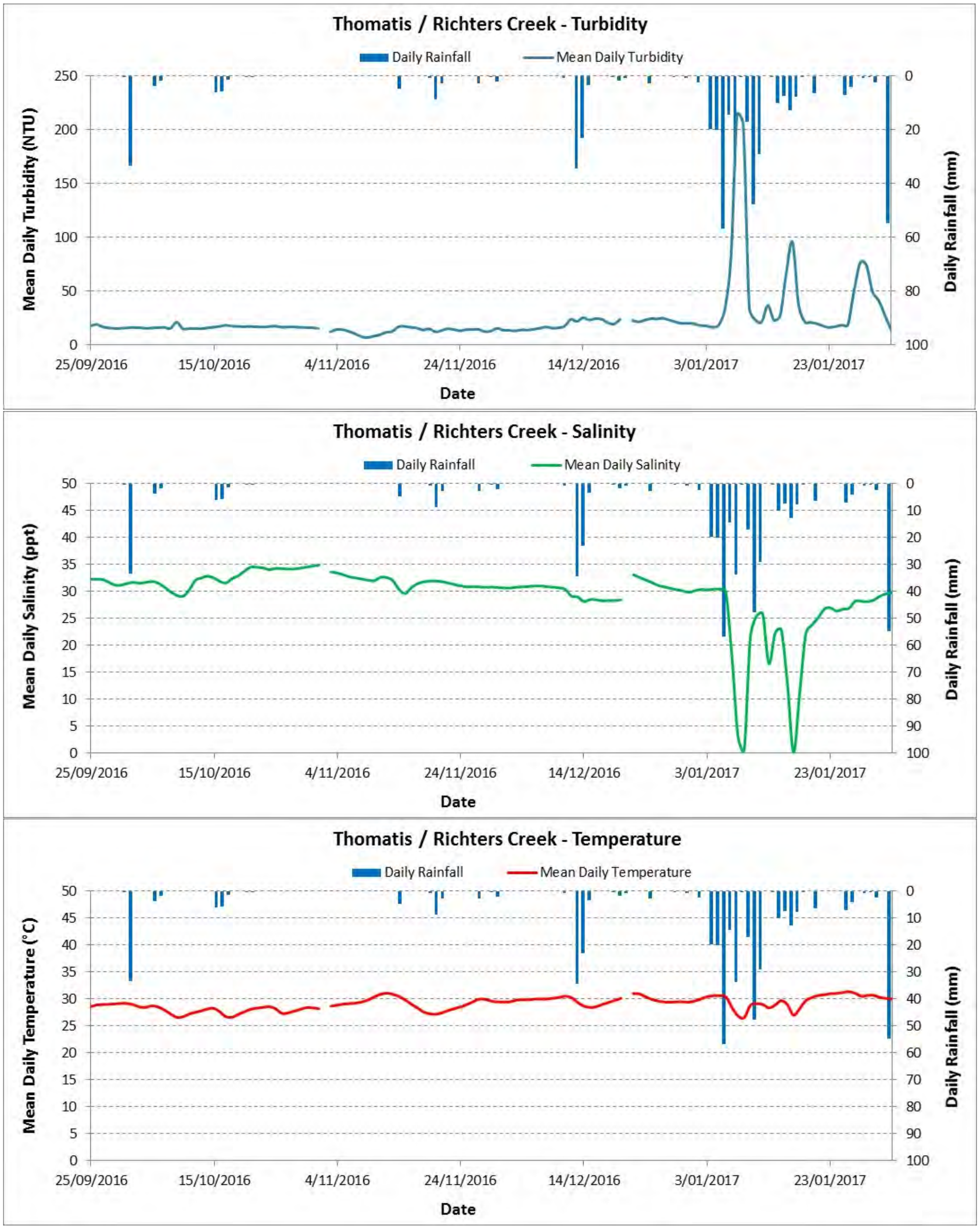



**Figure 3-12 Thomatis / Richters Creek Deployed Instrument Data – Sept 2016 to Feb 2017**

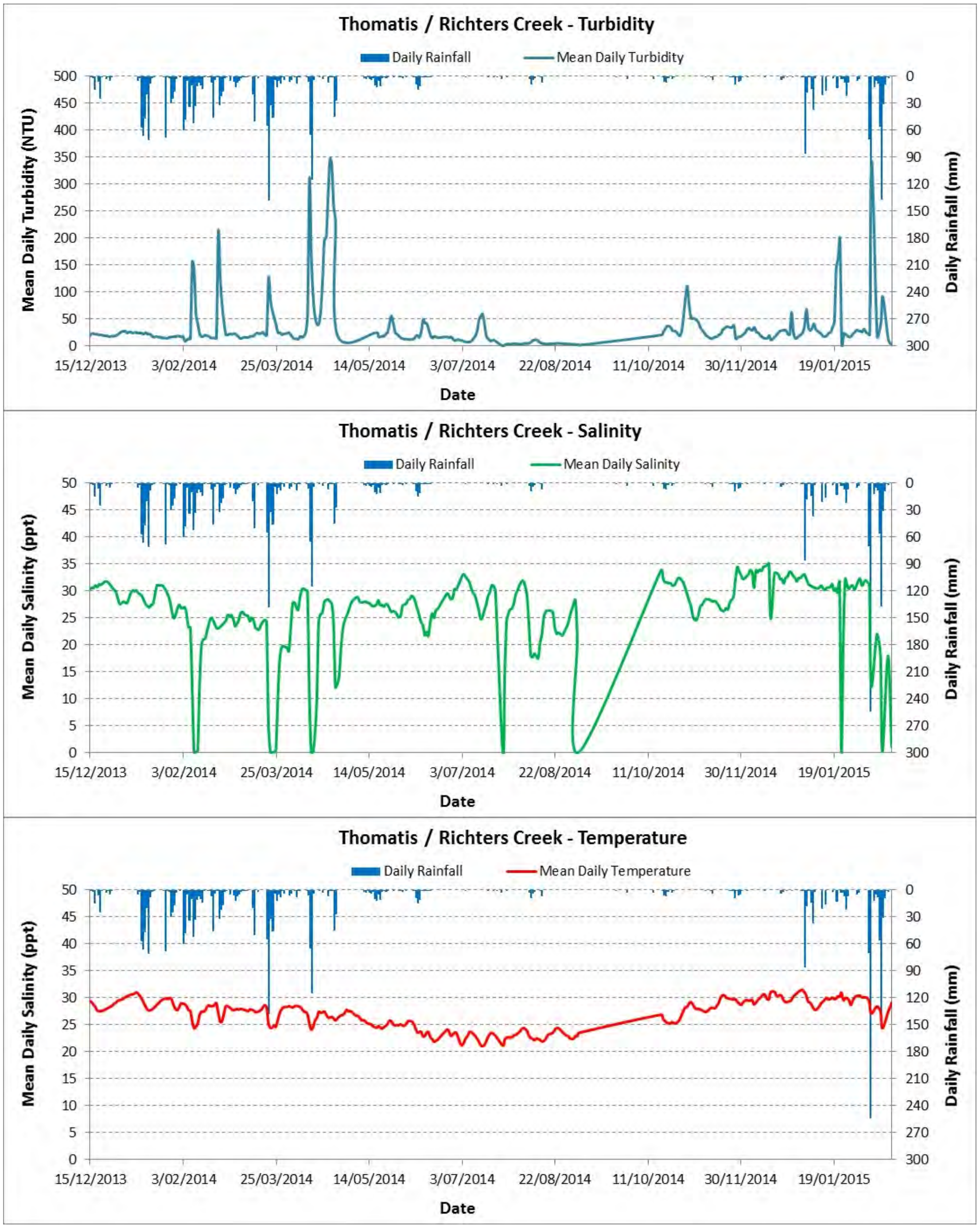



**Figure 3-13 Thomatis / Richters Creek Deployed Instrument Data – Dec 2013 to Feb 2015**

### 3.3.3 Summary of Thomatis / Richters Creek Data

The water quality data collected in Thomatis / Richters Creek (discussed in preceding sections) was collated and summary statistics produced. The summary statistics for each deployment period and data source is presented in Table 3-3, with summary statistics for the combined data set at the bottom of this table.

To provide a comparison of the different data sets, box and whisker plots of this data are presented in Figure 3-14. This indicates that salinity, turbidity and temperature data was generally similar across both deployment periods, with slightly lower turbidity during the 2016/2017 deployment.

**Table 3-3 Summary Statistics of Thomatis / Richters Creek Data**

| Deployment Period | Summary Statistic | Salinity | Turbidity | Temperature |
|---|---|---|---|---|
| | | ppt | NTU | °C |
| Dec 13 – Feb 15 (AQUIS) | Minimum | 0.1 | 0.4 | 21.0 |
| | 20th Percentile | 24.0 | 13.9 | 24.1 |
| | Median | 27.9 | 21.0 | 27.6 |
| | 80th Percentile | 31.1 | 33.9 | 29.5 |
| | 95th Percentile | 33.1 | 122.7 | 30.5 |
| | Maximum | 35.2 | 346.2 | 31.5 |
| Sept 16 – Feb 17 (BMT WBM) | Minimum | 0.2 | 6.7 | 26.5 |
| | 20th Percentile | 28.4 | 14.3 | 28.2 |
| | Median | 30.9 | 16.7 | 29.1 |
| | 80th Percentile | 32.6 | 22.9 | 30.3 |
| | 95th Percentile | 34.4 | 59.6 | 31.0 |
| | Maximum | 34.9 | 214.9 | 31.4 |
| Combined Data | Minimum | 0.1 | 0.4 | 21.0 |
| | 20th Percentile | 24.6 | 14.0 | 24.9 |
| | Median | 28.7 | 19.2 | 28.2 |
| | 80th Percentile | 31.7 | 29.8 | 29.8 |
| | 95th Percentile | 33.6 | 89.6 | 30.7 |
| | Maximum | 35.2 | 346.2 | 31.5 |

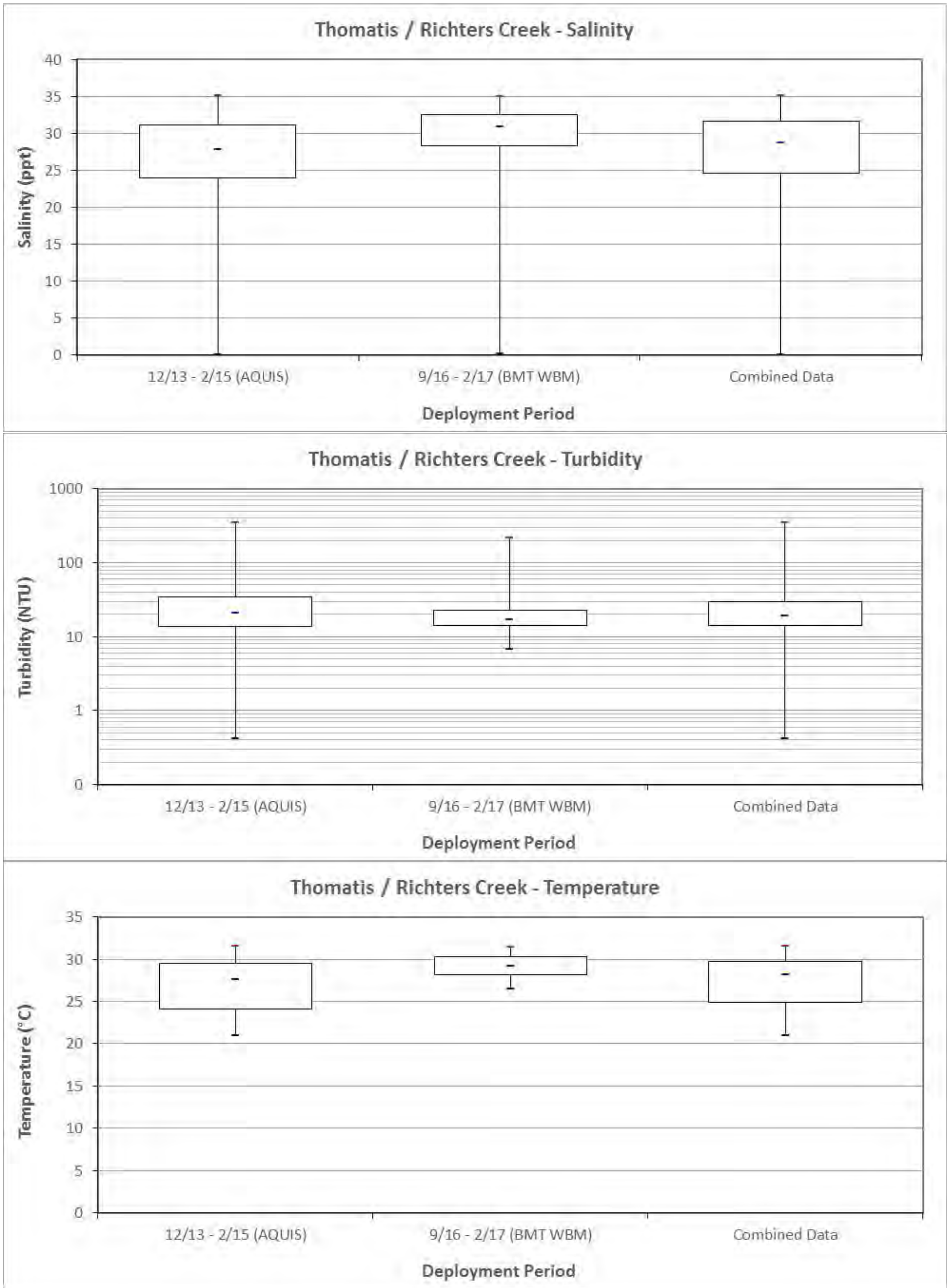



**Figure 3-14 Comparison of Thomatis / Richters Creek Data Sets**

## 3.4 Palm Cove (Double Island)

Palm Cove is located on the coastline approximately 25 km north of Cairns. Palm Cove is an important tourist destination and as such, Palm Cove beach has high amenity values.

Approximately 1 km offshore from Palm Cove is Double Island, which contains a narrow fringing reef to the north and an extensive reef platform to the south. This represents the largest reef in the study area, and the reef community is currently in excellent condition.

Due to the location of Palm Cove and Double Island being to the north of the proposed dredging works, there may be potential impacts from turbid dredge plumes if they become mobilised in a northerly direction.

### 3.4.1 Deployed Instrument Data

A water quality instrument was deployed near Palm Cove beach (and Double Island) in August 2016 and retrieved in November 2016 (refer to Figure 2-2 for location). The data from this three-month deployment period is presented in Figure 3-7.

A water quality instrument was also previously deployed at Palm Cove beach by BMT WBM in 2013/2014 (location in Figure 1-1), and collected 12 months of data (July 2013 to July 2014).

This data indicates that turbidity during the most recent deployment was around 50 NTU for most of the time, with some larger spikes in turbidity around 100 – 200 NTU. Turbidity during the 2013/2014 deployment period was slightly lower in general, however there were some larger turbid spikes up to around 400 - 700 NTU.

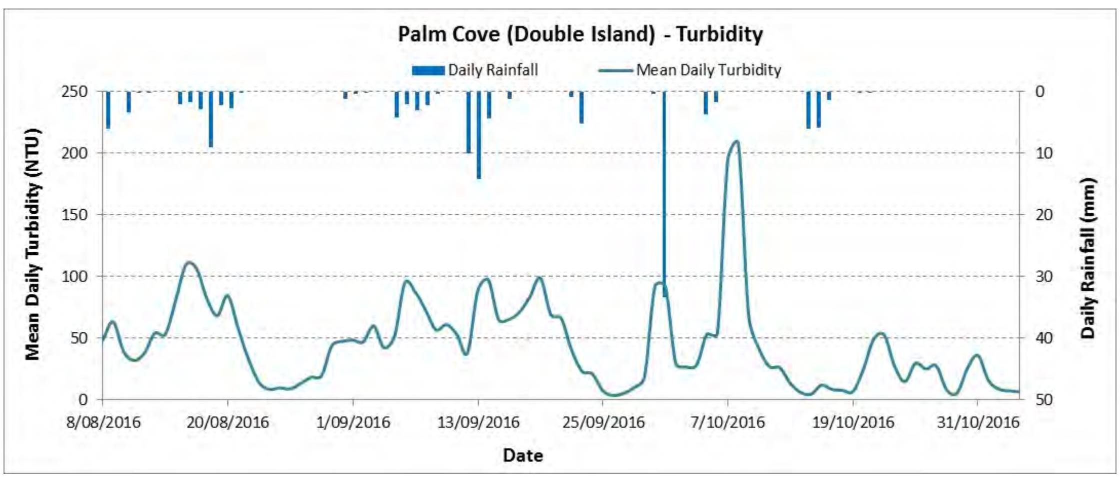



**Figure 3-15 Palm Cove (Double Island) Deployed Instrument Data – Aug 2016 to Nov 2016**

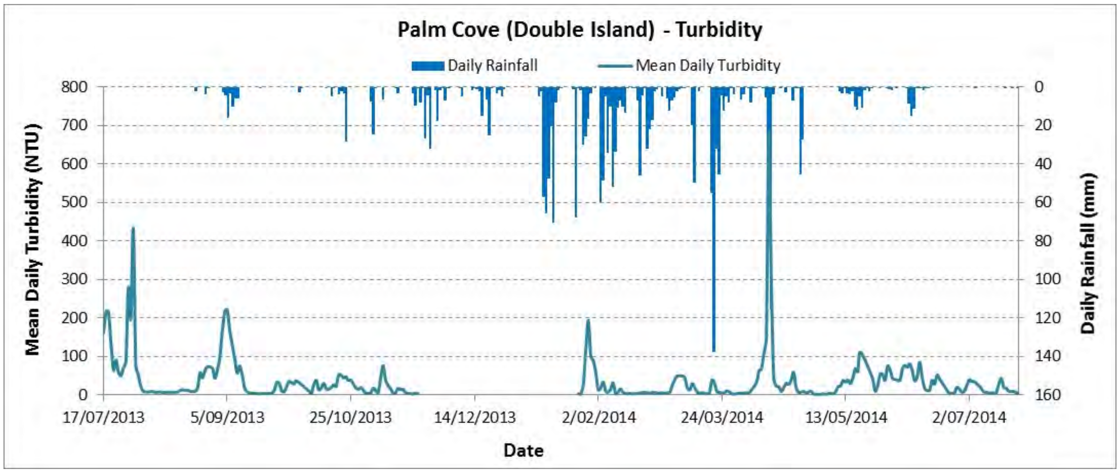



**Figure 3-16 Palm Cove (Double Island) Deployed Instrument Data – Jul 2013 to Jul 2014**

### 3.4.2 Summary of Palm Cove (Double Island) Data

The turbidity data collected at Palm Cove (discussed in preceding sections) was collated and summary statistics produced. The summary statistics for each deployment period and data source is presented in Table 3-4, with summary statistics for the combined data set at the bottom of this table.

To provide a comparison of the different data sets, a box and whisker plot of the turbidity data is presented in Figure 3-17. This indicates that turbidity was generally higher during the latest deployment (2016), with median turbidity of 40 NTU, compared to a median turbidity of 17 NTU during the 2013/2014 deployment period. However, it should be noted that the latest deployment was for a three-month period while the earlier deployment (2013/2014) was a 12-month deployment.

Table 3-4 Summary Statistics of Palm Cove (Double Island) Data

| Deployment Period | Summary Statistic | Turbidity NTU |
|---|---|---|
| July 13 – July 14 (BMT WBM) | Minimum | 0.8 |
| | 20th Percentile | 4.8 |
| | Median | 16.6 |
| | 80th Percentile | 50.6 |
| | 95th Percentile | 131.9 |
| | Maximum | 687.7 |
| Aug 16 – Nov 16 (BMT WBM) | Minimum | 4.0 |
| | 20th Percentile | 13.1 |
| | Median | 39.6 |
| | 80th Percentile | 69.0 |
| | 95th Percentile | 98.6 |
| | Maximum | 208.0 |
| Combined Data | Minimum | 0.8 |
| | 20th Percentile | 5.9 |
| | Median | 21.5 |
| | 80th Percentile | 57.9 |
| | 95th Percentile | 110.9 |
| | Maximum | 687.7 |

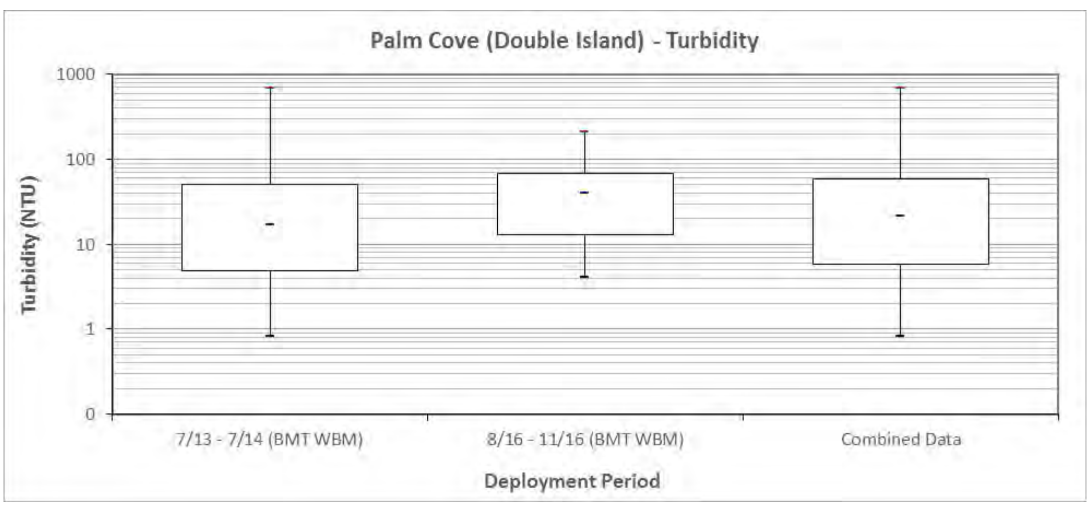



Figure 3-17 Comparison of Palm Cove (Double Island) Data Sets

## 3.5 Trinity Inlet

Trinity Inlet is a large estuary that is fed by several minor drainages including Skeleton, Chinaman, Blackfellows, Wrights, Redbank, Wahday, Falls and Seelee creeks. It is thought that the Trinity Inlet once formed the mouth of the Mulgrave River, but was diverted southwards as a result of sediment accumulation on the coastal plain. As Trinity Inlet is not flushed by a major river, it represents a tidally dominant system with less variation in salinity than is usual in estuaries in high rainfall areas (Perry 1995).

The catchments draining directly to Trinity Inlet are approximately 340 $km^2$ in total area (Barron and Haynes 2009). While the combined catchments are 46 percent natural forest, 29 percent of the land is used for grazing and 13 percent for crops including sugarcane, and seven percent urban. Sugarcane crops comprise approximately 26 percent of the Trinity Inlet catchment land use.

Water quality monitoring for the Draft EIS focused on the areas of seagrass in upper Trinity Inlet (Figure 1-1). As part of the revised EIS, additional data was collected at a location in lower Trinity Inlet (Figure 2-2) in closer proximity to the Port and proposed inner harbour dredging.

### 3.5.1 Water Quality Profiling Data

Water quality depth profiling was undertaken at one site in Trinity Inlet during the dry season (July 2016). Key findings from the profiling data, presented in Figure 3-18, include the following:

- Salinity in Trinity Inlet was consistent through the water column at around 32 ppt, which is close to the typical salinity of sea water (~35 ppt).
- Temperature decreased slightly (~0.3°C) from surface down to about 2 m water depth, then increased slightly and remained consentient around 27.2°C through the rest of the water column.
- pH was consistent through the water column at around 7.5 to 7.7.
- Turbidity was lower at the surface (~2 NTU) and increased with water depth up to about 5 NTU near the bottom (10-12 m depth).

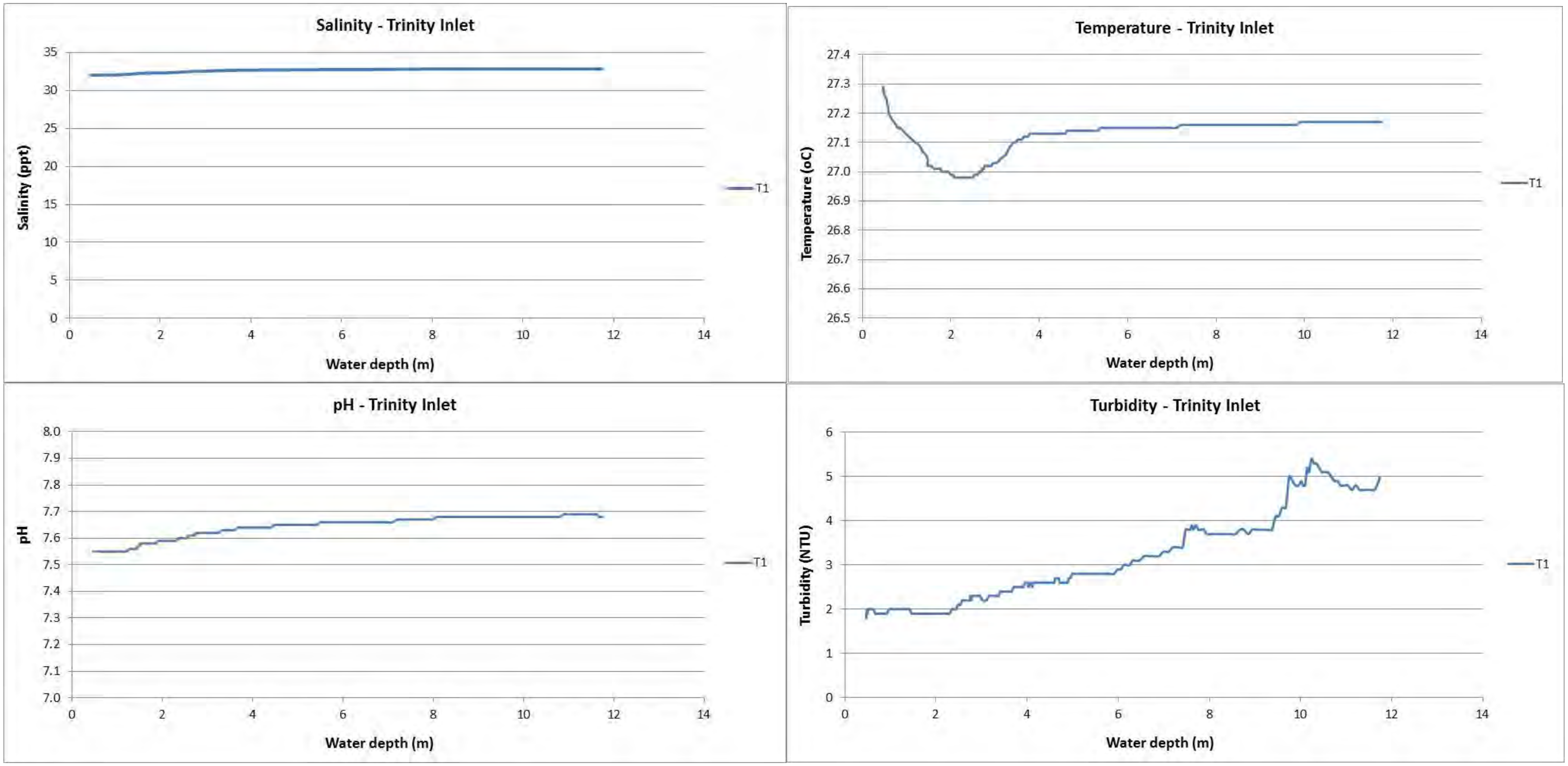



**Figure 3-18 Trinity Inlet Profiling Data**

### 3.5.2 Deployed Instrument Data

A water quality instrument was deployed in Trinity Inlet in July 2016 and retrieved in March 2017 (refer to Figure 2-2 for location). The data from this deployment period is presented in Figure 3-19.

A water quality instrument was also previously deployed in the upper reaches of Trinity Inlet by BMT WBM in 2013/2014 (location in Figure 1-1), and collected 12 months of data (July 2013 to July 2014). The purpose of the latest deployment was to collect water quality data closer to the Port and proposed Inner Harbour dredging works.

The data in Figure 3-19 indicates that turbidity fluctuated with tidal cycles and rainfall events, but was mostly below 20 NTU. There were some larger spikes in turbidity up to about 100 NTU coincident with spring tides and/or significant rainfall. Salinity and temperature were relatively consistent throughout the deployment period, with salinity between 30 and 35 ppt and temperature between 20°C and 30°C.

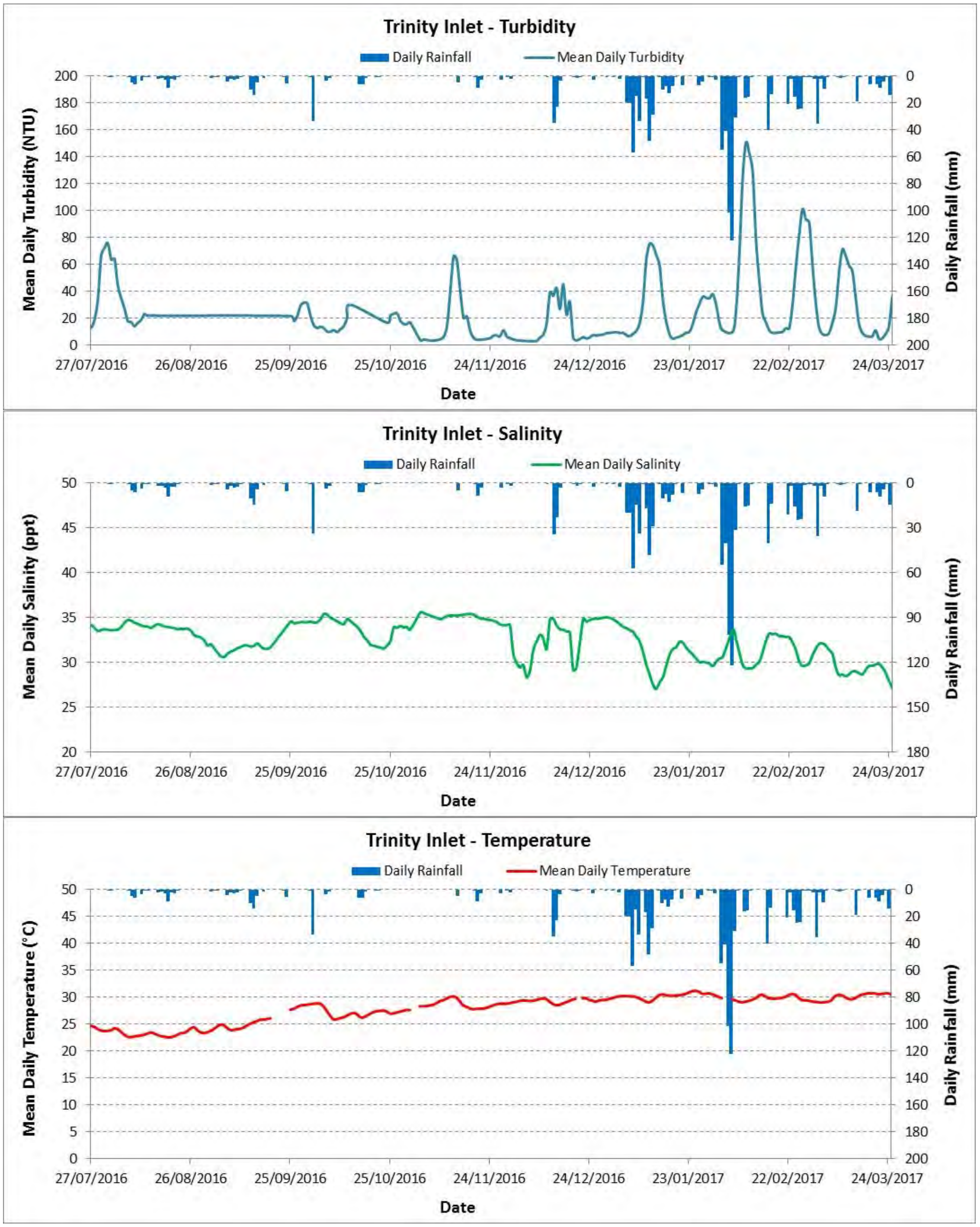



Figure 3-19 Trinity Inlet Deployed Instrument Data – Jul 2016 to Mar 2017

### 3.5.3 Summary of Trinity Inlet Data

Summary statistics produced from the deployed instrument data collected at Trinity Inlet are presented in Table 3-5. This indicates that median turbidity was approximately 16 NTU during the 2016/2017 deployment period, while median salinity and temperature were approximately 33 ppt and 29°C respectively.

**Table 3-5 Summary Statistics of Trinity Inlet Data**

| Deployment Period | Summary Statistic | Salinity | Turbidity | Temperature |
|---|---|---|---|---|
| | | ppt | NTU | °C |
| July 16 – March 17 (BMT WBM) | Minimum | 27.1 | 3.4 | 22.5 |
| | 20th Percentile | 30.1 | 6.9 | 24.8 |
| | Median | 33.1 | 15.9 | 28.9 |
| | 80th Percentile | 34.6 | 36.9 | 30.1 |
| | 95th Percentile | 35.3 | 75.8 | 30.7 |
| | Maximum | 35.6 | 150.4 | 31.3 |

## 3.6 Smiths Creek

### 3.6.1 Deployed Instrument Data

A water quality instrument was deployed in Smiths Creek (otherwise known as Chinamans Creek) in March 2017 and retrieved in July 2017 (refer to Figure 2-2 for location). The data from this deployment period is presented in Figure 3-20.

The data in Figure 3-20 indicates that turbidity fluctuated with tidal cycles and rainfall events, but was mostly below 60 NTU. There were some larger spikes in turbidity up to about 120 NTU coincident with spring tides and/or rainfall. Salinity and temperature were relatively consistent throughout the deployment period, with salinity around 25-30 ppt and temperature between 20°C and 30°C.

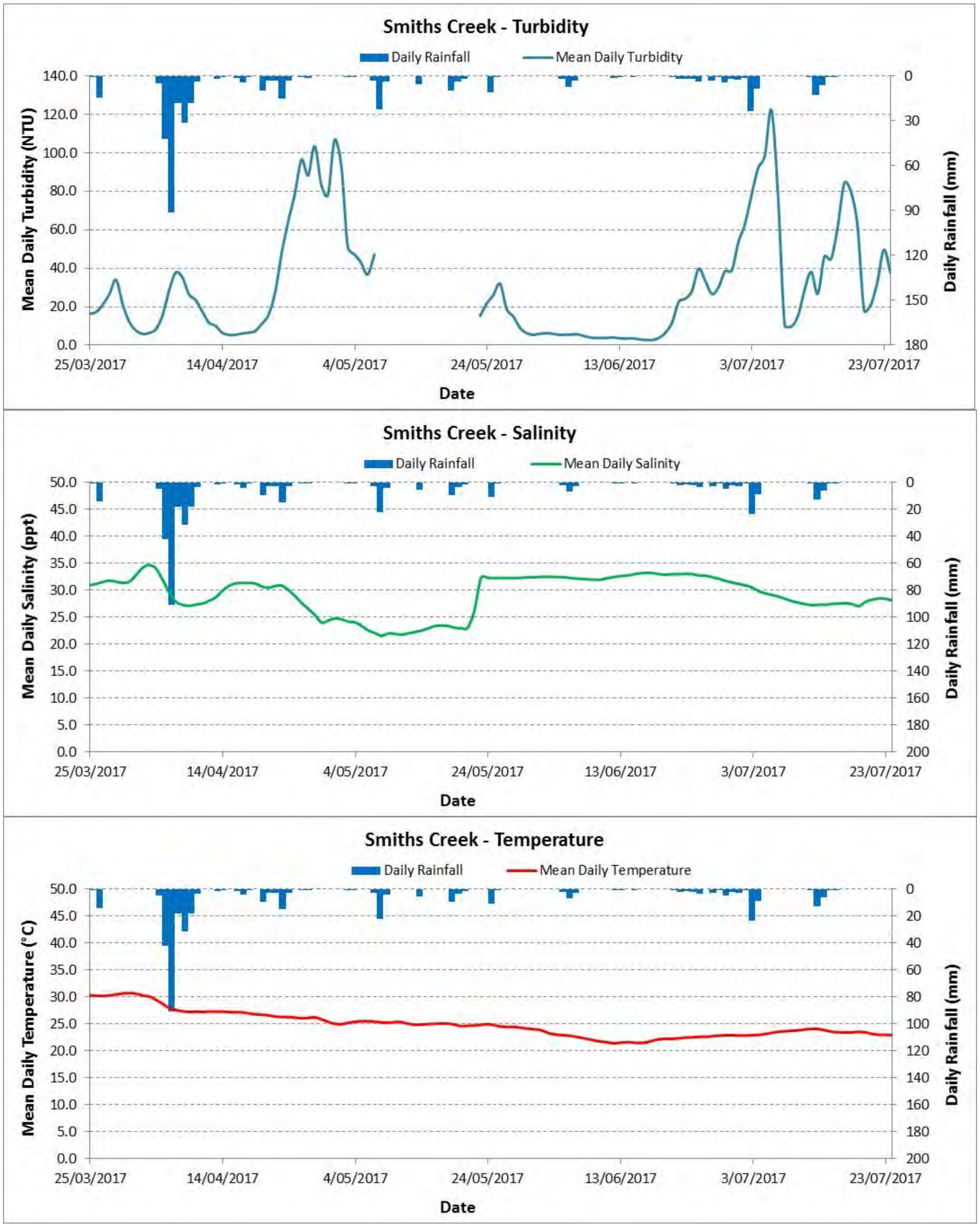



**Figure 3-20 Smiths Creek Deployed Instrument Data – Mar 2017 to July 2017**

### 3.6.2 Summary of Smiths Creek Data

Summary statistics produced from the deployed instrument data collected at Smiths Creek are presented in Table 3-6. This indicates that median turbidity was approximately 22 NTU during the deployment period, while median salinity and temperature were approximately 31 ppt and 25°C respectively.

**Table 3-6 Summary Statistics of Smiths Creek Data**

| Deployment Period | Summary Statistic | Salinity | Turbidity | Temperature |
|---|---|---|---|---|
| | | ppt | NTU | °C |
| March 17 – July 17 (BMT WBM) | Minimum | 21.7 | 2.5 | 21.5 |
| | 20th Percentile | 26.4 | 5.9 | 22.9 |
| | Median | 30.6 | 21.6 | 24.7 |
| | 80th Percentile | 32.4 | 49.2 | 27.0 |
| | 95th Percentile | 33.0 | 93.1 | 30.4 |
| | Maximum | 34.6 | 122.1 | 30.8 |

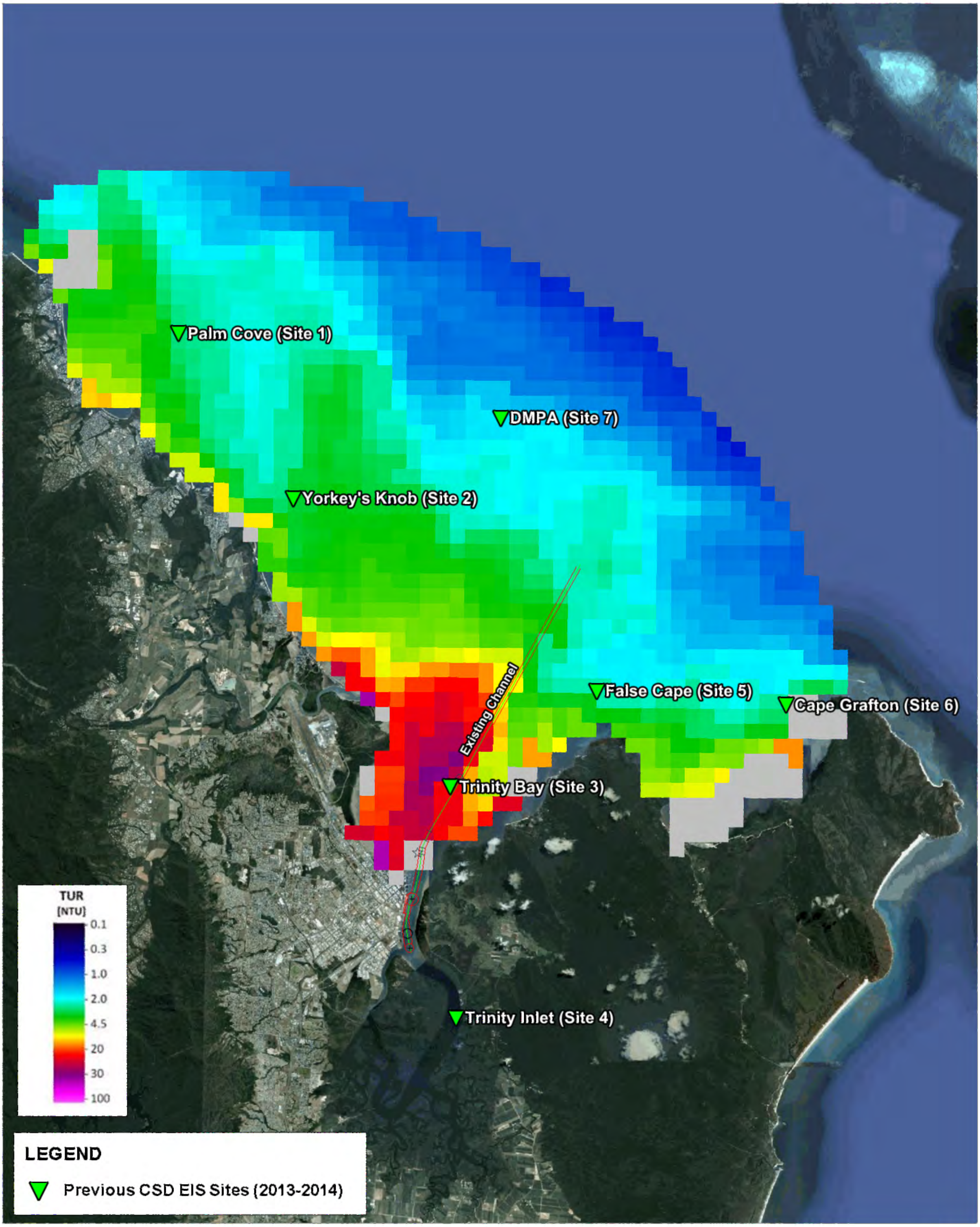
## 3.7 Historic Satellite-Based Water Quality

To address regulator concerns about the 12-month period of turbidity monitoring for the Draft EIS (July 2013 – July 2014) being representative of typical conditions, historic water quality conditions were assessed using satellite imagery.

Satellite image data was sourced from National Aeronautics and Space Administration (NASA) MODIS TERRA and MODIS AQUA satellites, with data resolution of 500 m pixels. The key water quality parameter of turbidity was mapped using satellite imagery from 100 historical dates, from September 2006 to August 2016.

To ensure evenly distributed data over wet and dry seasons for a temporal coverage of ten satellite scenes per year, the first month of each season was skipped: June for dry season, November for wet season. In order to avoid bias in date selection, the first feasible scene of each month was selected and processed. Note that Trinity Inlet is narrower than the minimum mapping extent of the chosen sensors. At a spatial resolution of 500 m of the satellite data, the minimum mapping extent of three pixels is equal to 1500 m.

The satellite image data was processed by EOMAP using a physics-based Modular Inversion and Processing System (MIP). Satellite-derived turbidity is determined by the backward scattering of light between 450 to 800 nm, which is physically retrieved using satellite data. The processed satellite derived turbidity data was provided as geo-referenced images (100 images spanning a 10-year period). An example is provided in Figure 3-21, which illustrates the general trend of higher turbidity in nearshore waters (especially in Cairns Harbour) and less turbidity in offshore waters.




Title:

**Geo-referenced Satellite Derived Turbidity (One of 100 Images Processed)**

Figure: 3-21

Rev: A

BMT WBM endeavours to ensure that the information provided in this map is correct at the time of publication. BMT WBM does not warrant, guarantee or make representations regarding the currency and accuracy of information contained in this map.

N

0 3 6km

Approx.Scale

BMT WBM

www.bmtwbm.com.au

Filepath: I:\B22074.I.Cairns EIS Update\DRG\WQU_005_161020_Satellite Image.wor

The geo-referenced images were transformed into spatial grid data using GIS software (ESRI ArcGIS). This gridded data was interrogated at each location where 12 months of turbidity data was collected for the CSD EIS (refer to locations in Figure 3-21). This analysis produced water quality statistics for each location (except Trinity Inlet), with the results shown in Figure 3-22 and Figure 3-23. The 12-month turbidity monitoring data for the CSD EIS (2013/2014) are shown in these figures.

Note that satellite derived turbidity may differ to turbidity measured using an *in-situ* turbidity sensor device due to different methods of measuring backscatter, temporal differences in satellite and *in-situ* measurements, and different sampling depths. The satellite sensors measure turbidity in surface waters, while the bottom-mounted turbidity sensors deployed for the CSD EIS measure turbidity near the bottom. When comparing the two datasets, turbidity was higher in bottom waters in the Cairns area compared to less turbid surface waters measured by the satellites. Therefore, the satellite derived turbidity has not been used here to assess absolute turbidity values, but instead has been used to assess relative differences across the 10-year period.

As shown in Figure 3-22 and Figure 3-23, the monitoring period of July 2013 – July 2014 was fairly typical of conditions over the 10-year period between 2006 and 2016. If anything, the range of turbidity values is narrower compared to other years, meaning that the turbidity values used to represent background conditions in the impact assessment are conservative.

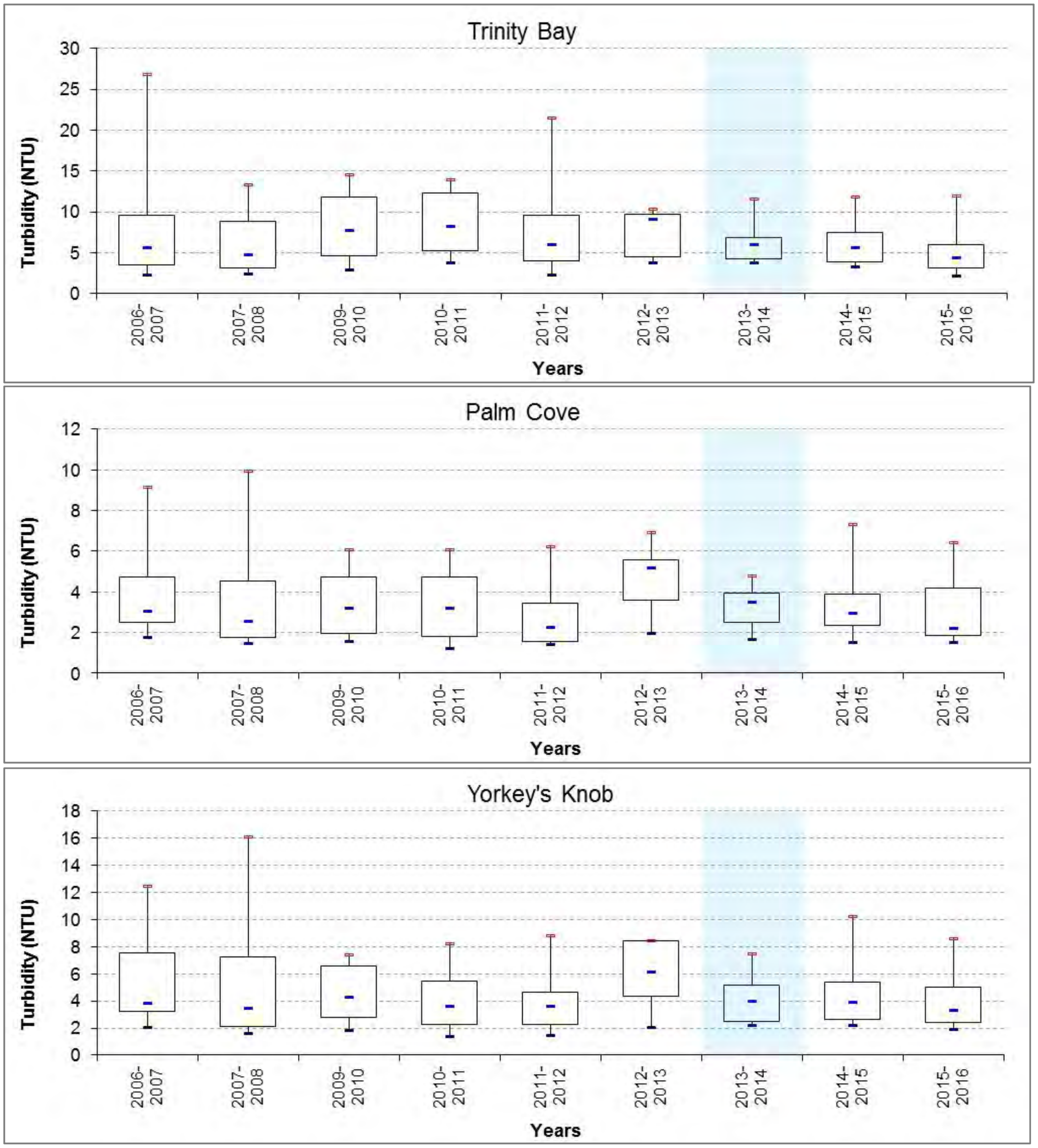



**Figure 3-22 Box and Whisker Plots of Satellite Derived Turbidity- Trinity Bay (top), Palm Cove (middle) and Yorkey's Knob (bottom)**

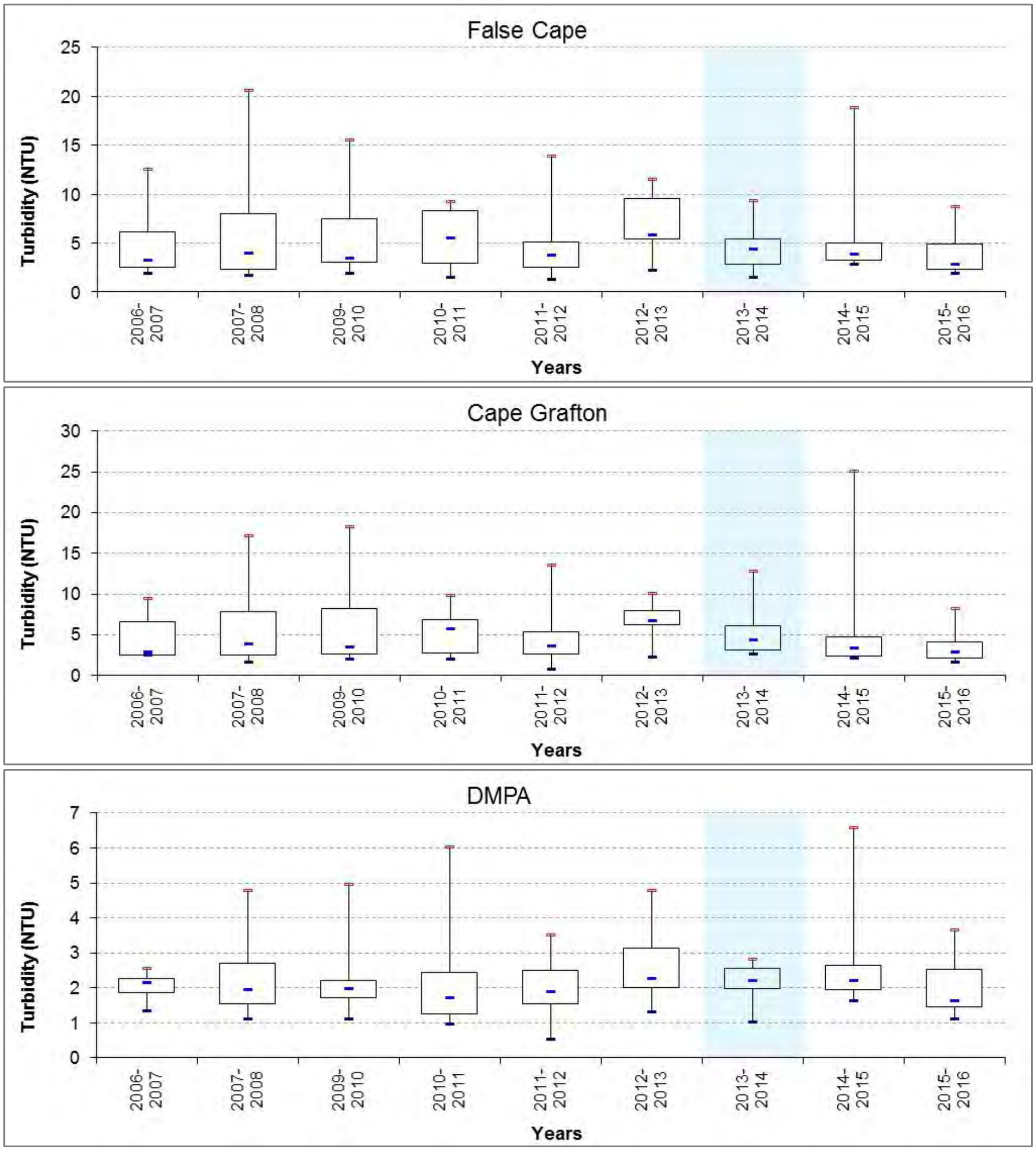



**Figure 3-23 Box and Whisker Plots of Satellite Derived Turbidity- False Cape (top), Cape Grafton (middle) and DMPA (bottom)**

# 4 Summary of Key Findings

The revised CSD EIS now includes land placement of all dredge material. With the change in design, additional marine water quality field studies were undertaken to supplement the existing baseline data already collected for the CSD EIS.

The following sections summarise the key findings from these additional field studies.

## 4.1 Northern Sands

Water quality grab samples and depth profiling was undertaken at the existing Northern Sands void on 26 July 2016. Historical monitoring data for the void (2010 to 2016) was also provided by Northern Sands (Landline Consulting).

The void water is typically fresh (electrical conductivity between 200 and 1,000 µs/cm), with electrical conductivity and salinity (around 0.4 ppt) consistent through the water column.

During profiling on 26/7/16, turbidity was 25 NTU at the surface and increased to approximately 70 NTU near the bottom.

Dissolved oxygen (DO) levels have historically fluctuated significantly, with levels between 0 mg/L and 9 mg/L. On 26/7/16, DO was approximately 100 % saturation at the surface and decreased to approximately 40-60 % saturation near the bottom.

Historically pH has been relatively neutral, with levels maintained between 6.5 and 8.0. On 26/7/16, pH generally decreased with depth, and was between 7 and 8.

Concentrations of metals/metalloids and hydrocarbons were low; however nutrients were elevated, in particular NOx (nitrite and nitrate) which were significantly elevated above guideline values.

## 4.2 Barron River

Water quality depth profiling was undertaken in the Barron River on two separate occasions, once during the dry season (July 2016) and again in the wet season (March 2017). Further to this, a water quality instrument was deployed in the Barron River from July 2016 to March 2017 (and will remain deployed until July 2017), and also previously for two months during the dry season (July 2014 to September 2014).

Salinity in the Barron River typically ranged between about 5 ppt and 30 ppt, and appeared to fluctuate in response to tidal cycles and rainfall events. Higher salinities (~30 ppt) were generally coincident with spring tides, while lower salinities (~5 ppt) were generally coincident with neap tides when freshwater flows appeared to dominate the salinity regime in the Barron River. Salinity in the Barron River can become very fresh (about 0.1 ppt) for short periods of time after rainfall events, however in general, the Barron River is brackish with salinity typically around 20 ppt for most of the time.

Water quality profiling data indicated that there is a salt water wedge in effect in the Barron River, with saline water up to 30 ppt (seawater is typically ~35 ppt) near the bottom, and brackish water (5 to 20 ppt) in surface water layers (top 2 m of water).

Turbidity in the Barron River was variable, with turbidity ranging from 6 NTU during dry conditions up to 500 NTU during rainfall events. In general, turbidity was typically around 20 NTU as indicated by the median value of monitoring data (Table 4-1).

Water quality profiling data indicated that pH was fairly consistent through the water column, with a slight increase in pH with increasing water depth. Values were similar between the dry season and wet season surveys, with pH ranging between 7 and 8.

Water temperature in the Barron River was relatively consistent, with temperature between 25°C and 30°C during the summer, and 20°C to 25°C during the winter.

A summary of the combined data sets for the Barron River is presented in Table 4-1.

**Table 4-1 Summary of Combined Barron River Data**

| Summary Statistic | Salinity | Turbidity | Temperature |
|---|---|---|---|
| | ppt | NTU | °C |
| Minimum | 0.1 | 2.1 | 21.0 |
| 20th Percentile | 14.2 | 6.5 | 23.8 |
| Median | 21.7 | 20.8 | 26.4 |
| 80th Percentile | 25.5 | 57.3 | 29.6 |
| 95th Percentile | 29.3 | 122.7 | 30.7 |
| Maximum | 32.2 | 508.9 | 32.2 |

## 4.3 Thomatis / Richters Creek

A water quality instrument was deployed in Thomatis/Richters Creek from September 2016 to February 2017, and also previously for 14 months between December 2013 and February 2015.

Salinity in Thomatis/Richters Creek was mostly around 30 ppt, with minimal fluctuation evident due to tidal cycles. Salinity only decreased during large rainfall events when freshwater flows in the Barron River were large enough to push into Thomatis/Richters Creek. During these periods, salinity would decrease to about 0.1 ppt for short periods of time.

Similar to the Barron River, turbidity in Thomatis/Richters Creek was variable with turbidity ranging from about 10 NTU during dry conditions up to 350 NTU during rainfall events. In general, turbidity was typically around 20 NTU as indicated by the median value of monitoring data (Table 4-2).

Water temperature in Thomatis/Richters Creek was relatively consistent, with temperature between 25°C and 30°C during the summer, and 20°C to 25°C during the winter.

A summary of the combined data sets for Thomatis/Richters Creek is presented in Table 4-2.

**Table 4-2 Summary of Combined Thomatis / Richters Creek Data**

| Summary Statistic | Salinity | Turbidity | Temperature |
|---|---|---|---|
| | ppt | NTU | °C |
| Minimum | 0.1 | 0.4 | 21.0 |
| 20th Percentile | 24.6 | 14.0 | 24.9 |
| Median | 28.7 | 19.2 | 28.2 |
| 80th Percentile | 31.7 | 29.8 | 29.8 |
| 95th Percentile | 33.6 | 89.6 | 30.7 |
| Maximum | 35.2 | 346.2 | 31.5 |

## 4.4 Palm Cove (Double Island)

A water quality instrument was deployed near Palm Cove beach (and Double Island) for three months from August 2016 to November 2016. The purpose of this deployment was to supplement the previous 12 months of turbidity data collected between July 2013 and July 2014.

This data indicates that turbidity during the most recent deployment was around 50 NTU for most of the time, with some larger spikes in turbidity around 100 – 200 NTU. While turbidity during the 2013/2014 deployment period was slightly lower in general, there were some larger turbid spikes up to around 400 - 700 NTU during this period.

Turbidity was higher during the latest three-month deployment (2016), with median turbidity of 40 NTU, compared to a median turbidity of 17 NTU during the 12-month 2013/2014 deployment.

A summary of the combined data sets for Palm Cove (Double Island) is presented in Table 4-3.

**Table 4-3 Summary of Combined Palm Island (Double Island) Data**

| Summary Statistic | Turbidity |
|---|---|
| | NTU |
| Minimum | 0.8 |
| 20th Percentile | 5.9 |
| Median | 21.5 |
| 80th Percentile | 57.9 |
| 95th Percentile | 110.9 |
| Maximum | 687.7 |

## 4.5 Trinity Inlet

A water quality instrument was previously deployed in the upper reaches of Trinity Inlet and collected 12 months of data (July 2013 to July 2014). To collect water quality data closer to the Port and proposed Inner Harbour dredging works, a water quality instrument was deployed in the mid to lower reaches of Trinity Inlet between July 2016 and March 2017. Additionally, water quality depth profiling was undertaken at the same location in Trinity Inlet during the dry season (July 2016).

Salinity in Trinity Inlet was relatively consistent temporally and spatially, with salinity maintained between 30 and 35 ppt throughout the deployment period and through the water column during water quality profiling.

Turbidity fluctuated with tidal cycles and rainfall events. There were some larger spikes in turbidity up to about 100 NTU coincident with spring tides and/or significant rainfall, however median turbidity during the instrument deployment was approximately 16 NTU (Table 4-4). During profiling, turbidity was lower at the surface (~2 NTU) and increased with water depth up to about 5 NTU near the bottom.

Temperature were relatively consistent throughout the deployment period, with temperature between 20°C and 30°C, while pH was consistent through the water column at around 7.5 to 7.7.

A summary of the Trinity Inlet deployed instrument data is presented in Table 4-4.

**Table 4-4 Summary of Trinity Inlet Data**

| Summary Statistic | Salinity | Turbidity | Temperature |
|---|---|---|---|
| | ppt | NTU | °C |
| Minimum | 27.1 | 3.4 | 22.5 |
| 20th Percentile | 30.1 | 6.9 | 24.8 |
| Median | 33.1 | 15.9 | 28.9 |
| 80th Percentile | 34.6 | 36.9 | 30.1 |
| 95th Percentile | 35.3 | 75.8 | 30.7 |
| Maximum | 35.6 | 150.4 | 31.3 |

## 4.6 Smiths Creek

A water quality instrument was deployed in Smiths Creek (otherwise known as Chinamans Creek) near to the proposed dredge material placement area at Tingira Street. Data was collected at this location over a period of approximately four months (March 2017 to July 2017).

Salinity in Smiths Creek was relatively consistent, with salinity maintained around 25-30 ppt throughout the deployment period.

Turbidity fluctuated with tidal cycles and rainfall events. There were some larger spikes in turbidity up to about 120 NTU coincident with spring tides and/or rainfall, however median turbidity during the instrument deployment was approximately 22 NTU (Table 4-5).

Temperature were relatively consistent throughout the deployment period, with temperature between 20°C and 30°C.

A summary of the Trinity Inlet deployed instrument data is presented in Table 4-5.

Table 4-5 Summary of Smiths Creek Data

| Summary Statistic | Salinity | Turbidity | Temperature |
|---|---|---|---|
| | ppt | NTU | °C |
| Minimum | 21.7 | 2.5 | 21.5 |
| 20th Percentile | 26.4 | 5.9 | 22.9 |
| Median | 30.6 | 21.6 | 24.7 |
| 80th Percentile | 32.4 | 49.2 | 27.0 |
| 95th Percentile | 33.0 | 93.1 | 30.4 |
| Maximum | 34.6 | 122.1 | 30.8 |

# 5 References

ANZECC/ARMCANZ (20022000) Australian and New Zealand Guidelines for Fresh and Marine water Quality. Australian and New Zealand Environment and Conservation Council, and Agriculture and Resource Management Council of Australia and New Zealand, Canberra.

DERM (2009) Queensland Water Quality Guideline, Version 3. ISBN 978-0-9806986-0-2.

# Appendix A Laboratory Data

# CERTIFICATE OF ANALYSIS

| | | | |
|---|---|---|---|
| **Work Order** | : **EB1619456** | Page | : 1 of 27 |
| Client | : **BMT WBM GROUP LTD** | Laboratory | : Environmental Division Brisbane |
| Contact | : MR BRAD GRANT | Contact | : John Pickering |
| Address | : PO BOX 203 SPRING HILL<br>BRISBANE QLD 4004 | Address | : 2 Byth Street Stafford QLD Australia 4053 |
| Telephone | : +61 07 3831 6744 | Telephone | : +61 7 3552 8634 |
| Project | : B22074 | Date Samples Received | : 02-Aug-2016 10:00 |
| Order number | : ---- | Date Analysis Commenced | : 03-Aug-2016 |
| C-O-C number | : ---- | Issue Date | : 09-Aug-2016 21:17 |
| Sampler | : CONOR JONES | | |
| Site | : ---- | | |
| Quote number | : ---- | | |
| No. of samples received | : 29 | | |
| No. of samples analysed | : 29 | | |

NATA Accredited Laboratory 825
Accredited for compliance with
ISO/IEC 17025.

NATA WORLD RECOGNISED ACCREDITATION

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

**Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.**

## *Signatories*

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

| *Signatories* | *Position* | *Accreditation Category* |
|---|---|---|
| Andrew Epps | Senior Inorganic Chemist | Brisbane Inorganics, Stafford, QLD |
| Greg Vogel | Laboratory Manager | Brisbane Inorganics, Stafford, QLD |
| Kim McCabe | Senior Inorganic Chemist | Brisbane Inorganics, Stafford, QLD |
| Matt Frost | Senior Organic Chemist | Brisbane Organics, Stafford, QLD |

## General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EG020-F & T (Dissolved & Total Metals by ICP-MS): Limit of reporting raised for some samples due to matrix interference.
- It is recognised that EG020-T (Total Metals by ICP-MS) is less than EG020-F (Dissolved Metals by ICP-MS) for some samples. However, the difference is within experimental variation of the methods.
- EK061G (Total Kjeldahl Nitrogen as N): Samples were diluted due to matrix interference. LOR adjusted accordingly.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.

## *Analytical Results*

| Sub-Matrix: **WATER** (Matrix: **WATER**) | | | *Client sample ID* | **VOID 1 - TOP** | **VOID 1 - MID** | **VOID 1 - BOT** | **VOID 2 - TOP** | **VOID 2 - BOT** |
|---|---|---|---|---|---|---|---|---|
| | | | *Client sampling date / time* | [26-Jul-2016] | [26-Jul-2016] | [26-Jul-2016] | [26-Jul-2016] | [26-Jul-2016] |
| *Compound* | *CAS Number* | *LOR* | *Unit* | **EB1619456-001** | **EB1619456-002** | **EB1619456-003** | **EB1619456-004** | **EB1619456-005** |
| | | | | Result | Result | Result | Result | Result |
| **EA025: Total Suspended Solids dried at 104 ± 2°C** | | | | | | | | |
| **Suspended Solids (SS)** | ---- | 5 | mg/L | **16** | **34** | **50** | **12** | **28** |
| **EA065: Total Hardness as CaCO3** | | | | | | | | |
| **Total Hardness as CaCO3** | ---- | 1 | mg/L | **118** | **120** | **122** | **118** | **122** |
| **ED037P: Alkalinity by PC Titrator** | | | | | | | | |
| **Hydroxide Alkalinity as CaCO3** | DMO-210-001 | 1 | mg/L | <1 | <1 | <1 | <1 | <1 |
| **Carbonate Alkalinity as CaCO3** | 3812-32-6 | 1 | mg/L | <1 | <1 | <1 | <1 | <1 |
| **Bicarbonate Alkalinity as CaCO3** | 71-52-3 | 1 | mg/L | **56** | **68** | **56** | **58** | **60** |
| **Total Alkalinity as CaCO3** | ---- | 1 | mg/L | **56** | **68** | **56** | **58** | **60** |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA** | | | | | | | | |
| **Sulfate as SO4 - Turbidimetric** | 14808-79-8 | 1 | mg/L | **70** | **72** | **70** | **68** | **68** |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | | |
| **Chloride** | 16887-00-6 | 1 | mg/L | **161** | **153** | **162** | **159** | **161** |
| **ED093F: Dissolved Major Cations** | | | | | | | | |
| **Calcium** | 7440-70-2 | 1 | mg/L | **24** | **25** | **24** | **24** | **24** |
| **Magnesium** | 7439-95-4 | 1 | mg/L | **14** | **14** | **15** | **14** | **15** |
| **Sodium** | 7440-23-5 | 1 | mg/L | **93** | **92** | **96** | **91** | **93** |
| **Potassium** | 7440-09-7 | 1 | mg/L | **8** | **7** | **8** | **8** | **8** |
| **EG020F: Dissolved Metals by ICP-MS** | | | | | | | | |
| **Aluminium** | 7429-90-5 | 0.01 | mg/L | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| **Arsenic** | 7440-38-2 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| **Cadmium** | 7440-43-9 | 0.0001 | mg/L | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| **Chromium** | 7440-47-3 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| **Copper** | 7440-50-8 | 0.001 | mg/L | **0.002** | <0.001 | **0.002** | <0.001 | **0.002** |
| **Lead** | 7439-92-1 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| **Manganese** | 7439-96-5 | 0.001 | mg/L | **0.003** | **0.015** | **0.011** | **0.002** | **0.094** |
| **Nickel** | 7440-02-0 | 0.001 | mg/L | **0.002** | **0.002** | **0.002** | **0.002** | **0.002** |
| **Silver** | 7440-22-4 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| **Zinc** | 7440-66-6 | 0.005 | mg/L | **0.010** | **0.007** | **0.009** | <0.005 | **0.006** |
| **Iron** | 7439-89-6 | 0.05 | mg/L | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| **EG020T: Total Metals by ICP-MS** | | | | | | | | |
| **Aluminium** | 7429-90-5 | 0.01 | mg/L | **0.48** | **0.97** | **1.28** | **0.81** | **1.68** |
| **Arsenic** | 7440-38-2 | 0.001 | mg/L | <0.001 | **0.001** | **0.001** | <0.001 | **0.001** |
| **Cadmium** | 7440-43-9 | 0.0001 | mg/L | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| **Chromium** | 7440-47-3 | 0.001 | mg/L | **0.001** | **0.002** | **0.003** | **0.002** | **0.004** |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | VOID 1 - TOP | VOID 1 - MID | VOID 1 - BOT | VOID 2 - TOP | VOID 2 - BOT |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | [26-Jul-2016] | [26-Jul-2016] | [26-Jul-2016] | [26-Jul-2016] | [26-Jul-2016] |
| Compound | CAS Number | LOR | Unit | EB1619456-001 | EB1619456-002 | EB1619456-003 | EB1619456-004 | EB1619456-005 |
| | | | | Result | Result | Result | Result | Result |
| **EG020T: Total Metals by ICP-MS - Continued** | | | | | | | | |
| Copper | 7440-50-8 | 0.001 | mg/L | **0.002** | **0.002** | **0.005** | **0.002** | **0.003** |
| Lead | 7439-92-1 | 0.001 | mg/L | <0.001 | <0.001 | **0.001** | <0.001 | <0.001 |
| Manganese | 7439-96-5 | 0.001 | mg/L | **0.020** | **0.046** | **0.061** | **0.018** | **0.141** |
| Nickel | 7440-02-0 | 0.001 | mg/L | **0.002** | **0.003** | **0.004** | **0.002** | **0.003** |
| Silver | 7440-22-4 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Zinc | 7440-66-6 | 0.005 | mg/L | **0.010** | **0.011** | **0.022** | **0.024** | **0.010** |
| Iron | 7439-89-6 | 0.05 | mg/L | **0.56** | **1.26** | **1.93** | **0.86** | **1.95** |
| **EG035F: Dissolved Mercury by FIMS** | | | | | | | | |
| Mercury | 7439-97-6 | 0.0001 | mg/L | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| **EG035T: Total Recoverable Mercury by FIMS** | | | | | | | | |
| Mercury | 7439-97-6 | 0.0001 | mg/L | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| **EK055G: Ammonia as N by Discrete Analyser** | | | | | | | | |
| Ammonia as N | 7664-41-7 | 0.01 | mg/L | **0.04** | <0.01 | <0.01 | **0.06** | **0.03** |
| **EK057G: Nitrite as N by Discrete Analyser** | | | | | | | | |
| Nitrite as N | 14797-65-0 | 0.01 | mg/L | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| **EK058G: Nitrate as N by Discrete Analyser** | | | | | | | | |
| Nitrate as N | 14797-55-8 | 0.01 | mg/L | **0.56** | **0.63** | **0.62** | **0.59** | **0.60** |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser** | | | | | | | | |
| Nitrite + Nitrate as N | ---- | 0.01 | mg/L | **0.56** | **0.63** | **0.62** | **0.59** | **0.60** |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser** | | | | | | | | |
| Total Kjeldahl Nitrogen as N | ---- | 0.1 | mg/L | **0.6** | **0.6** | **0.6** | **0.6** | **0.7** |
| **EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser** | | | | | | | | |
| ^ Total Nitrogen as N | ---- | 0.1 | mg/L | **1.2** | **1.2** | **1.2** | **1.2** | **1.3** |
| **EK067G: Total Phosphorus as P by Discrete Analyser** | | | | | | | | |
| Total Phosphorus as P | ---- | 0.01 | mg/L | **0.02** | **0.04** | **0.05** | **0.02** | **0.04** |
| **EK071G: Reactive Phosphorus as P by discrete analyser** | | | | | | | | |
| Reactive Phosphorus as P | 14265-44-2 | 0.01 | mg/L | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| **EN055: Ionic Balance** | | | | | | | | |
| Total Anions | ---- | 0.01 | meq/L | **7.12** | **7.17** | **7.15** | **7.06** | **7.16** |
| Total Cations | ---- | 0.01 | meq/L | **6.60** | **6.58** | **6.81** | **6.51** | **6.68** |
| Ionic Balance | ---- | 0.01 | % | **3.78** | **4.32** | **2.40** | **4.04** | **3.43** |
| **EP075(SIM)B: Polynuclear Aromatic Hydrocarbons** | | | | | | | | |
| Naphthalene | 91-20-3 | 1 | µg/L | <1.0 | ---- | <1.0 | <1.0 | <1.0 |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | VOID 1 - TOP | VOID 1 - MID | VOID 1 - BOT | VOID 2 - TOP | VOID 2 - BOT |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | [26-Jul-2016] | [26-Jul-2016] | [26-Jul-2016] | [26-Jul-2016] | [26-Jul-2016] |
| Compound | CAS Number | LOR | Unit | EB1619456-001 | EB1619456-002 | EB1619456-003 | EB1619456-004 | EB1619456-005 |
| | | | | Result | Result | Result | Result | Result |
| **EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued** | | | | | | | | |
| Acenaphthylene | 208-96-8 | 1 | µg/L | <1.0 | ---- | <1.0 | <1.0 | <1.0 |
| Acenaphthene | 83-32-9 | 1 | µg/L | <1.0 | ---- | <1.0 | <1.0 | <1.0 |
| Fluorene | 86-73-7 | 1 | µg/L | <1.0 | ---- | <1.0 | <1.0 | <1.0 |
| Phenanthrene | 85-01-8 | 1 | µg/L | <1.0 | ---- | <1.0 | <1.0 | <1.0 |
| Anthracene | 120-12-7 | 1 | µg/L | <1.0 | ---- | <1.0 | <1.0 | <1.0 |
| Fluoranthene | 206-44-0 | 1 | µg/L | <1.0 | ---- | <1.0 | <1.0 | <1.0 |
| Pyrene | 129-00-0 | 1 | µg/L | <1.0 | ---- | <1.0 | <1.0 | <1.0 |
| Benz(a)anthracene | 56-55-3 | 1 | µg/L | <1.0 | ---- | <1.0 | <1.0 | <1.0 |
| Chrysene | 218-01-9 | 1 | µg/L | <1.0 | ---- | <1.0 | <1.0 | <1.0 |
| Benzo(b+j)fluoranthene | 205-99-2 205-82-3 | 1 | µg/L | <1.0 | ---- | <1.0 | <1.0 | <1.0 |
| Benzo(k)fluoranthene | 207-08-9 | 1 | µg/L | <1.0 | ---- | <1.0 | <1.0 | <1.0 |
| Benzo(a)pyrene | 50-32-8 | 0.5 | µg/L | <0.5 | ---- | <0.5 | <0.5 | <0.5 |
| Indeno(1.2.3.cd)pyrene | 193-39-5 | 1 | µg/L | <1.0 | ---- | <1.0 | <1.0 | <1.0 |
| Dibenz(a.h)anthracene | 53-70-3 | 1 | µg/L | <1.0 | ---- | <1.0 | <1.0 | <1.0 |
| Benzo(g.h.i)perylene | 191-24-2 | 1 | µg/L | <1.0 | ---- | <1.0 | <1.0 | <1.0 |
| ^ Sum of polycyclic aromatic hydrocarbons | ---- | 0.5 | µg/L | <0.5 | ---- | <0.5 | <0.5 | <0.5 |
| ^ Benzo(a)pyrene TEQ (zero) | ---- | 0.5 | µg/L | <0.5 | ---- | <0.5 | <0.5 | <0.5 |
| **EP080/071: Total Petroleum Hydrocarbons** | | | | | | | | |
| C6 - C9 Fraction | ---- | 20 | µg/L | <20 | ---- | <20 | <20 | <20 |
| C10 - C14 Fraction | ---- | 50 | µg/L | <50 | ---- | <50 | <50 | <50 |
| C15 - C28 Fraction | ---- | 100 | µg/L | <100 | ---- | **120** | <100 | <100 |
| C29 - C36 Fraction | ---- | 50 | µg/L | <50 | ---- | <50 | <50 | <50 |
| ^ C10 - C36 Fraction (sum) | ---- | 50 | µg/L | <50 | ---- | **120** | <50 | <50 |
| **EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions** | | | | | | | | |
| C6 - C10 Fraction | C6_C10 | 20 | µg/L | <20 | ---- | <20 | <20 | <20 |
| ^ C6 - C10 Fraction minus BTEX (F1) | C6_C10-BTEX | 20 | µg/L | <20 | ---- | <20 | <20 | <20 |
| >C10 - C16 Fraction | ---- | 100 | µg/L | <100 | ---- | <100 | <100 | <100 |
| >C16 - C34 Fraction | ---- | 100 | µg/L | <100 | ---- | **110** | <100 | <100 |
| >C34 - C40 Fraction | ---- | 100 | µg/L | <100 | ---- | <100 | <100 | <100 |
| ^ >C10 - C40 Fraction (sum) | ---- | 100 | µg/L | <100 | ---- | **110** | <100 | <100 |
| ^ >C10 - C16 Fraction minus Naphthalene (F2) | ---- | 100 | µg/L | <100 | ---- | <100 | <100 | <100 |
| **EP080: BTEXN** | | | | | | | | |
| Benzene | 71-43-2 | 1 | µg/L | <1 | ---- | <1 | <1 | <1 |

## Analytical Results

Sub-Matrix: WATER
(Matrix: WATER)

| Compound | CAS Number | LOR | Unit | VOID 1 - TOP | VOID 1 - MID | VOID 1 - BOT | VOID 2 - TOP | VOID 2 - BOT |
|---|---|---|---|---|---|---|---|---|
| Client sampling date / time | | | | [26-Jul-2016] | [26-Jul-2016] | [26-Jul-2016] | [26-Jul-2016] | [26-Jul-2016] |
| | | | | EB1619456-001 | EB1619456-002 | EB1619456-003 | EB1619456-004 | EB1619456-005 |
| | | | | Result | Result | Result | Result | Result |
| **EP080: BTEXN - Continued** | | | | | | | | |
| Toluene | 108-88-3 | 2 | µg/L | <2 | ---- | <2 | <2 | <2 |
| Ethylbenzene | 100-41-4 | 2 | µg/L | <2 | ---- | <2 | <2 | <2 |
| meta- & para-Xylene | 108-38-3 106-42-3 | 2 | µg/L | <2 | ---- | <2 | <2 | <2 |
| ortho-Xylene | 95-47-6 | 2 | µg/L | <2 | ---- | <2 | <2 | <2 |
| ^ Total Xylenes | 1330-20-7 | 2 | µg/L | <2 | ---- | <2 | <2 | <2 |
| ^ Sum of BTEX | ---- | 1 | µg/L | <1 | ---- | <1 | <1 | <1 |
| Naphthalene | 91-20-3 | 5 | µg/L | <5 | ---- | <5 | <5 | <5 |
| **EP075(SIM)S: Phenolic Compound Surrogates** | | | | | | | | |
| Phenol-d6 | 13127-88-3 | 1 | % | 25.4 | ---- | 28.2 | 28.6 | 31.3 |
| 2-Chlorophenol-D4 | 93951-73-6 | 1 | % | 62.8 | ---- | 67.6 | 67.3 | 74.8 |
| 2.4.6-Tribromophenol | 118-79-6 | 1 | % | 58.2 | ---- | 66.1 | 60.9 | 70.9 |
| **EP075(SIM)T: PAH Surrogates** | | | | | | | | |
| 2-Fluorobiphenyl | 321-60-8 | 1 | % | 70.6 | ---- | 73.9 | 74.1 | 88.4 |
| Anthracene-d10 | 1719-06-8 | 1 | % | 66.1 | ---- | 74.7 | 72.0 | 87.6 |
| 4-Terphenyl-d14 | 1718-51-0 | 1 | % | 79.5 | ---- | 85.2 | 85.6 | 104 |
| **EP080S: TPH(V)/BTEX Surrogates** | | | | | | | | |
| 1.2-Dichloroethane-D4 | 17060-07-0 | 2 | % | 95.2 | ---- | 96.0 | 101 | 96.1 |
| Toluene-D8 | 2037-26-5 | 2 | % | 96.8 | ---- | 98.0 | 97.0 | 102 |
| 4-Bromofluorobenzene | 460-00-4 | 2 | % | 91.5 | ---- | 95.7 | 90.6 | 89.8 |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | VOID 3 - TOP | VOID 3 - BOT | H1 | H2 | H3 |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | [26-Jul-2016] | [26-Jul-2016] | [27-Jul-2016] | [27-Jul-2016] | [27-Jul-2016] |
| Compound | CAS Number | LOR | Unit | EB1619456-006 | EB1619456-007 | EB1619456-008 | EB1619456-009 | EB1619456-010 |
| | | | | Result | Result | Result | Result | Result |
| **EA025: Total Suspended Solids dried at 104 ± 2°C** | | | | | | | | |
| Suspended Solids (SS) | ---- | 5 | mg/L | **9** | **22** | **5** | <5 | **8** |
| **EA065: Total Hardness as CaCO3** | | | | | | | | |
| Total Hardness as CaCO3 | ---- | 1 | mg/L | **118** | **124** | **469** | **1480** | **2340** |
| **ED037P: Alkalinity by PC Titrator** | | | | | | | | |
| Hydroxide Alkalinity as CaCO3 | DMO-210-001 | 1 | mg/L | <1 | <1 | <1 | <1 | <1 |
| Carbonate Alkalinity as CaCO3 | 3812-32-6 | 1 | mg/L | <1 | <1 | <1 | <1 | <1 |
| Bicarbonate Alkalinity as CaCO3 | 71-52-3 | 1 | mg/L | **58** | **58** | **26** | **45** | **64** |
| Total Alkalinity as CaCO3 | ---- | 1 | mg/L | **58** | **58** | **26** | **45** | **64** |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA** | | | | | | | | |
| Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | **69** | **68** | **218** | **688** | **1170** |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | | |
| Chloride | 16887-00-6 | 1 | mg/L | **158** | **160** | **1350** | **5190** | **7920** |
| **ED093F: Dissolved Major Cations** | | | | | | | | |
| Calcium | 7440-70-2 | 1 | mg/L | **24** | **25** | **31** | **102** | **163** |
| Magnesium | 7439-95-4 | 1 | mg/L | **14** | **15** | **95** | **297** | **470** |
| Sodium | 7440-23-5 | 1 | mg/L | **92** | **96** | **794** | **2560** | **3980** |
| Potassium | 7440-09-7 | 1 | mg/L | **7** | **8** | **29** | **93** | **149** |
| **EG020F: Dissolved Metals by ICP-MS** | | | | | | | | |
| Aluminium | 7429-90-5 | 0.01 | mg/L | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Arsenic | 7440-38-2 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Cadmium | 7440-43-9 | 0.0001 | mg/L | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Chromium | 7440-47-3 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Copper | 7440-50-8 | 0.001 | mg/L | <0.001 | **0.001** | <0.001 | <0.001 | <0.001 |
| Lead | 7439-92-1 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Manganese | 7439-96-5 | 0.001 | mg/L | **0.002** | **0.002** | **0.022** | **0.040** | **0.041** |
| Nickel | 7440-02-0 | 0.001 | mg/L | **0.001** | **0.002** | <0.001 | <0.001 | <0.001 |
| Silver | 7440-22-4 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | **0.002** | <0.001 |
| Zinc | 7440-66-6 | 0.005 | mg/L | <0.005 | <0.005 | **0.007** | **0.006** | **0.021** |
| Iron | 7439-89-6 | 0.05 | mg/L | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| **EG020T: Total Metals by ICP-MS** | | | | | | | | |
| Aluminium | 7429-90-5 | 0.01 | mg/L | **0.77** | **1.10** | **0.14** | **0.15** | **0.18** |
| Arsenic | 7440-38-2 | 0.001 | mg/L | <0.001 | **0.001** | <0.001 | <0.001 | **0.001** |
| Cadmium | 7440-43-9 | 0.0001 | mg/L | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| Chromium | 7440-47-3 | 0.001 | mg/L | **0.002** | **0.003** | <0.001 | <0.001 | <0.001 |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | VOID 3 - TOP | VOID 3 - BOT | H1 | H2 | H3 |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | [26-Jul-2016] | [26-Jul-2016] | [27-Jul-2016] | [27-Jul-2016] | [27-Jul-2016] |
| Compound | CAS Number | LOR | Unit | EB1619456-006 | EB1619456-007 | EB1619456-008 | EB1619456-009 | EB1619456-010 |
| | | | | Result | Result | Result | Result | Result |
| **EG020T: Total Metals by ICP-MS - Continued** | | | | | | | | |
| Copper | 7440-50-8 | 0.001 | mg/L | **0.001** | **0.003** | <0.001 | <0.001 | **0.001** |
| Lead | 7439-92-1 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Manganese | 7439-96-5 | 0.001 | mg/L | **0.021** | **0.039** | **0.024** | **0.046** | **0.051** |
| Nickel | 7440-02-0 | 0.001 | mg/L | **0.002** | **0.003** | <0.001 | <0.001 | **0.001** |
| Silver | 7440-22-4 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Zinc | 7440-66-6 | 0.005 | mg/L | <0.005 | **0.006** | <0.005 | <0.005 | **0.019** |
| Iron | 7439-89-6 | 0.05 | mg/L | **0.94** | **1.48** | **0.56** | **0.41** | **0.40** |
| **EG035F: Dissolved Mercury by FIMS** | | | | | | | | |
| Mercury | 7439-97-6 | 0.0001 | mg/L | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| **EG035T: Total Recoverable Mercury by FIMS** | | | | | | | | |
| Mercury | 7439-97-6 | 0.0001 | mg/L | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| **EK055G: Ammonia as N by Discrete Analyser** | | | | | | | | |
| Ammonia as N | 7664-41-7 | 0.01 | mg/L | **0.12** | **0.08** | <0.01 | <0.01 | **0.04** |
| **EK057G: Nitrite as N by Discrete Analyser** | | | | | | | | |
| Nitrite as N | 14797-65-0 | 0.01 | mg/L | **0.01** | <0.01 | <0.01 | <0.01 | <0.01 |
| **EK058G: Nitrate as N by Discrete Analyser** | | | | | | | | |
| Nitrate as N | 14797-55-8 | 0.01 | mg/L | **0.62** | **0.65** | **0.03** | **0.02** | **0.01** |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser** | | | | | | | | |
| Nitrite + Nitrate as N | ---- | 0.01 | mg/L | **0.63** | **0.65** | **0.03** | **0.02** | **0.01** |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser** | | | | | | | | |
| Total Kjeldahl Nitrogen as N | ---- | 0.1 | mg/L | **0.9** | **0.9** | **0.2** | **0.2** | **0.3** |
| **EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser** | | | | | | | | |
| ^ Total Nitrogen as N | ---- | 0.1 | mg/L | **1.5** | **1.6** | **0.2** | **0.2** | **0.3** |
| **EK067G: Total Phosphorus as P by Discrete Analyser** | | | | | | | | |
| Total Phosphorus as P | ---- | 0.01 | mg/L | **0.03** | **0.05** | <0.01 | <0.01 | **0.02** |
| **EK071G: Reactive Phosphorus as P by discrete analyser** | | | | | | | | |
| Reactive Phosphorus as P | 14265-44-2 | 0.01 | mg/L | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| **EN055: Ionic Balance** | | | | | | | | |
| Total Anions | ---- | 0.01 | meq/L | **7.05** | **7.09** | **43.1** | **162** | **249** |
| Total Cations | ---- | 0.01 | meq/L | **6.53** | **6.86** | **44.6** | **143** | **224** |
| Ionic Balance | ---- | 0.01 | % | **3.85** | **1.62** | **1.70** | **6.04** | **5.37** |
| **EP075(SIM)B: Polynuclear Aromatic Hydrocarbons** | | | | | | | | |
| Naphthalene | 91-20-3 | 1 | µg/L | <1.0 | <1.0 | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | VOID 3 - TOP | VOID 3 - BOT | H1 | H2 | H3 |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | [26-Jul-2016] | [26-Jul-2016] | [27-Jul-2016] | [27-Jul-2016] | [27-Jul-2016] |
| Compound | CAS Number | LOR | Unit | EB1619456-006 | EB1619456-007 | EB1619456-008 | EB1619456-009 | EB1619456-010 |
| | | | | Result | Result | Result | Result | Result |
| **EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued** | | | | | | | | |
| Acenaphthylene | 208-96-8 | 1 | µg/L | <1.0 | <1.0 | ---- | ---- | ---- |
| Acenaphthene | 83-32-9 | 1 | µg/L | <1.0 | <1.0 | ---- | ---- | ---- |
| Fluorene | 86-73-7 | 1 | µg/L | <1.0 | <1.0 | ---- | ---- | ---- |
| Phenanthrene | 85-01-8 | 1 | µg/L | <1.0 | <1.0 | ---- | ---- | ---- |
| Anthracene | 120-12-7 | 1 | µg/L | <1.0 | <1.0 | ---- | ---- | ---- |
| Fluoranthene | 206-44-0 | 1 | µg/L | <1.0 | <1.0 | ---- | ---- | ---- |
| Pyrene | 129-00-0 | 1 | µg/L | <1.0 | <1.0 | ---- | ---- | ---- |
| Benz(a)anthracene | 56-55-3 | 1 | µg/L | <1.0 | <1.0 | ---- | ---- | ---- |
| Chrysene | 218-01-9 | 1 | µg/L | <1.0 | <1.0 | ---- | ---- | ---- |
| Benzo(b+j)fluoranthene | 205-99-2 205-82-3 | 1 | µg/L | <1.0 | <1.0 | ---- | ---- | ---- |
| Benzo(k)fluoranthene | 207-08-9 | 1 | µg/L | <1.0 | <1.0 | ---- | ---- | ---- |
| Benzo(a)pyrene | 50-32-8 | 0.5 | µg/L | <0.5 | <0.5 | ---- | ---- | ---- |
| Indeno(1.2.3.cd)pyrene | 193-39-5 | 1 | µg/L | <1.0 | <1.0 | ---- | ---- | ---- |
| Dibenz(a.h)anthracene | 53-70-3 | 1 | µg/L | <1.0 | <1.0 | ---- | ---- | ---- |
| Benzo(g.h.i)perylene | 191-24-2 | 1 | µg/L | <1.0 | <1.0 | ---- | ---- | ---- |
| ^ Sum of polycyclic aromatic hydrocarbons | ---- | 0.5 | µg/L | <0.5 | <0.5 | ---- | ---- | ---- |
| ^ Benzo(a)pyrene TEQ (zero) | ---- | 0.5 | µg/L | <0.5 | <0.5 | ---- | ---- | ---- |
| **EP080/071: Total Petroleum Hydrocarbons** | | | | | | | | |
| C6 - C9 Fraction | ---- | 20 | µg/L | <20 | <20 | ---- | ---- | ---- |
| C10 - C14 Fraction | ---- | 50 | µg/L | <50 | <50 | ---- | ---- | ---- |
| C15 - C28 Fraction | ---- | 100 | µg/L | <100 | <100 | ---- | ---- | ---- |
| C29 - C36 Fraction | ---- | 50 | µg/L | <50 | <50 | ---- | ---- | ---- |
| ^ C10 - C36 Fraction (sum) | ---- | 50 | µg/L | <50 | <50 | ---- | ---- | ---- |
| **EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions** | | | | | | | | |
| C6 - C10 Fraction | C6_C10 | 20 | µg/L | <20 | <20 | ---- | ---- | ---- |
| ^ C6 - C10 Fraction minus BTEX (F1) | C6_C10-BTEX | 20 | µg/L | <20 | <20 | ---- | ---- | ---- |
| >C10 - C16 Fraction | ---- | 100 | µg/L | <100 | <100 | ---- | ---- | ---- |
| >C16 - C34 Fraction | ---- | 100 | µg/L | <100 | <100 | ---- | ---- | ---- |
| >C34 - C40 Fraction | ---- | 100 | µg/L | <100 | <100 | ---- | ---- | ---- |
| ^ >C10 - C40 Fraction (sum) | ---- | 100 | µg/L | <100 | <100 | ---- | ---- | ---- |
| ^ >C10 - C16 Fraction minus Naphthalene (F2) | ---- | 100 | µg/L | <100 | <100 | ---- | ---- | ---- |
| **EP080: BTEXN** | | | | | | | | |
| Benzene | 71-43-2 | 1 | µg/L | <1 | <1 | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | VOID 3 - TOP | VOID 3 - BOT | H1 | H2 | H3 |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | [26-Jul-2016] | [26-Jul-2016] | [27-Jul-2016] | [27-Jul-2016] | [27-Jul-2016] |
| Compound | CAS Number | LOR | Unit | EB1619456-006 | EB1619456-007 | EB1619456-008 | EB1619456-009 | EB1619456-010 |
| | | | | Result | Result | Result | Result | Result |
| **EP080: BTEXN - Continued** | | | | | | | | |
| Toluene | 108-88-3 | 2 | µg/L | <2 | <2 | ---- | ---- | ---- |
| Ethylbenzene | 100-41-4 | 2 | µg/L | <2 | <2 | ---- | ---- | ---- |
| meta- & para-Xylene | 108-38-3 106-42-3 | 2 | µg/L | <2 | <2 | ---- | ---- | ---- |
| ortho-Xylene | 95-47-6 | 2 | µg/L | <2 | <2 | ---- | ---- | ---- |
| ^ Total Xylenes | 1330-20-7 | 2 | µg/L | <2 | <2 | ---- | ---- | ---- |
| ^ Sum of BTEX | ---- | 1 | µg/L | <1 | <1 | ---- | ---- | ---- |
| Naphthalene | 91-20-3 | 5 | µg/L | <5 | <5 | ---- | ---- | ---- |
| **EP075(SIM)S: Phenolic Compound Surrogates** | | | | | | | | |
| Phenol-d6 | 13127-88-3 | 1 | % | **32.7** | **39.1** | ---- | ---- | ---- |
| 2-Chlorophenol-D4 | 93951-73-6 | 1 | % | **72.6** | **92.6** | ---- | ---- | ---- |
| 2.4.6-Tribromophenol | 118-79-6 | 1 | % | **68.6** | **81.2** | ---- | ---- | ---- |
| **EP075(SIM)T: PAH Surrogates** | | | | | | | | |
| 2-Fluorobiphenyl | 321-60-8 | 1 | % | **77.8** | **102** | ---- | ---- | ---- |
| Anthracene-d10 | 1719-06-8 | 1 | % | **74.6** | **94.3** | ---- | ---- | ---- |
| 4-Terphenyl-d14 | 1718-51-0 | 1 | % | **89.2** | **116** | ---- | ---- | ---- |
| **EP080S: TPH(V)/BTEX Surrogates** | | | | | | | | |
| 1.2-Dichloroethane-D4 | 17060-07-0 | 2 | % | **93.2** | **93.8** | ---- | ---- | ---- |
| Toluene-D8 | 2037-26-5 | 2 | % | **102** | **100** | ---- | ---- | ---- |
| 4-Bromofluorobenzene | 460-00-4 | 2 | % | **93.4** | **95.1** | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | H4 | H5 | H6 | FW1 | FW2 |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | [28-Jul-2016] | [28-Jul-2016] | [28-Jul-2016] | [28-Jul-2016] | [28-Jul-2016] |
| Compound | CAS Number | LOR | Unit | EB1619456-011 | EB1619456-012 | EB1619456-013 | EB1619456-014 | EB1619456-015 |
| | | | | Result | Result | Result | Result | Result |
| **EA025: Total Suspended Solids dried at 104 ± 2°C** | | | | | | | | |
| **Suspended Solids (SS)** | ---- | 5 | mg/L | **8** | **42** | **17** | **9** | <5 |
| **EA065: Total Hardness as CaCO3** | | | | | | | | |
| **Total Hardness as CaCO3** | ---- | 1 | mg/L | **5110** | **5510** | **5880** | **5380** | **5650** |
| **ED037P: Alkalinity by PC Titrator** | | | | | | | | |
| **Hydroxide Alkalinity as CaCO3** | DMO-210-001 | 1 | mg/L | <1 | <1 | <1 | <1 | <1 |
| **Carbonate Alkalinity as CaCO3** | 3812-32-6 | 1 | mg/L | <1 | <1 | <1 | <1 | <1 |
| **Bicarbonate Alkalinity as CaCO3** | 71-52-3 | 1 | mg/L | **109** | **111** | **111** | **113** | **111** |
| **Total Alkalinity as CaCO3** | ---- | 1 | mg/L | **109** | **111** | **111** | **113** | **111** |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA** | | | | | | | | |
| **Sulfate as SO4 - Turbidimetric** | 14808-79-8 | 1 | mg/L | **2430** | **2580** | **2620** | **2350** | **2480** |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | | |
| **Chloride** | 16887-00-6 | 1 | mg/L | **14900** | **17100** | **17400** | **18900** | **19300** |
| **ED093F: Dissolved Major Cations** | | | | | | | | |
| **Calcium** | 7440-70-2 | 1 | mg/L | **348** | **377** | **394** | **372** | **383** |
| **Magnesium** | 7439-95-4 | 1 | mg/L | **1030** | **1110** | **1190** | **1080** | **1140** |
| **Sodium** | 7440-23-5 | 1 | mg/L | **8540** | **9450** | **9780** | **9100** | **9600** |
| **Potassium** | 7440-09-7 | 1 | mg/L | **324** | **348** | **368** | **339** | **355** |
| **EG020F: Dissolved Metals by ICP-MS** | | | | | | | | |
| **Aluminium** | 7429-90-5 | 0.01 | mg/L | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| **Arsenic** | 7440-38-2 | 0.001 | mg/L | **0.006** | <0.005 | <0.005 | <0.005 | <0.005 |
| **Cadmium** | 7440-43-9 | 0.0001 | mg/L | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| **Chromium** | 7440-47-3 | 0.001 | mg/L | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| **Copper** | 7440-50-8 | 0.001 | mg/L | **0.009** | **0.010** | **0.010** | **0.010** | <0.005 |
| **Lead** | 7439-92-1 | 0.001 | mg/L | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| **Manganese** | 7439-96-5 | 0.001 | mg/L | **0.009** | **0.009** | **0.008** | **0.053** | **0.020** |
| **Nickel** | 7440-02-0 | 0.001 | mg/L | **0.006** | <0.005 | <0.005 | <0.005 | <0.005 |
| **Silver** | 7440-22-4 | 0.001 | mg/L | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| **Zinc** | 7440-66-6 | 0.005 | mg/L | <0.025 | <0.025 | <0.025 | <0.025 | <0.025 |
| **Iron** | 7439-89-6 | 0.05 | mg/L | **0.09** | **0.06** | **0.06** | **0.05** | **0.05** |
| **EG020T: Total Metals by ICP-MS** | | | | | | | | |
| **Aluminium** | 7429-90-5 | 0.01 | mg/L | **0.11** | **0.43** | **0.35** | **0.15** | **0.12** |
| **Arsenic** | 7440-38-2 | 0.001 | mg/L | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| **Cadmium** | 7440-43-9 | 0.0001 | mg/L | <0.0005 | <0.0005 | <0.0005 | <0.0005 | <0.0005 |
| **Chromium** | 7440-47-3 | 0.001 | mg/L | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | H4 | H5 | H6 | FW1 | FW2 |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | [28-Jul-2016] | [28-Jul-2016] | [28-Jul-2016] | [28-Jul-2016] | [28-Jul-2016] |
| Compound | CAS Number | LOR | Unit | EB1619456-011 | EB1619456-012 | EB1619456-013 | EB1619456-014 | EB1619456-015 |
| | | | | Result | Result | Result | Result | Result |
| **EG020T: Total Metals by ICP-MS - Continued** | | | | | | | | |
| Copper | 7440-50-8 | 0.001 | mg/L | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Lead | 7439-92-1 | 0.001 | mg/L | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Manganese | 7439-96-5 | 0.001 | mg/L | **0.015** | **0.016** | **0.020** | **0.049** | **0.020** |
| Nickel | 7440-02-0 | 0.001 | mg/L | <0.005 | <0.005 | <0.005 | <0.005 | <0.005 |
| Silver | 7440-22-4 | 0.001 | mg/L | **0.024** | **0.007** | <0.005 | <0.005 | <0.005 |
| Zinc | 7440-66-6 | 0.005 | mg/L | <0.026 | <0.026 | **0.054** | <0.026 | <0.026 |
| Iron | 7439-89-6 | 0.05 | mg/L | **0.14** | **0.51** | **0.48** | **0.78** | **0.29** |
| **EG035F: Dissolved Mercury by FIMS** | | | | | | | | |
| Mercury | 7439-97-6 | 0.0001 | mg/L | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| **EG035T: Total Recoverable Mercury by FIMS** | | | | | | | | |
| Mercury | 7439-97-6 | 0.0001 | mg/L | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| **EK055G: Ammonia as N by Discrete Analyser** | | | | | | | | |
| Ammonia as N | 7664-41-7 | 0.01 | mg/L | **0.08** | **0.10** | **0.09** | **0.13** | **0.11** |
| **EK057G: Nitrite as N by Discrete Analyser** | | | | | | | | |
| Nitrite as N | 14797-65-0 | 0.01 | mg/L | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| **EK058G: Nitrate as N by Discrete Analyser** | | | | | | | | |
| Nitrate as N | 14797-55-8 | 0.01 | mg/L | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser** | | | | | | | | |
| Nitrite + Nitrate as N | ---- | 0.01 | mg/L | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser** | | | | | | | | |
| Total Kjeldahl Nitrogen as N | ---- | 0.1 | mg/L | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| **EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser** | | | | | | | | |
| ^ Total Nitrogen as N | ---- | 0.1 | mg/L | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| **EK067G: Total Phosphorus as P by Discrete Analyser** | | | | | | | | |
| Total Phosphorus as P | ---- | 0.01 | mg/L | **0.12** | **0.13** | **0.17** | **0.14** | **0.09** |
| **EK071G: Reactive Phosphorus as P by discrete analyser** | | | | | | | | |
| Reactive Phosphorus as P | 14265-44-2 | 0.01 | mg/L | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| **EN055: Ionic Balance** | | | | | | | | |
| Total Anions | ---- | 0.01 | meq/L | **473** | **538** | **548** | **584** | **598** |
| Total Cations | ---- | 0.01 | meq/L | **482** | **530** | **552** | **512** | **540** |
| Ionic Balance | ---- | 0.01 | % | **0.91** | **0.78** | **0.42** | **6.62** | **5.17** |
| **EP075(SIM)B: Polynuclear Aromatic Hydrocarbons** | | | | | | | | |
| Naphthalene | 91-20-3 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | H4 | H5 | H6 | FW1 | FW2 |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | [28-Jul-2016] | [28-Jul-2016] | [28-Jul-2016] | [28-Jul-2016] | [28-Jul-2016] |
| Compound | CAS Number | LOR | Unit | EB1619456-011 | EB1619456-012 | EB1619456-013 | EB1619456-014 | EB1619456-015 |
| | | | | Result | Result | Result | Result | Result |
| **EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued** | | | | | | | | |
| Acenaphthylene | 208-96-8 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Acenaphthene | 83-32-9 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Fluorene | 86-73-7 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Phenanthrene | 85-01-8 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Anthracene | 120-12-7 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Fluoranthene | 206-44-0 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Pyrene | 129-00-0 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Benz(a)anthracene | 56-55-3 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Chrysene | 218-01-9 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Benzo(b+j)fluoranthene | 205-99-2 205-82-3 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Benzo(k)fluoranthene | 207-08-9 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Benzo(a)pyrene | 50-32-8 | 0.5 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Indeno(1.2.3.cd)pyrene | 193-39-5 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Dibenz(a.h)anthracene | 53-70-3 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Benzo(g.h.i)perylene | 191-24-2 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ Sum of polycyclic aromatic hydrocarbons | ---- | 0.5 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ Benzo(a)pyrene TEQ (zero) | ---- | 0.5 | µg/L | ---- | ---- | ---- | ---- | ---- |
| **EP080/071: Total Petroleum Hydrocarbons** | | | | | | | | |
| C6 - C9 Fraction | ---- | 20 | µg/L | ---- | ---- | ---- | ---- | ---- |
| C10 - C14 Fraction | ---- | 50 | µg/L | ---- | ---- | ---- | ---- | ---- |
| C15 - C28 Fraction | ---- | 100 | µg/L | ---- | ---- | ---- | ---- | ---- |
| C29 - C36 Fraction | ---- | 50 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ C10 - C36 Fraction (sum) | ---- | 50 | µg/L | ---- | ---- | ---- | ---- | ---- |
| **EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions** | | | | | | | | |
| C6 - C10 Fraction | C6_C10 | 20 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ C6 - C10 Fraction minus BTEX (F1) | C6_C10-BTEX | 20 | µg/L | ---- | ---- | ---- | ---- | ---- |
| >C10 - C16 Fraction | ---- | 100 | µg/L | ---- | ---- | ---- | ---- | ---- |
| >C16 - C34 Fraction | ---- | 100 | µg/L | ---- | ---- | ---- | ---- | ---- |
| >C34 - C40 Fraction | ---- | 100 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ >C10 - C40 Fraction (sum) | ---- | 100 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ >C10 - C16 Fraction minus Naphthalene (F2) | ---- | 100 | µg/L | ---- | ---- | ---- | ---- | ---- |
| **EP080: BTEXN** | | | | | | | | |
| Benzene | 71-43-2 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | H4 | H5 | H6 | FW1 | FW2 |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | [28-Jul-2016] | [28-Jul-2016] | [28-Jul-2016] | [28-Jul-2016] | [28-Jul-2016] |
| Compound | CAS Number | LOR | Unit | EB1619456-011 | EB1619456-012 | EB1619456-013 | EB1619456-014 | EB1619456-015 |
| | | | | Result | Result | Result | Result | Result |
| **EP080: BTEXN - Continued** | | | | | | | | |
| Toluene | 108-88-3 | 2 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Ethylbenzene | 100-41-4 | 2 | µg/L | ---- | ---- | ---- | ---- | ---- |
| meta- & para-Xylene | 108-38-3 106-42-3 | 2 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ortho-Xylene | 95-47-6 | 2 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ Total Xylenes | 1330-20-7 | 2 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ Sum of BTEX | ---- | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Naphthalene | 91-20-3 | 5 | µg/L | ---- | ---- | ---- | ---- | ---- |
| **EP075(SIM)S: Phenolic Compound Surrogates** | | | | | | | | |
| Phenol-d6 | 13127-88-3 | 1 | % | ---- | ---- | ---- | ---- | ---- |
| 2-Chlorophenol-D4 | 93951-73-6 | 1 | % | ---- | ---- | ---- | ---- | ---- |
| 2.4.6-Tribromophenol | 118-79-6 | 1 | % | ---- | ---- | ---- | ---- | ---- |
| **EP075(SIM)T: PAH Surrogates** | | | | | | | | |
| 2-Fluorobiphenyl | 321-60-8 | 1 | % | ---- | ---- | ---- | ---- | ---- |
| Anthracene-d10 | 1719-06-8 | 1 | % | ---- | ---- | ---- | ---- | ---- |
| 4-Terphenyl-d14 | 1718-51-0 | 1 | % | ---- | ---- | ---- | ---- | ---- |
| **EP080S: TPH(V)/BTEX Surrogates** | | | | | | | | |
| 1.2-Dichloroethane-D4 | 17060-07-0 | 2 | % | ---- | ---- | ---- | ---- | ---- |
| Toluene-D8 | 2037-26-5 | 2 | % | ---- | ---- | ---- | ---- | ---- |
| 4-Bromofluorobenzene | 460-00-4 | 2 | % | ---- | ---- | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | FW3 | FW4 | FW5 | FW6 | TRI 1 |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | [28-Jul-2016] | [28-Jul-2016] | [28-Jul-2016] | [28-Jul-2016] | [31-Jul-2016] |
| Compound | CAS Number | LOR | Unit | EB1619456-016 | EB1619456-017 | EB1619456-018 | EB1619456-019 | EB1619456-020 |
| | | | | Result | Result | Result | Result | Result |
| **EA025: Total Suspended Solids dried at 104 ± 2°C** | | | | | | | | |
| Suspended Solids (SS) | ---- | 5 | mg/L | 6 | 18 | <5 | <5 | 15 |
| **EA065: Total Hardness as CaCO3** | | | | | | | | |
| Total Hardness as CaCO3 | ---- | 1 | mg/L | 5850 | 5450 | 5460 | 5710 | ---- |
| **ED037P: Alkalinity by PC Titrator** | | | | | | | | |
| Hydroxide Alkalinity as CaCO3 | DMO-210-001 | 1 | mg/L | <1 | <1 | <1 | <1 | ---- |
| Carbonate Alkalinity as CaCO3 | 3812-32-6 | 1 | mg/L | <1 | <1 | <1 | <1 | ---- |
| Bicarbonate Alkalinity as CaCO3 | 71-52-3 | 1 | mg/L | 109 | 111 | 109 | 110 | ---- |
| Total Alkalinity as CaCO3 | ---- | 1 | mg/L | 109 | 111 | 109 | 110 | ---- |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA** | | | | | | | | |
| Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | 2380 | 2520 | 2500 | 2480 | ---- |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | | |
| Chloride | 16887-00-6 | 1 | mg/L | 18700 | 19100 | 16900 | 16900 | ---- |
| **ED093F: Dissolved Major Cations** | | | | | | | | |
| Calcium | 7440-70-2 | 1 | mg/L | 396 | 367 | 374 | 390 | ---- |
| Magnesium | 7439-95-4 | 1 | mg/L | 1180 | 1100 | 1100 | 1150 | ---- |
| Sodium | 7440-23-5 | 1 | mg/L | 9870 | 9060 | 9160 | 9660 | ---- |
| Potassium | 7440-09-7 | 1 | mg/L | 372 | 340 | 343 | 363 | ---- |
| **EG020F: Dissolved Metals by ICP-MS** | | | | | | | | |
| Aluminium | 7429-90-5 | 0.01 | mg/L | <0.05 | <0.05 | <0.05 | <0.05 | ---- |
| Arsenic | 7440-38-2 | 0.001 | mg/L | <0.005 | <0.005 | <0.005 | <0.005 | ---- |
| Cadmium | 7440-43-9 | 0.0001 | mg/L | <0.0005 | <0.0005 | <0.0005 | <0.0005 | ---- |
| Chromium | 7440-47-3 | 0.001 | mg/L | <0.005 | <0.005 | <0.005 | <0.005 | ---- |
| Copper | 7440-50-8 | 0.001 | mg/L | 0.010 | 0.010 | 0.009 | 0.009 | ---- |
| Lead | 7439-92-1 | 0.001 | mg/L | <0.005 | <0.005 | <0.005 | <0.005 | ---- |
| Manganese | 7439-96-5 | 0.001 | mg/L | 0.040 | 0.014 | 0.011 | 0.008 | ---- |
| Nickel | 7440-02-0 | 0.001 | mg/L | <0.005 | <0.005 | <0.005 | <0.005 | ---- |
| Silver | 7440-22-4 | 0.001 | mg/L | <0.005 | <0.005 | <0.005 | <0.005 | ---- |
| Zinc | 7440-66-6 | 0.005 | mg/L | <0.025 | 0.027 | <0.025 | <0.025 | ---- |
| Iron | 7439-89-6 | 0.05 | mg/L | <0.05 | <0.05 | <0.05 | <0.05 | ---- |
| **EG020T: Total Metals by ICP-MS** | | | | | | | | |
| Aluminium | 7429-90-5 | 0.01 | mg/L | 0.10 | 0.25 | 0.09 | 0.11 | ---- |
| Arsenic | 7440-38-2 | 0.001 | mg/L | <0.005 | <0.005 | <0.005 | <0.005 | ---- |
| Cadmium | 7440-43-9 | 0.0001 | mg/L | <0.0005 | <0.0005 | <0.0005 | <0.0005 | ---- |
| Chromium | 7440-47-3 | 0.001 | mg/L | <0.005 | <0.005 | <0.005 | <0.005 | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | FW3 | FW4 | FW5 | FW6 | TRI 1 |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | [28-Jul-2016] | [28-Jul-2016] | [28-Jul-2016] | [28-Jul-2016] | [31-Jul-2016] |
| Compound | CAS Number | LOR | Unit | EB1619456-016 | EB1619456-017 | EB1619456-018 | EB1619456-019 | EB1619456-020 |
| | | | | Result | Result | Result | Result | Result |
| **EG020T: Total Metals by ICP-MS - Continued** | | | | | | | | |
| **Copper** | 7440-50-8 | 0.001 | mg/L | <0.005 | <0.005 | <0.005 | <0.005 | ---- |
| **Lead** | 7439-92-1 | 0.001 | mg/L | <0.005 | <0.005 | <0.005 | <0.005 | ---- |
| **Manganese** | 7439-96-5 | 0.001 | mg/L | **0.037** | **0.019** | **0.013** | **0.011** | ---- |
| **Nickel** | 7440-02-0 | 0.001 | mg/L | <0.005 | <0.005 | <0.005 | <0.005 | ---- |
| **Silver** | 7440-22-4 | 0.001 | mg/L | <0.005 | <0.005 | <0.005 | **0.010** | ---- |
| **Zinc** | 7440-66-6 | 0.005 | mg/L | <0.026 | <0.026 | <0.026 | <0.026 | ---- |
| **Iron** | 7439-89-6 | 0.05 | mg/L | **0.16** | **0.41** | **0.11** | **0.09** | ---- |
| **EG035F: Dissolved Mercury by FIMS** | | | | | | | | |
| **Mercury** | 7439-97-6 | 0.0001 | mg/L | <0.0001 | <0.0001 | <0.0001 | <0.0001 | ---- |
| **EG035T: Total Recoverable Mercury by FIMS** | | | | | | | | |
| **Mercury** | 7439-97-6 | 0.0001 | mg/L | <0.0001 | <0.0001 | <0.0001 | <0.0001 | ---- |
| **EK055G: Ammonia as N by Discrete Analyser** | | | | | | | | |
| **Ammonia as N** | 7664-41-7 | 0.01 | mg/L | **0.11** | **0.09** | **0.08** | **0.09** | ---- |
| **EK057G: Nitrite as N by Discrete Analyser** | | | | | | | | |
| **Nitrite as N** | 14797-65-0 | 0.01 | mg/L | <0.01 | <0.01 | <0.01 | <0.01 | ---- |
| **EK058G: Nitrate as N by Discrete Analyser** | | | | | | | | |
| **Nitrate as N** | 14797-55-8 | 0.01 | mg/L | **0.01** | **0.02** | **0.02** | **0.01** | ---- |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser** | | | | | | | | |
| **Nitrite + Nitrate as N** | ---- | 0.01 | mg/L | **0.01** | **0.02** | **0.02** | **0.01** | ---- |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser** | | | | | | | | |
| **Total Kjeldahl Nitrogen as N** | ---- | 0.1 | mg/L | <0.5 | <0.5 | <0.5 | <0.5 | ---- |
| **EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser** | | | | | | | | |
| ^ **Total Nitrogen as N** | ---- | 0.1 | mg/L | <0.5 | <0.5 | <0.5 | <0.5 | ---- |
| **EK067G: Total Phosphorus as P by Discrete Analyser** | | | | | | | | |
| **Total Phosphorus as P** | ---- | 0.01 | mg/L | **0.09** | **0.08** | **0.13** | **0.08** | ---- |
| **EK071G: Reactive Phosphorus as P by discrete analyser** | | | | | | | | |
| **Reactive Phosphorus as P** | 14265-44-2 | 0.01 | mg/L | <0.01 | <0.01 | <0.01 | <0.01 | ---- |
| **EN055: Ionic Balance** | | | | | | | | |
| **Total Anions** | ---- | 0.01 | meq/L | **579** | **593** | **531** | **530** | ---- |
| **Total Cations** | ---- | 0.01 | meq/L | **556** | **512** | **516** | **544** | ---- |
| **Ionic Balance** | ---- | 0.01 | % | **2.09** | **7.42** | **1.40** | **1.20** | ---- |
| **EP075(SIM)B: Polynuclear Aromatic Hydrocarbons** | | | | | | | | |
| **Naphthalene** | 91-20-3 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | FW3 | FW4 | FW5 | FW6 | TRI 1 |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | [28-Jul-2016] | [28-Jul-2016] | [28-Jul-2016] | [28-Jul-2016] | [31-Jul-2016] |
| Compound | CAS Number | LOR | Unit | EB1619456-016 | EB1619456-017 | EB1619456-018 | EB1619456-019 | EB1619456-020 |
| | | | | Result | Result | Result | Result | Result |
| **EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued** | | | | | | | | |
| Acenaphthylene | 208-96-8 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Acenaphthene | 83-32-9 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Fluorene | 86-73-7 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Phenanthrene | 85-01-8 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Anthracene | 120-12-7 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Fluoranthene | 206-44-0 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Pyrene | 129-00-0 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Benz(a)anthracene | 56-55-3 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Chrysene | 218-01-9 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Benzo(b+j)fluoranthene | 205-99-2 205-82-3 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Benzo(k)fluoranthene | 207-08-9 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Benzo(a)pyrene | 50-32-8 | 0.5 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Indeno(1.2.3.cd)pyrene | 193-39-5 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Dibenz(a.h)anthracene | 53-70-3 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Benzo(g.h.i)perylene | 191-24-2 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ Sum of polycyclic aromatic hydrocarbons | ---- | 0.5 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ Benzo(a)pyrene TEQ (zero) | ---- | 0.5 | µg/L | ---- | ---- | ---- | ---- | ---- |
| **EP080/071: Total Petroleum Hydrocarbons** | | | | | | | | |
| C6 - C9 Fraction | ---- | 20 | µg/L | ---- | ---- | ---- | ---- | ---- |
| C10 - C14 Fraction | ---- | 50 | µg/L | ---- | ---- | ---- | ---- | ---- |
| C15 - C28 Fraction | ---- | 100 | µg/L | ---- | ---- | ---- | ---- | ---- |
| C29 - C36 Fraction | ---- | 50 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ C10 - C36 Fraction (sum) | ---- | 50 | µg/L | ---- | ---- | ---- | ---- | ---- |
| **EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions** | | | | | | | | |
| C6 - C10 Fraction | C6_C10 | 20 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ C6 - C10 Fraction minus BTEX (F1) | C6_C10-BTEX | 20 | µg/L | ---- | ---- | ---- | ---- | ---- |
| >C10 - C16 Fraction | ---- | 100 | µg/L | ---- | ---- | ---- | ---- | ---- |
| >C16 - C34 Fraction | ---- | 100 | µg/L | ---- | ---- | ---- | ---- | ---- |
| >C34 - C40 Fraction | ---- | 100 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ >C10 - C40 Fraction (sum) | ---- | 100 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ >C10 - C16 Fraction minus Naphthalene (F2) | ---- | 100 | µg/L | ---- | ---- | ---- | ---- | ---- |
| **EP080: BTEXN** | | | | | | | | |
| Benzene | 71-43-2 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |

## *Analytical Results*

| Sub-Matrix: **WATER** (Matrix: **WATER**) | | | *Client sample ID* | **FW3** | **FW4** | **FW5** | **FW6** | **TRI 1** |
|---|---|---|---|---|---|---|---|---|
| | | | *Client sampling date / time* | [28-Jul-2016] | [28-Jul-2016] | [28-Jul-2016] | [28-Jul-2016] | [31-Jul-2016] |
| *Compound* | *CAS Number* | *LOR* | *Unit* | **EB1619456-016** | **EB1619456-017** | **EB1619456-018** | **EB1619456-019** | **EB1619456-020** |
| | | | | Result | Result | Result | Result | Result |
| **EP080: BTEXN - Continued** | | | | | | | | |
| **Toluene** | 108-88-3 | 2 | µg/L | ---- | ---- | ---- | ---- | ---- |
| **Ethylbenzene** | 100-41-4 | 2 | µg/L | ---- | ---- | ---- | ---- | ---- |
| **meta- & para-Xylene** | 108-38-3 106-42-3 | 2 | µg/L | ---- | ---- | ---- | ---- | ---- |
| **ortho-Xylene** | 95-47-6 | 2 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ **Total Xylenes** | 1330-20-7 | 2 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ **Sum of BTEX** | ---- | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| **Naphthalene** | 91-20-3 | 5 | µg/L | ---- | ---- | ---- | ---- | ---- |
| **EP075(SIM)S: Phenolic Compound Surrogates** | | | | | | | | |
| **Phenol-d6** | 13127-88-3 | 1 | % | ---- | ---- | ---- | ---- | ---- |
| **2-Chlorophenol-D4** | 93951-73-6 | 1 | % | ---- | ---- | ---- | ---- | ---- |
| **2.4.6-Tribromophenol** | 118-79-6 | 1 | % | ---- | ---- | ---- | ---- | ---- |
| **EP075(SIM)T: PAH Surrogates** | | | | | | | | |
| **2-Fluorobiphenyl** | 321-60-8 | 1 | % | ---- | ---- | ---- | ---- | ---- |
| **Anthracene-d10** | 1719-06-8 | 1 | % | ---- | ---- | ---- | ---- | ---- |
| **4-Terphenyl-d14** | 1718-51-0 | 1 | % | ---- | ---- | ---- | ---- | ---- |
| **EP080S: TPH(V)/BTEX Surrogates** | | | | | | | | |
| **1.2-Dichloroethane-D4** | 17060-07-0 | 2 | % | ---- | ---- | ---- | ---- | ---- |
| **Toluene-D8** | 2037-26-5 | 2 | % | ---- | ---- | ---- | ---- | ---- |
| **4-Bromofluorobenzene** | 460-00-4 | 2 | % | ---- | ---- | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | TRI 2 | TRI 3 | TRI 4 | TRI 5 | BAR 1 |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | [31-Jul-2016] | [31-Jul-2016] | [31-Jul-2016] | [01-Aug-2016] | [30-Jul-2016] |
| Compound | CAS Number | LOR | Unit | EB1619456-021 | EB1619456-022 | EB1619456-023 | EB1619456-024 | EB1619456-025 |
| | | | | Result | Result | Result | Result | Result |
| **EA025: Total Suspended Solids dried at 104 ± 2°C** | | | | | | | | |
| Suspended Solids (SS) | ---- | 5 | mg/L | <5 | **19** | **18** | <5 | <5 |
| **EA065: Total Hardness as CaCO3** | | | | | | | | |
| Total Hardness as CaCO3 | ---- | 1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **ED037P: Alkalinity by PC Titrator** | | | | | | | | |
| Hydroxide Alkalinity as CaCO3 | DMO-210-001 | 1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Carbonate Alkalinity as CaCO3 | 3812-32-6 | 1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Bicarbonate Alkalinity as CaCO3 | 71-52-3 | 1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Total Alkalinity as CaCO3 | ---- | 1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA** | | | | | | | | |
| Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | | |
| Chloride | 16887-00-6 | 1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **ED093F: Dissolved Major Cations** | | | | | | | | |
| Calcium | 7440-70-2 | 1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Magnesium | 7439-95-4 | 1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Sodium | 7440-23-5 | 1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Potassium | 7440-09-7 | 1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EG020F: Dissolved Metals by ICP-MS** | | | | | | | | |
| Aluminium | 7429-90-5 | 0.01 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Arsenic | 7440-38-2 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Cadmium | 7440-43-9 | 0.0001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Chromium | 7440-47-3 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Copper | 7440-50-8 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Lead | 7439-92-1 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Manganese | 7439-96-5 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Nickel | 7440-02-0 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Silver | 7440-22-4 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Zinc | 7440-66-6 | 0.005 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Iron | 7439-89-6 | 0.05 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EG020T: Total Metals by ICP-MS** | | | | | | | | |
| Aluminium | 7429-90-5 | 0.01 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Arsenic | 7440-38-2 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Cadmium | 7440-43-9 | 0.0001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Chromium | 7440-47-3 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | TRI 2 | TRI 3 | TRI 4 | TRI 5 | BAR 1 |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | [31-Jul-2016] | [31-Jul-2016] | [31-Jul-2016] | [01-Aug-2016] | [30-Jul-2016] |
| Compound | CAS Number | LOR | Unit | EB1619456-021 | EB1619456-022 | EB1619456-023 | EB1619456-024 | EB1619456-025 |
| | | | | Result | Result | Result | Result | Result |
| **EG020T: Total Metals by ICP-MS - Continued** | | | | | | | | |
| Copper | 7440-50-8 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Lead | 7439-92-1 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Manganese | 7439-96-5 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Nickel | 7440-02-0 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Silver | 7440-22-4 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Zinc | 7440-66-6 | 0.005 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Iron | 7439-89-6 | 0.05 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EG035F: Dissolved Mercury by FIMS** | | | | | | | | |
| Mercury | 7439-97-6 | 0.0001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EG035T: Total Recoverable Mercury by FIMS** | | | | | | | | |
| Mercury | 7439-97-6 | 0.0001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EK055G: Ammonia as N by Discrete Analyser** | | | | | | | | |
| Ammonia as N | 7664-41-7 | 0.01 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EK057G: Nitrite as N by Discrete Analyser** | | | | | | | | |
| Nitrite as N | 14797-65-0 | 0.01 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EK058G: Nitrate as N by Discrete Analyser** | | | | | | | | |
| Nitrate as N | 14797-55-8 | 0.01 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser** | | | | | | | | |
| Nitrite + Nitrate as N | ---- | 0.01 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser** | | | | | | | | |
| Total Kjeldahl Nitrogen as N | ---- | 0.1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser** | | | | | | | | |
| ^ Total Nitrogen as N | ---- | 0.1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EK067G: Total Phosphorus as P by Discrete Analyser** | | | | | | | | |
| Total Phosphorus as P | ---- | 0.01 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EK071G: Reactive Phosphorus as P by discrete analyser** | | | | | | | | |
| Reactive Phosphorus as P | 14265-44-2 | 0.01 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EN055: Ionic Balance** | | | | | | | | |
| Total Anions | ---- | 0.01 | meq/L | ---- | ---- | ---- | ---- | ---- |
| Total Cations | ---- | 0.01 | meq/L | ---- | ---- | ---- | ---- | ---- |
| Ionic Balance | ---- | 0.01 | % | ---- | ---- | ---- | ---- | ---- |
| **EP075(SIM)B: Polynuclear Aromatic Hydrocarbons** | | | | | | | | |
| Naphthalene | 91-20-3 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | TRI 2 | TRI 3 | TRI 4 | TRI 5 | BAR 1 |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | [31-Jul-2016] | [31-Jul-2016] | [31-Jul-2016] | [01-Aug-2016] | [30-Jul-2016] |
| Compound | CAS Number | LOR | Unit | EB1619456-021 | EB1619456-022 | EB1619456-023 | EB1619456-024 | EB1619456-025 |
| | | | | Result | Result | Result | Result | Result |
| **EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued** | | | | | | | | |
| Acenaphthylene | 208-96-8 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Acenaphthene | 83-32-9 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Fluorene | 86-73-7 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Phenanthrene | 85-01-8 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Anthracene | 120-12-7 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Fluoranthene | 206-44-0 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Pyrene | 129-00-0 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Benz(a)anthracene | 56-55-3 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Chrysene | 218-01-9 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Benzo(b+j)fluoranthene | 205-99-2 205-82-3 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Benzo(k)fluoranthene | 207-08-9 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Benzo(a)pyrene | 50-32-8 | 0.5 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Indeno(1.2.3.cd)pyrene | 193-39-5 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Dibenz(a.h)anthracene | 53-70-3 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Benzo(g.h.i)perylene | 191-24-2 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ Sum of polycyclic aromatic hydrocarbons | ---- | 0.5 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ Benzo(a)pyrene TEQ (zero) | ---- | 0.5 | µg/L | ---- | ---- | ---- | ---- | ---- |
| **EP080/071: Total Petroleum Hydrocarbons** | | | | | | | | |
| C6 - C9 Fraction | ---- | 20 | µg/L | ---- | ---- | ---- | ---- | ---- |
| C10 - C14 Fraction | ---- | 50 | µg/L | ---- | ---- | ---- | ---- | ---- |
| C15 - C28 Fraction | ---- | 100 | µg/L | ---- | ---- | ---- | ---- | ---- |
| C29 - C36 Fraction | ---- | 50 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ C10 - C36 Fraction (sum) | ---- | 50 | µg/L | ---- | ---- | ---- | ---- | ---- |
| **EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions** | | | | | | | | |
| C6 - C10 Fraction | C6_C10 | 20 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ C6 - C10 Fraction minus BTEX (F1) | C6_C10-BTEX | 20 | µg/L | ---- | ---- | ---- | ---- | ---- |
| >C10 - C16 Fraction | ---- | 100 | µg/L | ---- | ---- | ---- | ---- | ---- |
| >C16 - C34 Fraction | ---- | 100 | µg/L | ---- | ---- | ---- | ---- | ---- |
| >C34 - C40 Fraction | ---- | 100 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ >C10 - C40 Fraction (sum) | ---- | 100 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ >C10 - C16 Fraction minus Naphthalene (F2) | ---- | 100 | µg/L | ---- | ---- | ---- | ---- | ---- |
| **EP080: BTEXN** | | | | | | | | |
| Benzene | 71-43-2 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | TRI 2 | TRI 3 | TRI 4 | TRI 5 | BAR 1 |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | [31-Jul-2016] | [31-Jul-2016] | [31-Jul-2016] | [01-Aug-2016] | [30-Jul-2016] |
| Compound | CAS Number | LOR | Unit | EB1619456-021 | EB1619456-022 | EB1619456-023 | EB1619456-024 | EB1619456-025 |
| | | | | Result | Result | Result | Result | Result |
| **EP080: BTEXN - Continued** | | | | | | | | |
| Toluene | 108-88-3 | 2 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Ethylbenzene | 100-41-4 | 2 | µg/L | ---- | ---- | ---- | ---- | ---- |
| meta- & para-Xylene | 108-38-3 106-42-3 | 2 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ortho-Xylene | 95-47-6 | 2 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ Total Xylenes | 1330-20-7 | 2 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ Sum of BTEX | ---- | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Naphthalene | 91-20-3 | 5 | µg/L | ---- | ---- | ---- | ---- | ---- |
| **EP075(SIM)S: Phenolic Compound Surrogates** | | | | | | | | |
| Phenol-d6 | 13127-88-3 | 1 | % | ---- | ---- | ---- | ---- | ---- |
| 2-Chlorophenol-D4 | 93951-73-6 | 1 | % | ---- | ---- | ---- | ---- | ---- |
| 2.4.6-Tribromophenol | 118-79-6 | 1 | % | ---- | ---- | ---- | ---- | ---- |
| **EP075(SIM)T: PAH Surrogates** | | | | | | | | |
| 2-Fluorobiphenyl | 321-60-8 | 1 | % | ---- | ---- | ---- | ---- | ---- |
| Anthracene-d10 | 1719-06-8 | 1 | % | ---- | ---- | ---- | ---- | ---- |
| 4-Terphenyl-d14 | 1718-51-0 | 1 | % | ---- | ---- | ---- | ---- | ---- |
| **EP080S: TPH(V)/BTEX Surrogates** | | | | | | | | |
| 1.2-Dichloroethane-D4 | 17060-07-0 | 2 | % | ---- | ---- | ---- | ---- | ---- |
| Toluene-D8 | 2037-26-5 | 2 | % | ---- | ---- | ---- | ---- | ---- |
| 4-Bromofluorobenzene | 460-00-4 | 2 | % | ---- | ---- | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | BAR 2 | BAR 3 | BAR 4 | BAR 5 | ---- |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | [30-Jul-2016] | [30-Jul-2016] | [30-Jul-2016] | [30-Jul-2016] | ---- |
| Compound | CAS Number | LOR | Unit | EB1619456-026 | EB1619456-027 | EB1619456-028 | EB1619456-029 | -------- |
| | | | | Result | Result | Result | Result | ---- |
| **EA025: Total Suspended Solids dried at 104 ± 2°C** | | | | | | | | |
| Suspended Solids (SS) | ---- | 5 | mg/L | **42** | **24** | <5 | <5 | ---- |
| **EA065: Total Hardness as CaCO3** | | | | | | | | |
| Total Hardness as CaCO3 | ---- | 1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **ED037P: Alkalinity by PC Titrator** | | | | | | | | |
| Hydroxide Alkalinity as CaCO3 | DMO-210-001 | 1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Carbonate Alkalinity as CaCO3 | 3812-32-6 | 1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Bicarbonate Alkalinity as CaCO3 | 71-52-3 | 1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Total Alkalinity as CaCO3 | ---- | 1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA** | | | | | | | | |
| Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | | |
| Chloride | 16887-00-6 | 1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **ED093F: Dissolved Major Cations** | | | | | | | | |
| Calcium | 7440-70-2 | 1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Magnesium | 7439-95-4 | 1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Sodium | 7440-23-5 | 1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Potassium | 7440-09-7 | 1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EG020F: Dissolved Metals by ICP-MS** | | | | | | | | |
| Aluminium | 7429-90-5 | 0.01 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Arsenic | 7440-38-2 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Cadmium | 7440-43-9 | 0.0001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Chromium | 7440-47-3 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Copper | 7440-50-8 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Lead | 7439-92-1 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Manganese | 7439-96-5 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Nickel | 7440-02-0 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Silver | 7440-22-4 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Zinc | 7440-66-6 | 0.005 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Iron | 7439-89-6 | 0.05 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EG020T: Total Metals by ICP-MS** | | | | | | | | |
| Aluminium | 7429-90-5 | 0.01 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Arsenic | 7440-38-2 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Cadmium | 7440-43-9 | 0.0001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Chromium | 7440-47-3 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | BAR 2 | BAR 3 | BAR 4 | BAR 5 | ---- |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | [30-Jul-2016] | [30-Jul-2016] | [30-Jul-2016] | [30-Jul-2016] | ---- |
| Compound | CAS Number | LOR | Unit | EB1619456-026 | EB1619456-027 | EB1619456-028 | EB1619456-029 | -------- |
| | | | | Result | Result | Result | Result | ---- |
| **EG020T: Total Metals by ICP-MS - Continued** | | | | | | | | |
| Copper | 7440-50-8 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Lead | 7439-92-1 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Manganese | 7439-96-5 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Nickel | 7440-02-0 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Silver | 7440-22-4 | 0.001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Zinc | 7440-66-6 | 0.005 | mg/L | ---- | ---- | ---- | ---- | ---- |
| Iron | 7439-89-6 | 0.05 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EG035F: Dissolved Mercury by FIMS** | | | | | | | | |
| Mercury | 7439-97-6 | 0.0001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EG035T: Total Recoverable Mercury by FIMS** | | | | | | | | |
| Mercury | 7439-97-6 | 0.0001 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EK055G: Ammonia as N by Discrete Analyser** | | | | | | | | |
| Ammonia as N | 7664-41-7 | 0.01 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EK057G: Nitrite as N by Discrete Analyser** | | | | | | | | |
| Nitrite as N | 14797-65-0 | 0.01 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EK058G: Nitrate as N by Discrete Analyser** | | | | | | | | |
| Nitrate as N | 14797-55-8 | 0.01 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser** | | | | | | | | |
| Nitrite + Nitrate as N | ---- | 0.01 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser** | | | | | | | | |
| Total Kjeldahl Nitrogen as N | ---- | 0.1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser** | | | | | | | | |
| ^ Total Nitrogen as N | ---- | 0.1 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EK067G: Total Phosphorus as P by Discrete Analyser** | | | | | | | | |
| Total Phosphorus as P | ---- | 0.01 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EK071G: Reactive Phosphorus as P by discrete analyser** | | | | | | | | |
| Reactive Phosphorus as P | 14265-44-2 | 0.01 | mg/L | ---- | ---- | ---- | ---- | ---- |
| **EN055: Ionic Balance** | | | | | | | | |
| Total Anions | ---- | 0.01 | meq/L | ---- | ---- | ---- | ---- | ---- |
| Total Cations | ---- | 0.01 | meq/L | ---- | ---- | ---- | ---- | ---- |
| Ionic Balance | ---- | 0.01 | % | ---- | ---- | ---- | ---- | ---- |
| **EP075(SIM)B: Polynuclear Aromatic Hydrocarbons** | | | | | | | | |
| Naphthalene | 91-20-3 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | BAR 2 | BAR 3 | BAR 4 | BAR 5 | ---- |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | [30-Jul-2016] | [30-Jul-2016] | [30-Jul-2016] | [30-Jul-2016] | ---- |
| Compound | CAS Number | LOR | Unit | EB1619456-026 | EB1619456-027 | EB1619456-028 | EB1619456-029 | -------- |
| | | | | Result | Result | Result | Result | ---- |
| **EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued** | | | | | | | | |
| Acenaphthylene | 208-96-8 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Acenaphthene | 83-32-9 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Fluorene | 86-73-7 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Phenanthrene | 85-01-8 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Anthracene | 120-12-7 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Fluoranthene | 206-44-0 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Pyrene | 129-00-0 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Benz(a)anthracene | 56-55-3 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Chrysene | 218-01-9 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Benzo(b+j)fluoranthene | 205-99-2 205-82-3 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Benzo(k)fluoranthene | 207-08-9 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Benzo(a)pyrene | 50-32-8 | 0.5 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Indeno(1.2.3.cd)pyrene | 193-39-5 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Dibenz(a.h)anthracene | 53-70-3 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Benzo(g.h.i)perylene | 191-24-2 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ Sum of polycyclic aromatic hydrocarbons | ---- | 0.5 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ Benzo(a)pyrene TEQ (zero) | ---- | 0.5 | µg/L | ---- | ---- | ---- | ---- | ---- |
| **EP080/071: Total Petroleum Hydrocarbons** | | | | | | | | |
| C6 - C9 Fraction | ---- | 20 | µg/L | ---- | ---- | ---- | ---- | ---- |
| C10 - C14 Fraction | ---- | 50 | µg/L | ---- | ---- | ---- | ---- | ---- |
| C15 - C28 Fraction | ---- | 100 | µg/L | ---- | ---- | ---- | ---- | ---- |
| C29 - C36 Fraction | ---- | 50 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ C10 - C36 Fraction (sum) | ---- | 50 | µg/L | ---- | ---- | ---- | ---- | ---- |
| **EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions** | | | | | | | | |
| C6 - C10 Fraction | C6_C10 | 20 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ C6 - C10 Fraction minus BTEX (F1) | C6_C10-BTEX | 20 | µg/L | ---- | ---- | ---- | ---- | ---- |
| >C10 - C16 Fraction | ---- | 100 | µg/L | ---- | ---- | ---- | ---- | ---- |
| >C16 - C34 Fraction | ---- | 100 | µg/L | ---- | ---- | ---- | ---- | ---- |
| >C34 - C40 Fraction | ---- | 100 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ >C10 - C40 Fraction (sum) | ---- | 100 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ >C10 - C16 Fraction minus Naphthalene (F2) | ---- | 100 | µg/L | ---- | ---- | ---- | ---- | ---- |
| **EP080: BTEXN** | | | | | | | | |
| Benzene | 71-43-2 | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | BAR 2 | BAR 3 | BAR 4 | BAR 5 | ---- |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | [30-Jul-2016] | [30-Jul-2016] | [30-Jul-2016] | [30-Jul-2016] | ---- |
| Compound | CAS Number | LOR | Unit | EB1619456-026 | EB1619456-027 | EB1619456-028 | EB1619456-029 | -------- |
| | | | | Result | Result | Result | Result | ---- |
| **EP080: BTEXN - Continued** | | | | | | | | |
| Toluene | 108-88-3 | 2 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Ethylbenzene | 100-41-4 | 2 | µg/L | ---- | ---- | ---- | ---- | ---- |
| meta- & para-Xylene | 108-38-3 106-42-3 | 2 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ortho-Xylene | 95-47-6 | 2 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ Total Xylenes | 1330-20-7 | 2 | µg/L | ---- | ---- | ---- | ---- | ---- |
| ^ Sum of BTEX | ---- | 1 | µg/L | ---- | ---- | ---- | ---- | ---- |
| Naphthalene | 91-20-3 | 5 | µg/L | ---- | ---- | ---- | ---- | ---- |
| **EP075(SIM)S: Phenolic Compound Surrogates** | | | | | | | | |
| Phenol-d6 | 13127-88-3 | 1 | % | ---- | ---- | ---- | ---- | ---- |
| 2-Chlorophenol-D4 | 93951-73-6 | 1 | % | ---- | ---- | ---- | ---- | ---- |
| 2.4.6-Tribromophenol | 118-79-6 | 1 | % | ---- | ---- | ---- | ---- | ---- |
| **EP075(SIM)T: PAH Surrogates** | | | | | | | | |
| 2-Fluorobiphenyl | 321-60-8 | 1 | % | ---- | ---- | ---- | ---- | ---- |
| Anthracene-d10 | 1719-06-8 | 1 | % | ---- | ---- | ---- | ---- | ---- |
| 4-Terphenyl-d14 | 1718-51-0 | 1 | % | ---- | ---- | ---- | ---- | ---- |
| **EP080S: TPH(V)/BTEX Surrogates** | | | | | | | | |
| 1.2-Dichloroethane-D4 | 17060-07-0 | 2 | % | ---- | ---- | ---- | ---- | ---- |
| Toluene-D8 | 2037-26-5 | 2 | % | ---- | ---- | ---- | ---- | ---- |
| 4-Bromofluorobenzene | 460-00-4 | 2 | % | ---- | ---- | ---- | ---- | ---- |

## Surrogate Control Limits

Sub-Matrix: **WATER**

| Compound | CAS Number | Recovery Limits (%) Low | High |
|---|---|---|---|
| **EP075(SIM)S: Phenolic Compound Surrogates** | | | |
| **Phenol-d6** | 13127-88-3 | 10 | 72 |
| **2-Chlorophenol-D4** | 93951-73-6 | 27 | 130 |
| **2.4.6-Tribromophenol** | 118-79-6 | 19 | 181 |
| **EP075(SIM)T: PAH Surrogates** | | | |
| **2-Fluorobiphenyl** | 321-60-8 | 14 | 146 |
| **Anthracene-d10** | 1719-06-8 | 35 | 137 |
| **4-Terphenyl-d14** | 1718-51-0 | 36 | 154 |
| **EP080S: TPH(V)/BTEX Surrogates** | | | |
| **1.2-Dichloroethane-D4** | 17060-07-0 | 66 | 138 |
| **Toluene-D8** | 2037-26-5 | 79 | 120 |
| **4-Bromofluorobenzene** | 460-00-4 | 74 | 118 |

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