



# Warrell Creek to Nambucca Heads – Pacific Highway Upgrade Project

## ENVIRONMENT PROTECTION AUTHORITY MONTHLY REPORT

■ November 2015

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Pacifico Project Number: WC2NH



A team consisting of RMS and Pacifico (ACCIONA Ferrovial JV) to upgrade the Pacific Highway at Warrell Creek to Nambucca Heads

# Contents

|            |  |           |
|------------|--|-----------|
| <b>1.</b>  | <b>Introduction</b> .....                    | <b>2</b>  |
| <b>1.1</b> | <b>Description of Works</b> .....            | <b>2</b>  |
| <b>1.2</b> | <b>Consultation Activities</b> .....         | <b>3</b>  |
| <b>2.</b>  | <b>Weather</b> .....                         | <b>4</b>  |
| 2.1        | Discussion.....                              | 4         |
| <b>3.</b>  | <b>Surface Water Monitoring</b> .....        | <b>7</b>  |
| <b>4.</b>  | <b>Sediment Basin Water Monitoring</b> ..... | <b>9</b>  |
| <b>5.</b>  | <b>Noise Monitoring</b> .....                | <b>11</b> |
| <b>6.</b>  | <b>Vibration Monitoring</b> .....            | <b>12</b> |
| 6.1        | Blasting.....                                | 12        |
| <b>7.</b>  | <b>Dust Monitoring</b> .....                 | <b>12</b> |
| <b>8.</b>  | <b>Groundwater Monitoring</b> .....          | <b>13</b> |
| <b>9.</b>  | <b>Acoustic Investigations</b> .....         | <b>13</b> |
| <b>10.</b> | <b>Complaints</b> .....                      | <b>14</b> |
| 10.1       | Summary of Complaints for the month.....     | 14        |
| <b>11.</b> | <b>Non-Compliance</b> .....                  | <b>14</b> |
| 11.1       | Summary of Non-compliances.....              | 14        |

# 1. Introduction

Environmental Protection Licence (EPL) 20533 was issued to ACCIONA Infrastructure for the Warrell Creek to Nambucca Heads Pacific Highway Upgrade project on the 16<sup>th</sup> December 2014. Condition R1.8 of the EPL requires the licensee to provide the EPA with a monthly report containing the following information:

- a) details of all non-compliances with the conditions of this licence and measures taken, or proposed, to prevent a recurrence of such a non-compliance; and
- b) details of all discharges from the sediment basins where the water quality results exceed the limits prescribed by Condition L2.4 including the results of rainfall measurements to demonstrate compliance with Condition M4.1; and

The report referred to in this condition must be received by the EPA within 10 working days of the end of each month.

This document has been prepared to fulfil the requirements of Condition R1.8.

## 1.1 Description of Works

The project's construction activities during November 2015 were limited to the following:

- Clearing and Grubbing;
- Topsoil stripping;
- Earthworks including crushing;
- Production blasting;
- Continuation of piling including driven piling;
- Continuing bridge works including temporary work platforms;
- Earthworks through the flying fox area;
- Installation of erosion and sediment controls;
- Installation of permanent boundary fencing;
- Installation of monitoring instruments – extensometers, inclinometers and piezometers
- Continuing culvert installation;
- Site compound establishment (Northern Compound);
- Geotechnical Investigations;
- Installation of temporary waterway crossings; and
- Site Survey.
- Drainage works including shotcreting of permanent drains
- Topsoil placement
- Scour rock installation
- Williamson Creek Realignment works

The works scheduled for next month include:

- Earthworks including crushing;
- Production blasting;
- Continuing of piling including driven piling;
- Continuing bridge works including temporary work platforms;
- Installation of erosion and sediment controls;

- Continuing culvert installation;
- Geotechnical Investigations;
- Clearing and grubbing;
- Topsoil stripping
- Drainage works including shotcreting of permanent drains
- Topsoil placement
- Scour rock installation

## 1.2 Consultation Activities

The project’s consultation activities during November 2015 included various community letterbox drop notifications and the following:

Table 1 – Consultation Activities

| Groups                     | Date     | Key Topics   |
|----------------------------|----------|--|
| Environmental Review Group | 17/11/15 | Construction Progress, Design Update, Upcoming works, EWMS discussion, Environmental Update, Monitoring update.  |
| Drop-in session            | 7/11/15  | The purpose of drop-in session was to present the Urban Design and Landscape package (UD01) to interested community members and obtain feedback about the package. |
| Information stand          | 28/11/15 | An information stand was established for the 2015 Nambucca River Festival enabling community members the opportunity to ask questions about the project.           |

### At House Noise Treatments

The At House noise treatment program is currently being managed by RMS and is not part of the ACCIONA (Pacifco) Scope of Works and Technical Criteria.

### **Upcoming Community and stakeholder activities:**

- Quarterly community information sessions will be held in 2016, the first being held in the first week of February.
- Community Construction Tours will commence in late February 2016. The free tours will be held monthly (bookings are essential).

## 2. Weather

### 2.1 Discussion

The automatic recording weather station at the main site compounds (north and south) records rainfall totals daily at 9AM. The total rainfall received for the month is as follows:-

Table 2 - Precipitation

| Month               | Total monthly rainfall | Location              |
|---------------------|------------------------|-----------------------|
| 01/11/15 – 30/11/15 | 139.6mm                | Northern Compound     |
| 01/11/15 – 30/11/15 | 134.4mm                | Albert Drive Compound |

The site experienced a total of 15 rain days throughout the month of November 2015.

During November, rainfall received on site was higher than the November monthly average of 117.1mm. A summary of weather conditions recorded over the month for Smoky Cape by the Bureau of Meteorology is detailed below in Table 2.3.

The daily summaries for rainfall received in November at the Albert Drive Compound and Northern Compound are shown below in Table 2.1 and 2.2.

Table 2.1 – Rainfall recorded at Albert Drive Southern Compound Automated Weather Station

| Date       | Time    | TOTAL Rain Gauge |
|------------|---------|------------------|
| 1/11/2015  | 9:00:00 | 0.4              |
| 2/11/2015  | 9:00:00 | 0                |
| 3/11/2015  | 9:00:00 | 0                |
| 4/11/2015  | 9:00:00 | 13.6             |
| 5/11/2015  | 9:00:00 | 17.4             |
| 6/11/2015  | 9:00:00 | 7.6              |
| 7/11/2015  | 9:00:00 | 0                |
| 8/11/2015  | 9:00:00 | 43.6             |
| 9/11/2015  | 9:00:00 | 16               |
| 10/11/2015 | 9:00:00 | 0                |
| 11/11/2015 | 9:00:00 | 0                |
| 12/11/2015 | 9:00:00 | 0                |
| 13/11/2015 | 9:00:00 | 0                |
| 14/11/2015 | 9:00:00 | 14.2             |
| 15/11/2015 | 9:00:00 | 14.8             |

| Date       | Time    | TOTAL Rain Gauge |
|------------|---------|------------------|
| 16/11/2015 | 9:00:00 | 1                |
| 17/11/2015 | 9:00:00 | 0.8              |
| 18/11/2015 | 9:00:00 | 0                |
| 19/11/2015 | 9:00:00 | 0                |
| 20/11/2015 | 9:00:00 | 0                |
| 21/11/2015 | 9:00:00 | 0                |
| 22/11/2015 | 9:00:00 | 2.2              |
| 23/11/2015 | 9:00:00 | 0                |
| 24/11/2015 | 9:00:00 | 0                |
| 25/11/2015 | 9:00:00 | 0                |
| 26/11/2015 | 9:00:00 | 0                |
| 27/11/2015 | 9:00:00 | 0                |
| 28/11/2015 | 9:00:00 | 0.4              |
| 29/11/2015 | 9:00:00 | 1.6              |
| 30/11/2015 | 9:00:00 | 0.8              |

Table 2.2 – Rainfall recorded at the Northern Compound Automated Weather Station

| SiteName:<br>Northern<br>Compound |         |                  |
|-----------------------------------|---------|------------------|
| Date                              | Time    | TOTAL Rain Gauge |
| 1/11/2015                         | 9:00:00 | 0.2              |
| 2/11/2015                         | 9:00:00 | 0                |
| 3/11/2015                         | 9:00:00 | 2                |
| 4/11/2015                         | 9:00:00 | 8.2              |
| 5/11/2015                         | 9:00:00 | 21.8             |
| 6/11/2015                         | 9:00:00 | 4.2              |
| 7/11/2015                         | 9:00:00 | 0.2              |
| 8/11/2015                         | 9:00:00 | 14               |
| 9/11/2015                         | 9:00:00 | 41.4             |
| 10/11/2015                        | 9:00:00 | 0                |
| 11/11/2015                        | 9:00:00 | 0                |
| 12/11/2015                        | 9:00:00 | 0                |
| 13/11/2015                        | 9:00:00 | 0                |
| 14/11/2015                        | 9:00:00 | 27.6             |
| 15/11/2015                        | 9:00:00 | 11               |
| 16/11/2015                        | 9:00:00 | 0.6              |
| 17/11/2015                        | 9:00:00 | 0                |
| 18/11/2015                        | 9:00:00 | 0                |
| 19/11/2015                        | 9:00:00 | 0                |
| 20/11/2015                        | 9:00:00 | 0                |
| 21/11/2015                        | 9:00:00 | 0                |

|            |         |     |
|------------|---------|-----|
| 22/11/2015 | 9:00:00 | 2.6 |
| 23/11/2015 | 9:00:00 | 0   |
| 24/11/2015 | 9:00:00 | 0   |
| 25/11/2015 | 9:00:00 | 0   |
| 26/11/2015 | 9:00:00 | 0   |
| 27/11/2015 | 9:00:00 | 0   |
| 28/11/2015 | 9:00:00 | 0.6 |
| 29/11/2015 | 9:00:00 | 0.8 |
| 30/11/2015 | 9:00:00 | 4.4 |

Table 2.3: Weather conditions recorded in November 2015 at Smoky Cape by the Bureau of Meteorology.

| November 2015 |                          |                          |               |
|---------------|--------------------------|--------------------------|---------------|
| Date          | Minimum temperature (°C) | Maximum temperature (°C) | Rainfall (mm) |
| 1/11/2015     | 18.2                     | 24.1                     | 0             |
| 2/11/2015     | 19.2                     | 24.6                     | 0             |
| 3/11/2015     | 19.2                     | 26                       | 8.8           |
| 4/11/2015     | 19                       | 23.1                     | 8             |
| 5/11/2015     | 18.4                     | 20.5                     | 9.2           |
| 6/11/2015     | 19                       | 24.5                     | 5.4           |
| 7/11/2015     | 19.5                     | 26                       | 0             |
| 8/11/2015     | 18.3                     | 20.5                     | 12.4          |
| 9/11/2015     | 15.9                     | 25.1                     | 21            |
| 10/11/2015    | 16.4                     | 26.1                     | 0             |
| 11/11/2015    | 17.5                     | 26.4                     | 0             |
| 12/11/2015    | 18.5                     | 25.1                     | 0             |
| 13/11/2015    | 19.1                     | 25                       | 0             |
| 14/11/2015    | 17                       | 25.2                     | 24.5          |
| 15/11/2015    | 15.8                     | 23.9                     | 25.6          |
| 16/11/2015    | 14.7                     | 25.4                     | 2.6           |
| 17/11/2015    | 15.8                     | 26.1                     | 0             |
| 18/11/2015    | 18                       | 27.8                     | 0             |
| 19/11/2015    |                          | 30.4                     | 0             |
| 20/11/2015    |                          | 33.3                     | 0             |
| 21/11/2015    | 20.6                     | 26.3                     | 0             |
| 22/11/2015    | 17.5                     | 24.1                     | 0             |
| 23/11/2015    | 18.5                     | 26.9                     | 2             |
| 24/11/2015    | 18.7                     | 28.2                     | 0             |
| 25/11/2015    | 20.9                     | 27.2                     | 0             |
| 26/11/2015    | 21                       | 26.8                     | 0             |
| 27/11/2015    | 17.7                     | 22.5                     | 0             |
| 28/11/2015    | 17.4                     | 22.7                     | 6.8           |

| Date       | Minimum temperature (°C) | Maximum temperature (°C) | Rainfall (mm) |
|------------|--------------------------|--------------------------|---------------|
| 29/11/2015 | 19.7                     | 25                       | 0.6           |
| 30/11/2015 | 19.8                     | 29.2                     | 0             |

### 3. Surface Water Monitoring

Pacifico have been provided trigger levels for baseline monitoring from RMS, these will be compared against monthly data as well as between upstream and downstream sites to determine works impact.

Monthly sampling was undertaken by ACCIONA (Pacifico):

#### **Wet Sampling Event**

A “wet” sampling event was undertaken on the 5<sup>th</sup> November after >10mm of rainfall in a 24 hour period, field and lab tests were undertaken. Results are available in Appendix A.

#### Dissolved oxygen (DO) levels noted to be below trigger values at:

Stony Creek upstream and downstream site. This is attributed to the decomposing vegetative matter present in the waterbody at this location.

Lower Warrell Creek upstream and downstream sites. This is attributed to the low-flow environment as well as decomposing vegetative matter in the waterbody.

All upstream Gumma Wetland sites. This is attributed to the high amount of decomposing vegetative matter in the water as well as the stagnant wetlands waterbody. It is also noted that there is only one set of trigger values provided by RMS for the upstream and downstream sites rather than individual trigger levels for each site. This may result in a set of trigger values not necessarily representative of each site due to the inclusion of data not applicable to each individual site.

Nambucca River sites, both upstream and downstream. It is noted that both sites were above ANZECC criteria, and that only one set of trigger values were provided for the Nambucca River.

#### pH levels noted to outside trigger levels at:

Stony Creek upstream. It is noted that the pH value has no change in value from upstream to downstream sites (6.51), and that these values are within ANZECC criteria.

Nambucca River both sites. Comparing upstream and downstream values show that the difference between them is minimal (7.74 upstream, 7.69 downstream), and is therefore unlikely to be as a result of construction works.



Metals noted to be above trigger levels at:

Upper Warrell Creek upstream and downstream for manganese. It is noted that the values are within ANZECC criteria.

Stony Creek upstream and downstream for manganese. It is noted that these are well within ANZECC criteria.

Elevated levels were recorded at Gumma Wetlands downstream for copper, manganese, nickel, zinc and iron. Upstream values for manganese, zinc, nickel and iron were also elevated. The elevated copper results were consistent with upstream values (0.001mg/L to 0.002mg/L). Manganese was also consistent with ANZECC guidelines.

Nutrient levels above trigger levels at:

Upper Warrell Creek upstream and downstream for nitrate and total nitrogen. Upstream and downstream values for both are consistent with no major elevation after passing through the construction site.

Stony Creek downstream and upstream recorded elevated levels of nitrate. Stony Creek downstream also had elevated levels of total nitrogen. This is possibly due to the amount of vegetative matter in the waterway.

Lower Warrell Creek had elevated levels of nitrate and nitrogen upstream and downstream. This is possibly due to the decomposing vegetative material in the waterway at the downstream site.

Gumma Wetlands recorded elevated levels of nitrate, this was consistent with upstream values for the location (0.56mg/L downstream, 0.64mg/L upstream).

Nambucca River recorded elevated levels of total phosphorus, total nitrogen, nitrate. These levels were consistent with upstream values for the location.

**2<sup>nd</sup> Wet Sampling Event**

On the 25<sup>th</sup> November after >10mm of rainfall within a 24 hour period a "wet" surface water monitoring event occurred, field tests were undertaken. The results are available in Appendix A.

Below exceedances of trigger levels are discussed:

Dissolved oxygen (DO) levels noted to be below trigger values at:

Lower Warrell Creek, at the upstream and downstream locations. This is attributed to decomposing vegetative matter present at the site as well as the low-flow environment.

pH levels noted to outside trigger levels at:

Lower Warrell Creek upstream and downstream. It is noted that only one set of trigger values was provided for both upstream and downstream locations, which may result in pH levels being outside trigger values.

Gumma wetlands downstream, although it was a minimal decrease from upstream to downstream (6.48 to 5.97).

Turbidity levels noted to be above trigger levels at:

All downstream sites were below trigger values for turbidity.

**Dry Sampling Event**

A “dry” monitoring event was conducted on the 25<sup>th</sup> of November 2015, field tests were undertaken. Below exceedences of trigger levels are discussed.

Dissolved oxygen (DO) levels noted to be below trigger values at:

Stony Creek downstream, this is attributed to decomposing vegetative matter in the waterway upstream.

pH noted to be outside trigger values at:

Upper Warrell Creek upstream and downstream were below trigger values. It is noted that the pH value increased from upstream to downstream and so the low level was unlikely to be attributed to construction.

Turbidity noted to be outside trigger values at:

Stony Creek downstream recorded slightly elevated turbidity levels. It is noted that there was a minimal increase in turbidity from upstream to downstream (7.2 to 9.3). ERSED controls were checked and verified that controls were in place with no visible sediment entering the waterway from site.

Lower Warrell Creek upstream and downstream recorded elevated turbidity reading. It is noted that the turbidity level decreased from upstream to downstream (17.5 upstream to 10.4 downstream). The elevated turbidity is not as a result of construction works and could potentially be from a source further upstream.

## **4. Sediment Basin Water Monitoring**

Water was released from commissioned sediment basins between the 2<sup>nd</sup> and 30<sup>th</sup> November after rainfall and water being transferred into basins from nearby waterways. Water pumped into basins was treated and released as soon as possible, especially if rainfall is predicted in the 5 day forecast. Table 3 below has the water quality results recorded for the water release events:

Table 3 – Water Release Register

| Date       | Basin ID | Oil and Grease (visible) | pH   | Turbidity (NTU) | TSS (mg/L) | Approx Volume Discharged (kL) |
|------------|----------|--------------------------|------|-----------------|------------|-------------------------------|
| 2/11/2015  | B44.45   | N                        | 7.36 | 40.4            |            | 600                           |
| 6/11/2015  | B47.14   | N                        | 8    | 55.4            |            | 600                           |
| 6/11/2015  | B42.8    | N                        | 6.72 | 11.1            |            | 400                           |
| 6/11/2015  | B45.64   | N                        | 6.57 | 64.7            |            | 800                           |
| 9/11/2015  | B44.44   | N                        | 6.95 | 14.9            | 7          | 800                           |
| 9/11/2015  | B45.64   | N                        | 6.66 | 15.8            | 5          | 400                           |
| 10/11/2015 | B42.8    | N                        | 7.03 | 3.5             |            | 1300                          |
| 10/11/2015 | B42.87   | N                        | 7.92 | 6.6             |            | 700                           |
| 10/11/2015 | B44.55   | N                        | 6.86 | 44.2            | 6          | 700                           |
| 10/11/2015 | B60.5    | N                        | 6.62 | 18.6            |            | 350                           |
| 10/11/2015 | B60.1    | N                        | 6.91 | 60.1            |            | 400                           |
| 10/11/2015 | B60.3    | N                        | 6.53 | 2.2             |            | 170                           |
| 11/11/2015 | B44.55   | N                        | 6.93 | 48.4            |            | 400                           |
| 11/11/2015 | B48.46   | N                        | 6.95 | 5.4             |            | 800                           |
| 11/11/2015 | B56.7    | N                        | 6.75 | 7.12            |            | 400                           |
| 11/11/2015 | B60.8    | N                        | 7.5  | 66              |            | 500                           |
| 11/11/2015 | B55.5    | N                        | 7.21 | 4.3             |            | 400                           |
| 11/11/2015 | B55.17   | N                        | 6.67 | 6.3             |            | 350                           |
| 11/11/2015 | B59.00   | N                        | 7.29 | 64              |            | 900                           |
| 11/11/2015 | B59.78   | N                        | 7.01 | 41.2            |            | 700                           |
| 12/11/2015 | B59.5    | N                        | 6.82 | 3.2             |            | 180                           |
| 12/11/2015 | B58.45   | N                        | 6.81 | 45.3            |            | 750                           |
| 12/11/2015 | B56.9    | N                        | 7.14 | 7.2             |            | 650                           |
| 12/11/2015 | B55.0    | N                        | 6.72 | 54.3            |            | 1800                          |
| 13/11/2015 | B55.8    | N                        | 6.69 | 2.5             |            | 850                           |
| 13/11/2015 | B59.25   | N                        | 7.13 | 10.3            |            | 400                           |
| 13/11/2015 | B57.3    | N                        | 7.21 | 60.9            |            | 350                           |
| 13/11/2015 | B58.6    | N                        | 6.56 | 26.3            |            | 500                           |
| 13/11/2015 | B57.25   | N                        | 7.81 | 70.2            |            | 500                           |
| 13/11/2015 | B60.1    | N                        | 6.7  | 72.3            |            | 400                           |
| 14/11/2015 | B54.3    | N                        | 8.39 | 69.3            |            | 350                           |
| 16/11/2015 | B47.15   | N                        | 6.67 | 34.9            |            | 700                           |
| 17/11/2015 | B43.37   | N                        | 8.11 | 21.1            |            | 400                           |
| 17/11/2015 | B44.55   | N                        | 6.8  | 17.2            | 7          | 700                           |
| 17/11/2015 | B54.7    | N                        | 6.86 | 50.7            |            | 1500                          |
| 17/11/2015 | B56.9    | N                        | 7.17 | 37.2            |            | 600                           |
| 17/11/2015 | B60.3    | N                        | 6.86 | 26.3            |            | 170                           |

| Date       | Basin ID | Oil and Grease (visible) | pH   | Turbidity (NTU) | TSS (mg/L) | Approx Volume Discharged (kL) |
|------------|----------|--------------------------|------|-----------------|------------|-------------------------------|
| 17/11/2015 | B57.3    | N                        | 8.15 | 6.45            |            | 350                           |
| 17/11/2015 | B60.1    | N                        | 6.66 | 2.1             |            | 300                           |
| 17/11/2015 | B60.5    | N                        | 6.91 | 38.3            |            | 350                           |
| 18/11/2015 | B44.55   | N                        | 6.75 | 31.5            |            | 600                           |
| 18/11/2015 | B47.5    | N                        | 6.63 | 19.9            | 5          | 800                           |
| 18/11/2015 | B55.9    | N                        | 8.08 | 2.8             | <5         | 800                           |
| 18/11/2015 | B55.8    | N                        | 8.03 | 3.1             | <5         | 800                           |
| 18/11/2015 | B59.6    | N                        | 7.35 | 19.2            | 5          | 270                           |
| 18/11/2015 | B59.5    | N                        | 7.38 | 11.1            | <5         | 180                           |
| 18/11/2015 | B58.03   | N                        | 7.31 | 17.6            |            | 380                           |
| 18/11/2015 | B59.78   | N                        | 7.56 | 19.2            |            | 700                           |
| 18/11/2015 | B55.5    | N                        | 7.62 | 6.9             |            | 400                           |
| 19/11/2015 | B43.21   | N                        | 7.7  | 78.3            |            | 300                           |
| 19/11/2015 | B43.37   | N                        | 7.67 | 67.2            | 5          | 300                           |
| 19/11/2015 | B44.55   | N                        | 7.03 | 30.8            |            | 120                           |
| 19/11/2015 | B47.5    | N                        | 7.05 | 42.1            |            | 600                           |
| 20/11/2015 | B47.6    | N                        | 6.61 | 21.5            |            | 200                           |
| 20/11/2015 | B49.07   | N                        | 7.21 | 28.1            |            | 400                           |
| 20/11/2015 | B49.2    | N                        | 7.21 | 28.1            |            | 400                           |
| 20/11/2015 | B54.7    | N                        | 6.38 | 22.6            |            | 1500                          |
| 23/11/2015 | B42.00   | N                        | 7.98 | 24              |            | 400                           |
| 23/11/2015 | B49.67   | N                        | 6.94 | 33.3            |            | 375                           |
| 27/11/2015 | B47.15   | N                        | 7.12 | 30.3            |            | 400                           |
| 27/11/2015 | B47.96   | N                        | 6.94 | 33.7            |            | 100                           |
| 30/11/2015 | B44.55   | N                        | 6.72 | 17.7            |            | 150                           |
| 30/11/2015 | B47.6    | N                        | 8.42 | 13.9            |            | 100                           |

- **Green** = Water released from sediment trap

## 5. Noise Monitoring

Monthly routine construction noise monitoring was undertaken on the 19<sup>th</sup>, 20<sup>th</sup> and 23<sup>rd</sup> November at eight locations near to construction works. Results from this are available in Appendix A.

All sites were within predicted levels for the activity being undertaken.

## 6. Vibration Monitoring

Vibration monitoring was undertaken as part of blasting works.

### 6.1 Blasting

Five blasting events occurred in November 2015 – 3<sup>rd</sup>, 12<sup>th</sup>, 17<sup>th</sup>, 24<sup>th</sup>, 26<sup>th</sup> November. No exceedances of overpressure or vibration limits occurred from these blasts.

There were no exceedances for overpressure from these five blasts, the highest recorded was 124.9dB on the 24<sup>th</sup> of November 2015 (this occurred at a residence with agreement for 125dB blasting).

We are required to achieve less than 5% exceedance (of 5mm/s limit) within a 12month period for those sensitive receptors that have not agreed to the 25mm/s limit. We have anticipated a total of 49 blasts. At the end of November our percentage is 11.54% from commencement of production blasting.

Note: only one exceedance in the last 24 blasts

## 7. Dust Monitoring

Dust deposition gauges (DDG) were placed at nearby sensitive receivers from the 12<sup>th</sup> October 2015 to 12<sup>th</sup> to 13<sup>th</sup> November 2015. DDG results are available in Appendix A.

An elevated level of 8.2g/m<sup>2</sup>/month Total Insoluble Matter (TIM) was recorded at dust deposition gauge DDG6. It was noted during changeover of the dust gauge bottle that the lawn around the gauge had been mowed, with a large amount of grass clippings and gecko excretion present in the gauge. It is likely that these contributed to the exceedance of total insoluble matter. The total ash content (typically more associated with construction activities vs. TIM) for DDG6 was below 4g/m<sup>2</sup>/month, with only 2.8g/m<sup>2</sup>/month.

An elevated level of 18.9g/m<sup>2</sup>/month Total Insoluble Matter was recorded at dust deposition gauge DDG5, with an Ash Content level of 15.8g/m<sup>2</sup>/month. It was noted that the result was very unusual due to the hydromulching of abutment (26<sup>th</sup> Oct 15) nearby as well as the ceasing of the truck and dog movements through the area that were likely contributors to previous exceedances due to construction activities. Additional gauges will be set up along the alignment to try and further identify the cause of this exceedance.

Surfactant additives have been and will continue to be utilised on site in water carts to assist with dust mitigation. Extra water carts have also been utilised by the project to suppress dust emissions from site, as well as utilisation of water carts outside of standard construction hours to assist in reducing dust emissions from the project.

## 8. Groundwater Monitoring

ACCIONA (Pacífico) have undertaken groundwater monitoring on the 26<sup>th</sup> and 27<sup>th</sup> of November 2015. The results from the groundwater monitoring is available in Table 4 of Appendix A.

The groundwater monitoring results have been provided to RMS to provide advice on the trigger levels determined during the baseline sampling. The finalised groundwater report from the baseline sampling has not been issued from RMS to Pacífico including groundwater triggers.

## 9. Acoustic Investigations

Acoustic Investigations (modelling) have been conducted and approved for several Out of Hours Works proposed to model impact on residents during the month of November 2015. A summary of these approvals is below in Table 4.

Table 4 – November Out of Hours Works Assessed

| OOH Request Title              | Residential Agreements Required (Y/N) | Approval Date |
|--------------------------------|---------------------------------------|---------------|
| Butchers Creek Pumping         | N                                     | 18/11/2015    |
| Rosewood Drive Finishing Works | N                                     | 28/11/2015    |
| Quarry Culvert Switchover      | N                                     | 20/11/2015    |

## **10. Complaints**

### **10.1 Summary of Complaints for the month**

The following is a brief summary of environmental complaints received in November 2015.

On the 9<sup>th</sup> of November, a resident of Macksville (Kerr Drive) contacted AFJV regarding concerns about management of run-off from the site. AFJV undertook an inspection of the resident's property as well as an explanation of permanent drainage design for the area. Remediation works were undertaken as well as additional ERSED controls being utilised to further strengthen controls in the area and ensure compliance with PESCP for the area.

On the 20<sup>th</sup> of November a resident of Donnellyville (Pacific Highway) contacted AFJV regarding dust generation concerns. Additional water carts have been allocated to this area during construction hours, as well as the utilisation of water carts over Saturday and Sunday to minimise dust generation during high wind periods.

On the 24<sup>th</sup> of November, a resident of Warrell Creek (Albert Drive) contacted AFJV regarding concerns about noise and dust generated from truck movements on Albert Drive. An inspection at the site was undertaken in addition to a meeting with the resident to explain additional mitigation measures including: house and tank cleaning, as well as increasing the frequency of sweeper truck passes at this areas during periods of high truck movement to help reduce dust generation on the roadway. The new Albert Drive Connection will also assist greatly in reducing truck movements on the existing Albert Drive, which is scheduled to be opened in early 2016.

On the 26<sup>th</sup> of November, a resident of North Macksville (Old Coast Road) contacted AFJV regarding concerns about dust generation during high wind. Frequency of water carts to the area adjacent to the resident was increased. Polo Citrus surfactant is also continuing to be utilised along the alignment throughout November to assist in dust emission reduction.

## **11. Non-Compliance**

### **11.1 Summary of Non-compliances**

No non-compliances have been raised on the site during the month of November 2015.

### Appendix A – Monitoring Results

Table 1a - Surface Water Sampling Results November – 1<sup>st</sup> Wet

| Location                                   | Units | Levels of Concern                 | SW01                |           |        | SW02                |           |        | SW03        |           |        | SW04        |           |        | SW05                |           |        | SW06                |           |        | SW07                     |           |        | SW08                     |           |        | SW09                      |           |        | SW10                 |           |         | SW11                 |           |        |            |   |  |
|--|-------|-----------------------------------|---------------------|-----------|--------|---------------------|-----------|--------|-------------|-----------|--------|-------------|-----------|--------|---------------------|-----------|--------|---------------------|-----------|--------|--------------------------|-----------|--------|--------------------------|-----------|--------|---------------------------|-----------|--------|----------------------|-----------|---------|----------------------|-----------|--------|------------|---|--|
|  |       |                                   | Upper Warrell Creek |           |        | Upper Warrell Creek |           |        | Stony Creek |           |        | Stony Creek |           |        | Lower Warrell Creek |           |        | Lower Warrell Creek |           |        | Unnamed Creek Gumma West |           |        | Unnamed Creek Gumma East |           |        | Unnamed Creek Gumma North |           |        | Nambucca River South |           |         | Nambucca River South |           |        |            |   |  |
|  |       |                                   | 80th %ile           | 20th %ile | Result | 80th %ile           | 20th %ile | Result | 80th %ile   | 20th %ile | Result | 80th %ile   | 20th %ile | Result | 80th %ile           | 20th %ile | Result | 80th %ile           | 20th %ile | Result | 80th %ile                | 20th %ile | Result | 80th %ile                | 20th %ile | Result | 80th %ile                 | 20th %ile | Result | 80th %ile            | 20th %ile | Result  | 80th %ile            | 20th %ile | Result |            |   |  |
| Freshwater / Estuarine                     |       | ANZECC 2000 95% species protected | Upstream            |           |        | Downstream          |           |        | Upstream    |           |        | Downstream  |           |        | Upstream            |           |        | Downstream          |           |        | Upstream                 |           |        | Downstream               |           |        | Upstream                  |           |        | Downstream           |           |         | Upstream             |           |        | Downstream |   |  |
| Date of Sampling                           |       |                                   | 5-Nov-15            |           |        | 5-Nov-15            |           |        | 5-Nov-15    |           |        | 5-Nov-15    |           |        | 5-Nov-15            |           |        | 5-Nov-15            |           |        | 5-Nov-15                 |           |        | 5-Nov-15                 |           |        | 5-Nov-15                  |           |        | 5-Nov-15             |           |         | 5-Nov-15             |           |        | 5-Nov-15   |   |  |
| Time of Sampling                           |       | Freshwater Marine                 | 8:45 AM             |           |        | 8:20 AM             |           |        | 9:30 AM     |           |        | 9:00 AM     |           |        | 12:45 PM            |           |        | 12:30 PM            |           |        | 11:30 AM                 |           |        | 11:00 AM                 |           |        | 11:15 AM                  |           |        | 12:00 PM             |           |         | 11:50 AM             |           |        |            |   |  |
| Comments                                   |       |                                   |                     |           |        |                     |           |        |             |           |        |             |           |        |                     |           |        |                     |           |        |                          |           |        |                          |           |        |                           |           |        |                      |           |         |                      |           |        |            |   |  |
| Laboratory data                            |       |                                   |                     |           |        |                     |           |        |             |           |        |             |           |        |                     |           |        |                     |           |        |                          |           |        |                          |           |        |                           |           |        |                      |           |         |                      |           |        |            |   |  |
| <b>Metals</b>                              |       |                                   |                     |           |        |                     |           |        |             |           |        |             |           |        |                     |           |        |                     |           |        |                          |           |        |                          |           |        |                           |           |        |                      |           |         |                      |           |        |            |   |  |
| Aluminium                                  | mg/L  | 0.055                             | -                   | 0.244     | 0.0162 | 0.02                | 0.194     | 0.016  | 0.02        | 0.098     | 0.02   | <0.01       | 0.114     | 0.01   | <0.01               | 0.28      | 0.01   | 0.03                | 0.28      | 0.01   | 0.03                     | 0.25      | 0.02   | 0.06                     | 0.25      | 0.02   | 0.11                      | 0.25      | 0.02   | 0.1                  | 0.11      | 0.01    | <0.01                | 0.11      | 0.01   | 0.01       |   |  |
| Arsenic                                    | mg/L  | 0.024                             | 0.0023              | 0.001     | 0.001  | 0.001               | 0.001     | 0.001  | 0.001       | 0.002     | 0.001  | <0.0001     | 0.002     | 0.001  | 0.002               | 0.001     | 0.001  | 0.001               | 0.001     | 0.001  | <0.0001                  | 0.002     | 0.001  | 0.003                    | 0.002     | 0.001  | 0.001                     | 0.002     | 0.001  | 0.002                | 0.001     | 0.002   | 0.001                | 0.004     | 0.002  | 0.001      |   |  |
| Cadmium                                    | mg/L  | 0.0002                            | 0.0055              | -         | -      | <0.0001             | -         | -      | <0.0001     | -         | -      | <0.0001     | -         | -      | <0.0001             | 0.0002    | 0.0001 | 0.0002              | 0.0002    | 0.0001 | <0.0001                  | -         | -      | <0.0001                  | -         | -      | <0.0001                   | -         | -      | 0.0007               | -         | <0.0001 | -                    | <0.0001   | -      | <0.0001    |   |  |
| Chromium                                   | mg/L  | 0.001                             | 0.0044              | -         | -      | <0.001              | -         | -      | <0.001      | -         | -      | <0.001      | -         | -      | <0.001              | -         | -      | <0.001              | -         | -      | <0.001                   | -         | -      | <0.001                   | -         | -      | <0.001                    | -         | -      | <0.001               | -         | <0.001  | -                    | <0.001    | -      | <0.001     |   |  |
| Copper                                     | mg/L  | 0.0014                            | 0.0013              | -         | -      | 0.001               | -         | -      | <0.001      | -         | -      | <0.001      | -         | -      | <0.001              | -         | -      | <0.001              | -         | -      | <0.001                   | 0.001     | 0.001  | <0.001                   | 0.001     | 0.001  | 0.001                     | 0.001     | 0.001  | 0.001                | 0.001     | 0.001   | 0.001                | 0.001     | 0.001  | 0.001      |   |  |
| Lead                                       | mg/L  | 0.0034                            | 0.0044              | -         | -      | <0.001              | -         | -      | <0.001      | -         | -      | <0.001      | -         | -      | <0.001              | -         | -      | <0.001              | -         | -      | <0.001                   | -         | -      | <0.001                   | -         | -      | <0.001                    | -         | -      | <0.001               | -         | <0.001  | -                    | <0.001    | -      | <0.001     |   |  |
| Manganese                                  | mg/L  | 1.9                               | 0.08                | 0.3       | 0.01   | 0.441               | 0.158     | 0.0178 | 0.187       | 0.0726    | 0.0218 | 0.084       | 0.083     | 0.0164 | 0.168               | 0.35      | 0.087  | 0.6                 | 0.35      | 0.087  | 0.209                    | 0.49      | 0.011  | 0.684                    | 0.49      | 0.011  | 0.598                     | 0.49      | 0.011  | 0.011                | 0.038     | 0.076   | 0.006                | 0.038     | 0.076  | 0.006      |   |  |
| Nickel                                     | mg/L  | 0.011                             | 0.07                | -         | -      | 0.002               | -         | -      | 0.004       | -         | -      | <0.001      | -         | -      | 0.002               | 0.0034    | 0.001  | 0.02                | 0.0034    | 0.001  | <0.001                   | 0.002     | 0.001  | 0.003                    | 0.002     | 0.001  | 0.001                     | 0.002     | 0.001  | 0.002                | 0.001     | 0.002   | 0.001                | 0.002     | 0.001  | 0.002      |   |  |
| Selenium                                   | mg/L  | 11                                | -                   | -         | -      | <0.01               | -         | -      | <0.01       | -         | -      | <0.01       | -         | -      | <0.01               | -         | -      | <0.01               | -         | -      | <0.01                    | -         | -      | <0.01                    | -         | -      | <0.01                     | -         | -      | <0.01                | -         | -       | 0.02                 | -         | -      | 0.02       |   |  |
| Silver                                     | mg/L  | 0.00005                           | 0.0014              | -         | -      | <0.001              | -         | -      | <0.001      | -         | -      | <0.001      | -         | -      | <0.001              | -         | -      | <0.001              | -         | -      | <0.001                   | -         | -      | <0.001                   | -         | -      | <0.001                    | -         | -      | <0.001               | -         | <0.001  | -                    | <0.001    | -      | <0.001     |   |  |
| Zinc                                       | mg/L  | 0.008                             | 0.015               | 0.007     | 0.005  | 0.01                | 0.0062    | 0.0042 | <0.005      | 0.0064    | 0.005  | <0.005      | 0.006     | 0.005  | 0.01                | 0.018     | 0.005  | 0.059               | 0.018     | 0.005  | <0.005                   | 0.011     | 0.005  | 0.02                     | 0.011     | 0.005  | 0.009                     | 0.011     | 0.005  | 0.267                | 0.005     | 0.005   | <0.005               | 0.005     | 0.005  | <0.005     |   |  |
| Iron                                       | mg/L  | -                                 | -                   | 1.38      | 0.48   | 0.42                | 0.99      | 0.366  | 0.28        | 1.4       | 0.41   | 0.5         | 1.48      | 0.35   | <0.05               | 0.52      | 0.05   | 0.1                 | 0.52      | 0.05   | 0.1                      | 1.65      | 0.37   | 3.88                     | 1.65      | 0.37   | 2.79                      | 1.65      | 0.37   | 2.64                 | 0.26      | 0.05    | <0.05                | 0.26      | 0.05   | <0.05      |   |  |
| Mercury                                    | mg/L  | 0.0006                            | 0.0004              | -         | -      | <0.0001             | -         | -      | <0.0001     | -         | -      | <0.0001     | -         | -      | <0.0001             | -         | -      | <0.0001             | -         | -      | <0.0001                  | -         | -      | <0.0001                  | -         | -      | <0.0001                   | -         | -      | <0.0001              | -         | <0.0001 | -                    | <0.0001   | -      | <0.0001    |   |  |
| <b>Total Recoverable Hydrocarbons</b>      |       |                                   |                     |           |        |                     |           |        |             |           |        |             |           |        |                     |           |        |                     |           |        |                          |           |        |                          |           |        |                           |           |        |                      |           |         |                      |           |        |            |   |  |
| Naphthalene                                | µg/L  | 16                                | 50                  | 16        | -      | 16                  | -         | -      | 16          | -         | -      | 16          | -         | -      | 16                  | -         | -      | 16                  | -         | -      | 16                       | -         | -      | 16                       | -         | -      | 16                        | -         | -      | 16                   | -         | -       | 50                   | -         | 50     | -          |   |  |
| C6 - C10 Fraction                          | µg/L  | -                                 | -                   | -         | -      | -                   | -         | -      | -           | -         | -      | -           | -         | -      | -                   | -         | -      | -                   | -         | -      | -                        | -         | -      | -                        | -         | -      | -                         | -         | -      | -                    | -         | -       | -                    | -         | -      | -          |   |  |
| C6 - C10 Fraction minus BTEX (F1)          | µg/L  | -                                 | -                   | -         | -      | -                   | -         | -      | -           | -         | -      | -           | -         | -      | -                   | -         | -      | -                   | -         | -      | -                        | -         | -      | -                        | -         | -      | -                         | -         | -      | -                    | -         | -       | -                    | -         | -      | -          |   |  |
| >C10 - C16 Fraction                        | µg/L  | -                                 | -                   | -         | -      | -                   | -         | -      | -           | -         | -      | -           | -         | -      | -                   | -         | -      | -                   | -         | -      | -                        | -         | -      | -                        | -         | -      | -                         | -         | -      | -                    | -         | -       | -                    | -         | -      | -          |   |  |
| >C16 - C34 Fraction                        | µg/L  | -                                 | -                   | -         | -      | -                   | -         | -      | -           | -         | -      | -           | -         | -      | -                   | -         | -      | -                   | -         | -      | -                        | -         | -      | -                        | -         | -      | -                         | -         | -      | -                    | -         | -       | -                    | -         | -      | -          |   |  |
| >C34 - C40 Fraction                        | µg/L  | -                                 | -                   | -         | -      | -                   | -         | -      | -           | -         | -      | -           | -         | -      | -                   | -         | -      | -                   | -         | -      | -                        | -         | -      | -                        | -         | -      | -                         | -         | -      | -                    | -         | -       | -                    | -         | -      | -          |   |  |
| >C10 - C40 Fraction (sum)                  | µg/L  | -                                 | -                   | -         | -      | -                   | -         | -      | -           | -         | -      | -           | -         | -      | -                   | -         | -      | -                   | -         | -      | -                        | -         | -      | -                        | -         | -      | -                         | -         | -      | -                    | -         | -       | -                    | -         | -      | -          |   |  |
| >C10 - C16 Fraction minus Naphthalene (F2) | µg/L  | -                                 | -                   | -         | -      | -                   | -         | -      | -           | -         | -      | -           | -         | -      | -                   | -         | -      | -                   | -         | -      | -                        | -         | -      | -                        | -         | -      | -                         | -         | -      | -                    | -         | -       | -                    | -         | -      | -          |   |  |
| <b>BTEX</b>                                |       |                                   |                     |           |        |                     |           |        |             |           |        |             |           |        |                     |           |        |                     |           |        |                          |           |        |                          |           |        |                           |           |        |                      |           |         |                      |           |        |            |   |  |
| Benzene                                    | µg/L  | 950                               | 700                 | 950       | -      | 950                 | -         | -      | 950         | -         | -      | 950         | -         | -      | 950                 | -         | -      | 950                 | -         | -      | 950                      | -         | -      | 950                      | -         | -      | 950                       | -         | -      | 700                  | -         | 700     | -                    | -         | -      | -          |   |  |
| Toluene                                    | µg/L  | 180                               | 180                 | 180       | -      | 180                 | -         | -      | 180         | -         | -      | 180         | -         | -      | 180                 | -         | -      | 180                 | -         | -      | 180                      | -         | -      | 180                      | -         | -      | 180                       | -         | -      | 180                  | -         | 180     | -                    | 180       | -      | 180        | - |  |
| Ethylbenzene                               | µg/L  | 80                                | 5                   | 80        | -      | 80                  | -         | -      | 80          | -         | -      | 80          | -         | -      | 80                  | -         | -      | 80                  | -         | -      | 80                       | -         | -      | 80                       | -         | -      | 80                        | -         | -      | 5                    | -         | 5       | -                    | 5         | -      | 5          |   |  |
| m&p-Xylenes                                | µg/L  | -                                 | -                   | -         | -      | -                   | -         | -      | -           | -         | -      | -           | -         | -      | -                   | -         | -      | -                   | -         | -      | -                        | -         | -      | -                        | -         | -      | -                         | -         | -      | -                    | -         | -       | -                    | -         | -      | -          |   |  |
| o-Xylene                                   | µg/L  | 350                               | 350                 | 350       | -      | 350                 | -         | -      | 350         | -         | -      | 350         | -         | -      | 350                 | -         | -      | 350                 | -         | -      | 350                      | -         | -      | 350                      | -         | -      | 350                       | -         | -      | 350                  | -         | 350     | -                    | 350       | -      | 350        |   |  |
| Xylenes - Total                            | µg/L  | -                                 | -                   | -         | -      | -                   | -         | -      | -           | -         | -      | -           | -         | -      | -                   | -         | -      | -                   | -         | -      | -                        | -         | -      | -                        | -         | -      | -                         | -         | -      | -                    | -         | -       | -                    | -         | -      | -          |   |  |
| Sum of BTEX                                | µg/L  | -                                 | -                   | -         | -      | -                   | -         | -      | -           | -         | -      | -           | -         | -      | -                   | -         | -      | -                   | -         | -      | -                        | -         | -      | -                        | -         | -      | -                         | -         | -      | -                    | -         | -       | -                    | -         | -      | -          |   |  |
| <b>Nutrients</b>                           |       |                                   |                     |           |        |                     |           |        |             |           |        |             |           |        |                     |           |        |                     |           |        |                          |           |        |                          |           |        |                           |           |        |                      |           |         |                      |           |        |            |   |  |
| Total Phosphorus                           | mg/L  | 0.05                              | 0.03                | 0.05      | 0.02   | 0.03                | 0.044     | 0.016  | 0.02        | 0.03      | 0.016  | 0.05        | 0.034     | 0.01   | 0.02                | 0.04      | 0.01   | 0.01                | 0.04      | 0.01   | 0.02                     | 0.11      | 0.03   | 0.14                     | 0.11      | 0.03   | 0.35                      | 0.11      | 0.03   | 0.11                 | 0.07      | 0.02    | 0.26                 | 0.07      | 0.02   |            |   |  |
| Phosphate (reactive phosphorus)            | mg/L  | -                                 | -                   | 0.01      | 0.0034 | <0.01               | 0.01      | 0.004  | <0.01       | 0.018     | 0.0022 | <0.01       | 0.01      | 0.003  | <0.01               | 0.011     | 0.006  | <0.01               | 0.011     | 0.006  | <0.01                    | 0.013     | 0.005  | <0.01                    | 0.013     | 0.005  | 0.03                      | 0.013     | 0.005  | <0.01                | 0.029     | 0.01    | <0.01                | 0.029     | 0.01   | <0.01      |   |  |
| Total Nitrogen                             | mg/L  | 0.5                               | 0.3                 | 0.56      | 0.3    | 1                   | 0.52      | 0.2    | 1           | 0.48      | 0.2    | 1.7         | 0.63      | 0.2    | 2.3                 | 0.54      | 0.31   | 0.8                 | 0.54      | 0.31   | 1.2                      | 3.1       | 0.9    | 2.5                      | 3.1       | 0.9    | 6                         | 3.1       | 0.9    | 2.6                  | 0.46      | 0.2     | 0.8                  | 0.46      | 0.2    |            |   |  |
| Total Kjeldahl Nitrogen                    | mg/L  | -                                 | -                   | 0.5       | 0.3    | 0.6                 | 0.5       | 0.2    | 0.5         | 0.34      | 0.2    | 0.5         | 0.6       | 0.2    | 0.6                 | 0.5       | 0.2    | 0.4                 | 0.5       | 0.2    | 0.6                      | 2.8       | 0.8    | 2.4                      | 2.8       | 0.8    | 5.4                       | 2.8       | 0.8    | 2                    | 0.3       | 0.2     | 0.4                  | 0.3       | 0.2    |            |   |  |
| Nitrate                                    | mg/L  | 0.7                               | -                   | 0.102     | 0.01   | 0.35                | 0.054     | 0.01   | 0.49        | 0.208     | 0.01   | 1.17        | 0.2       | 0.01   | 1.72                | 0.05      | 0.01   | 0.38                | 0.05      | 0.01   | 0.65                     | 0.03      | 0.01   | 0.13                     | 0.03      | 0.01   | 0.64                      | 0.03      | 0.01   | 0.56                 | 0.04      | 0.01    | 0.38                 | 0.04      | 0.01   |            |   |  |
| Nitrite                                    | mg/L  | -                                 | -                   | -         | -      | <0.01               | -         | -      | <0.01       | -         | -      | <0.01       | 0.02      | 0.01   | <0.01               | 0.02      | 0.01   | <0.01               | 0.02      | 0.01   | <0.01                    | 0.02      | 0.01   | <0.01                    | 0.02      | 0.01   | <0.01                     | 0.02      | 0.01   | <0.01                | 0.02      | 0.01    | <0.01                | 0.02      | 0.01   | <0.01      |   |  |
| Ammonia                                    | mg/L  | 0.9                               | -                   | 0.036     | 0.01   | 0.03                | 0.02      | 0.01   | 0.02        | 0.046     | 0.02   |             |           |        |                     |           |        |                     |           |        |                          |           |        |                          |           |        |                           |           |        |                      |           |         |                      |           |        |            |   |  |



Table 1b – Surface Water Sampling Results November – 2<sup>nd</sup> Wet

| Location                   | Units | Levels of Concern | Upper Warrell Creek |           |                                   | Upper Warrell Creek |           |                                   | Stony Creek |           |                                   | Stony Creek |           |                                   | Lower Warrell Creek |           |                                   | Lower Warrell Creek |           |                                   | Unnamed Creek Gumma West |           |                                   | Unnamed Creek Gumma East |           |                                   | Unnamed Creek Gumma North |           |                                   | Nambucca River South |           |                                   | Nambucca River South |        |                                   |       |
|----------------------------|-------|-------------------|---------------------|-----------|-----------------------------------|---------------------|-----------|-----------------------------------|-------------|-----------|-----------------------------------|-------------|-----------|-----------------------------------|---------------------|-----------|-----------------------------------|---------------------|-----------|-----------------------------------|--------------------------|-----------|-----------------------------------|--------------------------|-----------|-----------------------------------|---------------------------|-----------|-----------------------------------|----------------------|-----------|-----------------------------------|----------------------|--------|-----------------------------------|-------|
|                            |       |                   | Upstream            |           |                                   | Downstream          |           |                                   | Upstream    |           |                                   | Downstream  |           |                                   | Upstream            |           |                                   | Downstream          |           |                                   | Upstream                 |           |                                   | Downstream               |           |                                   | Upstream                  |           |                                   | Downstream           |           |                                   |                      |        |                                   |       |
|                            |       |                   | Freshwater          | Marine    | ANZECC 2000 95% species protected | Freshwater          | Marine    | ANZECC 2000 95% species protected | Freshwater  | Marine    | ANZECC 2000 95% species protected | Freshwater  | Marine    | ANZECC 2000 95% species protected | Freshwater          | Marine    | ANZECC 2000 95% species protected | Freshwater          | Marine    | ANZECC 2000 95% species protected | Freshwater               | Marine    | ANZECC 2000 95% species protected | Freshwater               | Marine    | ANZECC 2000 95% species protected | Freshwater                | Marine    | ANZECC 2000 95% species protected | Freshwater           | Marine    | ANZECC 2000 95% species protected | Freshwater           | Marine | ANZECC 2000 95% species protected |       |
| Date of Sampling           |       |                   | 16-Nov-15           | 16-Nov-15 | 16-Nov-15                         | 16-Nov-15           | 16-Nov-15 | 16-Nov-15                         | 16-Nov-15   | 16-Nov-15 | 16-Nov-15                         | 16-Nov-15   | 16-Nov-15 | 16-Nov-15                         | 16-Nov-15           | 16-Nov-15 | 16-Nov-15                         | 16-Nov-15           | 16-Nov-15 | 16-Nov-15                         | 16-Nov-15                | 16-Nov-15 | 16-Nov-15                         | 16-Nov-15                | 16-Nov-15 | 16-Nov-15                         | 16-Nov-15                 | 16-Nov-15 | 16-Nov-15                         | 16-Nov-15            | 16-Nov-15 | 16-Nov-15                         |                      |        |                                   |       |
| Time of Sampling           |       |                   | 11:15 AM            | 11:15 AM  | 11:15 AM                          | 11:00 AM            | 11:00 AM  | 11:00 AM                          | 12:00 PM    | 12:00 PM  | 12:00 PM                          | 11:45 AM    | 11:45 AM  | 11:45 AM                          | 2:15 PM             | 2:15 PM   | 2:15 PM                           | 2:10 PM             | 2:10 PM   | 2:10 PM                           | 1:00 PM                  | 1:00 PM   | 1:00 PM                           | 1:10 PM                  | 1:10 PM   | 1:10 PM                           | 12:45 PM                  | 12:45 PM  | 12:45 PM                          | 1:30 PM              | 1:30 PM   |                                   |                      |        |                                   |       |
| Comments                   |       |                   |                     |           |                                   |                     |           |                                   |             |           |                                   |             |           |                                   |                     |           |                                   |                     |           |                                   |                          |           |                                   |                          |           |                                   |                           |           |                                   |                      |           |                                   |                      |        |                                   |       |
| <b>Field Physical data</b> |       |                   |                     |           |                                   |                     |           |                                   |             |           |                                   |             |           |                                   |                     |           |                                   |                     |           |                                   |                          |           |                                   |                          |           |                                   |                           |           |                                   |                      |           |                                   |                      |        |                                   |       |
| Temperature                | °C    | -                 | -                   | 24.3      | 16.27                             | 19.65               | 24.52     | 16.79                             | 19.97       | 23.98     | 17.36                             | 19.65       | 24.7      | 17.65                             | 19.21               | 25.9      | 19.5                              | 23.29               | 25.9      | 19.5                              | 23.1                     | 25.84     | 19.1                              | 22.87                    | 25.84     | 19.1                              | 20.85                     | 25.84     | 19.1                              | 26.08                | 26.56     | 21.32                             | 22.9                 | 26.56  | 21.32                             | 23.62 |
| pH                         | pH    | -                 | 6.5-8               | 7.478     | 6.23                              | 6.14                | 7.192     | 6.42                              | 6.69        | 7.138     | 6.61                              | 6.58        | 6.98      | 6.21                              | 6.64                | 6.86      | 6.46                              | 7.33                | 6.86      | 6.46                              | 7.09                     | 6.9       | 6.08                              | 6.48                     | 6.9       | 6.08                              | 6.7                       | 6.9       | 6.08                              | 5.97                 | 7.56      | 6.58                              | 7.53                 | 7.56   | 6.58                              | 7.42  |
| Conductivity               | mS/cm | 0.125-2.2         | -                   | 0.3204    | 0.20184                           | 0.255               | 0.3242    | 0.19076                           | 0.246       | 0.313     | 0.2024                            | 0.266       | 0.309     | 0.20188                           | 0.26                | 20.918    | 0.50928                           | 3.35                | 20.918    | 0.50928                           | 3.18                     | 0.842     | 0.334                             | 0.608                    | 0.842     | 0.334                             | 0.803                     | 0.842     | 0.334                             | 1.39                 | 48.42     | 12.65                             | 25.2                 | 48.42  | 12.65                             | 24    |
| Turbidity                  | NTU   | 50                | 10                  | 26.16     | 5.94                              | 0.7                 | 27.32     | 3.72                              | 0.5         | 14.98     | 3.34                              | 2.3         | 17.16     | 4.59                              | 6                   | 26.1      | 2.4                               | 6.8                 | 26.1      | 2.4                               | 5.9                      | 66.8      | 11.6                              | 53                       | 66.8      | 11.6                              | 7.6                       | 66.8      | 11.6                              | 78.9                 | 19.04     | 5.81                              | 3.3                  | 19.04  | 5.81                              | 17.8  |
| Dissolved Oxygen           | mg/L  | 5                 | 5                   | 7.43      | 1.5                               | 5.42                | 6.88      | 2.28                              | 6.03        | 8.472     | 5.08                              | 8.35        | 7.59      | 4.42                              | 4.42                | 6.65      | 5.02                              | 4.46                | 6.65      | 5.02                              | 4.27                     | 7.3       | 1.78                              | 5.42                     | 7.3       | 1.78                              | 4.29                      | 7.3       | 1.78                              | 6.24                 | 8.47      | 6.88                              | 6.3                  | 8.47   | 6.88                              | 7.07  |
| TDS                        | g/L   | -                 | -                   | -         | -                                 | 0.166               | -         | -                                 | 0.16        | -         | -                                 | 0.173       | -         | -                                 | 0.169               | -         | -                                 | 2.15                | -         | -                                 | 2.03                     | -         | -                                 | 0.389                    | -         | -                                 | 0.514                     | -         | -                                 | 0.888                | -         | -                                 | 15.6                 | -      | -                                 | 14.9  |

Table 1c – Surface Water Monitoring Results November - Dry

| Location                   | Units | Levels of Concern | Upper Warrell Creek |           |                                   | Upper Warrell Creek |           |                                   | Stony Creek |           |                                   | Stony Creek |           |                                   | Lower Warrell Creek |           |                                   | Lower Warrell Creek |           |                                   | Unnamed Creek Gumma West |           |                                   | Unnamed Creek Gumma East |           |                                   | Unnamed Creek Gumma North |           |                                   | Nambucca River South |           |                                   | Nambucca River South |        |                                   |       |
|----------------------------|-------|-------------------|---------------------|-----------|-----------------------------------|---------------------|-----------|-----------------------------------|-------------|-----------|-----------------------------------|-------------|-----------|-----------------------------------|---------------------|-----------|-----------------------------------|---------------------|-----------|-----------------------------------|--------------------------|-----------|-----------------------------------|--------------------------|-----------|-----------------------------------|---------------------------|-----------|-----------------------------------|----------------------|-----------|-----------------------------------|----------------------|--------|-----------------------------------|-------|
|                            |       |                   | Upstream            |           |                                   | Downstream          |           |                                   | Upstream    |           |                                   | Downstream  |           |                                   | Upstream            |           |                                   | Downstream          |           |                                   | Upstream                 |           |                                   | Downstream               |           |                                   | Upstream                  |           |                                   | Downstream           |           |                                   |                      |        |                                   |       |
|                            |       |                   | Freshwater          | Marine    | ANZECC 2000 95% species protected | Freshwater          | Marine    | ANZECC 2000 95% species protected | Freshwater  | Marine    | ANZECC 2000 95% species protected | Freshwater  | Marine    | ANZECC 2000 95% species protected | Freshwater          | Marine    | ANZECC 2000 95% species protected | Freshwater          | Marine    | ANZECC 2000 95% species protected | Freshwater               | Marine    | ANZECC 2000 95% species protected | Freshwater               | Marine    | ANZECC 2000 95% species protected | Freshwater                | Marine    | ANZECC 2000 95% species protected | Freshwater           | Marine    | ANZECC 2000 95% species protected | Freshwater           | Marine | ANZECC 2000 95% species protected |       |
| Date of Sampling           |       |                   | 25-Nov-15           | 25-Nov-15 | 25-Nov-15                         | 25-Nov-15           | 25-Nov-15 | 25-Nov-15                         | 25-Nov-15   | 25-Nov-15 | 25-Nov-15                         | 25-Nov-15   | 25-Nov-15 | 25-Nov-15                         | 25-Nov-15           | 25-Nov-15 | 25-Nov-15                         | 25-Nov-15           | 25-Nov-15 | 25-Nov-15                         | 25-Nov-15                | 25-Nov-15 | 25-Nov-15                         | 25-Nov-15                | 25-Nov-15 | 25-Nov-15                         | 25-Nov-15                 | 25-Nov-15 | 25-Nov-15                         | 25-Nov-15            | 25-Nov-15 | 25-Nov-15                         | 25-Nov-15            |        |                                   |       |
| Time of Sampling           |       |                   | 11:15 AM            | 11:15 AM  | 11:15 AM                          | 11:00 AM            | 11:00 AM  | 11:00 AM                          | 11:50 AM    | 11:40 AM  | 11:40 AM                          | 2:35 PM     | 2:35 PM   | 2:25 PM                           | 2:25 PM             | 1:10 PM   | 1:10 PM                           | 1:10 PM             | 1:10 PM   | 1:10 PM                           | 1:10 PM                  | 1:10 PM   | 1:10 PM                           | 1:10 PM                  | 1:10 PM   | 1:10 PM                           | 1:10 PM                   | 1:00 PM   | 1:00 PM                           | 2:10 PM              | 2:10 PM   | 2:00 PM                           | 2:00 PM              |        |                                   |       |
| Comments                   |       |                   |                     |           |                                   |                     |           |                                   |             |           |                                   |             |           |                                   |                     |           |                                   |                     |           |                                   |                          |           |                                   |                          |           |                                   |                           |           |                                   |                      |           |                                   |                      |        |                                   |       |
| <b>Field Physical data</b> |       |                   |                     |           |                                   |                     |           |                                   |             |           |                                   |             |           |                                   |                     |           |                                   |                     |           |                                   |                          |           |                                   |                          |           |                                   |                           |           |                                   |                      |           |                                   |                      |        |                                   |       |
| Temperature                | °C    | -                 | -                   | 24.86     | 14.99                             | 22.95               | 25.1      | 16.3                              | 25.91       | 24.4      | 16                                | 26.73       | 26.46     | 15.94                             | 23.31               | 27.9      | 18.4                              | 29.6                | 27.9      | 18.4                              | 29.42                    | 26.5      | 16.3                              | 26.92                    | 26.5      | 16.3                              | 24.05                     | 26.5      | 16.3                              | -                    | 27.9      | 18.1                              | 27.73                | 27.9   | 18.1                              | 27.56 |
| pH                         | pH    | -                 | 6.5-8               | 7.25      | 6.48                              | 6.02                | 7.3       | 6.4                               | 6.25        | 7.5       | 6.6                               | 6.76        | 7.33      | 6.26                              | 6.68                | 7.02      | 6.57                              | 7.55                | 7.02      | 6.57                              | 7.38                     | 7         | 6.1                               | 6.6                      | 7         | 6.1                               | 6.31                      | 7         | 6.1                               | -                    | 7         | 7                                 | 7.8                  | 7      | 7                                 | 7.8   |
| Conductivity               | mS/cm | 0.125-2.2         | -                   | 0.316     | 0.232                             | 0.232               | 0.348     | 0.227                             | 0.23        | 0.348     | 0.227                             | 0.269       | 0.3338    | 0.2168                            | 0.263               | 20.946    | 0.679                             | 2.9                 | 20.946    | 0.679                             | 2.92                     | 0.808     | 0.4234                            | 0.626                    | 0.808     | 0.4234                            | 0.478                     | 0.808     | 0.4234                            | -                    | 47.32     | 29.44                             | 32.7                 | 47.32  | 29.44                             | 33    |
| Turbidity                  | NTU   | 50                | 10                  | 10.96     | 4                                 | 6.8                 | 9.9       | 3.5                               | 6.2         | 9.9       | 3.5                               | 7.2         | 5.97      | 3.74                              | 9.3                 | 6.82      | 1.83                              | 17.5                | 6.82      | 1.83                              | 10.4                     | 52.78     | 11.3                              | 10                       | 52.78     | 11.3                              | 4                         | 52.78     | 11.3                              | -                    | 19.3      | 6.7                               | 17.4                 | 19.3   | 6.7                               | 18.2  |
| Dissolved Oxygen           | mg/L  | 5                 | 5                   | 4.98      | 1.91                              | 7.1                 | 4.8       | 2.6                               | 7.1         | 4.8       | 2.6                               | 5.29        | 6.34      | 3.52                              | 3.37                | 7.98      | 5.07                              | 6.6                 | 7.98      | 5.07                              | 6.4                      | 6.4       | 1.75                              | 3.83                     | 6.4       | 1.75                              | 2.66                      | 6.4       | 1.75                              | -                    | 9.1       | 7.4                               | 8.1                  | 9.1    | 7.4                               | 8.5   |
| TDS                        | g/L   | -                 | -                   | -         | -                                 | 0.151               | -         | -                                 | 0.149       | -         | -                                 | 0.175       | -         | -                                 | 0.171               | -         | -                                 | 1.86                | -         | -                                 | 1.87                     | -         | -                                 | 0.4                      | -         | -                                 | 0.31                      | -         | -                                 | -                    | -         | -                                 | 19.9                 | -      | -                                 | 20.1  |

Table 2 – Noise Monitoring Results November

| Date       | Time    | Location       | Rec ID | NCA | NML | Activity    | Predicted levels for activity | Laeq | LAFMAX | LAFMIN | LCEQ | LAF05 | LAF10 | LAF50 | LAF90 | Principal sources/ operations            | Measurements exceeding criteria, plant/ operations causing | Corrective actions | Notes  |
|------------|---------|----------------|--------|-----|-----|-------------|-------------------------------|------|--------|--------|------|-------|-------|-------|-------|--|--|--------------------|--|
| 23/11/2015 | 2:45 PM | Albert Drive   | 74     | 1   | 50  | Cut         | 62                            | 54.4 | 64.1   | 48.4   | 70.4 | 57.1  | 56.3  | 53.9  | 51.7  | Moxy, excavators, roller, drilling       | NA   | NA                 | Within predicted levels for activity   |
| 20/11/2015 | 4:06 PM | Cockburns Lane | 16     | 1   | 50  | Cut         | 65                            | 50.6 | 75.6   | 42.3   | 63   | 54.3  | 52.4  | 47.5  | 44.9  | Moxy - reverse beeper                    | NA   | NA                 | Within predicted levels for activity   |
| 19/11/2015 | 5:26 PM | Bald Hill Rd   | 197    | 3   | 50  | Cut         | 72                            | 52.5 | 80.8   | 38.1   | 64.5 | 55.9  | 53    | 45.6  | 41.2  | Dozer, truck + dogs                      | NA   | NA                 | Within predicted levels for activity   |
| 19/11/2015 | 4:18 PM | Letitia Rd     | 406    | 4   | 59  | Cut         | 74                            | 47.6 | 69.3   | 40.2   | 63.3 | 51.6  | 50    | 45.6  | 43.1  | Excavators, backhoe, roller              | NA   | NA                 | Within predicted levels for activity   |
| 19/11/2015 | 3:06 PM | Mattick Rd     | 442    | 6   | 44  | Cut         | 62                            | 53.8 | 75     | 45.1   | 75   | 57    | 55.3  | 51.6  | 48.5  | Scrapers, truck + dog, dozer, excavators | NA   | NA                 | Within predicted levels for activity   |
| 19/11/2015 | 4:00 PM | Nursery Rd     | 415    | 4   | 59  | NA          |                               | 57.6 | 81/4   | 41.1   | 67.6 | 54.9  | 52.5  | 48.5  | 44.6  | Construction not audible                 | NA   | NA                 | Background - Highway + local traffic, birds  |
| 20/11/2015 | 4:45 PM | Wallace St     | 148    | 3   | 50  | Cut         | 47                            | 59.1 | 74     | 45.8   | 66.7 | 65.4  | 63.9  | 53.2  | 49.5  | Construction not audible                 | NA   | NA                 | Background - highway + local traffic, other construction site                                  |
| 19/11/2015 | 4:45 PM | Gumma Rd       | 383    | 3   | 50  | Bridgeworks | 67                            | 50.4 | 62     | 44     | 66.1 | 54.6  | 53    | 49.2  | 46.9  | Crane                                    | NA   | NA                 | Within predicted levels - Taken along project boundary to reduce additional noise from traffic |

Table 3 - Dust monitoring results October/November

|                              |                | DDG ID                  |                         | DDG1       | DDG2       | DDG3       | DDG4       | DDG5                                     | DDG6       | DDG7  | DDG8          | DDG A1                                   | DDG A2         |      |
|------------------------------|----------------|-------------------------|-------------------------|------------|------------|------------|------------|--|------------|---|---------------|--|----------------|------|
|                              |                |                         | Start date of sampling  | 12/10/2015 | 12/10/2015 | 12/10/2015 | 12/10/2015 | 12/10/2015                               | 12/10/2015 | 12/10/2015  | 12/10/2015    | 12/10/2015                               | 12/10/2015     |      |
|                              |                |                         | Finish date of sampling | 12/11/2015 | 13/11/2015 | 12/11/2015 | 13/11/2015 | 13/11/2015                               | 12/11/2015 | 12/11/2015  | 12/11/2015    | 12/11/2015                               | 13/11/2015     |      |
| Analyte                      | Time Period    | Unit                    | Levels of Concern       | LOR        |            |            |            |  |            |   |               |  |                |      |
| Ash Content                  | Current Month  | g/m <sup>2</sup> .month | 4                       | 0.1        | 0.3        | 1.1        | 2          | 0.9                                      | 15.8       | 2.8   | 0.5           | 0.8                                      | ----           | ---- |
|                              |                | mg                      | N/A                     | 1          | 6          | 20         | 37         | 17                                       | 298        | 51  | 9             | 14                                       | ----           | ---- |
|                              | Previous Month | g/m <sup>2</sup> .month |                         |            | 0.2        | 0.7        | 2.5        | 0.8                                      | 7.7        | 1.6   | 0.5           | 3.6                                      | ----           | ---- |
|                              | Change         | g/m <sup>2</sup> .month | Increase of 2           |            | 0.1        | 0.4        | -0.5       | 0.1                                      | 8.1        | 1.2   | 0             | -2.8                                     | ----           | ---- |
| Combustible Matter           | Current Month  | g/m <sup>2</sup> .month | N/A                     | 0.1        | 0.2        | 0.7        | 0.5        | 0.4                                      | 3.1        | 5.4   | 0.1           | 0.4                                      | ----           | ---- |
|                              |                | mg                      | N/A                     | 1          | 4          | 14         | 8          | 7  | 58         | 98  | 2             | 7  | ----           | ---- |
| Total Insoluble Matter (TIM) | Current Month  | g/m <sup>2</sup> .month | 4                       | 0.1        | 0.5        | 1.8        | 2.5        | 1.3                                      | 18.9       | 8.2   | 0.6           | 1.2                                      | ----           | ---- |
|                              |                | mg                      | N/A                     | 1          | 10         | 34         | 45         | 24                                       | 356        | 149   | 11            | 21                                       | ----           | ---- |
|                              | Previous Month | g/m <sup>2</sup> .month |                         | 0.1        | 0.6        | 1.5        | 3.2        | 1.2                                      | 9.2        | 7.3   | 0.8           | 4.5                                      |                |      |
|                              | Change         | g/m <sup>2</sup> .month | Increase of 2           | 0.1        | -0.1       | 0.3        | -0.7       | 0.1                                      | 9.7        | 0.9   | -0.2          | -3.3                                     |                |      |
| Arsenic                      | Current Month  | mg/L                    | 0.001                   | 0.001      | ----       | ----       | ----       | ----                                     | ----       | ----  | ----          | 0.007                                    | <0.001         |      |
| Comments                     |                |                         |                         |            |            |            |            | Frog + insects (bees, beetles) in bottle |            | Large amount of gecko excretion-blocked funnel + lawns mowed recently - grass clippings in bottle | Bee in bottle | Leaves in bottle (resident moved funnel) | Frog in bottle |      |

Table 4 – Groundwater Monitoring Results November 2015

| Location                               | Units       | Groundwater Investigation Levels (GILs) from Interpretive Report | 4BH007     | 4BH008     | 4BH010     | 4BH011     | 4LDBH009   | 1BH04      | 4LDBH011   | 4LDBH012   | 1BH10      | 1BH12      | 4BH021     | 4BH022     | 4BH025     | 4BH026     | 4BH037     | 4BH038     | 1BH49               | 4BH058     | 4BH061          | 4BH062          | 4BH065     | 4BH066     | 4BH064                              |  |
|--|-------------|--|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|---------------------|------------|-----------------|-----------------|------------|------------|-------------------------------------|--|
| Cut/Fill                               |             |  | Cut 4      | Cut 4      | Cut 6      | Cut 6      | Cut 7      | Cut 7      | Cut 8      | Cut 9      | Cut 9      | Cut 10     | Cut 11     | Cut 11     | Cut 12     | Cut 12     | Fill 15    | Fill 15    | Cut 17              | Cut 17     | Cut 26          | Cut 26          | Cut 28     | Cut 28     | Cut 28                              |  |
| Date of Sampling                       |             |  | 26/11/2015 | 26/11/2015 | 26/11/2015 | 26/11/2015 | 26/11/2015 | 26/11/2015 | 26/11/2015 | 26/11/2015 | 26/11/2015 | 26/11/2015 | 27/11/2015 | 27/11/2015 | 27/11/2015 | 26/11/2015 | 26/11/2015 | 26/11/2015 | 26/11/2015          | 26/11/2015 | 26/11/2015      | 26/11/2015      | 26/11/2015 | 26/11/2015 | 26/11/2015                          |  |
| Comments                               |             |  | DRY        | DRY        |            | DRY        |            |            |            |            |            |            |            |            |            | DRY        |            |            | Pungent water (egg) |            | Dry - no logger | Dry - no logger |            |            | Unable to sample - bore not located |  |
| <b>Laboratory data</b>                 |             |  |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |                     |            |                 |                 |            |            |                                     |  |
| <b>Metals</b>                          |             |  |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |                     |            |                 |                 |            |            |                                     |  |
| Aluminium                              | mg/L        | 0.055  | -          | -          | 0.2500     | -          | 0.0100     | <0.01      | <0.01      | 0.0400     | <0.01      | 0.0500     | <0.01      | <0.01      | <0.01      | -          | <0.01      | <0.01      | <0.01               | <0.01      | -               | -               | 0.1100     | <0.01      | -                                   |  |
| Arsenic                                | mg/L        | 0.024  | -          | -          | <0.001     | -          | <0.001     | <0.001     | 0.0010     | 0.0320     | <0.001     | 0.0020     | 0.0020     | <0.001     | <0.001     | -          | <0.001     | <0.001     | <0.001              | <0.001     | -               | -               | 0.0010     | <0.001     | -                                   |  |
| Cadmium                                | mg/L        | <LOR   | -          | -          | 0.0001     | -          | <0.0001    | <0.0001    | <0.0001    | <0.0001    | <0.0001    | 0.0023     | <0.0001    | <0.0001    | <0.0001    | -          | <0.0001    | <0.0001    | <0.0001             | <0.0001    | -               | -               | <0.0001    | <0.0001    | -                                   |  |
| Chromium                               | mg/L        | 0.001  | -          | -          | <0.001     | -          | <0.001     | <0.001     | <0.001     | <0.001     | <0.001     | <0.001     | <0.001     | <0.001     | <0.001     | -          | <0.001     | <0.001     | <0.001              | <0.001     | -               | -               | <0.001     | <0.001     | -                                   |  |
| Copper                                 | mg/L        | 0.0014   | -          | -          | 0.0100     | -          | <0.001     | <0.001     | <0.001     | <0.001     | <0.001     | 0.0030     | 0.0050     | <0.001     | <0.001     | -          | <0.001     | 0.0010     | <0.001              | <0.001     | -               | -               | <0.001     | <0.001     | -                                   |  |
| Lead                                   | mg/L        | 0.0034   | -          | -          | 0.0010     | -          | 0.1430     | 0.2110     | <0.001     | <0.001     | 0.2710     | 1.2000     | 0.0010     | 0.0020     | 0.0040     | -          | <0.001     | <0.001     | 0.0200              | <0.001     | -               | -               | <0.001     | 0.4170     | -                                   |  |
| Manganese                              | mg/L        | -  | -          | -          | 0.2160     | -          | 0.0340     | 0.1700     | 0.9880     | 4.4500     | 0.1050     | 4.4900     | 0.0130     | 0.2320     | 0.0060     | -          | 5.2900     | 1.4700     | 0.0760              | 1.6900     | -               | -               | 0.3540     | 0.0780     | -                                   |  |
| Nickel                                 | mg/L        | 0.011  | -          | -          | 0.0180     | -          | 0.0030     | 0.0020     | <0.001     | 0.0130     | 0.0030     | 0.0980     | 0.0050     | 0.0020     | <0.001     | -          | 0.0060     | 0.0040     | 0.0020              | 0.0100     | -               | -               | 0.0130     | 0.0060     | -                                   |  |
| Selenium                               | mg/L        | -  | -          | -          | <0.01      | -          | <0.01      | <0.01      | <0.01      | <0.01      | <0.01      | <0.01      | <0.01      | <0.01      | <0.01      | -          | <0.01      | <0.01      | <0.01               | <0.01      | -               | -               | <0.01      | <0.01      | -                                   |  |
| Silver                                 | mg/L        | <LOR   | -          | -          | <0.001     | -          | <0.001     | <0.001     | <0.001     | <0.001     | <0.001     | <0.001     | <0.001     | <0.001     | <0.001     | -          | <0.001     | <0.001     | <0.001              | <0.001     | -               | -               | <0.001     | <0.001     | -                                   |  |
| Zinc                                   | mg/L        | 0.008  | -          | -          | 0.0540     | -          | 0.0330     | 0.0160     | <0.005     | <0.005     | 0.0140     | 0.2190     | 0.0180     | <0.005     | 0.0060     | -          | 0.0160     | 0.0130     | 0.0080              | 0.0060     | -               | -               | 0.0200     | 0.0160     | -                                   |  |
| Iron                                   | mg/L        | -  | -          | -          | 4.5800     | -          | 0.1000     | 0.0500     | 0.5000     | 8.0800     | <0.05      | 1.7200     | <0.05      | 0.5200     | <0.05      | -          | 74.0000    | 0.1800     | <0.05               | 2.1200     | -               | -               | 0.2200     | <0.05      | -                                   |  |
| Mercury                                | mg/L        | 0.0006   | -          | -          | <0.0001    | -          | <0.0001    | <0.0001    | <0.0001    | <0.0001    | <0.0001    | <0.0001    | <0.0001    | <0.0001    | <0.0001    | -          | <0.0001    | <0.0001    | <0.0001             | <0.0001    | -               | -               | <0.0001    | <0.0001    | -                                   |  |
| <b>Total Petroleum Hydrocarbons</b>    |             |  |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |                     |            |                 |                 |            |            |                                     |  |
| C6-C9 Fraction                         | µg/L or ppb | -  | -          | -          | <20        | -          | <20        | <20        | <20        | <20        | <20        | <20        | <20        | <20        | <20        | -          | <20        | <20        | <20                 | <20        | -               | -               | <20        | <20        | -                                   |  |
| C10-C14 Fraction                       | µg/L or ppb | -  | -          | -          | 280.0000   | -          | <50        | <50        | <50        | <50        | <50        | <50        | <50        | <50        | <50        | -          | <50        | <50        | <50                 | <50        | -               | -               | <50        | <50        | -                                   |  |
| C15-C28 Fraction                       | µg/L or ppb | -  | -          | -          | <100       | -          | <100       | <100       | <100       | <100       | <100       | 660.0000   | <100       | <100       | <100       | -          | <100       | <100       | <100                | <100       | -               | -               | <100       | <100       | -                                   |  |
| C290C36 Fraction                       | µg/L or ppb | -  | -          | -          | <50        | -          | <50        | <50        | <50        | <50        | <50        | <50        | <50        | <50        | <50        | -          | <50        | <50        | <50                 | <50        | -               | -               | <50        | <50        | -                                   |  |
| C10-C36 Fraction                       | µg/L or ppb | -  | -          | -          | 280.0000   | -          | <50        | <50        | <50        | <50        | <50        | 660.0000   | <50        | <50        | <50        | -          | <50        | <50        | <50                 | <50        | -               | -               | <50        | <50        | -                                   |  |
| <b>BTEX</b>                            |             |  |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |                     |            |                 |                 |            |            |                                     |  |
| Benzene                                | µg/L or ppb | 950  | -          | -          | <1         | -          | <1         | <1         | <1         | <1         | <1         | <1         | <1         | <1         | <1         | -          | <1         | <1         | <1                  | <1         | -               | -               | <1         | <1         | -                                   |  |
| Toluene                                | µg/L or ppb | -  | -          | -          | <2         | -          | <2         | <2         | <2         | <2         | <2         | <2         | <2         | <2         | <2         | -          | <2         | <2         | <2                  | <2         | -               | -               | <2         | <2         | -                                   |  |
| Ethylbenzene                           | µg/L or ppb | -  | -          | -          | <2         | -          | <2         | <2         | <2         | <2         | <2         | <2         | <2         | <2         | <2         | -          | <2         | <2         | <2                  | <2         | -               | -               | <2         | <2         | -                                   |  |
| m+p-Xylene                             | µg/L or ppb | -  | -          | -          | <2         | -          | <2         | <2         | <2         | <2         | <2         | <2         | <2         | <2         | <2         | -          | <2         | <2         | <2                  | <2         | -               | -               | <2         | <2         | -                                   |  |
| o-Xylene                               | µg/L or ppb | -  | -          | -          | <2         | -          | <2         | <2         | <2         | <2         | <2         | <2         | <2         | <2         | <2         | -          | <2         | <2         | <2                  | <2         | -               | -               | <2         | <2         | -                                   |  |
| Naphthalene                            | µg/L or ppb | -  | -          | -          | <5         | -          | <5         | <5         | <5         | <5         | <5         | <5         | <5         | <5         | <5         | -          | <5         | <5         | <5                  | <5         | -               | -               | <5         | <5         | -                                   |  |
| <b>Nutrients</b>                       |             |  |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |                     |            |                 |                 |            |            |                                     |  |
| Total Phosphorus                       | mg/L        | -  | -          | -          | 0.0300     | -          | 0.1400     | 0.1600     | 0.1400     | 0.6700     | 0.0200     | 0.0400     | 0.0400     | 0.0500     | 0.0600     | -          | 0.0500     | 0.0500     | 0.0500              | 0.7000     | -               | -               | 0.0500     | <0.01      | -                                   |  |
| Phosphate                              | mg/L        | -  | -          | -          | <0.01      | -          | <0.01      | <0.01      | 0.0200     | 0.0900     | <0.01      | <0.01      | <0.01      | <0.01      | <0.01      | -          | <0.01      | 0.0400     | <0.01               | <0.01      | -               | -               | <0.01      | <0.01      | -                                   |  |
| Total Nitrogen                         | mg/L        | -  | -          | -          | 0.6000     | -          | 0.7000     | 0.4000     | 0.6000     | 5.5000     | 0.3000     | 14.3000    | 1.2000     | 0.6000     | 0.7000     | -          | 1.9000     | 0.8000     | 0.5000              | 2.1000     | -               | -               | 0.8000     | 0.9000     | -                                   |  |
| Total Kjeldahl Nitrogen                | mg/L        | -  | -          | -          | 0.6000     | -          | 0.6000     | 0.3000     | 0.5000     | 5.3000     | 0.2000     | 4.5000     | 0.2000     | 0.2000     | 0.3000     | -          | 1.4000     | 0.4000     | 0.2000              | 2.1000     | -               | -               | 0.6000     | 0.2000     | -                                   |  |
| Nitrate                                | mg/L        | -  | -          | -          | <0.01      | -          | 0.1000     | 0.0500     | 0.0700     | <0.01      | 0.1400     | 7.7900     | 0.9900     | 0.4300     | 0.4200     | -          | 0.4600     | 0.4100     | 0.3200              | 0.0300     | -               | -               | 0.1800     | 0.6900     | -                                   |  |
| Nitrite                                | mg/L        | -  | -          | -          | <0.01      | -          | <0.01      | <0.01      | 0.4200     | <0.01      | 2.0100     | <0.01      | <0.01      | <0.01      | <0.01      | -          | <0.01      | 0.0400     | <0.01               | <0.01      | -               | -               | <0.01      | <0.01      | -                                   |  |
| Ammonia                                | mg/L        | -  | -          | -          | 0.1000     | -          | 0.5500     | 0.0600     | 0.2400     | 1.7000     | 0.0700     | 0.7800     | 0.0700     | 0.0700     | 0.0200     | -          | 0.7800     | 0.1300     | 0.0400              | 0.0800     | -               | -               | 0.0400     | 0.0300     | -                                   |  |
| <b>Major anions</b>                    |             |  |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |                     |            |                 |                 |            |            |                                     |  |
| Chloride                               | mg/L        | -  | -          | -          | 1410.0000  | -          | 52.0000    | 27.0000    | 188.0000   | 137.0000   | 30.0000    | 115.0000   | 13.0000    | 116.0000   | 18.0000    | -          | 940.0000   | 1940.0000  | 23.0000             | 360.0000   | -               | -               | 125.0000   | 72.0000    | -                                   |  |
| Sulfate                                | mg/L        | -  | -          | -          | 46.0000    | -          | 17.0000    | 14.0000    | 77.0000    | 897.0000   | 54.0000    | 400.0000   | 8.0000     | 64.0000    | 4.0000     | -          | 2040.0000  | 2600.0000  | 13.0000             | 35.0000    | -               | -               | 8.0000     | 26.0000    | -                                   |  |
| Bicarbonate                            | mg/L        | -  | -          | -          | <1         | -          | 45.0000    | 39.0000    | 463.0000   | 180.0000   | 61.0000    | 89.0000    | 25.0000    | 143.0000   | 22.0000    | -          | 72.0000    | 990.0000   | 35.0000             | 17.0000    | -               | -               | 80.0000    | 44.0000    | -                                   |  |
| <b>Major cations</b>                   |             |  |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |                     |            |                 |                 |            |            |                                     |  |
| Sodium                                 | mg/L        | -  | -          | -          | 713.0000   | -          | 45.0000    | 32.0000    | 229.0000   | 295.0000   | 45.0000    | 161.0000   | 18.0000    | 80.0000    | 20.0000    | -          | 700.0000   | 1690.0000  | 30.0000             | 179.0000   | -               | -               | 96.0000    | 65.0000    | -                                   |  |
| Potassium                              | mg/L        | -  | -          | -          | 2.0000     | -          | 1.0000     | 2.0000     | 2.0000     | 21.0000    | 1.0000     | 8.0000     | <1         | 7.0000     | <1         | -          | 42.0000    | 93.0000    | <1                  | 10.0000    | -               | -               | 1.0000     | 1.0000     | -                                   |  |
| Calcium                                | mg/L        | -  | -          | -          | 4.0000     | -          | 9.0000     | 2.0000     | 68.0000    | 82.0000    | 8.0000     | 40.0000    | 1.0000     | 44.0000    | 2.0000     | -          | 174.0000   | 241.0000   | 1.0000              | 8.0000     | -               | -               | 3.0000     | 4.0000     | -                                   |  |
| Magnesium                              | mg/L        | -  | -          | -          | 109.0000   | -          | 5.0000     | 2.0000     | 27.0000    | 63.0000    | 8.0000     | 42.0000    | 2.0000     | 13.0000    | <1         | -          | 303.0000   | 512.0000   | 2.0000              | 12.0000    | -               | -               | 6.0000     | 4.0000     | -                                   |  |
| <b>Field Physical data</b>             |             |  |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |            |                     |            |                 |                 |            |            |                                     |  |
| Depth to standing water level from TOC | m           | -  | -          | -          | 15.78      | -          | 11.29      | 11.49      | 2.79       | 9.94       | 12.35      | 13.12      | 0.85       | 7.35       | 6.07       | -          | 0.77       | 0.92       | 16.40               | 18.03      | -               | -               | 13.55      | 7.30       | -                                   |  |
| pH                                     | pH          | -  | -          | -          | 4.78       | -          | 5.93       | 7.31       | 7.19       | 6.51       | 5.80       | 6.25       | 7.10       | 6.08       | 6.19       | -          | 6.06       | 7.05       | 5.92                | 5.96       | -               | -               | 6.39       | 5.83       | -                                   |  |
| Conductivity                           | mS/cm       | -  | -          | -          | 4.830      | -          | 0.253      | 0.197      | 1.290      | 2.140      | 0.364      | 1.040      | 0.757      | 0.132      | 0.136      | -          | 5.520      | 9.720      | 0.175               | 1.050      | -               | -               | 0.317      | 0.245      | -                                   |  |
| Temperature                            | °C          | -  | -          | -          | 23.09      | -          | 27.47      | 30.48      | 22.77      | 27.57      | 27.50      | 31.04      | 22.36      | 20.30      | 21.74      | -          | 21.80      | 0.25       | 30.82               | 29.49      | -               | -               | 28.63      | 28.65      | -                                   |  |
| Total Dissolved Solids                 | mg/L        | -  | -          | -          | 3.0900     | -          |            |            |            |            |            |            |            |            |            |            |            |            |                     |            |                 |                 |            |            |                                     |  |