Gladstone Nickel Project
Environmental Impact Statement Supplement

Volume 3 • Appendices H — M

Prepared for

Gladstone Pacific Nickel LTD

February 2008

Prepared by

URS

Level 14,
240 Queen Street
GPO Box 302
Brisbane Qld 4001

In association with

RLMS

Level 5,
379 Queen Street
GPO Box 2292
Brisbane Qld 4001

List of Appendices

VOLUME 3

GLADSTONE NICKEL PROJECT ENVIRONMENTAL IMPACT STATEMENT SUPPLEMENT

Marine Impacts from Extraction of Seawater from the Calliope River

H

URS

Gladstone Pacific Nickel LTD

R E P O R T

Supplementary Marine Ecological Investigations

Prepared for

Gladstone Pacific Nickel

17 October 2007

42625791

Project Manager:

Chris Pigott
Senior Principal

URS Australia Pty Ltd

Project Director:

Bob McGowan
Regional Manager,
Queensland

Level 14, 240 Queen Street
Brisbane, QLD 4000
GPO Box 302, QLD 4001
Australia
Tel: 61 7 3243 2111
Fax: 61 7 3243 2199

Date: 17 October 2007
Reference: 42625791
Status: Report

Contents

Section 1 Introduction

This report provides additional information to address the following issues:

- The EIS proposed extraction of seawater for cooling purposes from the proposed Wiggins Island terminal. It is now proposed that a much smaller volume of seawater be extracted from the Calliope River adjacent to the refinery.
- The Department of Primary Industries and Fisheries (DPIF) requested further information on the marine habitats potentially affected by the discharge seawater pipeline crossing at the mouth of the Calliope River. It should be noted at the time of the DPIF comments it was proposed that the pipeline would cross the bed of the Calliope River in an excavated trench. It is now proposed to use horizontal directional drilling and so the river bed and fringing mangroves will not be disturbed.

The scope of this technical note includes data review, field investigation and reporting of the marine biological components of the seawater intake facility on the Calliope River and the discharge pipeline crossing at the Calliope River mouth. Also included is a brief discussion on the possible environmental effects of the abstraction on flows within the Calliope River and Anabranch.

Section 2 Methods

2.1 Review

A review of the existing data was carried out prior to entering the field. This included the Gladstone Nickel Project (GNP) EIS (URS, 2007) and relevant information from the Wiggins Island Coal Terminal (WICT) EIS (Connell Hatch, 2006).

The review indicated that there was sufficient information available on the mangrove habitats potentially affected. As such, it was decided that additional field surveys of mangroves were unwarranted. However, visual observations were recorded of the condition of the mangroves in the target areas.

Macrobenthic sampling commissioned for the WICT EIS (Connell Hatch, 2006) was primarily focussed on areas potentially impacted by construction works for the terminal, with only a few sites relevant to the GNP investigations. Additional sampling of macrobenthic communities was carried out across the mouth of the Calliope River, along the route of the proposed discharge pipeline, and also in the region where it is proposed to draw the cooling water from.

2.2 Field Survey

A one day 'gap-filling' survey was carried out on 21 September 2007 by URS scientists aboard the MV Boomerang. A van veen grab (125 cm^2) was used to sample sediments for sediment type and the presence or absence of marine flora and benthic organisms at both the Calliope River mouth and at the seawater intake location. On arriving at each location, observations were made on the profiles of the shorelines and condition of the mangroves.

At each sampling site, the position was recorded using a Global Positioning System (GPS) and the depth recorded (and later adjusted to AHD). The grab was deployed from the boat and retrieved. If the grab failed to collect any sediments, or only partly operated, further grabs were taken (up to three per site) to ensure that the benthos could be adequately described. Physical characteristics of the sediment were recorded and the samples were then sieved using a 1 mm mesh sieve. The presence of marine flora and fauna was recorded. Photographs of representative taxa were taken at selected sites.

Section 3 Results

3.1 Mouth of Calliope River

The locations of sampling sites at the mouth of the Calliope River are shown in Figure 1. Also shown is the extent of exposed intertidal mudflats at 8:20 am (approximately 1.7 m above AHD).

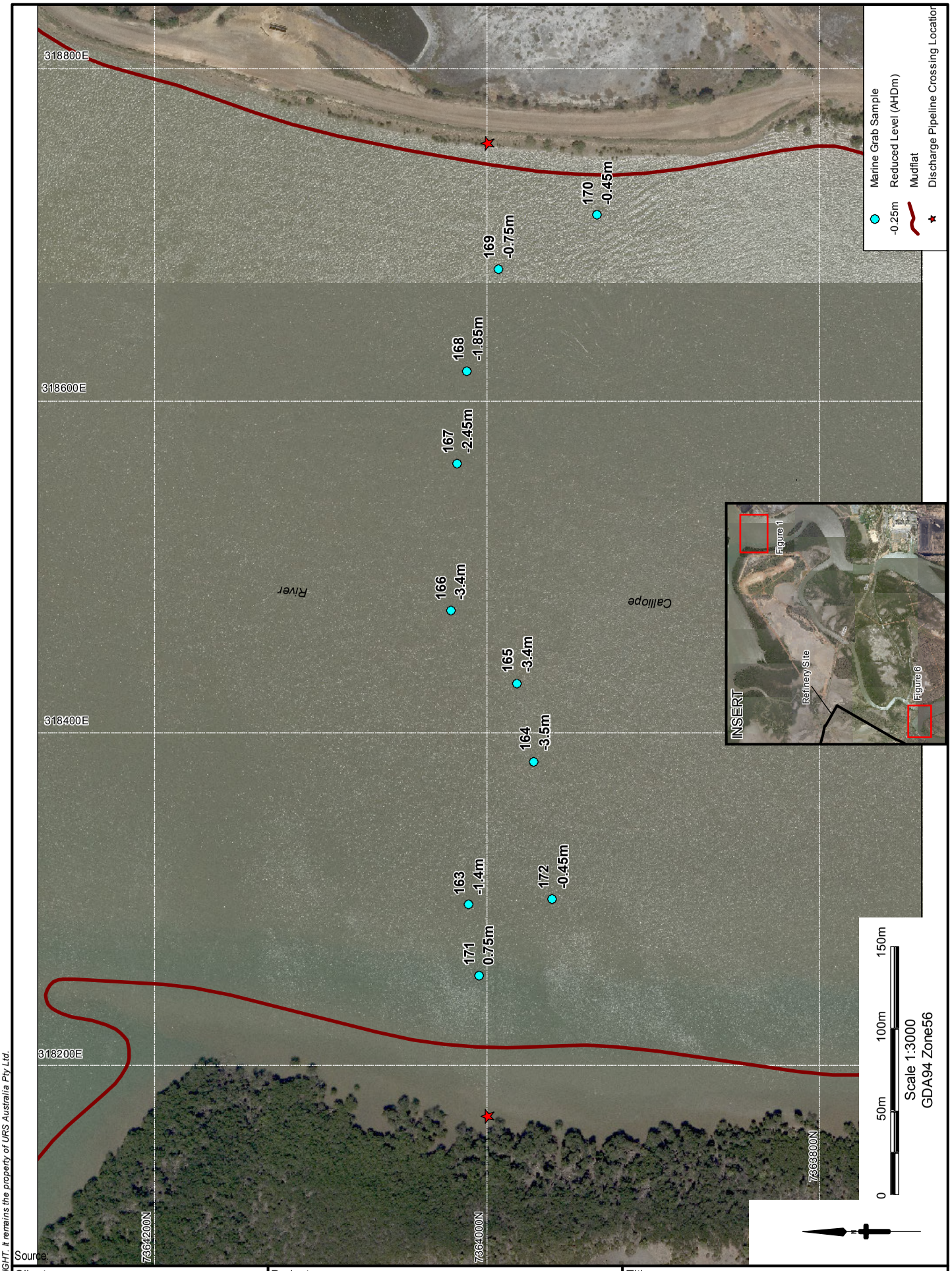
The western bank features dense red mangroves (*Rhizophora stylosa*) to approximately 4 m in height in the intertidal zone (Figure 2). The canopy density could not be calculated accurately, although the canopy appeared closed. Low tide conditions revealed the exposed mud supported small patches of seagrass and what appeared to be filamentous green algae. This assessment is consistent with the intertidal wetland mapping in the Connell Hatch (2006).

Part of the intertidal zone adjacent to the sampling transect on the western bank featured a number of dead mangrove plants. Whilst the cause of death of these individuals is unknown, erosion and root exposure caused by boat wash is not an uncommon occurrence in estuarine systems, and may have contributed to mangrove mortality in this instance.

The eastern bank has been substantially modified, and in the area adjacent to the sampling transect, only scattered juvenile red mangroves were observed (Figure 3).

Sediments were comprised of fine mud and silt at the sites close to the western bank (sites 163, 171 and 172). The grab was unable to collect any material from sites 164 and 165. This is likely to be because the bottom consists of coarse gravel (John Clark, personal communication). Sites 166 and 167 comprised sand and shell grit, and the sites further towards the eastern bank (168, 169 and 170) contained a mix of sand (fine to coarse), mud and shell grit.

Sparse to moderate cover of seagrass (*Halophila ovalis*) was detected towards the western bank (sites 163, 171 and 172) along with gastropods, bivalves, polychaete worms, brittlestars and shrimp (*Acetes* sp.). Figure provides examples of representative flora and fauna detected at sites towards the western bank. No flora or fauna were detected at sites in the middle of the channel (sites 164 – 168). Filamentous red algae and tube worms were observed attached to gravel at sites 169 and 170 (Figure 5).



Client: Gladstone Pacific Nickel Ltd

URS

Project: GLADSTONE NICKEL PROJECT
ENVIRONMENTAL IMPACT STATEMENT
SUPPLEMENT

Title: **RIVER BED GRAB SAMPLE LOCATIONS - CALLIOPE RIVER MOUTH**

Drawn: VH	Approved: CP	Date: 26-11-07
Job No: **4262 5791**	File No: 42625791-g-220.wor	

Figure: **1**

Rev: A

A4

Section 3 Results

Figure 2 West side of Calliope River mouth

Figure 3 East side of Calliope River mouth

Section 3 Results

Figure 4 Representative flora and fauna at sites 163, 171 and 172

Figure 5 Filamentous red algae from site 170

Section 3 Results

3.2 Seawater Intake Location

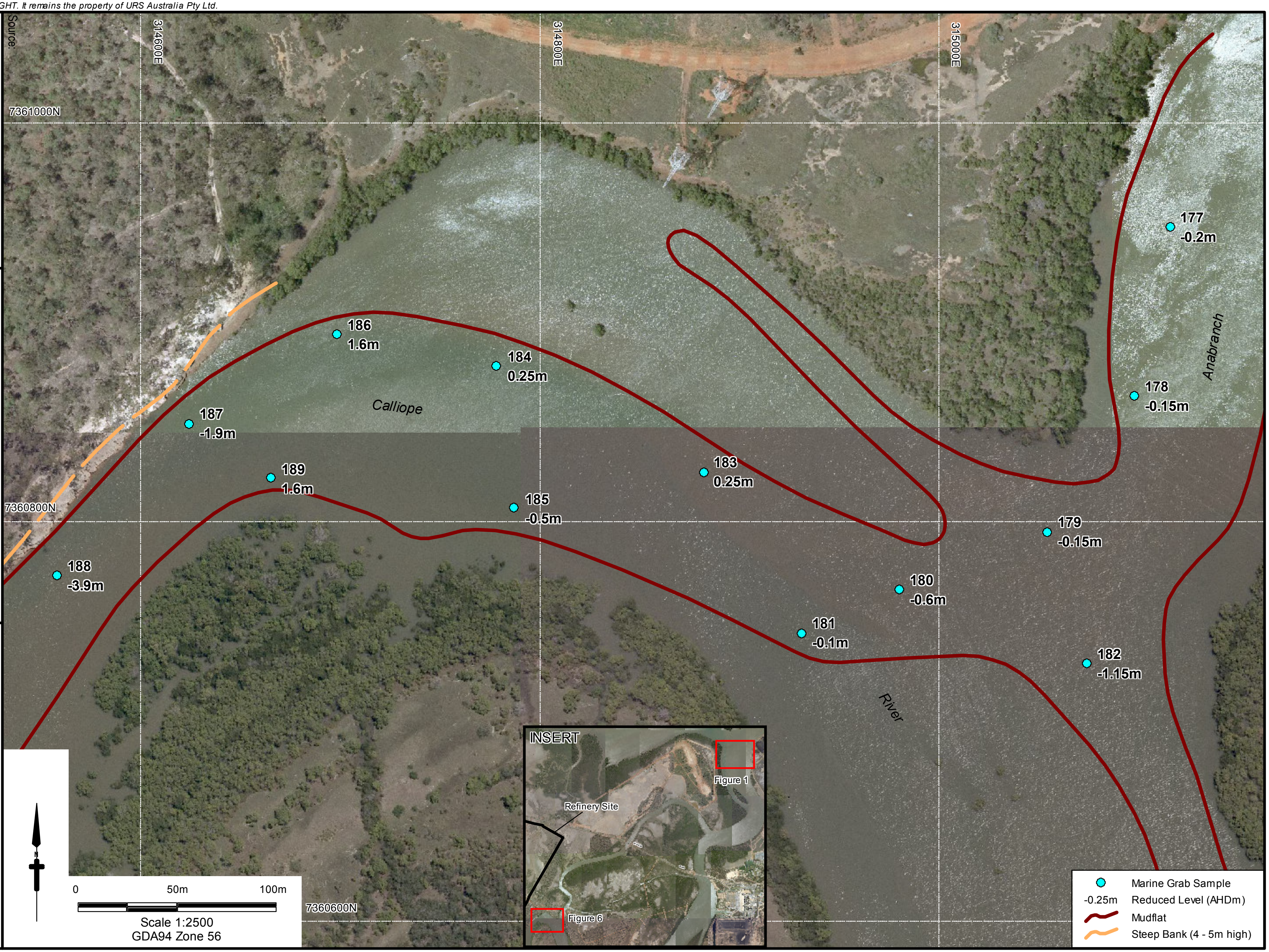
The locations of sampling sites at the confluence of the Calliope River oxbow and the anabranch are shown in Figure 6. Also shown is the extent of exposed intertidal mudflats at 1:00 pm (approximately 2.3 m above AHD) and the region where the eroded bank occurs.

The system is estuarine and bank conditions are typified by the presence of mud flats and mangrove communities in the intertidal zone (see Figure 7). Red mangrove (*Rhizophora stylosa*) is the dominant mangrove species in this area, although grey mangrove (*Avicennia marina*) was also readily identifiable. Connell Hatch (2006) notes that the yellow mangrove (*Ceriops tagal*) is also present in this area, primarily as a component of mixed *Avicennia* or *Avicennia/Rhizophora* assemblages.

The outside river bends feature active weathering of the bank and in these places bank height can exceed 5 m from MHWS. Two locales adjacent to the sampling site display these effects; the eastern bank of the anabranch immediately upstream of the confluence with the oxbow, and the westernmost portion of the northern bend in the oxbow. The vegetation communities in these areas are typically Eucalypt woodlands. Ongoing bank erosion is causing undermining of the roots and subsequent tree collapse and mortality. The water velocity along this reach has scoured the channel to a depth of 4+ m (AHD) close to the bank, with only a steep narrow low bench formed at the toe of the eroded vertical bank. Scattered juvenile red mangroves have colonised this bench.

Sediments were comprised of fine mud and silt at all sites, except for site 180 where the grab was unable to collect any material (presumably gravel). Sites 179, 185 and 188 also contained shell grit.

The shallowest sites (186 and 189), exposed at high tide, were covered in a slimy green algae. No seagrass or other algae were recorded. Fauna was generally depauperate, with polychaete worms and bivalves most common. Other fauna recorded included a hermit crab, an oyster, an amphipod and two stalked barnacles.



Client: Gladstone Pacific Nickel Ltd

URS

Project: GLADSTONE NICKEL PROJECT ENVIRONMENTAL IMPACT STATEMENT SUPPLEMENT

Drawn: VH | Approved: CP | Date: 26-10-07

Job No: 4262 5791 | File No: 42625791-g-220.wor

Title: RIVER BED GRAB SAMPLE LOCATIONS - REFINERY WATER INTAKE LOCATION

Figure: 6

Rev: A

A4

Section 3 Results

Figure 7 Seawater intake location, looking north, showing exposed mudflats, anabranch (to the right) and eroded bank (top left)

Figure 8 Looking northwest along the anabranch, showing exposed mudflats (left) and eroded bank (top right)

Section 3 Results

Figure 9 Eroded bank – looking south west along the oxbow of the Calliope River

Section 4 Discussion

The observations made during the field work for this report support the findings from the GPN EIS (URS, 2007) and the WICT EIS (Connell Hatch, 2006). The mangrove communities at the mouth of the Calliope River are severely degraded on the eastern bank and show clear signs of distress on the western bank. The seagrass detected on the intertidal and near subtidal areas of the western bank are not regionally significant, and the infaunal community in the channel is generally depauperate. Information obtained from this survey generally supports the impact assessment and management strategies discussed in URS (2006).

The area where it is proposed to install a seawater intake has similarly low levels of infauna. The erosion of the river and anabranch banks is probably natural, but may be likely to continue into the future, necessitating bank stabilisation if a seawater intake were to be installed.

The abstraction of water from this area may lead to a number of environmental impacts, including:

- Reduced water flow;
- Stress or mortality of fish; and
- Damage to landscapes.

The volume of water to be abstracted (2,600m^3/h) is minor compared to the flows generally experienced in this section of the Calliope River where peak tidal flows can reach up to 3,000,000 $m^{3/}$h. On this basis the reduction in water flow from the abstraction will not have any significant impact.

To minimise stress or mortality on fish in the river, it is proposed to install a mesh at the inlet to the abstraction pipe. The mesh will be designed to limit the opportunity for fish (and debris) from being sucked into the pipe.

Section 5 References

URS (2007) Gladstone Nickel Project Environmental Impact Statement. Prepared for Gladstone Pacific Nickel Ltd, April 2007. Prepared by URS, in association with RLMS.

Connell Hatch (2006) Wiggins Island Coal Terminal EIS, November 2006. Prepared by Connell Hatch.

Section 6 Abbreviations

DPIF	Department of Primary Industries and Fisheries
EIS	Environmental Impact Statement
GNP	Gladstone Nickel Project
GPNL	Gladstone Pacific Nickel Ltd
URS	URS Australia
WICT	Wiggins Island Coal Terminal
GPS	Global Positioning System
AHD	Australian Height Datum
MHWS	Mean High Water - Spring

Section 7 Limitations

URS Australia Pty Ltd (URS) or Insert name of correct entity has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Insert Client name and only those third parties who have been authorised in writing by URS to rely on the report. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report. It is prepared in accordance with the scope of work and for the purpose outlined in the Proposal dated Insert details.

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

This report was prepared between Insert dates and is based on the conditions encountered and information reviewed at the time of preparation. URS disclaims responsibility for any changes that may have occurred after this time.

This report should be read in full. No responsibility is accepted for use of any part of this report in any other context or for any other purpose or by third parties. This report does not purport to give legal advice. Legal advice can only be given by qualified legal practitioners.