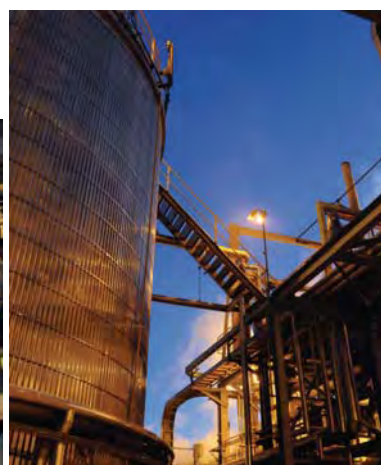




Proposed Ammonium Nitrate Facility Heron Road, Kooragang Island

Response to Submissions

October 2013

Prepared for Incitec Pivot Limited

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Appendices

Appendix A Summary of Submissions
Appendix B Supplementary Water Reports

Abbreviations

Abbreviation	Description
ACGIH	American Conference of Governmental Industrial Hygienists
AEGL	Acute Exposure Guidance Level
AIHA	American Industrial Hygiene Association
ALARP	As Low As Reasonably Practicable
AN	Ammonium Nitrate
ANSOL	Ammonium Nitrate Solution
ASS	Acid Sulfate Soils
AMBS	Australian Museum Business Service (Heritage Consultant)
AQIA	Air Quality Impact Assessment
CEA	Cumulative Effects Assessment
CEMP	Construction Environment Management Plan
CLG	Community Liaison Group
CPCFM	Correct Planning and Consultation for Mayfield (Group)
DAC	Development Assessment Commission (SA)
dB	Decibel
DCP	Development Control Plan
DGRs	Director General's Requirements
DP&I	NSW Department of Planning and Infrastructure (formerly DoP)
DoP	NSW Department of Planning
EIS	Environmental Impact Statement
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPA	Environment Protection Agency
EPI	Environmental Planning Instrument
EPL	Environment Protection Licence
ERPG	Emergency Response Planning Guideline
EWS	Early Warning System
GWMP	Groundwater Management Plan
ha	hectare
HIPAP	NSW Hazardous Industry Planning Advisory Papers
IDLH	Immediately Dangerous to Life or Health
IMESAFR	Institute of Makers of Explosives Safety Analysis for Risk
IPL	Incitec Pivot Limited
IVCC	Islington Village Community Group
km	kilometres
LEP	Local Environment Plan
LOS	Level Of Service
LTIFR	Lost Time Injury Frequency Rate
MHF	Major Hazard Facility
MTIFR	Medically Treated Injury Frequency Rate
Mtpa	Million tonnes per annum
NA	Nitric Acid
NCC	Newcastle City Council
NEPM	National Environment Protection Measures
NPC	Newcastle Port Corporation

Abbreviations

Abbreviation	Description
NSW	New South Wales
OEH	NSW Office of Environment and Heritage
OEMP	Operational Environmental Management Plan
PAC	Planning Assessment Commission
PACIA	Plastics and Chemical Industry Association
PHA	Preliminary Hazard Analysis
PoEO Act	<i>Protection of Environmental Operations Act 1997</i>
PSNL	Project Specific Noise Limits
QRA	Quantitative Risk Assessment
RAAF	Royal Australian Air Force
RMS	NSW Roads and Maritime Service
TRIFR	Total Recordable Injury Frequency Rate
SCAG	Stockton Community Action Group
SEWPaC	Commonwealth Department of Sustainability, Environment, Water, Population and Communities
SLOD	Significant Likelihood of Death
SLOT	Specified Level of Toxicity
SSAN	Security Sensitive Ammonium Nitrate
SSD	State Significant Development
SWMP	Surface Water Management Plan
TEOM	Tapered Element Oscillating Microbalance
TIA	Traffic Impact Assessment
TGAN	Technical Grade Ammonium Nitrate
TLV-STEL	Threshold Limit Value - Short Term Exposure Limit
TLV-TWA	Threshold Limit Value - Time-Weighted Average
TMP	Traffic Management Plan
URS	URS Australia Pty Ltd

Introduction

1.1 Project Context

Incitec Pivot Limited (IPL) is seeking planning approval for the development of a Nitric Acid (NA)/Technical Grade Ammonium Nitrate (TGAN) facility (the 'Project') at Kooragang Island, Newcastle.

The Project is required to service the future needs of the mining industry in the Hunter Valley. Whilst not an explosive itself, Ammonium Nitrate (AN) is the main raw material used in the manufacture of commercial blasting products used by the mining, quarrying and construction industries. In 2010/11, 99,042 tonnes of AN were imported through the Port of Newcastle and there will be increasing levels of AN imports required to meet future demand in the Hunter Valley¹. The Project would replace the need for imports and ensure that the future mining operations in the Hunter Valley are not unnecessarily constrained through an inadequate supply of this important product.

An Environmental Impact Statement (EIS) was prepared under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and placed on exhibition for a period of 47 days up to and including 29 October 2012. This report responds to and addresses the submissions received during and following the public exhibition. Further detail in relation to the assessment process is provided in **Section 1.3**.

1.2 Project Location and Description

The Project would be located on the IPL site situated at 39 Heron Road, Kooragang Island, Newcastle, NSW (the 'Site') within the Port of Newcastle, approximately 3 kilometres (km) north from the Newcastle CBD. The Site is located on the lot legally described as Lot 3 on DP1117013. This Lot is approximately 36.8 hectares (ha) in size.

The Site has been used as a fertiliser manufacturing facility since its development and was originally owned by Australian Fertilizers Ltd. IPL now owns the Site through a wholly owned subsidiary, TOP Australia Ltd. It is currently used as a fertiliser distribution centre. This existing use is concentrated in the western portion of the Site and comprises a number of industrial buildings and facilities such as storage tanks, as well as office buildings and associated infrastructure. The existing operation and the majority of the existing infrastructure would be retained alongside the Project.

The Project would involve the construction of a number of new structures and related infrastructure across the central part of the Site.

The key Project components include the construction of:

- Additional pipe racks including an overhead connection to the Newcastle Port Corporation (NPC) bulk liquids berth for Ammonia unloading;
- Ammonia Storage Tank;
- Nitric Acid (NA) Plant including an air compressor, gas heater, waste heat boiler, steam superheater, air heater, condenser, absorber tower, power generator and various catalysts;
- Nitric Acid storage tank;
- AN Plant including an ammonia vessel, neutraliser, flash drum, evaporator, remelt tank, prill tower and fluidised bed cooler;
- AN Solution (ANSOL) storage tank;
- TGAN Prill (TGAN) bulk and bagged storages;

¹ Draft Strategic Development Plan for Port of Newcastle (NPC, 2013).

1 Introduction

- Cooling water tower and pumps;
- Additives and coating agent storage;
- Waste concentrated ANSOL storage;
- Associated utilities and services;
- Associated infrastructure including new stormwater and wastewater systems as well as stormwater outfalls to the east of the Site that join the existing NPC stormwater network; and
- Associated buildings including a control room and laboratory, administration building and workshop and stores.

Further details regarding the Project can be found in **Chapter 4 Project Description** of the *Proposed Ammonium Nitrate Facility Environmental Impact Statement* (the EIS) (URS, 2012)².

1.3 Environmental Impact Statement

The Project has been identified as a State Significant Development (SSD) and is therefore subject to the provisions of Part 4 of the EP&A Act and will undergo assessment by the Department of Planning and Infrastructure (DP&I) and determination by the Minister for Planning and Infrastructure. The Minister may delegate this determination to the NSW Planning Assessment Commission (PAC).

An Environmental Impact Statement was prepared under Part 4 of the EP&A Act to document the environmental assessment for the Project.

An EIS is part of a larger assessment process in which the Proponent of a Project:

- Identifies a need;
- Considers alternatives and identifies a preferred option;
- Assesses the likely environmental impacts and identifies mitigation measures;
- Presents the EIS to the DP&I for public exhibition;
- Responds to submissions from the public exhibition in a submissions report; and
- Provides a copy of the EIS and submissions report to DP&I for their consideration.

The EIS was placed on public exhibition between 12 September and 29 October 2012. Submissions were invited from anyone with an interest in the Project including government authorities and members of the community. A total of 372 submissions were received by DP&I during the exhibition period. The DP&I sent these the submissions to IPL on 07 November 2012. A submission was received from the Environment Protection Agency (EPA) on 9 April 2013.

Two submissions were in support of the Project, 370 raised some level of opposition.

Appendix A provides a summary of the submissions; the submissions in full are available on the DP&I website³.

This report has been prepared to address the issues raised in the submissions that were received during and after the official exhibition period for the Project. Should any alterations to the management and mitigation measures be required, the table from the main EIS summarising these measures may also be revised.

² http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=4986

³ http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=4986

1 Introduction

The next step in the approvals process will involve IPL's submission of this report to the DP&I where it will be placed on their website. The DP&I will assess the EIS and this report (the Response to Submissions) and the Director General will prepare an assessment report for the Project, taking into account any comments received from relevant Government Authorities, stakeholders, and members of the community. The assessment report could then be submitted to the Planning Assessment Commission (PAC) for determination under powers delegated from the Minister.

1.4 Supplementary Water Reports

Initial comments from the NSW EPA were received just prior to the EIS being placed on Public Exhibition. The EPA requested that the hydrodynamic modelling be augmented and that the water quality data used within the EIS assessment be verified in a series of sampling events. This augmentation and verification process was completed over a three month period in order to allow for sampling during a range of estuary conditions. Supplementary interim water quality and modelling reports were prepared and submitted to the EPA on 30 November 2012 and the final water quality report submitted on 6 March 2013.

Appendix B provides the Supplementary Water Reports.

1.5 Document Structure

This report comprises the following:

- Section 1: Introduction including background and context.
- Section 2: Summary of consultation during the Exhibition stage.
- Sections 3 – 21: Response to the submissions.
- Section 22: The revised Management and Mitigation Measures for the Project.

The submissions report is supported by the following Appendices:

- Appendix A: A summary of the issues raised in the submissions.
- Appendix B: Supplementary Water Reports.

Exhibition Consultation

2.1 Stakeholder Consultation

Consultation with the community regarding the Project commenced in October 2011. IPL announced the Project with a letterbox drop, Project fact sheet and media releases. Since the announcement, IPL has maintained regular contact with local stakeholders in a number of ways, including:

- information letters circulated to the local community;
- regular meetings and updates with key government ministers and departments;
- media releases to local press, radio etc.; and
- regular meetings with the Community Liaison Group (CLG).

The consultation strategy was undertaken as part of the EIS to identify the potential issues relevant to the local community. The process was discussed with the DP&I and found to be adequate for the purposes of this assessment. The consultation effort up to exhibition is explained in detail within **Chapter 7 Consultation** of the EIS.

The State Significant Development process, under Part 4 of the EP&A Act, requires that the EIS be exhibited for at least 30 days unless the exhibition period falls over a school holiday in which case this period can be extended to 45 days. As stated above, the Project EIS was placed on exhibition for a period of 47 days from Wednesday 12 September to Monday 29 October due to the presence of school holidays during this time. During exhibition, members of the public, along with statutory agencies and other stakeholders are invited to make submissions on the Project.

2.2 EIS Information Days

2.2.1 Exhibition Day Attendance

During the exhibition, IPL held two drop-in sessions to allow members of the community to speak directly to the Project team. These sessions were held at the following times and locations:

- Stockton Senior Citizens Hall – Thursday 20 September 2012 from 1-4pm and 6-8pm; and
- Mayfield Senior Citizens – Saturday 22 September 2012 from 11am-1pm and 2-4pm.

In total, 19 stakeholders attended the two information days. **Table 2-1** provides a summary of the attendance at the information days.

Table 2-1 Information Day Attendance

Date	Location	Attendees
Thursday 20 September	Stockton Senior Citizens Hall	15
Saturday 22 September	Mayfield Senior Citizens Hall	4
Total number of attendees		19

2 Exhibition Consultation

2.2.2 Issues Raised During Exhibition Days

Feedback forms were available during the exhibition days to allow any comments on the Project to be recorded. Some attendees to the exhibition days elected to complete forms during their visit.

Table 2-2 below contains:

- the names of those that completed the feedback form (where available);
- a summary of the issue raised; and
- the location within this document where that issue is addressed.

Table 2-2 Issues Raised at Information Days

Session	Attendee	Concern	Benefit	Section Addressed
Stockton	Unknown	General objection		Sections 3 - 21
	B. Fensom	Risk profile		Section 20.4
			Limited employment opportunities	Section 20.9
		Location of Project		Section 20.1
	G. Frenell	Pollution		Section 20
			Jobs	Section 20.9
	S. Moore	Project delays		Section 20.1
			Local Economy	Section 20.9
	Unknown	Disasters		Section 20.4
			Employment	Section 20.9
	L. Donnelly	Potential for accidents		Section 20.4
			Local mining operations	Section 20.9
	J Ellerey	Risk of explosion near communities		Section 20.4
	F Curtis	Proximity to Orica plant		Section 20.4
Mayfield	C. Lawler	Air Pollution		Section 20.5
			Employment	Section 20.9
	T. Gibbons	Explosions		Section 20.4
			Employment	Section 20.9

2.3 Additional Consultation

In addition to the EIS Information days, IPL has also engaged in additional consultation since submission of the EIS. This consultation has included:

- The Community Liaison Group met on 11 September 2012 for Dr S Coakes to present the findings of the Community Survey and for IPL and URS to present and discuss the key findings of the EIS.
- The Community Liaison Group met on 24 October 2012 for IPL to provide a Project update and answer any questions regarding the EIS.

2 Exhibition Consultation

- IPL and URS met with NCC council officers on 10 December 2012 to discuss the issues raised within the NCC submission. The conclusions of this discussion are included in the responses in **Section 7** of this report.
- IPL and URS appeared before councillors in a closed session on 11 December 2012 to present details regarding the Project and answer any questions. Following a presentation on the Project the discussion was brief and focused mainly on noise, lighting, employment, program and IPL's environmental performance record.
- IPL and URS met with the EPA on 21 November 2012 to discuss any issues/concerns the EPA had with the Air Quality Impact Assessment (AQIA) and Noise and Vibration Impact Assessment (NVIA) in the EIS. The EPA were generally satisfied with the AQIA and NVIA but believed a more conservative Project Specific Noise Limit should be applied.
- IPL and URS had email conversations with the EPA/OEH in January and February 2013 regarding the Hunter River estuary hydrodynamic modelling and water quality studies.

Environment Protection Agency

Introduction

A submission was received from the NSW EPA on 9 April 2013. The submission outlined the EPA's assessment of the aspects of the Project relating to Noise and Vibration, Air Quality and Water Quality. The EPA did not ask for any further clarification on any issues, provided the suggested conditions attached within the submission could be agreed. The text below summarises the EPA submission.

3.1 Noise and Vibration

In the EPA's assessment of the Noise and Vibration Impact Assessment (NVIA) (refer to **Appendix F** of the EIS), the EPA discussed three key issues:

- The identification of sensitive noise receptors;
- Background noise assessment; and
- Project Specific Noise Levels (PSNL).

On the whole the EPA found the approach taken within the NVIA to be generally adequate, however they did pass more substantial comment on the PSNL.

The EPA noted: *"Orica currently has a Pollution Reduction Program requiring reduction in noise emissions from their premises. Therefore the maximum noise level from the new source [the Project] should be "Acceptable noise level minus 10dB(A)" which would mean 30dB(A) (40dB(A) – 10dB(A)) would be the noise level applied to Incitec. This is a relatively low level for an industrial plant likely to require significant expenditure on attenuation. The EPA does not believe this is a reasonable or feasible noise level to apply to the Incitec plant, particularly as the proposed facility is within an area zoned for heavy industrial development.*

"The EPA's preference is to encourage noisy industry to cluster together as a means of minimising the potential for overall noise impact. The cost of achieving the objective is a consideration against the amount environmental noise benefit achieved, if it discourages industry from clustering in a zone that has been established in, and is intended for, industrial development.

"Therefore the EPA believes that 40dB(A), not 42dB(A) as proposed by Incitec, may be a more appropriate objective for the proposed facility..."

Response

IPL has committed to a number of measures to avoid or reduce noise impacts from the Project. Whilst meeting the EPA's suggested limit will require further mitigation, IPL believes that suitable measures can be put in place to ensure that the recommended noise limits can be met. IPL therefore agrees to the suggested noise limits of 40 dB (A) during night time and 41 dB (A) during the day and evening at Stockton from the Project.

3 Environment Protection Agency

3.2 Air Quality

The EPA has advised that the Air Quality Impact Assessment (AQIA) was “conducted generally in accordance with the EPA’s Approved Methods for the Modelling and Assessment of Air Pollutants in NSW”, as consistent with feedback received during EPA discussions in November 2012 (refer **Section 2.3** of this report). The EPA also advised that “the assessment predicts compliance with the EPA’s impact assessment criteria for NO₂, PM₁₀ and ammonia during both routine and non-routine operations. The AQIA proposes emission controls that are consistent with best practice”.

Whilst no additional comments were made regarding the Air Quality Assessment, EPA did provide a number of recommended conditions of approval. It is understood that these conditions would facilitate the licencing of the Project, subject to approval. These conditions cover a range of areas including requirements for both routine and post-commissioning air emissions monitoring, meteorological monitoring, and reporting of flare operation.

3.3 Water Quality

On 30 July 2012 the EPA wrote to the Department of Planning and Infrastructure following their review of the Draft EIS. The EPA outlined a need for some of the findings of the Water Quality Report (**Appendix H Water Management Report** of the EIS) to be verified. This additional work involved more detailed hydrodynamic modelling to confirm the proposed location, depth and method for the wastewater discharge, and additional water quality sampling of the Hunter River to confirm the existing Hunter River water quality data.

This additional work was completed between September 2012 and March 2013 and the results were provided to the EPA for their review. The hydrodynamic work and the majority of the sampling work was completed before December 2012, however IPL had to wait until early 2013 to complete the final round of sampling to ensure that the results were from a range of estuary conditions.

The additional sampling and modelling work was supplied to the EPA before they made a submission on the EIS. This additional verification work is supplied in **Appendix B** of this report.

Following review of the final sampling and modelling reports, the EPA is generally satisfied with the results of the environmental assessments for the Project and the conclusions within the EIS. The EPA have recommended a number of conditions of consent for the Project, to manage any potential impacts on the Hunter River estuary and associated receptors.

3.4 Draft Conditions of Consent

The submission from the EPA also included a set of recommended conditions of approval for the Project. IPL is currently discussing some of these conditions with the EPA and are hoping to agree any final conditions with the EPA prior to project approval.

RMS - Roads

Introduction

A submission was received from NSW Roads and Maritime Services (Roads) via a letter dated 10 October 2012. The submission raised no objections to the Project provided that the following issues are addressed.

In addition to commenting on the Project, the submission provides advice to the consent authority. This advice is not responded to in this section, instead a response can be found where this advice has been incorporated into the submission from that authority.

4.1 Issue 1 – Traffic Management Plans

RMS has requested that Traffic Management Plans (TMPs) should be prepared for the construction and operational phases of the Project. TMPs should be designed to have minimal impact to the operation of the road network and will be submitted to RMS for approval. RMS also requested that a right of review is retained to allow RMS to make changes to the TMP in the interest of maintaining road safety.

Response

IPL has noted this request. TMPs would be submitted to RMS for approval prior to construction.

This request has already been included in the Management and Mitigation Measures for the Project.

4.2 Issue 2 – Site Access / Egress Routes

RMS has requested that: *“vehicular access to/from the site, particularly for heavy vehicles and in the AM peak periods, should be via the on-load and off-load ramps on Teal Street to/from Greenleaf Road. This route will minimise impacts of the development both during the construction and operational phases on the operation of the Cormorant Road/ Teal Street roundabout.”*

Response

IPL has noted this request and would incorporate these requirements within the TMP. This request has been included in the revised Management and Mitigation Measures for the Project (refer to Measure G2, **Table 22-2** in this report).

RMS - Maritime

Introduction

A submission was received from NSW Roads and Maritime Service (Maritime) via email on 16 October 2012.

The submission stated that RMS (Maritime) did not wish to comment on the Project at this time.

Newcastle Ports Corporation

Introduction

A submission was received from Newcastle Ports Corporation (NPC) via a letter dated 29 October 2012.

The submission notes that the Project would result in a greater utilisation of the port infrastructure and that NPC is therefore supportive of the Project.

6.1 Issue 1 – Commercial Agreement

Notwithstanding the general support for the Project expressed within the NPC submission, it stated that: *“the proponent must enter into a commercial agreement with Newcastle Ports Corporation in respect of the construction and ongoing operation and maintenance of all infrastructure and works in accordance with the Project Approval prior to any development commencing on NPC land.”*

Response

IPL is engaged in an ongoing dialogue with NPC regarding both the Project and their existing operations on the Site. The details of the commercial agreement between IPL and NPC would be finalised prior to construction. In general, IPL would be happy to enter an acceptable commercial agreement with NPC pertaining to the construction, ongoing operation and maintenance of loading and unloading equipment located on land owned by NPC.

Newcastle City Council

Introduction

A submission was received from Newcastle City Council (NCC). The submission raised a number of issues that require clarification in order to gain the satisfaction of the Council.

IPL and URS appeared before councillors in a closed session on 11 December 2012 to present details regarding the Project and answer any questions.

IPL and URS also met with NCC council officers on 10 December 2012 to discuss the issues raised within the submission. Geoff Mansfield (Principal Planner), James Cross (Development Engineer) and Kristy Munro (Environment Strategy) attended from NCC.

7.1 Issue 1 – Shed 5

The submission raised questions regarding the existing location and proposed use of Shed 5, as identified within **Chapter 3 Project Location and Existing Environment** of the EIS.

Response

Shed 5 is currently located approximately in the centre of the Site, as shown on the updated version of **Figure 3-1** below. The building is to be demolished prior to the project construction. The demolition works do not form part of the Project. They are subject to Development Application 2012/574. The application was approved by NCC on 27 September 2012 and is valid from 27 September 2012 to 27 September 2017.

7.2 Issue 2 – Chemtrans

The submission requests clarification on the planning pathway proposed to facilitate the alterations to the Chemtrans facility at the northern side of the Site. Discussions with NCC indicated that their key concern related to the reconfiguration of the Chemtrans truck parking and storage area.

Response

IPL is including the alterations to the Chemtrans site within the works description for the Project. These alterations involve the reconfiguration of the truck parking area. They would not involve any alterations to the permanent structures on Site. Therefore these works would be assessed as part of the determination for State Significant Development (SSD_4986).

The existing Chemtrans site comprises an area approximately 1.5 ha, located in the north east of the Project Site. The site is generally rectangular in shape, approximately 200 m in length and 70 m in width. The truck parking area in the south end of the site widens from 70 m to approximately 90 m in width.

The existing Chemtrans Site contains the following structures:

- Shed 1 (c. 20 m wide, c. 20 m long, single storey) used as a truck workshop;
- Shed 2 (c. 5 m wide, c. 15 m long, single storey) used as a site office; and
- Shed 3 (c. 5 m wide, c. 15 m long, single storey) site amenities.

The existing truck parking area in the south of the Chemtrans site would be relocated to the east of the site office and amenities as shown in Figure 4-1 of the EIS. The existing buildings would be retained on the proposed Chemtrans site.



Existing Infrastructure Key	
1	Shed 1
2	Shed 2
3	Shed 3
4	Shed 4 - DG Store
5	Shed 5
6	Bagging/ Storage Warehouse
7	Wax Tanks (redundant)
8	Sulphuric Acid Loadout
9	Sulphuric Acid Storage Tanks
10	Entrance
11	Operations Office
12	Weightbridge
13	Sulphuric Acid Inland Pipe
14	Existing Amenities Building
15	Office/Seminar Center

Legend	
 	Site_Boundary
 	Lot and DP Boundary
 	CTB Wharf



0 37.5 75 150 225 300 Meters

Datum: GDA94
Grid: MGA Zone 56

Source: Aerial Imagery - Nearmaps 2011

Whilst every care is taken by URS to ensure the accuracy of the digital data, URS makes no representation or warranties about its accuracy, reliability, completeness, suitability for any particular purpose and disclaims all responsibility and liability (including without limitation, liability in negligence) for any expenses, losses, damages (including indirect or consequential damage) and costs which may be incurred as a result of data being inaccurate in any way for any reason. Electronic files are provided for information only. The data in these files is not controlled or subject to automatic updates for users outside of URS.

INCITEC
PIVOT LIMITED

PROPOSED AMMONIUM NITRATE FACILITY

CURRENT SITE LAYOUT

URS

File No: 43177771.050.mxd

Drawn: STB

Approved: WM

Date: 12/12/2012

Figure: **3-1**

Rev. A A4



7 Newcastle City Council

The storage of transportable chemical isotanks on the Chemtrans truck parking area has ceased. The EPA and NCC have been advised of the change.

The environmental impact of the existing and proposed stormwater catchments for the Chemtrans site were included in the Surface and Wastewater assessments in **Chapter 13** and **Appendix H** of the EIS. The details of the proposed truck park area will be finalised during detailed design in accordance with the Design Approach outlined in Section 2.2 of **Appendix H** of the EIS.

Detailed design for the proposed Chemtrans area would be finalised to meet the contemporary need of Chemtrans when the Project is to be constructed. Flexibility has been included in the design at this stage in order to allow for variations in future capacity and use of the Chemtrans area. The Site contains sufficient land to allow for the future needs of the Chemtrans operation and IPL can confirm that the number of car and truck parking spaces during construction and operation of the Project would be at least equal to that which are currently available. No parking off site would be required.

7.3 Issue 3 – Newcastle Urban Strategy

The submission states that: *“The proposed use of the Kooragang Island site for an ammonium nitrate manufacturing facility is consistent with the City-Wide strategies adopted in the Newcastle Urban Strategy for servicing the Port of Newcastle and the future of Newcastle’s industrial areas.”*

Response

IPL has noted the council’s submission regarding land use.

7.4 Issue 4 – Heritage

The submission seeks to clarify some confusion surrounding the correct referencing of heritage items in the local area. However, the submission states that: *“despite the confusion, the conclusion of the heritage assessment that these items will not be significantly impacted ... is accepted.”*

Response

IPL accepts the proposed references attached to the heritage items within the council’s submission. Following this clarification, **Table 19-2** within the EIS should be replaced with the revised **Table 19-2** below.

Table 19-2 Heritage Items (Original Table)

Ref	Name	Primary Address	Significance
1208	Tongues Tree Fig	Kooragang Nature Reserve	Local
1209	131 Radar Igloo (building)	200 Kooragang Street	Local
1210	School Master’s House	200 Kooragang Street	Local

7 Newcastle City Council

Table 19-2 Heritage Items (Revised Table)

Reference	Name	Address	Significance
1208 LEP 2012	Tongues Tree Fig	Kooragang Nature Reserve	Local
3 Ports SEPP	Palm	2A Heron Road	
SHR	131 Radar Igloo (building)	200 Kooragang Street	State
1210 LEP 2012	School Masters House	200 Kooragang Street	Local

The historic heritage assessment report for the Project was completed by the Australian Museum Business Service (AMBS). This document is included in the EIS as **Appendix M Heritage Impact Assessment**.

7.5 Issue 5 – Developer Contributions

The submission recommends that a Section 94A developer contributions levy of 1 % of construction cost should be payable to NCC upon development approval.

Response

IPL will be discussing the Section 94A developer contributions levy with Newcastle City Council and the DP&I. The agreed contribution levy would be paid prior to operation of the Project.

7.6 Issue 6 – Hazard and Risk

The submission requests more information surrounding the EIS' claim that the recommendations of the Department's *Newcastle and Kooragang Island Risk Assessment Study* are not relevant to the Project.

Response

The *Newcastle Kooragang Island Area Risk Assessment Study* (DoP, 1992) contains a set of recommendations pertaining to the land use of Kooragang Island and the surrounding area. **Table 7-1** outlines these recommendations and describes their relevance to the Project and the existing IPL operation on the Site. Many of the recommendations are now included as NSW WorkCover requirements for Major Hazard Facilities. The existing IPL operations are, and the proposed Project would be, classified as Major Hazard Facilities.

7 Newcastle City Council

Table 7-1 IPL Compliance with Newcastle Kooragang Island Area Risk Assessment Study

No.	Recommendation	Status for Existing IPL Site	Status for Proposed Project
1	Organisations operating the sites which are the subject of the safety upgrading recommendations as per (2) to (19) inclusive should prepare a timetable and provide firm commitments for the implementation of such safety upgrading. The timetable for the implementation of safety control upgrading should give priority to safety measures that would reduce risk most rapidly with due regard for cost-effectiveness. (The priorities should be consistent with the major risk contributors as identified in this risk assessment study.)	Complete	Not applicable
2	Organisations should, as a matter of priority, undertake a review and implementation of all safety recommendations for each of their respective site(s) as contained in the separate site recommendation lists.	Complete	Not applicable
3	Technical safety upgrades for petroleum and LPG storage sites should focus particularly on the provision of high level alarms on storage tanks, overfill prevention and protection systems on road tanker loading and cylinder filling operations, emergency shutoff at least two locations (local and remote) at transfer pumping and/or tanker loading, gas detection, deluging of vessels and other fire protection measures.	Not relevant to IPL – no petroleum or LPG storage on-site.	Not relevant to IPL – no petroleum or LPG storage on-site.
4	In the safety upgrades for the Incitec site, emphasis should be on the ammonia storage and transfer operations.	Not relevant to IPL – applies to Orica's ammonia storage and transfer operations.	Included in design of ammonia storage and transfer operations.
5	All valves and transfer pipelines within the industrial sites should be adequately labelled and colour coded for product and flow identification.	Existing sulphuric acid transfer pipelines comply.	Valves and transfer pipelines for the proposed Project would be adequately labelled and colour coded.
6	The organisations in the study area should demonstrate to the Department of Planning's satisfaction that an appropriate regime of storage vessel integrity testing, including ultrasonic testing and foundation checks as applicable, is being implemented.	Existing sulphuric acid storage tanks comply.	Mechanical integrity programs would be developed for the proposed Project before operation.
7	All organisations in the study area should maintain training manuals and formalised training policies and procedures and keep records of training.	Existing training systems comply and audited by NSW WorkCover.	Proposed Project would develop and implement training systems.

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No.	Recommendation	Status for Existing IPL Site	Status for Proposed Project
8	All organisations in the study area should review and update documentation as necessary to include the following as minimum: • site layout to appropriate scale showing location of storage vessels, loading bays, drum filling areas, pumps and other plant, equipment and buildings; • piping and instrumentation diagrams; • site inventory layout showing storage capacity of vessels, nature of products stored/handled on-site, typical transfer rates and average and maximum throughput, details of cylinder filling and storage areas by type of products and quantity of materials on-site; • formalised operating procedures applicable to site operations; • formalised safety monitoring procedures/ programs applicable to site operations; • regulatory licences applicable to the site; and • plans showing the location and actuation methods of safety devices such as shut- off systems, fire extinguishers, monitors and so on.	Existing site complies.	Proposed Project would develop required documentation.
9	Organisations in the study area, as applicable, should prepare updated plans and documentation showing bunding capacity, the basis for retention capacity, material of construction and permeability of bund floors and walls. Reports should be prepared by qualified personnel to verify as applicable the conditions and adequacy of bunds, including integrity of bund walls under stress, and compliance with the relevant Australian Standards.	Complete	Bunding would comply with current standards.
10	All organisations in the study area, as applicable, should formalise maintenance programs and maintain records of maintenance implementation.	Existing operations comply.	Formal maintenance programs would be developed for proposed Project.
11	All organisations in the study area should maintain detailed records of incidents on-site and formulate or review procedures for reporting and recording near incidents. An outline of basic facts on all incidents or near incidents with actual or potential significant off- site impacts on people or the biophysical environment should be reported to the Department of Planning within 24 hours. A further detailed report should be prepared and submitted following investigations of the causes and identification of necessary additional control measures.	Complies with current incident reporting requirements.	Would comply with current incident reporting requirements.
12	Organisations in the study area should update emergency procedures and plans. The plans and procedures should be based on specific analysis of site hazards, regularly updated, exercised, reviewed and revised. Hazardous Industry Planning Advisory Paper No. 1, Industry Emergency Planning Guidelines, should be used as a basis for the development of these plans. (See also Recommendations Nos. 35 to 39.)	Existing emergency procedures and plans regularly updated.	Emergency procedures and plans would be updated for the proposed Project.
13	All documents specified In (6) to (12) inclusive should be kept on-site at all times and be available for Inspection as part of auditing or other internal or external safety review at any time.	Complies	Would comply
14	All documents specified in (6) to (12) inclusive should be regularly updated. Plant and equipment modification procedures should ensure that such updates are an integral part of modification implementation.	Complies	Would comply

7 Newcastle City Council

No.	Recommendation	Status for Existing IPL Site	Status for Proposed Project
15	All organisations in the study area should review and upgrade fire prevention and protection systems including implementing measures such as increased fire protection coverage of transfer pumps, tanker loading bays and cylinder filling operations. Automatic deluge systems or fixed monitors should be considered, where applicable. The adequacy of existing provision of foam on-site should be reviewed. Updated fire prevention and protection should be based on formal fire safety studies to reflect the specific types of hazards applicable to the site. The Hazardous Industry Planning Advisory Paper No. 2 Fire Safety Study Guidelines should be used as a basis for these studies which should include consideration of contaminated firefighting water minimisation and containment. Fire protection and prevention upgrading should be implemented in liaison with the NSW Fire Brigades.	No flammable inventories on-site, except minor storage.	Fire prevention and protection would be upgraded as part of the proposed Project. A Fire Safety Study would also be completed.
16	All sites without direct alarm lines to the Fire Brigade should install such lines as a matter of priority.	No direct brigade alarm.	Direct fire alarm would be installed as part of Project.
17	Sites should review and update security measures as warranted including fencing and control of entry to site during and outside operating hours.	Complete for existing operations.	Security plan would be developed and submitted to NSW WorkCover for proposed Project.
18	An independent hazard audit should be undertaken at least every three years for all sites in the study area by either a qualified consultant or company personnel from a separate management/organisation function to that associated with the site's management. Hazard audits should include all operational and organisational safety measures and be consistent with Hazardous Industry Planning Advisory Paper No. 5, Hazard Audit Guidelines.	Independent audits conducted by IPL Corporate, NSW WorkCover MHF and EPA.	As a condition of development approval, a hazard audit would be required after 12 months of operation and every three years thereafter. The audit would be carried out by a qualified person or team, independent of the development and consistent with HIPAP5.
19	Copies of the hazard audit reports should be kept on-site and made available to local management and relevant authorities. They should contain specific recommendations. An action plan for implementation developed in consultation with site management should be included.	Complies	Would comply

7 Newcastle City Council

No.	Recommendation	Status for Existing IPL Site	Status for Proposed Project
20	Site management arrangements should include contingency plans for rapid and effective clean- up of spills as well as the monitoring and detection of any losses of stored product. All sites should maintain a quick and accurate detection system, including appropriate documentation for minor and large losses of materials.	Complies	Would comply
21	Site plans with details of materials stored, quantities and storage vessels should be provided to the local fire brigade stations and other emergency services as appropriate for the sites in the study area. This information should be updated on a routine basis.	Complies	Would comply
22	The housekeeping on sites should be reviewed as applicable to ensure it is consistent with good industry safety standards. Improvements should be initiated where necessary.	Complies	Would comply
23	Sites should maintain quick and accurate detection systems and appropriate documentation for minor and large losses of materials.	Complies	Would comply
24	Consistent with the department's advice at the assessment stage, all proposals including the Esso, MSB, Cleanaway and Ampol proposals should be subject to the appropriate studies and programs as outlined in Hazardous Industry Planning Advisory Paper No. 3, Environmental Risk Assessment Guidelines.	Complies	As conditions of development approval, a number of studies and programs would be required during design, before construction and before/during operations. These would include: • hazard and operability study; • final hazard analysis; • fire safety study; • construction safety study; • safety management system; • emergency plan; and • independent hazard audit .

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No.	Recommendation	Status for Existing IPL Site	Status for Proposed Project
25	Intensification of industrial uses, including significant extensions to existing facilities or new development proposals, should have to demonstrate by way of a comprehensive preliminary hazard analysis (including quantification of risk where applicable) full compliance with the criteria set out in Hazardous Industry Planning Advisory Paper No. 4, Risk Criteria for Land Use Safety Planning. Hazardous Industry Planning Advisory Paper No. 6, Hazard Analysis Guidelines (to be published shortly) sets out the requirements for appropriate preliminary hazard analysis. The analysis for new development proposals should be set in the context of the existing risk profiles as identified in this study.	Current site risk profiles comply.	PHA show development complies.
26	A program of safety upgrades should be implemented for the Incitec site, principally related to the ammonia storage, with the aim of progressively reducing risk levels at the affected residential and industrial areas.	Not relevant to IPL – applies to Orica's ammonia storage.	
27	While risk levels at the affected residential areas remain above the criteria levels, there should be no intensification of residential development in those areas.	Not relevant to IPL	Not relevant to IPL – applies to land use safety planning authorities.
28	Decisions made on future use of existing industrial lands and surrounding lands should pay full regard to the findings of this study and to the possibility of constraining future industrial development.	Complies	Not relevant to IPL – applies to land use safety planning authorities.
29	The safeguards for future developments on Kooragang Island and the south arm of the Hunter should be designed with particular regard to protection of the wetlands of Kooragang Island and the northern bank of the Hunter River.	Not applicable	Proposed Project complies
30	Further analysis should be undertaken for the Ampol site to test the validity of some of the conservative assumptions made and to identify any specific risk reduction measures warranted. The company and the Department of Planning should pursue discussions on how this further analysis can be carried out most beneficially.	Not relevant to IPL	Not relevant to IPL
31	The continued use of the SRA tank in Elizabeth Street in the medium to long term should be reviewed. The adequacy of existing safeguards and security should also be comprehensively reviewed and upgraded if the use of the tank is to continue.	Not relevant to IPL	Not relevant to IPL
32	The use of the Horton sphere on the Boral site should be discontinued. The sphere should be decommissioned and preferably removed from the site	Not relevant to IPL	Not relevant to IPL
33	A comprehensive hazard analysis should be undertaken for the Boral site to identify necessary upgrading. The analysis could be prepared in support of a future development application provided that this does not unduly delay its commencement. The company should be required to conclusively demonstrate that the upgraded facility satisfies the department's risk criteria.	Not relevant to IPL	Not relevant to IPL

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No.	Recommendation	Status for Existing IPL Site	Status for Proposed Project
34	The Elgas site upgrading which is currently proceeding is to be commended and should continue without delay. A comprehensive hazard analysis of the upgraded silo, including all proposed changes, should be carried out and any necessary additional safety measures implemented. For any future development, it should be conclusively demonstrated that the control measures proposed will ensure that the site satisfies the residential risk criteria at the nearest residences.	Not relevant to IPL	Not relevant to IPL
35	The site plans and specific emergency services plans and procedures should be based on hazard identification and analysis and build on the strengths of existing arrangements. They should be fully consistent with the multi-hazard plan being prepared under the auspices of the Newcastle Emergency Management Committee established by the new State Emergency Management Organisation. The development and review of the emergency plans should have particular regard to: • arrangements for informing people in the potentially affected areas of possible future incidents, emergency arrangements and appropriate responses; • requirements and arrangements for incident notification of neighbouring companies and of people in potentially affected areas; and • control, containment and recovery of spillages of ammonia and other hazardous materials. The plans should make specific provision for exercise, review and revision.	IPL Site Plan complies	Site plans and emergency service plans would be developed.

7 Newcastle City Council

No.	Recommendation	Status for Existing IPL Site	Status for Proposed Project
36	Mutual Aid Groups with the following functions should be established amongst industrial organisations in the study area for: - improving understanding of the nature of hazardous incidents which could occur in the area and of the appropriate emergency responses; - exchange of information on measures for the prevention, mitigation and control of hazardous incidents and emergencies; - coordination of industry's emergency procedures with those adopted by relevant State emergency organisations; and - the dissemination of relevant safety information to the general public in the area. A separate Mutual Aid Group would be appropriate for Kooragang Island.	Major Hazard Facilities on Kooragang Island provide information to neighbouring industries and communities. This information includes: - Operations overview; - Safety Management Systems overview; - Emergency response; - Emergency telephone numbers; and - Types of incidents and community notification.	The IPL Community Safety Information would be updated for the Project. The Newcastle Local Emergency Management Committee has prepared a Kooragang Island Emergency Sub-Plan which is currently awaiting endorsement from the State Emergency Management Committee.
37	The adequacy of foam and firefighting water arrangements and supplies should be regularly reviewed. The review process should also be triggered by any new development or increased demand on the system.	Not relevant to IPL	The adequacy of firefighting water and foam would be addressed as part of the Fire Safety Study for the Project. The Fire Safety Study would be reviewed and approved by Fire and Rescue NSW.
38	Kooragang Island should be brought within the jurisdiction of the NSW Fire Brigades.	Not relevant to IPL	Not relevant to IPL
39	A continuously staffed fire station equipped to deal with relevant emergencies, including ammonia releases, should be established on Kooragang Island as soon as practicable. Until such time as the Kooragang Island station is established the Stockton Fire Station should be upgraded in both equipment and staffing to ensure a response capacity to incidents on Kooragang Island under all conditions.	Not relevant to IPL	Not relevant to IPL

7 Newcastle City Council

No.	Recommendation	Status for Existing IPL Site	Status for Proposed Project
40	A full hazardous materials transportation hazard analysis and risk assessment study should be carried out for Newcastle as a whole as the basis for developing an integrated transportation risk management strategy to cover both existing and future development. The study and strategy should cover road, rail, shipping and pipelines.	Not relevant to IPL	Not relevant to IPL
41	The prevention and emergency response arrangements for releases from sites and transport operations which could impact significantly on the biophysical environment should be upgraded as recommended in site reports. Consideration should be given to the possibility of large amounts of phosphorous and nitrogen entering the river.	Pollution Reduction Plans completed or in progress to reduce nutrient discharge to the river.	Would comply

7.7 Issue 7 – Stormwater

The submission states that in order to comply with the provisions of the *Newcastle Development Control Plan (DCP) 2012*, stormwater reuse should be incorporated into the Project design wherever possible.

Response

IPL is prepared to incorporate stormwater reuse into the detailed design of new amenities on the Site, where appropriate. Stormwater could be captured and used for the toilets on Site. Therefore IPL is happy to commit to this measure at this stage.

However a cost benefit analysis would have to be conducted before IPL could commit to incorporating captured stormwater into the industrial process. Stormwater may have to be extensively purified before it is of sufficient quality to be incorporated into the process, which could prove to be prohibitively expensive. This cost benefit analysis would be completed during detailed design.

A management and mitigation measure has been added in line with the discussion above (refer to Measure F11, **Table 22-3** in this report).

7.8 Issue 8 – Flooding

The submission states that the flood risk assessment for the Project is satisfactory.

Response

IPL has noted this submission.

7.9 Issue 9 – Water Quality

The submission states that it should be ensured that the Project: “*will not contribute to a decline in water quality in the Hunter River*”.

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Response

As described in **Appendix H** of the EIS and in **Appendix B** of this document, the Hunter River is an environment in which a large amount of bio-available nutrients are present. The information that informed the study of the environmental baseline for this assessment came mainly from data collected by Sanderson and Redden (2001). This data was verified during a local water sampling exercise in 2012 and 2013.

Local sampling of the Hunter River confirmed that the quality of the water in the area was heavily influenced by nutrient run-off from up-stream catchments. Effluent water emissions from the Project have been designed to allow for compliance with the objectives of the ANZECC guidelines and therefore, when examined within their local context, the Project would not contribute to a decline in the water quality of the Hunter River.

7.10 Issue 10 – Car Parking

The submission states that *“the submitted EIS does not include a detailed assessment of the likely parking demands of the proposal set against the relevant requirements of either the Newcastle DCP, 2012 or the Roads and Maritime Service document – ‘Guide to Traffic Generating Developments’. It is recommended that, should consent be granted, to the application, an appropriate condition be imposed requiring the provision of on site parking facilities for cars, bikes and motor bikes in accordance with the relevant requirement of Section 7.03 – ‘Traffic, Parking and Access’ of the Newcastle DCP, 2012 and the Australian Standards referred to in that document”.*

Response

There are currently approximately 160 car parking spaces in the main car park on the Site. In addition to this there are a number of ancillary car parks with a total approximate capacity of 10 cars and two covered bike / motor bike parking areas with an approximate capacity of 15 motor bikes. The existing demand for parking is approximately 25 cars and 3 motor bikes.

As noted in the EIS, during the construction phase of the Project, 80 parking spaces on the Site would be reserved for construction contractors. The remaining construction workforce would travel to and from the Site using a park and ride scheme; thereby eliminating the need to park on the Site. During the operations phase, the Project would employ an additional 60 full time staff, increasing the number of employees on the Site to 100. In addition contractors would be required for maintenance, security and transport.

There is no planned change to the capacity of the existing car parking areas or the covered motor bike parking areas. The proposed design includes locations suitable for on-site B-Double truck parking.

Section 7.03 – ‘Traffic, Parking and Access’ of the Newcastle DCP, 2012 requires the provision of the following parking spaces for new development for industrial landuse:

- Car parking – 1 space per 100m² gross floor area or 1 space per 2 staff, whichever is the greater;
- Bike parking – 1 space per 20 staff; and
- Motor bike parking – 1 space per 20 car spaces.

The current and proposed parking provisions would conform with Newcastle DCP, 2012 parking requirements and are sufficient to accommodate cars, bikes and motorbikes for the construction and operation of the Project.

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7.11 Issue 11 – Acid Sulfate Soils

The submission recommends that an Acid Sulfate Soil (ASS) Management Plan be completed for the Site prior to construction works commencing.

Response

The Phase II environmental assessment that was completed as part of the EIS (included as **Appendix G**) indicated that ASS were not likely to be an issue during construction. At present the EIS commits IPL to producing an ASS Management Plan should ASS be found during construction. In response to discussions with NCC, this commitment would be revised so that an ASS Management Plan would be produced prior to construction. This ASS Management Plan would be part of the Construction Environment Management Plan (CEMP).

The original management and mitigation measures for the Project have been revised in line with the discussion above (refer to Measure E8, **Table 22-2** in this report).

7.12 Issue 12 – Visual Impact

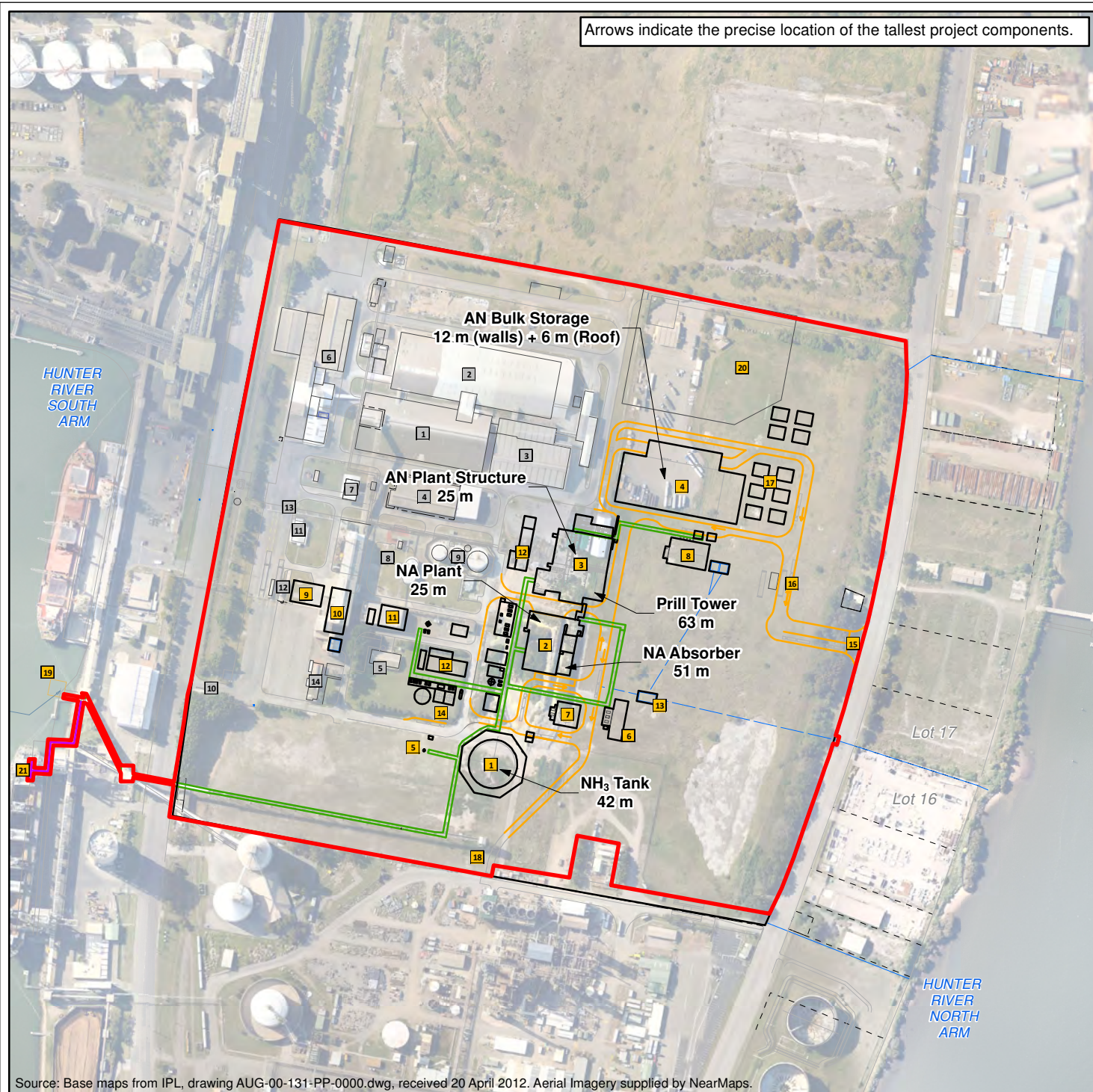
The submission notes that no elevation drawings were submitted as part of the EIS. It also claims that additional consideration needs to be given to the visual impact of the Project. Primarily, the submission is concerned about the visual impact to the eastern side (North Arm) of the Hunter River and Stockton foreshore areas.

Response

The Visual Impact Assessment appended to the EIS (refer to **Appendix K**) contains a number of digital photo montages that indicate the level of visual impact that would be expected along the Stockton foreshore area, including **Figures 10, 11** and **12**. For the sake of clarity these figures, along with an annotated version of **Figure 4-1** are replicated below. The annotated **Figure 3-1** indicates the locations and heights of the Project components that are labelled on **Figures 10, 11** and **12**.

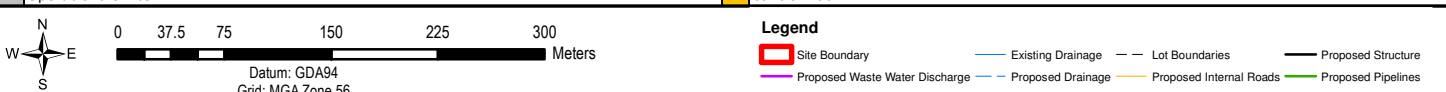
No detailed or concept elevations of the Project were submitted for assessment as part of the EIS, however figures showing the Project layout and details regarding the proposed height of key Project components are included in the EIS and is consistent with the existing industrial structures on Site. The Visual Impact Assessment determined that the Project would not have a material impact on static or transient views from the surrounding area. The majority of the Project would be screened from any residential receptors by existing vegetation and man-made structures, as shown in the photomontages.

Arrows indicate the precise location of the tallest project components.



Source: Base maps from IPL, drawing AUG-00-131-PP-0000.dwg, received 20 April 2012. Aerial Imagery supplied by NearMaps.

Existing Structures				Project Components			
1 Shed 1	12 Existing Weighbridge	1 Ammonia Tank	12 Substations	2 Shed 2	13 Sulphuric Acid Inland Pipe	2 NA Plant	13 Contaminated Water Retention Pond
3 Shed 3	14 Existing Amenities Building	3 AN Plant	14 Waste Water System	4 Shed 4 - DG Store		4 TGAN Prill Store & Bagging	15 Proposed Entrance
5 Office/Seminar Center		5 NH ₃ Flare	16 Proposed Weighbridge & Security	6 Bagging/Storage Warehouse		6 Cooling Tower Package	17 TGAN Container Store
7 Redundant Wax Tanks		7 NA Storage	18 Emergency Exit	8 Sulphuric Acid Loadout		8 ANSOL Storage and Handling	19 Ammonia Ship Berth
9 Sulphuric Acid Storage Tanks		9 Administration Building	20 Modified Truck Parking	10 Existing Entrance		9 Workshop/Warehouse	21 Waste Water Discharge
11 Operations Office		11 Control Room					



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INCITEC
PIVOT
LIMITED

PROPOSED AMMONIUM NITRATE FACILITY

PROJECT LAYOUT



7 Newcastle City Council

Figure 10 – Photomontage of the Project from Fullerton Street

Photo Location W6 - Proposed view west from Fullerton Street, Stockton



Photomontage PM2 - Proposed view west from Fullerton Street, Stockton - Detail View

Figure 10

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Figure 11 – Photomontage of the Project from Stockton Boat Ramp



Photomontage PM3 - Proposed view west from boat ramp (west of Fullerton Street and Booth Street intersection), Stockton - Detail view

Figure 11

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Figure 12 – Photomontage of the Project from Foreshore Park



Photomontage PM4- Proposed view west from foreshore park (west of Fullerton and Bay Street Intersection), Stockton - Detail View

Figure 12

7 Newcastle City Council

7.13 Issue 13 – Ecology

The submission infers from the EIS that a number of feed trees would be removed as part of the Project. The submission recommends an appropriate condition to require the rehabilitation and landscaping of the area to compensate for the loss of any habitat.

Response

As part of the Environmental Impact Assessment process, key feed trees, including Moreton Bay Figs, within the Site have been identified and avoided by the Project design. As noted in Section 18.6.1 of the EIS: *“The majority of the trees bordering Greenleaf Road have been retained. A new entrance to the Lot would require the removal of some trees; however this new entrance has been located to avoid the best feed trees in the southeast corner of the Lot.”*

The eastern border of the Site contains a line of trees and shrubs. As noted above the best feed trees are located in the south east corner of the Site. This line of trees thins as it goes north and includes significant gaps beyond the Kooragang Island Bicycle Club Shed, before retaining a more constant structure.

The new vehicle entrance from the Site to Greenleaf Road is located just south of the existing bicycle club shed. It would result in the loss of a number of mature and semi-mature, native and introduced trees, but would not affect the best feed trees further to the south. Nevertheless, in order to mitigate the loss of these trees, IPL would commit to replacing all of the native and non-native trees that would be lost with suitable native tree species where the line of trees and shrubs bordering Greenleaf Road includes gaps to the north of the Kooragang Island Bicycle Club Shed. Suitable replacement trees would be recommended by a suitably experienced and qualified ecologist. Over time this planting would help strengthen the existing tree and shrub habitat along Greenleaf Road by reducing the number of non-native species and enhancing the vegetation corridor to the north of the Bicycle Club Shed.

A management and mitigation measure has been added in line with the discussion above (refer to Measure J6, **Table 22-3** in this report).

Hunter Water

Introduction

A submission was received from the Hunter Water Corporation via a letter dated 26 October 2012.

The letter stated that Hunter Water have no objections to the Project and are in close liaison with IPL regarding the likely resource requirements of the Project upon commissioning.

WorkCover

Introduction

A submission was received from WorkCover via letter dated 29 October 2012.

9.1 Issue 1 – Further Consultation

The submission states that at the time of commencement of detailed design, the proponent must consult with the Major Hazard Facilities Unit of WorkCover, and address any matters raised, to the satisfaction of WorkCover.

Response

IPL has taken note of this requirement and would comply once detailed design of the Project has commenced. This requirement has been added to the original management and mitigation measures for the Project (refer to Measure B19, **Table 22-3** in this report).

9.2 Issue 2 – Further Consultation

The submission states that IPL must consult with WorkCover at least six months prior to the commencement of construction, to prepare a programme for updating the Safety Case to incorporate the changes associated with the Project.

Response

IPL has taken note of this requirement and would consult with WorkCover at least six months prior to the commencement of construction of the Project (except for construction of those preliminary works that are outside the scope of the pre-construction hazard studies). This requirement has been added to the original management and mitigation measures for the Project (refer to Measure B20, **Table 22-3** in this report).

NSW Health

Introduction

A submission was received from Hunter New England Population Health (NSW Health) via a letter dated 12 October 2012.

The letter stated that: *“A review of the recent Environmental Impact Statement (EIS) was carried out and assuming the impacts relating to air quality, noise and vibration, and surface and groundwater are within those levels indicated in the EIS, and all Management and Monitoring Plans are complied with, Hunter New England Population Health has no objections to these aspects of the proposal.”*

Despite this, the submission raised a number of issues that require response. These are outlined below.

10.1 Issue 1 – Existing and Future Industrial Use

The submission states that existing and future industrial uses in the vicinity of the Project should be assessed cumulatively and that appropriate buffers should be established to ensure that the surrounding population is protected from noise and particulate emissions.

Response

The EP&A Act requires every new development to conduct an environmental assessment. The environmental assessment is required to be of an appropriate scale to address the potential issues associated with the development.

The environmental assessment for this Project is documented within the Environmental Impact Statement (EIS). This EIS contains 13 technical assessments. In many cases these assessments also include a number of sub-assessments. Each of these assessments assesses the potential impact of the Project against the relevant existing environmental baseline for that particular aspect. Each environmental baseline contains a number of receptors that could be potentially impacted by the Project if impacts are not avoided or mitigated. Where relevant, these receptors include the existing local communities and industry in the vicinity of the Project, and therefore the impacts of the Project on existing local communities and industry are considered within the EIS.

In addition to assessing the project alone against the environmental baseline, a Cumulative Effects Assessment (CEA) was also completed. This CEA considered cumulative projects or actions that have been approved but are not yet operational (i.e. ‘present’ actions), or projects where there are sufficient details prior to approval for a robust assessment to be made (e.g. if a project has produced an EIS for Exhibition) (i.e. ‘future’ actions). Equally, in order to be included in the cumulative assessment, a project must have a high probability of occurring during the same period of time as the construction or operation as the Project. Relevant projects that may have a cumulative impact with this Project were identified using the following assessment parameters:

- Spatial parameter – The spatial parameter will depend on the characteristics of the environmental impact and the likely distance that any residual impact would travel. For example an air quality impact would potentially affect a wider area than a noise impact and would therefore affect different human or environmental receptors in different ways.

10 NSW Health

- Temporal parameter- Projects that are on exhibition, have completed exhibition but are not yet determined, have gained development approval, or have gained development approval but are not yet operational have been considered. Projects that are operational have been considered as part of the baseline for the assessment. Projects that are not on exhibition do not contain enough detail on residual effects or final design to be included in a robust cumulative assessment. Projects that are not yet on exhibition would be required to conduct a cumulative assessment as part of their EIS.

In this way 'future' projects around the Site were considered as part of the EIS.

The establishment of buffer zones or any other land use planning provisions within Newcastle Local Government Area is not the responsibility of IPL. Therefore this part of the submission has not been commented on further.

10.2 Issue 2 – Water Heating / Cooling

The submission states that water heating and cooling must meet Australian Standards (AS3666) and be installed and maintained to prevent the growth of *Legionella*.

Response

IPL accept this recommendation. Any water heating or cooling systems would be installed to meet the relevant Australian standards and regulated systems registered with the Local Council.

10.3 Issue 3 – Emergency Management Plan

The submission states that IPL should incorporate procedures that outline a strategic Early Warning System (EWS) for any incident or emergency that could affect local populations. The submission also states that the Emergency Management Plan should take an all hazards approach to allow all possible hazards, and their effects, to be carefully modelled with details of risk reduction, management and mitigation measures included.

Response

IPL already has an emergency response plan for the Site. The plan was prepared to comply with legislation such as *Work Health and Safety Regulation 2011* and the new requirements introduced by the *Protection of the Environment Legislation Amendment Act 2011*. The emergency plan would be revised before operation of the Project and a copy provided to the primary emergency service organisation.

The plan would be prepared to meet the requirements of the *Hazardous Industry Planning Advisory Paper (HIPAP) No 1 – Emergency Planning (2011)*. The plan would incorporate responses to emergencies from the hazards and their potential impacts identified in the Preliminary Hazard Analysis. If there is an emergency, IPL would immediately notify Emergency Services. The Emergency Services would advise the community – either in person or through radio or TV broadcasts – what action to take. Emergency Services would work with company experts to define a hazardous zone and people in this zone may be asked to evacuate or stay indoors ('Shelter in Place').

10 NSW Health

10.4 Issue 4 – Community Engagement

The submission states that the social impact of this development is important and that IPL needs to demonstrate a process of consultation with the community to ensure that a level of understanding and acceptance is achieved.

Response

IPL is involved with an ongoing process of consultation, as outlined in **Section 2** of this document and in **Chapter 7 Consultation** of the EIS. Following exhibition, a total of 373 submissions were received by DP&I relating to the Project. This relatively large number of submission illustrates that the community is aware of the Project.

Community consultation is an ongoing process and would be continued throughout design, construction and operation should the Project be approved, to ensure that the public understand and, where possible, accept the Project.

IPL's commitment to continued community consultation has been included in the revised Management and Mitigation Measures for the Project (refer to Measure A7, **Table 22-3** in this report).

Department of Primary Industries

Introduction

A submission was received from the NSW Department of Primary Industries via an undated letter received from DP&I on 13 November 2012.

11.1 Issue 1 – Groundwater Impacts

The submission requests that planned groundwater monitoring be undertaken at the following wells: MW55, MW53, MW21/21A and BP6 (as identified in Orica's 2008 EMP).

Response

IPL has noted this request and would seek permission to collect groundwater information from the Orica monitoring wells located on the Site during the construction phase of the Project. Provided permission was received from Orica, IPL would incorporate these groundwater monitoring wells into any groundwater monitoring program.

The original management and mitigation measures for the Project have been revised in line with the discussion above (refer to Measure E11, **Table 22-2** in this report).

11.2 Issue 2 – Reinjection of Dewatered Groundwater

The submission states that dewatered groundwater should only be reinjected if undertaken in accordance with the provisions of the *Protection of Environmental Operations Act 1997* (PoEO Act).

Response

IPL has noted this request. All dewatered groundwater would be managed in accordance with the provisions of the PoEO Act and only reinjected if it is of equal or better quality than the receiving environment.

This requirement has been added to the original management and mitigation measures for the Project (refer to Measure E20, **Table 22-3** in this report).

11.3 Issue 3 – Groundwater Interference

The submission states that any action with the potential to interact with groundwater would need to be licenced in accordance with the *Water Act 1912*.

Response

The submission is noted. As stated in **Chapter 6 Legislation and Planning Policy** and **Chapter 12 Soil and Groundwater** of the EIS, any groundwater interference would be licenced in accordance with Part 5 of the *Water Act 1912*. IPL has committed to this management measure and it was included in the management and mitigation measures listed within the EIS in **Chapter 23 Management and Mitigation Measures**.

11 Department of Primary Industries

11.4 Issue 4 – Site Water Management Plan

The submission states that a Site Water Management Plan should be developed. This plan should outline measures to mitigate potential impacts to surface water and groundwater sources. It should incorporate monitoring, impact trigger definition and response actions for all water sources potentially impacted by the Project.

Response

A Surface Water Management Plan (SWMP) would be developed as part of the CEMP for the Project prior to construction. This SWMP would include measures to manage surface water impacts and includes commitments to monitor surface water flows and inception measures as well as respond to any potential impacts.

A Groundwater Management Plan (GWMP) would be developed and included within the CEMP. This plan would outline the measures that would be used to manage the discovery, testing, dewatering, storage, movement and treatment of any groundwater during the construction phase.

Chapter 12 Soil and Groundwater and **Chapter 13 Surface Water and Wastewater** of the EIS outline the potential Project impact on surface and ground water and cover all anticipated impacts during the operation of the Project. Operational management and mitigation measures would be included in the Site's Operational Environmental Management Plan (OEMP).

Newcastle Greens

Introduction

A submission was received from the Newcastle Greens via a letter dated October 2012.

12.1 Issue 1 – Cumulative Impacts

The submission states that *“The EIS fails to address the Director General’s directive regarding cumulative impacts of the proposal”*.

The submission also claims that *“It is a failure of the assessment process for this proposal to be considered in isolation of existing potentially hazardous industries that already exist at the Port.”*

Response

The EIS for the Project contained Cumulative Effects Assessments (CEAs) (refer to **Chapter 22 Cumulative Effects** of the EIS) for a number of technical studies. These CEAs assessed the potential cumulative impacts of the Project alongside other relevant developments.

As stated in the EIS, CEA is a receptor led assessment, i.e. in order to have a cumulative effect, two projects or impacts need to affect the same receptor.

Cumulative effects can be caused by past, present or reasonably foreseeable actions acting with a project. Past actions result from existing projects that have been commissioned and are usually operational. The impacts resulting from these projects already form part of the environmental baseline for each of the technical studies against which the impacts of the Project are assessed (i.e. the air quality impacts of an operational project are already accounted for within existing air quality monitoring data). Therefore these actions/projects are not considered within the CEA as they have already been considered when assessing the Project alone.

CEA only considers cumulative projects or actions that have been approved but are not yet operational (i.e. ‘present’ actions), or projects for which there is sufficient detail prior to approval for a robust assessment to be made (e.g. if a project has produced an EIS for Exhibition) (i.e. ‘future’ actions). Equally, in order to be included in the cumulative assessment, a project must have a high probability of occurring during the same period of time as the construction or operation as the Project. Relevant projects that may have a cumulative impact with this Project were identified using the following assessment parameters:

- Spatial parameter – The spatial parameter will depend on the characteristics of the environmental impact and the likely distance that any residual impact would travel. For example an air quality impact would potentially affect a wider area than a noise impact and would therefore affect different human or environmental receptors in different ways.
- Temporal parameter- Projects that are on exhibition, have completed exhibition but are not yet determined, have gained development approval, or have gained development approval but are not yet operational have been considered. Projects that are operational have been considered as part of the baseline for the assessment. Projects that are not on exhibition do not contain enough detail on residual effects or final design to be included in a robust cumulative assessment. Projects that are not yet on exhibition would be required to conduct a cumulative assessment as part of their EIS.

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In order to identify relevant projects that are proposed in the vicinity of the Site, two databases were reviewed:

- Major Project Assessments register on the NSW DP&I website; and
- Public notices and invitations to comment register on SEWPaC's website.

A review of these databases was considered the most effective way of identifying future projects that are likely to have significant residual impacts, and therefore may have a cumulative effect with this Project.

In order to assess the cumulative impacts of other projects alongside the Project, the findings of third parties must be relied upon as it would be unreasonable to expect a single proponent to independently assess every development in the area.

Under these parameters, CEAs were completed for the following environmental aspects: Hazards & Risks, Air Quality, Noise & Vibration, Traffic & Transport and Visual (refer to **Chapter 22 Cumulative Effects** of the EIS). These assessments concluded that the Project is unlikely to result in significant adverse cumulative effects.

The EIS clearly shows that the Project has not been assessed in isolation from other cumulative developments in the surrounding area. Equally the CEA that formed part of the EIS was judged by the NSW DP&I to have adequately responded to the Director General's directive regarding cumulative effects in the DGRs.

12.2 Issue 2 – Economic Justification

The submission claims that there is no economic need for the Project given the reduction in demand for coal over the past year.

"The justification of the project is based on false assumptions. It is clear that Australia is losing its cost competitiveness with other global coal producers."

Response

Coal exports from the Port of Newcastle during the period from July 2012 to June 2013 were 142.6 million tonnes. These exports were a 20.7 million tonnes or 17.0% increase over the previous corresponding period in 2011/12.⁴

With the completion of Stage 3 expansion of the Newcastle Coal Infrastructure Group (NCIG) in 2013, the nameplate capacity of the Newcastle port coal terminals will be 211 million tonnes per annum (Mtpa⁵). The current annualised throughput is approximately 143 Mtpa or 68 per cent of total terminal capacity.

The local coal export industry is currently feeling the impacts of a slump in thermal coal prices over the past twelve months but is confident the sector will emerge from the price cycle. On 2 May 2013, Port Waratah Coal Services announced a deferral of their T4 expansion project stating *"there is sufficient terminal capacity at the port to meet what the producers foresee for the next five years"*.⁶ The current terminal capacity would allow coal exports to grow at eight percent per annum over the next five years.

⁴ NPC (2013), Newcastle Port News – August/September 2013

⁵ Port Waratah Coal Services – 145 Mtpa (T4 Project EIS)

Newcastle Coal Infrastructure Group – 66 Mtpa (NCIG Stage 3 EIS)

⁶ PWCS CEO, 5 May 2013, The Australian newspaper

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Currently contracted export coal volumes are around 158 Mtpa in 2013 and may be as high as 188 Mtpa in 2014 and 197 Mtpa in 2015 where they approximately stabilize until increasing to around 204 Mtpa in 2018 and 206 Mtpa in 2019.

“In addition to contracted volumes, ARTC, in consultation with the Hunter Valley Coal Chain Coordinator, has identified new and existing mines that producers have plans to develop in the medium term. These projects have not proceeded to a stage where producers would want to commit to take-or-pay contracts, but to ensure that ARTC is able to plan appropriately for future growth are considered in this Strategy as a prospective volume scenario. Prospective volume had been estimated at around 10 Mtpa in 2015, 13 Mtpa in 2016, 17 Mtpa in 2017, 41Mtpa in 2018, 58 Mtpa in 2019 and stabilizing at 71 Mtpa in 2020”⁷

The growth forecasts stated in the EIS are conservatively comparable to the above forecasts of the coal producers. Section 2.2 of the EIS stated “Australian exports of thermal coal from the Hunter Valley region are forecast to grow at around six percent per annum over the next decade” and “Total AN demand in NSW over the next nine years is expected to grow by around seven percent per annum along with the projected increase in mining in the Hunter region”.

Whilst the current short term uncertainty in the expansion of the Hunter Valley mines has resulted in deferral of the Project for at least two years, long term demand trends support the future expansion and development of the Hunter Valley. It is important that IPL is ready to act to ensure a safe and secure supply of TGAN to the Hunter Valley market in the future.

12.3 Issue 3 – Location of Project

The submission claims that the Project is “*simply in the wrong place*”.

Response

Alternative locations for the Project were considered within the EIS in **Chapter 2 Project Need and Alternatives**. IPL assessed the Site and other locations against a number of considerations and determined that Kooragang Island is the most appropriate location for the Project.

12.4 Issue 4 – Hazard and Risk

The submission suggests that the Project location is inappropriate because of the risk to neighbouring suburbs, noting that “*The blast contours in Incitec’s EIS do not reach Stockton despite the fact an ammonia nitrate [sic] explosion involving 300 Tonnes of ammonia nitrate in Toulouse, France killed 33 people and injured 14,000 people within a 5 km radius.*”

Response

The lines that are identified within the submission as ‘blast contours’ are ‘risk contours’. Risk contours delineate the areas that are subject to different levels of risk from major hazards and are required by the NSW Hazardous Industry Planning Advisory Papers (HIPAP). Blast contours are not required for this kind of assessment in NSW.

In developing these risk contours, the Preliminary Hazard Analysis (PHA) for the Project considered 78 major accident events (refer to Table 5-9 in **Appendix D1** of the EIS). These events included worst

⁷ ARTC, 2013-2022 Hunter Valley Corridor Capacity Strategy, June 2013.

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case credible events from explosions, fires and toxic gas releases. The consequences of the major accident events, combined with their likelihood, were used to develop the risk contours shown in the PHA (refer to Section 8 in **Appendix D1** of the EIS).

Domino effects were also assessed to determine the impact of an explosion on other storage tanks, process vessels and pipework and included in the hazard analysis.

The Preliminary Hazard Analysis (PHA) and Transport Risk Assessment (TRA) were prepared by independent process safety and risk engineering experts at Lloyds Register Rail Ltd. The draft reports were peer reviewed by R4Risk Pty Ltd before submission to the DP&I and NSW Workcover. The safety risk experts in DP&I reviewed the reports and also sought another independent peer review by expert consultants at Scott Lister. The final PHA and TRA reports addressed the comments raised in these reviews.

12.5 12.5 Issue 5 – Community Consultation

The submission claims that, *“Incitec has carried out insufficient community consultation and it has chosen to ignore public feedback regarding their proposal.”*

Response

IPL is involved with an ongoing process of consultation, as outlined in **Section 2** of this document and in **Chapter 7 Consultation** of the EIS. Following exhibition, a total of 373 submissions were received by DP&I relating to the Project. This relatively large number of submission illustrates that the community is aware of the Project. The consultation process identified the key concerns of the community with the Project and the EIS has addressed those concerns.

IPL has taken a multifaceted approach to consulting and engaging with stakeholders. IPL engaged the following specialist consulting groups as part of the consulting effort:

- FordComm was engaged to manage media relations and local politicians;
- Coakes Consulting was engaged to measure the impact of the consultation effort and how informed the community were of the project; and
- Kreab Gavin Anderson was engaged to inform State Government ministers and their offices on the progress of the project.

In addition to this, as part of the indigenous heritage assessment, consultation was conducted with the local Aboriginal community.

The community consultation effort undertaken as part of the Project prior to exhibition of the EIS included the following:

- a letterbox drop to 3,500 households in Stockton and Fern Bay in October 2011 announcing the Project;
- media releases to all local media including the announcement of the feasibility study on 27 October 2011 and the announcement of the EIS exhibition on 12 September 2012;
- Project website launched in October 2011 with continuous updating;
- a letterbox drop of fact sheets to 10,000 households (Stockton, Fern Bay, Mayfield; Carrington and Warabrook) in December 2011 and a Project Update in July 2012;
- formation of a Project community liaison group with representation from community, environment groups and business which met 4 times in March, April, September and October 2012;

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- appointment of an independent technical expert agreed to by the members of the Project community liaison group;
- advertisements in local newspapers (Newcastle Herald, Star, Post and Stockton Local) of community hotline for information, times and dates for community information sessions and EIS exhibition dates;
- community information sessions in November and December 2011 and September 2012 in Stockton and Mayfield;
- community perception telephone survey of 633 households in surrounding suburbs and wider local government area in April 2012 with a summary on the website in September 2012; and
- distribution of a summary of the EIS to 10,000 households in Stockton, Fern Bay, Mayfield; Carrington and Warabrook in September 2012.

IPL's public and stakeholder consultation effort was developed in consultation with the Department of Planning and Infrastructure and was deemed to be adequate during a review of the EIS process.

Stockton Community Action Group

Introduction

A submission was received from the Stockton Community Action Group (SCAG). The submission was 48 pages in length and was accompanied by a covering letter dated 18 October 2012. SCAG was represented on and participated in the Project community liaison group meetings. SCAG was provided the opportunity and raised their issues and concerns in the meetings. The Project team and the independent expert provided comment and feedback in response to the issues raised.

SCAG's submission raised a number of issues which are discussed below.

13.1 Issue 1 – Explosion Risk

A number of aspects relating to the risk of explosion were raised by SCAG. These issues are discussed below.

13.1.1 Assessment of Worst Case Scenarios Response

SCAG objected on the grounds that worst case scenarios have not been assessed, contrary to the requirements of the NSW Planning Department Hazardous Industry Planning Advisory papers. SCAG claimed that the scenarios chosen appear to be small in quantity with minimal frequency.

Response

The Preliminary Hazard Analysis (PHA) and Transport Risk Assessment (TRA) were prepared by independent process safety and risk engineering experts at Lloyds Register Rail Ltd. The draft reports were peer reviewed by R4Risk Pty Ltd before submission to the DP&I and NSW Workcover. The safety risk experts in DP&I and NSW Workcover reviewed the reports and DP&I sought another independent peer review by expert consultants at Scott Lister. The final PHA and TRA reports addressed the comments raised in these reviews.

The Preliminary Hazard Analysis considered 78 major accident scenarios for the Project (refer to Table 5-9 in **Appendix D1** of the EIS). These events included worst case credible events from explosions, fires and toxic gas releases.

The likelihood of the major accident events is very low and derived from recently published UK HSE data, SAFEX data and fault tree analysis (refer to Assumptions 22 to 29 in Appendix A of **Appendix D1** of the EIS).

Domino effects have been assessed to determine the impact of an explosion on other storage tanks, process vessels and pipework potentially leading to the loss of containment of toxic gases.

Domino effects as a result of sympathetic detonation of ammonium nitrate were not included as the site layout and TGAN storage configurations are such that the distances between two stacks are far enough to not allow for sympathetic detonation to occur, let alone between facilities. Refer to Assumption No. 24 in Appendix A of the Preliminary Hazard Analysis, **Appendix D** of the EIS.

IPL will adhere to international and Australian regulations for the safe storage of AN as per required by *SAFEX Good Practice Guide: Storage of Solid Technical Grade Ammonium Nitrate (2010)*, *EFMA Guidance for the Storage of Hot Ammonium Nitrate Solutions (2005)* and Australian Standard AS4326 *The Storage and Handling of Oxidising Agents (2008)*.

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13.1.2 Dismissal of Accident Scenarios

The SCAG submission suggested that accident scenarios should not be dismissed if an explosion is possible at the plant. The submission further suggested that scenarios should be included in the risk assessment based on a review of major ammonium nitrates explosions worldwide. SCAG has suggested that the following scenarios be included:

1. Explosion due to detonation from shock (500 tonnes)
2. Explosion due to detonation from shock and subsequent domino effect (4,500 tonnes)
3. Explosion due to terrorism or malicious act (500 and 2,250 tonnes)
4. Explosion due to an aircraft crash (500, 4500 and 11,000 tonnes)
5. Explosion due to an earthquake or lightning (500 and 2,250 tonnes)
6. Explosion of all AN stored on both Incitec and Orica site (20,000 tonnes)

"The explosion scenarios to be assessed should pay particular attention to identifying worst case scenarios.

"No significant events should be omitted and propagation and domino effects should be considered. Accident scenarios should not be dismissed because they are thought to be unlikely.

"A review of major ammonium nitrate explosions worldwide would indicate that an explosion is possible, but unlikely at the plant. Even though an explosion is unlikely, the Planning Department's requirements outline that these accident scenarios should not be dismissed and should be used in the risk assessment."

Response

The scenarios raised within the submission will be responded to in turn.

Explosion due to detonation from shock (500 tonnes)

The Dutch Research Institute TNO conducted tests to show that TGAN requires a critical shock initiation pressure of about 0.20 GPa (2kbar, 29 000 psi) to achieve initiation⁸. No Class 1 explosives would be present on-site that could generate this level of shock. The site layout and TGAN storage configurations are such that the distances between two TGAN stacks and from the processing areas are far enough to not allow for sympathetic detonation to occur from an AN explosion initiated by fire, contamination or process incident. The explosions at Toulouse (2001), Cherokee (1973), Port Neal (1994) and West Texas (2013) did not initiate sympathetic detonations of TGAN storages.

Explosion due to detonation from shock and subsequent domino effect (4,500 tonnes)

The site layout and bulk TGAN storage configuration are such that the distances from the processing areas and other AN storage are far enough to not allow for sympathetic detonation to occur. The bulk store also is protected by reinforced concrete walls. This means that any domino effect would be very unlikely to occur and have a negligible contribution to overall risk.

⁸ Nygaard E (2008), Storage of Technical (Porous) Ammonium Nitrate, ISEE Proceedings

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Explosion due to terrorism or malicious act (500 and 2,250 tonnes)

The explosion risk due to terrorism or malicious acts has been considered in the Preliminary Hazard Analysis (refer to Section 4.4, **Appendix D1** of the EIS).

The likelihood of terrorist or malicious acts is difficult to estimate quantitatively due to limited data collection and the complexities of geography, threats, target attractiveness and vulnerability.

The likelihood of criminal acts for the Site has been assessed using a threat analysis and risk assessment process prescribed in the confidential NSW Police Major Hazards Facilities Security Handbook. There have been no security incidents on-site. Based on the security risk assessment and current threat environment, the likelihood of a terrorist or malicious act is low.

The Site has a Major Hazard Facility and Security Sensitive Dangerous Substances (SSDS) Security Plan which has been reviewed by NSW Workcover and NSW Police. The Plan includes the security risk assessment, details of existing site security measures and actions on elevation of security levels.

The Project would include upgrades to security measures and would not result in an increased risk of terrorism. The Security Plan would be revised to be consistent with the NSW Police Major Hazards Facilities Security Handbook and the DP&I Hazardous Industry Planning Advisory Paper No. 9 'Safety Management'. The Plan would be submitted for approval from NSW Workcover, NSW Police and DP&I prior to commissioning the Project.

Explosion due to an aircraft crash (500, 4,500 and 11,000 tonnes)

There are no documented historical incidents where initiation of an AN explosion has resulted from these causes.

The likelihood of an aircraft crash is considered to have negligible contribution to overall risk. The IPL Site is located 12 km from the Williamstown airport and orientated at approximately 100 degrees to Runway 30. A PHA for Terminals Pty Ltd in 2011 found the likelihood of an aircraft crash for scheduled aircraft was 1×10^{-8} p.a. at Port Botany. The likelihood of an aircraft crash would be significantly lower on Kooragang Island.

Explosion due to an earthquake or lightning (500 and 2,250 tonnes)

There are no documented historical incidents where initiation of an AN explosion has resulted from these causes.

The risk of an explosion of TGAN due to a lightning strike is considered to be negligible as storage buildings and tall structures would have lightning protection.

A detailed structural analysis of the bulk ammonia storage tank and associated pipework will be undertaken during the final design to ensure it is designed to withstand credible earthquake and strong wind events.

Explosion of all AN stored on both Incitec and Orica site (20,000 tonnes)

Please refer to the response in **Section 13.1.1** above. As stated:

'the site layout and TGAN storage configurations are such that the distances between two stacks are far enough to not allow for sympathetic detonation to occur, let alone between facilities. Refer to Assumption No. 24 in Appendix A of the Preliminary Hazard Analysis.'

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13.1.3 Explosion Efficiency

SCAG suggested that explosion efficiencies for TGAN should be between 30 to 82% TNT equivalence. SCAG also noted that the US military uses 70% TNT equivalent for solid AN.

Response

TNT equivalence for TGAN used for the Preliminary Hazard Analysis are documented in Assumption 13 in Appendix A of the PHA and based on the *SAFEX Good Practice Guide: Storage of Solid Technical Grade Ammonium Nitrate (2010)*. The SAFEX guidelines state that TGAN has a TNT equivalence that varies depending on circumstance and the nature of explosion initiation. Depending on the nature of initiation, the overall TNT equivalence range from:

- 5% - Fire
- 16% - Contamination
- 32% - Shock Energy from High Velocity Projectile

In order to ensure a robust assessment, a factor of 2 was applied on top of the TNT equivalence stated in the SAFEX Guidelines, effectively doubling the overall TNT equivalence as assessed within the EIS.

The TNT equivalence of the Toulouse explosion in 2001 was estimated to be approximately 5 to 10% - refer to Section 5.2 in the PHA. In addition, the explosion did not lead to sympathetic detonation of other ammonium nitrate storages, where up to 30,000 tonnes of storage were permitted.

13.1.4 European Hazard and Risk Values

SCAG objected to the selected overpressure impairment criteria on the grounds that other European countries have smaller values for the associated impairment.

"In the EIS (in the Impairment Criteria Section) an overpressure of 7 kPa from an explosion has been used to assess when an injury will occur off-site and 14 kPa for property damage. These are high values of overpressure for injury and damage with a number of European countries using much lower values of overpressure for injury and property damage."

Response

The Hazard and Risk Assessment within the EIS complies with the requirements of the NSW Hazardous Industry Planning Advisory Papers (HIPAP). As the Project is located in NSW, it is not required to comply with the requirements of another country, state or territory.

On the basis of the results of the QRA, the proposed development is an acceptable land use at this location. The cumulative individual fatality risk for the IPL and Orica sites was also estimated and found to comply with the NSW DP&I risk criterion for residential land uses, which is normally only applicable for a single proposed development. Therefore, it can also be concluded that IPL's proposed facility will not increase the cumulative individual fatality risk to an unacceptable level at residential areas.

13.1.5 Missing Documents

SCAG requested the information within the missing documents related to the Hazard and Risk Assessment to be made available for public review.

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"As well as explosion, toxic gases can be released in a fire involving ammonium nitrate including ammonia and nitrogen dioxide. This is a scenario that should be assessed through dispersion modelling however the details of this work and outcomes are not available in the EIS due to the missing documents related to the Hazard and Risk Assessment."

Response

The sections of the PHA excluded from public access are on the grounds that it contains information associated with the manufacture of Security Sensitive Ammonium Nitrate, disclosure of which could:

- increase the likelihood of, or prejudice the prevention of, preparedness against, response to, or recovery from, a public emergency (including any natural disaster, major accident, civil disturbance or act of terrorism) (s14(2) Table 2(c));
- endanger, or prejudice any system or procedure for protecting, the life, health or safety of any person (s14(2) Table 2(d)); or
- facilitate the commission of a criminal act (including a terrorist act within the meaning of the *Terrorism (Police Powers) Act 2002*) (s14(2) Table 2(f)).

The dispersion of toxic gases released from a fire involving ammonium nitrate were included in the PHA – refer to scenarios 68-71 in Table 5-9, **Appendix D Hazards and Risks Assessment** of the EIS.

13.1.6 Frequency of Explosion Events

SCAG suggested that the assessed frequency of explosions is too low. It requested that the frequency of AN explosions should be taken as unlikely using a risk matrix provided by SCAG.

"Frequency of the events has been selected inappropriately when considering events worldwide and cumulative and domino effects have not been fully assessed in the EIS."

The frequency of an explosion of ammonium nitrate should be taken as unlikely and be in the 10^{-4} to 10^{-2} range given that explosion events have occurred in the industry and storages and continue to occur.

As outlined in the risk matrix below the chance of an ammonium nitrate explosion at the proposed Incitec plant is in the "Unlikely" range and the outcome would be Catastrophic making the plant a Level 1 unacceptable risk for the community and requiring a different location for the plant to be assessed in detail."

Response

The frequency of TGAN explosions was derived based on explosion frequencies defined in the SAFEX Good Practice Guide: Storage of Solid Technical Grade Ammonium Nitrate (2010), which are appropriate for storage of TGAN at an individual AN manufacturing facility.

The SAFEX explosion frequencies for contamination and fire of bulk TGAN and TGAN in bags or containers were derived from two relevant historical accidents, namely Toulouse in 2001 (i.e. bulk off-spec AN explosion likely to be caused by contamination) and Cherokee in 1973 (i.e. AN explosion caused by a fire in a warehouse, which included timber beams and plywood sheeting). The total number of operating years was used to determine the frequency of an explosion per year per site. This gives a historical accident rate of 62.5×10^{-6} p.a. for either an explosion of a bulk off-spec AN due to

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contamination or an explosion of one stack of AN due to a fire, with a combined total of 125×10^{-6} p.a. per site. Note that these two historical examples were not well managed sites and not built to current standards.

Many of the major accidents prior to 1950 were caused when blasting explosives were used to break up caked AN or fires involving wax-coated AN. The investigations of these accidents led to clear guidelines for the specification of safer products, their manufacturing processes and storage and handling operations. This created a major turning point in the product and accident history of AN since 1960. The accident in Papua New Guinea in 1994 occurred at an explosives manufacturing facility and did not involve TGAN or ANSOL. The listing of the incidents at Port Neal, Iowa and Sioux City, Iowa are in fact references to the same event.

Since the publication of the SAFEX Good Practice Guide: Storage of Solid Technical Grade Ammonium Nitrate in 2010, a major fire and explosion occurred at the West Fertilizer facility in West, Texas, on 17 April 2013. The US Chemical Safety Board (CSB) investigates major chemical accidents and develops recommendations to prevent a recurrence in the future. The CSB released some preliminary findings on 27 June 2013 which included:

- (i) *“The explosion at West, Texas, resulted from an intense fire in a wooden warehouse building that led to the detonation of approximately 30 tons of AN stored inside wooden bins. Not only were the warehouse and bins combustible, but the building also contained significant amounts of combustible seeds, which likely contributed to the intensity of the fire.”*
- (ii) *“The building lacked a sprinkler system or other systems to automatically detect or suppress fire, especially when the building was unoccupied after hours.”*

The CSB investigation is currently ongoing and it is too early to draw any conclusions as to the cause of the incident or the recommendations from the investigation. IPL will continue to monitor the investigation, review the findings and recommendations, and reflect any appropriate changes to IPL's safety management systems and standards.

As the Project would be a modern controlled facility, employing safe practices to minimise the risk of explosion due to contamination, fire or high energy impact, the majority of historical events can be ruled out or mitigated.

The PHA (refer to **Appendix D1** of the EIS) has been conducted according to the requirements of a Level 3 Analysis (i.e. a full Quantitative Risk Analysis) and not a Level 1 Analysis (i.e. a Qualitative Analysis) as published in HIPAP No. 10 Land Use Safety Planning. The different levels of analysis are also described in the DP&I's guideline: Multi-level Risk Assessment (2011).

A risk matrix is only used as a qualitative risk assessment technique in a Level 1 analysis. A Level 3 analysis, as was undertaken in the PHA, is a more rigorous approach and is more appropriate for analysis of the proposed IPL facility.

13.1.7 Cumulative Impact

SCAG objected on the grounds that the cumulative impacts from explosion risk have not been fully assessed. SCAG suggested that the following scenarios be included:

1. Orica plant stored AN in relation to domino effect from explosion shock including worst case scenario of a domino effect and all the stored AN exploding

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2. Orica plant in regard to fire spreading onto the Incitec plant and causing an explosion
3. Hydrogen emitted from Orica plant as AN contaminant and possible explosion of hydrogen initiating an explosion of stored AN
4. A large biofuel storage and processing plant has been approved by the Planning Department for Manildra Park Pty Ltd adjacent to the proposed Incitec plant and existing Orica plants. A fire and explosion in the storage and processing plant or transfer pipeline from the wharf has not been assessed at all in the cumulative impact as required from the development
5. Fire and explosion of ammonium nitrate being loaded on ships at the wharf appears not to have been assessed for cumulative effect
6. An explosion in the grain storage resulting in a grain dust cloud explosion appears not to have been assessed for cumulative impacts
7. Brisanse effect of an AN explosion, which could damage or destroy tanks and cause release of large amounts on toxic gases and result in secondary fires as well as explosions; including the 30,000 t ammonia storage tank at Incitec, ammonia storage at the Orica plant and large fuel tanks at the proposed Manildra biofuels storage.

"In addition to overpressure, explosion incidents can also produce a significant hazard in the form of high momentum projectiles. Their consideration is particularly important with regard to the potential for incident propagation, and the prediction of maximum effect distances, since fragments are often projected well beyond the thermal radiation or blast overpressure effect zones."

Response

Facilities associated with AN on the IPL site have been intentionally located such that there is maximum separation between the AN on IPL's site and the potentially hazardous materials at the Orica, Manildra and grain silo sites.

1. The TGAN stored on the Orica site is located more than 800 metres from IPL's proposed TGAN storage and sympathetic explosion would not be credible according to the *SAFEX Good Practice Guide: Storage of Solid Technical Grade Ammonium Nitrate* (2010).
2. The Orica plant boundary is located more than 400 metres from the proposed IPL's TGAN storage and a fire could not spread onto the IPL plant. In addition, Orica and IPL have independent firewater protection systems.
3. Hydrogen is considerably lighter than air and any hydrogen emitted from the Orica plant would rapidly disperse and could not contaminate TGAN stored more than 400 metres away.
4. The proposed Manildra Park Pty Ltd biofuel storage and processing plant is located more than 550 metres from IPL's proposed TGAN storage. In 2007 the PHA for the Manildra proposal concluded the risks of any significant off-site impacts is considered to be low and therefore complies with the risk criteria from HIPAP No. 4 – Risk Criteria for Land Use Safety Planning.
5. GrainCorp's bulk grain storage at Carrington is more than three kilometres from the IPL site and a grain dust explosion would have no cumulative explosion impact on the IPL Site.

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13.1.8 Cumulative Transport Risk

SCAG objected on the grounds that the cumulative impacts from explosion risk have not been fully assessed and suggests that the following scenario be included:

1. *Fire and explosion of ammonium nitrate being loaded on ships at the wharf appears not to have been assessed for cumulative effect.*

Response

The Project would reduce the number of TGAN shipments through the Port of Newcastle and result in a positive cumulative impact. Without additional local manufacture of 350 ktpa of TGAN, imports by ship would be required to meet the future demand in the Hunter Valley. The assessment of TGAN shipments is not within the scope of the PHA or TRA as this is separately covered in a Quantitative Risk Assessment undertaken by Newcastle Port Authority and IPL for the Mayfield berth.

13.1.9 Brisance

SCAG objected on the grounds that the cumulative impacts from explosion risk have not been fully assessed and suggests that the following scenario be included:

"Brisance effect of an AN explosion, which could damage or destroy tanks and cause release of large amounts of toxic gases and result in secondary fires as well as explosions; including the 30,000 t ammonia storage tank at Incitec, ammonia storage at the Orica plant and large fuel tanks at the proposed Manildra biofuels storage."

Response

Potential for damage to the bulk ammonia storage tank from an AN explosion was considered as part of the escalation analysis in the PHA. The proposed development complies with the relevant land use safety planning risk criteria for new industrial developments, as published in HIPAP No. 4 and 6 by the NSW DP&I, which includes overpressure and heat radiation criteria for off-site property damage and accident propagation.

13.1.10 Projectiles

SCAG objected on the grounds that the cumulative impacts from explosion risk have not been fully assessed and suggests that the following scenario be included:

"In addition to overpressure, explosion incidents can also produce a significant hazard in the form of high momentum projectiles. Their consideration is particularly important with regard to the potential for incident propagation, and the prediction of maximum effect distances, since fragments are often projected well beyond the thermal radiation or blast overpressure effect zones."

Response

The location of the ammonia storage tank was given careful consideration during the facility siting study and IPL has intentionally located this tank away from the TGAN storage and manufacturing facilities.

The probability of fragments impacting the bulk ammonia tank was estimated using the Institute of Makers of Explosives Safety Analysis for Risk (IMESAFR) software and found to be very low. The

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presence of intervening structures and the double-wall design of the tank ensure a release from the tank due to projectile impact is not a significant contributor to off-site risk.

13.1.11 Compliance with Western Australian Code of Practice

The SCAG objected on the grounds of the submission not adhering to the requirements of the WA code of practice on safe storage of solid ammonium nitrate.

"The Western Australian Government Code of Practice on Safe Storage of Solid Ammonium Nitrate Second Edition includes a table with separation distance from various quantities of stored ammonium nitrate from off-site protected works, vulnerable facilities and critical infrastructure."

Response

The storage of AN in Western Australia requires approval by Resources Safety in the Department of Mines and Petroleum. Storage and handling of AN requires licensing under the Dangerous Goods Safety (Storage and Handling of Non-Explosives) Regulations 2007. The *Western Australian Government Code of Practice on Safe Storage of Solid Ammonium Nitrate Second Edition* provides safety and security recommendations to assist people in meeting their obligations under the Act and regulations. If the separation distances in Table 4-1 of the Code cannot be met, then an appropriate risk assessment is required to support an application for a storage licence.

The Project complies with the relevant land use safety planning risk criteria for new industrial developments, as published in HIPAP No. 4 and 6 by the NSW DP&I.

13.1.12 Safe Work SA Report

The SCAG objected on the grounds that a Safe Work SA report recommended that the storage of ammonium nitrate at the IPL Port Adelaide facility was an unacceptable explosion risk to the surrounding community.

Response

In July 2010, the SA Environmental Protection Authority (EPA) presented a report to the Development Assessment Commission (DAC) in response to a development application for a multi-million dollar Newport Quays residential development in Port Adelaide. The EPA report raised a number of concerns including:

- Noise from road and rail traffic and general industry in the vicinity;
- Air quality impacts from Adelaide Brighton Cement, Incitec Pivot, and fuel storage facilities in addition to general air quality issues that exist across the Le Fevre Peninsula;
- The potential explosion/fire hazard posed by the large scale storage of ammonium nitrate at the fertiliser company sites in close proximity to the proposed land division site. The EPA advised DAC that it should consult Safe Work SA about this issue.

The site of the proposed 275 home development site is approximately 380 metres from the Incitec Pivot distribution facility (at its closest point).

The product referred to in the EPA and SafeWork SA report is Calcium Ammonium Nitrate (Cal-Am). Cal-Am is a homogeneous compound fertiliser comprised of ammonium nitrate and calcium

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carbonate. Cal-Am is not classified as a Dangerous Good under the SA Dangerous Substances Act and subordinate Regulation. Incitec Pivot does not store ammonium nitrate at Port Adelaide.

Cal-Am is stored, transported and sold by Incitec Pivot from Port Adelaide in accordance with licences and permits issued under the Explosives (Security Sensitive Substances) Regulations 2006. These licences and permits were reissued by SafeWork SA in July 2013. The site is also licensed by the EPA as a chemical storage and warehousing facility.

13.1.13 Traffic Risk

The SCAG objected on the grounds of an increased number of traffic movements causing unacceptable levels of risk of road accidents and AN explosion.

Response

The risk to populated areas along the transport routes as a result of the increased traffic movements of AN was determined in the Transport Risk Assessment to be below comparable risk criteria applied for fixed facilities in NSW.

Controls to manage transport risk are described in Section 6.1 of the Transport Risk Assessment (Appendix D2 of the EIS).

13.1.14 Emergency Evacuation Plans

The SCAG requested that the process for evacuating off- and on-site people in the event of a potential explosion be clearly documented.

Response

An emergency plan (c.f. Hazardous Industry Planning Advisory Paper No. 1) is normally required as a post-approval study and will be required as part of the Safety Case that will be submitted to WorkCover for this MHF. The emergency plan must be effective in addressing the consequences of a major accident both on-site and off-site and should therefore address any relevant evacuation processes. The responsibility for evacuating off-site people in the event of fire is with the NSW emergency services.

13.2 Issue 2 – Air Pollution

13.2.1 Particle Emissions

The submission claimed that the Project would add to the deterioration of air quality in the area, particularly regarding fine particles (PM₁₀) and Nitrogen Dioxide.

Response

The Air Quality Impact Assessment (AQIA) for the Project (refer to **Appendix E** of the EIS) included a detailed review of existing air quality monitoring data from the local area around the Site. With the exception of regional dust events, existing air quality within this area was noted to be compliant with air quality goals, with general trends showing a slight improvement in air quality within recent decades.

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The AQIA used this background air quality monitoring data, and assessed the impact of emissions from the Project against the background levels. When added to background levels, emissions from the Project were found to be compliant with impact assessment criteria that are endorsed and routinely applied by the NSW EPA for the management of air quality impacts relating to the proposed developments. Compliance with these criteria indicates that a proposal is unlikely to result in adverse air quality impacts or the deterioration of air quality.

IPL acknowledges that the Project would result in pollutant emissions (including NO_x and Particulate Matter). However, in designing the Project, IPL has proposed emission control technology that is consistent with best available technology as identified in international references, and that the performance of this technology would be ensured by the application of emission standards to be enforced under the Environmental Protection Licence for the facility through the routine monitoring of emissions. In this context, IPL has sought to minimise emissions of these pollutants, and minimise air quality impacts.

13.2.2 Nitrogen Dioxide

The submission suggested that the Project would increase NO₂ levels in Stockton by 50%.

Response

The nitrogen dioxide estimates provided within the assessment have been prepared in accordance with the government's approved methods, for the purpose of allowing EPA to consider the potential for adverse air quality impacts, and hence include a range of conservative assumptions.

Noting this conservatism, care should be taken when considering the AQIA predictions in the context of actual pollutant levels that may occur as a result of the Project. Such conservatism includes the assumptions that background concentrations are continuously present at peak (short-term) levels; that the Project operates continuously at the proposed licence limits; and that all NO_x emissions from the Project exist in the form of NO₂. Given these levels of conservatism, it is expected that actual increases in NO₂ levels would be lower than those predicted within the AQIA.

This expectation would also be consistent with the scale of NO₂ levels that were reviewed within **Section 5** of the AQIA. The data reviewed in **Section 5** of the AQIA included 5 years of Stockton monitoring data which were comparable to levels measured elsewhere in the region. This is despite the data being collected during times at which the Orica facility was operational, having NO_x emissions significantly higher than those estimated from the Project⁹.

13.2.3 Ammonia Emissions

The Submission stated that the Project would be responsible for emissions of ammonia and that an ammonia release would be responsible for various health effects. The submission states that the assessment within the EIS should have measured a 'worst case scenario' of the air quality impacts of a massive release of ammonia.

⁹ Based on the 2010/2011 National Pollution Inventory data reviewed in the AQIA, the scale of emissions from the Project was estimated as constituting a minor increase (of approximately 10%) above the existing Orica emissions at Kooragang Island.

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Response

IPL proposes to control ammonia emissions through the use of an ammonia flare and the monitoring of ammonia generation. The refrigeration systems will be used to minimise the generation of gaseous ammonia during both storage and ship unloading events. In the event that some gaseous ammonia cannot be handled by the refrigeration systems, IPL proposes to direct this to an ammonia flare, where the ammonia will be broken down into nitrogen and water through assisted combustion, thus minimising release of ammonia to atmosphere. The potential impact of these emissions has been assessed quantitatively in the AQIA (refer to **Appendix E** in the EIS), covering both routine operations, as well as the unlikely event in which the flare is operational. Flare operation was assessed under worst case meteorological conditions, and found to be compliant with impact assessment criteria endorsed by regulatory agencies as being protective of both adverse health effects and amenity. In accordance with the requirements of the EPA, any significant flaring activity would be a reportable environmental incident and therefore records would be maintained on significant releases and subsequent combustion of ammonia in flaring incidents.

It should also be noted that IPL anticipate that such an event would occur less than once in 10 years, with a typical flaring event lasting 12 hours. In the context of the AQIA, which has assessed this event as occurring on a continuous basis for all 8,760 hours of the year, this modelling is considered a conservative assessment of worst case emissions.

It is also noted that the Project would also include leak detection and isolation technology that would isolate any leaks in pipework and thereby mitigate any ammonia leaks through defects in the Project pipework. The details of the leak detection facilities associated with the Project are contained within the EIS.

13.3 Issue 3 – Noise and Vibration

13.3.1 Project Specific Noise Levels

The submission points out the INP requirement for new noise sources where noise levels are already above the acceptable amenity criteria levels in suburbs and where noise levels are likely to be reduced in the future (as evidenced by the Orica Noise reduction program) is 10 dB less than the acceptable levels in the amenity criteria. This would require the project noise levels to be < 30 dB, which is not the case for the Project. Therefore the Project fails to meet the *NSW Industrial Noise Policy*.

Response

Both IPL and the EPA have reviewed the noise data within the EIS and a number of other reports. Discussions with the EPA have noted that a Project Specific Noise Limit (PSNL) of 30 dB (A) would not be a reasonable or feasible noise level to apply to the Project, particularly as the proposed facility is within an area zoned for heavy industrial development and that the EPA prefers industry to cluster together. The EPA also accepts that the cost of achieving 30 dB (A) would be prohibitive and would be of limited environmental benefit in this location.

Therefore the EPA has requested (via its submission dated 9 April 2013) that IPL ensure that the Project meets a PSNL of 40 dB (A) during night time operations, rather than the 42 dB (A) that was initially proposed by IPL. This level is based on the application of '*existing noise level minus*

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10 dB (A)' from the INP. IPL has agreed to implement measures to meet this PSNL and agrees with the EPA's application of the INP in this particular circumstance.

13.4 Issue 4 – Traffic Impacts

The submission raised a question about Traffic impacts of the Project and about the cumulative impact on traffic that the Project presents along with other projects in the area.

13.4.1 Traffic Impacts

The submission stated: *"Traffic is already a major concern on Cormorant Road, Kooragang Island...The increased amount of traffic associated with truck movements and general traffic with the plant will further add to the traffic problems being experienced."*

The submission went on to make a link between increased transport levels and potential air quality impacts.

Response

As stated in the EIS (Pg. 15-1) *"The capacity of a road network is determined using information about the capacity of the intersections. Level Of Service (LOS) is a performance measure used to describe an intersection of mid-block location. LOS ranges are defined as falling between A, which indicates good intersection performance, to F, which indicates saturated conditions with long queues and delays."* The Transport Impact Assessment, conducted as part of the EIS, concluded that there would not be a change in LOS on any intersection or midblock location as a result of the construction or operation of the Project.

The submission states that delay and congestion is already a feature of the area, particularly Cormorant Road. This is reflected in the TIA, the recorded existing LOS for Tourle Street / Cormorant Road is F.

Responsibility for the maintenance and upgrade of road infrastructure in NSW lies with the NSW Roads and Maritime Service (RMS) and the local council. In addition to this, in this location, Heron Road and Greenleaf Road (immediately east and west of the Site) are managed by Newcastle Port Corporation.

Cormorant Road is managed by the NSW RMS. As such they are responsible for maintaining an acceptable LOS. RMS completed work to improve safety along Cormorant Road on 2 July 2011. The work involved carrying out maintenance upgrades along a 1.4 kilometre length of road between the wind generator and Egret Street.

The full length of the road was resurfaced and wider shoulders constructed on both sides of the road, the existing Newcastle bound merge lane was extended 200 metres and maintenance carried out to the drains.

The upgrade involved widening the road to extend the Newcastle bound merge lane further away from the existing railway level crossing to improve the merge.

RMS is also planning for the duplication of Cormorant Road and Tourle Street in the longer term, however this improvement has not been included in the LOS.

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The Project will result in additional truck movements. Given their mobile nature, trucks constitute a diffuse emissions source, where the volume specifically associated with the Project is considered unlikely to result in a significant increase in air pollution across the region.

For trucks present on the Site, IPL proposes to implement a range of measures to minimise emissions, including such measures as the training of staff, switching off engines to avoid idling emissions, and using vehicles that are properly maintained, and operated in accordance with their design. These management and mitigation measures are outlined within the EIS in **Chapter 23 Management and Mitigation Measures**.

With regard to potential air quality impacts, it is noted that the Project will result in additional truck movements. Given their mobile nature, trucks constitute a diffuse emissions source, and the volume specifically associated with the Project is considered unlikely to result in a significant increase in air pollution across the region¹⁰.

For trucks present on the Site, IPL proposes to implement a range of measures to minimise emissions, including such measures as the training of staff, switching off engines to avoid idling emissions, and using vehicles that are properly maintained, and operated in accordance with their design. These management and mitigation measures are outlined within **Chapter 23 Management and Mitigation Measures** of the EIS.

13.4.2 Cumulative Impacts

The SCAG submission drew a link between the transport impacts associated with the Project and the possibility for cumulative impact from the Project alongside other traffic generating Projects in the area.

Response

The potential for the Project to cause a cumulative traffic impact is assessed within the EIS in **Chapter 15 Traffic and Transport** and **Chapter 22 Cumulative Impacts**. The cumulative assessment of traffic and transport impacts contained within the EIS determined that there would be no change to the LOS experienced on any of the roads surrounding the Project Site and therefore no cumulative impact is predicted to arise from the Project in relation to traffic and transport.

13.5 Issue 5 – Employment Impacts

The submission states that the Project: *“will not be a big employer in the Hunter, rather there will only be 60 people employed at the plant.”*

The submission goes on to state that the risk that the plant brings to the area is not justified by this increase in employment.

¹⁰ **Table 2-4** of the Traffic Impact Assessment (refer to **Appendix J** of the EIS), notes an Annual Average Daily Traffic (AADT) flow of 29,588 vehicles for the Tourle St/Cormorant road section of IPL’s proposed haul route. Assuming that 10% of this count is composed of heavy vehicles (the assumption within the TIA), this would equate to approximately 2,960 heavy vehicle movements per day on this section of road. In contrast, under peak (weekday) operational conditions, IPL estimate an additional 80 heavy vehicle journeys either to or from the IPL site. Assuming that all of these trucks complete the return trip over this section of road, this would equate to an additional 160 heavy vehicle movements, or an increase in heavy vehicle movements of 5% on this section of road. Hence potential air quality impacts from additional truck movements are not considered significant in the context of existing traffic volumes in the vicinity of the Project, and transport emissions across the wider region.

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Response

As stated in the EIS (**Chapter 5 Construction** and **Chapter 21 Socio-Economics**) the Project would employ over 300 people during the 28 month construction phase and approximately 60 additional long-term employees once operational. In addition, a similar number of contractors would be required for maintenance, security and transport during operations.

Once operational, the Project would support the mining industry in the Hunter Valley and therefore have a role in supporting the numerous jobs that rely on that industry in the Hunter Valley and NSW.

The additional staff would be sourced both locally and from further afield. The employment of people who already live in the area would provide jobs for local people, thereby reducing unemployment. Importing skilled labour from elsewhere brings new families into the area thereby increasing the Gross Regional Product of the area through increased spending in local businesses.

13.6 Issue 6 – Community Consultation

The submission raises a number of objections relating to the method in which the community consultation was conducted.

13.6.1 Overview

The submission stated that, “*Stockton Community Action Group strongly believes that the consultation process for Incitec’s ammonium nitrate plant was both disingenuous and inadequate*”. The points relating to community consultation that were raised within the submission are addressed in turn below.

Response

SCAG was represented on, and participated in, the Project community liaison group meetings. SCAG was provided the opportunity and raised issues and concerns in the meetings. The Project team and the independent expert provided comment and feedback in response to the issues raised by SCAG.

The consultation effort that accompanies this Project is outlined in **Chapter 7 Consultation** of the EIS. IPL has taken a multifaceted approach to consulting and engaging with stakeholders. IPL engaged the following specialist consulting groups in support of the consultation effort on the Project:

- FordComm was engaged to manage media relations and local politicians;
- Coakes Consulting was engaged to measure the impact of the consultation effort and how informed the community were of the project; and
- Kreab Gavin Anderson was engaged to inform State Government ministers and their offices on the progress of the project.

In addition to this, as part of the indigenous heritage assessment, consultation was conducted with the local Aboriginal community.

The community consultation effort undertaken as part of the Project prior to exhibition of the EIS included the following:

- a letterbox drop to 3,500 households in Stockton and Fern Bay in October 2011 announcing the Project;
- media releases to all local media including the announcement of the feasibility study on 27 October 2011 and the announcement of the EIS exhibition on 12 September 2012;

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- Project website launched in October 2011 with continuous updating;
- a letterbox drop of fact sheets to 10,000 households (Stockton, Fern Bay, Mayfield; Carrington and Warabrook) in December 2011 and a Project Update in July 2012;
- formation of a Project community liaison group with representation from community, environment groups and business which met 4 times in March, April, September and October 2012;
- appointment of an independent technical expert agreed to by the members of the Project community liaison group;
- advertisements in local newspapers (Newcastle Herald, Star, Post and Stockton Local) of community hotline for information, times and dates for community information sessions and EIS exhibition dates;
- community information sessions in November and December 2011 and September 2012 in Stockton and Mayfield;
- community perception telephone survey of 633 households in surrounding suburbs and wider local government area in April 2012 with a summary on the website in September 2012; and
- distribution of a summary of the EIS to 10,000 households in Stockton, Fern Bay, Mayfield; Carrington and Warabrook in September 2012.

The consultation effort is quantified within the EIS in **Chapter 7 Consultation** and in **Section 2** of this document.

IPL's public and stakeholder consultation program was developed in consultation with the Department of Planning and Infrastructure and was deemed to be adequate during a review of the EIS process.

13.6.2 Frequency of Consultation

The submission stated that *"One community information session ... in eleven months does not translate to meaningful consultation."* The submission claimed that, *"attendance for the sessions was very low"*. It also claimed that *"Incitec's community engagement strategy was to keep residents and the media in the dark."*

Response

During the EIS process, the Orica facility was forced to suspend operations. This suspension of operations caused an unforeseen extension of the Project timeframe as key assessments were postponed until the Orica facility was operational. During this postponement the Project was not progressing, additional community information sessions would have been superfluous as no new Project information would have been available. IPL kept the community up to date during this time with regular information leaflets, delivered to households within Stockton, Mayfield and neighbouring suburbs.

13.6.3 Proactive Media Releases

The Submission stated that *"One media release in eleven months is unacceptable and other major Project milestones such as community information sessions, selection of community reference group, addressing community concerns and the launch of EIS were never communicated to local media via proactive press releases"*

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Response

IPL issued media releases at major milestones during the project. This included the public announcement of the feasibility study on 27 October 2011 and the exhibition of the EIS on 12 September 2012. Details of the community information sessions were advertised in local newspapers (Newcastle Herald, Star, Post and Stockton Local).

13.6.4 Project Website

The submission states that SCAG disputed the stated number of visitors to the Project Website and that in their opinion many of the visitors to the website would have been IPL staff, suppliers and customers.

Response

The Project website (<http://www.iplkooragang.com.au>) was launched on 27th October 2011.

Table 13-1 provides the analytical statistics from the website up to 20 March 2013.

Table 13-1 Project Website Analytics

Category	Statistic
Unique Visitors	3,834
Site Visits	11,984
Page Views	23,866
Document Downloads	8,422

When a website visitor is directed from another website, such as a search engine, that point of origin is recorded. By interrogating the data that is collected in this manner it is possible to build up a picture of how the website visitors arrived at the page. **Table 13-2** shows from where each visit was redirected and how many visitors have travelled this route.

Table 13-2 Visitor Origin

Visitor Origin	Number of Visits
Google	2,228
Incitec Pivot	820
DP&I Website	242
Bing	81
Various Others / Direct Site Access	463

Working on the assumption that IPL staff, suppliers and customers would not have to rely on a search engine or the DP&I website to locate the Project website, it is possible to deduce that although some visitors to the website may have been people working on the project, a majority of visitors are likely to be members of the public. Based on this assumption it is possible to calculate that over 79% of page visitors were unique visitors and members of the public.

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13.6.5 Concerns of the Community

The submission stated that many of the concerns of the community, notably the possibility of locating the Project in another location have not been adequately addressed within the EIS. Stating: *“Through not addressing basic concerns, Incitec have operated in complete contempt of groups and local residents.”*

Response

The Community Liaison Group (CLG) was organised by IPL to maintain a dialogue with the local community raised a number of concerns during the feasibility study and EIS process. These concerns were all documented and integrated into the EIS.

The Stockton Community Action Group (SCAG) and Correct Planning & Consultation for Mayfield Group (CPCFM), are both members of the CLG, submitted a joint statement to a meeting of the CLG on 26 April 2012 expressing their opposition to the Project and their concerns. IPL responded to the joint statement in an attachment to the meeting minutes and published on the Project website. Additionally, community concerns were logged during the EIS exhibition period. Issues that were raised during this period are recorded in **Table 2-2** of this report.

The request of the CLG to investigate alternative locations for the Project was addressed and a response is contained within the EIS in **Chapter 2 Project Need and Alternatives**.

13.7 Issue 7 – Impact on House Prices

The submission claimed that the Project would have an impact on the price of houses in Stockton and surrounding suburbs. The submission also claims that the Project would be responsible for a stigma being attached to the area, which would result in a reduction in new families moving to the area.

“Incitec’s EIS does not acknowledge this issue, nor does it address who would be responsible if property values were lowered by their Project.”

Response

The likely socio-economic impact of the Project is assessed in **Chapter 21 Socio-Economics** within the EIS.

Property prices in any area are governed by a number of factors. While public perception of the area is undoubtedly one of these factors, it is only one of the many complicated interactions that drive the market-set prices of housing stock.

There has been industry on Kooragang Island for over 50 years; this industry, and the traditionally industrial workers of the area, have increased together over this time. Stockton is a desirable suburb with a diverse range of housing stock and an active community. House prices in the suburb are varied and reflect the diversity of housing stock.

Section 13.5 of this document outlines how the Project could lead to an increase in families moving to the area following the increase in demand for skilled labour. The increase in demand for housing could lead to an increase in housing value.

The cyclical nature of market economics leads to periodic inflations and deflations in housing prices across the country. This mechanism and the local house prices that it has an impact on was not

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materially affected by the recent environmental incidents in the area. Evidence suggests¹¹ that median house prices in Stockton increased more year-on-year in 2012 than they did in 2011 despite the much-publicised incidents on Kooragang Island.

13.8 Issue 8 – Emergency Response Plan

The submission claimed that the draft Kooragang Island Plan for emergencies (such as an emergency at Orica or IPL) does not include the Stockton Peninsula due to the difficulty of evacuation.

Response

The Newcastle Local Emergency Management Committee has prepared a draft Kooragang Island Precinct Emergency Sub-Plan, which has been sent to the State Emergency Management Committee for endorsement. The plan has been prepared as a sub plan to the New South Wales Disaster Plan (DISPLAN) to detail special control and coordination arrangements for the response to an emergency in the Kooragang Island precinct.

In addition the NSW Hazardous Materials (HAZMAT)/Chemical Biological Radiological Nuclear (CRBN) Emergency Sub-Plan describes the arrangements for the control and coordination of major HAZMT/CBRN emergencies requiring a coordinated response and recovery activities.

Development of an emergency response plan for Kooragang Island and Stockton is beyond the scope of the Project and it has not been required by the various NSW regulators. IPL is required to establish a site-specific emergency plan in line with the requirements of the *Hazardous Industry Planning Advisory Paper No. 1 – Emergency Planning* and EPA requirements. The site-specific plan seeks to minimise the effect of an incident inside and outside the facility.

Section 10.3 of this report responds to the submission from NSW Health relating to the Emergency Response Plan for Kooragang Island and Stockton.

13.9 Issue 9 – IPL Environmental Record

The submission claimed that IPL has a poor environmental record globally, stating that: *“This year, the Incitec operations on Kooragang Island have received two environmental breaches.”*

Response

Incitec Pivot Limited is an international chemical manufacturer supplying agricultural fertilizers, industrial chemicals and commercial explosives to Australian and international markets. IPL operates over 25 major industrial chemical manufacturing sites internationally and employs over 5,000 people in over 18 countries.

The operations of the IPL Group are subject to environmental regulation under the jurisdiction of the countries in which those operations are conducted including Australia, United States of America, Mexico, Canada, Indonesia, Papua New Guinea and Turkey.

The environmental laws and regulations generally address the potential aspects and impacts of the Group’s activities in relation to, among other things, air and noise quality, soil, water, biodiversity and wildlife.

¹¹ <http://www.rs.realestate.com.au/cgi-bin/rsearch?a=sp&s=nsw&u=stockton>

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The Group operates under a Global Health, Safety and Environment Management System which sets out guidelines on the Group's approach to environmental management, including a requirement for sites to undertake an Environmental Site Assessment.

In certain jurisdictions, the Group will hold licences for some of its operations and activities from the relevant environmental regulator. The Group measures its compliance with such licences and reports statutory non-compliances as required.

The Group categorise its environmental incidents using 4 categories:

- Category 1 – Insignificant or minor
- Category 2 – Moderate
- Category 3 – Major
- Category 4 – Catastrophic

During the 2011/12 financial year, there were no major or catastrophic incidents. However, there were 13 Category 2 environmental licence non-compliances and 14 Category 2 losses of containment.

For terms of these incidents:

- a Category 2 environmental licence non-compliance is a moderate excursion outside statutory discharge or emission limits as set out in the relevant licence and as measured in a scheduled test; and
- a Category 2 loss of containment is an incident where there is an unplanned release or spill on a site of material from a vessel, tank, pipe pump, container or package in which it was designed to be contained and such incident causes moderate injury or damage, impacts the environment or causes concern in the surrounding community.

The aggregate value of fines paid by the Group for the incidents for the financial year amounted to approximately \$60,000.

Annually, the Company publishes a Sustainability Report which is available on its website at www.incitecpivot.com.au. The Report provides details of the Group's environmental management, performance and initiatives.

In the last 12 months, IPL's operations on Kooragang Island have received one penalty notice from the EPA. This notice was in relation to the tracking of material from vehicles leaving the site and travelling along Heron Road and likely to be washed into stormwater and cause water pollution. IPL investigated the incident to identify root causes and corrective actions have been implemented to minimise the risk of it occurring again.

In addition, the current operations on the Project Site have been inspected or audited by the EPA on a number of occasions since October 2011. These inspections/audits identified a number of issues which are being addressed through the implementation of Pollution Reduction Plans, agreed between IPL and the EPA. These improvements would continue to reduce the existing pollution in the area following Project approval.

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13.10 Issue 10 – Alternative Locations

The submission from SCAG suggested that no appropriate assessment of alternative locations for the Project had been conducted as part of the EIS.

“There are alternative locations that were not fully assessed by Incitec in the EIS and alternative supply options that would eliminate major risk and hazards to the communities surrounding Kooragang Island.”

Response

Alternative locations for the Project were considered within the EIS in **Chapter 2 Project Need and Alternatives**. The EIS assessed the selected location against a number of considerations to determine Kooragang Island as the most appropriate location for the Project.

Correct Planning & Consultation for Mayfield Group

Introduction

Correct Planning and Consultation for Mayfield Group are members of the Project's Community Liaison Group and have participated in the meetings throughout the development of the Feasibility stage.

A submission was received from the Correct Planning and Consultation for Mayfield Group (CPCFM). The group has more than 500 members and supporters, based mainly in Mayfield and surrounding inner city suburbs. The submission raised a number of issues that are outlined and responded to below.

14.1 Issue 1 – Potential for Explosion

A number of aspects relating to the risk of explosion were raised by CPCMG. These issues are discussed below.

14.1.1 Inaccurate Blast Contours

The CPCFM Group suggested that the 'blast contours' in the EIS were inaccurate.

Response

The lines that are identified within the Submission as 'blast contours' are risk contours. Risk contours delineate the areas that are subject to different levels of risk from major hazards and are required by the NSW Hazardous Industry Planning Advisory Papers (HIPAP). Blast contours are not required for this kind of assessment in NSW.

As described in the response to **Section 13.1.1**, the Preliminary Hazard Analysis considered 78 major accident events for the Project (refer to Table 5-9 in **Appendix D1** of the EIS). These events included worst case credible events from explosions, fires and toxic gas releases. The consequences of these credible events were assessed as part of the risk assessment process. The consequences were combined with the likelihood of each outcome and aggregated to develop the risk contours shown in the PHA (refer to Section 8 in **Appendix D1** of the EIS).

Domino effects have been assessed to determine the impact of an explosion on other storage tanks, process vessels and pipework potentially leading to the loss of containment of toxic gases.

Domino effects as a result of sympathetic detonation of ammonium nitrate were not included as the site layout and TGAN storage configurations are such that the distances between the two stacks are far enough to not allow for sympathetic detonation to occur, let alone between facilities. Refer to Assumption No. 24 in Appendix A of the Preliminary Hazard Analysis.

14.1.2 Interstate Examples

The Submission also stated that the DP&I should recognise examples in South Australia where residential areas are not permitted in proximity to IPL's Port Adelaide storage facility. The submission claims that, *"Such a massive concentration of ammonium nitrate storage on KI, within 800 m of residents is not acceptable to the communities that surround the proposal."*

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Response

The Hazard and Risk Assessment within the EIS complies with the requirements of the NSW HIPAP. As the Project is located in NSW it not required to comply with the requirements of another country, state or territory.

As described within the EIS in **Chapter 6 Legislation and Planning Policy**, the land use zoning for the Site means that the Project is permissible in this location under NSW planning policy.

A more complete response to this issue can be found in **Section 13.1.12**.

14.2 Issue 2 – Air Quality

14.2.1 Increase in Nitrogen Oxides

The submission stated that the Project, alongside the Orica facility, would create especially high levels of NO_x.

Response

The AQIA for the Project quantitatively assessed the potential for cumulative impacts of nitrogen dioxide (NO₂) from the Orica expansion project and the IPL facilities and predicted that the NO₂ concentrations would not exceed the relevant regulatory criteria, and hence would be unlikely to result in adverse air quality impacts. **Section 8** of the AQIA (refer to **Appendix E** of the EIS) presents these results.

The AQIA included background monitoring data that was collected during times at which the existing Orica facility was operational. The data reviewed in **Section 5** of the AQIA included 5 years of Stockton monitoring data which were shown to be similar to levels measured elsewhere in the region, and within the range classified by the Office of Environment and Heritage (OEH) as either “good” to “very good”^[1] at all times during this period. This is despite the data being collected during times at which the Orica facility was operational, having NO_x emissions significantly higher than those estimated from the Project¹².

Whilst IPL acknowledges that the Project would result in pollutant emissions (including NO_x and Particulate Matter), it is noted that in designing the Project, IPL has proposed emission control technology that is consistent with best available technology as identified in international references. The performance of this technology would be ensured by the application of emission standards to be enforced under the Environmental Protection Licence (EPL) for the facility through the routine monitoring of emissions. In this context, IPL has sought to minimise emissions of these pollutants, and minimise air quality impacts.

^[1] The OEH Air Quality Index (AQI) uses the classifications of “very good” and “good” for air quality conditions which range from 0-33% and 33-66% of criteria (respectively) <http://www.environment.nsw.gov.au/AQMS/dataindex.htm>. For NO₂, this equates to 0-82 µg/m³, and 83-164 µg/m³, for “very good” and “good” conditions (respectively). A background NO₂ concentration of 84 µg/m³ was adopted within the AQIA.

¹² Based on the 2010/2011 National Pollution Inventory data reviewed in the AQIA, the scale of emissions from the Project was estimated as constituting a minor increase (of approximately 10%) above the existing Orica emissions at Kooragang Island.

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14.2.2 Cumulative Air Quality

The submission raised concerns about the cumulative air quality in the area.

Response

The AQIA for the project has provided a consideration of the Project in the context of existing industry through the incorporation of background monitoring data which has been collected within the region during times when the existing industries were present and operational (refer to **Section 5** of the AQIA, **Appendix E** of the EIS). Emissions from the Project, when added to these existing levels were found to be within impact assessment criteria which are used to assess the potential for proposal to result in adverse air quality impacts. In the case of particulate matter emissions, impacts associated with the Project were predicted to be minor, relative to existing concentrations and impact assessment criteria, with these impacts being localised to small areas near to the facility.

Proposed industry in the area that was either (i) on exhibition, or (ii) had been on exhibition but not yet approved, or (iii) approved but not yet commissioned at the time of the AQIA, was subject to a separate assessment (refer **Section 7.6.1** and **Section 8.3** within the AQIA) that addressed cumulative effects. The cumulative impact assessment found the air quality to be within impact assessment criteria.

Air quality monitoring within the region is being improved through the establishment of the Lower Hunter Air Quality Monitoring Network. This network will assist in the management of air quality at a regional level, and will likely include Orica's new monitoring station at Stockton, which continuously records levels of nitrogen dioxide (NO₂), total oxides of nitrogen (NO_x), particulate matter (PM₁₀ and PM_{2.5}) and ammonia.

In addition, in accordance with the EPA's proposed conditions of consent, the Project emissions would be monitored as part of the EPL for the Site.

14.3 Issue 3 – Noise and Vibration

14.3.1 Industrial Noise

The submission claimed that 'industry' cannot be trusted because of the current night-time acoustic exceedance on Kooragang Island.

Response

The Sound Power Level (noise) from industry on Kooragang Island is managed under existing Environment Protection Licences (EPLs) issued by the NSW EPA. The EPA is aware of the current noise exceedances in the area and is working with various companies, e.g. Orica, to reduce the level of noise experienced in Stockton and other surrounding suburbs. Industry can be subject to financial penalty if it fails to comply with the conditions of an EPL. IPL has no control over the noise created by other industries on Kooragang Island.

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14.3.2 Accuracy of Baseline Assessment

The submission claimed that the baseline monitoring for the EIS was completed while the Orica plant was not operational.

Response

As noted in the Noise and Vibration Assessment within the EIS (refer to **Appendix F**) and within **Chapter 11 Noise & Vibration** of the EIS, the acoustic baseline surrounding the Site was assessed when the Orica site was partially operational. When the Orica site is fully operational, the acoustic baseline in the area would be higher than that assessed in the EIS. Both IPL and the EPA are aware of this situation and have used other noise monitoring data to fully understand the acoustic baseline in Stockton.

14.4 Issue 4 – Community Consultation

The submission stated that, *“Many residents from Stockton, Carrington, Tighes Hill and Mayfield have been left in the dark on this project. Letter drops and one information session two months after the Orica disaster is not proper consultation for a project of such magnitude and widespread impacts.”* This submission is consistent with that received from SCAG and outlined in **Section 13.6** of this document.

Response

The community consultation undertaken as part of the Project prior to exhibition of the EIS included the following:

- a letterbox drop to 3,500 households in Stockton and Fern Bay in October 2011 announcing the Project;
- media releases to all local media including the announcement of the feasibility study on 27 October 2011 and the announcement of the EIS exhibition on 12 September 2012;
- Project website launched in October 2011 with continuous updating;
- a letterbox drop of fact sheets to 10,000 households (Stockton, Fern Bay, Mayfield; Carrington and Warabrook) in December 2011 and a Project Update in July 2012;
- formation of a Project community liaison group with representation from community, environment groups and business which met 4 times in March, April, September and October 2012;
- appointment of an independent technical expert agreed to by the members of the Project community liaison group;
- advertisements in local newspapers (Newcastle Herald, Star, Post and Stockton Local) of community hotline for information, times and dates for community information sessions and EIS exhibition dates;
- community information sessions in November and December 2011 and September 2012 in Stockton and Mayfield;
- community perception telephone survey of 633 households in surrounding suburbs and wider local government area in April 2012 with a summary on the website in September 2012; and
- distribution of a summary of the EIS to 10,000 households in Stockton, Fern Bay, Mayfield; Carrington and Warabrook in September 2012.

IPL’s public and stakeholder consultation program was developed in consultation with the Department of Planning and Infrastructure and was deemed to be adequate during a review of the EIS process.

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It is not the role of IPL to engage in consultation that relates, directly or indirectly, to any incident suffered by any entity other than IPL.

A more complete response to this issue can be found in **Section 12.5** of this document. A more complete account of the consultation undertaken as part of the Project can be found in **Section 2** of this document and within the EIS in **Chapter 7 Consultation**.

14.5 Issue 5 – Impact on House Prices

The submission claimed that the Project would have an impact on the price of houses in Stockton, Mayfield and surrounding suburbs. The submission also claims that the Project would be responsible for a stigma being attached to the area, which would result in a reduction in new families moving to the area.

“Incitec’s EIS does not acknowledge this issue, nor does it address who would be responsible if property values were lowered by their Project.”

The submission is consistent with that received from SCAG, as outlined in **Section 13.7** of this document.

Response

There is no empirical evidence that the house prices in Stockton would be affected by the presence of the Project. A more complete response to this issue can be found in **Section 13.7** of this document.

14.6 Issue 6 – Traffic Impacts

The submission claimed that traffic is already a major concern in the area and that the EIS does nothing to mitigate the impact of the Project on the roads in the area during construction or operation.

The submission also claims that the additional traffic associated with the Project would add to the deterioration of air quality in the area.

Response

As outlined in the EIS, measures have been proposed by IPL to mitigate the impact of the Project on the local traffic. These measures can be found in **Section 15.7** of the EIS.

During the construction phase of the Project, construction staff would travel to and from the Site using a park and ride scheme, run by IPL specifically for the Project. Additionally, Project components would be delivered to the Site through Newcastle Port to avoid the need to transport them by road. More information on the traffic impacts of the Project is provided in **Section 13.4** of this report and can be found in the EIS in **Chapter 15 Traffic and Transport** and **Appendix J Transport Impact Assessment**.

The Project will result in additional truck movements. Given their mobile nature, trucks constitute a diffuse emissions source, where the volume specifically associated with the Project is considered unlikely to result in a significant increase in air pollution across the region.

For trucks present on the Site, IPL proposes to implement a range of measures to minimise emissions, including such measures as the training of staff, switching off engines to avoid idling emissions, and using vehicles that are properly maintained, and operated in accordance with their

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design. These management and mitigation measures are outlined within the EIS in **Chapter 23 Management and Mitigation Measures**.

14.7 Issue 7 – Employment and Economic Impacts

The submission claimed that the Project will only employ 60 people and that many of these will be imports from IPL's Moranbah facility. The submission also stated that the economic factors behind IPL's decision to delay the Project namely rising construction costs and a falling coal price should be included in the EIS.

Response

The decision to defer the Project for at least two years reflected the anticipated reduction in demand for ammonium nitrate and the high cost of construction in Australia. The deferral of the Project was not included in the EIS as the EIS was already on public exhibition when the decision was taken. IPL announced the deferral of the Project to the Australian Securities Exchange on 26 September 2012, while the EIS commenced public exhibition on 12 September 2012.

In line with IPL's disciplined approach, development of the plant would proceed only on meeting IPL's strict financial hurdles and achieving firm customer commitments.

A response to the section of the submission that relates to the number of people that the Project would employ, from where they will come and what impact that may have on the economics of the region, can be found in **Section 13.5** of this document supported by **Chapter 21 Socio-Economics** of the EIS.

14.8 Issue 8 – Impacts on the Ramsar Wetland

The submission claimed that the Project would have an impact on the Ramsar wetland to the north of the Project Site. The submission states, *"Excessive industrial development with licenses to pollute the river close to a RAMSAR area is not common sense planning; nor does it position the Hunter River in a positive light to tourists."*

Response

As described in the EIS within **Chapter 13 Surface Water and Wastewater** and in Appendix H, as well as **Chapter 18 Ecology**, the Project would not have an impact on the Ramsar Wetland situated to the north of the Site.

Dispersion modelling was undertaken to ensure that the selected location, depth and method for the wastewater outfall on the south arm of the Hunter River would not result in an impact on the internationally important wetlands. The conclusions contained within the EIS have been supplemented with additional sampling and modelling work, (refer to **Appendix B** of this report) which concluded that the waste water streams from the Project would not significantly impact upon the Hunter River. As such the conclusions of the ecological assessment remain the same; the Project is unlikely to result in a significant impact to the Hunter Estuary Wetlands.

Presbyterian Aged Care Group

Introduction

A submission was received on behalf of Presbyterian Aged Care Group (PAC). The PAC provides residential aged care, community aged care and retirement housing across NSW. PAC Wescott is located at 128 Fullerton Road, Stockton approximately 1.5km from the IPL site boundary. Wescott provides the Stockton peninsula's only residential aged care facility with up to 130 people housed there. The concerns raised in the submission are outlined below.

15.1 Issue 1 – Emergency Planning

The submission noted that industrial development is needed in NSW and that Kooragang Island has been an industrial area for many years. Despite this, it stated a preference that the Project not be located in this location. The submission highlighted that if the Project is to go ahead, there is a need to engage with the community to develop and operate a robust emergency plan.

Response

IPL is required to establish a site-specific emergency plan in line with the requirements of the *Hazardous Industry Planning Advisory Paper No. 1 – Emergency Planning* and EPA requirements. The site-specific plan seeks to minimise the effect of an incident inside and outside the facility. IPL would engage with the community and emergency services to develop and operate a robust emergency response plan.

A more complete response to this issue is included in **Section 13.8**.

Orica Australia Pty. Ltd.

Introduction

A submission was received on behalf of Orica Australia Pty Ltd (Orica).

16.1 Issue 1 – Suitability of IPL’s Selected Noise Assessment criteria

The submission stated that “*The noise assessment criteria selected by IPL should not result in any increase to the current noise levels at Stockton, nor should compliance by IPL be dependent on work being undertaken by Orica to reduce noise levels.*”

Response

As required by the EPA, the proposed Project Specific Noise Limits (PSNL) for the Project would be set at 40 dB during the night time. This limit would not be reliant on any work being undertaken by Orica. While operating within its proposed noise limits, the noise from the Project would be imperceptible in Stockton.

16.2 Issue 2 – Hazard and Risk

A number of aspects relating to the risk of explosion were raised by Orica. These issues are discussed below.

16.2.1 Separation Distances

Orica sought further clarification on whether IPL plans to upgrade existing AN storage to SAFEX recommended separation distances.

Recommendation 10 notes that the SAFEX recommended separation distances will be applied to new AN storages but does not state that this will be done for the existing site AN storages.

Response

The storage of AN in Shed 4 will be upgraded to comply with SAFEX recommended separation distances as part of the Project. A management and mitigation measure has been added to accommodate this commitment (refer to Measure B21 in **Table 22.3** of this report).

16.2.2 Toxic Criteria for Injury and Irritation

Orica objected to the toxic criteria for injury and irritation used on the grounds that the Emergency Response Planning Guideline (ERPG) values were predominantly used as opposed to using Acute Exposure Guideline Levels (AEGL) values which are, Orica submits, considered to be more reflective of the general population through the greater inclusion of susceptible individuals.

“A review of AEGL values available for ammonia would suggest a more conservative exposure concentration of 220ppm for 10 minutes associated with toxic injury and 30ppm for 10 minutes, consistent with the exposure values considered in Orica’s expansion project, should be considered by IPL as part of their QRA process.

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"In addition Orica is concerned with the selection of nitrogen dioxide irritation exposure value of 5ppm by IPL, justified by IPL as being consistent with industrial workplace exposure criteria outlined for OSHA Ceiling Limit PEL and ACGIH 2011 STEL. Orica considers the use of industrial workplace exposure standards as being not appropriate as they do not reflect the broader demographic of surrounding Kooragang Island community. A review of the April 2012 ACGIH NO₂ criteria also indicates that there is currently no published value for NO₂ STEL and therefore the justification provided by IPL for using this value, in preference to the AEGL value of 0.5ppm, is considered by Orica as no longer valid."

Response

HIPAP 4 sets the risk criteria of 50×10^{-6} per annum for toxic exposure irritation (no injury) risk and 10×10^{-6} per annum for toxic exposure injury risk. However, it does not specify the concentrations or toxic dose relationships for these effects for any toxic materials.

The selection of exposure concentration or dose is based on the following considerations:

- It has to be based on "conservative best estimate", as suggested in HIPAP No. 4, and not necessarily over-conservative or unrealistic.
- It has to be consistent with the tolerable risk level.

Therefore, it is essential in a QRA to take account of the exposure concentration and duration, with its systemic effects, together with the reasonableness of the exposure risk criteria to make informed decisions on risk tolerability, and not focus solely on the consequence dimension of the risk.

Exposure limits for Ammonia and Nitrogen Dioxide

Table 16-1 summarises the available information on exposures to ammonia and nitrogen dioxide.

Table 16-1 NH₃ and NO₂ Exposure Limits

	NH ₃		NO ₂	
	ppm	time (min)	ppm	time (min)
Used in QRA (Injury)	300	15	15	15
Used in QRA (Irritation)	41	15	5	15
SLOT (UK HSE)	5,020	15	80	15
TLV-TWA	25	480	3	480
TLV-STEL	35	15	5	15
IDLH	300	30	20	30
ERPG-1	25	60	1	60
ERPG-2	150	60	15	60
ERPG-3	750	60	30	60
AEGL-1	30	480	0.5	480
AEGL-2	220	30	15	30

Source: <http://www.hse.gov.uk/chemicals/haztox.htm>

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Selection of exposure concentration for Irritation Risk

AEGL-1 is the airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic non-sensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

The AEGL-1 value of 30 ppm for ammonia allows an exposure of up to 8 hours. Acute exposures from the Project are unlikely to last more than 60 minutes based on the isolatable inventories, as assessed in the IPL PHA. Therefore, selecting 30 ppm for 10 minute exposure is far too conservative, and not an appropriate value for a 50×10^{-6} per annum risk criterion.

The "dose" is a function of concentration (C) and time (t) and is a more appropriate way of assessing toxic effects than the concentration alone. Assuming a $C^2.t$ relationship (cf. as used by the UK HSE for their SLOT criterion, refer to **Table 16-1** above), the equivalent ERPG-1 for 15 minutes exposure is estimated at 50 ppm (35 mg/m³). Using the additional relevant toxicity data in AIHA's Emergency Response Planning Guidelines, the irritation level for exposure to ammonia is 50 ppm for 10 minutes and 72 ppm for 5 minutes. Based on the $C^2.t$ relationship, the equivalent concentration for 15 minutes exposure is only slightly lower at approximately 41 ppm. Therefore, IPL used a dose based on exposure to 41 ppm for 15 minutes (i.e. dose = 25,215 ppm².minutes) for analysis of toxic irritation risk from ammonia.

A dose of 41 ppm for 15 minutes for irritation risk is still conservative and justifiable on the grounds of "conservative best estimate" and the low 50×10^{-6} per annum risk criterion.

A similar argument applies for exposure to NO₂. A value of 0.5 ppm is allowed for up to 8 hours exposure (AEGL-1). This is also considered the "No Observable Effect Level (NOEL) for the Asthmatic Population". For toxic irritation risk, use of a higher concentration value is justified, especially for the 50×10^{-6} per annum risk criteria.

The dose used in the IPL PHA for NO₂ was based on exposure to 5 ppm for 15 minutes (i.e. dose = 375 ppm².minutes) and this is consistent with the Safe Work Australia STEL value for a 15 minute exposure, with no irreversible effects. By definition, the STEL is a limit to which a healthy individual may be exposed 3 or 4 times a day for up to 20 minutes. IPL has used a 15 minute exposure. Further, IPL has used an exposure frequency target of 50×10^{-6} per annum, based on HIPAP 4.

Orica noted that the American Conference of Governmental Industrial Hygienists (ACGIH) did not have a published value for NO₂ STEL in April 2012. However, on 10 May 2013, Safe Work Australia's Hazardous Substances Information System (HSIS) Consolidated Lists (<http://hsis.safeworkaustralia.gov.au/ConsolidatedLists>) reported a STEL concentration for Nitrogen Dioxide of 5 ppm.

The argument advanced by Orica that IPL has used a STEL value for a healthy adult for public exposure is incorrect as the former allows an exposure of up to 3-4 times a day for up to 20 minutes, whereas the risk target is several thousand times lower for members of the public. Therefore, the dose based on exposure to 5 ppm for 15 minutes chosen by IPL is not only justified, but is equally conservative.

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Selection of exposure concentration for Injury Risk

Historically, over the many years of studies conducted in NSW, the IDLH concentration has often been used for analysis of toxic injury risk (i.e. no irreversible effect for short duration exposure, typically less than 30 minutes). The IDLH for ammonia is 300 ppm for 30 minutes exposure. When the ERPG values were published, the ERPG-3 values was set the same as IDLH.

The dose selected in the IPL PHA for ammonia is based on exposure to a concentration of 300 ppm for 15 minutes (less than half the time for IDLH dose). This means that for the 15 minute exposure duration selected, at this concentration level, there would be no irreversible injury. Thus, for a target risk of 10×10^{-6} p.a., a dose based on exposure to 300 ppm for 15 minutes (i.e. dose = 1.35×10^6 ppm².minutes) is considered appropriate, and still conservative and consistent with the principles of "cautious best estimate".

Orica has used a value of 200 ppm for 30 minutes in the recent QRA for their AN facility. IPL has chosen a dose based on exposure to 300 ppm for 15 minutes. By comparison, the C²t dose value is 1.35×10^6 ppm².minutes for IPL and 1.20×10^6 ppm².minutes for Orica. Thus, IPL has chosen a dose comparable to that used by Orica.

In the case of NO₂, the reasoning behind IPL's selection of the injury concentration is based on dose, and a comparison shows that Orica has used a dose marginally higher than that of IPL. IPL used a dose based on exposure to 15 ppm for 15 min (i.e. dose= 3375 ppm².minutes) and Orica used 20 ppm for 10 minutes (i.e. dose= 4000 ppm².minutes). Thus, IPL has been more conservative in terms of dosage.

16.2.3 Toxic Irritation Map

Orica requested a toxic irritation map with a higher resolution to clearly distinguish the residential zoned areas of Stockton.

On the toxic irritation contour map, it is hard to distinguish the residential zoned area. It is important to do so in order to compliance [sic] to HIPAP 4 criteria.

Response

The best resolution map obtainable for the area has already been used in the analysis. The estimated irritation risk is reported for the risk ranking point No. 3 at the corner of Fullerton St. & Meredith St. to avoid any uncertainty regarding the magnitude of the risk at the closest residential location.

16.2.4 Isolation Times

Orica requested additional information on how IPL will achieve the stated on-shore process isolation time and marine automatic isolation time, with additional justification of the deviation from the values used in the Purple Book.

1. "On-shore process isolation time of 3 minutes.

The Purple Book states that with automatic leak detection and remotely actuated operation of isolation valves that the isolation time is 10 minutes (4.4.1). This is much higher than the 3 minutes the PHA asserts as achievable in 99% of releases.

2. On-shore process isolation time of 15 minutes.

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The Purple Book states that with automatic leak detection and manual operation of isolation valves that the isolation time is 30 minutes (4.4.1).

3. Marine automatic isolation time of 25 seconds.

The Purple Book states that for a fully automatic isolation system, the isolation time is 2 minutes (4.4.1). This is much longer than the 25 seconds stated in the PHA."

Response

For on-shore processes, the isolation times used in the PHA were based on IPL operational experience.

The default guideline isolation times reported in the Purple Book do not specifically take account of the type, size and complexity of the facility. As the proposed IPL Site is relatively small (i.e. less than 1 km between the furthest ends of the Site), will be continuously manned, and has relatively few hazardous materials, it was concluded that a value less than quoted in the Purple book is still appropriate and conservative.

Furthermore, it was recommended in the PHA (Recommendation No. 6) that the isolation system be designed to meet the assumed isolation times.

For marine processes the isolation time chosen for the powered emergency release coupling (PERC) is conservatively estimated to take 15 seconds to detect; 5 seconds to send the signal to the isolation valve and 5 seconds for the isolation valve to close. This PERC requires no manual intervention and is designed such that on accidental disconnection there will be little to no loss of containment.

16.2.5 Model Leak Rates

Orica requested for model leak rates associated with pipeline ruptures to be undertaken taking into consideration the Purple book factor of 1.5 times.

Orica requested clarification on the use of double-sided pipe rupture flows in the risk modelling.

Liquid transfer systems are assumed to be flow controlled upstream of the leak which means the leak flow rate is largely controlled at the normal process flow rate.

This assumption depends on flow measurement always being upstream of the leak and controlling the pump speed or upstream flow control valve.

The Purple Book states (4.3 Note 9) that the presence of pumps must be taken into account and suggest outflows are modelled using 1.5 times the nominal pumping rate due to loss of downstream pressure.

For a pipeline rupture, double-sided flow will occur and the flow from the end downstream of the leak should be included.

Response

Double sided pipe rupture (guillotine fracture) can only occur in the following failure modes:

- Corrosion of flange bolts and hence full separation of the two flanges; or
- Major impact on or a direct dropped load on pipework fracturing the pipe or flange connection.

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Corrosion and pipe wall thinning can result in a rupture equivalent to the diameter of the pipe, but would not result in a guillotine failure, with flows occurring from both directions.

The piping specification for liquefied ammonia provides high integrity. The pipework is constructed from Schedule 80 seamless, low temperature, carbon steel piping with 300# flanges. Flanged fittings are kept to a minimum with the use of fully welded valves and other pipe fittings. Internal corrosion of the pipework with ammonia is negligible. The pipework would be classified as critical pipework with regular inspections and non-destructive testing.

The likelihood of direct dropped load from a mobile crane lift is very low (e.g. 1.2×10^{-5} per lift¹³). Most crane lifts for maintenance work are only carried out after the maintenance section is isolated, depressurised, flushed/ purged. Further, there are significant controls on the integrity of the crane and rigging equipment and the competency of crane operators. All significant lifts are subject to detailed planning, a risk assessment, and permit to work is approved by an authorised person. The frequency of failure modes that may cause a guillotine fracture and cause double-side flow would be negligible for the Project.

16.2.6 PHAST-Risk Instantaneous Release Model

Orica requested a sensitivity analysis be carried out for fatality, toxic injury and irritation risks using the PHAST-Risk instantaneous release model instead of "*a hole size equal to the largest pipe diameter or nozzle connected to the vessel*" on the grounds that the Purple Book requires a vessel rupture case to be modelled as both an instantaneous release and a hole size equivalent to a 10 minutes release case.

Response

A 10-minute release of the inventory was originally suggested by the HSE in the UK (Pape & Nussey, 1984), with respect to major releases from pressure vessels, and has worked reasonably well over many years. The release from a full-bore equivalent hole of the largest nozzle (i.e. the approach adopted in the PHA, refer to **Appendix D1** of the EIS) approximately equates to the 10 minute release of inventory. Such a failure mode is also relatively more credible for the majority of the identified major accident events for the Project compared to an "instantaneous" release of the inventory.

Further, it is stated in the PHAST-Risk user guide that "*if the release is of short duration, but is confined to flow in a particular direction, then it may not be well described as an instantaneous release, and you should use one of the continuous release models*". As the majority of the shorter duration gas release events identified for the proposed IPL facility involve major failures of pipework systems rather than pressure vessels, it is reasonable to expect that these would be confined to a particular direction and therefore not well described by the instantaneous release model.

IPL and Lloyds Register Rail do not believe that it is necessary or appropriate to undertake a sensitivity analysis using the instantaneous release model in PHAST-Risk for the identified major accident events at the proposed IPL facility.

¹³ DNV-RP-F107 Risk Assessment of Pipeline Protection (Oct 2010)

Mayfield East P&C Association

Introduction

A submission was received from the Mayfield East Public School Parent and Child Association. The members of Mayfield East Public School P&C Association represent the families of 250 school children. The school is located in Crebert St, Mayfield East and approximately 2.7 km from the Project. The submission raised three main issues, which are outlined below.

17.1 Issue 1 – Release of Overpressure Maps

The submission drew information from the Newcastle Herald article of 20 September 2012. The submission claims that IPL is refusing to release over pressure blast maps that would show *“the extent of devastation should there be a catastrophic blast”*.

Response

The reasons for the exclusion of certain sections of the report are on the grounds that it contains information associated with the manufacture of Security Sensitive Ammonium Nitrate. Disclosure of such information may:

- increase the likelihood of, or prejudice the prevention of, preparedness against, response to, or recovery from, a public emergency (including any natural disaster, major accident, civil disturbance or act of terrorism) (s14(2) Table 2(c));
- endanger, or prejudice any system or procedure for protecting, the life, health or safety of any person (s14(2) Table 2(d)); or
- facilitate the commission of a criminal act (including a terrorist act within the meaning of the *Terrorism (Police Powers) Act 2002* (s14(2) Table 2(f)).

17.2 Issue 2 - Size of Potential Explosion

The submission claimed that the amount of AN that would be stored on Kooragang Island would have the capability to create an explosion several times larger than the one that occurred in Toulouse in 2001.

Response

The worst case scenarios were identified and assessed to determine its impact for its offsite risk.

On the basis of the results of the QRA, the proposed development complies with the relevant land use safety planning risk criteria for new industrial developments, as published in HIPAP No. 4 and 6 by the NSW DP&I.

A combined explosion of the Project AN storage and the Orica AN storage is not credible because the facilities associated with AN have been intentionally located such that there is a maximum separation between the TGAN on IPL's site and the potentially hazardous materials at Orica.

The Toulouse explosion in 2001 did not kill hundreds of people. The explosion fatally injured 30 persons (22 employees and 8 public).

17 Mayfield East P&C Association

17.3 Issue 3 – Air Quality

The submission urged that the air quality impacts associated with the Project be assessed '*in the light of the other polluting industries already there.*'

Response

The AQIA for the Project has provided a consideration of the Project in the context of existing industry through the incorporation of background monitoring data which has been collected within the region during times when the existing industries were present and operational (refer to **Section 5** of the AQIA, **Appendix E** of the EIS). Emissions from the Project, when added to assess these existing levels were found to be within impact assessment criteria which are used to assess the potential for a proposal to result in adverse air quality impacts. In the case of particulate matter emissions, impacts associated with the proposal were predicted to be minor, relative to existing concentrations and impact assessment criteria, with these impacts being localised to small areas near to the Project.

Proposed industry in the area that was either (i) on exhibition, or (ii) had been on exhibition but not yet approved, or (iii) approved but not yet commissioned at the time of the AQIA, was subject to a separate assessment (refer **Section 7.6.1** and **Section 8.3** within the AQIA) that addressed cumulative effects. The cumulative impact assessment found the air quality to be within impact assessment criteria.

Islington Village Community Group

Introduction

A submission was received on from the Islington Village Community Group (IVCG). The group represents a concerned group of Newcastle residents. Their submission raises eight key concerns, which are outlined below.

18.1 Issue 1 – Potential for Explosion

A number of aspects relating to the risk of explosion were raised by IVCG. These issues are discussed below.

18.1.1 Inaccurate Blast Contours

The IVCG claimed that the ‘blast contours’ do not correlate with information from the incident in Toulouse in 2001.

Response

The contours presented in the PHA are iso-risk contours and not “blast contours” (i.e. they are not consequence distance contours). The iso-risk contours were determined in accordance with the methodology required in HIPAP No. 6.

Therefore, iso-risk contours presented in the PHA will not correlate with the consequence information from the Toulouse incident.

The consequences of credible hazardous events, that could have off-site impacts, were assessed as part of the risk assessment process in the Preliminary Hazard Analysis (refer to **Appendix D1** of the EIS). The consequences of the events, combined with their likelihood, were used to develop the iso-risk contours.

18.1.2 Cumulative Risk

The IVCG claimed that the EIS does not adequately address the concerns regarding the combined storage of AN at the Incitec and Orica sites.

Response

The cumulative risk of the proposed expansion of the Orica site and the IPL Project was assessed in the Preliminary Hazard Analysis (refer to Section 8.5 in **Appendix D1** of the EIS). The maximum cumulative individual risk for Orica’s proposed facility and IPL’s proposed facility is significantly below the NSW DP&I risk criteria for residential land uses, which is applicable to a single proposed development.

The facilities associated with AN have been intentionally located such that there is a maximum separation between the AN on IPL’s site and the storage at Orica. An explosion between Orica and IPL due to domino effects is not credible due to the separation distances between the two facilities.

18 Islington Village Community Group

18.1.3 Interstate Examples

The Submission also stated that the DP&I should recognise examples in South Australia where residential areas are not permitted in proximity to IPL's Port Adelaide storage facility. The submission claims that, *"Such a massive concentration of ammonium nitrate storage on KI, within 800 m of residents is not acceptable to the communities that surround the proposal."*

Response

Refer to the response in **Section 13.1.12**.

The Hazard and Risk Assessment within the EIS complies with the requirements of the NSW HIPAPs. As the Project is located in NSW it not required to comply with the requirements of another country, state or territory.

As described within the EIS in **Chapter 6 Legislation and Planning Policy**, the land use zoning for the Site means that the Project is permissible in this location.

18.2 Issue 2 – Air Pollution

18.2.1 Increase in Nitrogen Oxides

The submission stated that the Project, alongside the Orica facility, would create especially high levels of NO_x.

Response

The AQIA for the Project quantitatively assessed the potential for cumulative impacts of nitrogen dioxide (NO₂) from the Orica expansion project and the proposed IPL facility and predicted that the NO₂ concentrations would not exceed the relevant regulatory criteria, and hence would be unlikely to result in adverse air quality impacts. **Section 8** of the AQIA (refer to **Appendix E** of the EIS) presents these results.

The AQIA included background monitoring data that was collected during times at which the existing Orica facility was operational. The data reviewed in **Section 5** of the AQIA included 5 years of Stockton monitoring data which were shown to be similar to levels measured elsewhere in the region, and within the range classified by the Office of Environment and Heritage (OEH) as either "good" to "very good"^[1] at all times during this period. This is despite the data being collected during times at which the Orica facility was operational, having NO_x emissions significantly higher than those estimated from the Project¹⁴.

Whilst IPL acknowledges that the Project would result in pollutant emissions (including NO_x and Particulate Matter), it is noted that in designing the Project, IPL has proposed emission control technology that is consistent with best available technology as identified in international references. The performance of this technology would be ensured by the application of emission standards to be

^[1] The OEH Air Quality Index (AQI) uses the classifications of "very good" and "good" for air quality conditions which range from 0-33% and 33-66% of criteria (respectively) <http://www.environment.nsw.gov.au/AQMS/dataindex.htm>. For NO₂, this equates to 0-82 µg/m³, and 83-164 µg/m³, for "very good" and "good" conditions (respectively). A background NO₂ concentration of 84 µg/m³ was adopted within the AQIA.

¹⁴ Based on the 2010/2011 National Pollution Inventory data reviewed in the AQIA, the scale of emissions from the Project was estimated as constituting a minor increase (of approximately 10%) above the existing Orica emissions at Kooragang Island.

18 Islington Village Community Group

enforced under the Environmental Protection Licence (EPL) for the facility through the routine monitoring of emissions. In this context, IPL has sought to minimise emissions of these pollutants, and minimise air quality impacts.

18.2.2 Cumulative Air Quality

The submission raised concerns about the cumulative air quality in the area.

Response

The AQIA for the project has provided a consideration of the Project in the context of existing industry through the incorporation of background monitoring data which has been collected within the region during times when the existing industries were present and operational (refer to **Section 5** of the AQIA, **Appendix E** of the EIS). Emissions from the Project, when added to these existing levels were found to be within impact assessment criteria which are used to assess the potential for a proposal to result in adverse air quality impacts. In the case of particulate matter emissions, impacts associated with the proposal were predicted to be minor, relative to existing concentrations and impact assessment criteria, with these impacts being localised to small areas near to the facility.

Proposed industry in the area that was either (i) on exhibition, or (ii) had been on exhibition but not yet approved, or (iii) approved but not yet commissioned at the time of the AQIA, was subject to a separate assessment (refer **Section 7.6.1** and **Section 8.3** within the AQIA) that addressed cumulative effects. The cumulative impact assessment found the air quality to be within impact assessment criteria.

Air quality monitoring within the region is being improved through the establishment of the Lower Hunter Air Quality Monitoring Network. This network will assist in the management of air quality at a regional level, and will likely include Orica's new monitoring station at Stockton, which continuously records levels of nitrogen dioxide (NO₂), total oxides of nitrogen (NO_x), particulate matter (PM₁₀ and PM_{2.5}) and ammonia.

In addition, in accordance with the EPA's proposed conditions of consent, the Project emissions would be monitored as part of the EPL for the Site.

18.3 Issue 3 – Noise Pollution

18.3.1 Industrial Noise

The submission claimed that 'industry' cannot be trusted because of the current night-time acoustic exceedances from Kooragang Island.

Response

The Sound Power Level (noise) from industry on Kooragang Island is managed under existing Environment Protection Licences (EPLs) issued by the NSW EPA. The EPA is aware of the current industrial noise exceedances in the area and is working with various companies, e.g. Orica, to reduce the level of noise experienced in Stockton and other surrounding suburbs. Industry can be subject to financial penalty if it fails to comply with the conditions of an EPL. IPL has no control over the noise created by other industries on Kooragang Island.

18 Islington Village Community Group

18.3.2 Accuracy of Baseline Assessment

The submission claimed that the baseline monitoring for the EIS was completed while the Orica plant was not operational.

Response

As noted in the Noise and Vibration Assessment within the EIS (refer to **Appendix F**) and within **Chapter 11 Noise & Vibration** of the EIS, the acoustic baseline surrounding the Site was assessed when the Orica site was partially operational. When the Orica site is fully operational, the acoustic baseline in the area would be higher than that assessed in the EIS. Both IPL and the EPA are aware of this situation and have used other noise monitoring data to fully understand the acoustic baseline in Stockton.

18.4 Issue 4 – Community Consultation

The submission claimed that many of the residents of Stockton, Carrington, Islington, Tighes Hill, Wickham and Mayfield have been left in the dark on this Project.

Response

The community consultation program undertaken as part of the Project prior to exhibition of the EIS included the following:

- a letterbox drop to 3,500 households in Stockton and Fern Bay in October 2011 announcing the Project;
- media releases to all local media including the announcement of the feasibility study on 27 October 2011 and the announcement of the EIS exhibition on 12 September 2012;
- Project website launched in October 2011 with continuous updating;
- a letterbox drop of fact sheets to 10,000 households (Stockton, Fern Bay, Mayfield; Carrington and Warabrook) in December 2011 and a Project Update in July 2012;
- formation of a Project community liaison group with representation from community, environment groups and business which met 4 times in March, April, September and October 2012;
- appointment of an independent technical expert agreed to by the members of the Project community liaison group;
- advertisements in local newspapers (Newcastle Herald, Star, Post and Stockton Local) of community hotline for information, times and dates for community information sessions and EIS exhibition dates;
- community information sessions in November and December 2011 and September 2012 in Stockton and Mayfield;
- community perception telephone survey of 633 households in surrounding suburbs and wider local government area in April 2012 with a summary on the website in September 2012; and
- distribution of a summary of the EIS to 10,000 households in Stockton, Fern Bay, Mayfield; Carrington and Warabrook in September 2012.

IPL's public and stakeholder consultation program was developed in consultation with the Department of Planning and Infrastructure and was deemed to be adequate during a review of the EIS process. A more complete account of the consultation undertaken as part of the Project can be found in **Section 2** of this report and within the EIS in **Chapter 7 Consultation**.

18 Islington Village Community Group

18.5 Issue 5 – Impact on House Prices

The submission claims that the Project would have an impact on the price of houses in Stockton and surrounding suburbs. The submission also claims that the Project would be responsible for a stigma being attached to the area, which would result in a reduction in new families moving to the area.

“Incitec’s EIS does not acknowledge this issue, nor does it address who would be responsible if property values were lowered by their Project.”

Response

There is no evidence that the house prices in Stockton would be affected by the presence of the Project. Prices were not overtly affected by environmental incidents in 2011 and 2012. Additionally, the influx of new families that would be looking for accommodation in the area as a result of the Project could increase demand for housing and thereby potentially cause prices to rise. A more complete response to this issue can be found in **Section 13.7** of this document.

18.6 Issue 6 – Traffic Impacts

The submission claimed that traffic is already a major concern in the area and that the EIS does nothing to mitigate the impact of the Project on the roads in the area during construction or operation.

The submission also claimed that the additional traffic associated with the Project would add to the deterioration of air quality in the area.

Response

As outlined in the EIS, measures have been proposed by IPL to mitigate the impact of the Project on the local road infrastructure. These measures can be found in **Section 15.7** of the EIS. A more complete response to this issue can be found in **Section 14.6** of this document.

18.7 Issue 7 – Economic Impact of the Project

The submission claimed that the Project would only employ 60 people and that many of these would be imports from IPL’s Moranbah facility. The submission also states that the economic factors behind IPL’s decision to delay the Project should be included in the EIS.

Response

The decision to defer the Project for at least two years reflected the anticipated reduction in demand for ammonium nitrate and the high cost of construction in Australia. The deferral of the Project was not included in the EIS as the EIS was already on public exhibition when the decision was taken. IPL announced the deferral of the Project to the Australian Securities Exchange on 26 September 2012, while the EIS commenced public exhibition on 12 September 2012.

A response to the section of the submission that relates to the number of people that the Project would employ, from where they would come and what impact that may have on the economics of the region, can be found in **Section 13.5** of this document.

18 Islington Village Community Group

18.8 Issue 8 – Pollution of the Hunter River

The submission claimed that the Project would have an impact on the Ramsar wetland to the north of the Project Site. The submission states, *“Excessive industrial development with licenses to pollute the river close to a RAMSAR area is not common sense planning; nor does it position the Hunter River in a positive light to tourists.”*

Response

As described in the EIS within **Chapter 13 Surface Water and Wastewater** and in Appendix H, as well as **Chapter 18 Ecology**, the Project would not have an impact on the Ramsar Wetland situated to the north of the Site.

Dispersion modelling was undertaken to ensure that the selected location, depth and method for the wastewater outfall on the south arm of the Hunter River would not result in an impact on the internationally important wetlands. The conclusions contained within the EIS have been supplemented with additional sampling and modelling work, (refer to **Appendix B** of this report) which concluded that the waste water streams from the Project would not significantly impact the Hunter River. As such the conclusions of the ecological assessment remain the same; the Project is unlikely to result in a significant impact to the Hunter Estuary Wetlands.

Form Letters

Introduction

Two of the local community action groups, SCAG and CPCFM, circulated a pre-authored letter to their membership and other members of the public outlining the issues that the action group had identified. Some of these “form letters” have been signed and returned in their original form while some have been customised to reflect the individual signatory.

Two different form letters were circulated by local action groups and were submitted by a number of people around Stockton and the surrounding suburbs. This section lists the signatories of the unmodified form letters and responds to the issues that were raised within each letter.

Form Letter One

Form letter 1 was received from the following people. The names reflect the names given to the letters by the DP&I.

- Ammann, D&M
- Abbot, D
- Abbot, P
- A’Beckett, M
- B*
- Bailey, J
- Bailey, L
- Bailey, T
- Barker, R
- Bellinger, K
- Bellingham, S
- Bennett, C
- Bennett, D
- Bennett, J
- Blefari, S
- Boyd, J
- Bulmer, K and Gresham, L
- Bulmer, K
- Burelow, N
- Burns, N
- Butterworth, A, R, and G
- Callaghan, P
- Cameron, G
- Carrall, B
- Cavanagh, G and K
- Constable, I
- Constable, J
- Cook, J
- Cook, J 2
- County, G and P
- Craig, B
- Craig, P
- Crawford, P
- Crawford, S
- Craig, N
- Crennan, L
- Croft, J
- Croft, N
- Croft, V
- Croft, Y
- D*
- Darley, D
- Delaney, A
- Dickson, B
- Dillon-Smith, N
- Dunn, G
- Dunn, S
- East, J
- Egan, S
- Elby, M
- Elder, J
- Ellery, J
- Ellery, S
- Emms, P and J
- Faulkner, C
- Fensom, V
- Fisher, C and D
- Fullford, D
- G, A*
- Gard, S
- Gippel, V
- Gorst, R and D
- Wise, B
- Grainger, P and J
- Grieve, M
- Hailg, R
- Hallam, N
- Hammerton, W and E
- Hampersum, R
- Harper, D and Sneddon, L
- Hayne, R and L
- Hill, M
- Hodges, C 2
- Hoffman, C
- Hoffman, P
- Holmes, W
- Howard, S
- Hyde, R
- Hyde, W
- Illegible 2
- Illegible
- Jack, T
- Jameson, A
- Jarrot, G
- Johnson, W and L
- Jones, A
- Jones, J
- Jones, M
- Jones, P
- Jones, T
- K*
- Kench, M and P
- Ketas, A
- Kuszelyic, S and R

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- Lands
- Larkin, P and S
- Laver, L
- Lawrence, M
- Lawson, J
- Lewis, J 2
- Lim, B
- Lim, J
- Lowe, H
- Lowe, K
- M, B*
- M*
- Macleay, C
- MacLeay, M
- Maskey, R
- McCarron, N
- McCarthy, M
- McHugh, J
- McIlwraith, D 3
- McKessar, L
- McKessar, R
- McKessar, S
- Mclean, L
- Mcmamara,
- Mewett, S
- Mills, GD and S
- Moody, J
- Moran, L
- Nella, E
- Nella, J
- Niblett, B
- Nicholas, C
- Nixon, E and C
- Osborne, G
- Owens, D and M
- Paphaul, M
- Parr, E
- Payne, L
- Petrie, M
- Pickering, L
- Plooy, M and C
- Plumstead, A
- Porter, W
- Potter, G
- Preston, P
- Preston, V
- Price, M
- Punch, M
- R, C*
- R*
- Rees, C
- Rees, H
- Reyngoud, R
- Riddle, M
- Riley, M
- Riley, M 2
- Ritchingman, A and J
- Roach, D
- Robards, M
- Robinson, D and J
- Robinson, W
- Robinson
- Rodham, S, D and T
- Rogie, B
- Roth, K
- Russel, J M
- Russel, S
- Ryan, K
- Salmon, G
- Sansom, G and C
- Schofield, B
- Shaw, S
- Sheehan, J and M
- Shornton, S
- Shotter, L
- Shotter, S
- Smidliy, P
- Stacy, B
- Stringer, A
- Sweeney, D
- Sweeney, E
- Neill, D
- Neill, G
- Punch, M
- Tamindzic, L, A and G
- Taylor, K and L
- Thienie, J
- Thomas, A
- Thomas, E
- Thomas, G
- Thomas, M
- Thomson, B
- Trahair, S
- Vial, P
- Walfs, I
- Walker, E
- Wall, R and J
- Walmsley, J
- Wasson, A
- Watson, F
- Watson, J
- Watson, T
- Wilson, H
- Woolley, A
- Woolley, B
- Woolley, T and McInnes, E
- Woolnough, C
- Young, J
- Confidential (2)
- Confidential (8)
- Confidential (13)

* Where names were illegible on submissions, and where possible, one or two initials of the indistinct name have been noted here to reference the submission.

19 Form Letters

Form letter 1 raised a number of issues. These were:

- Potential for Explosion;
- Air Pollution;
- Noise Pollution;
- Inadequate Consultation;
- Impacting House Prices;
- Traffic Impacts;
- Employment and Economic Impacts in Newcastle and the Lower Hunter; and
- Polluting the Hunter River.

Responses to these issues are provided below

19.1 Issue 1 – Potential for Explosion

A number of aspects relating to the risk of explosion were raised. These issues are discussed below.

19.1.1 Cumulative Impact

The submission stated that the EIS does not adequately address the concerns regarding the potential risks of storing 21,000 tonnes of AN at IPL and Orica. The submission further states that there is enough explosive power on Kooragang Island to match the Hiroshima atomic bomb (18,000 tonnes of TNT).

Response

The cumulative risk of the proposed expansion of the Orica site and the IPL Project was assessed in the Preliminary Hazard Analysis (refer to Section 8.5 in **Appendix D1** of the EIS). The maximum cumulative individual risk for Orica's proposed facility and IPL's proposed facility is significantly below the NSW DP&I risk criteria for residential land uses, which is applicable to a single proposed development.

Facilities associated with AN on IPL site have been intentionally located such that there is maximum separation between the AN on IPL's site and the AN at the Orica site. The TGAN stored on the Orica site is located more than 800 metres from the proposed IPL TGAN storage and sympathetic explosion would not be credible according to the SAFEX Good Practice Guide: Storage of Solid Technical Grade Ammonium Nitrate (2010).

In addition the storage of bagged TGAN has been configured so that stacks are limited to 500 tonnes and the distances between the stacks are far enough to not allow for sympathetic detonation.

Refer to **Section 13.1.3** for a response on TGAN explosion efficiency. The claim that there is enough explosive power to match the Hiroshima atomic bomb is not correct and alarmist.

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19.1.2 Inaccurate Blast Contours

The form letters suggested that the 'blast contours' in the EIS are inaccurate.

Response

The contours presented in the PHA are iso-risk contours and not "blast contours" (i.e. they are not consequence contours). The iso-risk contours were determined in accordance with the methodology allowed in HIPAP No. 6.

Therefore, iso-risk contours presented in the PHA will not correlate with the consequence information from the Toulouse incident.

The consequences of credible hazardous events, that could have off-site impacts, were assessed as part of the risk assessment process in the Preliminary Hazard Analysis (refer to **Appendix D1** of the EIS). The consequences of the events, combined with their likelihood, were used to develop the iso-risk contours.

19.1.3 Interstate Examples

The submission stated that the DP&I should recognise examples in South Australia where residential areas are not permitted in proximity to IPL's Port Adelaide storage facility. The submission claims that, *"Such a massive concentration of ammonium nitrate storage on KI, within 800 m of residents is not acceptable to the communities that surround the proposal."*

Response

The Hazard and Risk Assessment within the EIS complies with the requirements of the NSW HIPAP. As the Project is located in NSW it not required to comply with the requirements of another country, state or territory.

As described within the EIS in **Chapter 6 Legislation and Planning Policy**, the land use zoning for the Site means that the Project is permissible in this location.

Refer to **Section 13.1.12** of this document for a detailed response regarding the issue at Port Adelaide.

19.2 Issue 2 – Air Quality

19.2.1 Increase in Nitrogen Oxides

The submission stated that the Project, alongside the Orica facility, would create especially high levels of NO_x.

Response

The AQIA for the Project quantitatively assessed the potential for cumulative impacts of nitrogen dioxide (NO₂) from the Orica expansion project and the IPL facilities and predicted that the NO₂ concentrations would not exceed the relevant regulatory criteria, and hence would be unlikely to result in adverse air quality impacts. **Section 8** of the AQIA (refer to **Appendix E** of the EIS) presents these results.

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The AQIA included background monitoring data that was collected during times at which the existing Orica facility was operational. The data reviewed in **Section 5** of the AQIA included 5 years of Stockton monitoring data which were shown to be similar to levels measured elsewhere in the region, and within the range classified by the Office of Environment and Heritage (OEH) as either “good” to “very good”^[1] at all times during this period. This is despite the data being collected during times at which the Orica facility was operational, having NO_x emissions significantly higher than those estimated from the Project¹⁵.

Whilst IPL acknowledges that the Project would result in pollutant emissions (including NO_x and Particulate Matter), it is noted that in designing the Project, IPL has proposed emission control technology that is consistent with best available technology as identified in international references. The performance of this technology would be ensured by the application of emission standards to be enforced under the Environmental Protection Licence (EPL) for the facility through the routine monitoring of emissions. In this context, IPL has sought to minimise emissions of these pollutants, and minimise air quality impacts.

19.2.2 Cumulative Air Quality

The submission raised concerns about the cumulative air quality in the area.

Response

The AQIA for the project has provided a consideration of the Project in the context of existing industry through the incorporation of background monitoring data which has been collected within the region during times when the existing industries were present and operational (refer to **Section 5** of the AQIA, **Appendix E** of the EIS). Emissions from the Project, when added to these existing levels were found to be within impact assessment criteria which are used to assess the potential for proposal to result in adverse air quality impacts. In the case of particulate matter emissions, impacts associated with the proposal were predicted to be minor, relative to existing concentrations and impact assessment criteria, with these impacts being localised to small areas near to the facility.

Proposed industry in the area that was either (i) on exhibition, or (ii) had been on exhibition but not yet approved, or (iii) approved but not yet commissioned at the time of the AQIA, was subject to a separate assessment (refer **Section 7.6.1** and **Section 8.3** within the AQIA) that addressed cumulative effects. The cumulative impact assessment found the air quality to be within impact assessment criteria.

Air quality monitoring within the region is being improved through the establishment of the Lower Hunter Air Quality Monitoring Network. This network will assist in the management of air quality at a regional level, and will likely include Orica's new monitoring station at Stockton, which continuously records levels of nitrogen dioxide (NO₂), total oxides of nitrogen (NO_x), particulate matter (PM₁₀ and PM_{2.5}) and ammonia.

^[1] The OEH Air Quality Index (AQI) uses the classifications of “very good” and “good” for air quality conditions which range from 0-33% and 33-66% of criteria (respectively) <http://www.environment.nsw.gov.au/AQMS/dataindex.htm>. For NO₂, this equates to 0-82 µg/m³, and 83-164 µg/m³, for “very good” and “good” conditions (respectively). A background NO₂ concentration of 84 µg/m³ was adopted within the AQIA.

¹⁵ Based on the 2010/2011 National Pollution Inventory data reviewed in the AQIA, the scale of emissions from the Project was estimated as constituting a minor increase (of approximately 10%) above the existing Orica emissions at Kooragang Island.

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In addition, in accordance with the EPA's proposed conditions of consent, the Project emissions would be monitored as part of the EPL for the Site.

19.3 Issue 3 – Noise and Vibration

19.3.1 Industrial Noise

The submission claimed that 'industry' cannot be trusted because of the current night-time acoustic exceedances from Kooragang Island.

Response

The Sound Power Level (noise) from industry on Kooragang Island is managed under existing Environment Protection Licences (EPLs) issued by the NSW EPA. The EPA is aware of the current industrial noise exceedances in the area and is working with various companies, e.g. Orica, to reduce the level of noise experienced in Stockton and other surrounding suburbs. Industry can be subject to financial penalty if it fails to comply with the conditions of an EPL. IPL has no control over the noise created by other industries on Kooragang Island.

19.3.2 Accuracy of Baseline Assessment

The submission claimed that the baseline monitoring for the EIS was completed while the Orica plant was not operational.

Response

As noted in the Noise and Vibration Assessment within the EIS (refer to **Appendix F**) and within **Chapter 11 Noise & Vibration** of the EIS, the acoustic baseline surrounding the Site was assessed when the Orica site was partially operational. When the Orica site is fully operational, the acoustic baseline in the area would be higher than that assessed in the EIS. Both IPL and the EPA are aware of this situation and have used other noise monitoring data to fully understand the acoustic baseline in Stockton.

19.4 Issue 4 – Community Consultation

The submission stated that, *"Incitec's own 'community perception' survey conducted in April 2012, identified less than a third of residents were unaware (sic) of the Project"*. The submission also states that suburbs such as Cooks Hill, Newcastle CBD and Foreshore and Newcastle West have been excluded from the consultation process.

The submission stated that, *"Many residents from Stockton, Carrington, Tighes Hill and Mayfield have been left in the dark on this project. Letter drops and one information session two months after the Orica disaster is not proper consultation for a project of such magnitude and widespread impacts."*. This submission is consistent with that received from SCAG and outlined in **Section 13.6** of this document

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Response

The community consultation undertaken as part of the Project prior to exhibition of the EIS included the following:

- a letterbox drop to 3,500 households in Stockton and Fern Bay in October 2011 announcing the Project;
- media releases to all local media including the announcement of the feasibility study on 27 October 2011 and the announcement of the EIS exhibition on 12 September 2012;
- Project website launched in October 2011 with continuous updating;
- a letterbox drop of fact sheets to 10,000 households (Stockton, Fern Bay, Mayfield; Carrington and Warabrook) in December 2011 and a Project Update in July 2012;
- formation of a Project community liaison group with representation from community, environment groups and business which met 4 times in March, April, September and October 2012;
- appointment of an independent technical expert agreed to by the members of the Project community liaison group;
- advertisements in local newspapers (Newcastle Herald, Star, Post and Stockton Local) of community hotline for information, times and dates for community information sessions and EIS exhibition dates;
- community information sessions in November and December 2011 and September 2012 in Stockton and Mayfield;
- community perception telephone survey of 633 households in surrounding suburbs and wider local government area in April 2012 with a summary on the website in September 2012; and
- distribution of a summary of the EIS to 10,000 households in Stockton, Fern Bay, Mayfield; Carrington and Warabrook in September 2012.

IPL's public and stakeholder consultation program was developed in consultation with the Department of Planning and Infrastructure and was deemed to be adequate during a review of the EIS process. A more complete account of the consultation undertaken as part of the Project can be found in **Section 2** of this document and within the EIS in **Chapter 7 Consultation**.

19.5 Issue 5 – Impact on House Prices

The submission claimed that the Project would have an impact on the price of houses in Stockton and surrounding suburbs. The submission also claims that the Project would be responsible for a stigma being attached to the area, which would result in a reduction in new families moving to the area.

"Incitec's EIS does not acknowledge this issue, nor does it address who would be responsible if property values were lowered by their Project."

Response

There is no empirical evidence that the house prices in Stockton would be affected by the presence of the Project. Prices were not overtly affected by environmental incidents in 2011 and 2012. Additionally, the influx of new families that would be looking for accommodation in the area due to the Project could increase demand for housing and thereby potentially cause prices to rise.

Property prices in any area are governed by a number of factors. While public perception of the area is undoubtedly one of these factors it is only one of the many complicated interactions that drive the market-set prices of housing stock.

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There has been industry on Kooragang Island for over 50 years; the industry in the area and the traditionally industrial workers of the area have increased together over this time. Stockton is a desirable suburb with a diverse range of housing stock and an active community. House prices in the suburb are varied and reflect the diversity of housing stock.

Section 13.5 of this document outlines how the Project could lead to an increase in families moving to the area following the increase in demand for skilled labour.

19.6 Issue 6 – Traffic Impacts

The submission claimed that traffic is already a major concern in the area and that the EIS does nothing to mitigate the impact of the Project on the roads in the area during construction or operation.

The submission also claims that the additional traffic associated with the Project would add to the deterioration of air quality in the area.

Response

The EIS acknowledges that many of the roads surrounding the Project Site suffer from existing congestion. Responsibility for the maintenance and upgrade of road infrastructure in NSW lies with the NSW Roads and Maritime Service (RMS) and the local council. In addition to this, in this location Heron Road and Greenleaf Road (immediately east and west of the Project Site) are managed by Newcastle Port Corporation.

Cormorant Road is managed by the NSW RMS. As such they are responsible for maintaining an acceptable Level Of Service (LOS). RMS completed work to improve safety along Cormorant Road on 2 July 2011. The work involved carrying out maintenance upgrades along a 1.4 kilometre length of road between the wind generator and Egret Street.

The full length of the road was resurfaced and wider shoulders constructed on both sides of the road, the existing Newcastle bound merge lane was extended 200 metres and maintenance carried out to the drains.

The upgrade involved widening the road to extend the Newcastle bound merge lane further away from the existing railway level crossing to improve the merge.

RMS is also planning for the duplication of Cormorant Road and Tourle Street in the longer term, however this improvement has not been included in the LOS.

As outlined in the EIS, measures have been proposed by IPL to mitigate the impact of the Project on the local road infrastructure. These measures can be found in Section 15.7 of the EIS. During the construction phase of the Project, construction staff would travel to and from the Site using a park and ride scheme, run by IPL specifically for the Project. Additionally, Project components would be delivered to the Site through Newcastle Port to avoid the need to transport them by road. More information on the traffic impacts of the Project can be found in the EIS in **Chapter 15 Traffic and Transport** and **Appendix J Transport Impact Assessment** and in **Section 13.4** of this document.

A response to the issues raised in this submission regarding air quality impacts as a result of increase traffic can be found in **Section 20.5.7**.

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19.7 Issue 7 – Employment and Economic Impacts

The submission claimed that the Project will only employ 60 people and that many of these would be imports from IPL's Moranbah facility. The submission also stated that the economic factors behind IPL's decision to delay the Project should be included in the EIS.

Response

The decision to defer the Project for at least two years reflected the anticipated reduction in demand for ammonium nitrate and the high cost of construction in Australia. The deferral of the Project was not included in the EIS as the EIS was already on public exhibition when the decision to defer was taken. IPL announced the deferral of the Project to the Australian Securities Exchange on 26 September 2012, while the EIS commenced public exhibition on 12 September 2012.

In line with IPL's disciplined approach to management of its business, development of the plant would proceed only on meeting IPL's strict financial hurdles and achieving firm customer commitments.

A response to the section of the submission that relates to the number of people that the Project would employ, from where they would come and what impact that may have on the economics of the region, can be found in **Section 13.5** of this document and **Chapter 21 Socio-Economics** of the EIS.

19.8 Issue 8 – Pollution of the Hunter River

The submission claimed that the Project would have an impact on the Ramsar wetland to the north of the Project Site. The submission stated, *"Excessive industrial development with licenses to pollute the river close to a RAMSAR area is not common sense planning; nor does it position the Hunter River in a positive light to tourists."*

Response

As described in the EIS within **Chapter 13 Surface Water and Wastewater** and in Appendix H, as well as **Chapter 18 Ecology**, the Project would not have an impact on the Ramsar Wetland situated to the north of the Site.

Dispersion modelling was undertaken to ensure that the selected location, depth and method for the wastewater outfall on the south arm of the Hunter River would not result in an impact on the internationally important wetlands. The conclusions contained within the EIS have been supplemented with additional sampling and modelling work, (refer to **Appendix B** of this report) which concluded that the waste water streams from the Project would not significantly impact the Hunter River. As such the conclusions of the ecological assessment remain the same; the Project is unlikely to result in a significant impact to the Hunter Estuary Wetlands.

Form Letter Two

Form Letter Two was received from the following people. The names reflect the names given to the letters by the DP&I.

• Bathgate, S	• Hodges, C	• Kuszelyic, R
• Grainleon, K	• Holiday, G	• Kuszelyic, S
• Greig, A	• Holmes, D	• Marlborough, E
• Greig, P	• Hyde, W	• Maurice, L and F
• Hatcher, M	• Johnson, C	• McIlwraith, J

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- Meaulel, J
- Mitchell, K
- Peak, B
- Peak, K
- Simpson, G
- Thomas, J
- Anderson, G
- Ward, E

Issues raised in this letter were as follows:

- Explosion Risk;
- Air Pollution;
- Noise Pollution;
- Traffic Impacts; and
- Employment in Newcastle and Lower Hunter.

Responses to these issues are provided below.

19.9 Issue 1 – Potential for Explosion

A number of aspects relating to the risk of explosion were raised within the letter. These issues are discussed below

19.9.1 Assessment of Worst Case Scenarios Response

The submission claimed that there will be enough explosive power on Kooragang Island to match half the power of the Hiroshima bomb, should the project be approved.

Response

The potential for damage from all relevant AN explosion scenarios have been assessed for its impact to residential areas according to the requirements of HIPAP No. 6.

The cumulative risk is estimated and assessed against the requirements of HIPAP No. 4, as published by the NSW DP&I. On the basis of the results of the QRA, the risk from the proposed development is significantly below the NSW DP&I land use safety planning risk criteria for new industrial developments, which is applicable to a single proposed development.

Facilities associated with AN on IPL site have been intentionally located such that there is maximum separation between the AN on IPL's site and the AN at the Orica site. The TGAN stored on the Orica site is located more than 800 metres from the proposed IPL's TGAN storage and sympathetic explosion would not be credible according to the SAFEX Good Practice Guide: Storage of Solid Technical Grade Ammonium Nitrate (2010).

In addition the storage of bagged TGAN has been configured so that stacks are limited to 500 tonnes and the distances between the stacks are far enough to not allow for sympathetic detonation.

Refer to **Section 13.1.3** for a response on TGAN explosion efficiency. The claim that there is enough explosive power to match half the power of the Hiroshima atomic bomb is clearly wrong and alarmist.

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19.9.2 Comparison with the Toulouse Incident

This form letter submission claimed that if 300 t of AN were to explode, then all structures and people within a 3 to 5 km radius would be affected, as was the case in Toulouse, France.

Response

The Toulouse incident is discussed in Section 5.2 of the Preliminary Hazard Analysis. This incident led to a number of significant changes to international and Australian regulations and new codes of practice for the storage of AN to prevent a recurrence. For example, the SAFEX Good Practice Guide: Storage of Solid Technical Grade Ammonium Nitrate (2010), EFMA Guidance for the Storage of Hot Ammonium Nitrate Solutions (2005) and Australian Standard AS4326 The Storage and Handling of Oxidising Agents (2008). IPL has embraced and would meet all the current relevant Australian regulations, standards and codes of practice and International SAFEX Code of Practice for the safe storage of TGAN and ANSOL.

On the basis of the results of the PHA, the proposed development complies with the relevant land use safety planning risk criteria for new industrial developments, as published in HIPAP No. 4 and 6 by the NSW DP&I.

19.9.3 Interstate Examples

The Submission cited examples in South Australia where residential areas are not permitted in proximity to IPL's Port Adelaide storage facility. The submission claims that, *"Such a massive concentration of ammonium nitrate storage on KI, within 800 m of residents is not acceptable to the communities that surround the proposal."*

Response

Refer to **Section 13.1.12** of this document for a detailed response regarding the issue at Port Adelaide.

On the basis of the results of the PHA, the proposed development in NSW complies with the relevant land use safety planning risk criteria for new industrial developments, as published in HIPAP No. 4 and 6 by the NSW DP&I.

As described within the EIS in **Chapter 6 Legislation and Planning Policy**, the land use zoning for the Site means that the Project is permissible in this location.

19.10 Issue 2 – Air Quality

19.10.1 Increase in Nitrogen Oxides

The submission stated that the Project, alongside the Orica facility, would create especially high levels of NO_x.

Response

The AQIA for the Project quantitatively assessed the potential for cumulative impacts of nitrogen dioxide (NO₂) from the Orica expansion project and the IPL facilities and predicted that the NO₂ concentrations would not exceed the relevant regulatory criteria, and hence would be unlikely to result

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in adverse air quality impacts. **Section 8** of the AQIA (refer to **Appendix E** of the EIS) presents these results.

The AQIA included background monitoring data that was collected during times at which the existing Orica facility was operational. The data reviewed in **Section 5** of the AQIA included 5 years of Stockton monitoring data which were shown to be similar to levels measured elsewhere in the region, and within the range classified by the Office of Environment and Heritage (OEH) as either “good” to “very good”^[1] at all times during this period. This is despite the data being collected during times at which the Orica facility was operational, having NO_x emissions significantly higher than those estimated from the Project¹⁶.

Whilst IPL acknowledges that the Project would result in pollutant emissions (including NO_x and Particulate Matter), it is noted that in designing the Project, IPL has proposed emission control technology that is consistent with best available technology as identified in international references. The performance of this technology would be ensured by the application of emission standards to be enforced under the Environmental Protection Licence (EPL) for the facility through the routine monitoring of emissions. In this context, IPL has sought to minimise emissions of these pollutants, and minimise air quality impacts.

19.10.2 Cumulative Air Quality

The submission raised concerns about the cumulative air quality in the area.

Response

The AQIA for the project has provided a consideration of the Project in the context of existing industry through the incorporation of background monitoring data which has been collected within the region during times when the existing industries were present and operational (refer to **Section 5** of the AQIA, **Appendix E** of the EIS). Emissions from the Project, when added to these existing levels were found to be within impact assessment criteria which are used to assess the potential for proposal to result in adverse air quality impacts. In the case of particulate matter emissions, impacts associated with the proposal were predicted to be minor, relative to existing concentrations and impact assessment criteria, with these impacts being localised to small areas near to the facility.

Proposed industry in the area that was either (i) on exhibition, or (ii) had been on exhibition but not yet approved, or (iii) approved but not yet commissioned at the time of the AQIA, was subject to a separate assessment (refer **Section 7.6.1** and **Section 8.3** within the AQIA) that addressed cumulative effects. The cumulative impact assessment found the air quality to be within impact assessment criteria.

^[1] The OEH Air Quality Index (AQI) uses the classifications of “very good” and “good” for air quality conditions which range from 0-33% and 33-66% of criteria (respectively) <http://www.environment.nsw.gov.au/AQMS/dataindex.htm>. For NO₂, this equates to 0-82 µg/m³, and 83-164 µg/m³, for “very good” and “good” conditions (respectively). A background NO₂ concentration of 84 µg/m³ was adopted within the AQIA.

¹⁶ Based on the 2010/2011 National Pollution Inventory data reviewed in the AQIA, the scale of emissions from the Project was estimated as constituting a minor increase (of approximately 10%) above the existing Orica emissions at Kooragang Island.

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Air quality monitoring within the region is being improved through the establishment of the Lower Hunter Air Quality Monitoring Network. This network will assist in the management of air quality at a regional level, and will likely include Orica's new monitoring station at Stockton, which continuously records levels of nitrogen dioxide (NO₂), total oxides of nitrogen (NO_x), particulate matter (PM₁₀ and PM_{2.5}) and ammonia.

In addition, in accordance with the EPA's proposed conditions of consent, the Project emissions would be monitored as part of the EPL for the Site.

19.11 Issue 3 – Noise and Vibration

The submission claimed that *'We are already experiencing excessive noise from Kooragang Island in Stockton. The current night time levels of noise are above the 45 dB standard for suburbs, being 49 to 51dB. The Incitec plant will further increase noise levels and this is totally unacceptable to the community.'*

Response

As required by the EPA, the proposed Project Specific Noise Limits (PSNL) for the Project would be set at a maximum of 40 dB (A) during the night time. While operating within its proposed noise limits, the noise from the Project would be imperceptible in Stockton or any other surrounding suburb.

19.12 Issue 4 – Traffic Impacts

The submission stated: *"Traffic is already a major concern on Cormorant Road, Kooragang Island...The increased amount of traffic associated with truck movements and general traffic with the plant will further add to the traffic problems being experienced."*

The submission went on to make a statement relating to Transport Risk and Air Quality.

Response

A Traffic Impact Assessment was conducted as part of the EIS. This assessment confirmed that many of the roads in the area, notably Tourle Street / Cormorant Road are already operating at capacity. Although the Project would add additional vehicles to these roads during construction and operation, measures would be in place to mitigate the impact of the Project. Additionally, improvement works have been completed or are planned by RMS to ease congestion in the area.

A more complete response to this submission can be found in **Section 13.4** of this document.

19.13 Issue 5 – Employment Impacts

The submission stated that the Project: *"will not be a big employer in the Hunter, rather there will only be 60 people employed at the plant."*

The submission went on to state that the risk that the plant brings to the area is not justified by this increase in employment.

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Response

A response to the section of the submission that relates to the number of people that the Project would employ, from where they would come and what impact that may have on the economics of the region, can be found in **Section 13.5** of this document.

Public Submissions

Introduction

The Project received 110 unique submissions from members of the public. These submissions consisted of modified versions of form letters (18 letters) and original compositions (92 letters).

This section identifies the issues raised within the unique submissions. As many of these submissions raised the same issues, they have been responded to here thematically. The themes are ordered to reflect the structure of the EIS. Examples of the submissions that raised the issues are also provided to provide a sense of how these were expressed.

A list and summary of the public submissions can be found in **Appendix A**, the original submissions can be located on the DP&I website.

20.1 Project Description, Location, Need and Alternatives

The following issues were raised by members of the public under this category.

20.1.1 Export of Technical Grade (TG) AN

The submission from **Leka, N** pointed out that there is no indication of how much TGAN is intended for the export market. The submission stated: *“The EIS states that IPL intends to export some of its Technical Grade AN (TGAN) to international markets, and Kooragang Island is ideally placed to allow it “sales flexibility”. Since IPL explains that it is difficult to source large amounts from overseas suppliers, then it follows the export market must be a lucrative possibility. Yet there is no mention of just how much IPL intends to export.”*

Response

As stated in **Chapter 2 Project Needs and Alternatives** of the EIS, the Project has four main objectives, these are:

1. ensure thermal coal production in the Hunter Region is supported to maintain the economic benefits to the local region and the State;
2. develop a sustainable and secure solution to meet the medium and long term market demand for AN in the Hunter region;
3. maintain a primary focus on safety by only considering a Project that would be considered by the relevant experts and regulators to present an acceptable level of safety for employees, the local communities and the environment; and
4. introduce competition into the AN market in the Hunter region.

The primary purpose of the Project would be to meet these objectives. Once these objectives are satisfied, additional TGAN could be made available to the export market.

Section 3.4.3 of the Transportation Risk Assessment states with the growth in the Hunter Valley demand for TGAN, exports of TGAN from the Project is expected to decrease over the first five years of operation, from the 50,000 tonnes per annum down to nil exports after five years.

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20.1.2 Project Site Map

The submission from **Cousins, P** stated that the map within the EIS is inappropriate as it does not show the limitations of egress that would be placed upon the residents of Stockton should there be a need to evacuate the peninsula. The submission stated: *“That map is absolutely misleading, possibly to the extent of being deceptive. What it fails to show are all relevant considerations in the case of explosion or pollution release. In particular, it fails to show that Stockton is a peninsula with its narrow neck and only land access being opposite the site ... A map showing a larger area is required for the full considerations required to be evident.”*

Response

There are a number of maps of the Project location and surrounding area within the EIS however the submission does not specify the map that is being referred to. Most relevant to submission would be the map within the **Executive Summary** and **Chapter 1 Introduction** of the EIS (Figure ES-1 / Figure 1-1). This map shows the context of the Project Site in relation to the Stockton peninsula and the Hunter River.

A map showing a larger area is available within the main Report of EIS in **Chapter 15 Traffic and Transport** (Figure 15-1). This map shows the road network in the area and the fact that Stockton is located on a peninsula. Figure 2-3 in **Appendix J Transport Impact Assessment** of the EIS shows the relevant public transport routes for Kooragang Island and Stockton.

20.1.3 Alternative Locations (General)

A number of submissions suggested that alternative locations for the Project had not been adequately ruled out within the EIS. These submissions were received from the following people: **Craig, K; Confidential (11); Confidential (14); Gorst R and D; Kelly, B; Leka, N; Moran, S; and Pollington, S.**

Response

Chapter 2 Project Need and Alternatives of the EIS outlines the need for the Project and also describes the three location options that were considered for the Project. The three locations that were discussed within the EIS were:

- Kooragang Island;
- Hunter Valley; and
- Tomago.

A decision on which of these locations would be most appropriate for the Project was taken based on a number of criteria. These criteria are as follows:

1. safety of the plant in its proposed location;
2. access to ammonia;
3. accessibility of the plant for effective logistics from the source of the ammonia to the plant;
4. accessibility for effective logistics from the AN plant to the customers;
5. access to skilled labour;
6. the plant's capital and operating cost;
7. the availability of suitable industrial land;
8. the availability of site services (e.g. water and power); and
9. sales flexibility (domestic sales and/or product export).

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Table 2-1, within the EIS, outlines the assessment of the three locations against these nine criteria. **Table 2-1** is presented again below as **Table 20-1**.

Following an analysis of three sites against the nine stated criteria, the Kooragang Island Site was considered to be the most appropriate for the Project for the following reasons:

- As confirmed by the Preliminary Hazard Analysis, the distance from the Site to the nearest residential community is such that it is not an unacceptable risk to the local community.
- The Site is located in an existing industrial area, is owned by IPL, has suitable land available and contains existing usable infrastructure.
- The Site would be an integrated production facility with the majority of products transported off-site, being the finished products TGAN and ANSOL.
- The Site is connected to existing utility services such as water, natural gas and power supply with adequate supplies of each being available for the Project.
- The Site, being located in Newcastle, has good access to skilled labour.
- The Site is close to the Port of Newcastle and the proposed NPC bulk liquids berth. Its location also allows for import of large plant components during construction as well as export of excess AN to international markets while minimising traffic movements.
- Building the Project in this location has lower capital and operating costs than an inland site. In addition it also does not involve building a standalone ammonia storage facility at the port and transporting large quantities of ammonia via truck or pipeline from the port to either Tomago or the Hunter Region. Ammonia is a dangerous good, requires purpose built trucks for transport and the transport of ammonia presents a greater risk to public safety than the transport of TGAN or ANSOL.
- A single integrated production facility on Kooragang Island means that safety and environmental issues can be managed more effectively.

Table 20-1 Consideration of Project Location Options

Criteria	Kooragang Island	Hunter Valley	Tomago
1. Safety of the plant in its location	Prior to completing a detailed Hazards and Risk analysis, IPL believed that it was possible to safely construct and operate the Project on Kooragang Island. This would be confirmed through completion of more detailed studies.	Prior to completing a detailed Hazards and Risk analysis, IPL believed that it was possible to safely construct and operate the Project in the Hunter Valley. This would be confirmed through completion of more detailed studies.	Prior to completing a detailed Hazards and Risk analysis, IPL believed that it was possible to safely construct and operate the Project in Tomago. This would be confirmed through completion of more detailed studies.
2. Access to ammonia	Ammonia import via pipeline onto the Kooragang Island site.	Ammonia import via pipeline onto the Kooragang Island site.	Ammonia import via pipeline onto the Kooragang Island site. Ammonia cannot be imported directly onto a Tomago site due to insufficient draft in the north arm of the Hunter River.

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Criteria	Kooragang Island	Hunter Valley	Tomago
3. Accessibility for effective logistics from the source of the ammonia to the plant	This is the most efficient and lowest risk option with ammonia being transferred via a short pipeline.	Ammonia has to be transported via truck from Kooragang Island site to Hunter Valley plant. A large number of Ammonia truck movements would introduce a greater level of transportation risk to the Hunter Region.	Ammonia has to be transported via truck or pipeline from port to plant. The pipeline would have to go through or around the Hunter Wetlands National Park. A large number of Ammonia truck movements would introduce a level of transportation risk to the roads around Newcastle and Tomago.
4. Accessibility for effective logistics from the TGAN plant to the customer	TGAN to be transported via truck utilising the upgraded Hunter Expressway.	TGAN to be transported locally via truck.	TGAN to be transported via truck utilising the upgraded Hunter Expressway.
5. Access to skilled labour	The City of Newcastle provides good access to skilled labour.	Skilled labour from outside the Hunter Valley will be required.	The City of Newcastle provides good access to skilled labour.
6. Capital and operating cost	This option is an integrated site and provides the lowest capital and operating cost.	Construction and operations on two sites leads to higher capital and operating cost.	Construction and operations on two sites leads to higher capital and operating cost.
7. Land availability	IPL owns a suitably zoned industrial site on Kooragang Island with existing operations which complement the Project.	Availability of suitably zoned land is uncertain.	Land is likely to be unsuitable as it located on Tomago Sandbeds which provide about 20% of lower Hunter's drinking water.
8. Site services availability (water and power)	Water and power are available at this location.	Water availability is uncertain. Power is available at this location.	Water and power are available at this location.
9. Sales flexibility (domestic and/or export)	The proximity of the site to the road network and port provide flexibility for domestic sales or international export of TGAN.	The site has access to the road network but TGAN would need to be trucked to port for international export.	The proximity of the site to the road network and port provide flexibility for domestic sales or international export of TGAN.

20.1.4 Tomago

The submission from **Leka, N** stated that the EIS does not adequately rule out piping ammonia to Tomago.

Response

Piping ammonia to Tomago would involve laying a new pipeline either through or directly adjacent to the Hunter Estuary wetlands. This would not be acceptable as the construction impact would be likely to cause a significant direct impact to this sensitive natural resource.

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Equally ammonia for the new facility would need to be imported into the Port of Newcastle and if not piped, then trucked from a storage facility at the port to the proposed facility at Tomago. Trucking ammonia is more hazardous than trucking TGAN or ANSOL.

20.1.5 Hunter Valley

The submission from **Confidential (11)** stated that the Project should be located in the Hunter Valley. The submission from **Kelly, B** suggests that the EIS did not present a sensible argument as to why AN must be produced in the area.

Response

AN has been produced and distributed from Kooragang Island since 1969. **Chapter 2 Project Need and Alternatives** of the EIS outlines the need AN production in the region and the additional need for production capacity in NSW that necessitates the Project.

The reasons why locating the Project in the Hunter Valley was not considered further are listed in **Table 20-1**. Most notably, in order to supply the Project with ammonia, imports of ammonia would still arrive on Kooragang Island before being transported by road to the Project Site. Ammonia is more environmentally hazardous than TGAN and the number of road journeys that would have to be made would present a greater risk to communities along the road as well as the environment. It is safer to process the ammonia at the import location, rather than transport it by truck.

20.1.6 Financial Motivation

The submission from **Pollington, S** stated that the decision to locate the Project on Kooragang Island was based mainly on finance.

Response

As outlined above, although the financial viability of the Project was a consideration in the location decision, logistical and environmental viability were also key considerations. However, overriding the financial, logistical and environmental considerations throughout the Project planning process was the viability of a safe operation.

20.1.7 Proximity to Residential Areas

A number of submissions claimed that the proximity of the Project Site to urban or residential areas is inappropriate. Submissions from **Confidential (4); Confidential (5); Confidential (6); Confidential (7); Ross, P; Steadman, C and D; Stroud, D; and Taylor, K&L** stated that the Project should be located in an area removed from residents. **Confidential (4); Confidential (5); Confidential (6); Confidential (7)** all stated the following: *“The mere thought of two ammonium nitrate plants, operating side-by-side just 800 metres from residents is a perfect example of the lack of due consideration given to a proposal that would allow a concentration of high risk industrial activity that I understand is to be found nowhere else in the world.”*

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Response

NSW has guidelines for assessing potentially hazardous development; these guidelines help to determine the suitability of certain development for a given location. Further information on the hazard and risk assessment that has been conducted for the Project can be found in **Section 13** of this document and **Appendix D Hazards and Risk** of the EIS.

Appropriate land use in NSW is determined by land-use zoning. One of the aims of land-use zoning is to separate conflicting land uses and allow economic and social development that is sustainable and works in harmony with the natural environment. In NSW, land-use zoning is determined by Environmental Planning Instruments; the zoning in the Newcastle CBD and Stockton is set by the *Newcastle Local Environment Plan 2012* (Newcastle LEP). Land use zoning on Kooragang Island is set by the *State Environmental Planning Policy for Major Development* (2005).

The interactions between these two Environmental Planning Instruments (EPIs) are managed by Newcastle City Council via the *Newcastle Urban Strategy* (NCC, 2009) and by NSW DP&I through the *Lower Hunter Regional Strategy* (DoP, 2006).

The Project complies with the objectives of these plans and is permissible in its current location under the existing land use zoning. Compliance with the Newcastle Urban Strategy is confirmed in the submission from NCC (refer to **Section 7.3**). Although the Project would be located at least 800 m from residential areas, it is compliant with the stated objectives of the land-use zones in this area. As evidenced by the conclusions of the assessments within **Appendix D Hazards and Risks** of the EIS, the Project also complies with the stipulations of HIPAP No. 4 – Risk Criteria for Land Use Safety Planning.

20.1.8 Need for Project

The submissions that were received from: **Burgess, C; Craig, K; Hanna, M; and Ostinga, M** questioned the need for the Project based on the falling international demand for coal.

Response

Even though international coal demand growth is slowing, the world is expected to consume 1.2 billion more tonnes of coal per year by 2017 compared to today.¹⁷ Global coal demand grew 4.3% in 2011, or 304 million tonnes.

The growth of Australian exports of thermal coal is constrained in the short-term due to a number of factors, including:

- High production costs;
- Strong value of Australian dollar; and
- Low coal prices due to oversupply from USA caused by cheap gas prices.

Coal prices and Australian export growth are expected to recover as gas prices increase in the USA.

Whilst the current short term uncertainty in the expansion of the Hunter Valley mines has resulted in deferral of the Project for at least two years, long term demand trends support the future expansion and development of the Hunter Valley. It is important that IPL is ready to act to ensure the availability of a safe and secure supply of TGAN to the Hunter Valley market in the future.

¹⁷ <http://www.iea.org/newsroomandevents/news/2012/december/name,34467,en.html>

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IPL will proceed with the Project only if the Project achieves firm customer commitments and meets IPL's strict financial tests.

20.1.9 Delay in Project

Several submissions questioned why the decision to delay the Project was not included in the EIS. This question was posed by the following: **Birrell, W; Charles, C; Confidential (4); Confidential (5); Confidential (6); Confidential (7); Confidential (8); Craig, A; Craig, L; Davies, B; Deacon, V; Hollingshed, D2; Jauden, M; McCauley, T; Thornton, R; and Vought, G.**

Response

The decision to defer the Project for at least two years reflected the anticipated reduction in the growth of demand for ammonium nitrate and the high cost of construction in Australia. The deferral of the Project was not included in the EIS as the EIS was already on public exhibition when the decision was taken. IPL announced the deferral of the Project to the Australian Securities Exchange on 26 September 2012, while the EIS commenced public exhibition on 12 September 2012.

20.2 Planning Process

The following issues were raised by members of the public under this category.

20.2.1 EIS Process

Two submissions questioned the process of assessment through which the Project is attempting to gain approval. The submission from **Berry, G** claimed that the EIS is biased towards the needs of the proponent. The submission from **Wright, S** claimed that the EIS is inadequate. The submission from **Leka, N** suggested that the EIS is *"littered with window dressing designed to convey a favourable impression, rather than facts."*

Response

The EIS was produced by URS Australia Pty Ltd (URS). URS was supported in the production of this document by a number of other specialist consultants as follows:

- Hazard and Risk consultants – Lloyds Register Rail;
- Aboriginal and European Heritage consultants – Australian Museum Business Service; and
- Visual Impact Assessment – Green Bean Design.

The EIS was peer-reviewed by GHD, an independent environmental consultant.

Once completed in draft, the EIS was examined by the NSW DP&I along with all other relevant government agencies to ensure that it was consistent with the requirements of the Director General's Requirements. Once deemed to be consistent, the EIS was placed on public exhibition.

The reputation of all these consultancies depends on their ability to deliver a scientifically robust and unbiased environmental assessment. Throughout the EIS process, where potential environmental impacts were deemed to be unacceptable, changes to the Project design were made in order to manage or mitigate the impact. An account of these mitigation measures is contained within the EIS in **Chapter 23 Management and Mitigation Measures**. The EIS was deemed by NSW DP&I to be an unbiased and adequate environmental assessment prior to public exhibition.

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20.2.2 Strategic Planning in Newcastle

Some public submissions raised concerns about the suitability of the strategic planning framework in the Newcastle area and how the Project could be permissible in this location. A number of these submissions stated that: *“One of the fundamental responsibilities of any Government is the welfare and protection of people and this proposal undermines the safety of around 50,000 residents within a 5km radius.”* A key point within these submissions was a perception that there is no strategic plan for the Newcastle Area.

This point was raised in the following submissions: **Berry, G; Birrell, W; Burgess, C; Charles, C; Confidential (4); Confidential (5); Confidential (6); Confidential (7); Confidential (8); Confidential (12); Craig, A; Craig, L; Croft, D; Davies, B; Deacon, V; Hollingshed, D2; Jauden, M; Johnson, K; Kelly, B; McCauley, T; Pitt, A; Prietto, C; Squire, T; Thornton, R; and Vought, G.**

Response

Strategic planning in the Newcastle area is managed by Newcastle City Council via the *Newcastle Urban Strategy* (NCC, 2009) and from NSW DP&I through the *Lower Hunter Regional Strategy* (DoP, 2006).

The Project complies with the objectives of these plans. Compliance with the Newcastle Urban Strategy is confirmed in the submission from NCC (**Section 7.3**). Although the Project would be located at least 800 m from a residential area, it is compliant with the stated objectives of the land-use zones in this area.

When plans are drafted and placed on exhibition an adequate window is allowed for public consultation before the plan is gazetted by the relevant authority. It is beyond the scope of the Project to comment on the appropriateness of the strategic plans that apply to this area at this time.

20.2.3 Diversification of Industry

The Submission from **Scurry, B** encouraged the diversification of industry on Kooragang Island. *“Encourage other forms of business that are less detrimental to the residents of Newcastle - and have a chance of creating work for locals too, not a specialized few!”*

A similar submission was received from **Cahill, F**, the author suggested: *“There are clean industries that could be more suitable, bringing more employment and not impacting on the quality of life in this beautiful city of Newcastle.”*

The submission from **Charles, C** also argued for a diversification of industry stating: *“I do not accept that Newcastle Port, its present infrastructure and industrial focus is in the best interest of Newcastle and the Hunter Region. The potential for Port facilities to be left as a series of stranded assets in the foreseeable future is real and will be of significant cost to the community and our region.”*

Response

It is not the role of the NSW Government or IPL to dictate what specific industry is proposed in any given area. The NSW Government, together with NCC set out types of industry permissible in any one location through strategic and local planning documents. As outlined above the Project is compliant with the current land-use zoning and strategic objectives of the area. Refer to Section 6.3.2 of the EIS for details of the relevant planning policies, strategic objectives and land-use zoning.

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Any proposal that is compliant with the land-use zonings is assessed on its merits. The Project does not prevent the future diversification of industry on Kooragang Island, Newcastle or the Hunter Valley should that diversification be proposed in future.

20.3 Consultation

The following issues were raised by members of the public under this category.

20.3.1 Adequacy of Consultation Effort

Submission from the following people raised concerns about the adequacy of the consultation process that accompanied the Project application: **Banyard, R; Berry, G; Birrell, W; Burgess, C; Cahill, F; Charles, C; Confidential (4); Confidential (5); Confidential (6); Confidential (7); Confidential (8); Confidential (10); Confidential (14); Cousins, P; Craig, A; Craig, K; Craig, L; Croft, D; Deacon, V; Greig, J; Hanna, S; Hayes P; Hollingshed, D2; Jauden, M; Johnson, K; Lloyd, D; McCauley, T; McIlwraith, D; McIlwraith, D2; McIlwraith, R; McQueen, A; Melville, S; Morrison, S; Preece, V and I; Prietto, G; Scholin, O; Terry, S; Thornton, R; Vought, G; Whitcher, B and Bernie, B; and Wright, S.**

Response

Chapter 7 Consultation of the EIS outlines the community consultation undertaken by IPL as part of the Project. Additional consultation that has been completed between September 2012 and February 2013 is summarised in **Section 2** of this document. A more complete response to this issue can be located in **Section 10.4 and Section 12.5** of this document.

20.3.2 Addressing the Community Concerns

The submission from **Taylor, S** stated, *“All community concerns [regarding the Project] should be addressed to the satisfaction of the community before the facility is even considered”*.

Response

IPL is engaged in an ongoing community consultation process that is outlined **Chapter 7 Consultation** of the EIS and in **Section 2, Section 10.4 and Section 13.6** of this document. Community concerns have been gathered and addressed in the EIS as part of the IPL feasibility study.

IPL is required to ensure that all members of community are informed of the Project and provide engagement mechanisms which ensure the community concerns are raised and responded to by the Project Team; however IPL would continue to engage with the community in a meaningful and productive manner throughout the planning, construction and operation of the Project.

20.3.3 Identification of Community Groups

The submission from **Harwood, A** was concerned about the lack of identification of key community grass roots groups including the Newcastle Wilderness Society, The Greens, Climate Action Newcastle and the Mayfield East Residents' Group. The submission is also noted alarm that no local schools had been identified as part of the Stakeholder Engagement Strategy.

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Response

As part of the consultation process, representatives from the following organisations were included within the Community Liaison Group:

- Hunter Bird Observers Club;
- Stockton Primary School;
- Stockton Surfside Presbyterian Church;
- Shotters Law Firm;
- Stockton Newsagency;
- Newcastle Ports Corporation;
- Stockton Community Action Group;
- Correct Planning and Consultation for Mayfield Group;
- Hunter Business Chamber; and
- Newcastle City Council (Ward One Councillors).

The representatives included the headmistress of the Stockton Primary School. The intent was to have a cross section of the local community represented at the CLG meetings.

Nevertheless the wider community would have been included in a number of consultation measures during the environmental assessment and exhibition process. Equally all members of the community have had the opportunity to post questions on the Project website, attend public information days in 2011 and 2012 and make submissions during exhibition.

20.4 Hazard and Risk

Submissions were received from: **a'Beckett, K; Terry, S; Taylor, S; Struck, R; Stroud, S; Stedman, C & D; Squire, T; Smith, M; Shorland, I; Smith, J; Shorland, C; Allan, D; Banyard, R; Bellingham, K; Bellingham, S; Berry, G; Burgess, C; Calthorpe, J; Cardow, M; Charlton, M; Clifton, E; Croft, Y; Cole, S; Colomb, R; Cousins, P; Craig, K; Croft, D; Danuser, D; Edwards, J; Gippel, R; Grainger, C; Greig, J; Hancock, R and J; Harwood, A; Heys, C; Hollingshed, D; Johnson, K; Kurtze, M; Leka, N; Lewis, J; Lloyd, D; McIlwraith, D; McIlwraith, D2; McIlwraith, R; McLaughlan, A; Melbourne P & A; Melville, S; Moran, S; Morrison, S; Moten, S; Ostinga, K; Ostinga, V; Philips, A; Pollington, S; Prietto; Prietto, G; Richards, T; Robertson, B; Rogers, A; Scurry, B; Scholin, O; Todhunter, W; Unidentified; Van Oort, E; Whitcher, B & Bernie, B; Wood, R; Wright, S; Young, B; Yudaeff, L; Confidential (1); Confidential (3); Confidential (4); Confidential (5); Confidential (6); Confidential (7); ; Confidential (9); Confidential (10); ; Confidential (11); Confidential (12); Confidential (15); Blefari, N; Cameron, P; Gorst, R & D; Unidentified (1); Unidentified (2); Birrell, W; Cahill, F; Charles, C; Cook, J2; Craig, A; Craig, L; Deacon, V; Hansen, J; Jauden, M; McCauley, T; Pitt, A; Thornton, R; Vought, G.**

These submissions objected to the Project on the grounds of a perceived increased level of risk associated with the Project. A number of these submissions also raised more specific points regarding the hazard or risk presented by the Project. These are discussed below.

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20.4.1 Increased Risk of Explosions

Submissions expressed concern regarding an increased risk of explosion.

Response

The risks associated with the Project have been assessed by Lloyds Register Rail, in line with the NSW DP&I Hazard Industry Planning Advisory Papers. The assessment concluded that the Project risks and cumulative risks from explosions and other hazards were compliant with the NSW criteria for development of this type and in this location.

20.4.2 Risk to the Community

Some submissions claimed that the Project represents an unacceptable risk to the community. For example:

1. The level of risk from positioning two AN plants in one location this close to residential area is unprecedented elsewhere in the world.
2. The planned storage of TGAN on the site is excessive.
3. Fear from the risk of an explosion.

Response

The PHA was conducted according to the requirements and methodology allowed by HIPAP No. 6 and 10 by the NSW DP&I. A Level 3 analysis (full Quantitative Risk Analysis) was conducted. The analysis identified all potential hazards associated with the proposal and analysed them in terms of their consequences and likelihood, taking into account proposed control measures.

The Project and cumulative risk are estimated and assessed against the requirements of HIPAP No. 4, as published by the NSW DP&I. On the basis of the results of the QRA, the proposed development complies with the relevant land use safety planning risk criteria for new industrial developments.

20.4.3 Blast Contours

Public submissions referred to figures within the EIS (**Figure 9-2** and **Figure 9-3**) as blast contour maps. The submissions claimed that these 'blast contours' are inaccurate as, based on previous examples (such as the Toulouse incident) the amount of AN known to be stored on the Site has potential have an explosive impact over a larger area than shown.

Response

The contours presented in the PHA are iso-risk contours and not "blast contours" (i.e. they are not consequence distance contours). The iso-risk contours were determined in accordance with the methodology allowed in HIPAP No. 6.

Therefore, iso-risk contours presented in the PHA will not correlate with the consequence information from the Toulouse incident.

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The consequences of credible hazardous events, that could have off-site impacts, were assessed as part of the risk assessment process in the Preliminary Hazard Analysis (refer to **Appendix D1** of the EIS). The consequences of the events, combined with their likelihood, were used to develop the iso-risk contours.

20.4.4 Storage of Hazardous Chemicals

Submissions expressed concern regarding the storage of large amounts of hazardous chemicals at the Ammonium Nitrate plant. Some of the submissions also expressed concern about the potential for stored chemicals to leak.

Response

The risk associated with the Project has been assessed by Lloyds Register Rail, in line with the NSW DP&I Hazard Industry Planning Advisory Papers. The assessment concluded that the Project was compliant with the NSW criteria for development of this type and in this location.

During the assessment, industrial processes were examined and the likelihood of a leakage was assessed and found to be compliant with the NSW guidelines. Hazardous chemical storage for the Project would comply with the requirements of the relevant Australian Standards and be provided with secondary containment that will capture any leaks from the storage tank or containers.

20.4.5 Pipeworks Leaks

A submission claimed that claims that 'toxic' ammonia gas would be released from numerous sources including leaks in the pipework.

Response

A potential release of toxic ammonia gas was identified and included in the QRA (Section 5.4 of Appendix D1 of the EIS). This included various sources such as piping, valves, gaskets, pumps, etc.

On the basis of the results of the QRA, the proposed development complies with the relevant land use safety planning risk criteria for new industrial developments, as published in HIPAP No. 4 and 6 by the NSW DP&I.

20.4.6 Ammonia Tank Failure

Some submissions suggested that the impact of a failure of the ammonia storage tank should be assessed, including during natural catastrophes such as an earthquake.

Response

As discussed in **Section 20.4.4** the release of toxic ammonia gas, both from process pipework or the ammonia storage tank, was identified and assessed accordingly.

Additionally, a detailed structural analysis of the bulk ammonia storage tank and associated pipework will be undertaken during the final design to ensure it is designed to withstand credible earthquake and strong wind events.

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On the basis of the results of the QRA, the proposed development complies with the relevant land use safety planning risk criteria for new industrial developments, as published in HIPAP No. 4 and 6 by the NSW DP&I.

20.4.7 Interstate Examples

Some submissions claimed that the Project would not stand up to the hazard and risk management guidelines in South Australia or Western Australia.

Response

The Project needs to meet the hazard and risk guidelines in New South Wales, namely Hazardous Industry Planning Advisory Paper No. 4 - Risk Criteria for Land Use Safety Planning (DP&I, 2011). The Environmental Protection Authority of Western Australia published criteria for evaluating risk posed by hazardous industries in 2000. The WA EPA has set the off-site individual risk criteria for fatalities from hazardous industrial plant at the following levels:

- a. A risk level in residential areas of one in a million per year or less, is so small as to be acceptable to the EPA.
- b. A risk level in "sensitive developments", such as hospitals, schools, child care facilities and aged care housing developments, of one half in a million per year or less is so small as to be acceptable to the EPA.

In the case of risk generators within the grounds of the "sensitive development" necessary for the amenity of the residents, the risk level can exceed the risk level of one half in a million per year up to a maximum of one in a million per year, for areas that are intermittently occupied, such as garden areas and car parks.

- c. Risk levels from industrial facilities should not exceed a target of fifty in a million per year at the site boundary for each individual industry, and the cumulative risk level imposed upon an industry should not exceed a target of one hundred in a million per year.
- d. A risk level for any non-industrial activity or active open spaces located in buffer areas between industrial facilities and residential areas of ten in a million per year or less, is so small as to be acceptable to the EPA.
- e. A risk level for commercial developments, including offices, retail centres, showrooms, restaurants and entertainment centres, located in buffer areas between industrial facilities and residential areas, of five in a million per year or less, is so small as to be acceptable to the EPA.

Although the Western Australia individual fatality risks criteria are the same as for New South Wales, the New South Wales risk criteria are more stringent with additional off-site criteria for injury, irritation, property damage, accident propagation and societal risk.

No risk criteria is currently specified in South Australia. However since 1 January 2013, South Australia has new work health and safety (WHS) laws which provide regulation of major hazard facilities. The SafeWork SA guidance for MHFs refers to the Safe Work Australia guides, which in turn refer to risk benchmarks established in the NSW HIPAPs.

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20.4.8 “Acceptable” Risks

A submission objected to the use of “acceptable” to describe certain risks.

Response

The proposed development complies with the relevant land use safety planning risk criteria for new industrial developments, as published in HIPAP No. 4 and 6 by the NSW DP&I.

Therefore, on the basis of the results of the QRA, the proposed development is an acceptable land use at this location.

20.4.9 Emergency Evacuation Procedures

Public submissions expressed concern over the emergency evacuation procedures that would be in place in the event of an emergency resulting from the Project.

Response

A site emergency plan (c.f. Hazardous Industry Planning Advisory Paper No. 1) is required as a post-approval study and will be required as part of the revised Safety Case that will be submitted to WorkCover for this MHF. The emergency plan must be effective in addressing the consequences of a major accident both on-site and off-site and should therefore address any relevant evacuation processes.

The Newcastle Local Emergency Management Committee has prepared the Newcastle Local Disaster Plan (DISPLAN) in compliance with the State Emergency and Rescue Management Act, 1989. The Committee is currently finalising an Emergency Sub-Plan for the Kooragang Island area.

20.4.10 Selection of Worst Case Scenarios based on Worldwide Examples

Some submissions stated that there have been many ammonium nitrate explosions worldwide.

Response

The frequency of TGAN explosions were derived based on explosion frequencies defined in the SAFEX Good Practice Guide: Storage of Solid Technical Grade Ammonium Nitrate (2010), which are appropriate for storage of TGAN at an individual facility.

The SAFEX explosion frequencies for contamination and fire of bulk TGAN and TGAN in bags or containers were derived from two relevant historical accidents, namely Toulouse in 2001 (i.e. bulk off-spec AN explosion likely to be caused by contamination) and Cherokee in 1973 (i.e. AN explosion caused by a fire in a warehouse, which included timber beams and plywood sheeting). The total number of operating years was used to determine the frequency of an explosion per year per site. This gives a historical accident rate of 62.5×10^{-6} p.a. for either an explosion of a bulk off-spec AN due to contamination or an explosion of one stack of AN due to a fire, with a combined total of 125×10^{-6} p.a. per site. Note that these two historical examples were not well managed sites and not built to current standards.

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Many of the major accidents prior to 1950 were caused when blasting explosives were used to break up caked AN or fires involving wax-coated AN. The investigations of these accidents led to clear guidelines for the specification of safer products, their manufacturing processes and storage and handling operations. This created a major turning point in the product and accident history of AN since 1960.

As the Project would be a new and modern controlled facility, employing safe practices to minimise the risk of explosion due to contamination, fire or high energy impact, the majority of historical events can be ruled out or mitigated.

The PHA has been conducted according to the requirements of a Level 3 Analysis (i.e. a full Quantitative Risk Analysis) and not a Level 1 Analysis (i.e. a Qualitative Analysis) as published in HIPAP No. 10 Land Use Safety Planning. The different levels of analysis are also described in the DP&I's guideline: Multi-level Risk Assessment (2011).

AN explosions have been assessed according to its different modes of initiation in the PHA. On the basis of the results of the QRA, the proposed development complies with the relevant land use safety planning risk criteria for new industrial developments, as published in HIPAP No. 4 and 6 by the NSW DP&I.

20.4.11 Comparison to Toulouse

Some submissions claimed that if 300 t of AN were to explode, then all within a 3 to 5 km radius would be affected, as was the case in Toulouse, France.

Response

On the basis of the results of the PHA, the proposed development complies with the relevant land use safety planning risk criteria for new industrial developments, as published in HIPAP No. 4 and 6 by the NSW DP&I.

20.4.12 Hiroshima Equivalence

Some submissions claimed that there will be enough explosive power on Kooragang Island to match the Hiroshima bomb, should the project be approved.

Response

The potential for damage from all relevant AN explosion scenarios have been assessed for the impact to residential areas according to the requirements of HIPAP No. 6. An explosion between Orica and IPL due to domino effects is not credible due to the separation distances between the two facilities.

The cumulative risk is estimated and assessed against the requirements of HIPAP No. 4, as published by the NSW DP&I. On the basis of the results of the QRA, the proposed development complies with the relevant land use safety planning risk criteria for new industrial developments.

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20.4.13 Transport Risk

Submissions expressed concern of increased risk with the transport of large amounts of dangerous goods on public roads.

Response

The risk to populated areas along the transport routes as a result of the increased traffic movements was determined in the Transport Risk Assessment to be below comparable risk criteria applied for fixed facilities in NSW.

20.4.14 Adequacy of Risk Assessment

Some submissions claimed that the analysis in the Risk Assessment was inadequate.

Response

The PHA was conducted according to the requirements and methodology allowed by HIPAP No. 6 and 10 by the NSW DP&I. A Level 3 analysis (Full Quantitative Risk Analysis) was conducted. The analysis identified all potential hazards associated with the proposal and analysed them in terms of their consequences and likelihood, taking into account proposed control measures.

The Project and cumulative risk are estimated and assessed against the requirements of HIPAP No. 4, as published by the NSW DP&I. On the basis of the results of the QRA, the proposed development complies with the relevant land use safety planning risk criteria for new industrial developments.

20.4.15 Documents out of the Public Domain

Public submissions stated that documents detailing the hazards and risks of the Project had been kept out of the public domain throughout the exhibition stage of the proposal.

Response

The sections of the PHA excluded from public access have been excluded on the ground that it contains information associated with the manufacture of Security Sensitive Ammonium Nitrate, disclosure of which could:

- increase the likelihood of, or prejudice the prevention of, preparedness against, response to, or recovery from, a public emergency (including any natural disaster, major accident, civil disturbance or act of terrorism) (s14(2) Table 2(c));
- endanger, or prejudice any system or procedure for protecting, the life, health or safety of any person (s14(2) Table 2(d)); or
- facilitate the commission of a criminal act (including a terrorist act within the meaning of the *Terrorism (Police Powers) Act 2002*) (s14(2) Table 2(f)).

20.4.16 Brisance

Some submissions stated that the EIS did not adequately address the concerns regarding the combined storage of IPL and Orica. For example, AN has 'brisance potential' and it was stated that

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there is a risk of a secondary explosion which is heightened to an unacceptable level considering the neighbouring facilities.

Response

Facilities associated with AN on IPL's site have been intentionally located such that there is maximum separation between the AN on IPL's site and the potentially hazardous materials at the Orica, Manildra and grain silo sites.

1. The TGAN stored on the Orica site is located more than 800 metres from the proposed IPL TGAN storage and sympathetic explosion would not be credible according to the SAFEX Good Practice Guide: Storage of Solid Technical Grade Ammonium Nitrate (2010).
2. The Orica plant boundary is located more than 400 metres from the proposed IPL TGAN storage and a fire could not spread onto the IPL plant. In addition, Orica and IPL have independent firewater protection systems.
3. Hydrogen is considerably lighter than air and any hydrogen emitted from the Orica plant would rapidly disperse and could not contaminate TGAN stored more than 400 metres away.
4. The proposed Manildra Park Pty Ltd biofuel storage and processing plant is located more than 550 metres from IPL's proposed TGAN storage. In 2007 the PHA for the Manildra proposal concluded the risks of any significant off-site impacts is considered to be low and therefore complies with the risk criteria from HIPAP No. 4 – Risk criteria for Land Use Safety Planning.
5. GrainCorp's bulk grain storage at Carrington is more than three kilometres from the IPL site and would have no cumulative explosion impact.

20.4.17 Handling of Explosives

One submission claims that the EIS is misleading / deceptive regarding the risks involved with explosives.

Response

The site would not store or handle explosives. Ammonium nitrate is classified as an oxidising agent.

20.4.18 Risk of Terrorism

A number of public submissions expressed concern that the project would result in an increased risk of terrorism.

Response

The risk due to terrorism or malicious act has been considered in the Preliminary Hazard Analysis (refer to Appendix D1 of the EIS).

The likelihood of terrorist or malicious acts is difficult to estimate quantitatively due to limited data collection and the complexities of geography, threats, target attractiveness and vulnerability.

The likelihood of criminal acts for the Site has been assessed using a threat analysis and risk assessment process prescribed in the confidential NSW Police Major Hazards Facilities Security

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Handbook. There have been no security incidents on-site. Based on the security risk assessment and current threat environment, the likelihood of a terrorist or malicious act is low.

The Site has a Major Hazard Facility and Security Sensitive Dangerous Substances (SSDS) Security Plan which has been reviewed by NSW Workcover and NSW Police. The Plan includes the risk assessment, details of existing site security measures and actions on elevation of security levels.

The Project would include upgrades to security measures and would not result in an increased risk of terrorism. The Security Plan would be revised consistent with the NSW Police Major Hazards Facilities Security Handbook and the DP&I Hazardous Industry Planning Advisory Paper No. 9 'Safety Management'. The Plan would be submitted for approval from NSW Workcover, NSW Police and DP&I prior to commissioning the Project.

20.4.19 Hexavalent Chromium

A submission claimed that if there were a leak of toxic gas (hexavalent chromium) then the residents of Stockton would be affected.

Response

Hexavalent chromium would not be used at any stage of the process proposed for the IPL facility because the Project does not include an ammonia manufacturing plant.

20.4.20 Additional DA

A submission noted another DA with Newcastle Council for the storage of fertiliser at 23 Egret Street on Kooragang Island (DA 2012 / 955).

Response

This Development Application for a 'fertiliser storage facility' was approved by Newcastle City Council on 25th November 2012. The approval occurred after the completion of the Project EIS and therefore could not be included within the assessment. The site (23 Egret Street) is located approximately 1.2 km from the proposed process and storage areas at the IPL site. This distance is far enough from the site to ensure that any domino effects from the Project would not be credible. Therefore this proposed fertiliser storage facility would not have cumulative effect with the Project.

20.4.21 Risk of Transport by Ship

A submission claimed that the risk of AN being loaded onto ships did not appear in the Transport Risk Assessment.

Response

The Project would reduce the number of TGAN shipments through the Port of Newcastle and result in a positive cumulative impact. The assessment of the loading of the AN onto ship is not within the scope of the PHA as this is separately covered in a Quantitative Risk Assessment undertaken by Newcastle Port Authority and IPL for the Mayfield berth. The Director General Requirements only specified "an evaluation of the impacts of the transport of dangerous goods to and from the site in the surrounding area".

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20.4.22 Transport Risk

Some submissions stated that truck movements should be limited, citing the recent Maitland, NSW incident where an AN truck was hit by a petrol tanker. Safeguards that are in place to prevent transport accidents were requested.

Additionally, some submissions express concerns about the additional danger resulting from the additional trucks on the road and ship movements.

Response

The risk to populated areas along the transport routes as a result of the increased traffic movements was determined in the Transport Risk Assessment to be below comparable risk criteria applied for fixed facilities in NSW.

Controls to manage transport risk are described in **Section 6.1** of the Transport Risk **Appendix D2** of the EIS.

20.5 Air Quality and Odour

The following issues were raised by members of the public under this category.

20.5.1 Ammonia

The submission from **Burgess, C** raised concern about fugitive ammonia emissions from the ammonia storage tank and from the unloading of ships.

Response

IPL proposes to control ammonia emissions through the use of an ammonia flare and the monitoring of ammonia generation. The refrigeration systems will be used to minimise the generation of gaseous ammonia during both storage and ship unloading events. In the event that some gaseous cannot be handled by the refrigeration systems, IPL proposes to direct this to an ammonia flare, where the ammonia will be broken down into nitrogen and water through assisted combustion, thus minimising release of ammonia to atmosphere. The potential impact of these emissions has been assessed quantitatively in the AQIA (refer to **Appendix E** in the EIS), covering both routine operations, as well as the unlikely event in which the flare is operational. Flare operation was assessed under worst case meteorological conditions, and found to be compliant with impact assessment criteria endorsed by the regulatory agencies as being protective of both adverse health effects and amenity.

In accordance with the requirements of the EPA, any significant flaring activity would be a reportable environmental incident and therefore records would be maintained on significant releases and subsequent combustion of ammonia in flaring incidents.

It is also noted that the Project would also include leak detection and isolation technology that would isolate any leaks in pipework and thereby mitigate any ammonia leaks through defects in the Project pipework. The details of the leak detection facilities associated with the Project are contained within the EIS.

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20.5.2 Air Quality Impacts of a Catastrophic Explosion

The submission from **Craig, K** suggested that the air quality impacts in the event of a catastrophic explosion should be assessed.

Response

The EIS and supporting studies assess the impact of the Project on the air quality in the region during routine and non-routine operations and during the construction of the Project. Impacts outside of these operations are not required to be assessed as part of the EIS.

The Project has many layers of protection to prevent and mitigate major incidents that could impact off-site. The chance of an emergency arising from the Project is very remote. If there is an emergency, IPL would immediately notify Emergency Services. The Emergency Services would advise the community – either in person or through radio or TV broadcasts – what action to take. Emergency Services would work with IPL experts to define a potentially hazardous zone and people inside this zone may be asked to stay indoors (“Shelter in Place”) to protect themselves from any adverse air quality impacts.

20.5.3 Cumulative Impacts of the Project

The Submissions from **Confidential (4); Confidential (5); Confidential (6); Confidential (7); Shorland, C; Shorland I; Cahill, F; Charles, C; Craig, A; Craig, L; Deacon, V; Hansen, J; Hollinshed, D2; Jauden, M; McCauley, T; Pitt, A; Thornton, R; Vought, G; Birrell, W; and Confidential (8)** raised concerns regarding the cumulative impact of the Project alongside other polluting industry in the area.

The AQIA for the project has provided a consideration of the Project in the context of existing industry through the incorporation of background monitoring data which has been collected within the region during times when the existing industries were present and operational (refer to **Section 5** of the AQIA, **Appendix E** of the EIS). Emissions from the Project, when added to these existing levels were found to be within impact assessment criteria which are used to assess the potential for proposal to result in adverse air quality impacts. In the case of particulate matter emissions, impacts associated with the proposal were predicted to be minor, relative to existing concentrations and impact assessment criteria, with these impacts being localised to small areas near to the facility.

Proposed industry in the area that was either (i) on exhibition, or (ii) had been on exhibition but not yet approved, or (iii) approved but not yet commissioned at the time of the AQIA, was subject to a separate assessment (refer **Section 7.6.1** and **Section 8.3** within the AQIA) that addressed cumulative effects. The cumulative impact assessment found the air quality to be within impact assessment criteria.

Air quality monitoring within the region is being improved through the establishment of the Lower Hunter Air Quality Monitoring Network. This network will assist in the management of air quality at a regional level, and will likely include Orica's new monitoring station at Stockton, which continuously records levels of nitrogen dioxide (NO₂), total oxides of nitrogen (NO_x), particulate matter (PM₁₀ and PM_{2.5}) and ammonia.

In addition, in accordance with the EPA's proposed conditions of consent, the Project emissions would be monitored as part of the EPL for the Site.

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20.5.4 Existing Pollution in the Area

The submissions from **Bellingham, K; Bellingham, S; Confidential (4); Confidential (5); Confidential (6); Confidential (7); Gippel, R; Wright, S; Pollington, S; Squire, T; Morrison, S; Whitcher, B and Bernie, B; Robertson, B; Heys, C; Confidential (11); Harwood, A; Philips, A; Danauser, D; Jauden, M; and Pitt, A** raised a concern about the existing levels of air quality pollution in the area.

Response

The AQIA included a detailed review of existing air quality monitoring data in the area of the Project. With the exception of regional dust events, existing air quality within the area was noted to be compliant with air quality goals, with general trends showing a slight improvement in air quality within recent decades. This finding is consistent with (OEHL, 2013) An Assessment of Three Reports Concerning Air Quality in the Lower Hunter Region, which notes in summary that monitoring in the lower hunter “has demonstrated compliance with the National Environmental Protection Measure (NEPM) and air quality is equal to that in the Sydney and Illawarra regions.”

20.5.5 General Air Pollution Comment

Submissions from **Hollingshed, D; Confidential (10); McIlwraith, D2; McIlwraith, R; McPherson, A; Melville, S; Calthorpe, J; Cardow, M; Clifton, E; Colomb, R; A’Becket, K; Allan, D; Gravenlock, D; Yudaeff, L; Dillon-Smith, C; Parry, L; Smith, J; Struck, R; Taylor, S; Terry, S; Todhunter, W; and Preece V and I** made a general comment about the impact of the Project on air quality in the region.

Response

Air quality in the local area has been assessed within the Air Quality Impact Assessment (AQIA) for the Project. The AQIA was contained within Appendix E of the EIS (URS, 2012). Within the AQIA predicted emissions from the Project were added to background levels, and found to be compliant with relevant impact assessment criteria. These criteria are endorsed and routinely applied by regulatory agencies for the management of air quality impacts relating to proposed developments, where compliance indicates that a proposal is unlikely to result in adverse air quality impacts or the deterioration of air quality.

Whilst IPL acknowledges that the Project would result in pollutant emissions (including NO_x and Particulate Matter), it is noted that in designing the Project, IPL has proposed emission control technology that is consistent with best available technology as identified in international references. The performance of this technology would be ensured by the application of emission standards to be enforced under the Environmental Protection Licence (EPL) for the facility through the routine monitoring of emissions. In this context, IPL has sought to minimise emissions of these pollutants, and minimise air quality impacts.

20.5.6 Dust and Particulate Matter

Submissions from **Craig, A; Craig, L; Cameron, P; Gorst, R and D; Unidentified 2; Pameron, P; Berry, G; Craig, K; Bellingham, J; Shorland, C; Shorland, I; Burgess, C; Preece, V and I; Lloyd, D; and Banyard, R** made reference to the increased impact of particulate matter as a result of the Project.

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Response

Particulate matter emissions were assessed within the AQIA for the Project. Within the AQIA, emissions from the Project, when added to existing levels within the region were found to be within the relevant impact assessment criteria which are used to assess the potential for proposal to result in adverse air quality impacts. In the case of particulate matter emissions, impacts associated with the proposal were predicted to be minor relative to existing concentrations and impact assessment criteria (e.g. the 24 hour PM₁₀ criterion of 50 µg/m³), with these impacts (e.g. > 2 µg/m³) being localised to small areas near to the facility.

20.5.7 Emissions from Trucks

Submission from **Craig, K; Davies, B; Whitcher, B and Bernie, B; Cahill, F; Charles, C; Craig, A; Craig, L; Deacon, V; Hansen, J; Hollingshed, D2; Jauden, M; McCauley, T; Thornton, R; Vought, G; Birrell, W; Confidential (8); Cameron, P; Gorst, R and D; and Unidentified 2** raised concerns about the increase in numbers of trucks on the road and the associated air quality impact of this increase.

Response

The Project will result in additional truck movements. Given their mobile nature, trucks constitute a diffuse emissions source, and the volume specifically associated with the Project is considered unlikely to result in a significant increase in air pollution across the region¹⁸.

For trucks present on the Site, IPL proposes to implement a range of measures to minimise emissions, including such measures as the training of staff, switching off engines to avoid idling emissions, and using vehicles that are properly maintained, and operated in accordance with their design. These management and mitigation measures are outlined within the EIS in **Chapter 23 Management and Mitigation Measures**.

20.5.8 Licencing and Monitoring

Submissions from **McQueen, A** and **Cahill F** raised concern about the appropriateness of the licencing and monitoring requirements that would be imposed on the Project, if approved.

Response

IPL proposes to conduct a targeted emission monitoring program for key pollutant sources as identified within the AQIA performed within the EIS for the Project. This monitoring would be incorporated into the EPL for the Project if approved. The results of this monitoring would be required to demonstrate compliance with emission limits stipulated by EPA within the EPL for the Project.

¹⁸ **Table 2-4** of the Traffic Impact Assessment (refer to **Appendix J** of the EIS), notes an Annual Average Daily Traffic (AADT) flow of 29,588 vehicles for the Tourle St/Cormorant road section of IPL's proposed haul route. Assuming that 10% of this count is composed of heavy vehicles (the assumption within the TIA), this would equate to approximately 2,960 heavy vehicle movements per day on this section of road. In contrast, under peak (weekday) operational conditions, IPL estimate an additional 80 heavy vehicle journeys either to or from the IPL site. Assuming that all of these trucks complete the return trip over this section of road, this would equate to an additional 160 heavy vehicle movements, or an increase in heavy vehicle movements of 5% on this section of road. Hence potential air quality impacts from additional truck movements are not considered significant in the context of existing traffic volumes in the vicinity of the Project, and transport emissions across the wider region.

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20.5.9 Nitrogen Oxides

The submissions from **Smith, M; Confidential (14); Burgess, C; and Craig, K** raised concerns about the increase in nitrogen oxides in the region as a result of the Project.

Response

An AQIA has been performed for the Project, and has applied impact assessment criteria that are endorsed and routinely applied by Government regulators for the management of air quality impacts relating to proposed emission sources, where compliance with these criteria indicates the proposal is unlikely to result in adverse air quality impacts. The AQIA quantitatively assessed all proposed NO_x emission sources operating at the proposed emission limits and showed compliance with the impact assessment criteria. IPL proposes to ensure that emissions from plant items are within these emission limits through the use of routine emission monitoring.

It should also be noted that the AQIA included background monitoring data that was collected during times at which the existing Orica facility was operational. The data reviewed in **Section 5** of the AQIA included 5 years of Stockton monitoring data of nitrogen oxides which were shown to be similar to levels measured elsewhere in the region, and within the range classified by the Office of Environment and Heritage (OEH) as either “good” to “very good”^[1] at all times during this period. This is despite the data being collected during times at which the Orica facility was operational, having NO_x emissions significantly higher than those estimated from the Project¹⁹.

20.5.10 Significant Reduction in Air Quality

The submission from **Woods, R** disputed claim within the EIS summary document that the Project would “*significantly reduce the likelihood of impacts on air quality*”.

Response

The EIS Summary document states: ‘*The AQIA identifies a number of management and mitigation measures that would be incorporated into the design of the Project to significantly reduce the likelihood of impacts on air quality*’.

These management and mitigation measures are listed within the EIS in **Chapter 23 Management and Mitigation Measures**.

20.5.11 Additional Prill Tower

Submissions from **Shorland, I** and **Shorland, C** raised a concern about an additional prill tower being installed in the area and the impact that this could have on the air quality in the area.

^[1] The OEH Air Quality Index (AQI) uses the classifications of “very good” and “good” for air quality conditions which range from 0-33% and 33-66% of criteria (respectively) <http://www.environment.nsw.gov.au/AQMS/dataindex.htm>. For NO₂, this equates to 0-82 µg/m³, and 83-164 µg/m³, for “very good” and “good” conditions (respectively). A background NO₂ concentration of 84 µg/m³ was adopted within the AQIA.

¹⁹ Based on the 2010/2011 National Pollution Inventory data reviewed in the AQIA, the scale of emissions from the Project was estimated as constituting a minor increase (of approximately 10%) above the existing Orica emissions at Kooragang Island.

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Response

IPL has sought to minimise emissions from prilling operations through the use of best available technologies which both minimise the quantity of air to be exhausted to atmosphere, and also control the concentrations of pollutants within this stream to modern standards. As a result, IPL expects particulate emissions from prilling, cooling and drying that will be approximately 5% of emissions from the existing Orica prill tower in isolation (as identified within the Orica expansion AQIA - approximately 10 g/s).

20.6 Noise and Vibration

The following issues were raised by members of the public under this category.

20.6.1 Industrial Noise

Submissions from **Davies, B; Confidential (4); Confidential (5); Confidential (6);** and **Confidential (7)** claimed that 'industry' cannot be trusted because of the current night-time acoustic exceedance on Kooragang Island.

Response

The Sound Power Level (noise) from industry on Kooragang Island is managed under existing Environment Protection Licences (EPLs) issued by the NSW EPA. The EPA is aware of the current industrial noise exceedances in the area and is working with various companies, e.g. Orica, to reduce the level of noise experienced in Stockton and other surrounding suburbs. Industry can be subject to financial penalty if it fails to comply with the conditions of an EPL. IPL has no control over the noise created by other industries on Kooragang Island.

20.6.2 Adding to Existing Noise

Submissions from **Prietto, G, Bellingham, K; Bellingham, S; Preece, V and I; Hanna, S; Hayes, P; Confidential (11); Allan, D; McIlwraith, D2; McIlwraith R; Shorland, C; Shorland, I; Delaney, R; Davies, B; Burgess, C; Edwards, J; Murray, J; Robertson, J; Colomb, R; Berry, G; Dillon-Smith, C; Taylor, S; Smith, J; Struck, J; Terry, S; Todhunter, W; Scurry, B and Heys, C** suggested that the Project would add to existing industrial noise pollution experienced in Stockton and other surrounding suburbs.

Response

As required by the EPA, the proposed Project Specific Noise Limits (PSNL) for the Project would be set at 40 dB during the night time. While operating within its proposed noise limits, the noise from the Project would be imperceptible in Stockton or other surrounding suburbs.

20.6.3 Accuracy of Baseline Assessment

Submissions from **Confidential (4); Confidential (5); Confidential (6); Confidential (7) Wright, S; Danuser, D; Davies, B;** claimed that the baseline monitoring for the EIS was completed while the Orica plant was not operational.

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Response

As noted in the Noise and Vibration Assessment within the EIS (refer to **Appendix F**) and within **Chapter 11 Noise & Vibration** of the EIS, the acoustic baseline surrounding the Site was assessed when the Orica site was partially operational. When the Orica site is fully operational, the acoustic baseline in the area would be higher than that assessed in the EIS. Both IPL and the EPA are aware of this situation and have used other noise monitoring data to fully understand the acoustic baseline in Stockton.

20.6.4 Acceptable Noise Limits

Submission from **Lloyd, D; Banyard, R; Davies, B; Calthorpe, J; Craig, K; Greig, J; Kelly, B; Shorland, C; Shorland, I; Richards, T; Smith, M; Confidential (15);** and **Croft, D** raised issues with the suggested noise limits proposed by the EIS.

Response

The submission from the EPA on the Project has suggested appropriate Project Specific Noise Levels. These limits have been accepted by IPL and would be adopted for the operation of the Project. While operating within its proposed noise limits, the noise from the Project would be imperceptible in Stockton or other surrounding suburbs.

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20.6.5 Acoustic Mitigation

Submission from **Wood, R; Wilce, R; and Davies, B** claimed that additional mitigation should be provided by IPL.

Response

Acoustic mitigation has been incorporated into the design of the Project and every effort has been made to reduce the noise levels associated with Project operation. IPL has agreed strict noise limits for the operation of the Project with the EPA to ensure that no adverse noise impacts would affect residential receptors during normal operations. While operating within these proposed noise limits, the noise from the Project would be imperceptible in Stockton or other surrounding suburbs.

20.7 Surface Water and Wastewater

Submissions from **Confidential (14); Banyard, R; Burgess, C; Dillon,-Smith, C; Hollingshed, D; Murray, J; Confidential (10); Calthorpe, J; Cardow, M; Clifton, E; Lloyd, D; McIlwraith, D; McPherson, A; Melville, S; A'Beckett, K; Allan, D; Berry, G; Preece, V and I; Richards, T; Davies, B; Confidential (4); Confidential (5); Confidential (6); Confidential (7); Scurry, B; Parry, L; Morrison; Robertson, B; Taylor, S; Craig, K; Smith, J; Struck, R; Terry, S; Toddhunter, W; Van Oort, E; Witcher, B and Bernie, B; Wright, S; Charles, C; Craig, A; Craig, L; Deacon, V; Hollingshed, D2; Jauden, M; McCauley, T; Thornton, R; Vought, G; Birrell, W; and Confidential (8);** raised concern about the impact of the Project on the Hunter River and the Ramsar wetlands that are located to the north west of the Project Site.

Response

As described in Appendix H of the EIS and in **Appendix B** of this document, the Hunter River is an environment in which a large amount of bio-available nutrients are present. The information that informed the study of the environmental baseline for this assessment came mainly from data collected by Sanderson and Redden (2001); this data was verified during a local water sampling campaign in 2012 and 2013.

Local sampling of the Hunter River confirmed that the quality of the water in the area was heavily influenced by nutrient run-off from up-stream catchments. Effluent water emissions from the Project have been designed to allow for compliance with the objectives of the ANZECC guidelines and therefore, when examined within their local context, the Project would not contribute to a decline in the water quality of the Hunter River.

As described in the EIS within **Chapter 13 Surface Water and Wastewater** and in **Appendix H**, as well as **Chapter 18 Ecology**, the Project would not have an impact on the Ramsar Wetland located to the north of the Site.

Dispersion modelling was undertaken to ensure that the selected location, depth and method for the wastewater outfall on the south arm of the Hunter River would not result in an impact on the internationally important wetlands. The conclusions contained within the EIS have been supplemented with additional sampling and modelling work, (refer to **Appendix B** of this report) which concluded that the waste water streams from the Project would not significantly impact the Hunter River. As such the conclusions of the ecological assessment remain the same; the Project is unlikely to result in a significant impact to the Hunter Estuary Wetlands.

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20.8 Traffic and Transport

The following issues were raised by members of the public under this category.

20.8.1 Existing Congestion in the Area

A number of submissions mentioned existing peak-hour congestion within the local road network. Although this congestion is noted within the EIS (**Chapter 15** and **Appendix J**) it was also mentioned by the following submissions: **Birrell, W; Burgess, C; Cameron, P; Charles, C; Confidential (4); Confidential (5); Confidential (6); Confidential (7); Confidential (8); Craig, A; Craig, K; Craig, L; Danauser, D; Davies, B; Deacon, V; Delaney, R; Grainger, C; Gorst, R and D; Hansen, J; Hollingshed, D2; Jauden, M, Lewis, J; McCauley, T; McLaughlan, A; McQueen, A; Prietto, G; Richards, T; Scurry, B; Thornton, R; Unidentified (2); and Vought, G.**

Response

As stated in the EIS (Pg. 15-1) *“The capacity of a road network is determined using information about the capacity of the intersections. Level Of Service (LOS) is a performance measure used to describe an intersection of mid-block location. LOS ranges are defined as falling between A, which indicates good intersection performance, to F, which indicates saturated conditions with long queues and delays.”*

The submissions state that delay and congestion is already a feature of the area, particularly Cormorant Road. This is reflected in the TIA. The recorded existing LOS for Tourle Street / Cormorant Road is F.

Responsibility for the maintenance and upgrade of road infrastructure in NSW lies with the NSW Roads and Maritime Service (RMS) and the local council. In addition Heron Road and Greenleaf Road (immediately east and west of the Site) are managed by Newcastle Port Corporation.

Cormorant Road is managed by the NSW RMS. As such they are responsible for maintaining an acceptable LOS.

RMS completed work to improve safety along Cormorant Road on 2 July 2011. The work involved carrying out maintenance upgrades along a 1.4 kilometre length of road between the wind generator and Egret Street. The full length of the road was resurfaced and wider shoulders constructed on both sides of the road, the existing Newcastle bound merge lane was extended 200 metres and maintenance carried out to the drains. The upgrade involved widening the road to extend the Newcastle bound merge lane further away from the existing railway level crossing to improve the merge.

RMS is also planning for the duplication of Cormorant Road and Tourle Street in the longer term, however this improvement has not been included in the LOS.

20.8.2 Impact and Mitigation

Submissions were received from a number of authors that raised concerns regarding the impact that the Project would have on the road network in the area. This issue was raised within submissions from the following authors: **Cahill, F; Cousins, P; Harwood, A; Heys, C; Smith, J; Struck, J; and Whitcher, B and Bernie, B.**

20 Public Submissions

Additionally, a number of submissions claimed that the Project makes no attempt to mitigate the impact that it would have on the road infrastructure. Submissions from the following authors make this claim: **Birrell, W; Charles, C; Craig, A; Craig, L; Confidential (4); Confidential (5); Confidential (6); Confidential (7); Confidential (8); Davies, B; Deacon, V; Hollingshed, D2; Jauden, M; McCauley, T; Thornton, R; and Vought, G.**

The submission from **Harwood, A** questions the claims within the EIS that there will be no change to the Level Of Service as a result of the Project.

Response

The assessment scope for the Project is set by the requirements of the Director General (DGRs). This document is compiled by NSW DP&I with input from other government agencies. It outlines the parameters of the assessment and key areas of focus. The DGRs for the Project (refer to **Appendix A DGRs** or the EIS) state that there should be no change in the Level Of Service (LOS) on any of the roads affected by the Project.

As outlined above (refer to **Section 20.8.1**) and in the EIS (**Chapter 15** and **Appendix J**) the Project is proposed in an area that is subject to peak hour congestion. Mitigation measures were proposed as part of the Project to help reduce the impact of the Project on the existing infrastructure. Namely:

- During the construction phase of the Project, most construction staff would travel to and from the Site using a park and ride scheme, run by IPL specifically for the Project; and
- Project components would be delivered to the Site by sea to avoid the need to transport them by road.

These mitigation measures are listed in **Chapter 22 Management and Mitigation Measures** of the EIS and would be likely to feature in the conditions of consent for the Project should it gain approval. While the Project would add vehicles to an already congested road network, particularly during construction, mitigation measures would ensure that there would be no change to the LOS on any of the roads in the area due to the Project.

The findings of the EIS were peer reviewed by an independent third party before being assessed by DP&I and RMS. RMS accepted the level of assessment and mitigation proposed for the Project and have no issues provided Traffic Management Plans are submitted and approved prior to construction.

20.8.3 Transport of Materials

The submission from **Confidential (14)** questioned the need to transport AN by road, instead suggesting that the 'materials' be transported rather than AN.

Response

By "the materials" it is assumed that the submission is referring to the raw materials that are needed for the production of AN. One of the key materials that would have to be transported is ammonia. Ammonia presents a much greater environmental risk than that presented by TGAN or ANSOL and it must be stored and transported in a climate controlled environment. Transporting the materials instead of the product to consumers would involve locating the Project in an alternative location. An assessment of alternative locations can be found in **Chapter 2 Project Need and Alternatives** of the EIS and in **Section 20.1.3** of this document.

20 Public Submissions

20.8.4 Traffic Studies

The submission from **Croft, D** asked, *“What traffic studies have been conducted, especially along Cormorant Drive and the New England Highway, to ascertain the amount to traffic and the possibility of major accidents?”*.

Response

As part of the EIS process, a number of specialist studies were completed, independently reviewed and deemed adequate by the relevant government authority. Amongst these, a Transport Impact Assessment (TIA) was conducted to assess the existing and future LOS along the routes likely to be impacted by the Project. A Transport Risk Assessment (TRA) was also conducted to assess the possibility of a major accident.

The TRA can be located in Appendix D of the EIS, the TIA can be located in **Appendix J** of the EIS.

20.8.5 Emergency Procedures

The submission from **Confidential (11)** stated that, *“Increased traffic on and off the island has not been adequately addressed by the EIS nor is there an emergency management plan in place to deal with the closing of the one road into and out of Stockton if there was an emergency caused by gas leak and/or explosion. This is an unacceptable risk that has not been addressed.”*.

Response

As discussed above (refer to **Section 20.8.2** and **Section 20.8.4**), the traffic impacts associated with the Project have been adequately assessed within the EIS.

As discussed in **Section 10.3** of this document, an emergency response plan is being developed in consultation with other key stakeholders in the area.

20.8.6 Rail Transport of TGAN

The submission from **Banyard, R** stated: *“this development would seem not to have taken advantage of using the rail for product dispatch. This omission is of real concern.”*

Response

There is a redundant rail spur on the west side of the IPL site. The use of this rail spur for despatch of product from the Project would be impracticable due to the layout of the existing facilities and fertiliser operations on the west side of the Site.

TGAN is delivered by bulk road tippers to many Hunter Valley customers on the mine bench. These blast site locations are remote from existing rail infrastructure and a fleet of trucks would be needed to transport the product to the mine bench. This double handling of TGAN would be inefficient and not cost competitive.

Similarly, hot liquid ANSOL product is despatched from the Site in unheated road tankers to be transported to the IPL facility at Warkworth. Again the plant is remote from existing rail infrastructure and would require double handling with trucks. In addition, any significant delays during transport would also see the product start to solidify and create operational issues.

20 Public Submissions

20.8.7 Cumulative Traffic Assessment

The submission from **Johnson, K** suggested that the EIS had not considered two large residential developments in the Fullerton Cove area or expansion plans of the airport and the associated traffic impacts on the existing congestion.

Response

The TIA adopted a conservative approach in modelling for growth in traffic volumes in the area; growth was modelled at 2.5% year on year, higher than historical growth levels and higher than is predicted as the area over the coming years.

The Cumulative Effect Assessment (CEA) contained within the EIS in **Chapter 22 Cumulative Effects** is a receptor led assessment. In order to have a cumulative effect, a receptor must experience an impact from more than one project or more than one aspect of the same project. Effects from other projects are included based on the findings of their environmental assessment.

A residential development was approved under Part 3A for Seaside Boulevard, Fern Bay, in 2010. The development proposed 411 lots comprising: 370 residential lots, 38 super lots (for future residential purposes), 2 commercial lots and 1 community lot. As part of the Part 3A determination for this residential development, a TIA was conducted. The TIA calculates the impact of the development when fully constructed.

The Site is operated by Metricon with the intention of selling lots within the development off the plan. Each lot would be developed once a buyer is identified. This method of building reduces the impact of the construction as only a limited number of lots would be built at any given time. A separate approval would be required for each lot within the development.

The peak impact of the Project would come the 24 months after Project approval by the IPL Board, during the construction stage. The probability of the peak traffic impact from the Project creating a cumulative effect alongside the Fern Bay development at Seaside Boulevard is minimal as it would take more than 24 months for the development to reach the capacity described in the project TIA. This project has therefore been excluded from the cumulative TIA.

Expansion plans for the RAAF base at Williamstown (Newcastle Airport) have also been excluded from the cumulative assessment as no development approval for expansion has been achieved for the site.

20.9 Socio-Economics

The following issues were raised by members of the public under this category.

20.9.1 Impact on House Prices

Numerous submissions raised concerns regarding the impact that the Project may have on the price of houses in Stockton and the other suburbs surrounding the Project. Many of these submissions also asked who would take responsibility for any reduction in house prices. This issue was raised by the following submission authors: **A'Beckett, K; Banyard, R; Bellingham, K; Bellingham, S; Charles, C; Confidential (4); Confidential (5); Confidential (6); Confidential (7); Confidential (8); Craig, K; Craig, L; Davies, B; Deacon, V; Hancock, J and R; Kelly, B; Hollingshed, D; Hollingshed, D2; Kurtze, M and A; Lloyd, D; McCauley, T; McIlwraith, D2; McIlwraith, R; Melville, S; Preece, V and I; Prietto, G; Richards, T; Scurry, B; Shorland, C; Shorland, I; Struck, R; Thornton, R; Todhunter, W; Whitcher, B and Bernie, B; Vought, G; and Wright, S.**

20 Public Submissions

Response

Property prices in any area are governed by a number of factors. While public perception of the area is undoubtedly one of these factors it is only one of the many complicated interactions that drive the market-set prices of housing stock.

There has been industry on Kooragang Island for over 50 years; the industry in the area, and the residents of the area, have developed together over this time. Stockton is a desirable suburb with a diverse range of housing stock and an active community. House prices in the suburb are varied and reflect the diversity of housing stock.

Increased in demand for housing, following the arrival of new worker families in the area, could lead to an increase in housing value.

The cyclical nature of market economics leads to periodic inflations and deflations in housing prices across the country. This mechanism and the local house prices that it has an impact on, was not materially affected by the recent environmental incidents in the area. It is therefore unlikely that, should the Project be built, the house prices in the area would be affected by the Project.

20.9.2 New Families

Some submissions suggested that new families would be disinclined to move to the area thanks to the stigma attached to living in close proximity to the Project. This issue was raised by the following submission authors: **Charles, C; Craig, K; Craig, L; Deacon, V; Davies, B; Confidential (4); Confidential (5); Confidential (6); Confidential (7); Confidential (8); Hollingshed, D2; McCauley, T; Thornton, R; and Vought G.**

Response

As noted above, there are a number of reasons why families would choose to move to a given area. There has been industry on Kooragang Island for over 50 years, the industry in the area and the traditionally industrial workers of the area have developed together over this time. **Section 13.5** of this document outlines why new families may be drawn to the area as a result of the Project.

20.9.3 Impact on the Local Economy

Submissions from some authors raised concerns that the economic stimulus through job creation did not justify the increased risk that the Project could bring to the area. The submissions state: *"Incitec's plant will employ just 60 people, many of whom will be transfers from the company's Moranbah ammonium nitrate plant. Considering the risk and impacts the plant brings to tens of thousands of people, 60 jobs are not commensurate with the more obvious and insidious impacts the plant will bring."*

Submissions from the following authors raised this point: **Banyard, R; Birrell, W; Witcher, B and Bernie, B; Cahill, F; Charles, C; Confidential (4); Confidential (5); Confidential (6); Confidential (7); Confidential (8); Craig, A; Craig, K; Craig, L; Davies, B; Deacon, V; Hansen, J; Hollinshead, D2; Jauden, M; McCauley, T; Thornton, R; and Vought, G.**

The submission from **Charlton, M** stated that the area does not need the jobs that would be created by the Project.

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Response

The 2011 census revealed that Newcastle currently has an unemployment rate of 5.3%.

During construction, as many as 350 workers would be employed on the Project Site. Many of these workers would be transient, providing trade for a number of local businesses (e.g. local guesthouses and hotels).

Sixty (60) jobs would be created once the Project is operational. Whilst this has been labelled as insignificant by some submission authors, the economic impact of the Project would also be felt on a regional and State-wide level.

Regionally the local economy would benefit as new employees and their families brought to the area by the Project buy produce in local shops and support local businesses. Increased demand for local housing has the potential to raise the price of existing housing in the area through increased demand pressure.

On a State-wide level, the reliability of AN supply to the mines in the Hunter Valley would ensure that jobs reliant on this industry are secure and competitive.

The socio-economic impact of the Project has been assessed within **Chapter 21 Socio-Economics** of the EIS.

20.9.4 Import of Prefabricated Modules

The submission from **McIlwraith, D** suggested that importing prefabricated modules to the Project Site would reduce the socio-economic impact on the region as much of the construction can take place overseas. *"The plant is to be built in China and shipped here so no benefit to the Australian workers there."*

Response

Australian based companies, as well as overseas companies, would be invited to tender for the prefabricated modules. Some of the modules may be constructed in Australia then transported to Site.

During construction, the Project would import prefabricated modules into the Port of Newcastle. These would then be transferred to barges and transported to the Project Site via the CTB Wharf on the east foreshore of Kooragang Island.

Although this method does reduce the amount of construction that takes place on the Site and therefore, arguably, the level of beneficial impact that the Project has on the local economy, the import of prefabricated modules drastically reduces the impact of the Project construction on the local roads. The Project would still employ up to 350 construction works at its peak resulting in a total contribution to the Gross Regional Product of Newcastle LGA during the construction phase of approximately \$345 million.

Project impact on local roads is a key issue for local stakeholders. This is evidenced by the number of times that this issue has been raised during the exhibition process.

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20.10 Other Issues

The following issues were raised by members of the public under this category.

20.10.1 Cumulative Impact

Submission from a number of authors posed questions regarding the methodology of assessing the cumulative impact of the Project alongside other industrial developments in the Newcastle area.

Submissions raising this issue were received from the following authors: **Burgess, C; Confidential (4); Confidential (5); Confidential (6); Confidential (7); Confidential (12); Grainger, C; Grieg, J; Harwood, A; Moran, S; Shorland, C; and Shorland, I.**

Response

The EIS for the Project contained Cumulative Effects Assessments (CEAs) (refer to **Chapter 22 Cumulative Effects** of the EIS) for a number of technical studies. These CEAs assessed the potential cumulative impacts of the Project alongside other relevant developments.

As stated in the EIS, CEA is a receptor led assessment, i.e. in order to have a cumulative effect, two projects or impacts need to affect the same receptor.

Cumulative effects can be caused by past, present or reasonably foreseeable actions acting with a project. Past actions result from existing projects that have been commissioned and are usually operational. The impacts resulting from these projects already form part of the environmental baseline for each of the technical studies against which the impacts of the Project are assessed (i.e. the air quality impacts of an operational project are already accounted for within existing air quality monitoring data). Therefore these actions/projects are not considered within the CEA as they have already been considered when assessing the Project alone.

CEA only considers cumulative projects or actions that have been approved but are not yet operational (i.e. 'present' actions), or for which there is sufficient detail prior to approval for a robust assessment to be made (e.g. if a project has produced an EIS for Exhibition) (i.e. 'future' actions). Equally, in order to be included in the cumulative assessment, a project must have a high probability of occurring during the same period of time as the construction or operation as the Project. Relevant projects that may have a cumulative impact with this Project were identified using the following assessment parameters:

- Spatial parameter – The spatial parameter will depend on the characteristics of the environmental impact and the likely distance that any residual impact would travel. For example an air quality impact would potentially affect a wider area than a noise impact and would therefore affect different human or environmental receptors in different ways.
- Temporal parameter- Projects that are on exhibition, have completed exhibition but are not yet determined, have gained development approval, or have gained development approval but are not yet operational have been considered. Projects that are operational have been considered as part of the baseline for the assessment. Projects that are not on exhibition do not contain enough detail on residual effects or final design to be included in a robust cumulative assessment. Projects that are not yet on exhibition would be required to conduct a cumulative assessment as part of their EIS.

20 Public Submissions

In order to identify relevant projects that are proposed in the vicinity of the Site, two databases were reviewed:

- Major Project Assessments register on the NSW DP&I website; and
- Public notices and invitations to comment register on SEWPaC's website.

A review of these databases was considered the most effective way of identifying future projects that are likely to have significant residual impacts, and therefore may have a cumulative effect with this Project.

In order to assess the cumulative impacts of other projects alongside the Project, the findings of third parties must be relied upon as it would be unreasonable to expect a single proponent to independently assess every development in the area.

Under these parameters CEAs were completed for the following environmental aspects: Hazards & Risks, Air Quality, Noise & Vibration, Traffic & Transport and Visual (refer to **Chapter 22 Cumulative Effects** of the EIS). These assessments concluded that the Project is unlikely to result in significant adverse cumulative effects.

The CEA that formed part of the EIS was judged by the NSW DP&I to have responded to the Director General's directive regarding cumulative effects in the DGRs.

20.10.2 Social Impact Analysis

The submission from **Harwood, A**, *"support[s] the conducting of a comprehensive and effective Social and Health Impact Assessment as a matter of priority before the determination of this DA"*.

Response

The assessment requirements of an EIS are set by Schedule 2 of the *Environmental Planning and Assessment Regulations 2000*. The NSW DP&I set the assessment requirements, initially through the issue of the Director General's Requirements, additional information can be requested in writing before determination. A comprehensive and effective Social and Health Impact Assessment was not included in the DGRs for the Project and was therefore not specifically included.

The EIS includes a comprehensive study of the socio-economic impact of the Project (**Chapter 21 Socio-Economics** of the EIS). Potential for health impacts through deterioration of air quality as a result of the Project are also assessed within the EIS in Appendix E Air Quality and summarised in **Chapter 10 Air Quality**). A cumulative assessment is included in the EIS. This is discussed in **Section 20.10.1** of this document.

20.10.3 The Environmental and Safety Record of IPL

Submissions from **Craig, K; Leka, N; Moran, S; Ross, P** and **Yudaeff, L** raised concerns regarding IPL's environmental record. **Leka, N** stated: *"The safety record of both firms [IPL and Orica] does not inspire confidence, and their responses have typically been to downplay them [environmental incidents]. For instance IPL's response to the Stockton Community Action Group's criticism of its poor safety record by citing an EPA notice of March 2012 was to assert that the "infringement related to the tracking of mud onto Heron Road" rather than firstly, acknowledge its occurrence, and secondly, explain to the public why the EPA regarded it as serious enough to warrant an infringement notice."*

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Response

Incitec Pivot Limited is an international chemical manufacturer supplying agricultural fertilizers, industrial chemicals and commercial explosives to Australian and international markets. IPL operates over 25 major industrial chemical manufacturing sites internationally and employs over 5,000 people in over 18 countries.

The operations of the IPL Group are subject to environmental regulation under the jurisdiction of the countries in which those operations are conducted including, Australia, United States of America, Mexico, Canada, Indonesia, Papua New Guinea and Turkey.

The environmental laws and regulations generally address the potential aspects and impacts of the Group's activities in relation to, among other things, air and noise quality, soil, water, biodiversity and wildlife.

The Group operates under a Global Health, Safety and Environment Management System which sets out guidelines on the Group's approach to environmental management, including a requirement for sites to undertake an Environmental Site Assessment.

In certain jurisdictions, the Group will hold licences for some of its operations and activities from the relevant environmental regulator. The Group measures its compliance with such licences and reports statutory non-compliances as required.

The Group categorises its environmental incidents using four categories:

- Category 1 – Insignificant or minor
- Category 2 – Moderate
- Category 3 – Major
- Category 4 – Catastrophic

During the 2011/12 financial year, there were no major or catastrophic incidents. However, there were 13 Category 2 environmental licence non-compliances and 14 Category 2 losses of containment.

In relation to these terms:

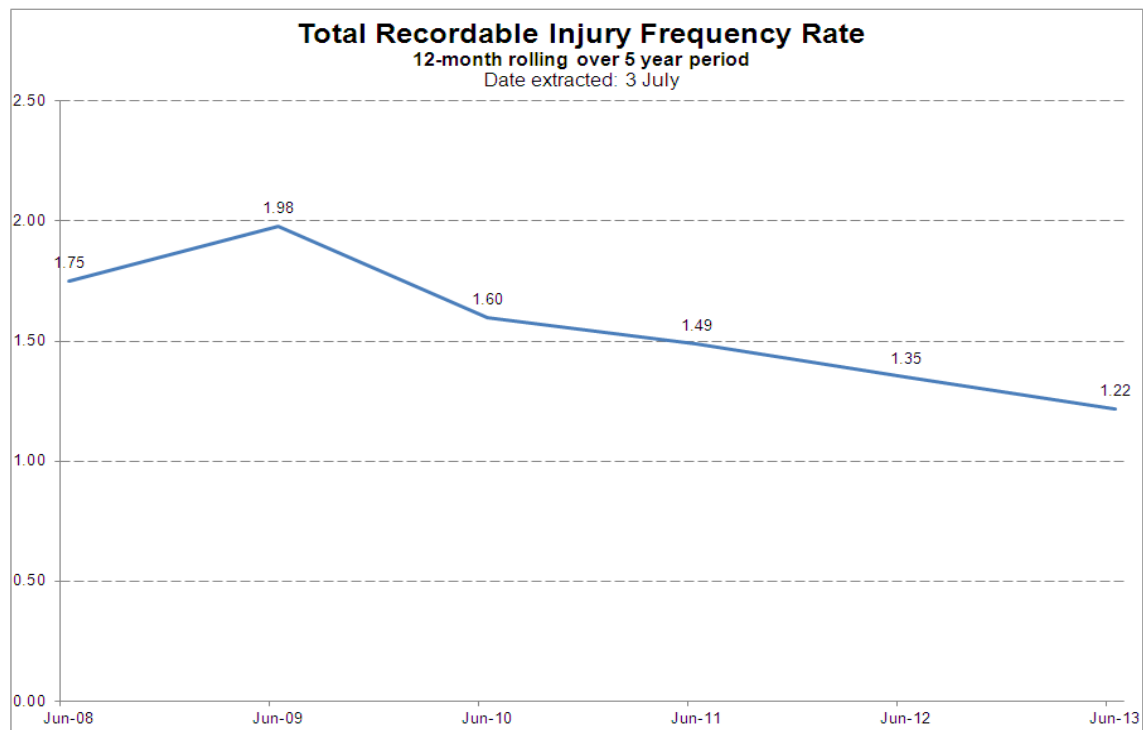
- a Category 2 environmental licence non-compliance is a moderate excursion outside statutory discharge or emission limits as set out in the relevant licence and as measured in a scheduled test; and
- a Category 2 loss of containment is an incident where there is an unplanned release or spill on a site of material from a vessel, tank, pipe pump, container or package in which it was designed to be contained and such incident causes moderate injury or damage, impacts the environment or causes concern in the surrounding community.

The aggregate value of fines paid by the Group for the incidents for the financial year amounted to approximately \$60,000.

IPL is committed to high standards of health and safety performance. Personnel injury and illness performance within IPL is measured by a lag indicator of Total Recordable Injury Frequency Rate (TRIFR – based on 200,000 hours). The rolling 12 month TRIFR for the last 5 years is shown in **Figure 20-1** below.

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Figure 20-1 IPL Total Recordable Injury Frequency Rate



The TRIFR performance (based on 1,000,000 hours) for 2011 and 2012 of IPL and other ASX 200 companies is shown in **Figure 20-2** below²⁰.

In 2011, 72 companies from the chemicals and plastics industry participated in a survey for the PACIA 2011 Health and Safety Performance Report. The average TRIFR²¹ in the industry was 2.9 (200,000 hours) compared to an equivalent rate of 0.9 for IPL (excludes restricted work cases).

In summary the IPL safety performance has improved each year for the last four years and is 70 % better than the average for the Australian chemicals and plastics industry.

Annually, the Company publishes a Sustainability Report which is available on its website at www.incitecpivot.com.au. The Report provides details of the Group's health, safety, environment and community management, performance and initiatives.

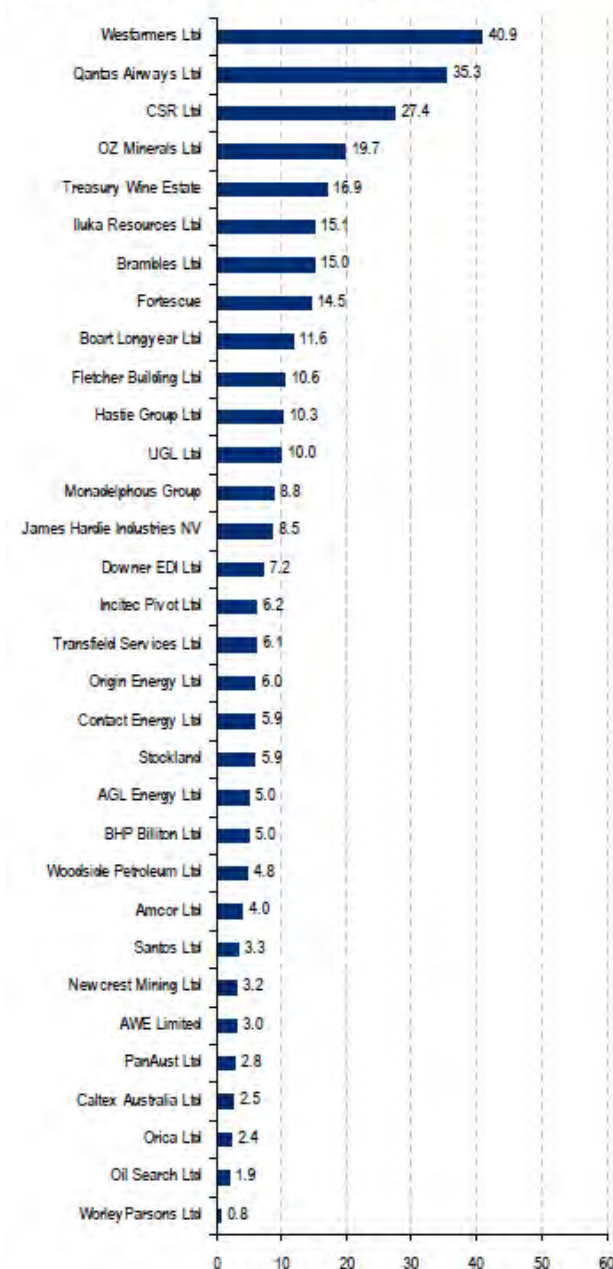
²⁰ Source: ASX Data, Citi Research 2013

²¹ PACIA TRIFR = LTIFR + MTIFR, IPL TRIFR normally includes restricted work cases.

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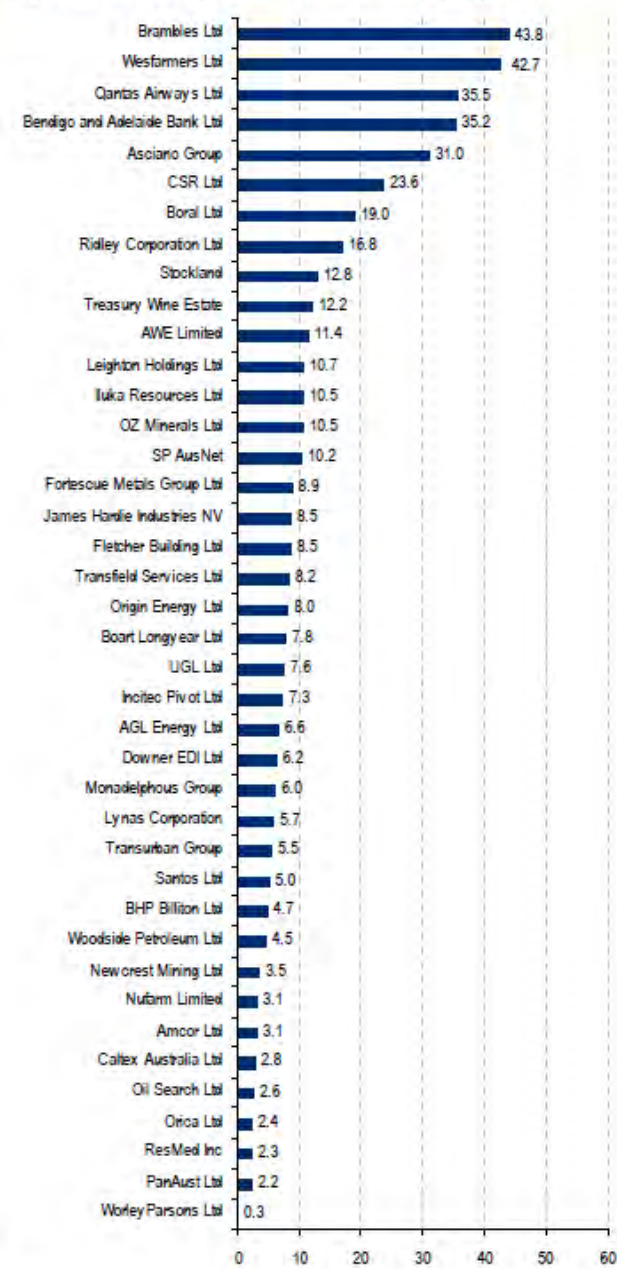
Figure 20-2 Total Recordable Injury Frequency Rate Company Comparison

Figure 10. TRIFR 2011, Per Million Hours Worked, by Company



Source: Company data, Citi Research.

Figure 11. TRIFR 2012, Per Million Hours Worked, by Company



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In the last 12 months, IPL's operations on Kooragang Island have received one penalty notice from the EPA for \$1,500. This notice was in relation to the tracking of material from vehicles leaving the Site and travelling along Heron Road and likely to be washed into stormwater and potentially cause water pollution. IPL investigated the incident to identify root causes, and corrective actions have been implemented to minimise the risk of it occurring again.

In addition, the current operations on the Project Site have been inspected or audited by the EPA on a number of occasions since October 2011. These inspections/audits identified a number of issues which are being addressed through the implementation of Pollution Reduction Plans, agreed between IPL and the EPA. These improvements would continue to reduce the existing pollution in the area following Project approval.

The NSW government significantly increased enforcement of environmental protection regulatory compliance in 2011/12. The EPA/OEH issued 1,663 penalty notices in 2011/12, resulting in total fines of \$1,022,465. In addition, EPA/OEH commenced 140 prosecutions during 2011/12.²²

20.10.4 Off-Site Impacts

The submission from **Banyard, R** stated that the EIS does not fully explain how off-site impacts of the Project would be managed.

Response

Off-site impacts from the Project have been managed as follows:

- impacts have been avoided by design; and
- residual impacts would be managed using the management and mitigation measures outlined in **Chapter 23 Management and Mitigation Measures** of the EIS.

Impacts from the Project that remain after management and mitigation measures have been implemented are outlined within the EIS.

20.10.5 Flora and Fauna (Ecology)

The impact of the Project on the local ecology was raised in submissions from three people. Submissions from **Bellingham, J**; **Charles, C**; **Cousins, P**; **Deacon, V**; **Lewis, J**; and **McCauley, T** made general statements about the impact of the Project on local ecology and native species.

The submission from **Berry, G** suggested that the cost of depleting natural resources has not been included in the EIS.

Response

The impact of the Project on the ecology of the area was assessed and reported within **Chapter 18 Ecology** of the EIS. The study concluded that there would be no significant ecological impact on any native or introduced species.

During construction, potential impacts on ecology would be managed through a series of management plans:

- a flora management plan;
- a fauna management plan;

²² Department of Premier and Cabinet Annual Report 2011-12.

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- a weed and pest management plan; and
- a mosquito management plan.

These plans would be incorporated into the Construction Environment Management Plan. It would be the responsibility of the Construction Manager to ensure that the provisions of these plans are enacted throughout the construction phase.

Section 7.13 of this document describes additional ecological mitigation that would be incorporated into the Project to ensure that any minor loss of native trees is replaced on Site to enhance the existing local ecological resource.

20.10.6 Licences

Two authors submitted letters that raised issues regarding the licencing of the Project. **Confidential (11)** stated that the penalties imposed for breaches of the current licencing are too low to act as a deterrent; **Taylor, S** suggested that the Project should be subject to a one strike rule: *“If they [IPL] break any of the licences then the plant will be permanently decommissioned and the land returned to its natural state and gifted to the people of Newcastle as a park.”*

Response

IPL is not responsible for setting either the licence conditions nor the penalties for breach of licence conditions. These responsibilities rest with relevant government agencies.

20.10.7 Health Impacts

Submissions from **Dillon-Smith, C**; **Richards, C** and **Unidentified** raised concerns about health impacts as a result of the Project. **Dillon-Smith, C** stated that instances of asthma and cancer would increase while **Unidentified** is concerned about stress within the community.

Response

The air quality assessment conducted as part of the EIS (refer to **Chapter 10 Air Quality** of the EIS), outlines the anticipated air quality impacts from the Project and concludes that they fall within acceptable limits which reflect the protection of health and public amenity.

The issue of community health is an important one. It is an issue that has been recognised by NSW Health (refer to **Section 10.4** of this document) and an issue that IPL recognises. IPL is involved in an ongoing community consultation process to address specific community concerns and ease the possibility of stress as a result of the Project. IPL continues to engage with members of the public regarding the Project and provide information that will help resolve any health concerns.

Petition

A petition was received by NSW DP&I. The petition states:

“We the undersigned wish to express our objection to the proposed location by Incitec of another ammonium nitrate plant on Kooragang Island in close proximity to Stockton, Mayfield and Newcastle communities. We believe that it is totally inappropriate to locate such a plant in such close proximity to highly populated areas and adjacent to an existing ammonium nitrate plant. The cumulative explosive risk from the production of material for the explosive industry is not acceptable to the community. The plant would also increase the release of pollutants including nitrous oxide, nitrogen dioxide and dangerous small particles (PM_{2.5} and PM₁₀) which will result in increased health issues in the community. We call upon this project to be rejected.”

The petition attracted 12 signatures, these people are listed below:

1. Trudi Wayne
2. Angela McPherson
3. Shai Pritchard
4. Skye Morrison
5. Richard Mch
6. Jared Murray
7. Megan Stephenson
8. Natasha Whyte
9. Rebecca Fool
10. Partha Saha
11. Laura Miller
12. Bradley McPherson

Response

The petition raises several general issues relating to explosive risk, as well as emissions release and related potential health impacts. These issues have been addressed in responses to submissions discussed above. Specifically, responses to these issues can be found at:

- Explosive risk – refer to **Sections 13.1, 14.1 and 19.2** of this report; and
- Emissions release and associated health risks – refer to **Sections 13.2, 14.2, and 19.2** of this report.

Revised Management and Mitigation Measures

22.1 Introduction

The majority of the management and mitigation measures detailed with Section 23.2 of the EIS remain relevant to the Project. The following Section outlines where certain measures have been revised and where additional measures have been agreed following exhibition of the EIS. This is in response to the above submissions.

22.2 Revised Commitments

The following measures have been revised following the receipt of a number of submissions. **Table 22-1** outlines the original wording of the commitments, and **Table 22-2** provides the revised commitments. The proposed amendments in **Table 22-2** are shown in bold.

Table 22-1 Original Measures to be Replaced

Mitigation Measure and Commitment		Implementation of mitigation measures		
		Design	Construction	Operation
E8	If Acid Sulfate Soils (ASS) are encountered during construction, an ASS Management Plan would be prepared in accordance with the ASS Manual (ASS Management Advisory Committee 1998).		✓	
E11	Dewatering works would be appropriately licensed and carried out by suitably trained personnel.		✓	
G2	The TMP for the construction phase would include details of the construction personnel park and ride service. Details would include drop off and pick up locations and timings, as well as identification of an appropriate 'parking' location.		✓	

Table 22-2 Replacement Measures

Mitigation Measure and Commitment		Implementation of mitigation measures		
		Design	Construction	Operation
E8	An Acid Sulfate Soil Management Plan would be developed prior to construction; the ASS Management Plan would be prepared in accordance with the ASS Manual (ASS Management Advisory Committee 1998).		✓	
E11	Dewatering works would be appropriately licensed and carried out by suitably trained personnel. Additionally, monitoring will be undertaken at the following wells on the Project site: MW55, MW53, MW21/21A and BP6 (as identified in Orica's 2008 EMP) subject to approval by Orica.		✓	
G2	The TMP for the construction phase would include details of the construction personnel park and ride service. Details would include drop off and pick up locations and timings, as well as identification of an appropriate 'parking' location. The TMP would also stipulate that vehicular access to /from the site, particularly for heavy vehicles and in the AM peak periods, should be via the on-load and off-load ramps on Teal Street to /from Greenleaf Road.		✓	

22 Revised Management and Mitigation Measures

22.3 Additional Commitments

Eight additional measures are proposed following receipt of the submissions. These are presented in **Table 21-3** below.

Table 22-3 Additional Management and Mitigation Measures

Mitigation Measure and Commitment		Implementation of mitigation measures		
		Design	Construction	Operation
A7	Community consultation would be maintained throughout the design, construction and operation phase of the Project.	✓	✓	✓
B19	IPL would consult with Major Hazard Facilities Unit of NSW WorkCover at the commencement of detailed design of the Project.	✓		
B20	IPL would consult with Workcover at least six months prior to the commencement of construction (except for construction of those preliminary works that are outside the scope of the pre-construction hazard studies), to prepare a programme for updating the Safety Case to incorporate the changes associated with the Project.	✓		
B21	The storage of AN in Shed 4 would be upgraded to comply with SAFEX recommended separation distances as part of the Project.			✓
D14	The Project would operate within the acoustic limits recommended by the EPA. These operational limits are 41 dB (A) during the day and evening and 40 dB (A) during the night when measured from Stockton. These limits would apply at all times except under certain meteorological conditions, as agreed with the EPA.			✓
E20	All dewatered groundwater would be managed in accordance with the provisions of the PoEO Act and only reinjected if it is of equal or better quality than the receiving environment.		✓	
F11	IPL would capture and reuse stormwater for the toilets on Site, where possible.			✓
J6	All native and non-native trees that would be lost as a result of the new entrance off Greenleaf Road would be replaced with suitable native tree species where the line of trees and shrubs bordering Greenleaf Road includes gaps to the north of the Kooragang Island Bicycle Club Shed. Suitable replacement trees would be recommended by a suitably experienced and qualified ecologist.		✓	

References

ARTC (2013) *2013-2022 Hunter Valley Corridor Capacity Strategy*

Department of Planning (1992) *Newcastle Kooragang Island Area Risk Assessment Study* Newcastle City Council (2012) *Development Control Plan*

Department of Planning and Infrastructure (2012) *Major Project listing*
http://majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=4986

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International Energy Agency (2012) *2012 Factsheet*
<http://www.iea.org/newsroomandevents/news/2012/december/name,34467,en.html> (Accessed March 2012)

Newcastle City Council (2012) *Development Control Plan: Traffic, Parking and Access*

Newcastle Ports Corporation (2013) *Draft Strategic Development Plan for Port of Newcastle*

Newcastle Ports Corporation (2013a) *Newcastle Port News – August/September 2013*

Realestate.com.au Stockton Property trends
<http://www.rs.realestate.com.au/cgi-bin/rsearch?a=sp&s=nsw&u=stockton> (Accessed March 2013)

URS (2012) *Proposed Ammonium Nitrate Facility Environmental Impact Statement*

Limitations

URS Australia Pty Ltd (URS) has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Incitec Pivot Limited and only those third parties who have been authorised in writing by URS to rely on this 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 contract dated 3 October 2011.

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Appendix A Summary of Submissions

Appendix A - Summary of Submissions

Statutory Submissions		
Author	Comment	Section Addressed
Department of Primary Industries (Office of Water)	Soil and Groundwater: NOW have highlighted that any activity that is likely to intercept groundwater would require a licence under Part 5 of the Water Act 1912. This requirement has been included as a potential condition of consent.	Section 11.3
Department of Primary Industries (Office of Water)	Soil and Groundwater: NOW request that groundwater monitoring during dewatering include wells WM55, MW53, MW21/21A and BP6.	Section 11.1
Department of Primary Industries (Office of Water)	Soil and Groundwater: NOW request that groundwater reinjection be conducted in accordance with the PoEO Act.	Section 11.2
Department of Primary Industries (Office of Water)	Surface Water and Wastewater: NOW request that a Site Water Management Plan be developed.	Section 11.4
Newcastle City Council	Statutory Planning: The Council state that the proposed use is consistent with the city wide strategies adopted in the Newcastle Urban Strategy.	Section 7
Newcastle City Council	Statutory Planning: The submission states that a Section 94 payment should be attached to any consent issued by the Minister.	Section 7.5
Newcastle City Council	Ecology: The council recommend that the rehabilitation and replanting of the Site compensate for the loss of vegetation from the site.	Section 7.13
Newcastle City Council	Heritage: The Council have highlighted some slight confusion regarding a heritage items close to the site, despite this, the findings of the heritage assessment are supported.	Section 7.4
Newcastle City Council	Visual: The submission from the council claims that the visual assessment is not complete and that further assessment is required, particularly visual impacts to the eastern arm of the Hunter River and Stockton foreshore.	Section 7.12
Newcastle City Council	Hazard and Risk: The council have requested more justification of the EIS' claim that the recommendations of the <i>Newcastle and Kooragang Island Risk Assessment Study</i> are not relevant to the Project.	Section 7.6
Newcastle City Council	Project Description: the Council have requested clarification on the proposed use of Shed 5.	Section 7.1

Statutory Submissions		
Author	Comment	Section Addressed
Newcastle City Council	Project Description: The Council have indicated that they consider the alteration to the Chemtrans site to require significant changes and have noted that the EIS does not contain information on the detailed design and an environmental assessment of the proposed modification. They have also noted that the EIS is silent on the planning framework being relied upon for this transition.	Section 7.2
Newcastle City Council	Traffic and Transport The submission from the council claims that the EIS has not made an adequate assessment of the car parking requirements of the Project.	Section 7.10
Newcastle City Council	Soil and Groundwater: The submission from the Council claims that the Site is identified as having Class 2 Acid Sulfate Soils. The Council have requested that any works that would cause the water table to be lowered would require an ASS management plan to be submitted. Further the Council have suggested that the EIS' suggestion to prepare an ASS MP when ASS is encountered is not satisfactory.	Section 7.11
Newcastle City Council	Stormwater: The Council indicated that to be in accordance with the Newcastle DCP 2012, rainwater harvesting must be used on site and used for all toilet flushing. It is also indicated that stormwater be used in the industrial process rather than relying on mains water.	Section 7.7
Newcastle City Council	Surface Water and Wastewater: The Council have indicated that the EIS flood report is satisfactory.	Section 7.8
Newcastle City Council	Water Quality: The submission from the Council has indicated that the Project should not contribute to the decline in water quality in the Hunter River.	Section 7.9
Newcastle Port Corporation	Support: NPC are generally supportive of the Project but they request that IPL enter into a commercial contract with NPC to ensure that infrastructure is maintained adequately.	Section 6.1
NSW Health	Land Use: The submission states that future developments must be considered for odour, noise and vibration issues to ensure that the population is protected.	Section 10.1
NSW Health	Hazard and Risk: The submission states that Emergency Management Plan should take an All Hazards Approach and carefully analyse the model and impact of all hazards.	Section 10.3
NSW Health	Consultation: The submission states that the community perception of this project is important and that effective community consultation is important.	Section 10.4
NSW Health	Water: The council submission states that all water cooling and warming must be in line with current guidelines to prevent the growth of Legionaries disease.	Section 10.2

Appendix A - Summary of Submissions

Statutory Submissions		
Author	Comment	Section Addressed
RMS (Roads)	No objection provided a Traffic Management Plan is prepared and available for RMS review.	Section 4.2
RMS (Roads)	Traffic and Transport: Vehicular access to /from the site, particularly for heavy vehicles and in the AM peak periods, should be via the on-load and off-load ramps on Teal Street to /from Greenleaf Road. This route will minimise impacts of the development both during the construction and operational phases on the operation of the Cormorant Road/ Teal Street roundabout.	Section 4.2
WorkCover	Hazard and Risk: At the time of commencement of detailed design, the proponent must consult with the Major Hazard Facilities Unit of WorkCover and address any matters raised to the satisfaction of WorkCover.	Section 9.1
WorkCover	Hazard and Risk: Not less than 6 months prior to the commencement of construction, the proponent must consult with the Major Hazard Facilities Unit at WorkCover and prepare a program to the satisfaction of WorkCover for updating the safety case to incorporate the changes associated with the Proposal.	Section 9.2

Special Interest Group Submissions		
Author	Comment	Section Addressed
Correct Planning and Consultation for Mayfield Group	Air Quality: The submission states that the Project would add to the deteriorating levels of coal dust, diesel particulates and nitrous oxides.	Section 14.2.2
Correct Planning and Consultation for Mayfield Group	Cumulative Air Quality: The submission states that the Project would add to the emissions from PWCS.	Section 14.2.2
Correct Planning and Consultation for Mayfield Group	Hazard and Risk: The submission claims that the 'blast contours' do not correlate with information from the incident in Toulouse in 2001.	Section 14.1.1
Correct Planning and Consultation for Mayfield Group	Cumulative Risk: The submission claims that the EIS does not adequately address the concerns regarding the combined storage of AN at the Incitec Pivot and Orica Sites.	Section 14.1.1

Special Interest Group Submissions		
Author	Comment	Section Addressed
Correct Planning and Consultation for Mayfield Group	Noise and Vibration: The submission claims that 'industry' cannot be trusted because of the current night-time acoustic exceedance on Kooragang Island.	Section 14.3.1
Correct Planning and Consultation for Mayfield Group	Noise and Vibration: The submission claims that the baseline monitoring for the EIS was completed while the Orica plant was not operational.	Section 14.3.2
Correct Planning and Consultation for Mayfield Group	Consultation: The submission claims that the consultation effort for the Project has been inadequate.	Section 14.4
Correct Planning and Consultation for Mayfield Group	Consultation: The submission claims that the two year delay to the Project that has been declared is designed to allow an extended period of lobbying government ministers.	Section 14.5
Correct Planning and Consultation for Mayfield Group	Socioeconomic: The submission claims that the EIS does not address the potential for the Project to have an impact on house prices in Stockton.	Section 14.2
Correct Planning and Consultation for Mayfield Group	Socioeconomic: The submission claims that the EIS makes no mention of responsibility for a reduction in house prices.	Section 14.5
Correct Planning and Consultation for Mayfield Group	Socioeconomic: The submission claims that the Project would lead to fewer families moving to Stockton due to the stigma of being near to the two ammonium nitrate plants.	Section 14.7
Correct Planning and Consultation for Mayfield Group	Socioeconomic: The Submission states that the 60 jobs that the Project is stated to create within the EIS does not compensate for the increased risk of explosion.	Section 14.7
Correct Planning and Consultation for Mayfield Group	Traffic and Transport: The submission claims that the Project makes no attempt to mitigate impacts on local road network.	Section 14.6

Appendix A - Summary of Submissions

Special Interest Group Submissions		
Author	Comment	Section Addressed
Correct Planning and Consultation for Mayfield Group	Traffic and Transport: The submission mentions existing congestion on the local roads.	Section 14.6
Correct Planning and Consultation for Mayfield Group	Water Quality: The submission is concerned about the impact on tourism should the Ramsar Wetland be damaged by the Project.	Section 14.8
Correct Planning and Consultation for Mayfield Group	Water Quality: The submission states that any pollution into the Hunter River is unacceptable as industrial pollution is damaging to the recreational asset that is enjoyed by swimmers and fishermen.	Section 14.8
Islington Village Community Group	Air Quality: The submission states that the Project would add to the deteriorating levels of coal dust, diesel particulates and nitrous oxides.	Section 18.2.2
Islington Village Community Group	Cumulative Air Quality: The submission states that the Project would add to the emissions from PWCS.	Section 18.2.2
Islington Village Community Group	Hazard and Risk: The submission claims that the 'blast contours' do not correlate with information from the incident in Toulouse in 2001.	Section 18.1.1
Islington Village Community Group	Cumulative Risk: The submission claims that the EIS does not adequately address the concerns regarding the combined storage of AN at the Incitec Pivot and Orica Sites.	Section 18.2.1
Islington Village Community Group	Noise and Vibration: The submission claims that 'industry' cannot be trusted because of the current night-time acoustic exceedance on Kooragang Island.	Section 18.3.1
Islington Village Community Group	Noise and Vibration: The submission claims that the baseline monitoring for the EIS was completed while the Orica plant was not operational.	Section 18.3.2
Islington Village Community Group	Consultation: The submission claims that the consultation effort for the Project has been inadequate.	Section 18.4
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Special Interest Group Submissions		
Author	Comment	Section Addressed
Islington Village Community Group	Socioeconomic: The submission claims that the EIS makes no mention of responsibility for a reduction in house prices.	Section 18.5
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Islington Village Community Group	Water Quality: The submission states that any pollution into the Hunter River is unacceptable as industrial pollution is damaging to the recreational asset that is enjoyed by swimmers and fishermen.	Section 18.8
Mayfield East Public School P&C Association	Air Quality: The submission urges that the Project be considered against a backdrop of the polluting industries already there.	Section 17.3
Mayfield East Public School P&C Association	Air Quality: The submission is concerned about the Project's contribution to the 'alarming growth in air pollutants' in the area. The submission cites the Newcastle Herald (8 October 2012).	Section 17.3
Mayfield East Public School P&C Association	Hazard and Risk: The submission claims that "Incitec refuses to release the explosion blast 'overpressure' maps that would show the extent of the devastation if there was a catastrophic blast".	Section 17.1
Mayfield East Public School P&C Association	Hazard and Risk: The submission claims that should an incident occur it would be "an order of magnitude greater than any disaster Australia has ever witnessed."	Section 17.2

Appendix A - Summary of Submissions

Special Interest Group Submissions		
Author	Comment	Section Addressed
Mayfield East Public School P&C Association	Hazard and Risk: The submission is concerned about the possibly of a catastrophic explosion.	Section 17.2
Mayfield East Public School P&C Association	Cumulative Risk: The submission claims that the blast contours, should an explosion happen combining Orica and IPL, would be must greater than the 2001 incident in Toulouse.	Section 17.2
Orica Australia Pty Ltd	Hazard and Risk: The submission claims that there are inconsistencies between the assumptions that underpin the QRA and the published guidelines (the purple book). 19 assumptions from the Purple Book are appended to the Orica Submission.	Section 16.2
Orica Australia Pty Ltd	Hazard and Risk: The submission states that the EIS does not use a method of Quantitative Risk Assessment (QRA) that is consistent with other similar projects or with HIPAP. Exposure values should reflect the demographic of the general community, not a healthy adult male worker.	Section 16.2.2
Orica Australia Pty Ltd	Noise and Vibration: The submission states that the development of the noise and vibration assessment for the Project is inconsistent with that laid out in the NSW Industrial Noise Policy (INP).	Section 16.1
Presbyterian Aged Care	Statutory Planning: The submission highlights the juxtaposition of conflicting land uses in the area. The submission states that if the development were to go ahead it should do so only with a requirement to engage in strong emergency protocols with the local community.	Section 15.1
Stockton Community Action Group (Pg. 10 / 11)	Hazard and Risk: The submission claims that a full appreciation of a domino effect or cascading explosion has not been included.	Section 13.1
Stockton Community Action Group (Pg. 44)	General: The submission states that IPL has a poor environmental record worldwide	Section 13.9
Stockton Community Action Group (Pg. 14/ 15)	Hazard and Risk: The submission claims that the adoption of 7 kPa for the overpressure value within the PHA is not conservative enough and highlights instances in Europe where more conservative boundaries are set for overpressure.	Section 13.1

Special Interest Group Submissions		
Author	Comment	Section Addressed
Stockton Community Action Group (Pg. 21)	Hazard and Risk: The submission claims that all aspects of the PHA should be available for public exhibition.	Section 13.1.5
Stockton Community Action Group (Pg. 27)	Hazard and Risk: The submission claims that the brisance effect of an AN explosion could shatter tanks and cause further fires and fuel leaks.	Section 13.1.9
Stockton Community Action Group (Pg. 27)	Cumulative Risk: The submission claims that an explosion at the grain store, resulting in a grain dust cloud has not been incorporated into the PHA.	Section 13.1
Stockton Community Action Group (Pg. 27)	Cumulative Risk: The submission claims that risk of explosion as a result of interaction with the Orica facility development has not been properly assessed.	Section 13.1
Stockton Community Action Group (Pg. 27)	Cumulative Risk: The submission claims that risk of explosion has not been properly assessed as a result of interaction with the biofuel development that has been approved at Manildra Park.	Section 13.1
Stockton Community Action Group (Pg. 27)	Transport Risk: The risk of AN being loaded onto ships does not appear in the TRA.	Section 13.1.8
Stockton Community Action Group (Pg. 28 - 31)	Hazard and Risk: The submission claims that the project would not stand up to the hazard and risk management guidelines in South Australia or Western Australia.	Section 13.1.11 / Section 13.1.12
Stockton Community Action Group (Pg. 3)	Hazard and Risk: The Risk analysis undertaken for this Project has not met the NSW Planning Department Hazardous Industry Planning Advisory Papers requirements particularly Papers No 4 and 6.	Section 13.1
Stockton Community Action Group (Pg. 3)	Cumulative Risk: The submission states that “ the storage of large amounts of ammonium nitrate in one area increases the explosion risk and the area affected by an explosion causing injuries, deaths and damage to buildings.”	Section 13.1.7

Appendix A - Summary of Submissions

Special Interest Group Submissions		
Author	Comment	Section Addressed
Stockton Community Action Group (Pg. 30, 44)	Hazard and Risk: The submission states that the process for evacuating off and on site people in the event of a potential explosion must be clearly documented.	Section 13.1.14
Stockton Community Action Group (Pg. 32)	Air Quality: The submission claims that 'toxic ammonia gas' would be released from numerous sources including leaks in the pipework.	Section 13.2.3
Stockton Community Action Group (Pg. 36 – 37)	Hazard and Risk: The submission claims that a number of incidents (aircraft accident, earthquake) could cause a release of ammonia gas.	Section 13.1
Stockton Community Action Group (Pg. 36)	Air Quality: The submission acknowledges that there is no requirement to assess PM2.5 and claims that an assessment should have been conducted anyway in anticipation of the assessment becoming mandatory in the future.	Section 13.2.1
Stockton Community Action Group (Pg. 39 – 40)	Consultation: The submission claims that the community consultation effort has been inadequate.	Section 13.6
Stockton Community Action Group (Pg. 4)	Cumulative Air Quality: The submission states that the project along with the T4 expansion would increase levels of fine particles.	Section 13.2.1
Stockton Community Action Group (Pg. 4)	Noise and Vibration: The submission states that the Project would increase the noise levels beyond the current night-time levels of 49 – 51 dB.	Section 13.3.1
Stockton Community Action Group (Pg. 4, 32, 36)	Air Quality: The submission states that the nitrogen dioxide levels would increase by around 50% due to the Project.	Section 13.2.2
Stockton Community Action Group (Pg. 4, 32-33)	Air Quality: The submission states that there are existing exceedances in fine particles and that the Project would add to existing levels. (PM10, PM2.5 and PM1).	Section 13.2.1

Special Interest Group Submissions		
Author	Comment	Section Addressed
Stockton Community Action Group (Pg. 4, 38-39)	Noise and Vibration: The submission points out the INP requirement for new noise sources where noise levels are already above the acceptable amenity criteria levels in suburbs and where noise levels are likely to be reduced in the future (as Evidenced by the Orica Noise reduction program) is 10 dB less than the acceptable levels in the amenity criteria. This would require the project noise levels to be < 30 dB, which is not the case for the Project and fails to meet the NSW Industrial Noise Policy.	Section 13.3.1
Stockton Community Action Group (Pg. 4, 43)	Traffic and Transport: The submission claims that traffic is already a major concern on Cormorant Road and that the Project would increase the traffic on this road.	Section 13.4
Stockton Community Action Group (Pg. 40)	Consultation: The submission claims that the effort at consulting the public in Stockton is outweighed by the political influence that IPL are exerting through local PR and State level lobbyists.	Section 13.6
Stockton Community Action Group (Pg. 42)	Consultation: The submission disputes the claim that the Project website has had 9,126 visits and 50 registrations. SCAG is of the opinion that the number of registrations is misleading due to registrations by Incitec employees, suppliers and potential customers. Overall website visits (9,126) also appear high and Incitec should communicate whether they are unique visitors or multiple site visits by Incitec staff, suppliers and customers.	Section 13.6.4
Stockton Community Action Group (Pg. 43)	Transport Risk: The submission claims that a recent accident in Maitland in which an AN truck collided with a petrol tanker illustrates that the movement of AN by road presents an unacceptable risk to the public.	Section 13.1.8
Stockton Community Action Group (Pg. 43)	Socioeconomic: The submission claims that the EIS does not address the potential for the Project to have an impact on house prices in Stockton.	Section 13.7
Stockton Community Action Group (Pg. 43)	Socioeconomic: The submission claims that the EIS makes no mention of responsibility for a reduction in house prices.	Section 13.7
Stockton Community Action Group (Pg. 43)	Socioeconomic: The submission claims that the Project would lead to fewer families moving to Stockton due to the stigma of being near to the two ammonium nitrate plants.	Section 13.7

Appendix A - Summary of Submissions

Special Interest Group Submissions		
Author	Comment	Section Addressed
Stockton Community Action Group (Pg. 45)	Socioeconomic: The Submission states that the 60 jobs that the Project is stated to create within the EIS does not compensate for the increased risk of explosion.	Section 13.5
Stockton Community Action Group (Pg. 5)	Cumulative Risk (Transport Risk): The submission claims that the additional 35 truck movements a day, in addition to the extra movements as a result of the Orica expansion would increase the risk of a road accident.	Section 13.1.13
Stockton Community Action Group (Pg. 5)	Project Alternatives: The submission states that there are alternative locations that have not been fully assessed.	Section 13.10
Stockton Community Action Group (Pg. 5)	Socioeconomic: The submission states that the 60 jobs that are projected to be created by the Project do not justify the increased risk.	Section 13.5
Stockton Community Action Group (Pg. 5, 43)	Air Quality: The submission claims that the additional traffic movements would add dangerous carcinogens to the air quality of the area.	Section 13.2
Stockton Community Action Group (Pg. 7)	Hazard and Risk: The submission claims that the risk assessment that was undertaken for the Project was not transparent as key areas were not available for public exhibition.	Section 13.1.5
Stockton Community Action Group (Pg. 8/9)	Hazard and Risk: The submission highlights that within 5 km of the Project Site are a number of suburbs that could be at risk should there be a major incident.	Section 13.1

Public Submissions		
Author	Comment	Section Addressed
A'Beckett, K	Air Quality: The submission is concerned about pollution.	Section 20.5.5
A'Beckett, K	Hazard and Risk: The submission is concerned about the risk of explosion from the Project.	Section 20.4.1
A'Beckett, K	Socioeconomic: The submission is concerned about the effect on house prices.	Section 20.9.1
A'Beckett, K	Water Quality: The submission is concerned about pollution.	Section 20.7
Allan, D	Air Quality: The submission is concerned about pollution.	Section 20.5.5

Public Submissions		
Author	Comment	Section Addressed
Allan, D	Hazard and Risk: The submission claims that the risk of explosion is doubled if another AN plant is built on Kooragang island.	Section 20.4.14
Allan, D	Hazard and Risk: The submission states that there is no viable escape route from Stockton should an accident occur on Kooragang Island.	Section 20.4.9
Allan, D	Noise and Vibration: The submission is concerned about an increase in noise levels including noise from the Coal Loader, the Orica facility, the Airport and helicopters associated with the coal ships.	Section 20.6.1
Allan, D	Water Quality: The submission is concerned about pollution.	Section 20.7
Banyard, R	Air Quality: The submission claims that the EIS does not show that the Project would not increase levels of NOx and fine Particles.	Section 20.5.6 / Section 20.5.9
Banyard, R	General: The submission claims that the EIS does not fully explain how off site impacts from the Project would be managed.	Section 20.10.4
Banyard, R	Hazard and Risk: The submission claims that the level of risk from positioning two AN plants in one location is unprecedented elsewhere in the world.	Section 20.4.14
Banyard, R	Noise and Vibration: The submission claims that the EIS does not prove that the Project would not increase the 24 hour noise levels from KI.	Section 20.6.1
Banyard, R	Consultation: The submission claims that the community consultation effort has been inadequate.	Section 20.3.1
Banyard, R	Socioeconomic: The submission claims that a key aspect of the State Significant Development process is job creation and that the EIS does not present a convincing argument that the jobs that are to be created would be sufficient for the site due to a high level of automation.	Section 20.9.3
Banyard, R	Socioeconomic: The submission claims that the EIS does not show that the Project would not have an impact on property prices in the area.	Section 20.9.1
Banyard, R	Traffic and Transport: The submission highlights that the EIS has not considered TGAN dispatch by rail.	Section 20.8.6
Banyard, R	Water Quality: The submission claims that the EIS does not show that the Project would not have an impact on water quality and on the Ramsar wetland to the north of the Project.	Section 20.7
Bellingham, J	Air Quality: The submission claims that coal dust is a problem in the area and that this could be linked to high levels of cancer in the area.	Section 20.5.6

Appendix A - Summary of Submissions

Public Submissions		
Author	Comment	Section Addressed
Bellingham, J	Ecology: The submission is concerned about the native species that live in the area.	Section 20.10.5
Bellingham, K	Air Quality: The Project may add to existing pollution.	Section 20.5.4
Bellingham, K	Hazard and Risk: The submission claims that the positioning to two AN plants adjacent is unprecedented elsewhere in the world.	Section 20.4
Bellingham, K	Noise and Vibration: The Project may add to existing pollution.	Section 20.6.2
Bellingham, K	Socioeconomic: The Project may have an impact on house prices, the author claims that she will be seeking financial compensation from the NSW Government.	Section 20.9.1
Bellingham, S	Air Quality: The Project may add to existing pollution.	Section 20.5.4
Bellingham, S	Hazard and Risk: The submission claims that the positioning to two AN plants adjacent is unprecedented elsewhere in the world.	Section 20.4
Bellingham, S	Noise and Vibration: The Project may add to existing pollution.	Section 20.6.2
Bellingham, S	Socioeconomic: The Project may have an impact on house prices, the author claims that she will be seeking financial compensation from the NSW Government.	Section 20.9.1
Berry, G	Air Quality: The submission is concerned about pollution, particularly NOx, Ammonia and Dust.	Section 20.5.5
Berry, G	Statutory Planning: The submission states that the use of KI for heavy industry is incompatible with the ecological and anthropocentric demands on the area.	Section 20.2.2
Berry, G	General: the submission claims that the findings of the EIS are biased towards the needs of IPL.	Section 20.2.1
Berry, G	Ecologically Sustainable Development: The submission claims that the costs of depleting natural resources has not been included in the cost benefit analysis.	Section 20.10.5
Berry, G	Hazard and Risk: The submission claims that the EIS does not adequately address the potential risk of explosion.	Section 20.4.1
Berry, G	Hazard and Risk: The submission claims that the planned storage of TGAN on the site is excessive and that there is no sufficient evacuation distance stated.	Section 20.4.17
Berry, G	Noise and Vibration: The submission claims that there is already unacceptable noise levels coming from the coal loaders and the other industry on Kooragang Island and that the Project would add to this.	Section 20.6.1
Berry, G	Consultation: The submission states that the consultation effort has been inadequate.	Section 20.3.1

Public Submissions		
Author	Comment	Section Addressed
Berry, G	Water Quality: The submission is concerned about pollution.	Section 20.7
Birrell, W	Project Need: The Socioeconomic assessment within the EIS does not include the factors that led to the decision to delay the Project by two years.	Section 20.1.6
Burgess, C	Air Quality: The submission claims that fugitive emissions from the ammonia storage tank and from the loading and unloading of ships would cause a problem.	Section 20.5.1
Burgess, C	Air Quality: The submission states that the nitric acid plant creates dangerous emissions.	Section 20.5.9
Burgess, C	Air Quality: The submission states that the Project would increase air pollution including PM10 and PM2.5.	Section 20.5.6
Burgess, C	Statutory Planning: The submission states that the Project is not suitable for this location.	Section 20.2.2
Burgess, C	Statutory Planning: The submission states that there is no strategic plan for industrial development in Newcastle Port and this should be addressed before new industry is approved.	Section 20.2.2
Burgess, C	Cumulative Impact: The project should be assessed alongside all the existing industry and that the EIS fails to address the DGRs in relation to a cumulative impact assessment.	Section 20.10.1
Burgess, C	Hazard and Risk: The submission claims that the 'blast contours' shown in the EIS do not match the known impact of explosion of a much smaller amount of AN in Toulouse.	Section 20.4.3
Burgess, C	Hazard and Risk: The submission claims that the EIS does not address community fears about a catastrophic explosion.	Section 20.4.1
Burgess, C	Hazard and Risk: The submission claims that the Project represents a risk from malicious or accidental damage	Section 20.4.18
Burgess, C	Project Need: The submission claims that the Project will not be necessary should the current boom in coal exports end.	Section 20.1.6
Burgess, C	Noise and Vibration: The submission states that an increase in noise and vibration levels is not acceptable.	Section 20.6.2
Burgess, C	Consultation: The submission states that the community consultation effort is inadequate.	Section 20.3.1
Burgess, C	Traffic and Transport: The submission claims that the road network on the island is already congested and that the Project would exacerbate this.	Section 20.8.1
Burgess, C	Water Quality: The submission claims that the Project poses a threat to the Ramsar wetlands.	Section 20.7
Calthorpe, J	Air Quality: The submission is concerned about increases in pollution	Section 20.5.4

Appendix A - Summary of Submissions

Public Submissions		
Author	Comment	Section Addressed
Calthorpe, J	Noise and Vibration: The submission claims that the noise from the existing facilities on KI is magnified when it travels across the water at night. The submission states that low noise equipment should be mandatory.	Section 20.6.5
Calthorpe, J	Water Quality: The submission is concerned about increases in pollution	Section 20.7
Cardow, M	Air Quality: The submission is concerned about increases in pollution	Section 20.5.4
Cardow, M	Hazard and Risk: The submission claims that two plants adjacent would pose an unacceptable risk.	Section 20.4.1
Cardow, M	Water Quality: The submission is concerned about increases in pollution	Section 20.7
Charles, C	Project Need: The Socioeconomic assessment within the EIS does not include the factors that led to the decision to delay the Project by two years.	Section 20.1.6
Charlton, M	General: The submission states that the area does not need the jobs that would be created at the cost proposed.	Section 20.9.3
Clifton, E	Air Quality: The submission is concerned about increases in pollution	Section 20.5.4
Clifton, E	Hazard and Risk: The submission states that the Project represents a risk of accidental explosion and that the TGAN could fall into the hands of terrorists.	Section 20.4.18
Clifton, E	Water Quality: The submission is concerned about increases in pollution	Section 20.7
Cole, S	Hazard and Risk: The submission states that the Project represents a risk of accidental explosion and that the TGAN could fall into the hands of terrorists.	Section 20.4.18
Colomb, R	Air Quality: The submission is concerned about increases in pollution	Section 20.5.4
Colomb, R	Hazard and Risk: The submission claims that two plants adjacent would pose an unacceptable risk.	Section 20.4.1
Colomb, R	Noise and Vibration: The submission states that the 24 hour noise is not acceptable.	Section 20.6.2
Confidential (1)	Hazard and Risk: The submission states that the risk associated with the Project is too great to be allowed in this location.	Section 20.4.1
Confidential (10)	Air Quality: The submission is concerned about impacts on air quality.	Section 20.5.4
Confidential (10)	Hazard and Risk: The submission is concerned about the risk to local residents.	Section 20.4.1
Confidential (10)	Consultation: The submission claims that the community consultation effort has been inadequate.	Section 20.3.1
Confidential (10)	Water Quality: The submission is concerned about impacts on water quality.	Section 20.7

Public Submissions		
Author	Comment	Section Addressed
Confidential (11)	Air Quality: The submission states that the air quality of the region is adversely impacted and that the project would add to this.	Section 20.5.4
Confidential (11)	Hazard and Risk: The submission claims that the risk of a terrorist attack is not addressed in the EIS	Section 20.4.18
Confidential (11)	Hazard and risk: The submission states that there is no adequate reference to risk of explosion.	Section 20.4.2
Confidential (11)	Project Location: The submission states that the Project should be located in the Hunter Valley.	Section 20.1.5
Confidential (11)	Noise and Vibration: The submission claims that noise and vibration is already a problem and that the Project would add to this.	Section 20.6.2
Confidential (11)	Traffic and Transport: the submission claims that the EIS contains an inadequate consideration of traffic impacts including emergency procedures should one bridge onto Kooragang Island have to be closed.	Section 20.8.5
Confidential (12)	Statutory Planning: The submission states that the lack of strategic plan for the area leaves the port open to inefficiencies.	Section 20.2.2
Confidential (12)	Cumulative Impact: The submission claims that the industry on Kooragang Island does not fit with the urban environment of Newcastle.	Section 20.10.1
Confidential (12)	Hazard and Risk: The submission claims that the location of the Project does not fit the risk profile of the area.	Section 20.4.14
Confidential (14)	Air Quality: The submission requests an assessment of the average NOx emissions against the background instead of an assessment of the maximum against the OEH guidelines.	Section 20.5.9
Confidential (14)	Air Quality: the submission would like the periodic monitoring of the boiler and scrubber to be justified.	Section 20.5.8
Confidential (14)	Hazard and Risk: The submission point out that the assessment does not extend to emergency events.	Section 20.4.14
Confidential (14)	Hazard and Risk: The submission claims that the risk of explosion and the environmental impact of that explosion need to be examined.	Section 20.4.14
Confidential (14)	Project Location: The location of the Project was not justified.	Section 20.1.3
Confidential (14)	Consultation: The submission claims that the consultation effort is biased and that it does not reach an adequate conclusion.	Section 20.3.1
Confidential (14)	Traffic and Transport: The submission would like to know about the cumulative impact of the increase in ship movements thanks to the new coal loaders.	Section 20.8.7

Appendix A - Summary of Submissions

Public Submissions		
Author	Comment	Section Addressed
Confidential (14)	Traffic and Transport: The submission asks, why not transport the materials instead of the product?	Section 20.8.3
Confidential (14)	Water Quality: The submission asks, what would be a typical response for a water pollution event through the proposed discharge points?	Section 20.7
Confidential (14)	Water Quality: The submission would like to know if it is possible that the modelling is wrong and that the discharged water will exceed ANZECC guidelines	Section 20.7
Confidential (14)	Water Quality: The submission would like to know if it is possible to remove all nitrogen from the discharged water.	Section 20.7
Confidential (14)	Water Quality: The submissions would like details of the discharged water shown against ANZECC criteria.	Section 20.7
Confidential (3)	Hazard and Risk: The submission states that although the risk is low, the location is too near to the residential area.	Section 20.4.2
Confidential (4)	Air Quality: The submission claims that the Project would add to the already deteriorating air quality in the area.	Section 20.5.4
Confidential (4)	Air Quality: The submission is concerned about the cumulative impact of the industry on Kooragang Island on Air Quality. Particularly of the Project alongside the Orica expansion and the PWCS T4 Proposal.	Section 20.5.3
Confidential (4)	Cumulative Impact: The submission claims that the cumulative impact of industry on Kooragang Island is not being considered.	Section 20.10.1
Confidential (4)	Hazard and Risk: The submission claims that the “blast contours” are inaccurate.	Section 20.4.3
Confidential (4)	Hazard and Risk: The submission claims that the EIS fails to identify and quantify the cumulative risk of operating two AN Plants and fails to identify the security arrangements in place to avoid a catastrophic action.	Section 20.4.14
Confidential (4)	Hazard and Risk: The submission is concerned about the risk of a massive explosion.	Section 20.4.1
Confidential (4)	Cumulative Risk: The submission is concerned about two adjacent AN plants.	Section 20.4.14
Confidential (4)	Project Location: The submission states that a residential area is not appropriate for such a development.	Section 20.1.3
Confidential (4)	Noise and Vibration: The submission claims that ‘industry’ cannot be trusted because of the current night-time acoustic exceedance on Kooragang Island.	
Confidential (4)	Noise and Vibration: The submission claims that the acoustic baseline was assessed when the Orica plant was not operational.	Section 20.6.3

Public Submissions		
Author	Comment	Section Addressed
Confidential (4)	Consultation: The submission claims that the consultation effort for the Project has been inadequate.	Section 20.3.1
Confidential (4)	Socioeconomic: The Socioeconomic assessment within the EIS does not include the factors that led to the decision to delay the Project by two years.	Section 20.1.6
Confidential (4)	Socioeconomic: The submission claims that the EIS does not address the potential for the Project to have an impact on house prices in Stockton.	Section 20.9.1
Confidential (4)	Socioeconomic: The submission claims that the EIS makes no mention of responsibility for a reduction in house prices.	Section 20.9.1
Confidential (4)	Socioeconomic: The submission claims that the Project would lead to fewer families moving to Stockton due to the stigma of being near to the two ammonium nitrate plants.	Section 20.9.2
Confidential (4)	Socioeconomic: The Submission states that the 60 jobs that the Project is stated to create within the EIS does not compensate for the increased risk of explosion.	Section 20.4.2
Confidential (4)	Traffic and Transport: The submission claims that the Project makes no attempt to mitigate impacts on local road network.	Section 20.8.2
Confidential (4)	Traffic and Transport: The submission mentions existing congestion on the local roads.	Section 20.8.1
Confidential (4)	Water Quality: The submission is concerned on the impact on tourism should the Ramsar Wetland be damaged by the Project.	Section 20.7
Confidential (4)	Water Quality: The submission states that any pollution into the Hunter River is unacceptable as industrial pollution is damaging to the recreational asset that is enjoyed by swimmers and fishermen.	Section 20.7
Confidential (5)	Air Quality: The submission claims that the Project would add to the already deteriorating air quality in the area.	Section 20.5.4
Confidential (5)	Air Quality: The submission is concerned about the cumulative impact of the industry on Kooragang Island on Air Quality. Particularly of the Project alongside the Orica expansion and the PWCS T4 Proposal.	Section 20.5.3
Confidential (5)	Cumulative Impact: The submission claims that the cumulative impact of industry on Kooragang Island is not being considered.	Section 20.10.1
Confidential (5)	Hazard and Risk: The submission claims that the “blast contours” are inaccurate.	Section 20.4.3
Confidential (5)	Hazard and Risk: The submission claims that the EIS fails to identify and quantify the cumulative risk of operating two AN Plants and fails to identify the security arrangements in place to avoid a catastrophic action.	Section 20.4.14

Appendix A - Summary of Submissions

Public Submissions		
Author	Comment	Section Addressed
Confidential (5)	Hazard and Risk: The submission is concerned about the risk of a massive explosion.	Section 20.4.1
Confidential (5)	Cumulative Risk: The submission is concerned about two adjacent AN plants.	Section 20.4.14
Confidential (5)	Project Location: The submission states that a residential area is not appropriate for such a development.	Section 20.1.3
Confidential (5)	Noise and Vibration: The submission claims that 'industry' cannot be trusted because of the current night-time acoustic exceedance on Kooragang Island.	Section 20.6.1
Confidential (5)	Noise and Vibration: The submission claims that the acoustic baseline was assessed when the Orica plant was not operational.	Section 20.6.3
Confidential (5)	Consultation: The submission claims that the consultation effort for the Project has been inadequate.	Section 20.3.1
Confidential (5)	Socioeconomic: The Socioeconomic assessment within the EIS does not include the factors that led to the decision to delay the Project by two years.	Section 20.1.6
Confidential (5)	Socioeconomic: The submission claims that the EIS does not address the potential for the Project to have an impact on house prices in Stockton.	Section 20.9.1
Confidential (5)	Socioeconomic: The submission claims that the EIS makes no mention of responsibility for a reduction in house prices.	Section 20.9.1
Confidential (5)	Socioeconomic: The submission claims that the Project would lead to fewer families moving to Stockton due to the stigma of being near to the two ammonium nitrate plants.	Section 20.9.2
Confidential (5)	Socioeconomic: The Submission states that the 60 jobs that the Project is stated to create within the EIS does not compensate for the increased risk of explosion.	Section 20.4.2
Confidential (5)	Traffic and Transport: The submission claims that the Project makes no attempt to mitigate impacts on local road network.	Section 20.8.2
Confidential (5)	Traffic and Transport: The submission mentions existing congestion on the local roads.	Section 20.8.1
Confidential (5)	Water Quality: The submission is concerned on the impact on tourism should the Ramsar Wetland be damaged by the Project.	Section 20.7
Confidential (5)	Water Quality: The submission states that any pollution into the Hunter River is unacceptable as industrial pollution is damaging to the recreational asset that is enjoyed by swimmers and fishermen.	Section 20.7

Public Submissions		
Author	Comment	Section Addressed
Confidential (6)	Air Quality: The submission claims that the Project would add to the already deteriorating air quality in the area.	Section 20.5.4
Confidential (6)	Air Quality: The submission is concerned about the cumulative impact of the industry on Kooragang Island on Air Quality. Particularly of the Project alongside the Orica expansion and the PWCS T4 Proposal.	Section 20.5.3
Confidential (6)	Cumulative Impact: The submission claims that the cumulative impact of industry on Kooragang Island is not being considered.	Section 20.10.1
Confidential (6)	Hazard and Risk: The submission claims that the “blast contours” are inaccurate.	Section 20.4.3
Confidential (6)	Hazard and Risk: The submission claims that the EIS fails to identify and quantify the cumulative risk of operating two AN Plants and fails to identify the security arrangements in place to avoid a catastrophic action.	Section 20.4.14
Confidential (6)	Hazard and Risk: The submission is concerned about the risk of a massive explosion.	Section 20.4.1
Confidential (6)	Cumulative Risk: The submission is concerned about two adjacent AN plants.	Section 20.4.14
Confidential (6)	Project Location: The submission states that a residential area is not appropriate for such a development.	Section 20.1.3
Confidential (6)	Noise and Vibration: The submission claims that ‘industry’ cannot be trusted because of the current night-time acoustic exceedance on Kooragang Island.	Section 20.6.1
Confidential (6)	Noise and Vibration: The submission claims that the acoustic baseline was assessed when the Orica plant was not operational.	Section 20.6.3
Confidential (6)	Consultation: The submission claims that the consultation effort for the Project has been inadequate.	Section 20.3.1
Confidential (6)	Socioeconomic: The Socioeconomic assessment within the EIS does not include the factors that led to the decision to delay the Project by two years.	Section 20.1.6
Confidential (6)	Socioeconomic: The submission claims that the EIS does not address the potential for the Project to have an impact on house prices in Stockton.	Section 20.9.1
Confidential (6)	Socioeconomic: The submission claims that the EIS makes no mention of responsibility for a reduction in house prices.	Section 20.9.1
Confidential (6)	Socioeconomic: The submission claims that the Project would lead to fewer families moving to Stockton due to the stigma of being near to the two ammonium nitrate plants.	Section 20.9.2

Appendix A - Summary of Submissions

Public Submissions		
Author	Comment	Section Addressed
Confidential (6)	Socioeconomic: The Submission states that the 60 jobs that the Project is stated to create within the EIS does not compensate for the increased risk of explosion.	Section 20.4.2
Confidential (6)	Traffic and Transport: The submission claims that the Project makes no attempt to mitigate impacts on local road network.	Section 20.8.2
Confidential (6)	Traffic and Transport: The submission mentions existing congestion on the local roads.	Section 20.8.1
Confidential (6)	Water Quality: The submission is concerned on the impact on tourism should the Ramsar Wetland be damaged by the Project.	Section 20.7
Confidential (6)	Water Quality: The submission states that any pollution into the Hunter River is unacceptable as industrial pollution is damaging to the recreational asset that is enjoyed by swimmers and fishermen.	Section 20.7
Confidential (7)	Air Quality: The submission claims that the Project would add to the already deteriorating air quality in the area.	Section 20.5.4
Confidential (7)	Air Quality: The submission is concerned about the cumulative impact of the industry on Kooragang Island on Air Quality. Particularly of the Project alongside the Orica expansion and the PWCS T4 Proposal.	Section 20.5.3
Confidential (7)	Cumulative Impact: The submission claims that the cumulative impact of industry on Kooragang Island is not being considered.	Section 20.10.1
Confidential (7)	Hazard and Risk: The submission claims that the “blast contours” are inaccurate.	Section 20.4.3
Confidential (7)	Hazard and Risk: The submission claims that the EIS fails to identify and quantify the cumulative risk of operating two AN Plants and fails to identify the security arrangements in place to avoid a catastrophic action.	Section 20.4.14
Confidential (7)	Hazard and Risk: The submission is concerned about the risk of a massive explosion.	Section 20.4.1
Confidential (7)	Cumulative Risk: The submission is concerned about two adjacent AN plants.	Section 20.4.14
Confidential (7)	Project Location: The submission states that a residential area is not appropriate for such a development.	Section 20.1.3
Confidential (7)	Noise and Vibration: The submission claims that ‘industry’ cannot be trusted because of the current night-time acoustic exceedance on Kooragang Island.	Section 20.6.1
Confidential (7)	Noise and Vibration: The submission claims that the acoustic baseline was assessed when the Orica plant was not operational.	Section 20.6.3
Confidential (7)	Consultation: The submission claims that the consultation effort for the Project has been inadequate.	Section 20.3.1

Public Submissions		
Author	Comment	Section Addressed
Confidential (7)	Socioeconomic: The Socioeconomic assessment within the EIS does not include the factors that led to the decision to delay the Project by two years.	Section 20.1.6
Confidential (7)	Socioeconomic: The submission claims that the EIS does not address the potential for the Project to have an impact on house prices in Stockton.	Section 20.9.1
Confidential (7)	Socioeconomic: The submission claims that the EIS makes no mention of responsibility for a reduction in house prices.	Section 20.9.1
Confidential (7)	Socioeconomic: The submission claims that the Project would lead to fewer families moving to Stockton due to the stigma of being near to the two ammonium nitrate plants.	Section 20.9.2
Confidential (7)	Socioeconomic: The Submission states that the 60 jobs that the Project is stated to create within the EIS does not compensate for the increased risk of explosion.	Section 20.4.2
Confidential (7)	Traffic and Transport: The submission claims that the Project makes no attempt to mitigate impacts on local road network.	Section 20.8.2
Confidential (7)	Traffic and Transport: The submission mentions existing congestion on the local roads.	Section 20.8.1
Confidential (7)	Water Quality: The submission is concerned on the impact on tourism should the Ramsar Wetland be damaged by the Project.	Section 20.7
Confidential (7)	Water Quality: The submission states that any pollution into the Hunter River is unacceptable as industrial pollution is damaging to the recreational asset that is enjoyed by swimmers and fishermen.	Section 20.7
Confidential 8	Project Need: The Socioeconomic assessment within the EIS does not include the factors that led to the decision to delay the Project by two years.	Section 20.1.6
Cousins, P	Ecology: The submission claims that the Project, along with the other industry on KI represents an unnecessary risk and could have impact on roads and the ecology of the region.	Section 20.10.5
Cousins, P	Hazard and Risk: The submission claims that the EIS is misleading / deceptive regarding the risks involved with explosives.	Section 20.4.14
Cousins, P	Hazard and Risk: The submission claims that the Project could be disrupted by protestors or terrorists therefore disrupting supply of AN to the Hunter.	Section 20.4.18
Cousins, P	Hazard and Risk: The submission does not adequately address the possibility of terrorist actions in Newcastle.	Section 20.4.18

Appendix A - Summary of Submissions

Public Submissions		
Author	Comment	Section Addressed
Cousins, P	Hazard and Risk: The submission highlights that the Project site is vulnerable to seismic or volcanic activity leading to a tsunami. Citing the incident at Fukushima.	Section 20.4.14
Cousins, P	Hazard and Risk: The submission highlights flaws in the current and planned security surrounding the Site.	Section 20.4.18
Cousins, P	Hazard and Risk: The submission states that any evacuation would have to be completed from the south of the peninsular and that ferrys are unlikely to have the capacity to cope with such an event.	Section 20.4.9
Cousins, P	Hazard and Risk: The submission states that if there was a leak of toxic gas (hexavalent chromium) then the residents of Stockton would be affected.	Section 20.4.2
Cousins, P	Hazard and Risk: The submission states that no consideration is given to shrapnel resulting from an explosion on site.	Section 20.4.6
Cousins, P	Hazard and Risk: The submission states that the risk contours do not take into account the amount of AN stored, therefore 1 kg of AN is given the same risk as 1,000 kg.	Section 20.4.14
Cousins, P	Hazard and Risk: The submission states that there is no mention in the EIS of the geotechnical ability of the land in the area to withstand liquefaction.	Section 20.4.14
Cousins, P	Project Description: The submission states that the map shown in the EIS (Figure 3-1) is inadequate for the purpose.	Section 20.1.2
Cousins, P	Consultation: The submission states that the consultation effort is inadequate.	Section 20.3.1
Cousins, P	Socio Economic / Water Quality: The submission states that the EIS makes no mention of the impact of the Project on the fishing industry in the area.	Section 20.7
Cousins, P	Traffic and Transport: The submission claims that the Project, along with the other industry on Kooragang Island represents an unnecessary risk and could have impact on roads and the ecology of the region.	Section 20.4.2
Craig, A	Project Need: The Socioeconomic assessment within the EIS does not include the factors that led to the decision to delay the Project by two years.	Section 20.1.6
Craig, K	Air Quality: The submission acknowledges that there is no requirement to assess PM2.5 and claims that an assessment should have been conducted anyway in anticipation of the assessment becoming mandatory in the future.	Section 20.5.6
Craig, K	Air Quality: The submission claims that additional truck movements will add dangerous carcinogens to the air.	Section 20.5.7

Public Submissions		
Author	Comment	Section Addressed
Craig, K	Air Quality: The submission states that the nitrogen dioxide levels would increase by around 50% due to the Project.	Section 20.5.9
Craig, K	Air Quality: The submission states that there existing exceedances in fine particles and that the Project would add to this. (PM10, PM2.5 and PM1) – Further, the submissions states no further development that increase the PM10 should be allowed on Kooragang Island.	Section 20.5.4
Craig, K	General: The submission states that IPL has a poor environmental record.	Section 20.10.3
Craig, K	Hazard and Risk: The submission claims that contrary to the requirements of the HIPAP, worst case scenarios have not been taken into consideration.	Section 20.10.4
Craig, K	Hazard and Risk: The submission claims that significant events have been omitted from the risk register.	Section 20.4.14
Craig, K	Hazard and Risk: The submission claims that the adoption of 7 kPa for the overpressure value within the PHA is not conservative enough and highlights instances in Europe where more conservative boundaries are set for overpressure.	Section 20.4.3
Craig, K	Hazard and Risk: The submission claims that the area that could be affected by a catastrophic incident is much larger than that of Toulouse in 2001.	Section 20.4.11
Craig, K	Hazard and Risk: The submission claims that the brisance effect of an AN explosion could shatter tanks and cause further fires and fuel leaks.	Section 20.4.16
Craig, K	Hazard and Risk: The submission claims that the frequency of major incidents does not reflect the reality of previous events.	Section 20.4.14
Craig, K	Hazard and Risk: The submission states that an assessment should be undertaken of the impact of a failure of the ammonia storage tank.	Section 20.4.14
Craig, K	Hazard and Risk: The submission claims that the project would not stand up to the hazard and risk management guidelines in South Australia or Western Australia.	Section 20.4.7
Craig, K	Hazard and Risk: The submission claims that the risk assessment that was undertaken for the Project was not transparent as key areas were not available for public exhibition.	Section 20.4.15
Craig, K	Hazard and Risk: The submission claims that worst case scenarios have not been adequately assessed.	Section 20.4.10

Appendix A - Summary of Submissions

Public Submissions		
Author	Comment	Section Addressed
Craig, K	Hazard and Risk: The submission states that there is no viable emergency evacuation plan for Stockton.	Section 20.4.9
Craig, K	Hazard and Risk: The submission states that a frequency and likelihood analysis is missing from the EIS – the submission also presents an alternative frequency and likelihood analysis.	Section 20.4.14
Craig, K	Cumulative Risk: The submission states that an explosion at the grain store, resulting in a grain dust cloud has not been incorporated into the PHA.	Section 20.4.14
Craig, K	Cumulative Risk: The submission states that risk of explosion as a result of interaction with the Orica facility development has not been properly assessed.	Section 20.4.14
Craig, K	Cumulative Risk: The submission states that risk of explosion as a result of interaction with the Orica facility development has not been properly assessed.	Section 20.4.14
Craig, K	Cumulative Risk: The submission states that risk of explosion as a result of interaction with the biofuel development that has been approved at Manildra Park has not been properly assessed.	Section 20.4.14
Craig, K	Transport Risk: The risk of AN being loaded onto ships does not appear in the TRA.	Section 20.4.21
Craig, K	Transport Risk: The submission mentions a recent incident in Maitland where an AN truck was hit by a petrol tanker and cites this as a reason to limit truck movements.	Section 20.4.22
Craig, K	Project Alternatives: The submission claims that there are alternative locations that have not been fully examined.	Section 20.1.3
Craig, K	Project Need: The submission states that the downturn in the mining sector undermines the stated need for the Project.	Section 20.1.8
Craig, K	Noise and Vibration: The submission points out the INP requirement for new noise sources where noise levels are already above the acceptable amenity criteria levels in suburbs and where noise levels are likely to be reduced in the future (as Evidenced by the Orica Noise reduction program) is 10 dB less than the acceptable levels in the amenity criteria. This would require the project noise levels to be < 30 dB, which is not the case for the Project and fails to meet the NSW Industrial Noise Policy.	Section 20.6.1
Craig, K	Consultation: The submission claims that the community consultation effort was inadequate.	Section 20.3.1
Craig, K	Socioeconomic: The submission claims that the EIS does not address the potential for the Project to have an impact on house prices in Stockton.	Section 20.9.1

Public Submissions		
Author	Comment	Section Addressed
Craig, K	Socioeconomic: The submission claims that the EIS makes no mention of responsibility for a reduction in house prices.	Section 20.9.1
Craig, K	Socioeconomic: The submission claims that the Project would lead to fewer families moving to Stockton due to the stigma of being near to the two ammonium nitrate plants.	Section 20.9.2
Craig, K	Socioeconomic: The submission states that the claimed 60 jobs that would be created are not sufficient to justify the additional risk to the area.	Section 20.4.2
Craig, K	Traffic and Transport: The submission claims that the traffic congestion is already a problem on Kooragang Island.	Section 20.8.1
Craig, K	Water Quality: The submission states that the Project would be handed another licence to pollute the waters of the Hunter River and that this will have a detrimental impact on the Ramsar wetland.	Section 20.7
Craig, L	Project Need: The Socioeconomic assessment within the EIS does not include the factors that led to the decision to delay the Project by two years.	Section 20.1.6
Croft, D	Hazard and Risk: The submission claims that security is not tight enough.	Section 20.4.18
Croft, D	Hazard and Risk: The submission states that the Project must be rejected as it is an unacceptable risk.	Section 20.4.2
Croft, D	Hazard and Risk: The submission states that there is no viable emergency evacuation plan for Stockton.	Section 20.4.9
Croft, D	Cumulative Risk: The submission claims that the cumulative risk of the Project, along with the Orica expansion, the biodiesel tanks and the gas pipeline is too great.	Section 20.4.14
Croft, D	Cumulative Risk: The submission states that locating two adjacent AN plants presents too great a risk of terrorism.	Section 20.4.18
Croft, D	Transport Risk: The submission asks what checks are in place to screen drivers of AN trucks.	Section 20.4.22
Croft, D	Transport Risk: The submission asks what safeguards are in place to prevent transport accidents. Citing the Maitland accident.	Section 20.4.22
Croft, D	Transport Risk: The submission states that other road users pose a risk to the AN truck drivers.	Section 20.4.22
Croft, D	Noise and Vibration: The submission states that the Project, as a new industry, must have noise level under 35dB.	Section 20.6.4
Croft, D	Consultation: The submission claims that the consultation effort has been inadequate.	Section 20.3.1

Appendix A - Summary of Submissions

Public Submissions		
Author	Comment	Section Addressed
Croft, D	Traffic and Transport: The submission asks what traffic studies have been conducted, particularly along the New England Highway and Cormorant Drive.	Section 20.8.4
Danuser, D	Air Quality: The submission states that there are existing air quality problems in the area and that the Project would add to these.	Section 20.5.4
Danuser, D	Hazard and Risk: The submission states that the “blast contours” in the EIS are a joke.	Section 20.4.3
Danuser, D	Noise and Vibration: The submission claims that the EIS took the baseline assessment when the Orica facility was not operating.	Section 20.6.3
Danuser, D	Traffic and Transport: The submission states that road traffic is already a problem in the area.	Section 20.8.1
Davies, B	Air Quality: The submission claims that extra diesel trucks will add dangerous carcinogens to the air quality of the area.	Section 20.5.7
Davies, B	Hazard and Risk: The submission claims that the risk of explosion is too great	Section 20.10.1
Davies, B	Hazard and Risk: The submission states that the “blast contours” in the EIS do not fit with the knowledge of similar explosions in Toulouse.	Section 20.4.3
Davies, B	Noise and Vibration: The submission claims that ‘industry’ cannot be trusted because of the current night-time acoustic exceedance on Kooragang Island.	
Davies, B	Noise and Vibration: The submission claims that the EIS took the baseline assessment when the Orica facility was not operating.	Section 20.6.3
Davies, B	Noise and Vibration: The submission states that additional noise is not acceptable.	Section 20.6.2
Davies, B	Noise and Vibration: The submission states that if the development were to go ahead then IPL should pay for acoustic mitigation at the residential receptors.	Section 20.6.5
Davies, B	Socioeconomic: The Socioeconomic assessment within the EIS does not include the factors that led to the decision to delay the Project by two years.	Section 20.1.6
Davies, B	Socioeconomic: The submission claims that the EIS does not address the potential for the Project to have an impact on house prices in Stockton.	Section 20.9.1
Davies, B	Socioeconomic: The submission claims that the EIS makes no mention of responsibility for a reduction in house prices.	Section 20.9.1

Public Submissions		
Author	Comment	Section Addressed
Davies, B	Socioeconomic: The submission claims that the Project would lead to fewer families moving to Stockton due to the stigma of being near to the two ammonium nitrate plants.	Section 20.9.2
Davies, B	Socioeconomic: The Submission states that the 60 jobs that the Project is stated to create within the EIS does not compensate for the increased risk of explosion.	Section 20.4.2
Davies, B	Traffic and Transport: The submission claims that the Project makes no attempt to mitigate impacts on local road network.	Section 20.8.2
Davies, B	Traffic and Transport: The submission mentions existing congestion on the local roads.	Section 20.8.1
Davies, B	Traffic and Transport: The submission states that road traffic is already a problem in the area.	Section 20.8.1
Davies, B	Water Quality: The submission is concerned on the impact on tourism should the Ramsar Wetland be damaged by the Project.	Section 20.7
Deacon, V	Project Need: The Socioeconomic assessment within the EIS does not include the factors that led to the decision to delay the Project by two years.	Section 20.1.6
Delaney, R	Cumulative Risk: The submission states that all the development on KI is putting the whole of Newcastle at risk.	Section 20.4.2
Delaney, R	Noise and Vibration: The submission raises concerns over existing noise levels and claims that the proposal to increase the acceptable noise levels is absurd.	Section 20.6.2
Delaney, R	Traffic and Transport: The submission claims that the existing development on Kooragang Island is badly planned and that the road infrastructure in the area is inadequate.	Section 20.8.1
Dillon-Smith, C	Air Quality: The submission states that despite all the mitigation measures, the air quality will get worse.	Section 20.5.5
Dillon-Smith, C	Health Impacts: The submission states that instances of asthma, and cancer will increase	Section 20.10.7
Dillon-Smith, C	Noise and Vibration: The submission states that the existing noise levels in Stockton are unacceptable and that extended exposure to increased background noise is dangerous – suggesting that prolonged exposure to noise when young can lead to damaged hearing in later life.	Section 20.6.2
Dillon-Smith, C	Water Quality: The submission claims that the Project will be granted “another licence to pollute”.	Section 20.7
Edwards, J	Hazard and Risk: The submission claims that if there was an explosion, his house in Fern Bay would be blown away.	Section 20.4.9
Edwards, J	Noise and Vibration: The submission states that existing noise from the area inhibit the ability to sleep.	Section 20.6.2

Appendix A - Summary of Submissions

Public Submissions		
Author	Comment	Section Addressed
Gippel, R	Air Quality: The submission claims that the sky is already polluted in the area and that the Project should be refused.	Section 20.5.4
Gippel, R	Hazard and Risk: The submission states that the storage of large quantities of AN in an urban environment is unacceptable.	Section 20.4.2
Gippel, R	Socioeconomic: The jobs created by the Project do not outweigh the risk of the facility.	Section 20.4.2
Gorst, R and D	Project Need: The submission states the project should be situated away from residential areas, and near the mines.	Section 20.1.3
Grainger, C	Cumulative Impact: The submission states that there is inadequate consideration of the cumulative impacts related to numerous industry on the island.	Section 20.10.1
Grainger, C	Hazard and Risk: The submission raises a concern about the lack of an evacuation plan for the Stockton peninsular.	Section 20.4.9
Grainger, C	Cumulative Risk: The submission states that the risk of explosion places everyone within 5 km at an unacceptable risk.	Section 20.4.2
Grainger, C	Transport Risk: The submission states that the transport of AN by road and ship is an accident waiting to happen.	Section 20.4.22
Grainger, C	Traffic and Transport: The submission claims that the roads are already congested.	Section 20.8.1
Gravenlock, D	Air Quality: The submission is concerned about toxic emissions from the Project.	Section 20.5.5
Gravenlock, D	Hazard and Risk: The submission claims that evacuating the Stockton Centre would be an impossible task.	Section 20.4.9
Greig, J	Hazard and Risk: The submission objects to the proposal on the grounds of unacceptable risk.	Section 20.4.2
Greig, J	Noise and Vibration: The submission claims that the noise limits from the Project would be above legal limits.	Section 20.6.4
Greig, J	Consultation: The submission claims that the community have not been appropriately consulted on the Project.	Section 20.3.1
Grieg, J	Cumulative Impact: The submission claims that there has been no appreciation form the cumulative impact of the industry on KI.	Section 20.10.1
Hancock, J and R	Hazard and Risk: The submission claims that the risk from the Project would be unacceptable.	Section 20.4.1
Hancock, J and R	Socioeconomic: The submission claims that the Project would have an unacceptable impact on house prices.	Section 20.9.1
Hanna, M	Hazard and Risk: The submission claims there must be a safer location to build the Project.	Section 20.4.14

Public Submissions		
Author	Comment	Section Addressed
Hanna, M	Project Need: The submission questions the need for the Project.	Section 20.1.8
Hanna, S	Cumulative Risk: The submission claims that the decision to build two adjacent plants cannot be best practice.	Section 20.4.14
Hanna, S	Noise and Vibration: The submission claims that additional noise would be unacceptable.	Section 20.6.2
Hanna, S	Consultation: The submission states that the community consultation has been inadequate.	Section 20.3.1
Harwood, A	Air Quality: The submission states that the current levels of respiratory infection and irritation will increase.	Section 20.5.5
Harwood, A	Cumulative Impact: The submission claims that the cumulative impact assessment that has been conducted is inadequate as it relies on an accurate assessment of other operations.	Section 20.10.1
Harwood, A	Greenhouse Gas: The submission is concerned that there has been no cumulative assessment	Section 20.10.1
Harwood, A	Hazard and Risk: The submission claims that the Project represents an unacceptable risk.	Section 20.4.1
Harwood, A	Consultation: The submission is concerned about the lack of identification of key community grass roots groups including the Newcastle Wilderness Society, The Greens, Climate Action Newcastle and the Mayfield East Residents' Group.	Section 20.3.2
Harwood, A	Consultation: The submission is concerned that no social impact analysis has been performed.	Section 20.3.2
Harwood, A	Traffic and Transport: The submission claims that the increase in trucks from the Project will lead to increases in noise, vibration, dust and accidents.	Section 20.8.2
Harwood, A	Traffic and Transport: The submission questions the claim that there would be no change to the level of service of the roads around Kooragang Island.	Section 20.8.4
Hayes, P	Hazard and Risk: The submission claims that the Project represents an unacceptable risk.	Section 20.4.1
Hayes, P	Noise and Vibration: The submission claims that additional noise would be unacceptable.	Section 20.6.2
Hayes, P	Consultation: The submission states that the community consultation has been inadequate.	Section 20.3.1
Heys, C	Air Quality: The submission states that pollution will increase.	Section 20.5.4
Heys, C	Hazard and Risk: The submission states that Hazard and Risk will increase.	Section 20.4.2
Heys, C	Noise and Vibration: The submission states that noise will increase	Section 20.6.4
Heys, C	Traffic and Transport: the submission states that congestion will increase as a result of the Project.	Section 20.8.1

Appendix A - Summary of Submissions

Public Submissions		
Author	Comment	Section Addressed
Hollingshead, D	Air Quality: The submission claims that the Project would have an impact on the air quality of the area.	Section 20.5.5
Hollingshead, D	Hazard and Risk: The submission claims that the Project will make the area a prime terror attack target.	Section 20.4.18
Hollingshead, D	Socioeconomic: The submission claims that the Project will devalue homes.	Section 20.9.1
Hollingshead, D	Water Quality: The submission claims that the Project would poison the Hunter River.	Section 20.7
Hollingshead, D 2	Project Need: The Socioeconomic assessment within the EIS does not include the factors that led to the decision to delay the Project by two years.	Section 20.1.6
Jauden, M	Project Need: The Socioeconomic assessment within the EIS does not include the factors that led to the decision to delay the Project by two years.	Section 20.1.6
Johnson, K	Hazard and Risk: The submission claims that the Project represents an unacceptable risk.	Section 20.4.1
Johnson, K	Cumulative Risk: The submission claims that the locating the Project near to a new coal loader represents a “lethal cocktail of ingredients”.	Section 20.4.14
Johnson, K	Consultation: The submission states that the community consultation has been inadequate.	Section 20.3.1
Johnson, K	Traffic and Transport: The submission states that the EIS does not consider two large residential developments that are planned for the Fullerton Cove area of Newcastle and the traffic impact that this will have on the existing congestion.	Section 20.8.7
Johnson, V	Cumulative Risk: The submission states that the locating another AN plant adjacent to Orica represents an unbelievable disregard for the possibility of a cataclysmic event.	Section 20.4.2
Kelly, B	Statutory Planning: The submission claims that industry should not be allowed in this location.	Section 20.2.2
Kelly, B	Project Need: The submission claims that there is no sensible argument for why the AN must be made in the area.	Section 20.1.3
Kelly, B	Socioeconomic: The submission is concerned with a reduction in house values.	Section 20.9.1
Kurtze, M and A	Hazard and Risk: The submission claims that there is already too many major hazard facilities in the area.	Section 20.4.1
Kurtze, M and A	Hazard and Risk: The submission is concerned about the current emergency procedures.	Section 20.4.9
Kurtze, M and A	Cumulative Risk: The submission is concerned about the risk of Orica and IPL operating adjacent facilities.	Section 20.4.14
Kurtze, M and A	Socioeconomic: The submission is concerned with a reduction in house values.	Section 20.9.1

Public Submissions		
Author	Comment	Section Addressed
Leka, N	General: The submission claims that the EIS is “littered with window dressing designed to convey a favourable impression rather than facts”.	Section 20.2.1
Leka, N	General: The submission is concerned about IPL’s safety record.	Section 20.10.3
Leka, N	Hazard and Risk: The submission is concerned about the risk of storing a large amount of AN near a populated area.	Section 20.4.1
Leka, N	Project Description: The submission is concerned that there is no description of how much TGAN IPL is intending to export.	Section 20.1.1
Leka, N	Project Alternatives: The submission claims that the EIS does not adequately rule out piping ammonia to Tomago.	Section 20.1.3
Lewis, J	Ecology: The submission is concerned about the impact of the Project on the flora and fauna in the area.	Section 20.10.5
Lewis, J	Hazard and Risk: The submission expressed fear at the thought of a large amount of AN being stored less than 1 km from the author’s residence.	Section 20.4.2
Lewis, J	Transport Risk: The submission is concerned about the additional danger resulting from the additional trucks on the road.	Section 20.4.22
Lewis, J	Traffic and Transport: The submission states that the roads are already congested.	Section 20.8.1
Lloyd, D	Air Quality: The submission claims that dust and NOx emissions would increase.	Section 20.5.6 / Section 20.5.9
Lloyd, D	Hazard and Risk: The submission states that nowhere in the world will you find two AN plants operating this close to a populated area.	Section 20.4.2
Lloyd, D	Noise and Vibration: The submission claims that 24 noise would impact residences.	Section 20.6.2
Lloyd, D	Consultation: The submission claims that the consultation effort has been inadequate.	Section 20.3.1
Lloyd, D	Socioeconomic: The submission is concerned with a reduction in house values.	Section 20.9.1
Lloyd, D	Water Quality: The submission is concerned about pollution in the Hunter River.	Section 20.7
McCauley, T	Project Need: The Socioeconomic assessment within the EIS does not include the factors that led to the decision to delay the Project by two years.	Section 20.1.6

Appendix A - Summary of Submissions

Public Submissions		
Author	Comment	Section Addressed
McIllwraith, D	Hazard and Risk: The submission is concerned about the lack of an evacuation plan for the area,	Section 20.4.9
McIllwraith, D	Hazard and Risk: The submission is concerned about the risk of explosion	Section 20.4.1
McIllwraith, D	Consultation: The submission claims that the consultation effort has been inadequate.	Section 20.3.1
McIllwraith, D	Socioeconomic: The submission claims that as the plant is to be imported in modules, the benefit to the Australian workers is minimised.	Section 20.9.4
McIllwraith, D	Water Quality: The submission is concerned about pollution in the Hunter River.	Section 20.7
McIllwraith, D 2	Air Quality: The submission is concerned about increases in air pollution.	Section 20.5.4
McIllwraith, D 2	Hazard and Risk: The submission is concerned about the lack of an evacuation plan for the area,	Section 20.4.9
McIllwraith, D 2	Hazard and Risk: The submission is concerned about the risk of explosion	Section 20.4.1
McIllwraith, D 2	Cumulative Risk: The submission claims that the Project has not been assessed against other projects in the area.	Section 20.4.14
McIllwraith, D 2	Noise and Vibration: The submission is concerned about increases in Noise.	Section 20.6.1
McIllwraith, D 2	Consultation: The submission claims that the consultation effort has been inadequate.	Section 20.3.1
McIllwraith, D 2	Socioeconomic: The submission is concerned with a reduction in house values.	Section 20.9.1
McIllwraith, R	Air Quality: The submission is concerned about increases in air pollution.	Section 20.5.4
McIllwraith, R	Hazard and Risk: The submission is concerned about the lack of an evacuation plan for the area,	Section 20.4.9
McIllwraith, R	Hazard and Risk: The submission is concerned about the risk of explosion	Section 20.4.1
McIllwraith, R	Cumulative Risk: The submission claims that the Project has not been assessed against other projects in the area.	Section 20.4.14
McIllwraith, R	Noise and Vibration: The submission is concerned about increases in Noise.	Section 20.6.1
McIllwraith, R	Consultation: The submission claims that the consultation effort has been inadequate.	Section 20.3.1
McIllwraith, R	Socioeconomic: The submission is concerned with a reduction in house values.	Section 20.9.1
McLaughlan, A	Hazard and Risk: The submission claims that the risk of seismological impacts have not been considered.	Section 20.4.14
McLaughlan, A	Hazard and Risk: The submission is concerned about the lack of an evacuation plan for the area,	Section 20.4.9

Public Submissions		
Author	Comment	Section Addressed
McLaughlan, A	Hazard and Risk: The submission is concerned about the risk of explosion	Section 20.4.1
McLaughlan, A	Cumulative Risk: The submission is concerned about the cumulative risk of the multiple industrial projects in the area.	Section 20.4.14
McLaughlan, A	Traffic and Transport: The submission states that the roads are already congested.	Section 20.8.1
McPherson, A	Air Quality: The submission is concerned about increases in air pollution.	Section 20.5.4
McPherson, A	Hazard and Risk: The submission is concerned about the proximity of houses and industry.	Section 20.4.1
McPherson, A	Water Quality: The submission is concerned about pollution in the Hunter River.	Section 20.7
McQueen, A	Air Quality: The submission states that the air quality monitoring is inadequate.	Section 20.5.8
McQueen, A	Consultation: The submission claims that the EIS has not been adequately conveyed to the people who could be affected.	Section 20.3.1
McQueen, A	Traffic and Transport: The submission states that the roads are already congested.	Section 20.8.1
Melbourne, P and A	Hazard and Risk: The submission is concerned about the lack of an evacuation plan for the area,	Section 20.4.9
Melbourne, P and A	Cumulative Risk: The submission is concerned about the operation of two AN plants in close proximity.	Section 20.4.14
Melville, S	Air Quality: The submission is concerned about increases in air pollution.	Section 20.5.4
Melville, S	Cumulative Risk: The submission is concerned about the operation of two AN plants in close proximity.	Section 20.4.14
Melville, S	Consultation: The submission claims that the consultation effort has been inadequate.	Section 20.3.1
Melville, S	Socioeconomic: The submission is concerned with a reduction in house values.	Section 20.9.1
Melville, S	Water Quality: The submission is concerned about pollution in the Hunter River.	Section 20.7
Mills, B and J	Hazard and Risk: The submission claims that the site is a blast hazard.	Section 20.4.1
Moore, S	Support.	N/A
Moran, S	Cumulative Impact: The submission claims that there has been no sufficient assessment of the cumulative impact of the industry on Kooragang Island.	Section 20.10.1
Moran, S	General: The submission expressed a lack of confidence in IPL's safety operating record.	Section 20.10.3

Appendix A - Summary of Submissions

Public Submissions		
Author	Comment	Section Addressed
Moran, S	Hazard and Risk: The submission claims that the real safety concerns of possible explosions have not been assessed.	Section 20.4.1
Moran, S	Project Alternatives: The submission claims that the reasons for selecting the location on KI are not clearly defined.	Section 20.1.3
Morrison, S	Air Quality: The submission is concerned about worsening Air Quality and its effect on the health of local residents.	Section 20.5.4
Morrison, S	Hazard and Risk: The submission claims that Project represents an unacceptable risk.	Section 20.4.8
Morrison, S	Cumulative Risk: The submission is concerned about the adjacent AN plants operating.	Section 20.4.14
Morrison, S	Consultation: The submission claims that consultation has been inadequate.	Section 20.3.1
Morrison, S	Water Quality: The submission objects to further pollution of the Hunter River and associated impacts on protected wetlands.	Section 20.7
Moten, S	Hazard and Risk: The submission expresses concern about the location of the facility in relation to the residential areas.	Section 20.4.2
Moten, S	Cumulative Risk: The submission is concerned that locating the Project adjacent to Orica is doubling the risks.	Section 20.4.14
Murray, J	Noise and Vibration: The submission states that noise is already a problem in the area and that the Project would increase this problem.	Section 20.6.2
Murray, J	Water Quality: The submission highlights the importance of the Hunter River.	Section 20.7
Murray, V	Hazard and Risk: The submission is concerned about the national security problems potentially related to locating the Project near other industry and bulk fuel storage.	Section 20.4.9
Murray, V	Cumulative Risk: The submission is concerned about the impact of locating two AN plants adjacent to each other.	Section 20.4.14
Ostinga, K	Hazard and Risk: The submission is concerned about risk of explosion.	Section 20.4.1
Ostinga, K	Cumulative Risk: The submission is concerned about the impact of locating two AN plants adjacent to each other.	Section 20.4.14

Public Submissions		
Author	Comment	Section Addressed
Ostinga, M	Cumulative Risk: The submission states that building a second AN plant on KI is “not just negligent, it’s criminal”, it also states that terrorism must be a major consideration.	Section 20.4.2
Ostinga, M	Project Need: The submission questions the need for the Project based on the falling demand for coal.	Section 20.1.8
Parry, L	Air Quality: The submission states that the patients at the Stockton Centre would like to continue enjoying the “fresh, clean air which is enjoyed at the moment”.	Section 20.5.5
Parry, L	Water Quality: The submission mentions river pollution.	Section 20.7
Phillips, A	Air Quality: The submission states that the industry in the area is polluting.	Section 20.5.5
Phillips, A	Hazard and Risk: The submission is concerned about the proximity of the Project to residential areas.	Section 20.4.1
Pollington, S	Air Quality: The submission expresses concern about the addition of air pollutants into the already polluted air of the area.	Section 20.5.4
Pollington, S	Hazard and Risk: The submission claims to have researched AN plants and has not found another location where a plant has been located this close to residential areas and also there is nowhere that is planned to store this much AN in one location.	Section 20.4.14
Pollington, S	Cumulative Risk: The submission is concerned about the cumulative risk from the adjacent industry (PWCS and Orica).	Section 20.4.14
Pollington, S	Project Alternatives: The submission claims that the decision to proceed with this location is based mainly on financial reasons.	Section 20.1.6
Preece, V and I	Air Quality: The submission claims that air quality would be effected by dust and NOx	Section 20.5.6 / Section 20.5.9
Preece, V and I	Air Quality: the submission states that there is already too much industry on Kooragang Island.	Section 20.5.4
Preece, V and I	Cumulative Risk: The submission claims that nowhere in the world would you find two AN plants operating adjacent locations and less than 1 km from residents.	Section 20.4.14
Preece, V and I	Noise and Vibration: The submission claims that 24 hour noise is already a problem.	Section 20.6.2
Preece, V and I	Consultation: The submission claims that the consultation effort has been inadequate.	Section 20.3.1
Preece, V and I	Socioeconomic: The submission claims that house prices would be impacted by the Project.	Section 20.9.1

Appendix A - Summary of Submissions

Public Submissions		
Author	Comment	Section Addressed
Preece, V and I	Water Quality: The submission is concerned about the impact of the Project on the Hunter River.	Section 20.7
Prietto, C	Statutory Planning: The submission is concerned about the lack of strategic plan for Newcastle.	Section 20.2.2
Prietto, C	Cumulative Risk: The submission claims that the Project is unacceptable in this location due to the ongoing failings on the Orica site.	Section 20.4.14
Prietto, C	Cumulative Risk: The submission notes another DA with Newcastle Council for the storage of fertiliser on Kooragang Island (DA 2012/955).	Section 20.4.20
Prietto, G	Hazard and Risk: The submission claims that the Project represents an unacceptable risk.	Section 20.4.1
Prietto, G	Noise and Vibration: the submission claims that noise is already a problem in Stockton and that the Project will add to this.	Section 20.6.1
Prietto, G	Consultation: The submission claims that the community consultation effort has been inadequate.	Section 20.3.1
Prietto, G	Socioeconomic: The submission claims that the value of houses in the area has already dropped following the Orica spills.	Section 20.9.1
Prietto, G	Traffic and Transport: The submission claims that traffic congestion is already a problem and that the Project will add to this.	Section 20.8.1
Richards, T	Health Impacts: The submission is concerned about the health impacts from having industry near residential areas.	Section 20.10.7
Richards, T	Hazard and Risk: The submission draws on extensive experience of working with AN and questions the stability of the product.	Section 20.4.17
Richards, T	Transport Risk: The submission states that when firefighters attend an accident involving a truck with an AN load they are not allowed to tackle the fire for risk of explosion.	Section 20.4.1
Richards, T	Noise and Vibration: The submission is concerned with industrial noise levels being inflicted on residents.	Section 20.6.1
Richards, T	Socioeconomic: The submission claims that the value of houses in the area has already dropped following the Orica spills.	Section 20.9.1
Richards, T	Traffic and Transport: The submission claims that traffic congestion is already a problem and that the Project will add to this.	Section 20.8.1

Public Submissions		
Author	Comment	Section Addressed
Richards, T	Water Quality: The submission is concerned about the impact of the Project on the Hunter River.	Section 20.7
Robertson, B	Air Quality: The submission states that pollution is a serious concern.	Section 20.5.4
Robertson, B	Hazard and Risk: The submission claims that the Project represents an unacceptable risk.	Section 20.4.1
Robertson, B	Cumulative Risk: The submission claims that locating the Project adjacent to the Orica facility represents a significant risk.	Section 20.4.14
Robertson, B	Noise and Vibration: The submission states that pollution is a serious concern.	Section 20.6.2
Robertson, B	Water Quality: The submission states that pollution is a serious concern.	Section 20.7
Rogers, A	Cumulative Risk: The submission claims that locating the Project adjacent to the Orica facility represents a significant risk.	Section 20.4.14
Ross, P	General: The submission claims that the company has a poor track record.	Section 20.10.3
Ross, P	Project Location: The submission claims that the Project is located too close to residential areas.	Section 20.1.3
Scholin, O	Hazard and Risk: The submission claims that the layout of the site is inadequate to prevent a chain reaction.	Section 20.4.14
Scholin, O	Hazard and Risk: The submission states that AN is, “the explosive of choice for terrorists all over the world, even in highly developed countries.”	Section 20.4.18
Scholin, O	Hazard and Risk: The submission states that without the confidential sections of the PHA, it is not possible to see the full impact of the Project.	Section 20.4.15
Scholin, O	Cumulative Risk: The submission claims that locating the Project adjacent to the Orica facility represents a significant risk.	Section 20.4.14
Scholin, O	Consultation: The submission claims that the consultation effort has been inadequate with only the nearest suburbs being consulted.	Section 20.3.1
Scurry, B	Socioeconomic: The submission is concerned by the potential for a decrease in house prices and also by the taunts from colleagues following buying a house in Stockton.	Section 20.9.1
Scurry, B	Traffic and Transport: The submission claims that the roads on and off Kooragang Island are already congested and that the infrastructure should be upgraded.	Section 20.8.1
Scurry, B	Water Quality: The submission is concerned with additional pollution into the Hunter River.	Section 20.7

Appendix A - Summary of Submissions

Public Submissions		
Author	Comment	Section Addressed
Shorland, C	Air Quality: The submission is concerned with Dust and the impact that this has on garden furniture.	Section 20.5.6
Shorland, C	Air Quality: The submission is concerned with the cumulative impact of another Prill Tower on the area.	Section 20.5.11
Shorland, C	Cumulative Impact: The submission states that the cumulative impact of the Project has not been considered.	Section 20.10.1
Shorland, C	Hazard and Risk: The submission states that no evacuation plan is in place for Stockton.	Section 20.4.9
Shorland, C	Cumulative Risk: The submission claims that locating the Project adjacent to the Orica facility represents a significant risk.	Section 20.4.14
Shorland, C	Noise and Vibration: The submission is concerned that the Project would increase the industrial noise levels, already above the limits set by the guidelines.	Section 20.6.1
Shorland, C	Socioeconomic: The submission is concerned with the potential for house prices in Stockton to fall.	Section 20.9.1
Shorland, I	Air Quality: The submission is concerned with Dust and the impact that this has on garden furniture.	Section 20.5.6
Shorland, I	Air Quality: The submission is concerned with the cumulative impact of another Prill Tower on the area.	Section 20.5.11
Shorland, I	Cumulative Impact: The submission states that the cumulative impact of the Project has not been considered.	Section 20.10.1
Shorland, I	Hazard and Risk: The submission states that no evacuation plan is in place for Stockton.	Section 20.4.9
Shorland, I	Cumulative Risk: The submission claims that locating the Project adjacent to the Orica facility represents a significant risk.	Section 20.4.14
Shorland, I	Noise and Vibration: The submission is concerned that the Project would increase the industrial noise levels, already above the limits set by the guidelines.	Section 20.6.1
Shorland, I	Socioeconomic: The submission is concerned with the potential for house prices in Stockton to fall.	Section 20.9.1
Smith, J	Air Quality: The submission states that the Project would have an impact.	Section 20.5.5
Smith, J	Cumulative Risk: The submission states that locating two adjacent plants represents too big a risk.	Section 20.4.2
Smith, J	Noise and Vibration: The submission states that the Project would have an impact.	Section 20.6.4
Smith, J	Traffic and Transport: The submission states that the Project would have an impact.	Section 20.8.2
Smith, J	Water Quality: The submission states that the Project would have an impact.	Section 20.7
Smith, M	Air Quality: The submission is concerned with the increases in NOx gasses.	Section 20.5.9

Public Submissions		
Author	Comment	Section Addressed
Smith, M	Cumulative Risk: The submission states that locating two adjacent plants represents too big a risk. – A terrorist attack on this area would “change the fabric of Australian society”.	Section 20.4.18
Smith, M	Noise and Vibration: The submission is concerned with sleep deprivation following excess noise and that the suggestion to relax the acceptable noise limits for the area is unacceptable.	Section 20.6.4
Squire, T	Air Quality: The submission is concerned about the alarming growth in air pollutants in the area.	Section 20.5.4
Squire, T	Statutory Planning: The submission supports the argument that each project should be assessed against a backdrop of the existing environment.	Section 20.2.1
Squire, T	Hazard and Risk: The submission is concerned about the possibility of a massive explosion.	Section 20.4.1
Steadman, C and D	Project Location: The submission states that the Project is too close to the urban areas.	Section 20.1.3
Stroud, D	Project Location: The submission states that the Project would be located too close to the city and the environment and also too close to “a proven pollution hazard”	Section 20.1.3
Struck, R	Air Quality: The submission states that the Project would have an impact.	Section 20.5.5
Struck, R	Hazard and Risk: The submission is concerned about the possibility of a massive explosion.	Section 20.4.1
Struck, R	Noise and Vibration: The submission states that the Project would have an impact.	Section 20.6.4
Struck, R	Socioeconomic: The submission is concerned with the potential for house prices in Stockton to fall.	Section 20.9.1
Struck, R	Traffic and Transport: The submission states that the Project would have an impact.	Section 20.8.2
Struck, R	Water Quality: The submission states that the Project would have an impact.	Section 20.7
Taylor, S	Air Quality: The submission states that the Project should be designed to have no environmental output. The submission also states that independent monitoring operation should be funded by IPL to monitor all pollutants in the area.	Section 20.5.5
Taylor, S	Licences: The submission states that IPL’s EPL should be updated annually to ensure that world’s best practice is maintained. Additionally, the submission proposes that a “One Strike” rule should be implemented. Should IPL cause one breach of the licence terms, the lot would be returned to the natural condition and gifted to the people of Newcastle as a park.	Section 20.10.7

Appendix A - Summary of Submissions

Public Submissions		
Author	Comment	Section Addressed
Taylor, S	Hazard and Risk: The submission states that the Project must disclose all the information regarding the explosive capability of the facility.	Section 20.4.15
Taylor, S	Hazard and Risk: The submission states that the Project must include a “post 9/11 world security system”	Section 20.4.18
Taylor, S	Hazard and Risk: The submission suggests that the amount of AN allowed to be stored should be limited to 100 t, subject to an independent enquiry.	Section 20.4.1
Taylor, S	Transport Risk: The submission states that the transport of AN through residential areas represents too high a risk.	Section 20.4.22
Taylor, S	Project Location: The submission claims that the location of the Project near to residential areas is unacceptable.	Section 20.1.3
Taylor, S	Noise and Vibration: The submission states that the noise emissions from the Project would be within the residential limits of the area.	Section 20.6.4
Taylor, S	Consultation: The submission claims that all community concerns should be addressed before the Project is considered.	Section 20.3.1
Taylor, S	Water Quality: The submission states that the Project should be designed to have no environmental output. The submission also states that independent monitoring operation should be funded by IPL to monitor all pollutants in the Hunter river.	Section 20.7
Terry, S	Air Quality: The submission states that the Project would have an impact.	Section 20.5.5
Terry, S	Hazard and Risk: The submission is concerned about the possibility of a massive explosion.	Section 20.4.1
Terry, S	Noise and Vibration: The submission states that the Project would have an impact.	Section 20.6.4
Terry, S	Consultation: The submission claims that the consultation effort was inadequate.	Section 20.3.1
Terry, S	Water Quality: The submission states that the Project would have an impact.	Section 20.7
Thornton, R	Project Need: The Socioeconomic assessment within the EIS does not include the factors that led to the decision to delay the Project by two years.	Section 20.1.6
Todhunter, W	Air Quality: The submission states that the Project would have an impact.	Section 20.5.5
Todhunter, W	Hazard and Risk: The submission is concerned about the possibility of a massive explosion.	Section 20.4.1
Todhunter, W	Noise and Vibration: The submission states that the Project would have an impact.	Section 20.6.4

Public Submissions		
Author	Comment	Section Addressed
Todhunter, W	Noise and Vibration: The submission states that the Project would have an impact.	Section 20.6.4
Todhunter, W	Socioeconomic: The submission is concerned with the potential for house prices in Stockton to fall.	Section 20.9.1
Todhunter, W	Water Quality: The submission states that the Project would have an impact.	Section 20.7
Unidentified	Health Impacts: The submission claims that the community is showing signs of stress as a result of the Project.	Section 20.10.7
Unidentified	Hazard and Risk: The submission disputes the risk criteria set out in the PHA and is concerned about the possibility of a massive explosion.	Section 20.4.14
Unidentified	Hazard and Risk: The submission is concerned about the lack of an evacuation plan.	Section 20.4.9
Unidentified	Cumulative Risk: The submission is concerned about the cumulative risk of the Project alongside other major hazard facilities in the area.	Section 20.4.14
Van Oort, E	Hazard and Risk: The submission is concerned about the possibility of a massive explosion.	Section 20.4.1
Van Oort, E	Water Quality: The submission states that the Project would have an impact.	Section 20.7
Vought, G	Project Need: The Socioeconomic assessment within the EIS does not include the factors that led to the decision to delay the Project by two years.	Section 20.1.6
Whitcher, B and Bernie, B	Air Quality: The submission is concerned by impacts on air quality coming from the increase in trucks.	Section 20.5.7
Whitcher, B and Bernie, B	Air Quality: The submission states that air quality is already a problem and that the Project would add to this.	Section 20.5.4
Whitcher, B and Bernie, B	Hazard and Risk: The submission is concerned about the possibility of a massive explosion.	Section 20.4.1
Whitcher, B and Bernie, B	Consultation: The submission states that the consultation effort was inadequate and that there were too many closed questions within the phone surveys.	Section 20.3.1
Whitcher, B and Bernie, B	Socioeconomic: The submission claims that the risk is too high to justify the economic gains.	Section 20.4.2
Whitcher, B and Bernie, B	Socioeconomic: The submission is concerned with the potential for house prices in Stockton to fall.	Section 20.9.1

Appendix A - Summary of Submissions

Public Submissions		
Author	Comment	Section Addressed
Whitcher, B and Bernie, B	Traffic and Transport: The submission states that the Project would have an impact.	Section 20.8.2
Whitcher, B and Bernie, B	Water Quality: The submission states that the Project would have an impact.	Section 20.7
Wilce, R	Noise and Vibration: The submission points out that it would be possible to create a facility in which all noise limits are met but that this would be too expensive and therefore IPL is not doing so.	Section 20.6.4
Wood, R	Air Quality: The submission appears to be opposed to the idea of a “significant reduction” in air quality impacts.	Section 20.5.10
Wood, R	Noise and Vibration: The submission is opposed to the classification of the acoustic baseline as “dominated by industrial, traffic and port noise”, the submission is also opposed to the commitment to only “use low noise equipment where practicable”.	Section 20.6.1
Wright , S	Statutory Planning: The submission claims that the process of assessment is inadequate.	Section 20.2.1
Wright, S	Air Quality: The submission claims that there is already a poor air quality in the area and that the Project, alongside the other industry in the area, would cause a further deterioration of air quality.	Section 20.5.4
Wright, S	Hazard and Risk: The submission claims that the Project poses an unacceptable risk to the community.	Section 20.4.2
Wright, S	Noise and Vibration: The submission claims that the assessment for the EIS took place while the Orica facility was not operational. The submission claims that industrial noise in the area is already a problem.	Section 20.6.3
Wright, S	Consultation: The submission claims that the consultation effort has been inadequate.	Section 20.3.1
Wright, S	Socioeconomic: The submission is concerned with the potential for house prices in Stockton to fall.	Section 20.9.1
Wright, S	Traffic and Transport: The submission states that the Project would have an impact.	Section 20.8.2
Wright, S	Water Quality: The submission states that the Project would have an impact.	Section 20.7
Young, B	Hazard and Risk: The submission claims that the Project poses an unacceptable risk to the community.	Section 20.4.2
Yudaeff, L	Air Quality: The submission is concerned with the impact of air emissions on the residents of the two sheltered accommodation centres in the area. Including a cumulative impact along with the increasing Orica output.	Section 20.5.3
Yudaeff, L	General: The submission states that the safety record of IPL and Orica are poor.	Section 20.10.3
Yudaeff, L	Hazard and Risk: The submission is concerned about the lack of an emergency response plan.	Section 20.4.9

Public Submissions		
Author	Comment	Section Addressed
Yudaeff, L	Hazard and Risk: The submission states that seismic activity is recorded in the area.	Section 20.4.14
Yudaeff, L	Hazard and Risk: The submission states that the risk associated with the Project is too great to be allowed in this location.	Section 20.4.1

Modified Form Letters (responded to as 'Public Submissions')		
Author	Comment	Section Addressed
Birrell, W	Air Quality: The Submission claims that extra diesel trucks will add dangerous carcinogens to the air quality of the area.	Section 20.5.7
Birrell, W	Air Quality: The submission is concerned about the cumulative impact of the industry on Kooragang Island on Air Quality. Particularly of the Project alongside the Orica expansion and the PWCS T4 Proposal.	Section 20.5.3
Birrell, W	Cumulative Risk: The submission claims that the EIS does not adequately address the concerns regarding the combined storage of Incitec Pivot and Orica.	Section 20.4.14
Birrell, W	Noise and Vibration: The submission claims that 'industry' cannot be trusted because of the current night-time acoustic exceedance on Kooragang Island.	Section 20.6.1
Birrell, W	Noise and Vibration: The submission claims that the baseline monitoring for the EIS was completed while the Orica plant was not operational.	Section 20.6.3
Birrell, W	Consultation: The submission claims that the consultation effort for the Project has been inadequate.	Section 20.3.1
Birrell, W	Socioeconomic: The Submission states that the 60 jobs that the Project is stated to create within the EIS does not compensate for the increased risk of explosion.	Section 20.4.2
Birrell, W	Traffic and Transport: The submission claims that the Project makes no attempt to mitigate impacts on local road network.	Section 20.8.3
Birrell, W	Traffic and Transport: The submission mentions existing congestion on the local roads.	Section 20.8.1
Birrell, W	Water Quality: The submission is concerned about the impact on tourism should the Ramsar Wetland be damaged by the Project.	Section 20.7

Appendix A - Summary of Submissions

Modified Form Letters (responded to as 'Public Submissions')		
Author	Comment	Section Addressed
Birrell, W	Water Quality: The submission states that any pollution into the Hunter River is unacceptable as industrial pollution is damaging to the asset that is enjoyed by recreational users and fishermen.	Section 20.7
Cahill, F	Air Quality: The submission questions whether Incitec will adhere to licence requirements considering the Orica plant, which was once operated by Incitec, breached its licence.	Section 20.5.8
Cahill, F	Air Quality: The Submission claims that extra diesel trucks will add dangerous carcinogens to the air quality of the area.	Section 20.5.7
Cahill, F	Air Quality: The submission is concerned about the cumulative impact of the industry on Kooragang Island on Air Quality. Particularly of the Project alongside the Orica expansion and the PWCS T4 Proposal.	Section 20.5.3
Cahill, F	Hazards and Risk: No amount of precaution can eliminate the risk of explosion which could be caused by many factors including as human error and terrorism.	Section 20.4.2
Cahill, F	Hazards and Risk: Several documents have been kept from the public to prevent the public from making an 'informed judgement' about the risks involved with the plant.	Section 20.4.15
Cahill, F	Cumulative Risk: The submission claims that the EIS does not adequately address the concerns regarding the combined storage of Incitec Pivot and Orica.	Section 20.4.14
Cahill, F	Noise and Vibration: The submission claims Stockton is currently subject to noise levels that are exceeding the standard for suburbs and Incitec is using this as an excuse to raise noise levels, indicating a lack of community regard.	Section 20.6.4
Cahill, F	Consultation: The submission claims that only the closest suburbs to the proposed plant (Stockton and Mayfield) have received any information regarding the Project and considering an explosion would affect the whole of Newcastle, consultation efforts have been 'false and deceptive'.	Section 20.3.1
Cahill, F	Consultation: The submission claims that the consultation effort for the Project has been inadequate.	Section 20.3.1
Cahill, F	Socioeconomic: The Submission states that the 60 jobs that the Project is stated to create within the EIS does not compensate for the increased risk of explosion.	Section 20.4.2
Cahill, F	Traffic and Transport: The submission mentions existing congestion on the local roads which will increase under the project.	Section 20.8.1
Cameron, P	Air Quality: The submission claims that the additional trucks on the road thanks to the Project will create additional carcinogenic fine particles and nitrous oxides.	Section 20.5.6 / Section 20.5.9

Modified Form Letters (responded to as 'Public Submissions')		
Author	Comment	Section Addressed
Cameron, P	Air Quality: The submission claims that the Project will increase nitrous oxides and PM10 to above the standard of 50 mg/m ³ . The submission states that the area around Stockton is already experiencing increased levels of PM10 thanks to the coal loaders on Kooragang Island.	Section 20.5.6
Cameron, P	Air Quality: The submission claims that there are already high levels of coal dust in surrounding areas and projects such as T4 and Incitec will increase the levels of fine particles.	Section 20.5.6
Cameron, P	Cumulative Risk: The cumulative total of the Project and the Orica expansion would have an explosive power of half that of the Hiroshima atomic explosion.	Section 20.4.1
Cameron, P	Noise and Vibration The submission states that there is already an unacceptable level of night time noise in the area and that the Project is proposing to increase the allowable noise in the area to make the acoustic emissions from the Project acceptable.	Section 20.6.2
Cameron, P	Socioeconomic: The submission states that the number of jobs that would be created are does not justify the additional risk for the local community.	Section 20.9.3
Cameron, P	Traffic and Transport: The submission states that traffic congestion is already a problem around the area and that the Project will add to this.	Section 20.8.1
Charles, C	Air Quality: The Submission claims that extra diesel trucks will add dangerous carcinogens to the air quality of the area.	Section 20.5.7
Charles, C	Air Quality: The submission is concerned about the cumulative impact of the industry on Kooragang Island on Air Quality. Particularly of the Project alongside the Orica expansion and the PWCS T4 Proposal.	Section 20.5.3
Charles, C	Ecology: Submission expresses concern over impacts to internationally listed Ramsar wetlands.	Section 19.10.5
Charles, C	Cumulative Risk: The submission claims that the EIS does not adequately address the concerns regarding the combined storage of Incitec Pivot and Orica.	Section 20.4.14
Charles, C	Noise and Vibration: The submission claims that 'industry' cannot be trusted because of the current night-time acoustic exceedance on Kooragang Island.	Section 20.6.1
Charles, C	Noise and Vibration: Submissions expresses concern over an increase in 24 hour noise levels.	Section 20.6.4
Charles, C	Noise and Vibration: The submission claims that the baseline monitoring for the EIS was completed while the Orica plant was not operational.	Section 20.6.3

Appendix A - Summary of Submissions

Modified Form Letters (responded to as 'Public Submissions')		
Author	Comment	Section Addressed
Charles, C	Consultation: The submission claims that the consultation effort for the Project has been inadequate.	Section 20.3.1
Charles, C	Consultation: The submission claims that the two year delay to the Project that has been declared is designed to allow an extended period of lobbying government ministers.	Section 20.1.6
Charles, C	Socioeconomic: The submission claims that the EIS makes no mention of responsibility for a reduction in house prices.	Section 20.9.1
Charles, C	Socioeconomic: The submission claims that the Project would lead to fewer families moving to Stockton due to the stigma of being near to the two ammonium nitrate plants.	Section 20.9.2
Charles, C	Socioeconomic: The Submission states that the 60 jobs that the Project is stated to create within the EIS does not compensate for the increased risk of explosion.	Section 20.4.2
Charles, C	Traffic and Transport: The submission claims that the Project makes no attempt to mitigate impacts on local road network.	Section 20.8.3
Charles, C	Traffic and Transport: The submission mentions existing congestion on the local roads.	Section 20.8.1
Charles, C	Water Quality: The submission is concerned about the impact on tourism should the Ramsar Wetland be damaged by the Project.	Section 20.7
Charles, C	Water Quality: The submission states that any pollution into the Hunter River is unacceptable as industrial pollution is damaging to the asset that is enjoyed by recreational users and fishermen.	Section 20.7
Confidential 8	Air Quality: The Submission claims that extra diesel trucks will add dangerous carcinogens to the air quality of the area.	Section 20.5.7
Confidential 8	Air Quality: The submission is concerned about the cumulative impact of the industry on Kooragang Island on Air Quality. Particularly of the Project alongside the Orica expansion and the PWCS T4 Proposal.	Section 20.5.3
Confidential 8	Cumulative Risk: The submission claims that the EIS does not adequately address the concerns regarding the combined storage of Incitec Pivot and Orica.	Section 20.4.14
Confidential 8	Noise and Vibration: The submission claims that 'industry' cannot be trusted because of the current night-time acoustic exceedance on Kooragang Island.	Section 20.6.1
Confidential 8	Noise and Vibration: The submission claims that the baseline monitoring for the EIS was completed while the Orica plant was not operational.	Section 20.6.3

Modified Form Letters (responded to as 'Public Submissions')		
Author	Comment	Section Addressed
Confidential 8	Consultation: The submission claims that the consultation effort for the Project has been inadequate.	Section 20.3.1
Confidential 8	Socioeconomic: The submission claims that the EIS does not address the potential for the Project to have an impact on house prices in Stockton.	Section 20.9.1
Confidential 8	Socioeconomic: The submission claims that the EIS makes no mention of responsibility for a reduction in house prices.	Section 20.9.1
Confidential 8	Socioeconomic: The submission claims that the Project would lead to fewer families moving to Stockton due to the stigma of being near to the two ammonium nitrate plants.	Section 20.9.1
Confidential 8	Socioeconomic: The Submission states that the 60 jobs that the Project is stated to create within the EIS does not compensate for the increased risk of explosion.	Section 20.4.2
Confidential 8	Traffic and Transport: The submission claims that the Project makes no attempt to mitigate impacts on local road network.	Section 20.8.3
Confidential 8	Traffic and Transport: The submission mentions existing congestion on the local roads.	Section 20.8.1
Confidential 8	Water Quality: The submission is concerned about the impact on tourism should the Ramsar Wetland be damaged by the Project.	Section 20.7
Confidential 8	Water Quality: The submission states that any pollution into the Hunter River is unacceptable as industrial pollution is damaging to the asset that is enjoyed by recreational users and fishermen.	Section 20.7
Craig, A	Air Quality: The submission expresses concern over existing air quality in Stockton, particularly the levels of fine particles.	Section 20.5.6
Craig, A	Air Quality: The Submission claims that extra diesel trucks will add dangerous carcinogens to the air quality of the area.	Section 20.5.7
Craig, A	Air Quality: The submission is concerned about the cumulative impact of the industry on Kooragang Island on Air Quality. Particularly of the Project alongside the Orica expansion and the PWCS T4 Proposal.	Section 20.5.3
Craig, A	Cumulative Risk: The submission claims that the EIS does not adequately address the concerns regarding the combined storage of Incitec Pivot and Orica.	Section 20.4.14
Craig, A	Noise and Vibration: The submission claims that 'industry' cannot be trusted because of the current night-time acoustic exceedance on Kooragang Island.	Section 20.6.1

Appendix A - Summary of Submissions

Modified Form Letters (responded to as 'Public Submissions')		
Author	Comment	Section Addressed
Craig, A	Noise and Vibration: Submission claims the project will not adhere to NSW Noise Policy, particularly where noise levels already exceed limits and are likely to be reduced in the future.	Section 20.6.4
Craig, A	Noise and Vibration: The submission claims that the baseline monitoring for the EIS was completed while the Orica plant was not operational.	Section 20.6.3
Craig, A	Consultation: The submission claims that the consultation effort for the Project has been inadequate.	Section 20.3.1
Craig, A	Socioeconomic: The Submission states that the 60 jobs that the Project is stated to create within the EIS does not compensate for the increased risk of explosion.	Section 20.4.2
Craig, A	Traffic and Transport: The submission claims that the Project makes no attempt to mitigate impacts on local road network.	Section 20.8.3
Craig, A	Traffic and Transport: The submission mentions existing congestion on the local roads.	Section 20.8.1
Craig, A	Water Quality: The submission is concerned about the impact on tourism should the Ramsar Wetland be damaged by the Project.	Section 20.7
Craig, A	Water Quality: The submission states that any pollution into the Hunter River is unacceptable as industrial pollution is damaging to the asset that is enjoyed by recreational users and fishermen.	Section 20.7
Craig, L	Air Quality: The submission expresses concern over existing air quality in Stockton, particularly the levels of fine particles.	Section 20.5.6
Craig, L	Air Quality: The Submission claims that extra diesel trucks will add dangerous carcinogens to the air quality of the area.	Section 20.5.7
Craig, L	Air Quality: The submission is concerned about the cumulative impact of the industry on Kooragang Island on Air Quality. Particularly of the Project alongside the Orica expansion and the PWCS T4 Proposal.	Section 20.5.3
Craig, L	Cumulative Risk: The submission claims that the EIS does not adequately address the concerns regarding the combined storage of Incitec Pivot and Orica.	Section 20.4.14
Craig, L	Noise and Vibration: The submission claims that 'industry' cannot be trusted because of the current night-time acoustic exceedance on Kooragang Island.	Section 20.6.1
Craig, L	Noise and Vibration: Submission claims the project will not adhere to NSW Noise Policy, particularly where noise levels already exceed limits and are likely to be reduced in the future.	Section 20.6.4

Modified Form Letters (responded to as 'Public Submissions')		
Author	Comment	Section Addressed
Craig, L	Noise and Vibration: The submission claims that the baseline monitoring for the EIS was completed while the Orica plant was not operational.	Section 20.6.3
Craig, L	Consultation: The submission claims that the consultation effort for the Project has been inadequate.	Section 20.3.1
Craig, L	Socioeconomic: The submission claims that the EIS makes no mention of responsibility for a reduction in house prices.	Section 20.9.1
Craig, L	Socioeconomic: The submission claims that the Project would lead to fewer families moving to Stockton due to the stigma of being near to the two ammonium nitrate plants.	Section 20.9.1
Craig, L	Socioeconomic: The Submission states that the 60 jobs that the Project is stated to create within the EIS does not compensate for the increased risk of explosion.	Section 20.4.2
Craig, L	Traffic and Transport: The submission claims that the Project makes no attempt to mitigate impacts on local road network.	Section 20.8.3
Craig, L	Traffic and Transport: The submission mentions existing congestion on the local roads.	Section 20.8.1
Craig, L	Water Quality: The submission is concerned about the impact on tourism should the Ramsar Wetland be damaged by the Project.	Section 20.7
Craig, L	Water Quality: The submission states that any pollution into the Hunter River is unacceptable as industrial pollution is damaging to the asset that is enjoyed by recreational users and fishermen.	Section 20.7
Deacon, V	Air Quality: The Submission claims that extra diesel trucks will add dangerous carcinogens to the air quality of the area.	Section 20.5.7
Deacon, V	Air Quality: The submission is concerned about the cumulative impact of the industry on Kooragang Island on Air Quality. Particularly of the Project alongside the Orica expansion and the PWCS T4 Proposal.	Section 20.5.3
Deacon, V	Ecology: The submission claims industry on Kooragang Island has caused damage to the river and estuary	Section 19.10.5
Deacon, V	Hazard and Risk: The submission states the project is a danger to Newcastle and nearby river suburbs and should be established in a remote area.	Section 20.4.1
Deacon, V	Cumulative Risk: The submission claims that the EIS does not adequately address the concerns regarding the combined storage of Incitec Pivot and Orica.	Section 20.4.14

Appendix A - Summary of Submissions

Modified Form Letters (responded to as 'Public Submissions')		
Author	Comment	Section Addressed
Deacon, V	Noise and Vibration: The submission claims that 'industry' cannot be trusted because of the current night-time acoustic exceedance on Kooragang Island.	Section 20.6.1
Deacon, V	Noise and Vibration: The submission claims that the baseline monitoring for the EIS was completed while the Orica plant was not operational.	Section 20.6.3
Deacon, V	Consultation: The submission claims that the consultation effort for the Project has been inadequate.	Section 20.3.1
Deacon, V	Socioeconomic: The submission claims that the EIS does not address the potential for the Project to have an impact on house prices in Stockton.	Section 20.9.1
Deacon, V	Socioeconomic: The submission claims that the EIS makes no mention of responsibility for a reduction in house prices.	Section 20.9.1
Deacon, V	Socioeconomic: The submission claims that the Project would lead to fewer families moving to Stockton due to the stigma of being near to the two ammonium nitrate plants.	Section 20.9.1
Deacon, V	Socioeconomic: The Submission states that the 60 jobs that the Project is stated to create within the EIS does not compensate for the increased risk of explosion.	Section 20.4.2
Deacon, V	Traffic and Transport: The submission claims that the Project makes no attempt to mitigate impacts on local road network.	Section 20.8.3
Deacon, V	Traffic and Transport: The submission mentions existing congestion on the local roads.	Section 20.8.1
Deacon, V	Water Quality: The submission is concerned about the impact on tourism should the Ramsar Wetland be damaged by the Project.	Section 20.7
Deacon, V	Water Quality: The submission states that any pollution into the Hunter River is unacceptable as industrial pollution is damaging to the asset that is enjoyed by recreational users and fishermen.	Section 20.7
Gorst, R and D	Air Quality: The submission claims that the additional trucks on the road thanks to the Project will create additional carcinogenic fine particles and nitrous oxides.	Section 20.5.6 / Section 20.5.9
Gorst, R and D	Air Quality: The submission claims that the additional trucks on the road thanks to the Project will create additional carcinogenic fine particles and nitrous oxides.	Section 20.5.6 / Section 20.5.9
Gorst, R and D	Air Quality: The submission claims that the Project will increase nitrous oxides and PM10 to above the standard of 50 mg/m ³ . The submission states that the area around Stockton is already experiencing increased levels of PM10 thanks to the coal loaders on Kooragang Island.	Section 20.5.6

Modified Form Letters (responded to as 'Public Submissions')		
Author	Comment	Section Addressed
Gorst, R and D	Air Quality: The submission claims that the Project will increase nitrous oxides and PM10 to above the standard of 50 mg/m ³ . The submission states that the area around Stockton is already experiencing increased levels of PM10 thanks to the coal loaders on Kooragang Island.	Section 20.5.6
Gorst, R and D	Hazard and Risk: The submission mentions the IPL plant in South Australia that, it is claimed, poses too high an explosion risk for local residents.	Section 20.4.7
Gorst, R and D	Hazard and Risk: The submission mentions the IPL plant in South Australia that, it is claimed, poses too high an explosion risk for local residents.	Section 20.4.7
Gorst, R and D	Cumulative Risk: The cumulative total of the Project and the Orica expansion would have an explosive power of half that of the Hiroshima atomic explosion.	Section 20.4.1
Gorst, R and D	Cumulative Risk: The cumulative total of the Project and the Orica expansion would have an explosive power of half that of the Hiroshima atomic explosion.	Section 20.4.1
Gorst, R and D	Noise and Vibration The submission states that there is already an unacceptable level of night time noise in the area and that the Project is proposing to increase the allowable noise in the area to make the acoustic emissions from the Project acceptable.	Section 20.6.2
Gorst, R and D	Noise and Vibration The submission states that there is already an unacceptable level of night time noise in the area and that the Project is proposing to increase the allowable noise in the area to make the acoustic emissions from the Project acceptable.	Section 20.6.2
Gorst, R and D	Socioeconomic: The submission states that the number of jobs that would be created are does not justify the additional risk for the local community.	Section 20.9.3
Gorst, R and D	Socioeconomic: The submission states that the number of jobs that would be created are does not justify the additional risk for the local community.	Section 20.9.3
Gorst, R and D	Traffic and Transport: The submission states that traffic congestion is already a problem around the area and that the Project will add to this.	Section 20.8.1
Gorst, R and D	Traffic and Transport: The submission states that traffic congestion is already a problem around the area and that the Project will add to this.	Section 20.8.1
Hansen, J	Air Quality: The Submission claims that extra diesel trucks will add dangerous carcinogens to the air quality of the area.	Section 20.5.7

Appendix A - Summary of Submissions

Modified Form Letters (responded to as 'Public Submissions')		
Author	Comment	Section Addressed
Hansen, J	Air Quality: The submission is concerned about the cumulative impact of the industry on Kooragang Island on Air Quality, including PM10 particle levels in Stockton. Particularly of the Project alongside the Orica expansion and the PWCS T4 Proposal.	Section 20.5.3
Hansen, J	Cumulative Risk: The submission claims that the EIS does not adequately address the concerns regarding the combined storage of Incitec Pivot and Orica.	Section 20.4.14
Hansen, J	Noise and Vibration: The submission claims the project will increase noise levels, felt particularly by Stockton which is already experiencing noise that exceeds the standard for suburbs.	Section 20.6.4
Hansen, J	Socioeconomic: The Submission states that the 60 jobs that the Project is stated to create within the EIS does not compensate for the increased risk of explosion.	Section 20.4.2
Hansen, J	Traffic and Transport: The submission mentions existing congestion on the local roads.	Section 20.8.1
Hollingshed, D 2	Air Quality: The Submission claims that extra diesel trucks will add dangerous carcinogens to the air quality of the area.	Section 20.5.7
Hollingshed, D 2	Air Quality: The submission is concerned about the cumulative impact of the industry on Kooragang Island on Air Quality. Particularly of the Project alongside the Orica expansion and the PWCS T4 Proposal.	Section 20.5.3
Hollingshed, D 2	Cumulative Risk: The submission claims that the EIS does not adequately address the concerns regarding the combined storage of Incitec Pivot and Orica.	Section 20.4.14
Hollingshed, D 2	Noise and Vibration: The submission claims that 'industry' cannot be trusted because of the current night-time acoustic exceedance on Kooragang Island.	Section 20.6.1
Hollingshed, D 2	Noise and Vibration: The submission claims that the baseline monitoring for the EIS was completed while the Orica plant was not operational.	Section 20.6.3
Hollingshed, D 2	Consultation: The submission claims that the consultation effort for the Project has been inadequate.	Section 20.3.1
Hollingshed, D 2	Socioeconomic: The submission claims that the EIS does not address the potential for the Project to have an impact on house prices in Stockton.	Section 20.9.1
Hollingshed, D 2	Socioeconomic: The submission claims that the EIS makes no mention of responsibility for a reduction in house prices.	Section 20.9.1

Modified Form Letters (responded to as 'Public Submissions')		
Author	Comment	Section Addressed
Hollingshed, D 2	Socioeconomic: The submission claims that the Project would lead to fewer families moving to Stockton due to the stigma of being near to the two ammonium nitrate plants.	Section 20.9.1
Hollingshed, D 2	Socioeconomic: The Submission states that the 60 jobs that the Project is stated to create within the EIS does not compensate for the increased risk of explosion.	Section 20.4.2
Hollingshed, D 2	Traffic and Transport: The submission claims that the Project makes no attempt to mitigate impacts on local road network.	Section 20.8.3
Hollingshed, D 2	Traffic and Transport: The submission mentions existing congestion on the local roads.	Section 20.8.1
Hollingshed, D 2	Water Quality: The submission is concerned about the impact on tourism should the Ramsar Wetland be damaged by the Project.	Section 20.7
Hollingshed, D 2	Water Quality: The submission states that any pollution into the Hunter River is unacceptable as industrial pollution is damaging to the asset that is enjoyed by recreational users and fishermen.	Section 20.7
Jauden, M	Air Quality: The submission expresses concern over existing air quality in Stockton, particularly the levels of fine particles.	Section 20.5.6
Jauden, M	Air Quality: The Submission claims that extra diesel trucks will add dangerous carcinogens to the air quality of the area.	Section 20.5.7
Jauden, M	Air Quality: The submission is concerned about the cumulative impact of the industry on Kooragang Island on Air Quality. Particularly of the Project alongside the Orica expansion and the PWCS T4 Proposal.	Section 20.5.3
Jauden, M	Cumulative Risk: The submission claims that the EIS does not adequately address the concerns regarding the combined storage of Incitec Pivot and Orica. Particularly of the potential impacts within a 5km radius.	Section 20.4.14
Jauden, M	Noise and Vibration: Submission claims the project will not adhere to NSW Noise Policy, particularly where noise levels already exceed limits and are likely to be reduced in the future.	Section 20.6.1
Jauden, M	Noise and Vibration: The submission claims that 'industry' cannot be trusted because of the current night-time acoustic exceedance on Kooragang Island.	Section 20.6.1
Jauden, M	Noise and Vibration: The submission claims that the baseline monitoring for the EIS was completed while the Orica plant was not operational.	Section 20.6.3
Jauden, M	Consultation: The submission claims that the consultation effort for the Project has been inadequate.	Section 20.3.1

Appendix A - Summary of Submissions

Modified Form Letters (responded to as 'Public Submissions')		
Author	Comment	Section Addressed
Jauden, M	Socioeconomic: The Submission states that the 60 jobs that the Project is stated to create within the EIS does not compensate for the increased risk of explosion.	Section 20.4.2
Jauden, M	Traffic and Transport: The submission claims that the Project makes no attempt to mitigate impacts on local road network.	Section 20.8.3
Jauden, M	Traffic and Transport: The submission mentions existing congestion on the local roads.	Section 20.8.1
Jauden, M	Water Quality: The submission is concerned about the impact on tourism should the Ramsar Wetland be damaged by the Project.	Section 20.7
Jauden, M	Water Quality: The submission states that any pollution into the Hunter River is unacceptable as industrial pollution is damaging to the asset that is enjoyed by recreational users and fishermen.	Section 20.7
McCauley, T	Air Quality: The Submission claims that extra diesel trucks will add dangerous carcinogens to the air quality of the area.	Section 20.5.7
McCauley, T	Air Quality: The submission is concerned about the cumulative impact of the industry on Kooragang Island on Air Quality. Particularly of the Project alongside the Orica expansion and the PWCS T4 Proposal.	Section 20.5.3
McCauley, T	Ecology: Submission states that wetlands should be protected and industrial activity that has the potential to impact those areas should not be approved.	Section 19.10.5
McCauley, T	Cumulative Risk: The submission claims that the EIS does not adequately address the concerns regarding the combined storage of Incitec Pivot and Orica.	Section 20.4.14
McCauley, T	Noise and Vibration: The submission claims that the baseline monitoring for the EIS was completed while the Orica plant was not operational.	Section 20.6.3
McCauley, T	Consultation: The submission claims that the consultation effort for the Project has been inadequate.	Section 20.3.1
McCauley, T	Socioeconomic: The submission claims that the EIS does not address the potential for the Project to have an impact on house prices in Stockton.	Section 20.9.1
McCauley, T	Socioeconomic: The submission claims that the EIS makes no mention of responsibility for a reduction in house prices.	Section 20.9.1
McCauley, T	Socioeconomic: The submission claims that the Project would lead to fewer families moving to Stockton due to the stigma of being near to the two ammonium nitrate plants.	Section 20.9.1

Modified Form Letters (responded to as 'Public Submissions')		
Author	Comment	Section Addressed
McCauley, T	Socioeconomic: The Submission states that the 60 jobs that the Project is stated to create within the EIS does not compensate for the increased risk of explosion.	Section 20.4.2
McCauley, T	Traffic and Transport: The submission claims that the Project makes no attempt to mitigate impacts on local road network.	Section 20.8.3
McCauley, T	Traffic and Transport: The submission mentions existing congestion on the local roads.	Section 20.8.1
McCauley, T	Water Quality: The submission is concerned about the impact on tourism should the Ramsar Wetland be damaged by the Project.	Section 20.7
McCauley, T	Water Quality: The submission states that any pollution into the Hunter River is unacceptable as industrial pollution is damaging to the asset that is enjoyed by recreational users and fishermen.	Section 20.7
McCauley, T 1	Noise and Vibration: The submission claims that 'industry' cannot be trusted because of the current night-time acoustic exceedance on Kooragang Island, and Incitec are requesting exemptions from standards and regulations.	Section 20.6.1
Pitt, A	Air Quality: The submission states that the Stockton already experiences high levels of various pollutants which are of a magnitude that governments should not allow facilities to self monitor.	Section 20.5.8
Pitt, A	Air Quality: The submission is concerned about the cumulative impact of the industry on Kooragang Island on Air Quality. Particularly of the Project alongside the Orica expansion and the PWCS T4 Proposal.	Section 20.5.3
Pitt, A	Hazard and Risk: The submission states that the risk of injury and fatality cannot be met by a risk assessment.	Section 20.4.1
Pitt, A	Cumulative Risk: Submission states that "the cumulative effects of all future developments must be analysed."	Section 20.4.14
Pitt, A	Cumulative Risk: The submission claims that the EIS does not adequately address the concerns regarding the combined storage of Incitec Pivot and Orica.	Section 20.4.14
Pitt, A	Noise and Vibration: The submission claims that 'industry' cannot be trusted because of the current night-time acoustic exceedance on Kooragang Island.	Section 20.6.1
Pitt, A	Noise and Vibration: The submission claims that the baseline monitoring for the EIS was completed while the Orica plant was not operational.	Section 20.6.3
Thornton, R	Air Quality: The Submission claims that extra diesel trucks will add dangerous carcinogens to the air quality of the area.	Section 20.5.7

Appendix A - Summary of Submissions

Modified Form Letters (responded to as 'Public Submissions')		
Author	Comment	Section Addressed
Thornton, R	Air Quality: The submission is concerned about the cumulative impact of the industry on Kooragang Island on Air Quality. Particularly of the Project alongside the Orica expansion and the PWCS T4 Proposal.	Section 20.5.3
Thornton, R	Cumulative Risk: The submission claims that the EIS does not adequately address the concerns regarding the combined storage of Incitec Pivot and Orica.	Section 20.4.14
Thornton, R	Noise and Vibration: The submission claims that 'industry' cannot be trusted because of the current night-time acoustic exceedance on Kooragang Island.	Section 20.6.1
Thornton, R	Noise and Vibration: The submission claims that the baseline monitoring for the EIS was completed while the Orica plant was not operational.	Section 20.6.3
Thornton, R	Consultation: The submission claims that the consultation effort for the Project has been inadequate.	Section 20.3.1
Thornton, R	Socioeconomic: The submission claims that the EIS does not address the potential for the Project to have an impact on house prices in Stockton.	Section 20.9.1
Thornton, R	Socioeconomic: The submission claims that the EIS makes no mention of responsibility for a reduction in house prices.	Section 20.9.1
Thornton, R	Socioeconomic: The submission claims that the Project would lead to fewer families moving to Stockton due to the stigma of being near to the two ammonium nitrate plants.	Section 20.9.1
Thornton, R	Socioeconomic: The Submission states that the 60 jobs that the Project is stated to create within the EIS does not compensate for the increased risk of explosion.	Section 20.4.2
Thornton, R	Traffic and Transport: The submission claims that the Project makes no attempt to mitigate impacts on local road network.	Section 20.8.3
Thornton, R	Traffic and Transport: The submission mentions existing congestion on the local roads.	Section 20.8.1
Thornton, R	Water Quality: The submission is concerned about the impact on tourism should the Ramsar Wetland be damaged by the Project.	Section 20.7
Thornton, R	Water Quality: The submission states that any pollution into the Hunter River is unacceptable as industrial pollution is damaging to the asset that is enjoyed by recreational users and fishermen.	Section 20.7
Unidentified 2	Air Quality: The submission claims that the addition trucks on the road thanks to the Project will create additional carcinogenic fine particles and nitrous oxides.	Section 20.5.6 / Section 20.5.9

Modified Form Letters (responded to as 'Public Submissions')		
Author	Comment	Section Addressed
Unidentified 2	Air Quality: The submission claims that the Project will increase nitrous oxides and PM10 to above the standard of 50 mg/m ³ . The submission states that the area around Stockton is already experiencing increased levels of PM10 thanks to the coal loaders on Kooragang Island.	Section 20.5.6
Unidentified 2	Hazard and Risk: The submission mentions the IPL plant in South Australia that, it is claimed, poses too high an explosion risk for local residents.	Section 20.4.7
Unidentified 2	Cumulative Risk: The cumulative total of the Project and the Orica expansion would have an explosive power of half that of the Hiroshima atomic explosion.	Section 20.4.1
Unidentified 2	Noise and Vibration: The submission states that there is already an unacceptable level of night time noise in the area and that the Project is proposing to increase the allowable noise in the area to make the acoustic emissions from the Project acceptable.	Section 20.6.2
Unidentified 2	Socioeconomic: The submission states that the number of jobs that would be created are does not justify the additional risk for the local community.	Section 20.9.3
Unidentified 2	Traffic and Transport: The submission states that traffic congestion is already a problem around the area and that the Project will add to this.	Section 20.8.1
Vought, G	Air Quality: The Submission claims that extra diesel trucks will add dangerous carcinogens to the air quality of the area.	Section 20.5.7
Vought, G	Air Quality: The submission is concerned about the cumulative impact of the industry on Kooragang Island on Air Quality. Particularly of the Project alongside the Orica expansion and the PWCS T4 Proposal.	Section 20.5.3
Vought, G	Cumulative Risk: The submission claims that the EIS does not adequately address the concerns regarding the combined storage of Incitec Pivot and Orica.	Section 20.4.14
Vought, G	Noise and Vibration: The submission claims that 'industry' cannot be trusted because of the current night-time acoustic exceedance on Kooragang Island.	Section 20.6.1
Vought, G	Noise and Vibration: The submission claims that the baseline monitoring for the EIS was completed while the Orica plant was not operational.	Section 20.6.3
Vought, G	Consultation: The submission claims that the consultation effort for the Project has been inadequate.	Section 20.3.1
Vought, G	Socioeconomic: The submission claims that the EIS does not address the potential for the Project to have an impact on house prices in Stockton.	Section 20.9.1

Appendix A - Summary of Submissions

Modified Form Letters (responded to as 'Public Submissions')		
Author	Comment	Section Addressed
Vought, G	Socioeconomic: The submission claims that the EIS makes no mention of responsibility for a reduction in house prices.	Section 20.9.1
Vought, G	Socioeconomic: The submission claims that the Project would lead to fewer families moving to Stockton due to the stigma of being near to the two ammonium nitrate plants.	Section 20.9.1
Vought, G	Socioeconomic: The Submission states that the 60 jobs that the Project is stated to create within the EIS does not compensate for the increased risk of explosion.	Section 20.4.2
Vought, G	Traffic and Transport: The submission claims that the Project makes no attempt to mitigate impacts on local road network.	Section 20.8.3
Vought, G	Traffic and Transport: The submission mentions existing congestion on the local roads.	Section 20.8.1
Vought, G	Water Quality: The submission is concerned about the impact on tourism should the Ramsar Wetland be damaged by the Project.	Section 20.7
Vought, G	Water Quality: The submission states that any pollution into the Hunter River is unacceptable as industrial pollution is damaging to the asset that is enjoyed by recreational users and fishermen.	Section 20.7

Form Letters		
Author	Comment	Section Addressed
Form Letter 1	Air Quality: The submission is concerned about the cumulative impact of the industry on Kooragang Island on Air Quality. Particularly of the Project alongside the Orica expansion and the PWCS T4 Proposal.	Section 19.2.2
Form Letter 1	Hazard and Risk: The submission claims that the 'blast contours' do not correlate with information from the incident in Toulouse in 2001.	Section 19.1.2
Form Letter 1	Cumulative Risk: The submission claims that the EIS does not adequately address the concerns regarding the combined storage of Incitec Pivot and Orica.	Section 19.1.1
Form Letter 1	Noise and Vibration: The submission claims that 'industry' cannot be trusted because of the current night-time acoustic exceedance on Kooragang Island.	Section 19.1.3

Form Letters		
Author	Comment	Section Addressed
Form Letter 1	Noise and Vibration: The submission claims that the baseline monitoring for the EIS was completed while the Orica plant was not operational.	Section 20.6.3
Form Letter 1	Consultation: The submission claims that less than one third of people are unaware of the Project.	Section 19.4
Form Letter 1	Socioeconomic: The submission claims that the EIS does not address the potential for the Project to have an impact on house prices in Stockton.	Section 19.7
Form Letter 1	Socioeconomic: The submission claims that the EIS makes no mention of responsibility for a reduction in house prices.	Section 19.7
Form Letter 1	Socioeconomic: The submission claims that the Project would lead to fewer families moving to Stockton due to the stigma of being near to the two ammonium nitrate plants.	Section 19.7
Form Letter 1	Socioeconomic: The Submission states that the 60 jobs that the Project is stated to create within the EIS does not compensate for the increased risk of explosion.	Section 19.7
Form Letter 1	Traffic and Transport: The submission claims that the Project makes no attempt to mitigate impacts on local road network.	Section 19.6
Form Letter 1	Traffic and Transport: The submission mentions existing congestion on the local roads.	Section 19.6
Form Letter 1	Water Quality: The submission is concerned about the impact on tourism should the Ramsar Wetland be damaged by the Project.	Section 19.8
Form Letter 1	Water Quality: The submission states that any pollution into the Hunter River is unacceptable as industrial pollution is damaging to the recreational asset that is enjoyed by swimmers and fishermen.	Section 19.8
Form Letter 2	Air Quality: The submission claims that the Project will increase nitrous oxides and PM10 to above the standard of 50 mg/m ³ . The submission states that the area around Stockton is already experiencing increased levels of PM10 thanks to the coal loaders on Kooragang Island.	Section 19.10.2
Form Letter 2	Hazard and Risk: The submission claims that storage of ammonium nitrate risks injuries, deaths and damage to buildings.	Section 19.9
Form Letter 2	Hazard and Risk: The submission mentions the incident in Toulouse where a much smaller quantity of ammonium nitrate caused damage to houses up to 5 km away.	Section 19.9

Appendix A - Summary of Submissions

Form Letters		
Author	Comment	Section Addressed
Form Letter 2	Hazard and Risk: The submission mentions the IPL plant in South Australia that, it is claimed, poses too high an explosion risk for local residents.	Section 19.9
Form Letter 2	Cumulative Risk: The cumulative total of the Project and the Orica expansion would have an explosive power of half that of the Hiroshima atomic explosion.	Section 19.9
Form Letter 2	Noise and Vibration The submission states that there is already an unacceptable level of night time noise in the area and that the Project is proposing to increase the allowable noise in the area in make the acoustic emissions from the Project acceptable.	Section 19.11
Form Letter 2	Socioeconomic: The submission states that the number of jobs that would be created are does not justify the additional risk for the local community.	Section 19.13
Form Letter 2	Traffic and Transport: The submission states that traffic congestion is already a problem around the area and that the Project will add to this.	Section 19.12

Appendix B Supplementary Water Reports

Appendix B1 – Water Quality Profiles and Sampling of the Hunter River



Report

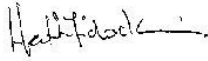
Water Quality Profiles and Sampling of the Hunter River Estuary

4 MARCH 2013

Prepared for
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Appendices

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Appendix D	Figures - Variation of Water Quality in the Hunter River Estuary
Appendix E	Figures - Comparison of Current and Historic Nutrient Data
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Executive Summary

Monitoring of water quality in the Hunter River estuary was undertaken in accordance with an agreed monitoring plan developed by URS Australia Pty Ltd (URS) in consultation with Incitec Pivot Limited (IPL) and NSW Environment Protection Authority (EPA).

Four sample rounds were completed between September 2012 and January 2013. The first three rounds were undertaken on a two week time step during a low flow period. The fourth and final sampling round was delayed to capture a flood event within the estuary that was triggered by a catchment wide event rather than local rainfall.

Sampling shows that the Hunter Estuary is well mixed with little if any stratification suggesting substantial interchange of waters presumably driven mainly by wind and tidal action.

The estuary is slightly alkaline and well aerated with healthy levels of dissolved oxygen.

Major inputs of nutrients are provided by catchment runoff from higher in the catchment. During the passage of flood waters the concentrations of various forms of phosphorus and nitrogen increase by from 100% up to an order of magnitude greater than concentrations under low flow periods. Much of this increase in nutrients is bioavailable with considerable increases in both reactive phosphorus and total kjeldahl nitrogen (TKN).

Comparison with historic data collated by Sanderson and Redden (2001) is fraught due to the limited number of samples able to be taken and the limited representativeness of the sampling effort across only 4 months and two separate flow conditions. Nevertheless, comparison with Sanderson and Redden's dataset indicates that there has been no major change in phosphorus concentrations in the estuary, but there has probably been a reduction in TKN and ammonia concentrations over the past decade. This is not a strong conclusion given the limited samples taken, the representativeness of samples as described above, and potential issues with detection limits in historic datasets.

The significant influence of catchment discharges on nutrient levels in the estuary suggests that the estuary is subject to a wide range of nutrient conditions. Establishing representative 90th percentile water quality concentrations is challenged by this linkage with flow conditions. Without other information to suggest a change in the population being sampled the best statistical approach is to utilise the longest period of record to increase the confidence in the estimate. The error bands on 90th percentile estimates are very large when only a few data points are used such as those collected in the last few months.

Certainly the limited number of recent samples is generally insufficient to set local trigger values. To minimise the errors in estimation of quantiles at least 15 – 20 samples are typically required across the full range of conditions expected to be present.

Introduction

Monitoring of water quality in the Hunter River estuary has been undertaken in accordance with the agreed monitoring plan that was developed by URS Australia Pty Ltd (URS) in consultation with Incitec Pivot Limited (IPL) and NSW Environment Protection Authority (EPA) to address EPA concerns regarding the lack of recent water quality monitoring available for the surface waters of the Lower Hunter River, specifically in relation to nutrients (URS, 2012).

Four sample rounds were completed. The first three rounds were undertaken on a two week time step. The fourth and final sampling round was delayed to capture a flood event within the estuary that was triggered by a catchment wide event rather than local rainfall.

This report provides a summary of data collected and an analysis of the sample results with respect to data from Sanderson and Redden (2001).

Approved Sampling Program

The detailed monitoring plan URS (2012)¹ was used as the basis for sampling and analysis of results. In brief, the sampling program consisted of:

- Samples at 7 locations within the Lower Hunter system (Figure 2-1, Table 2-1). All sites are approximately mid-channel with the exception of Site 4 which has been targeted as close as possible to the proposed discharge location(s) in South Arm. (Appendix A contains georeferences for each of the sites.)

The targeted field monitoring and sample collection for each site during each sampling round is summarised in Table 2-2:

- Fortnightly sampling to be conducted over a period of 8 weeks
- Samples to be collected on falling and rising tides at each location in each sampling round.
- At least one of the sampling events to be conducted to coincide with the inflow from a significant storm-event within the catchment if the opportunity arises.
- Physical water quality to be measured in the vertical at each site on each sampling event prior to the collection of any samples.
- The total number of samples to be collected during each monitoring event is in the range 13 to 21 dependent on stratification and including QA/QC samples.
- QA/QC samples include 1 field duplicate and 1 rinsate blank.
- Analysis of all samples as specified in Table 2-3.

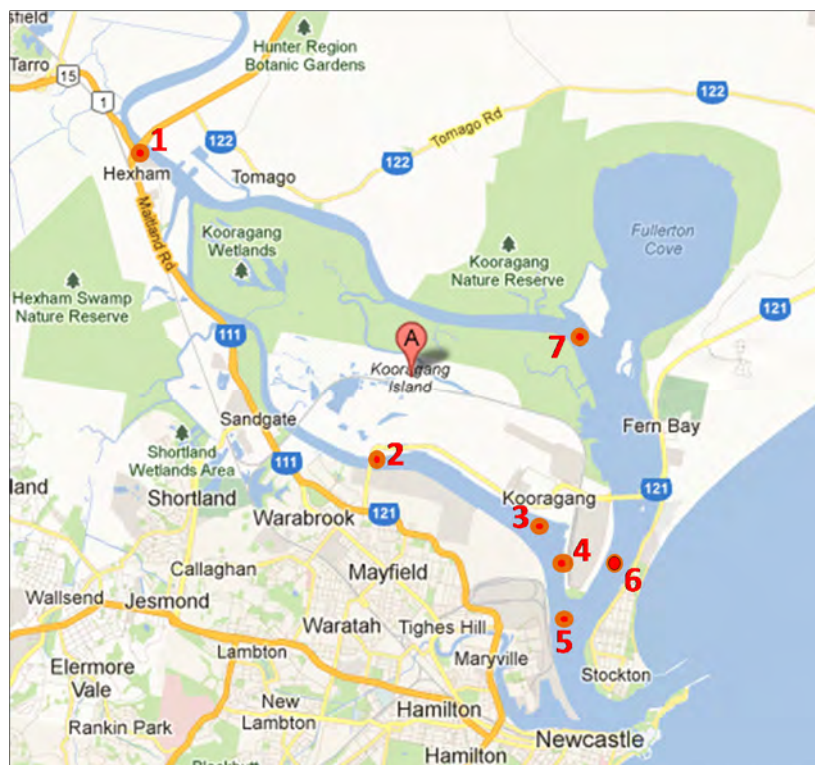


Figure 2-1 Monitoring and Sampling Locations

¹ see Appendix C

2 Approved Sampling Program

Table 2-1 Grid References for Sampling Sites

Site	Description	Easting (m)	Northing (m)
1	Hexham Bridge	386135	6363605
2	Tourle Street Bridge	386393	6359749
3	Upstream South Arm Discharge Location	385403	6358352
4	South Arm Discharge Location	385176	6359408
5	Lower Estuary	384415	6360162
6	North Arm Discharge Location	376994	6367528
7	Upstream Fullerton Cove	381533	6361448

Table 2-2 Monitoring and Sample Collection at Each Location during each Event

	Monitoring Site						
	1	2	3	4	5	6	7
Hydrolab Deployment	✓	✓	✓	✓	✓	✓	✓
Composite Surface Sample	1	1	1	1	1	1	1
Water Column Samples							
Salinity strata			2	2	2	2	
Temperature strata			+1	+1	+1	+1	
Mid-point*			1	1	1	1	
Total Samples	1	1	2-4	2-4	2-4	2-4	1
QA/QC Samples	1 field duplicate & 1 rinsate blank						

*Only if no stratification present.

Table 2-3 Analytical Methods and Sample Requirements

	ALS LOR* (µg/L)	ALS Method Reference	Sample Volume (mL)	Field Filtered	Preservation: H ₂ SO ₄ and Chill <4°C	Max Holding Time
Australian Standard 5667.1						
Nitrogen						
Ammonia	5	APHA 4500 NH ₃ H	60 a	Yes	Yes	28 day
Nitrate	2	APHA 4500 NO ₃	60 a	Yes	No	2 day
Nitrite	2	APHA 4500 NO ₂	60 a	Yes	No	2 day
NO _x	2	APHA 4500 N	60 a	Yes	Yes	28 day
TKN	10	APHA 4500 N org	60 a	No	Yes	28 day
Total Nitrogen	10	APHA 4500 N	60 c	No	Yes	28 day
Total Dissolved Nitrogen	10	APHA 4500N	60 b	Yes	Yes	28 day
Phosphorus						
Filterable Reactive Phosphorus	1	APHA 4500 P G	60 a	Yes	No	
Dissolved Inorganic Phosphorus (calculated including Acid Hydrolysable P)	10	APHA 4500 P B&H	125 d	Yes	No	2 day
Total Phosphorus	5	APHA 4500- P J	60 c	No	Yes	28 day
Total Dissolved Phosphorus	5	APHA 4500 PH	60 b	Yes	Yes	28 day
Other						
Suspended Solids	10,000	APHA 2540 D	500 e	No	No	7 day
Chlorophyll α	1	APHA 10200 H	1000 f	No	No	2 day

*LOR = Limit of reporting

All Nitrogen and phosphorus data reported as corrected to N or P

Sample 6 separate bottled volumes as follows: a = 60ml filtered; b = 60ml filtered; c = 60ml unfiltered; d = 125ml filtered; e = 500ml unfiltered; f = 1000ml unfiltered

Results and Quality Assurance/Control

This Section describes the sampling effort, timing and results collected. References are provided to summaries of the analytical and physical chemistry profiles obtained. Section 4 provides an analysis and discuss of the results.

3.1 Sampling Dates and Conditions

Four rounds of sampling were completed. The first three rounds of sampling were completed on 12th September, 26th September and 10th October 2012. The fourth round of sampling was postponed to target a high flow event and was completed 30th January 2013.

The distribution of sampling effort with Hunter River flow and local rainfall is shown in Figure 3-1. The fourth sample is taken on or near the rising limb of the hydrograph when significant chemical transport would be expected to occur².

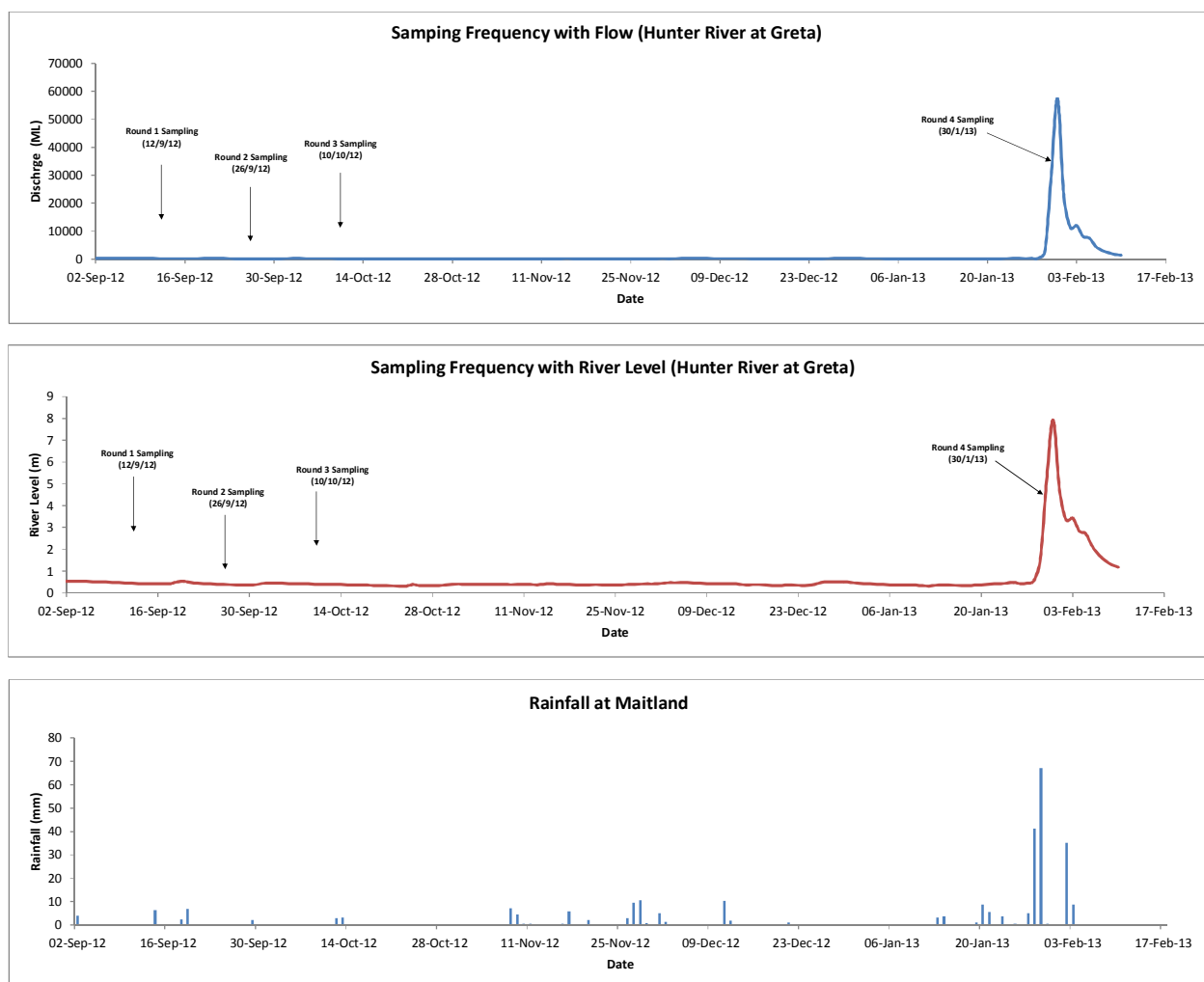


Figure 3-1 Distribution of Sampling Effort with Discharge in the Hunter River

² Hydrographs are from Greta approximately 48 km upstream of Kooragang Island consequently sampling may have occurred earlier on the rising limb in the Hunter Estuary.

3 Results and Quality Assurance/Control

Sampling was undertaken in accordance with the agreed monitoring program as summarised in Section 2. The sampling program is ambitious as it requires boat travel to seven different sites at two times per day, and delivery of samples to a courier for analysis in Sydney within the agreed holding times.

The first round of sampling required significant adjustment of procedures and flexibility by samplers, ALS couriers and boat operators. Delivery of samples within the holding times was achieved. However, due to time limitations and the adopted protocols it was not possible to capture a second sample at Site 7 despite a pre-dawn start.

In the second and third rounds of sampling, field staff were able to commence ½ hour earlier and were more efficient so were able to collect all required samples.

During the fourth sampling round challenges with the weather and problems with some of the Hydrolab sensors restricted sampling at some sites. All sites were sampled on the rising tide, but sites 2, 3, and 7 were unable to be sampled on the falling tide.

3.2 Meter Readings of Physical Chemistry & Stratification

The DSX5 Hydrolab water quality instrument was calibrated prior to each sampling event. Calibration was undertaken in a temperature controlled room no more than 24 hours prior to a sampling event, calibration was conducted by a trained technician in strict accordance with the procedures set out in the operating manual. For the purpose of this study, sensor calibration focused on the flowing physio-chemical parameters:

- pH – two point calibration (pH buffer 10, and pH buffer 7)
- Electrical Conductivity – two point calibration (0 µS/cm, and 58,670 µS/cm)
- Dissolved Oxygen – two point calibration (dry air, and 100% saturated water)
- Turbidity (0, and 90 NTU)
- Pressure (zeroed at time of sampling, at water level)

Hydrolab multi-parameter submersible probes were lowered down to the bed and retrieved prior to grab samples being taken at each site.

Profiles of physical chemistry are provided in Appendix A. It is evident that in some cases transducers were not necessarily stable with meter values “hunting” with depth. In other instances there are indications of impending meter failure or problems with connections. Nevertheless, the profiles provide a good indication that the sampling sites are generally well mixed with little if any stratification. Site 1 (Hexham Bridge) and possibly Site 7 (Hunter River North Arm upstream Fullerton Cove) show some evidence of salt wedges under various tidal conditions.

Depths of sampling at Site 5 vary according to whether it was possible to sample inside or outside the shipping channel for safety reasons.

3.3 Analytical Chemistry

3.3.1 Quality Assurance / Quality Control

Analytical data validation is the process of assessing whether the data is in compliance with prescribed analytical method performance and URS project specifications.

3 Results and Quality Assurance/Control

The primary objectives of this process are to ensure that all target analyte data are of an acceptable quality and representative of samples obtained from the river at the time of sampling. The data validation process should identify any limitations with respect to the results reported for all target analytes.

Specific elements that have been checked and assessed for this project include:

- preservation and storage of samples upon collection and during transport to the laboratory;
- sample holding times;
- use of appropriate analytical and field sampling procedures;
- required limits of reporting ;
- frequency of conducting quality control measurements;
- equipment rinsate results;
- laboratory blank results;
- field duplicate results – reported as relative percentage difference (RPD);
- laboratory duplicate results – reported as relative percentage difference (RPD);
- matrix spike results;
- occurrence of apparently unusual or anomalous results inconsistent with field observations

Sample management procedures were compliant with project specifications, with one exception:

- The analysis for dissolved acid hydrolyzable phosphorus for the sampling Round 2 performed on 26 September 2012 exceeded holding times by 4 days. The laboratory did not detect acid hydrolyzable phosphorus in subsequent sampling rounds where analysis was performed within holding times and thus URS reasonably conclude that the data for the 26 September 2012 sampling round was not significantly biased by the holding time exceedance.

Limits of Reporting were sufficiently low to enable a comparison between results and the adopted water quality guideline criteria.

A sufficient frequency of field duplicates and laboratory duplicates were reported to assess the precision of the sampling and analytical methodology. The laboratory duplicate data is presented in the laboratory QC reports. A high degree of precision was observed for all laboratory duplicate data indicating excellent method precision.

The field duplicate data is presented in Appendix B. Most field duplicate data pass QC criteria indicating a high degree of precision in the sampling methodology and minimal variation within the sample matrix, with the following exceptions:

- Total nitrogen for Site2-F_0-0.1 (sampled 12/09/12) where RPD = 55%;
- Total Dissolved nitrogen for Site2-F_0-0.1 (sampled 12/09/12) where RPD = 73%;
- Reactive Phosphorus for Site2-F_0-0.1 (sampled 12/09/12) where RPD = 78%;
- Total Dissolved nitrogen for SITE 1R 0-0.5 (sampled 30/01/12) where RPD = 62%;
- Reactive Phosphorus for SITE 1R 0-0.5 (sampled 30/01/12) where RPD = 41%;

URS field staff observed that at the time of sampling the water at sampling location SITE 1R was turbid. It is possible that the differences reported for these nutrient concentrations between the replicate sample volumes result from differences in the fine particulates suspended in the water.

A sufficient frequency of laboratory control spike (LCS) and matrix spikes were reported to assess the accuracy of the laboratory methods and potential bias due to matrix effects and extraction efficiency.

3 Results and Quality Assurance/Control

The matrix spike recovery data indicates excellent recovery of the target analytes from the sample matrix, and therefore no matrix induced bias in analyte quantitation. Recoveries for the LCS were within control limits, with one exception as follows:

- For dissolved reactive phosphorus for Round 4 the LCS recovery was reported as 92%, marginally lower than the lower control limit of 95%. URS considers the data for this analyte in this batch has not been significantly negatively biased by the recovery.

A sufficient frequency of equipment rinsates and laboratory method blanks were reported to assess whether potential contamination from sampling equipment or during the laboratory analysis process may have occurred. All equipment rinsate concentrations were reported as less than the LOR, with the following exceptions where a positive detect was reported for:

- Ammonia in rinsates 12/09/12 (0.006 mg/L) and 10/10/12 (0.03 mg/L)
- Nitrate in rinsates 12/09/12 (0.005 mg/L), 26/09/12 (0.002 mg/L), 10/10/12 (0.066 mg/L), and 30/01/13 (0.027 mg/L)
- Dissolved Total Nitrogen in rinsate 30/01/13 (0.03 mg/L)
- Reactive Phosphorus in rinsates 12/09/12 (0.001 mg/L), 26/09/12 (0.001 mg/L) and 10/10/12 (0.004 mg/L)
- Dissolved Total Phosphorus in rinsate 10/10/12 (0.041 mg/L)
- Total Phosphorus in rinsate 26/09/12 (0.008 mg/L)

The data suggest it is possible that trace concentrations of these analytes remained on the sampling equipment between sampling locations. Most concentrations are only marginally above the LOR and do not limit the interpretation of the data. The ammonia, nitrate and dissolved total phosphorus concentrations reported in rinsate SiteQC2R (10/10/2012) are significantly higher than the limit of reporting and similar to the primary sample. Having reviewed the data for the samples taken before and after the rinsate, there does not appear to have been an obvious high concentration sample likely to carry over into the rinsate. Further, there is no evidence for a misidentification (samples from same data reported with very low or <LOR concentrations). Therefore the cause of the anomaly is not resolved. URS note that the data for this equipment rinsate is an anomaly, and there is no evidence for significant bias to sample concentrations throughout the sampling events.

There are a number of samples where the concentration reported for total phosphorus is less than the concentrations for dissolved phosphorus. For several samples the anomaly can be reasonably attributed to being within typical margins of experimental (analytical) error. However, for samples Site2_F_0.0.1 sampled on 12/09/12 and Site 4_F_7 and Site 5_R_0-0.5, both sampled 30/01/13, the data appears anomalous. The cause of the anomaly has not been resolved although it is evidently not systematic. For these anomalous data, a misidentification of filtered versus unfiltered volumes may have occurred during sampling. It is likely that the data underestimates the true concentration of total phosphorus. For these samples the concentration reported for the higher of total dissolved or reactive phosphorus should be assumed to best approximate the total phosphorus concentration at the time of sampling.

In summary, an appropriate level of quality assurance and quality control was adopted throughout the sampling and analysis program. The quality control data indicate the sample analysis has been performed with appropriate accuracy and precision. The minor quality control non-compliances do not represent significant data quality issues and do not affect the characterisation of water quality.

3 Results and Quality Assurance/Control

Overall URS consider the data is representative of the samples taken in the field and is fit for interpretive use.

3.3.2 Laboratory Analyses

The full set of analytical results is tabulated in Appendix A. Quality control samples are not shown.

Appendix B contains the original lab sheets and Chain of Custody (CoC) forms.

Analysis & Discussion

This Section discusses the sample results and their variability in space, time and according to tidal conditions.

Data collected under the sampling program is then compared with Sanderson and Redden (2001) results.

4.1 Sample Variability of Laboratory Analyses

Physical chemistry water quality profiles (Appendix A) show the Hunter River to be well mixed with no observed temperature stratification, alkaline (pH ~ 7.5 – 8), well aerated, and subject to tidal wedge activity particularly upstream of the main estuary at Hexham Bridge.

4.1.1 Variability with Depth

Very little variability is evident in laboratory analytical results with depth for the first three sampling rounds. There is evidence of higher nutrient concentrations in the near surface samples than at depth during the fourth sampling round that was coincident with a minor flood in the Hunter River. There is also an apparent general increase in electrical conductivity with depth across a number of sampling sites suggestive of more nutrient laden fresher water near the surface.

4.1.2 Variability with Tidal Conditions

Very little variability is evident in laboratory analytical results with tidal conditions for the first three rounds.

Close inspection of data from the fourth sampling round indicates the influence of the passage of the flood in the Hunter River. At Hexham Bridge samples are higher in nutrients on the rising tide than the falling tide. This pattern changes with site presumably with the passage of nutrient laden water downstream.

Statistics of data from the rising and falling tide samples from all rounds are almost identical (i.e. within +/- 0.001 to 0.002 mg/L) to the statistics of the lumped data.

4.1.3 Spatial Variability

Appendix D provides a graphical summary of the spatial variability of nutrient chemistry from the samples taken.

Site 1 (Hexham Bridge) and Site 7 (upstream Fullerton Cove) appear to have different nutrient speciation compared with the remaining sites most likely due to the larger influence of freshwater inflows from the catchment. This is consistent with the conclusions of Sanderson and Redden (2001) who identified various zones of water quality (Figure 4-1).

Based on the limited data set and high variability in data available from the current sampling rounds it is not possible to discriminate between the data from the remaining sites with the possible exception of Site 2 which appears to have higher median phosphorus levels than downstream sites, but similar nitrogen concentrations. Site 2 clearly lies within Sanderson and Redden's Zone B and consequently was included in the assessment of lower estuary water quality provided in Table 4-1³.

³ Inclusion of Site 2 data provides a slight upwards bias on P levels, inclusion of Sites 5 and 6 provides a slight downwards bias to N levels.

4 Analysis & Discussion

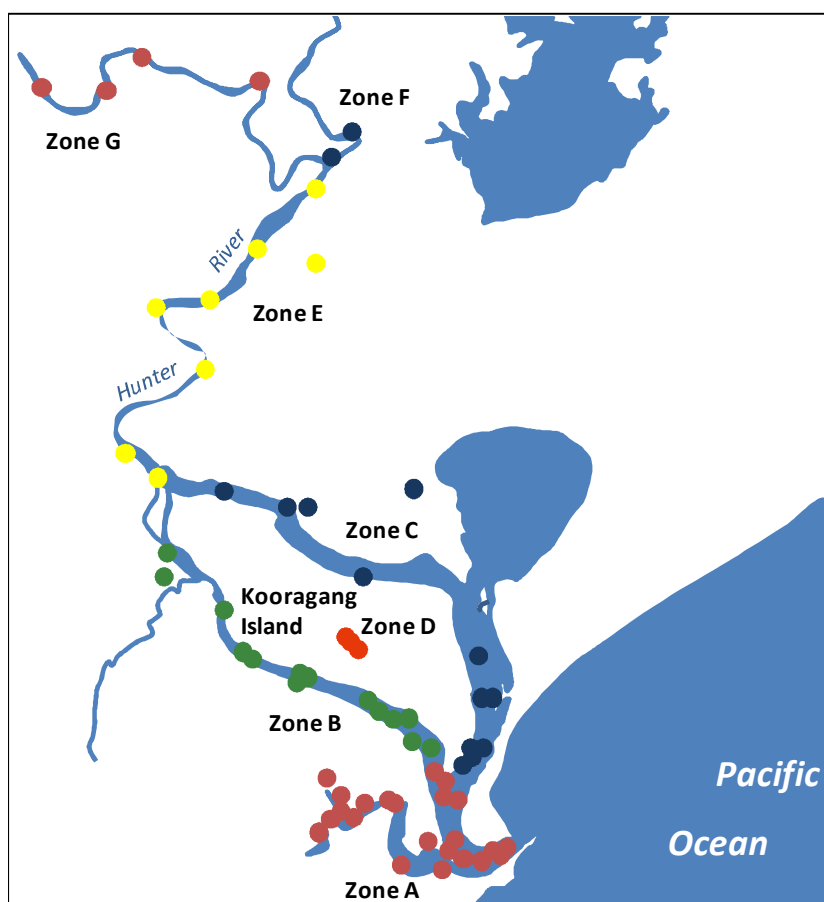


Figure 4-1 Water Quality Zones in the Hunter Estuary after Sanderson & Redden (2001)

Table 4-1 Summary Water Quality Statistics for Sites 2 - 6 Inclusive, All Depths & Sampling Rounds

Variable	Abbr.	Units	LOR	Min	Median	Q90	Max
pH	pH	-	-	7.0	7.9	8.4	8.5
Dissolved Oxygen	DO	%	-	82	96	89*	105
Electrical Conductivity	EC	µS/cm	-	46,784	52,524	52,950	53,560
Total Phosphorus	TP	mg/L	0.005	0.012	0.029	0.045	0.058
Dissolved Total Phosphorus	DTP	mg/L	0.005	0.005	0.020	0.032	0.052
Dissolved Reactive Phosphorus	DRP	mg/L	0.001	0.010	0.016	0.031	0.035
Dissolved Acid Hydrolyzable Phosphorus	DAHP	mg/L	0.01	0.01	0.01	0.01	0.01
Total Nitrogen	TN	mg/L	0.01	0.01	0.13	0.330	0.43
Dissolved Total Nitrogen	DTN	mg/L	0.01	0.02	0.12	0.270	0.38
Nitrate + Nitrite	NOx	mg/L	0.002	0.020	0.049	0.167	0.354
Nitrate	-	mg/L	0.002	0.020	0.049	0.160	0.348
Nitrite	-	mg/L	0.002	0.002	0.002	0.007	0.011
Ammonia	-	mg/L	0.005	0.005	0.020	0.048	0.059
Total Kjeldahl Nitrogen	TKN	mg/L	0.01	0.01	0.070	0.232	0.34
Chlorophyll – a	Chl-a	mg/L	1	1	1	2	6
Total Suspended Solids	TSS	mg/L	5	5	5	12	22

where Abbr = 'abbreviation for analyte name'; LOR = Limit of Reporting & Q90 = 90th percentile.

Figures for pH, DO and EC integrate across all meter readings for all depths excluding suspicious meter data.

* For DO the 90th percentile cell in the table contains the 10th percentile value.

4 Analysis & Discussion

4.2 Comparison with Data from Sanderson and Redden (2001)

Sanderson and Redden (2001) compiled historic water quality data for the Hunter River and estuary from a number of agencies. The data consists of a variety of samples from sites in estuarine and fresher water areas classified into water quality zones as shown in Figure 4-1.

Data from each zone were amalgamated and statistics produced. Table 4-2 provides 90th percentile water quality (nutrients and non-filterable residue data only) for each of the relevant zones. In addition, the 90th percentile water quality statistics for the four monitoring locations closest to the preferred discharge location into the South Arm of the Hunter River adjacent to the IPL site are listed.

Table 4-2 Nutrient and Non-Filterable Residue Concentrations (Sanderson & Redden, 2001)

Parameter	Units	90 th Percentile Water Quality			
		Zone A	Zone B	P.D.L.*	Zone C
Total Phosphorus	mg/L	0.53	0.15	0.64	0.27
Total Nitrogen**	mg/L	15.16	7.46	11.45	10.67
Nitrate	mg/L	0.63	0.39	1.96	0.33
Nitrite	mg/L	0.03	0.07	0.07	0.04
Total Kjeldahl Nitrogen	mg/L	14.50	7.00	9.42	10.30
Non Filterable Residual	mg/L	190	76	39	104

Notes:

* P.D.L. refers to the preferred discharge location adjacent to IPL's plant. Data shown reflects the 90th percentile water quality from four sites close to this location.

** Total Nitrogen was calculated as the sum of the other observed forms of nitrogen.

Direct comparison of estimated 90th percentile concentrations from Table 4-1 and Table 4-2 suggests that nutrients are considerably lower under current conditions than in the past. However, this conclusion is fraught since the number of samples taken from the present sampling round is limited and biased towards low flow conditions. The error bands on the 90th percentile concentrations shown in Table 4-1 are large.

Examination of Sanderson and Redden's data set indicates that there are periods when high nutrient concentrations are observed and periods when low nutrient concentrations are observed. Nutrient levels in the estuary are dependent on catchment inflows. Sanderson and Redden (2001) developed simple relationships between various nutrients and flow in an attempt to estimate catchment nutrient loads. Examination of their data suggests elevated nutrients during the period 1997 – 1998 which is a comparatively wet period in the last 20 years, but not atypical of wetter periods in the long term flow record (Appendix F).

Examination of Sanderson and Redden's data for a period in 1996 (i.e. prior to the wet year 1997) indicates that very similar results to those shown in Table 4-1 would have been derived if sampling was biased to low and high flow periods as per the recent sampling effort.

Appendix E provides plots of Sanderson and Redden's data against the ranges and medians of data for each of a number of sampling sites used in this study. These plots suggest that differences in total phosphorus, reactive phosphorus and nitrate (+ nitrite) concentrations between current conditions and historic data are readily explained by sampling effort.

Recently observed concentrations of ammonia appear somewhat lower than historic concentrations compiled by Sanderson and Redden (2001). However, historic TKN concentrations seem to be significantly higher than maximum observed levels recorded in this study.

4 Analysis & Discussion

Together these results suggest that there may have been a net drop in organic nitrogen within the estuary since Sanderson and Redden (2001). It is considered that the most likely cause of such a drop in organic nitrogen is removal of sewage overflows or discharges to the estuary. While this is consistent with the significant investment in remediation of these pollution sources in the late 1990's and early 2000's as reported by Hunter Water (2003), similar drops in phosphorus would also have been expected based on typical sewage treatment arrangements (ARMCANZ & ANZECC, 1997).

Limits of reporting for historic ammonia and TKN concentrations are not reported in Sanderson and Redden's data set. Inspection of sample results (e.g. Figure Appendix E-14) suggests variable detection limits may have been used that are higher than the Limit of Reporting used in the current study. It is considered that the evidence to draw strong conclusions regarding a drop in nitrogen within the estuary is limited.

Conclusions

Physical and chemical water quality data was collected from four sampling rounds between September 2012 and January 2013. Samples are biased to low flows in 2012 and one moderate flood event in 2013.

Sampling shows that the Hunter Estuary is well mixed with little if any stratification suggesting substantial interchange of waters presumably driven mainly by tidal action and perhaps aided by wind action.

The estuary is slightly alkaline and well aerated with healthy levels of dissolved oxygen.

Major inputs of nutrients are provided by catchment runoff from higher in the catchment. During the passage of flood waters the concentrations of various forms of Phosphorus and Nitrogen increased between a factor of 2 and an order of magnitude compared with concentrations under low flow periods. Much of this increase in nutrients is bioavailable with considerable increases in both Reactive Phosphorus and Total Kjeldahl Nitrogen.

Comparison with historic data collated by Sanderson and Redden (2001) is fraught due to the limited number of samples taken, and the limited representativeness of the sampling effort across only 4 months and two separate flow conditions. Inspection of Sanderson and Redden's dataset suggests that there has possibly been a reduction in TKN and Ammonia over the past decade. This is not a strong conclusion given the limited samples taken, the representativeness of samples, and potential issues with detection limits in historic datasets.

Sanderson and Redden's datasets are also biased by "wetter than average" conditions that occurred in 1997 and 1998; and by "drier than average" conditions in the period leading up to 1997. Examination of long term flow records suggest that wetter and drier than average events are not unusual.

Establishing representative 90th percentile water quality concentrations is challenged by this linkage with flow conditions. Without other information the best statistical approach is to utilise the longest period of record since the error bands on 90th percentile estimates are very large when only a few data points are used such as those collected in the last few months.

ANZECC & ARMCANZ (2000) recommend collecting sufficient samples to meet the objectives of the program. Based on power curves at least 15 – 20 samples would be a minimum number required across all sampling conditions to provide a reasonable estimate of quantiles from a given water quality distribution.

References

ANZECC & ARMCANZ (2000). *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, National Water Quality Management Strategy. Environment Australia.

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URS (2012). *Monitoring Plan – Hunter River Water Quality Proposed Ammonium Nitrate Facility, Heron Road, Kooragang Island*, Consultancy report to Incitec Pivot Ltd, 6 September 2012

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Appendix A Sample Summary and Water Quality Profiles

Appendix A - Sample Summary and Water Quality Profiles

Table Appendix A-1 Water Quality Sample Results Hunter River Estuary Sept/Oct 2012 & Jan 2013

Site	Tide	Sample Round #	Sample ID	Sample Date	Total Phosphorus (mg/L as P)	Dissolved TP (mg/L as P)	Reactive P (mg/L as P)	DAH P (mg/L as P)	Total Nitrogen (mg/L as N)	Dissolved TN (mg/L as N)	Nitrate + Nitrite (mg/L as N)	Nitrate (mg/L as N)	Nitrite (as N) (mg/L as N)	Ammonia (mg/L as N)	Total Kjeldahl Nitrogen (mg/L as N)	Chlorophyll - a (mg/m3)	Total Suspended Solids (mg/L)
				LOR:	0.005	0.005	0.001	0.01	0.01	0.01	0.002	0.002	0.002	0.005	0.01	1	5
1	Falling	1	SITE1_F_0-0.1	12/09/2012	0.047	0.026	0.02	0.02	0.17	0.17	0.007	0.007	<0.002	<0.005	0.16	1	8
1	Falling	1	SITE1_F_0-0.1_2	12/09/2012	0.039	0.021	0.021	0.01	0.17	0.16	0.014	0.014	<0.002	<0.005	0.16	4	<5
1	Rising	1	SITE1_R_0-0.1	12/09/2012	0.041	0.025	0.022	0.01	0.21	0.19	0.022	0.022	<0.002	<0.005	0.19	3	10
1	Falling	2	SITE1_F_0	26/09/2012	0.05	0.028	0.03	<0.01	0.22	0.24	0.036	0.036	<0.002	0.016	0.18	<1	<5
1	Rising	2	SITE1_R_0-0.1	26/09/2012	0.064	0.039	0.028	<0.01	0.28	0.29	0.029	0.029	<0.002	0.017	0.25	<1	6
1	Rising	2	SITE1_R_0-0.1	26/09/2012	0.053	0.032	0.029	<0.01	0.25	0.22	0.026	0.026	<0.002	0.008	0.22	<1	<5
1	Falling	3	SITE1_F_0.0-0.1	10/10/2012	0.056	0.051	0.034	<0.01	0.19	0.17	0.074	0.074	<0.002	0.01	0.12	<1	<5
1	Rising	3	SITE1_R_0.0-0.1	10/10/2012	0.048	0.038	0.031	<0.01	0.19	0.21	0.085	0.085	<0.002	0.006	0.1	<1	<5
1	Rising	4	SITE 1R 0-0.5	30/01/2013	0.094	0.05	0.047	<0.01	0.62	0.57	0.278	0.267	0.011	0.094	0.34	3	5
1	Falling	4	SITE 1F 0-0.5	30/01/2013	0.075	0.041	0.067	<0.01	0.63	0.59	0.182	0.17	0.012	0.097	0.45	3	8
2	Falling	1	SITE2_F_0-0.1	12/09/2012	0.012	0.032	0.032	<0.01	0.14	0.15	0.035	0.035	<0.002	<0.005	0.1	1	12
2	Rising	1	SITE2_R_0-0.1	12/09/2012	0.023	0.016	0.019	<0.01	0.06	0.07	0.041	0.041	<0.002	0.012	0.02	1	<5
2	Falling	2	SITE2_F_0	26/09/2012	0.037	0.02	0.022	<0.01	0.12	0.1	0.058	0.058	<0.002	0.014	0.06	<1	<5
2	Rising	2	SITE2_R_0-0.1	26/09/2012	0.047	0.033	0.024	<0.01	0.14	0.15	0.06	0.06	<0.002	<0.005	0.08	<1	<5
2	Falling	3	SITE2_F_0.0-0.1	10/10/2012	0.052	0.052	0.027	<0.01	0.21	0.1	0.068	0.068	<0.002	0.007	0.14	<1	<5
2	Rising	3	SITE2_R_0.0-0.1	10/10/2012	0.05	0.029	0.027	<0.01	0.2	0.11	0.072	0.072	<0.002	0.007	0.13	<1	<5
2	Rising	4	SITE 2R 0-0.5	30/01/2013	0.033	0.032	0.035	<0.01	0.41	0.2	0.172	0.166	0.006	0.059	0.24	1	<5
3	Falling	1	SITE3_F_0-0.1	12/09/2012	0.029	0.023	0.018	0.01	0.1	0.1	0.038	0.038	<0.002	0.009	0.06	<1	<5
3	Falling	1	SITE3_F_7.0	12/09/2012	0.023	0.011	0.014	<0.01	0.02	0.07	0.031	0.031	<0.002	0.016	<0.01	<1	<5
3	Rising	1	SITE3_R_0-0.1	12/09/2012	0.025	0.019	0.015	<0.01	0.11	0.12	0.045	0.045	<0.002	0.007	0.06	<1	<5
3	Rising	1	SITE3_R_7.0	12/09/2012	0.024	0.014	0.014	<0.01	0.04	0.04	0.047	0.047	<0.002	0.01	<0.01	2	14
3	Falling	2	SITE3_F_0-0.1	26/09/2012	0.037	0.019	0.016	<0.01	0.12	0.13	0.054	0.054	<0.002	0.025	0.07	<1	10
3	Falling	2	SITE3_F_6.5	26/09/2012	0.026	0.021	0.015	<0.01	0.11	0.13	0.049	0.049	<0.002	0.014	0.06	<1	6
3	Rising	2	SITE3_R_0-0.1	26/09/2012	0.034	0.024	0.016	<0.01	0.12	0.13	0.053	0.053	<0.002	0.02	0.07	<1	<5
3	Rising	2	SITE3_R_6.5	26/09/2012	0.031	0.021	0.014	<0.01	0.1	0.12	0.052	0.052	<0.002	0.021	0.05	<1	<5
3	Falling	3	SITE3_F_0.0-0.1	10/10/2012	0.058	0.015	0.016	<0.01	0.36	0.1	0.046	0.046	<0.002	0.026	0.31	1	<5
3	Falling	3	SITE3_F_7	10/10/2012	0.05	0.018	0.016	<0.01	0.21	0.08	0.044	0.044	<0.002	0.025	0.17	<1	<5
3	Rising	3	SITE3_R_0.0-0.1	10/10/2012	0.038	0.025	0.016	<0.01	0.13	0.08	0.056	0.056	<0.002	0.022	0.07	1	<5
3	Rising	3	SITE3_R_7	10/10/2012	0.031	0.017	0.015	<0.01	0.14	0.07	0.052	0.052	<0.002	0.025	0.09	1	<5
3	Rising	4	SITE 3R 0-0.5	30/01/2013	0.02	0.032	0.034	<0.01	0.43	0.15	0.091	0.083	0.008	0.056	0.34	1	<5
3	Rising	4	SITE 3R 8	30/01/2013	0.017	0.012	0.022	<0.01	0.23	0.23	0.08	0.074	0.006	0.035	0.15	<1	<5
4	Falling	1	SITE4_F_0-0.1	12/09/2012	0.028	0.02	0.016	<0.01	0.06	0.07	0.025	0.025	<0.002	<0.005	0.04	<1	<5
4	Falling	1	SITE4_F_6.5	12/09/2012	0.024	0.017	0.015	<0.01	0.04	0.05	0.038	0.038	<0.002	0.01	<0.01	<1	<5
4	Rising	1	SITE4_R_0-0.1	12/09/2012	0.025	0.015	0.014	<0.01	0.1	0.1	0.052	0.052	<0.002	0.021	0.05	<1	<5
4	Rising	1	SITE4_R_8.0	12/09/2012	0.02	0.011	0.012	<0.01	0.01	0.04	0.025	0.025	<0.002	0.018	<0.01	<1	<5
4	Falling	2	SITE4_F_0-0.1	26/09/2012	0.03	0.018	0.016	<0.01	0.13	0.12	0.063	0.063	<0.002	0.025	0.07	<1	12
4	Falling	2	SITE4_F_7.5	26/09/2012	0.028	0.021	0.014	<0.01	0.11	0.13	0.05	0.05	<0.002	0.023	0.06	<1	10
4	Rising	2	SITE4_R_0-0.1	26/09/2012	0.037	0.024	0.017	<0.01	0.2	0.19	0.057	0.057	<0.002	0.022	0.14	<1	<5
4	Rising	2	SITE4_R_7.5	26/09/2012	0.029	0.021	0.015	<0.01	0.11	0.12	0.065	0.065	<0.002	0.038	0.04	<1	<5
4	Falling	3	SITE4_F_0.0-0.1	10/10/2012	0.04	0.02	0.016	<0.01	0.11	0.12	0.048	0.048	<0.002	0.017	0.06	2	<5
4	Falling	3	SITE4_F_6	10/10/2012	0.035	0.02	0.015	<0.01	0.12	0.12	0.044	0.044	<0.002	0.024	0.08	<1	<5
4	Rising	3	SITE4_R_0.0-0.1	10/10/2012	0.053	0.031	0.024	<0.01	0.18	0.11	0.057	0.057	<0.002	0.035	0.12	<1	<5
4	Rising	3	SITE4_R_7	10/10/2012	0.034	0.023	0.014	<0.01	0.08	0.05	0.038	0.038	<0.002	0.015	0.04	1	<5
4	Falling	4	SITE 4F 0-0.5	30/01/2013	0.032	0.043	0.035	<0.01	0.33	0.29	0.229	0.223	0.006	0.05	0.1	<1	<5
4	Falling	4	SITE 4F 7	30/01/2013	0.016	0.034	0.021	<0.01	0.25	0.27	0.354	0.348	0.006	0.037	<0.01	<1	<5
4	Rising	4	SITE 4R 0-0.5	30/01/2013	0.032	0.026	0.034	<0.01	0.36	0.38	0.108	0.102	0.006	0.052	0.25	1	<5
4	Rising	4	SITE 4R 6.5	30/01/2013	0.015	0.007	0.023	<0.01	0.24	0.23	0.088	0.08	0.008	0.038	0.15	<1	<5

Appendix A - Sample Summary and Water Quality Profiles

Site	Tide	Sample Round #	Sample ID	Sample Date	Total Phosphorus (mg/L as P)	Dissolved TP (mg/L as P)	Reactive P (mg/L as P)	DAH P (mg/L as P)	Total Nitrogen (mg/L as N)	Dissolved TN (mg/L as N)	Nitrate + Nitrite (mg/L as N)	Nitrate (mg/L as N)	Nitrite (as N) (mg/L as N)	Ammonia (mg/L as N)	Total Kjeldahl Nitrogen (mg/L as N)	Chlorophyll - a (mg/m3)	Total Suspended Solids (mg/L)
				LOR:	0.005	0.005	0.001	0.01	0.01	0.01	0.002	0.002	0.002	0.005	0.01	1	5
5	Falling	1	SITE5_F_0-0.1	12/09/2012	0.023	0.01	0.012	<0.01	0.02	0.05	0.048	0.048	<0.002	0.007	<0.01	<1	22
5	Falling	1	SITE5_F_2.0	12/09/2012	0.021	0.014	0.013	<0.01	0.06	0.07	0.02	0.02	<0.002	0.007	0.04	<1	12
5	Rising	1	SITE5_R_0-0.1	12/09/2012	0.022	0.011	0.01	<0.01	0.02	0.02	0.031	0.031	<0.002	0.005	<0.01	1	5
5	Rising	1	SITE5_R_1.5	12/09/2012	0.02	0.008	0.011	<0.01	<0.01	0.03	0.021	0.021	<0.002	<0.005	<0.01	<1	7
5	Falling	2	SITE5_F_0-0.1	26/09/2012	0.025	0.02	0.013	<0.01	0.1	0.14	0.043	0.043	<0.002	0.014	0.06	<1	12
5	Falling	2	SITE5_F_1	26/09/2012	0.023	0.018	0.013	<0.01	0.15	0.14	0.044	0.044	<0.002	0.019	0.11	<1	<5
5	Rising	2	SITE5_R_0-0.1	26/09/2012	0.035	0.038	0.021	<0.01	0.14	0.16	0.05	0.05	<0.002	0.026	0.09	<1	<5
5	Rising	2	SITE5_R_1	26/09/2012	0.036	0.022	0.014	<0.01	0.12	0.09	0.049	0.049	<0.002	0.034	0.07	<1	<5
5	Falling	3	SITE5_F_0.0-0.1	10/10/2012	0.05	0.014	0.016	<0.01	0.27	0.11	0.049	0.049	<0.002	0.018	0.22	1	<5
5	Falling	3	SITE5_F_8	10/10/2012	0.032	0.029	0.011	<0.01	0.07	0.09	0.029	0.029	<0.002	0.014	0.04	2	5
5	Rising	3	SITE5_R_0.0-0.1	10/10/2012	0.035	0.02	0.01	<0.01	0.13	0.05	0.031	0.031	<0.002	0.01	0.1	<1	<5
5	Rising	3	SITE5_R_8	10/10/2012	0.028	0.019	0.01	<0.01	0.09	0.02	0.031	0.031	<0.002	0.011	0.06	2	<5
5	Falling	4	SITE5F_0-0.5	30/01/2013	0.024	0.034	0.024	<0.01	0.26	0.27	0.33	0.323	0.007	0.035	<0.01	1	8
5	Falling	4	SITE5F_4	30/01/2013	0.03	0.044	0.026	<0.01	0.28	0.25	0.325	0.318	0.007	0.038	<0.01	3	17
5	Rising	4	SITE5R_0-0.5	30/01/2013	0.024	0.005	0.035	<0.01	0.31	0.24	0.318	0.31	0.008	0.054	<0.01	2	<5
5	Rising	4	SITE5R_1	30/01/2013	0.018	0.006	0.025	<0.01	0.28	0.24	0.114	0.103	0.011	0.039	0.17	1	<5
6	Falling	1	SITE6_F_0-0.1	12/09/2012	0.029	0.02	0.016	<0.01	0.06	0.07	0.023	0.023	<0.002	0.006	0.04	<1	<5
6	Falling	1	SITE6_F_4.2	12/09/2012	0.023	0.025	0.017	<0.01	0.2	0.2	0.059	0.059	<0.002	0.044	0.14	<1	<5
6	Rising	1	SITE6_R_0-0.1	12/09/2012	0.024	0.008	0.012	<0.01	0.02	0.05	0.025	0.025	<0.002	<0.005	<0.01	<1	10
6	Rising	1	SITE6_R_4.0	12/09/2012	0.018	0.01	0.011	<0.01	0.02	0.05	0.022	0.022	<0.002	0.012	<0.01	<1	10
6	Falling	2	SITE6_F_0-0.1	26/09/2012	0.026	0.024	0.015	<0.01	0.14	0.11	0.052	0.052	<0.002	0.018	0.09	<1	<5
6	Falling	2	SITE6_F_2.5	26/09/2012	0.026	0.016	0.014	<0.01	0.13	0.15	0.044	0.044	<0.002	0.016	0.09	<1	<5
6	Rising	2	SITE6_R_0-0.1	26/09/2012	0.042	0.026	0.017	<0.01	0.13	0.15	0.05	0.05	<0.002	0.022	0.08	<1	8
6	Rising	2	SITE6_R_2	26/09/2012	0.044	0.025	0.016	<0.01	0.12	0.15	0.047	0.047	<0.002	0.021	0.07	<1	<5
6	Falling	3	SITE6_F_0.0-0.1	10/10/2012	0.032	0.02	0.015	<0.01	0.13	0.07	0.046	0.046	<0.002	0.02	0.08	<1	<5
6	Falling	3	SITE6_F_2	10/10/2012	0.021	0.017	0.014	<0.01	0.27	0.11	0.043	0.043	<0.002	0.021	0.23	2	<5
6	Rising	3	SITE6_R_0.0-0.1	10/10/2012	0.036	0.026	0.015	<0.01	0.28	0.07	0.039	0.039	<0.002	0.01	0.24	<1	<5
6	Rising	3	SITE6_R_2.5	10/10/2012	0.022	0.024	0.013	<0.01	0.08	0.07	0.035	0.035	<0.002	0.01	0.04	3	<5
6	Falling	4	SITE6F_0-0.5	30/01/2013	0.036	0.008	0.031	<0.01	0.33	0.3	0.332	0.323	0.009	0.051	<0.01	6	14
6	Falling	4	SITE6F_2	30/01/2013	0.033	0.018	0.03	<0.01	0.34	0.31	0.091	0.084	0.007	0.041	0.25	4	12
6	Rising	4	SITE6R_0-0.5	30/01/2013	0.032	0.02	0.033	<0.01	0.33	0.33	0.065	0.059	0.006	0.049	0.26	2	18
6	Rising	4	SITE6R_2	30/01/2013	0.029	0.011	0.031	<0.01	0.36	0.3	0.166	0.159	0.007	0.048	0.19	3	<5
7	Falling	1	SITE7_F_0-0.1	12/09/2012	0.028	0.015	0.014	0.02	0.1	0.04	0.021	0.021	<0.002	0.009	0.08	1	7
7	Falling	2	SITE7_F_0-0.1	26/09/2012	0.041	0.027	0.019	<0.01	0.14	0.15	0.051	0.051	<0.002	0.018	0.09	<1	7
7	Rising	2	SITE7_R_0-0.1	26/09/2012	0.045	0.029	0.02	<0.01	0.16	0.19	0.046	0.046	<0.002	0.005	0.11	<1	<5
7	Falling	3	SITE7_F_0.0-0.1	10/10/2012	0.05	0.036	0.028	<0.01	0.16	0.18	0.057	0.057	<0.002	0.022	0.1	2	<5
7	Rising	3	SITE7_R_0.0-0.1	10/10/2012	0.034	0.024	0.018	<0.01	0.13	0.08	0.054	0.054	<0.002	<0.005	0.08	3	<5
7	Rising	4	SITE7R_0-0.5	30/01/2013	0.058	0.026	0.023	<0.01	0.55	0.52	0.101	0.092	0.009	0.097	0.45	<1	10

Appendix A - Sample Summary and Water Quality Profiles

SAMPLING ROUND 1 - RISING TIDE

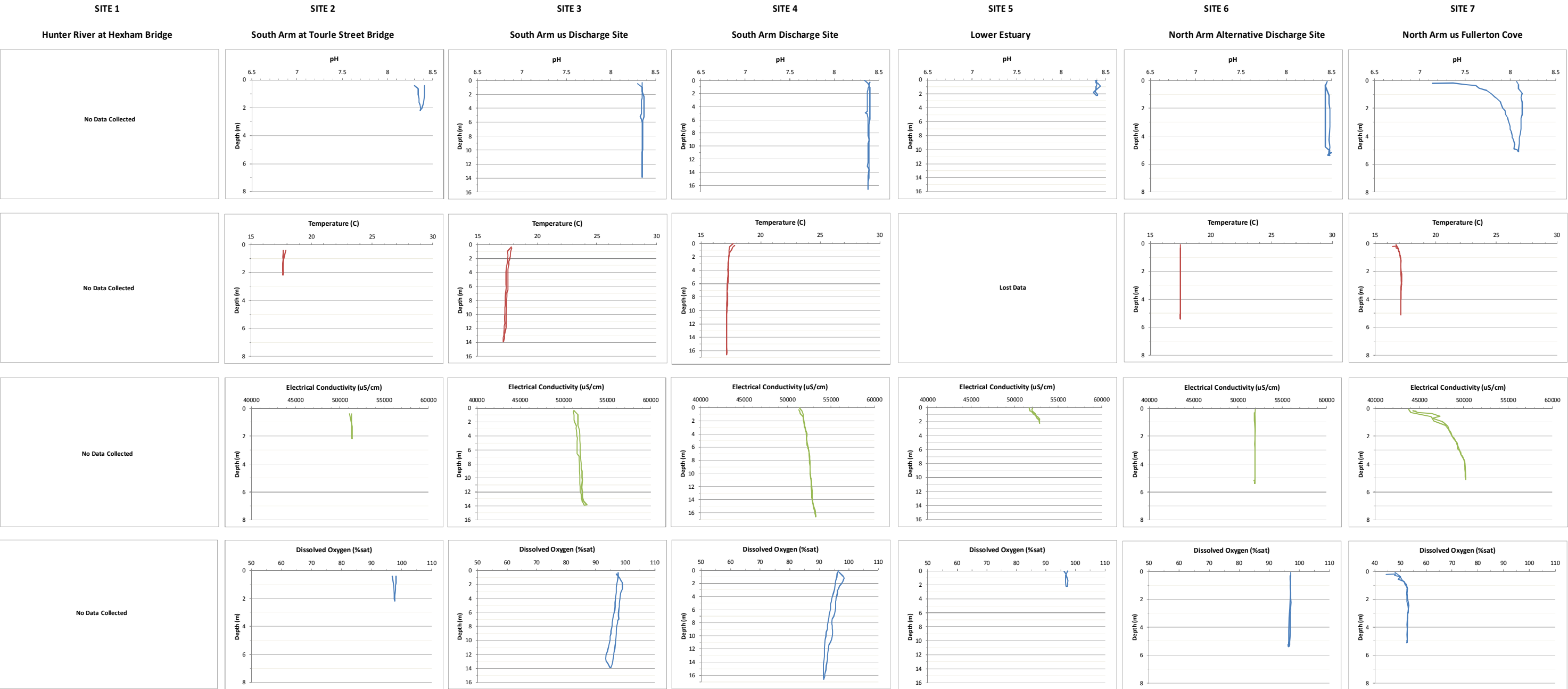


Figure Appendix A-1 Physical Chemistry Profiles for All Sampling Sites – Round 1, Rising Tide

Appendix A - Sample Summary and Water Quality Profiles

SAMPLING ROUND 1 - FALLING TIDE

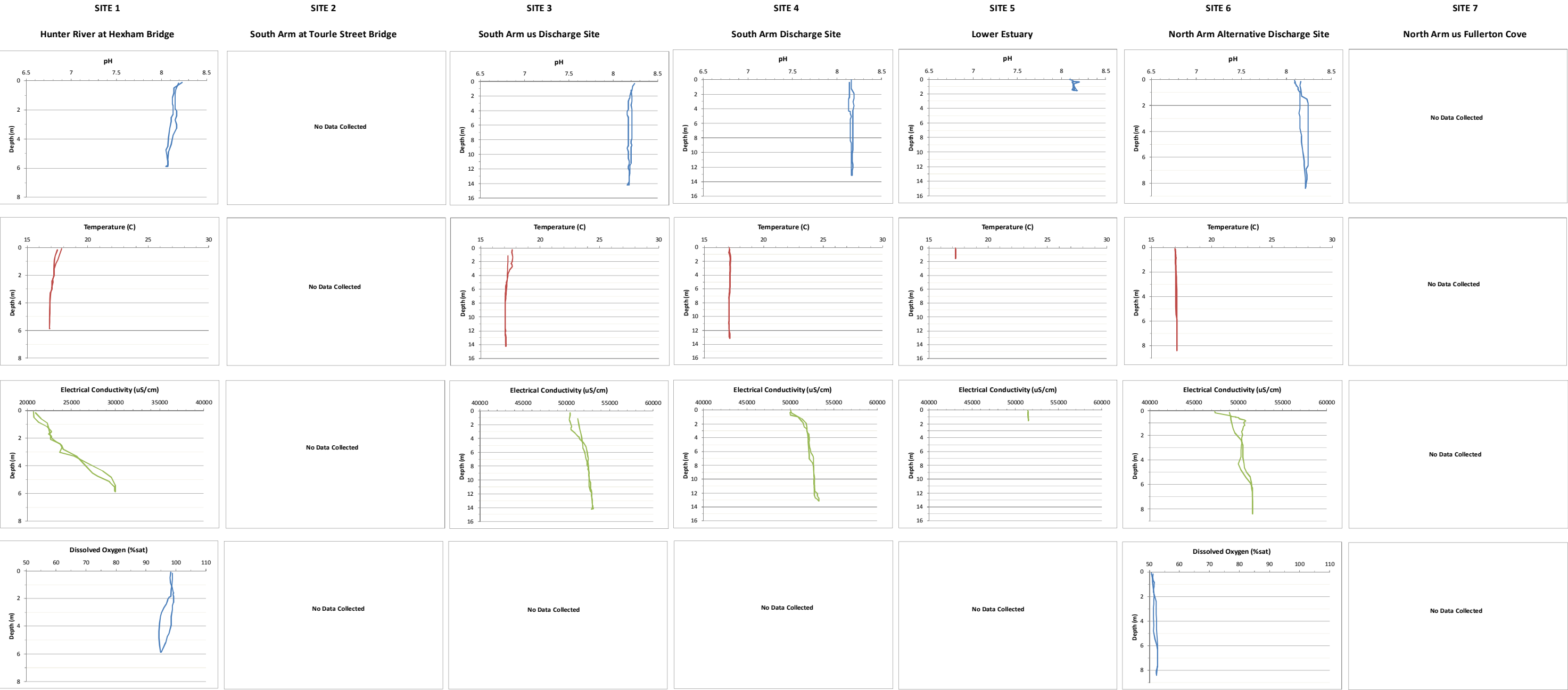


Figure Appendix A-2 Physical Chemistry Profiles for All Sampling Sites – Round 1, Falling Tide

Appendix A - Sample Summary and Water Quality Profiles

SAMPLING ROUND 2 - RISING TIDE

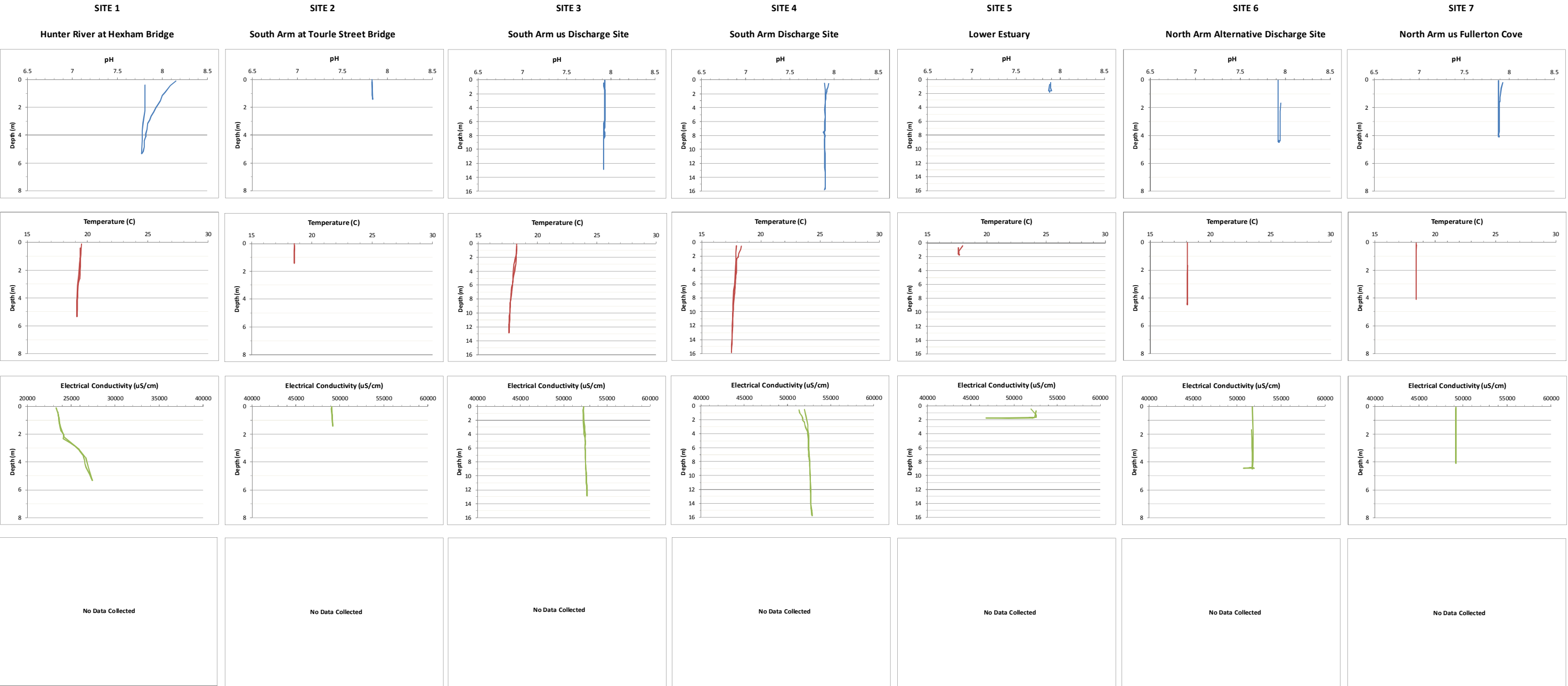


Figure Appendix A-3 Physical Chemistry Profiles for All Sampling Sites – Round 2, Rising Tide

Appendix A - Sample Summary and Water Quality Profiles

SAMPLING ROUND 2 - FALLING TIDE

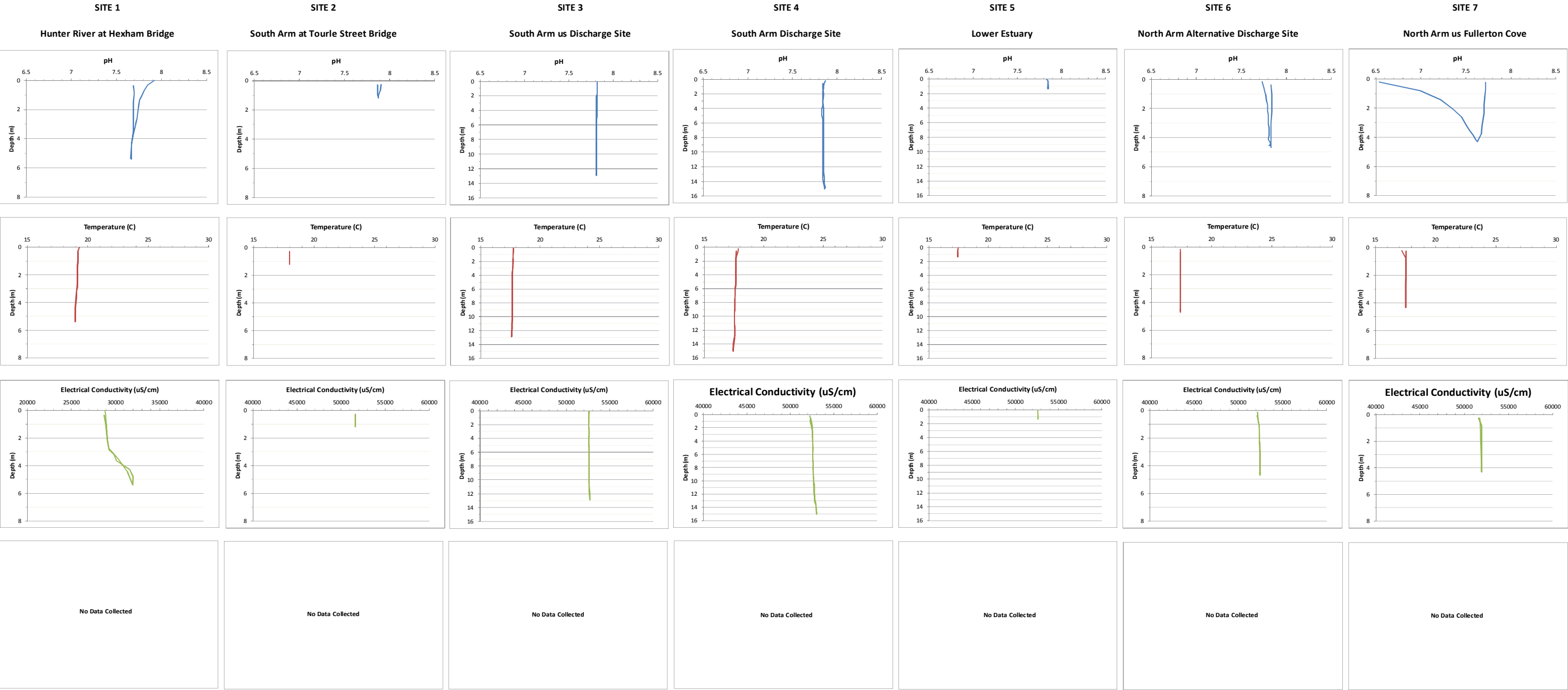


Figure Appendix A-4 Physical Chemistry Profiles for All Sampling Sites – Round 2, Falling Tide

Appendix A - Sample Summary and Water Quality Profiles

SAMPLING ROUND 3 - RISING TIDE

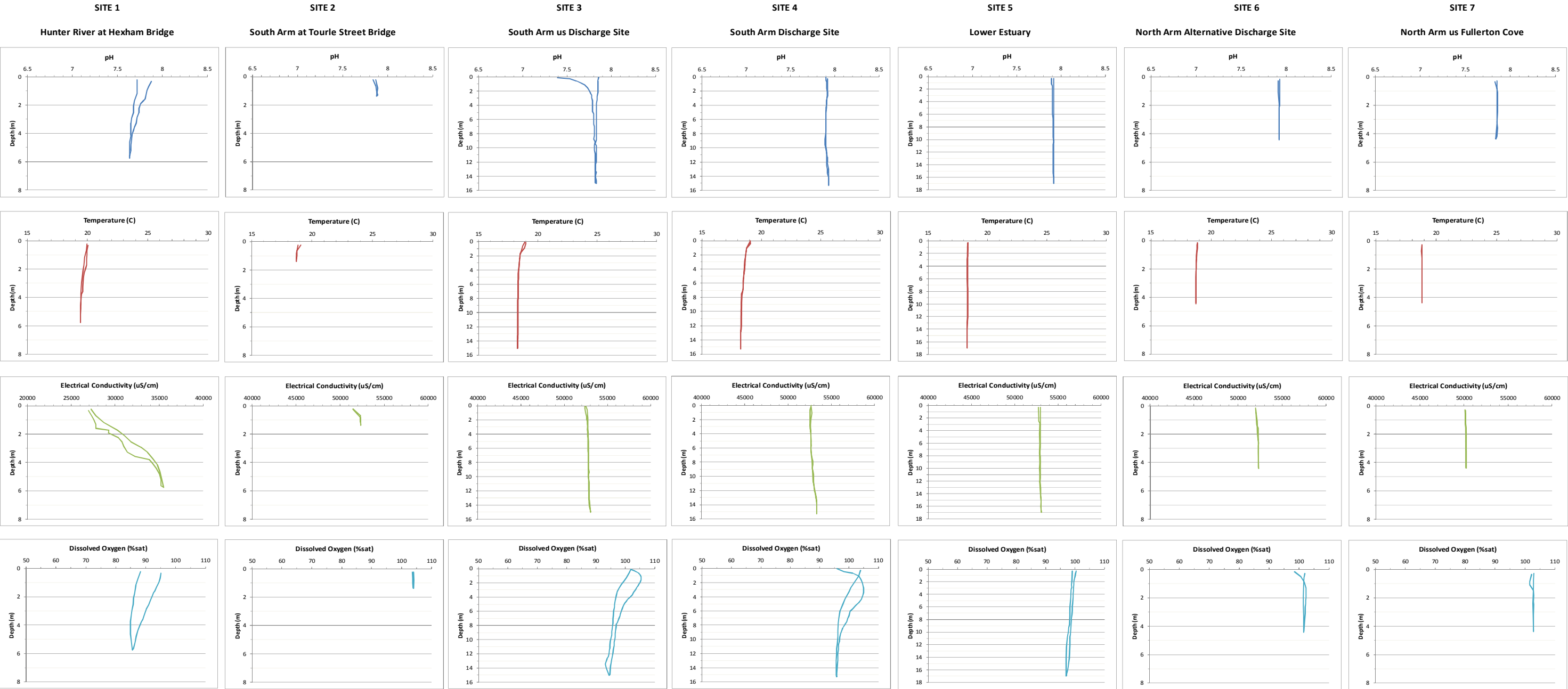


Figure Appendix A-5 Physical Chemistry Profiles for All Sampling Sites – Round 3, Rising Tide

Appendix A - Sample Summary and Water Quality Profiles

SAMPLING ROUND 3 - FALLING TIDE

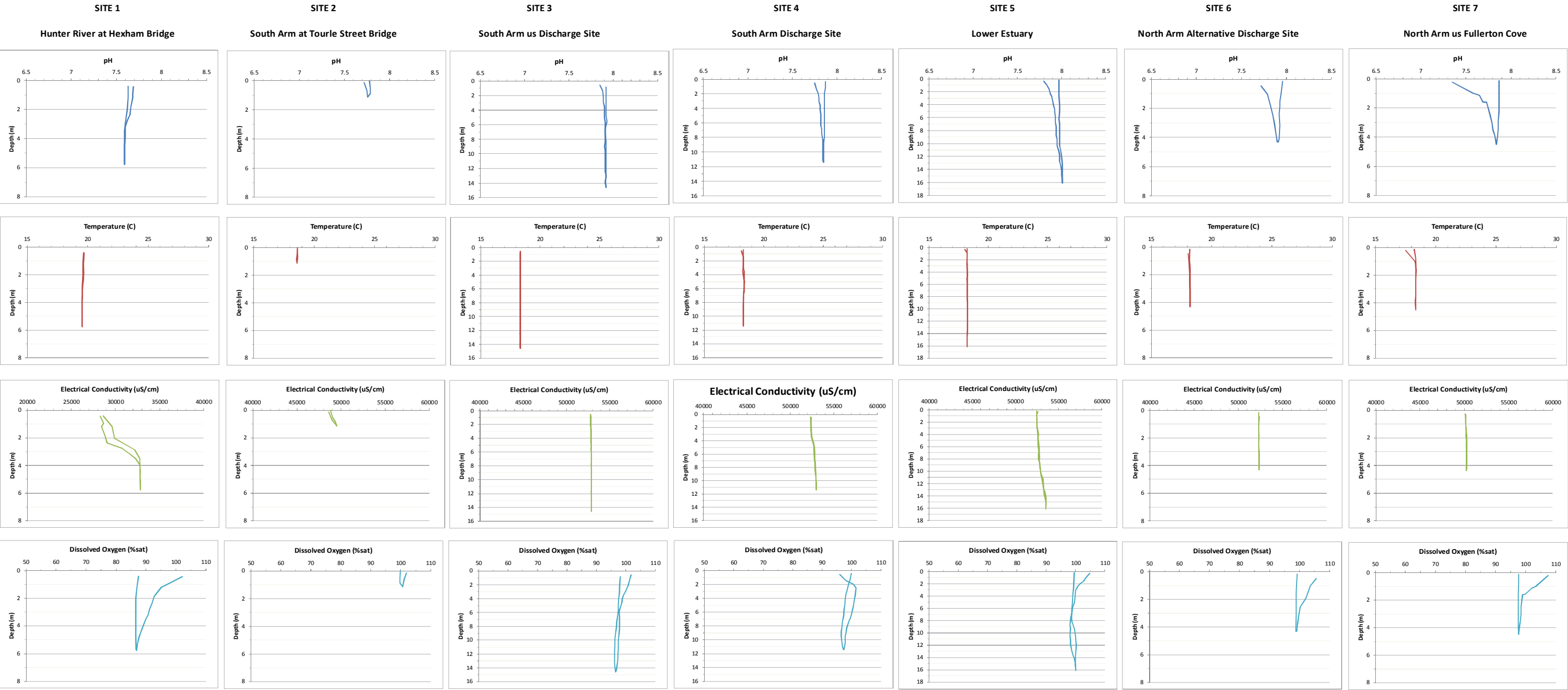


Figure Appendix A-6 Physical Chemistry Profiles for All Sampling Sites – Round 3, Falling Tide

Appendix A - Sample Summary and Water Quality Profiles

SAMPLING ROUND 4 - RISING TIDE

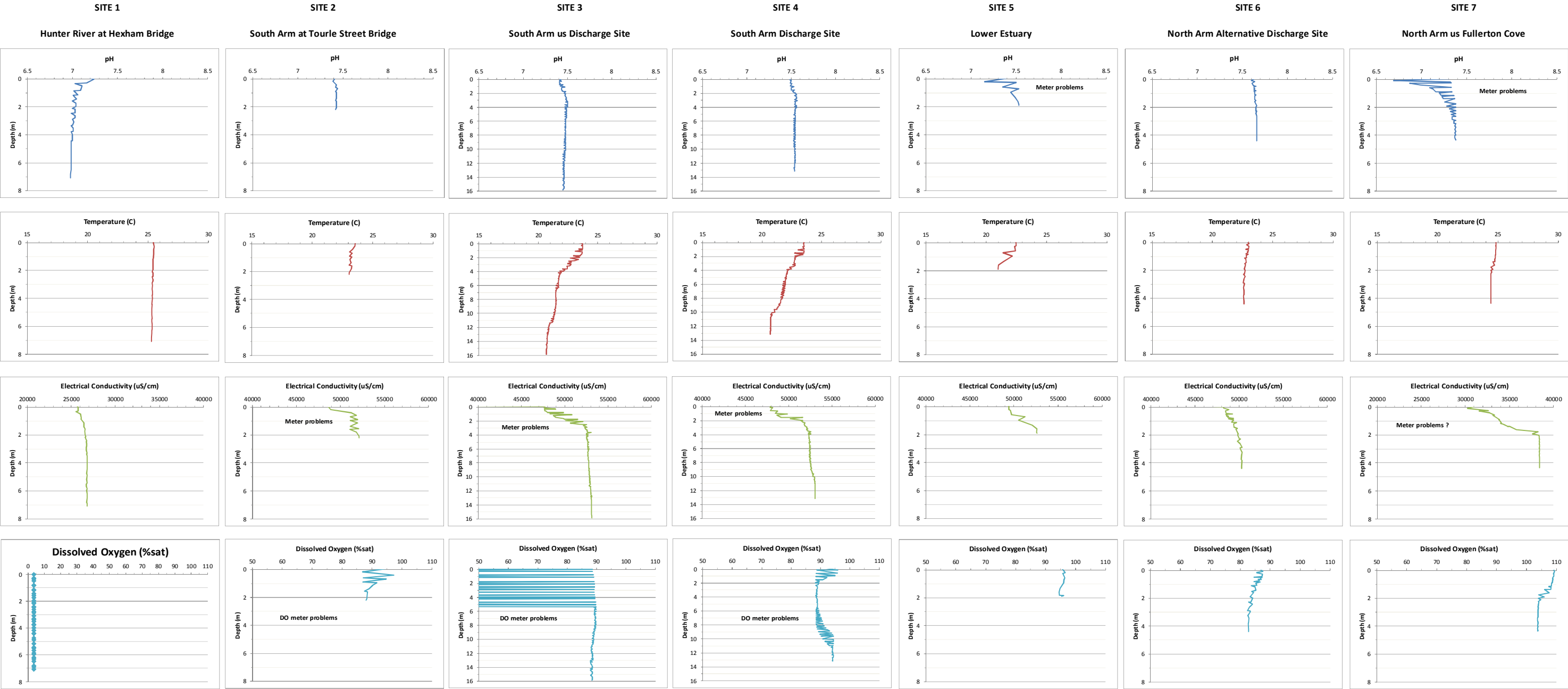


Figure Appendix A-7 Physical Chemistry Profiles for All Sampling Sites – Round 4, Rising Tide

Appendix A - Sample Summary and Water Quality Profiles

SAMPLING ROUND 4 - FALLING TIDE

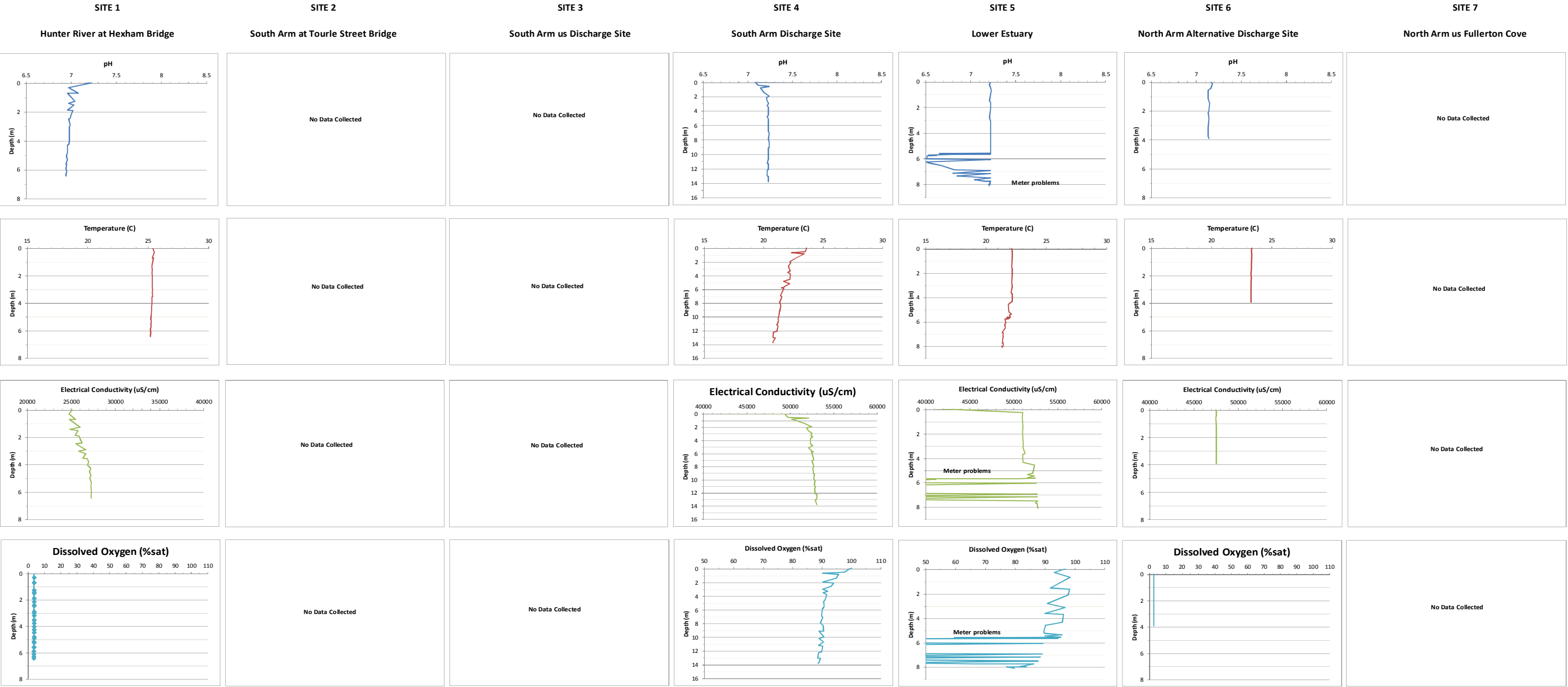


Figure Appendix A-8 Physical Chemistry Profiles for All Sampling Sites – Round 4, Falling Tide

Appendix B Laboratory Results and CoCs

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: ES1222001	Page	: 1 of 7
Amendment	: 1		
Client	: URS AUSTRALIA (VIC) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR HEATH FIDOCK	Contact	: Client Services
Address	: 155A HOGAN ST TATURA VIC, AUSTRALIA 3616	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: heath.fidock@urs.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 03 5824 3322	Telephone	: +61-2-8784 8555
Facsimile	: +61 03 5824 3563	Facsimile	: +61-2-8784 8500
Project	: 43177771	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 12-SEP-2012
Sampler	: ----	Issue Date	: 02-OCT-2012
Site	: NEWCASTLE		
Quote number	: ME/465/12 V4	No. of samples received	: 24
		No. of samples analysed	: 24

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Evie.Sidarta	Inorganic Chemist	Sydney Inorganics
Sarah Millington	Senior Inorganic Chemist	Sydney Inorganics



General Comments

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

- **EK255A-CM:** Repeat results confirm that Ammonia is positive in sample ID 'QC02'.
- **EK255A-CM:** It has been noted that Ammonia is greater than TKN for various samples, however, these differences are within the limits of experimental variation.
- **EK259A-CM:** Repeat results confirm that NOx is positive in sample ID 'QC02'
- **EK262PA-CM:** It has been noted that dissolved Total Nitrogen is greater than Total Nitrogen for various samples, however these differences are within the limits of experimental variation.
- **EK271A-CM:** It has been noted that dissolved Total Phosphorus is greater than Total Phosphorus for sample ID 'SITE2_F_0-0.1', however this difference is within the limits of experimental variation.
- **EK271A-CM:** It has been noted that Reactive Pphosphorus is greater than Dissolved Total Phosphorus for various samples, however this difference is within the limits of experimental variation.
- **EK271A-CM:** Repeated results confirm that Reactive Phosphorus is positive in sample ID 'QC02'.
- This report has been amended following changes to the analytical data reported. The quality system is being utilised to resolve this issue. The specific data affected includes the TSS result for sample SITE1_F_0-0.1_2.



Analytical Results

Sub-Matrix: WATER

Client sample ID

Client sampling date / time

Compound	CAS Number	LOR	Unit	SITE7_F_0-0.1	SITE6_F_0-0.1	SITE6_F_4.2	SITE5_F_0-0.1	SITE5_F_2.0
				12-SEP-2012 07:30	12-SEP-2012 08:15	12-SEP-2012 08:30	12-SEP-2012 09:10	12-SEP-2012 09:30
				ES1222001-001	ES1222001-002	ES1222001-003	ES1222001-004	ES1222001-005
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	7	<5	<5	22	12
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA								
Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	0.02	<0.01	<0.01	<0.01	<0.01
EP008: Chlorophyll a & Pheophytin a								
Chlorophyll a	----	1	mg/m³	1	<1	<1	<1	<1
Volume	----	0.01	L	1	1	1	1	1
Volume Extract	----	0.01	mL	10	10	10	10	10
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	0.009	0.006	0.044	0.007	0.007
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Nitrate as N	14797-55-8	0.002	mg/L	0.021	0.023	0.059	0.048	0.020
Nitrite + Nitrate as N	----	0.002	mg/L	0.021	0.023	0.059	0.048	0.020
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	0.08	0.04	0.14	<0.01	0.04
Dissolved Total Nitrogen as N	----	0.01	mg/L	0.04	0.07	0.20	0.05	0.07
Total Nitrogen as N	----	0.01	mg/L	0.10	0.06	0.20	0.02	0.06
Reactive Phosphorus as P	----	0.001	mg/L	0.014	0.016	0.017	0.012	0.013
Dissolved Total Phosphorus as P	----	0.005	mg/L	0.015	0.020	0.025	0.010	0.014
Total Phosphorus as P	----	0.005	mg/L	0.028	0.029	0.023	0.023	0.021



Analytical Results

Sub-Matrix: WATER

Client sample ID

Client sampling date / time

Compound	CAS Number	LOR	Unit	SITE4_F_0-0.1	SITE4_F_6.5	SITE3_F_0-0.1	SITE3_F_7.0	SITE2_F_0-0.1
				12-SEP-2012 10:00	12-SEP-2012 10:30	12-SEP-2012 10:45	12-SEP-2012 11:20	12-SEP-2012 12:00
				ES1222001-006	ES1222001-007	ES1222001-008	ES1222001-009	ES1222001-010
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	12
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA								
Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	0.01	<0.01	<0.01
EP008: Chlorophyll a & Pheophytin a								
Chlorophyll a	----	1	mg/m³	<1	<1	<1	<1	1
Volume	----	0.01	L	1	1	1	1	1
Volume Extract	----	0.01	mL	10	10	10	10	10
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.010	0.009	0.016	<0.005
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Nitrate as N	14797-55-8	0.002	mg/L	0.025	0.038	0.038	0.031	0.035
Nitrite + Nitrate as N	----	0.002	mg/L	0.025	0.038	0.038	0.031	0.035
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	0.04	<0.01	0.06	<0.01	0.10
Dissolved Total Nitrogen as N	----	0.01	mg/L	0.07	0.05	0.10	0.07	0.15
Total Nitrogen as N	----	0.01	mg/L	0.06	0.04	0.10	0.02	0.14
Reactive Phosphorus as P	----	0.001	mg/L	0.016	0.015	0.018	0.014	0.032
Dissolved Total Phosphorus as P	----	0.005	mg/L	0.020	0.017	0.023	0.011	0.032
Total Phosphorus as P	----	0.005	mg/L	0.028	0.024	0.029	0.023	0.012



Analytical Results

Sub-Matrix: **WATER**

Client sample ID

Client sampling date / time

				QC01	QC02	SITE1_F_0-0.1	SITE1_F_0-0.1_2	SITE1_R_0-0.1
				12-SEP-2012 12:00	12-SEP-2012 12:00	12-SEP-2012 12:15	12-SEP-2012 12:30	12-SEP-2012 13:30
Compound	CAS Number	LOR	Unit	ES1222001-011	ES1222001-012	ES1222001-013	ES1222001-014	ES1222001-015
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	6	<5	8	----	10
Suspended Solids (SS)	----	5	mg/L	----	----	----	<5	----
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA								
Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	0.02	0.01	0.01
EP008: Chlorophyll a & Pheophytin a								
Chlorophyll a	----	1	mg/m ³	<1	<1	1	4	3
Volume	----	0.01	L	1	1	1	1	1
Volume Extract	----	0.01	mL	10	10	10	10	10
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	0.024	0.006	<0.005	<0.005	<0.005
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Nitrate as N	14797-55-8	0.002	mg/L	0.043	0.005	0.007	0.014	0.022
Nitrite + Nitrate as N	----	0.002	mg/L	0.043	0.005	0.007	0.014	0.022
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	0.04	<0.01	0.16	0.16	0.19
Dissolved Total Nitrogen as N	----	0.01	mg/L	0.07	<0.01	0.17	0.16	0.19
Total Nitrogen as N	----	0.01	mg/L	0.08	<0.01	0.17	0.17	0.21
Reactive Phosphorus as P	----	0.001	mg/L	0.014	0.001	0.020	0.021	0.022
Dissolved Total Phosphorus as P	----	0.005	mg/L	0.014	<0.005	0.026	0.021	0.025
Total Phosphorus as P	----	0.005	mg/L	0.017	<0.005	0.047	0.039	0.041



Analytical Results

Sub-Matrix: WATER

Client sample ID

Client sampling date / time

Compound	CAS Number	LOR	Unit	SITE2_R_0-0.1	SITE3_R_0-0.1	SITE3_R_7.0	SITE4_R_0-0.1	SITE4_R_8.0
				[12-SEP-2012]	12-SEP-2012 14:30	12-SEP-2012 14:45	[12-SEP-2012]	12-SEP-2012 15:15
				ES1222001-016	ES1222001-017	ES1222001-018	ES1222001-019	ES1222001-020
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	<5	<5	14	<5	<5
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA								
Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP008: Chlorophyll a & Pheophytin a								
Chlorophyll a	----	1	mg/m ³	1	<1	2	<1	<1
Volume	----	0.01	L	1	1	1	1	1
Volume Extract	----	0.01	mL	10	10	10	10	10
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	0.012	0.007	0.010	0.021	0.018
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Nitrate as N	14797-55-8	0.002	mg/L	0.041	0.045	0.047	0.052	0.025
Nitrite + Nitrate as N	----	0.002	mg/L	0.041	0.045	0.047	0.052	0.025
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	0.02	0.06	<0.01	0.05	<0.01
Dissolved Total Nitrogen as N	----	0.01	mg/L	0.07	0.12	0.04	0.10	0.04
Total Nitrogen as N	----	0.01	mg/L	0.06	0.11	0.04	0.10	0.01
Reactive Phosphorus as P	----	0.001	mg/L	0.019	0.015	0.014	0.014	0.012
Dissolved Total Phosphorus as P	----	0.005	mg/L	0.016	0.019	0.014	0.015	0.011
Total Phosphorus as P	----	0.005	mg/L	0.023	0.025	0.024	0.025	0.020



Analytical Results

Sub-Matrix: WATER

Client sample ID

Client sampling date / time

				SITE5_R_0-0.1	SITE5_R_1.5	SITE6_R_0-0.1	SITE6_R_4.0	
				12-SEP-2012 15:30	12-SEP-2012 15:35	12-SEP-2012 15:45	12-SEP-2012 16:05	
Compound	CAS Number	LOR	Unit	ES1222001-021	ES1222001-022	ES1222001-023	ES1222001-024	
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	5	7	10	10	----
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA								
Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
EP008: Chlorophyll a & Pheophytin a								
Chlorophyll a	----	1	mg/m ³	1	<1	<1	<1	----
Volume	----	0.01	L	1	1	1	1	----
Volume Extract	----	0.01	mL	10	10	10	10	----
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	0.005	<0.005	<0.005	0.012	----
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	----
Nitrate as N	14797-55-8	0.002	mg/L	0.031	0.021	0.025	0.022	----
Nitrite + Nitrate as N	----	0.002	mg/L	0.031	0.021	0.025	0.022	----
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Dissolved Total Nitrogen as N	----	0.01	mg/L	0.02	0.03	0.05	0.05	----
Total Nitrogen as N	----	0.01	mg/L	0.02	<0.01	0.02	0.02	----
Reactive Phosphorus as P	----	0.001	mg/L	0.010	0.011	0.012	0.011	----
Dissolved Total Phosphorus as P	----	0.005	mg/L	0.011	0.008	0.008	0.010	----
Total Phosphorus as P	----	0.005	mg/L	0.022	0.020	0.024	0.018	----

Environmental Division

QUALITY CONTROL REPORT

Work Order	: ES1222001	Page	: 1 of 8
Amendment	: 1		
Client	: URS AUSTRALIA (VIC) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR HEATH FIDOCK	Contact	: Client Services
Address	: 155A HOGAN ST TATURA VIC, AUSTRALIA 3616	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: heath.fidock@urs.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 03 5824 3322	Telephone	: +61-2-8784 8555
Facsimile	: +61 03 5824 3563	Facsimile	: +61-2-8784 8500
Project	: 43177771	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: NEWCASTLE		
C-O-C number	: ----	Date Samples Received	: 12-SEP-2012
Sampler	: ----	Issue Date	: 02-OCT-2012
Order number	: ----		
Quote number	: ME/465/12 V4	No. of samples received	: 24
		No. of samples analysed	: 24

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Evie Sidarta	Inorganic Chemist	Sydney Inorganics
Sarah Millington	Senior Inorganic Chemist	Sydney Inorganics



General Comments

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

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

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

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

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC



Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA025: Suspended Solids (QC Lot: 2499309)									
ES1221868-004	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	17	12	34.5	No Limit
ES1222000-002	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	12	9	25.0	No Limit
EA025: Suspended Solids (QC Lot: 2499310)									
ES1222001-003	SITE6_F_4.2	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	13	90.9	No Limit
ES1222001-014	SITE1_F_0-0.1	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EA025: Suspended Solids (QC Lot: 2504712)									
ES1221999-012	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	232	256	9.8	0% - 20%
ES1222001-020	SITE4_R_8.0	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	7	33.3	No Limit
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA (QC Lot: 2497169)									
ES1222001-001	SITE7_F_0-0.1	EK069FG: Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	0.02	0.02	0.0	No Limit
ES1222001-011	QC01	EK069FG: Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA (QC Lot: 2497170)									
ES1222001-021	SITE5_R_0-0.1	EK069FG: Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 2496111)									
ES1222001-001	SITE7_F_0-0.1	EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	0.021	0.021	0.0	0% - 50%
ES1222001-011	QC01	EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	0.043	0.046	6.6	0% - 20%
Ultra-Trace Nutrients (QC Lot: 2496112)									
ES1222001-001	SITE7_F_0-0.1	EK257A-CM: Nitrite as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
ES1222001-011	QC01	EK257A-CM: Nitrite as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 2496113)									
ES1222001-001	SITE7_F_0-0.1	EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	0.009	0.009	0.0	No Limit
ES1222001-011	QC01	EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	0.024	0.024	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 2496114)									
ES1222001-001	SITE7_F_0-0.1	EK271A-CM: Reactive Phosphorus as P	----	0.001	mg/L	0.014	0.016	12.4	0% - 50%
ES1222001-011	QC01	EK271A-CM: Reactive Phosphorus as P	----	0.001	mg/L	0.014	0.014	0.0	0% - 50%
Ultra-Trace Nutrients (QC Lot: 2496115)									
ES1222001-021	SITE5_R_0-0.1	EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	0.031	0.031	0.0	0% - 50%
Ultra-Trace Nutrients (QC Lot: 2496116)									
ES1222001-021	SITE5_R_0-0.1	EK257A-CM: Nitrite as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 2496117)									
ES1222001-021	SITE5_R_0-0.1	EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	0.005	0.006	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 2496118)									
ES1222001-021	SITE5_R_0-0.1	EK271A-CM: Reactive Phosphorus as P	----	0.001	mg/L	0.010	0.011	17.3	0% - 50%

Page : 4 of 8
 Work Order : ES1222001 Amendment 1
 Client : URS AUSTRALIA (VIC) PTY LTD
 Project : 4317771



Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
Ultra-Trace Nutrients (QC Lot: 2496119)									
ES1222001-001	SITE7_F_0-0.1	EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.01	mg/L	0.04	0.04	0.0	No Limit
ES1222001-011	QC01	EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.01	mg/L	0.07	0.08	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 2496120)									
ES1222001-001	SITE7_F_0-0.1	EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.005	mg/L	0.015	0.022	37.0	No Limit
ES1222001-011	QC01	EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.005	mg/L	0.014	0.014	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 2496121)									
ES1222001-021	SITE5_R_0-0.1	EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.01	mg/L	0.02	<0.01	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 2496122)									
ES1222001-021	SITE5_R_0-0.1	EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.005	mg/L	0.011	0.010	9.8	No Limit
Ultra-Trace Nutrients (QC Lot: 2496123)									
ES1222001-001	SITE7_F_0-0.1	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	0.028	0.027	0.0	No Limit
ES1222001-011	QC01	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	0.017	0.017	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 2496124)									
ES1222001-001	SITE7_F_0-0.1	EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	0.10	0.09	12.4	No Limit
ES1222001-011	QC01	EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	0.08	0.08	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 2496125)									
ES1222001-021	SITE5_R_0-0.1	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	0.022	0.024	6.5	No Limit
Ultra-Trace Nutrients (QC Lot: 2496126)									
ES1222001-021	SITE5_R_0-0.1	EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	0.02	<0.01	0.0	No Limit

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA025: Suspended Solids (QCLot: 2499309)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	96.2	82	132
EA025: Suspended Solids (QCLot: 2499310)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	113	82	132
EA025: Suspended Solids (QCLot: 2504712)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	98.8	82	132
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA (QCLot: 2497169)								
EK069FG: Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	1 mg/L	97.3	----	----
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA (QCLot: 2497170)								
EK069FG: Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	1 mg/L	97.5	----	----
EP008: Chlorophyll a & Pheophytin a (QCLot: 2497967)								
EP008: Chlorophyll a	----	1	mg/m³	<1	20 mg/m³	105	61	131
EP008: Volume	----	0.01	L	1	----	1	----	----
EP008: Volume Extract	----	0.01	mL	10	----	10	----	----
EP008: Chlorophyll a & Pheophytin a (QCLot: 2497968)								
EP008: Chlorophyll a	----	1	mg/m³	<1	20 mg/m³	105	61	131
EP008: Volume	----	0.01	L	1	----	1	----	----
EP008: Volume Extract	----	0.01	mL	10	----	10	----	----
Ultra-Trace Nutrients (QCLot: 2496111)								
EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	0.1 mg/L	95.6	82	130
Ultra-Trace Nutrients (QCLot: 2496112)								
EK257A-CM: Nitrite as N	----	0.002	mg/L	<0.002	0.1 mg/L	95.8	91	133
Ultra-Trace Nutrients (QCLot: 2496113)								
EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.1 mg/L	98.6	68	130
Ultra-Trace Nutrients (QCLot: 2496114)								
EK271A-CM: Reactive Phosphorus as P	----	0.001	mg/L	<0.001	0.1 mg/L	86.8	76	116
Ultra-Trace Nutrients (QCLot: 2496115)								
EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	0.1 mg/L	96.6	82	130
Ultra-Trace Nutrients (QCLot: 2496116)								
EK257A-CM: Nitrite as N	----	0.002	mg/L	<0.002	0.1 mg/L	102	91	133
Ultra-Trace Nutrients (QCLot: 2496117)								
EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.1 mg/L	98.6	68	130
Ultra-Trace Nutrients (QCLot: 2496118)								

Matrix Spike (MS) Report

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
					MS	Low	High
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number				
Ultra-Trace Nutrients (QCLot: 2496111)							
ES1222001-001	SITE7_F_0-0.1	EK259A-CM: Nitrite + Nitrate as N	----	0.1 mg/L	104	70	130
Ultra-Trace Nutrients (QCLot: 2496112)							
ES1222001-001	SITE7_F_0-0.1	EK257A-CM: Nitrite as N	----	0.1 mg/L	89.8	70	130
Ultra-Trace Nutrients (QCLot: 2496113)							
ES1222001-001	SITE7_F_0-0.1	EK255A-CM: Ammonia as N	7664-41-7	0.1 mg/L	81.9	70	130
Ultra-Trace Nutrients (QCLot: 2496114)							
ES1222001-001	SITE7_F_0-0.1	EK271A-CM: Reactive Phosphorus as P	----	0.1 mg/L	98.2	70	130
Ultra-Trace Nutrients (QCLot: 2496115)							

Sub-Matrix: WATER				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
					MS	MSD	Low	High	Value	Control Limit
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number							
Ultra-Trace Nutrients (QCLot: 2496111)										
ES1222001-001	SITE7_F_0-0.1	EK259A-CM: Nitrite + Nitrate as N	----	0.1 mg/L	104	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2496112)										
ES1222001-001	SITE7_F_0-0.1									



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number		MS	MSD	Low	High	Value	Control Limit
Ultra-Trace Nutrients (QCLot: 2496112) - continued										
ES1222001-001	SITE7_F_0-0.1	EK257A-CM: Nitrite as N	----	0.1 mg/L	89.8	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2496113)										
ES1222001-001	SITE7_F_0-0.1	EK255A-CM: Ammonia as N	7664-41-7	0.1 mg/L	81.9	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2496114)										
ES1222001-001	SITE7_F_0-0.1	EK271A-CM: Reactive Phosphorus as P	----	0.1 mg/L	98.2	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2496115)										
ES1222001-021	SITE5_R_0-0.1	EK259A-CM: Nitrite + Nitrate as N	----	0.1 mg/L	103	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2496116)										
ES1222001-021	SITE5_R_0-0.1	EK257A-CM: Nitrite as N	----	0.1 mg/L	93.1	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2496117)										
ES1222001-021	SITE5_R_0-0.1	EK255A-CM: Ammonia as N	7664-41-7	0.1 mg/L	78.4	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2496118)										
ES1222001-021	SITE5_R_0-0.1	EK271A-CM: Reactive Phosphorus as P	----	0.1 mg/L	112	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2496119)										
ES1222001-001	SITE7_F_0-0.1	EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.5 mg/L	107	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2496120)										
ES1222001-001	SITE7_F_0-0.1	EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.5 mg/L	102	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2496121)										
ES1222001-021	SITE5_R_0-0.1	EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.5 mg/L	107	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2496122)										
ES1222001-021	SITE5_R_0-0.1	EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.5 mg/L	99.7	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2496123)										
ES1222001-001	SITE7_F_0-0.1	EK267PA-CM: Total Phosphorus as P	----	0.5 mg/L	111	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2496124)										
ES1222001-001	SITE7_F_0-0.1	EK262PA-CM: Total Nitrogen as N	----	0.5 mg/L	102	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2496125)										
ES1222001-021	SITE5_R_0-0.1	EK267PA-CM: Total Phosphorus as P	----	0.5 mg/L	98.6	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2496126)										
ES1222001-021	SITE5_R_0-0.1	EK262PA-CM: Total Nitrogen as N	----	0.5 mg/L	103	----	70	130	----	----

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: ES1222001	Page	: 1 of 10
Amendment	: 1		
Client	: URS AUSTRALIA (VIC) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR HEATH FIDOCK	Contact	: Client Services
Address	: 155A HOGAN ST TATURA VIC, AUSTRALIA 3616	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: heath.fidock@urs.com	E-mail	: sydney@alsglobal.com
Telephone	: +61 03 5824 3322	Telephone	: +61-2-8784 8555
Facsimile	: +61 03 5824 3563	Facsimile	: +61-2-8784 8500
Project	: 43177771	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: NEWCASTLE		
C-O-C number	: ----	Date Samples Received	: 12-SEP-2012
Sampler	: ----	Issue Date	: 02-OCT-2012
Order number	: ----		
Quote number	: ME/465/12 V4	No. of samples received	: 24
		No. of samples analysed	: 24

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers



Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non-volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA025: Suspended Solids								
Clear Plastic Bottle - Natural (EA025H) SITE7_F_0-0.1, SITE6_F_4.2, SITE5_F_2.0, SITE4_F_6.5, SITE3_F_7.0, QC01, SITE1_F_0-0.1, SITE1_R_0-0.1, SITE3_R_0-0.1,	SITE6_F_0-0.1, SITE5_F_0-0.1, SITE4_F_0-0.1, SITE3_F_0-0.1, SITE2_F_0-0.1, QC02, SITE1_F_0-0.1_2, SITE2_R_0-0.1, SITE3_R_7.0	12-SEP-2012	----	----	----	14-SEP-2012	19-SEP-2012	✓
Clear Plastic Bottle - Natural (EA025H) SITE4_R_0-0.1, SITE5_R_0-0.1, SITE6_R_0-0.1,	SITE4_R_8.0, SITE5_R_1.5, SITE6_R_4.0	12-SEP-2012	----	----	----	18-SEP-2012	19-SEP-2012	✓
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA								
Clear Plastic Bottle - Natural (EK069FG) SITE7_F_0-0.1, SITE6_F_4.2, SITE5_F_2.0, SITE4_F_6.5, SITE3_F_7.0, QC01, SITE1_F_0-0.1, SITE1_R_0-0.1, SITE3_R_0-0.1, SITE4_R_0-0.1, SITE5_R_0-0.1, SITE6_R_0-0.1,	SITE6_F_0-0.1, SITE5_F_0-0.1, SITE4_F_0-0.1, SITE3_F_0-0.1, SITE2_F_0-0.1, QC02, SITE1_F_0-0.1_2, SITE2_R_0-0.1, SITE3_R_7.0, SITE4_R_8.0, SITE5_R_1.5, SITE6_R_4.0	12-SEP-2012	13-SEP-2012	14-SEP-2012	✓	13-SEP-2012	14-SEP-2012	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
Ultra-Trace Nutrients							
Clear Plastic - Filtered (AS) - for UT Nut. (EK255A-CM) SITE7_F_0-0.1, SITE6_F_4.2, SITE5_F_2.0, SITE4_F_6.5, SITE3_F_7.0, QC01, SITE1_F_0-0.1, SITE1_R_0-0.1, SITE3_R_0-0.1, SITE4_R_0-0.1, SITE5_R_0-0.1, SITE6_R_0-0.1, SITE6_F_0-0.1, SITE5_F_0-0.1, SITE4_F_0-0.1, SITE3_F_0-0.1, SITE2_F_0-0.1, QC02, SITE1_F_0-0.1_2, SITE2_R_0-0.1, SITE3_R_7.0, SITE4_R_8.0, SITE5_R_1.5, SITE6_R_4.0	12-SEP-2012	---	13-SEP-2012	----	12-SEP-2012	13-SEP-2012	✔
Ultra-Trace Nutrients							
Clear Plastic - Filtered (AS) - for UT Nut. (EK257A-CM) SITE7_F_0-0.1, SITE6_F_4.2, SITE5_F_2.0, SITE4_F_6.5, SITE3_F_7.0, QC01, SITE1_F_0-0.1, SITE1_R_0-0.1, SITE3_R_0-0.1, SITE4_R_0-0.1, SITE5_R_0-0.1, SITE6_R_0-0.1, SITE6_F_0-0.1, SITE5_F_0-0.1, SITE4_F_0-0.1, SITE3_F_0-0.1, SITE2_F_0-0.1, QC02, SITE1_F_0-0.1_2, SITE2_R_0-0.1, SITE3_R_7.0, SITE4_R_8.0, SITE5_R_1.5, SITE6_R_4.0	12-SEP-2012	---	13-SEP-2012	----	12-SEP-2012	13-SEP-2012	✔
Ultra-Trace Nutrients							
Clear Plastic - Filtered (AS) - for UT Nut. (EK259A-CM) SITE7_F_0-0.1, SITE6_F_4.2, SITE5_F_2.0, SITE4_F_6.5, SITE3_F_7.0, QC01, SITE1_F_0-0.1, SITE1_R_0-0.1, SITE3_R_0-0.1, SITE4_R_0-0.1, SITE5_R_0-0.1, SITE6_R_0-0.1, SITE6_F_0-0.1, SITE5_F_0-0.1, SITE4_F_0-0.1, SITE3_F_0-0.1, SITE2_F_0-0.1, QC02, SITE1_F_0-0.1_2, SITE2_R_0-0.1, SITE3_R_7.0, SITE4_R_8.0, SITE5_R_1.5, SITE6_R_4.0	12-SEP-2012	---	13-SEP-2012	----	12-SEP-2012	13-SEP-2012	✔



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
Ultra-Trace Nutrients								
Clear Plastic Bottle - Natural (AS) (EK262PA-CM) SITE7_F_0-0.1, SITE6_F_4.2, SITE5_F_2.0, SITE4_F_6.5, SITE3_F_7.0, QC01, SITE1_F_0-0.1, SITE1_R_0-0.1, SITE3_R_0-0.1, SITE4_R_0-0.1, SITE5_R_0-0.1, SITE6_R_0-0.1, SITE6_F_0-0.1, SITE5_F_0-0.1, SITE4_F_0-0.1, SITE3_F_0-0.1, SITE2_F_0-0.1, QC02, SITE1_F_0-0.1_2, SITE2_R_0-0.1, SITE3_R_7.0, SITE4_R_8.0, SITE5_R_1.5, SITE6_R_4.0	12-SEP-2012	12-SEP-2012	13-SEP-2012	✔	12-SEP-2012	13-SEP-2012	✔	
Ultra-Trace Nutrients								
Clear Plastic - Filtered (AS) - for UT Nut. (EK262PA-F-CM) SITE7_F_0-0.1, SITE6_F_4.2, SITE5_F_2.0, SITE4_F_6.5, SITE3_F_7.0, QC01, SITE1_F_0-0.1, SITE1_R_0-0.1, SITE3_R_0-0.1, SITE4_R_0-0.1, SITE5_R_0-0.1, SITE6_R_0-0.1, SITE6_F_0-0.1, SITE5_F_0-0.1, SITE4_F_0-0.1, SITE3_F_0-0.1, SITE2_F_0-0.1, QC02, SITE1_F_0-0.1_2, SITE2_R_0-0.1, SITE3_R_7.0, SITE4_R_8.0, SITE5_R_1.5, SITE6_R_4.0	12-SEP-2012	12-SEP-2012	13-SEP-2012	✔	12-SEP-2012	13-SEP-2012	✔	
Ultra-Trace Nutrients								
Clear Plastic Bottle - Natural (AS) (EK267PA-CM) SITE7_F_0-0.1, SITE6_F_4.2, SITE5_F_2.0, SITE4_F_6.5, SITE3_F_7.0, QC01, SITE1_F_0-0.1, SITE1_R_0-0.1, SITE3_R_0-0.1, SITE4_R_0-0.1, SITE5_R_0-0.1, SITE6_R_0-0.1, SITE6_F_0-0.1, SITE5_F_0-0.1, SITE4_F_0-0.1, SITE3_F_0-0.1, SITE2_F_0-0.1, QC02, SITE1_F_0-0.1_2, SITE2_R_0-0.1, SITE3_R_7.0, SITE4_R_8.0, SITE5_R_1.5, SITE6_R_4.0	12-SEP-2012	12-SEP-2012	13-SEP-2012	✔	12-SEP-2012	13-SEP-2012	✔	



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
Ultra-Trace Nutrients							
Clear Plastic - Filtered (AS) - for UT Nut. (EK267PA-F-CM) SITE7_F_0-0.1, SITE6_F_4.2, SITE5_F_2.0, SITE4_F_6.5, SITE3_F_7.0, QC01, SITE1_F_0-0.1, SITE1_R_0-0.1, SITE3_R_0-0.1, SITE4_R_0-0.1, SITE5_R_0-0.1, SITE6_R_0-0.1, SITE6_F_0-0.1, SITE5_F_0-0.1, SITE4_F_0-0.1, SITE3_F_0-0.1, SITE2_F_0-0.1, QC02, SITE1_F_0-0.1_2, SITE2_R_0-0.1, SITE3_R_7.0, SITE4_R_8.0, SITE5_R_1.5, SITE6_R_4.0	12-SEP-2012	12-SEP-2012	13-SEP-2012	✔	12-SEP-2012	13-SEP-2012	✔
Ultra-Trace Nutrients							
Clear Plastic - Filtered (AS) - for UT Nut. (EK271A-CM) SITE7_F_0-0.1, SITE6_F_4.2, SITE5_F_2.0, SITE4_F_6.5, SITE3_F_7.0, QC01, SITE1_F_0-0.1, SITE1_R_0-0.1, SITE3_R_0-0.1, SITE4_R_0-0.1, SITE5_R_0-0.1, SITE6_R_0-0.1, SITE6_F_0-0.1, SITE5_F_0-0.1, SITE4_F_0-0.1, SITE3_F_0-0.1, SITE2_F_0-0.1, QC02, SITE1_F_0-0.1_2, SITE2_R_0-0.1, SITE3_R_7.0, SITE4_R_8.0, SITE5_R_1.5, SITE6_R_4.0	12-SEP-2012	---	13-SEP-2012	----	12-SEP-2012	13-SEP-2012	✔
EP008: Chlorophyll a & Pheophytin a							
White Plastic Bottle - Unpreserved (EP008) SITE7_F_0-0.1, SITE6_F_4.2, SITE5_F_2.0, SITE4_F_6.5, SITE3_F_7.0, QC01, SITE1_F_0-0.1, SITE1_R_0-0.1, SITE3_R_0-0.1, SITE4_R_0-0.1, SITE5_R_0-0.1, SITE6_R_0-0.1, SITE6_F_0-0.1, SITE5_F_0-0.1, SITE4_F_0-0.1, SITE3_F_0-0.1, SITE2_F_0-0.1, QC02, SITE1_F_0-0.1_2, SITE2_R_0-0.1, SITE3_R_7.0, SITE4_R_8.0, SITE5_R_1.5, SITE6_R_4.0	12-SEP-2012	----	----	----	13-SEP-2012	14-SEP-2012	✔



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER** Evaluation: * = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	3	24	12.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Acid Hydrolyzable Phosphorus as P by DA	EK069FG	3	24	12.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Nitrogen as N (Persulfate) - UT for CM	EK262PA-F-CM	3	24	12.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Phosphorus (Persulfate) - UT for CM	EK267PA-F-CM	3	24	12.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	3	24	12.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	3	24	12.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	3	24	12.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	6	60	10.0	9.5	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	3	24	12.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	3	24	12.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	2	24	8.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a and Pheophytin a	EP008	2	33	6.1	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Acid Hydrolyzable Phosphorus as P by DA	EK069FG	2	24	8.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Nitrogen as N (Persulfate) - UT for CM	EK262PA-F-CM	4	24	16.7	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Phosphorus (Persulfate) - UT for CM	EK267PA-F-CM	4	24	16.7	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	2	24	8.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	2	24	8.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	2	24	8.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	6	60	10.0	9.5	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	2	24	8.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	2	24	8.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	2	24	8.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a and Pheophytin a	EP008	2	33	6.1	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Acid Hydrolyzable Phosphorus as P by DA	EK069FG	2	24	8.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Nitrogen as N (Persulfate) - UT for CM	EK262PA-F-CM	2	24	8.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Phosphorus (Persulfate) - UT for CM	EK267PA-F-CM	2	24	8.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	2	24	8.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	2	24	8.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	2	24	8.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	3	60	5.0	4.8	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	2	24	8.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) Ultra-Trace for CM	EK267PA-CM	2	24	8.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement



Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Matrix Spikes (MS)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	2	24	8.3	5.0	✔	ALS QCS3 requirement
Dissolved Total Nitrogen as N (Persulfate) - UT for CM	EK262PA-F-CM	2	24	8.3	5.0	✔	ALS QCS3 requirement
Dissolved Total Phosphorus (Persulfate) - UT for CM	EK267PA-F-CM	2	24	8.3	5.0	✔	ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	2	24	8.3	5.0	✔	ALS QCS3 requirement
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	2	24	8.3	5.0	✔	ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	2	24	8.3	5.0	✔	ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	2	24	8.3	5.0	✔	ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	2	24	8.3	5.0	✔	ALS QCS3 requirement



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Suspended Solids (High Level)	EA025H	WATER	In-House, APHA 21st ed., 2540D A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Acid Hydrolyzable Phosphorus as P by DA	EK069FG	WATER	APHA 21st ed., 4500-P B&G. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	WATER	APHA 21st ed., 4500-NH3 H Ammonia is determined by direct colorimetry by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by FIA.
Nitrate as N - Ultra-Trace for Catchment Monitoring	EK258A-CM	WATER	APHA 21st ed., 4500-NO3- I Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by FIA. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results.
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	WATER	APHA 21st ed., 4500-NO3- I. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by FIA.
TKN (Total N - NOx-N). (FIA - UT) for Catchment Monitoring	EK261PA-CM	WATER	APHA 21st ed., 4500-P J. & 4500-NO3- I . Calculated by difference from total Nitrogen and NOx. Contributing method parameters are determined by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Nitrogen as N (Persulfate digestion) -Ultra-Trace - CM	EK262PA-CM	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Total Nitrogen as N (Persulfate) - UT for CM	EK262PA-F-CM	WATER	APHA 21st ed., 4500-P J. Dissolved forms of Total Nitrogen is digested in a 0.45um filtered sample by Persulfate Method (Simultaneous Determination of Total Nitrogen and Total Phosphorus). As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Total Phosphorus (Persulfate) - UT for CM	EK267PA-F-CM	WATER	APHA 21st ed., 4500-P J. Dissolved forms of Total Phosphorus is digested in a 0.45um filtered sample by Persulfate Method (Simultaneous Determination of Total Nitrogen and Total Phosphorus). As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	WATER	APHA 21st ed., 4500-P E Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chlorophyll a and Pheophytin a	EP008	WATER	In-house (APHA 21st ed., 10200 H mod.) The pigments are extracted into aqueous acetone. The optical density of the extract before and after acidification at both 664 nm and 665 nm is determined spectrometrically.

Preparation Methods	Method	Matrix	Method Descriptions



Preparation Methods	Method	Matrix	Method Descriptions
Total Acid Hydrolysable Phosphorus as P	EK069-PR	WATER	APHA 21st ed., 4500 P - B&G. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Persulfate Digestion for UT Dissolved TN and TP for FIA fin	EK262/267-PA F Prep	WATER	APHA 21st ed., 4500 P - J. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)



Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- For all matrices, no Method Blank value outliers occur.
- For all matrices, no Duplicate outliers occur.
- For all matrices, no Laboratory Control outliers occur.
- For all matrices, no Matrix Spike outliers occur.

Regular Sample Surrogates

- For all regular sample matrices, no surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- No Quality Control Sample Frequency Outliers exist.

CHAIN OF CUSTODY DOCUMENTATION - Falling Tide

COC Page 1 of 13



CLIENT: URS VIC

ADDRESS / OFFICE: Level 6, Southbank Boulevard, Southbank, Vic 3006

PROJECT MANAGER (PM): Heath Fidock

PROJECT ID: 43177771

SITE: Newcastle

P.O. NO.:

RESULTS REQUIRED (Date): 5 DAY TAT

QUOTE NO.: ME-465-12 V3

SAMPLER:

MOBILE: 0438 098 066

PHONE: 03-5824 6110

EMAIL REPORT TO: Heath Fidock, Peter McGowan

EMAIL INVOICE TO: heath.fidock@urs.com

ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY

COOLER SEAL (circle appropriate)

In Use: Yes No N/A

SAMPLE TEMPERATURE

CHILLED: Yes/No

COMMENTS:

Analyse within 24hr

Notes:

Falling Tide Samples

Field filtered - mark on label

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Total bottles	UTN-04 (TN, TP, NH ₃ , TKN, NO _x , NO ₂ , NO ₃ , Reac.P.)	EK262PA-F-CM (Total Dissolved N)	EK267PA-F-CM (Total Dissolved P)	EK069G* (Dissolved Acid Hydrolyzable P)	EP008 (Chlorophyll)	EA025H (TSS)
	Site 7_F_0-0.1	W	12/09/2012	7:30	6	x	x	x	x	x	x
	Site F	W	12/09/2012			x	x	x	x	x	x
	Site F	W	12/09/2012			x	x	x	x	x	x
	Site F	W	12/09/2012			x	x	x	x	x	x
	Site F	W	12/09/2012			x	x	x	x	x	x
	Site F	W	12/09/2012			x	x	x	x	x	x
	Site F	W	12/09/2012			x	x	x	x	x	x
	Site F	W	12/09/2012			x	x	x	x	x	x
	Site F	W	12/09/2012			x	x	x	x	x	x
	Site F	W	12/09/2012			x	x	x	x	x	x
	Site F	W	12/09/2012			x	x	x	x	x	x
	Site F	W	12/09/2012			x	x	x	x	x	x
	Site F	W	12/09/2012			x	x	x	x	x	x
	Site F	W	12/09/2012			x	x	x	x	x	x

Environmental Division
Sydney
Work Order
ES1222001



Telephone : +61-2-8784 8555

RELINQUISHED BY:

Name: H Fidock

Of: URS Australia

Name: *smc*

Of: *ALS*

Date: 12/9/12

Time: 5:30

Date: 12/9/12

Time: 17:30

RECEIVED BY:

Name: *smc*

Of: *ALS*

Name: *Sep*

Of: *ALS*

Date: 12/9

Time: 17:30

Date: 12/9/12

Time: 2000

METHOD OF SHIPMENT

ALS Internal Courier

Water Containers required:

Filtered samples will require field filtration to fill 1 x 125 ml green unpreserved plastic, 1 x 60 ml turquoise and white stripe unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

Unfiltered sample will require 1 x 1 lt green unpreserved plastic (solid white), 1 x 500 ml green unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

CHAIN OF CUSTODY DOCUMENTATION - Falling Tide

COC Page 2 of 13 Sme



Australian Laboratory Services Pty Ltd

CLIENT: URS VIC

ADDRESS / OFFICE: Level 6, Southbank Boulevard, Southbank, Vic 3006

PROJECT MANAGER (PM): Heath Fidock

PROJECT ID: 43177771

SITE: Newcastle

P.O. NO.:

RESULTS REQUIRED (Date): 5 DAY TAT

QUOTE NO.: ME-465-12 V3

SAMPLER:

MOBILE: 0438 098 066

PHONE: 03-5824 6110

EMAIL REPORT TO: Heath Fidock, Peter McGowan

EMAIL INVOICE TO: heath.fidock@urs.com

ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY

COOLER SEAL (circle appropriate)

Intact: Yes No N/A

SAMPLE TEMPERATURE

CHILLED: Yes No

COMMENTS:

Analyse within 24hr

Notes:

Falling Tide Samples

Field filtered - mark on label

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Total bottles	UTN-04 (TN, TP, NH ₃ , TKN, NO _x , NO ₂ , NO ₃ , Reac.P.)	EK262PA-F-CM (Total Dissolved N)	EK267PA-F-CM (Total Dissolved P)	EK069FG* (Dissolved Acid Hydrolyzable P)	EP008 (Chlorophyll)	EA025H (TSS)			
	Site 6_F_0-0.1	W	12/09/2012	8:35	6	x	x	x	x	x	x			
	Site 6_F_4.2	W	12/09/2012	8:30	6	x	x	x	x	x	x			
	~~Site F~~	~~W~~	~~12/09/2012~~			~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~			
	~~Site F~~	~~W~~	~~12/09/2012~~			~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~			
	~~Site F~~	~~W~~	~~12/09/2012~~			~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~			
	~~Site F~~	~~W~~	~~12/09/2012~~			~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~			
	~~Site F~~	~~W~~	~~12/09/2012~~			~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~			
	~~Site F~~	~~W~~	~~12/09/2012~~			~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~			
	~~Site F~~	~~W~~	~~12/09/2012~~			~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~			
	~~Site F~~	~~W~~	~~12/09/2012~~			~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~			
	~~Site F~~	~~W~~	~~12/09/2012~~			~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~			
	~~Site F~~	~~W~~	~~12/09/2012~~			~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~			
	~~Site F~~	~~W~~	~~12/09/2012~~			~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~			
	~~Site F~~	~~W~~	~~12/09/2012~~			~~x~~	~~x~~	~~x~~	~~x~~	~~x~~	~~x~~			

RELINQUISHED BY:

RECEIVED BY:

METHOD OF SHIPMENT

Name: H Fidock

Date:

Name: SMC

Date:

12/9 ALS Internal Courier

Of: URS Australia

Time:

Of: A2S

Time:

17:30

Name: Sme

Date: 12/9

Name: Sep

Date:

12/9/12

Of: A2S

Time: 17:30

Of: ALS

Time:

2000

Water Containers required:

Filtered samples will require field filtration to fill 1 x 125 ml green unpreserved plastic, 1 x 60 ml turquoise and white stripe unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

Unfiltered sample will require 1 x 1 lt green unpreserved plastic (solid white), 1 x 500 ml green unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

CHAIN OF CUSTODY DOCUMENTATION - Falling Tide

COC Page 3 of 13 *Sm*



Australian Laboratory Services Pty Ltd

CLIENT: URS VIC

ADDRESS / OFFICE: Level 6, Southbank Boulevard, Southbank, Vic 3006

PROJECT MANAGER (PM): Heath Fidock

PROJECT ID: 43177771

SITE: Newcastle

P.O. NO.:

RESULTS REQUIRED (Date): 5 DAY TAT

QUOTE NO.: ME-465-12 V3

SAMPLER:

MOBILE: 0438 098 066

PHONE: 03-5824 6110

EMAIL REPORT TO: Heath Fidock, Peter McGowan

EMAIL INVOICE TO: heath.fidock@urs.com

ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY

COOLER SEAL (circle appropriate)

Intact: Yes No *N/A*

SAMPLE TEMPERATURE

CHILLED: Yes No

COMMENTS:

Analyse within 24hr

Notes:

Falling Tide Samples

Field filtered - mark on label

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Total bottles	UTN-04 (TN, TP, NH3, TKN, NOx, NO2, NO3, React. P)	EK262PA-F-CM (Total Dissolved N)	EK267PA-F-CM (Total Dissolved P)	EK069FG* (Dissolved Acid Hydrolyzable P)	EP008 (Chlorophyll)	EA025H (TSS)		
	Site <u>S_F_0-0.1</u>	W	12/09/2012	<u>9.10</u>	<u>6</u>	x	x	x	x	x	x		
	Site <u>S_F_2.0</u>	W	12/09/2012	<u>9.30</u>	<u>6</u>	x	x	x	x	x	x		
	Site <u>F</u>	W	12/09/2012			x	x	x	x	x	x		
	Site <u>F</u>	W	12/09/2012			x	x	x	x	x	x		
	Site <u>F</u>	W	12/09/2012			x	x	x	x	x	x		
	Site <u>F</u>	W	12/09/2012			x	x	x	x	x	x		
	Site <u>F</u>	W	12/09/2012			x	x	x	x	x	x		
	Site <u>F</u>	W	12/09/2012			x	x	x	x	x	x		
	Site <u>F</u>	W	12/09/2012			x	x	x	x	x	x		
	Site <u>F</u>	W	12/09/2012			x	x	x	x	x	x		
	Site <u>F</u>	W	12/09/2012			x	x	x	x	x	x		
	Site <u>F</u>	W	12/09/2012			x	x	x	x	x	x		
	Site <u>F</u>	W	12/09/2012			x	x	x	x	x	x		

RELINQUISHED BY:

RECEIVED BY:

METHOD OF SHIPMENT

Name: H Fidock

Date:

Name: *Sm*

Date:

12/9 ALS Internal Courier

Of: URS Australia

Time:

Of: *Sm*

Time:

12.30

Name: *Sm*

Date: 12/9

Name: *Sm*

Date:

12/9/12

Of: *Sm*

Time: 17.30

Of: *ALS*

Time:

2000

Water Containers required:

Filtered samples will require field filtration to fill 1 x 125 ml green unpreserved plastic, 1 x 60 ml turquoise and white stripe unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

Unfiltered sample will require 1 x 1 lt green unpreserved plastic (solid white), 1 x 500 ml green unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

CHAIN OF CUSTODY DOCUMENTATION - Falling Tide

COC Page 4 of 13 *smc*



Australian Laboratory Services Pty Ltd

CLIENT: URS VIC

ADDRESS / OFFICE: Level 6, Southbank Boulevard, Southbank, Vic 3006

PROJECT MANAGER (PM): Heath Fidock

PROJECT ID: 43177771

SITE: Newcastle

P.O. NO.:

SAMPLER:

MOBILE: 0438 098 066

PHONE: 03-5824 6110

EMAIL REPORT TO: Heath Fidock, Peter McGowan

EMAIL INVOICE TO: heath.fidock@urs.com

RESULTS REQUIRED (Date): 5 DAY TAT

QUOTE NO.: ME-465-12 V3

ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY

COOLER SEALS (circle appropriate)

Intact Yes No N/A

SAMPLE TEMPERATURE

CHILLED Yes No

COMMENTS:

Analyse within 24hr

Notes:

Falling Tide Samples

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Total bottles	UTN-04 (TN, TP, NH3, TXN, NOx, NO2, NO3, Reac.P.)	EK262PA-F-CM (Total Dissolved N)	EK267PA-F-CM (Total Dissolved P)	EK069FG* (Dissolved Acid Hydrolyzable P)	EP008 (Chlorophyll)	EA025H (TSS)	Field filtered - mark on label
	Site <u>4</u> <u>F</u> <u>0-0.1</u>	W	12/09/2012	10:00	6	x	x	x	x	x	x	
	Site <u>4</u> <u>F</u> <u>6.5</u>	W	12/09/2012	10:30	6	x	x	x	x	x	x	
	Site <u>F</u>	W	12/09/2012			x	x	x	x	x	x	
	Site <u>F</u>	W	12/09/2012			x	x	x	x	x	x	
	Site <u>F</u>	W	12/09/2012			x	x	x	x	x	x	
	Site <u>F</u>	W	12/09/2012			x	x	x	x	x	x	
	Site <u>F</u>	W	12/09/2012			x	x	x	x	x	x	
	Site <u>F</u>	W	12/09/2012			x	x	x	x	x	x	
	Site <u>F</u>	W	12/09/2012			x	x	x	x	x	x	
	Site <u>F</u>	W	12/09/2012			x	x	x	x	x	x	
	Site <u>F</u>	W	12/09/2012			x	x	x	x	x	x	
	Site <u>F</u>	W	12/09/2012			x	x	x	x	x	x	
	Site <u>F</u>	W	12/09/2012			x	x	x	x	x	x	
	Site <u>F</u>	W	12/09/2012			x	x	x	x	x	x	

RELINQUISHED BY:

RECEIVED BY

METHOD OF SHIPMENT

Name: H Fidock

Date:

Name: *smc*

Date:

12/9 ALS Internal Courier

Of: URS Australia

Time:

Of: *ALS*

Time:

17:30

Name: *smc*

Date: 12/9

Name: *SEP*

Date:

12/9/12

Of: *ALS*

Time: 17:30

Of: *ALS*

Time:

2000

Water Containers required:

Filtered samples will require field filtration to fill 1 x 125 ml green unpreserved plastic, 1 x 60 ml turquoise and white stripe unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

Unfiltered sample will require 1 x 1 lt green unpreserved plastic (solid white), 1 x 600 ml green unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

CHAIN OF CUSTODY DOCUMENTATION - Falling Tide

COC Page 5 of 13 *Sm*



Australian Laboratory Services Pty Ltd

CLIENT: URS VIC		SAMPLER:	
ADDRESS / OFFICE: Level 6, Southbank Boulevard, Southbank, Vic 3006		MOBILE: 0438 098 055	
PROJECT MANAGER (PM): Heath Fidock		PHONE: 03-5824 6110	
PROJECT ID: 43177771		EMAIL REPORT TO: Heath Fidock, Peter McGowan	
SITE: Newcastle		P.O. NO.:	
RESULTS REQUIRED (Date): 5 DAY TAT		EMAIL INVOICE TO: heath.fidock@urs.com	
QUOTE NO.: ME-465-12 V3		ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)	

FOR LABORATORY USE ONLY

COOLER SEAL (circle appropriate)
 Intact: Yes ☒ No ☐ N/A ☐

SAMPLE TEMPERATURE
 CHILLED: Yes ☒ No ☐

COMMENTS:

Analyse within 24hr

Notes:

Falling Tide Samples

Field filtered - mark on label

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Total bottles	UTN-04 (TN, TP, NH3, TKN, NOx, NO2, NO3, Resac.P.)	EK262PA-F-CM (Total Dissolved N)	EK267PA-F-CM (Total Dissolved P)	EK069FG* (Dissolved Acid Hydrolyzable P)	EP008 (Chlorophyll)	EA025H (TSS)			
	Site 3_F_0-0.1	W	12/09/2012	10:45	6	x	x	x	x	x	x			
	Site 3_F_7.0	W	12/09/2012	11:20	6	x	x	x	x	x	x			
	Site_F_	W	12/09/2012			x	x	x	x	x	x			
	Site_F_	W	12/09/2012			x	x	x	x	x	x			
	Site_F_	W	12/09/2012			x	x	x	x	x	x			
	Site_F_	W	12/09/2012			x	x	x	x	x	x			
	Site_F_	W	12/09/2012			x	x	x	x	x	x			
	Site_F_	W	12/09/2012			x	x	x	x	x	x			
	Site_F_	W	12/09/2012			x	x	x	x	x	x			
	Site_F_	W	12/09/2012			x	x	x	x	x	x			
	Site_F_	W	12/09/2012			x	x	x	x	x	x			
	Site_F_	W	12/09/2012			x	x	x	x	x	x			
	Site_F_	W	12/09/2012			x	x	x	x	x	x			
	Site_F_	W	12/09/2012			x	x	x	x	x	x			

RELINQUISHED BY:		RECEIVED BY:		METHOD OF SHIPMENT	
Name: H Fidock	Date:	Name: <i>Sm</i>	Date:	12/9 ALS Internal Courier	
Of: URS Australia	Time:	Of: <i>Sm</i>	Time:	17:30	
Name: <i>Sm</i>	Date: 12/9	Name: <i>SEP</i>	Date:	12/9/12	
Of: <i>Sm</i>	Time: 17:30	Of: <i>ALS</i>	Time:	2000	

Water Containers required:

Filtered samples will require field filtration to fill 1 x 125 ml green unpreserved plastic, 1 x 60 ml turquoise and white stripe unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

Unfiltered sample will require 1 x 1 lt green unpreserved plastic (solid white), 1 x 500 ml green unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

CHAIN OF CUSTODY DOCUMENTATION - Falling Tide

COC Page 6 of 13 Sme



Australian Laboratory Services Pty Ltd

CLIENT: URS VIC

SAMPLER:

ADDRESS / OFFICE: Level 6, Southbank Boulevard, Southbank, Vic 3006

MOBILE: 0438 098 066

PROJECT MANAGER (PM): Heath Fidock

PHONE: 03-5824 6110

PROJECT ID: 43177771

EMAIL REPORT TO: Heath Fidock, Peter McGowan

SITE: Newcastle

P.O. NO.:

EMAIL INVOICE TO: heath.fidock@urs.com

RESULTS REQUIRED (Date): 5 DAY TAT

QUOTE NO.: ME-465-12 V3

ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY

COC USER SEAL (circle appropriate)

Intact: Yes No N/A

SAMPLE TEMPERATURE

CHILLED: Yes No

COMMENTS:

Analyse within 24hr

Notes:

Falling Tide Samples

Field filtered - mark on label

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Total bottles	UTN-04 (TN, TP, NH3, TKN, NOx, NO2, NO3, Reac P)	EK262PA-F-CM (Total Dissolved N)	EK267PA-F-CM (Total Dissolved P)	EK069FG+ (Dissolved Acid Hydrolyzable P)	EP008 (Chlorophyll)	EA028H (TSS)			
	Site2_F_0-0.1	W	12/09/2012	12:00	6	x	x	x	x	x	x			
	Site F Q201	W	12/09/2012	12:00	6	x	x	x	x	x	x			
	Site F Q202	W	12/09/2012	12:00	6	x	x	x	x	x	x			
	Site F -	W	12/09/2012			x	x	x	x	x	x			
	Site F -	W	12/09/2012			x	x	x	x	x	x			
	Site F -	W	12/09/2012			x	x	x	x	x	x			
	Site F -	W	12/09/2012			x	x	x	x	x	x			
	Site F -	W	12/09/2012			x	x	x	x	x	x			
	Site F -	W	12/09/2012			x	x	x	x	x	x			
	Site F -	W	12/09/2012			x	x	x	x	x	x			
	Site F -	W	12/09/2012			x	x	x	x	x	x			
	Site F -	W	12/09/2012			x	x	x	x	x	x			
	Site F -	W	12/09/2012			x	x	x	x	x	x			
	Site F -	W	12/09/2012			x	x	x	x	x	x			

RELINQUISHED BY:

Name: H Fidock

Of: URS Australia

Name: Sme

Of: ALS

Date:

Time:

Date: 12/9

Time: 17:30

RECEIVED BY:

Name: Sme

Of: ALS

Name: Sep

Of: ALS

Date:

Time:

Date:

Time:

METHOD OF SHIPMENT

12/9 ALS Internal Courier

17:30

12/9/12

2000

Water Containers required:

Filtered samples will require field filtration to fill 1 x 125 ml green unpreserved plastic, 1 x 60 ml turquiose and white stripe unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

Unfiltered sample will require 1 x 1 lt green unpreserved plastic (solid white), 1 x 500 ml green unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

CHAIN OF CUSTODY DOCUMENTATION - Falling Tide

COC Page 7 of 13

SMC



Australian Laboratory Services Pty Ltd

CLIENT: URS VIC		SAMPLER:	
ADDRESS / OFFICE: Level 5, Southbank Boulevard, Southbank, Vic 3006		MOBILE: 0438 088 086	
PROJECT MANAGER (PM): Heath Fidock		PHONE: 03-5824 6110	
PROJECT ID: 43177771		EMAIL REPORT TO: Heath Fidock, Peter McGowan	
SITE: Newcastle		P.O. NO.:	
RESULTS REQUIRED (Date): 5 DAY TAT		EMAIL INVOICE TO: heath.fidock@urs.com	
QUOTE NO.: ME-465-12 V3		ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)	

FOR LABORATORY USE ONLY

COOLER SEAL (circle appropriate)

Intact: Yes No N/A

SAMPLE TEMPERATURE

CHILLED: Yes No

COMMENTS:

Analyse within 24hr

UTN-04 (TN, TP, NH ₃ , TKW, NO _x , NO ₂ , NO ₃ , Resac.P.)	EK262PA-F-CM (Total Dissolved N)	EK267PA-F-CM (Total Dissolved P)	EK069FG* (Dissolved Acid Hydrolyzable P)	EP008 (Chlorophyll)	EA026H (TSS)
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x

Notes:

Falling Tide Samples

Field filtered - mark on label

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Total bottles
	Site 1_F_0-0.1	W	12/09/2012	12:15	6
	Site 1_F_0-0.1_2	W	12/09/2012	12:30	6
	Site 1_F_0-0.1_3	W	12/09/2012		
	Site 1_F_0-0.1_4	W	12/09/2012		
	Site 1_F_0-0.1_5	W	12/09/2012		
	Site 1_F_0-0.1_6	W	12/09/2012		
	Site 1_F_0-0.1_7	W	12/09/2012		
	Site 1_F_0-0.1_8	W	12/09/2012		
	Site 1_F_0-0.1_9	W	12/09/2012		
	Site 1_F_0-0.1_10	W	12/09/2012		
	Site 1_F_0-0.1_11	W	12/09/2012		
	Site 1_F_0-0.1_12	W	12/09/2012		
	Site 1_F_0-0.1_13	W	12/09/2012		
	Site 1_F_0-0.1_14	W	12/09/2012		
	Site 1_F_0-0.1_15	W	12/09/2012		

RELINQUISHED BY:		RECEIVED BY:		METHOD OF SHIPMENT	
Name: H Fidock	Date:	Name: SMC	Date:	12/9 ALS Internal Courier	
Of: URS Australia	Time:	Of: PWS	Time:	17:30	
Name: SMC	Date: 12/9	Name: Sep	Date: 12/9/12		
Of: PWS	Time: 17:30	Of: ALS	Time: 2000		

Water Containers required:

Filtered samples will require field filtration to fill 1 x 125 ml green unpreserved plastic, 1 x 60 ml turquoise and white stripe unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

Unfiltered sample will require 1 x 1 lt green unpreserved plastic (solid white), 1 x 500 ml green unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

CHAIN OF CUSTODY DOCUMENTATION - Rising Tide

COC Page 1 of 13 *5me*



Australian Laboratory Services Pty Ltd

CLIENT: URS VIC		SAMPLER:	
ADDRESS / OFFICE: Level 6, Southbank Boulevard, Southbank, Vic 3006		MOBILE: 0438 098 066	
PROJECT MANAGER (PM): Heath Fidock		PHONE: 03-5824 6110	
PROJECT ID: 43177771		EMAIL REPORT TO: Heath Fidock, Peter McGowan	
SITE: Newcastle		P.O. NO.:	
RESULTS REQUIRED (Date): 5 DAY TAT		QUOTE NO.: ME-465-12 V3	
ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)		EMAIL INVOICE TO: heath.fidock@urs.com	

FOR LABORATORY USE ONLY

COOLER SEAL (circle appropriate)

Intact: Yes No N/A

SAMPLE TEMPERATURE

CHILLED: Yes No

COMMENTS:

Analyse within 24hr

Notes:

Rising Tide Samples

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Total bottles	UTN-04 (TN, TP, NH3, TKN, NOx, NO2, NO3, React.P.)	EK262PA-F-CM (Total Dissolved N)	EK267PA-F-CM (Total Dissolved P)	EK069FG* (Dissolved Acid Hydrolyzable P)	EP008 (Chlorophyll)	EA025H (TSS)	Field filtered - mark on label
	Site <u>1</u> R <u>0-0.1</u>	W	12/09/2012	<u>15:30</u>	<u>6</u>	x	x	x	x	x	x	
	Site <u> </u> R <u> </u> - <u> </u>	W	12/09/2012			x	x	x	x	x	x	
	Site <u> </u> R <u> </u> - <u> </u>	W	12/09/2012			x	x	x	x	x	x	
	Site <u> </u> R <u> </u> - <u> </u>	W	12/09/2012			x	x	x	x	x	x	
	Site <u> </u> R <u> </u> - <u> </u>	W	12/09/2012			x	x	x	x	x	x	
	Site <u> </u> R <u> </u> - <u> </u>	W	12/09/2012			x	x	x	x	x	x	
	Site <u> </u> R <u> </u> - <u> </u>	W	12/09/2012			x	x	x	x	x	x	
	Site <u> </u> R <u> </u> - <u> </u>	W	12/09/2012			x	x	x	x	x	x	
	Site <u> </u> R <u> </u> - <u> </u>	W	12/09/2012			x	x	x	x	x	x	
	Site <u> </u> R <u> </u> - <u> </u>	W	12/09/2012			x	x	x	x	x	x	
	Site <u> </u> R <u> </u> - <u> </u>	W	12/09/2012			x	x	x	x	x	x	
	Site <u> </u> R <u> </u> - <u> </u>	W	12/09/2012			x	x	x	x	x	x	
	Site <u> </u> R <u> </u> - <u> </u>	W	12/09/2012			x	x	x	x	x	x	

RELINQUISHED BY:		RECEIVED BY		METHOD OF SHIPMENT	
Name: H Fidock	Date:	Name: <i>5me</i>	Date:	12/9 ALS Internal Courier	
Of: URS Australia	Time:	Of: <i>ALB</i>	Time:	17:30	
Name: <i>5me</i>	Date: 12/9	Name: <i>sep</i>	Date:	12/9/12	
Of: <i>ALB</i>	Time: 17:30	Of: <i>ALS</i>	Time:	2000	

Water Containers required:

Filtered samples will require field filtration to fill 1 x 125 ml green unpreserved plastic, 1 x 60 ml turquoise and white stripe unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

Unfiltered sample will require 1 x 1 lt green unpreserved plastic (solid white), 1 x 500 ml green unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

CHAIN OF CUSTODY DOCUMENTATION - Rising Tide

COC Page 9 of 13

SM



Australian Laboratory Services Pty Ltd

CLIENT: URS VIC		SAMPLER:	
ADDRESS / OFFICE: Level 6, Southbank Boulevard, Southbank, Vic 3006		MOBILE: 0438 098 066	
PROJECT MANAGER (PM): Heath Fidock		PHONE: 03-5824 6110	
PROJECT ID: 43177771		EMAIL REPORT TO: Heath Fidock, Peter McGowan	
SITE: Newcastle		P.O. NO.:	
RESULTS REQUIRED (Date): 5 DAY TAT		QUOTE NO.: ME-465-12 V3	
		ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)	

FOR LABORATORY USE ONLY

COOLER SEAL (circle appropriate)

Intact: Yes No N/A

SAMPLE TEMPERATURE

CHILLED: Yes No

COMMENTS:

Analyse within 24hr

UTN-04 (TN, TP, NH3, TKN, NOx, NO2, NO3, Reac.P.)	EK262PA-F-CM (Total Dissolved N)	EK267PA-F-CM (Total Dissolved P)	EK069FG* (Dissolved Acid Hydrolyzable P)	EP008 (Chlorophyll)	EA025H (TSS)
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x
x	x	x	x	x	x

Notes:

Rising Tide Samples

Field filtered - mark on label

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Total bottles
	Site 2_R_0-0.1	W	12/09/2012		6
	Site R -	W	12/09/2012		
	Site R -	W	12/09/2012		
	Site R -	W	12/09/2012		
	Site R -	W	12/09/2012		
	Site R -	W	12/09/2012		
	Site R -	W	12/09/2012		
	Site R -	W	12/09/2012		
	Site R -	W	12/09/2012		
	Site R -	W	12/09/2012		
	Site R -	W	12/09/2012		
	Site R -	W	12/09/2012		
	Site R -	W	12/09/2012		
	Site R -	W	12/09/2012		
	Site R -	W	12/09/2012		

RELINQUISHED BY:		RECEIVED BY		METHOD OF SHIPMENT	
Name: H Fidock	Date:	Name: SM	Date:	12/9 ALS Internal Courier	
Of: URS Australia	Time:	Of: ALS	Time:	17:30	
Name: SM	Date: 12/9	Name: RP	Date: 12/9/12		
Of: ALS	Time: 17:30	Of: ALS	Time: 2000		

Water Containers required:

Filtered samples will require field filtration to fill 1 x 125 ml green unpreserved plastic, 1 x 60 ml turquoise and white stripe unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

Unfiltered sample will require 1 x 1 lt green unpreserved plastic (solid white), 1 x 500 ml green unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

CHAIN OF CUSTODY DOCUMENTATION - Rising Tide

COC Page 10 of 14 V3 Sme



Australian Laboratory Services Pty Ltd

CLIENT: URS VIC	SAMPLER:
ADDRESS / OFFICE: Level 6, Southbank Boulevard, Southbank, Vic 3006	MOBILE: 0438 098 066
PROJECT MANAGER (PM): Heath Fidock	PHONE: 03-5824 6110
PROJECT ID: 43177771	EMAIL REPORT TO: Heath Fidock, Peter McGowan
SITE: Newcastle	EMAIL INVOICE TO: heath.fidock@urs.com
P.O. NO.:	
RESULTS REQUIRED (Date): 5 DAY TAT	QUOTE NO.: ME-465-12 V3
ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)	

FOR LABORATORY USE ONLY

COOLER SEAL (circle appropriate)

Intact: Yes No NA

SAMPLE TEMPERATURE

CHILLED: Yes No

COMMENTS:

Analyse within 24hr

Notes:

Rising Tide Samples

Field filtered - mark on label

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Total bottles	UTN-04 (TN, TP, NH3, TKN, NOx, NO2, NO3, Reac.P.)	EK262PA-F-CM (Total Dissolved N)	EK267PA-F-CM (Total Dissolved P)	EK069FG* (Dissolved Acid Hydrolyzable P)	EP008 (Chlorophyll)	EA025H (TSS)			
	Site 3_R 0-0.1	W	12/09/2012	14:30	6	x	x	x	x	x	x			
	Site 3_R 07-0	W	12/09/2012	14:45	6	x	x	x	x	x	x			
	Site R	W	12/09/2012			x	x	x	x	x	x			
	Site R	W	12/09/2012			x	x	x	x	x	x			
	Site R	W	12/09/2012			x	x	x	x	x	x			
	Site R	W	12/09/2012			x	x	x	x	x	x			
	Site R	W	12/09/2012			x	x	x	x	x	x			
	Site R	W	12/09/2012			x	x	x	x	x	x			
	Site R	W	12/09/2012			x	x	x	x	x	x			
	Site R	W	12/09/2012			x	x	x	x	x	x			
	Site R	W	12/09/2012			x	x	x	x	x	x			
	Site R	W	12/09/2012			x	x	x	x	x	x			
	Site R	W	12/09/2012			x	x	x	x	x	x			

RELINQUISHED BY:

RECEIVED BY

METHOD OF SHIPMENT

Name: H Fidock	Date:	Name: Sme	Date:	12/9 ALS Internal Courier
Of: URS Australia	Time:	Of: ALS	Time:	17:30
Name: Sme	Date: 12/9	Name: Sme	Date:	12/9/12
Of: ALS	Time: 17:30	Of: ALS	Time:	2000h

Water Containers required:

Filtered samples will require field filtration to fill 1 x 125 ml green unpreserved plastic, 1 x 60 ml turquoise and white stripe unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

Unfiltered sample will require 1 x 1 lt green unpreserved plastic (solid white), 1 x 500 ml green unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

CHAIN OF CUSTODY DOCUMENTATION - Rising Tide

COC Page 11 of 14 ¹³ SMC


Australasian Laboratory Services Pty Ltd

CLIENT: URS VIC

SAMPLER:

ADDRESS / OFFICE: Level 6, Southbank Boulevard, Southbank, Vic 3006

MOBILE: 0438 098 066

PROJECT MANAGER (PM): Heath Fidock

PHONE: 03-5824 6110

PROJECT ID: 43177771

EMAIL REPORT TO: Heath Fidock, Peter McGowan

SITE: Newcastle

P.O. NO.:

EMAIL INVOICE TO: heath.fidock@urs.com

RESULTS REQUIRED (Date): 5 DAY TAT

QUOTE NO.: ME-465-12 V3

ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY

COOLER SEAL (circle appropriate)

Intact Yes No N/A

SAMPLE TEMPERATURE

CHILLED: Yes No

COMMENTS:

Analyse within 24hr

Notes:

Rising Tide Samples

Field filtered - mark on label

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Total bottles	UTN-04 (TN, TP, NH ₃ , TKN, NO _x , NO ₂ , NO ₃ , React.P.)	EK262PA-F-CM (Total Dissolved N)	EK267PA-F-CM (Total Dissolved P)	EK069FG* (Dissolved Acid Hydrolyzable P)	EP008 (Chlorophyll)	EA025H (TSS)			
	Site 4_R_0-0.1	W	12/09/2012	15:00	6	x	x	x	x	x	x			
	Site 4_R_0.0 -	W	12/09/2012	15:15	6	x	x	x	x	x	x			
	Site R -	W	12/09/2012			x	x	x	x	x	x			
	Site R -	W	12/09/2012			x	x	x	x	x	x			
	Site R -	W	12/09/2012			x	x	x	x	x	x			
	Site R -	W	12/09/2012			x	x	x	x	x	x			
	Site R -	W	12/09/2012			x	x	x	x	x	x			
	Site R -	W	12/09/2012			x	x	x	x	x	x			
	Site R -	W	12/09/2012			x	x	x	x	x	x			
	Site R -	W	12/09/2012			x	x	x	x	x	x			
	Site R -	W	12/09/2012			x	x	x	x	x	x			
	Site R -	W	12/09/2012			x	x	x	x	x	x			
	Site R -	W	12/09/2012			x	x	x	x	x	x			
	Site R -	W	12/09/2012			x	x	x	x	x	x			

RELINQUISHED BY:

RECEIVED BY:

METHOD OF SHIPMENT

Name: H Fidock

Date:

Name: SMC

Date:

12/9 ALS Internal Courier

Of: URS Australia

Time:

Of: AS

Time:

17:30

Name: SMC

Date: 12/9

Name: Sep

Date:

12/9/12

Of: AS

Time: 17:30

Of: ALS

Time:

2000

Water Containers required:

Filtered samples will require field filtration to fill 1 x 125 ml green unpreserved plastic, 1 x 60 ml turquoise and white stripe unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

Unfiltered sample will require 1 x 1 lt green unpreserved plastic (solid white), 1 x 500 ml green unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

CHAIN OF CUSTODY DOCUMENTATION - Rising Tide

COC Page 12 of 1413

Sme



Australian Laboratory Services Pty Ltd

CLIENT: URS VIC

ADDRESS / OFFICE: Level 6, Southbank Boulevard, Southbank, Vic 3006

PROJECT MANAGER (PM): Heath Fidock

PROJECT ID: 43177771

SITE: Newcastle

P.O. NO.:

RESULTS REQUIRED (Date): 5 DAY TAT

QUOTE NO.: ME-465-12 V3

SAMPLER:

MOBILE: 0438 098 066

PHONE: 03-5824 6110

EMAIL REPORT TO: Heath Fidock, Peter McGowan

EMAIL INVOICE TO: heath.fidock@urs.com

ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY

COOLER SEAL (circle appropriate)

Intact Yes No N/A

SAMPLE TEMPERATURE

CHILLED: Yes No

COMMENTS:

Analyse within 24hr

Notes:

Rising Tide Samples

Field filtered - mark on label

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Total bottles	UTN-04 (TN, TP, NH3, TKN, NOx, NO2, NO3, React.P.)	EK262PA-F-CM (Total Dissolved N)	EK267PA-F-CM (Total Dissolved P)	EK069FG+ (Dissolved Acid Hydrolyzable P)	EP008 (Chlorophyll)	EA028H (TSS)			
	Site S_R 0-0.1	W	12/09/2012	16:30	6	x	x	x	x	x	x			
	Site S_R 1-5	W	12/09/2012	15:35	6	x	x	x	x	x	x			
	Site R	W	12/09/2012			x	x	x	x	x	x			
	Site R	W	12/09/2012			x	x	x	x	x	x			
	Site R	W	12/09/2012			x	x	x	x	x	x			
	Site R	W	12/09/2012			x	x	x	x	x	x			
	Site R	W	12/09/2012			x	x	x	x	x	x			
	Site R	W	12/09/2012			x	x	x	x	x	x			
	Site R	W	12/09/2012			x	x	x	x	x	x			
	Site R	W	12/09/2012			x	x	x	x	x	x			
	Site R	W	12/09/2012			x	x	x	x	x	x			
	Site R	W	12/09/2012			x	x	x	x	x	x			
	Site R	W	12/09/2012			x	x	x	x	x	x			
	Site R	W	12/09/2012			x	x	x	x	x	x			

RELINQUISHED BY:

Name: H Fidock

Of: URS Australia

Name: Sme

Of: AL

Date:

Time:

Date: 12/9

Time: 17:30

RECEIVED BY

Name: Sme

Of: AL

Name: Sep

Of: ALS

Date:

Time:

Date: 12/9/12

Time: 2000

METHOD OF SHIPMENT

12/9 ALS Internal Courier

17:30

12/9/12

2000

Water Containers required:

Filtered samples will require field filtration to fill 1 x 125 ml green unpreserved plastic, 1 x 60 ml turquoise and white stripe unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

Unfiltered sample will require 1 x 1 lt green unpreserved plastic (solid white), 1 x 500 ml green unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: ES1223028	Page	: 1 of 5
Client	: URS AUSTRALIA (VIC) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR HEATH FIDOCK	Contact	: Loren Schiavon
Address	: 155A HOGAN ST TATURA VIC, AUSTRALIA 3616	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: heath.fidock@urs.com	E-mail	: loren.schiavon@alsglobal.com
Telephone	: +61 03 5824 3322	Telephone	: +61 2 8784 8503
Facsimile	: +61 03 5824 3563	Facsimile	: +61 2 8784 8500
Project	: 43177771	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 26-SEP-2012
Sampler	: H.F	Issue Date	: 04-OCT-2012
Site	: NEWCASTLE		
Quote number	: ME/465/12 V4	No. of samples received	: 12
		No. of samples analysed	: 12

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Hoa Nguyen	Inorganic Chemist	Sydney Inorganics
Sarah Millington	Senior Inorganic Chemist	Sydney Inorganics



General Comments

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

- It has been noted that FTN is greater than TN in various samples , however this difference is within the limits of experimental variation.



Analytical Results

Sub-Matrix: WATER

Client sample ID

Client sampling date / time

Compound	CAS Number	LOR	Unit	SITE 1R 0-0.1	SITE 1R 0-0.1	SITE 2R 0-0.1	SITE 3R 0-0.1	SITE 3R 6.5
				26-SEP-2012 12:15	26-SEP-2012 12:30	26-SEP-2012 12:45	26-SEP-2012 13:05	26-SEP-2012 13:20
				ES1223028-001	ES1223028-002	ES1223028-003	ES1223028-004	ES1223028-005
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	6	<5	<5	<5	<5
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA								
Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP008: Chlorophyll a & Pheophytin a								
Chlorophyll a	----	1	mg/m ³	<1	<1	<1	<1	<1
Volume	----	0.01	L	1	0.75	1	1	1
Volume Extract	----	0.01	mL	10	10	10	10	10
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	0.017	0.008	<0.005	0.020	0.021
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Nitrate as N	14797-55-8	0.002	mg/L	0.029	0.026	0.060	0.053	0.052
Nitrite + Nitrate as N	----	0.002	mg/L	0.029	0.026	0.060	0.053	0.052
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	0.25	0.22	0.08	0.07	0.05
Dissolved Total Nitrogen as N	----	0.01	mg/L	0.29	0.22	0.15	0.13	0.12
Total Nitrogen as N	----	0.01	mg/L	0.28	0.25	0.14	0.12	0.10
Reactive Phosphorus as P	----	0.001	mg/L	0.028	0.029	0.024	0.016	0.014
Dissolved Total Phosphorus as P	----	0.005	mg/L	0.039	0.032	0.033	0.024	0.021
Total Phosphorus as P	----	0.005	mg/L	0.064	0.053	0.047	0.034	0.031



Analytical Results

Sub-Matrix: **WATER**

Client sample ID

Client sampling date / time

				SITE 4R 0-0.1	SITE4R 7.5	SITE 5R 0-0.1	SITE 5R 1	SITE 6R 0-0.1
				26-SEP-2012 13:35	26-SEP-2012 13:45	26-SEP-2012 14:10	26-SEP-2012 14:15	26-SEP-2012 14:30
Compound	CAS Number	LOR	Unit	ES1223028-006	ES1223028-007	ES1223028-008	ES1223028-009	ES1223028-010
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	----	<5	<5	<5	8
Suspended Solids (SS)	----	5	mg/L	<5	----	----	----	----
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA								
Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP008: Chlorophyll a & Pheophytin a								
Chlorophyll a	----	1	mg/m ³	<1	<1	<1	<1	<1
Volume	----	0.01	L	1	1	1	1	1
Volume Extract	----	0.01	mL	10	10	10	10	10
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	0.022	0.038	0.026	0.034	0.022
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Nitrate as N	14797-55-8	0.002	mg/L	0.057	0.065	0.050	0.049	0.050
Nitrite + Nitrate as N	----	0.002	mg/L	0.057	0.065	0.050	0.049	0.050
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	0.14	0.04	0.09	0.07	0.08
Dissolved Total Nitrogen as N	----	0.01	mg/L	0.19	0.12	0.16	0.09	0.15
Total Nitrogen as N	----	0.01	mg/L	0.20	0.11	0.14	0.12	0.13
Reactive Phosphorus as P	----	0.001	mg/L	0.017	0.015	0.021	0.014	0.017
Dissolved Total Phosphorus as P	----	0.005	mg/L	0.024	0.021	0.038	0.022	0.026
Total Phosphorus as P	----	0.005	mg/L	0.037	0.029	0.035	0.036	0.042



Analytical Results

Sub-Matrix: **WATER**

Client sample ID

Client sampling date / time

				SITE 6R 2	SITE 7R 0-0.1			
				26-SEP-2012 14:45	26-SEP-2012 15:00			
Compound	CAS Number	LOR	Unit	ES1223028-011	ES1223028-012			
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	<5	<5	----	----	----
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA								
Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	----	----	----
EP008: Chlorophyll a & Pheophytin a								
Chlorophyll a	----	1	mg/m ³	<1	<1	----	----	----
Volume	----	0.01	L	1	1	----	----	----
Volume Extract	----	0.01	mL	10	10	----	----	----
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	0.021	0.005	----	----	----
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	----	----	----
Nitrate as N	14797-55-8	0.002	mg/L	0.047	0.046	----	----	----
Nitrite + Nitrate as N	----	0.002	mg/L	0.047	0.046	----	----	----
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	0.07	0.11	----	----	----
Dissolved Total Nitrogen as N	----	0.01	mg/L	0.15	0.19	----	----	----
Total Nitrogen as N	----	0.01	mg/L	0.12	0.16	----	----	----
Reactive Phosphorus as P	----	0.001	mg/L	0.016	0.020	----	----	----
Dissolved Total Phosphorus as P	----	0.005	mg/L	0.025	0.029	----	----	----
Total Phosphorus as P	----	0.005	mg/L	0.044	0.045	----	----	----

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: ES1223029	Page	: 1 of 5
Client	: URS AUSTRALIA (VIC) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR HEATH FIDOCK	Contact	: Loren Schiavon
Address	: 155A HOGAN ST TATURA VIC, AUSTRALIA 3616	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: heath.fidock@urs.com	E-mail	: loren.schiavon@alsglobal.com
Telephone	: +61 03 5824 3322	Telephone	: +61 2 8784 8503
Facsimile	: +61 03 5824 3563	Facsimile	: +61 2 8784 8500
Project	: 43177771	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 26-SEP-2012
Sampler	: H.F	Issue Date	: 04-OCT-2012
Site	: NEWCASTLE		
Quote number	: ME/465/12 V4	No. of samples received	: 14
		No. of samples analysed	: 14

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Sarah Millington	Senior Inorganic Chemist	Sydney Inorganics



General Comments

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

- **EK259A-CM Repeated results confirm that NOx is positive in sample ID QC2_F_BLANK**
- **EK267PA-CM Repeated results confirm that TP is positive in sample ID QC2_F_BLANK**
- **EK271A-CM Repeated results confirm that Reactive P is positive in sample ID QC2_F_BLANK**
- **It has been noted that Dissolved TN is greater than TN in various samples , however this difference is within the limits of experimental variation.**
- **It has been noted that Reactive P is greater than Dissolved TP in various samples , however this difference is within the limits of experimental variation.**



Analytical Results

Sub-Matrix: WATER

Client sample ID

Client sampling date / time

Compound	CAS Number	LOR	Unit	SITE 7F 0-0.1	SITE 6F 0-0.1	SITE 6F 2.5	SITE 5F 0-0.1	SITE 5F 1
				26-SEP-2012 07:00	26-SEP-2012 07:30	26-SEP-2012 07:45	26-SEP-2012 08:00	26-SEP-2012 08:10
				ES1223029-001	ES1223029-002	ES1223029-003	ES1223029-004	ES1223029-005
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	7	<5	<5	12	<5
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA								
Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP008: Chlorophyll a & Pheophytin a								
Chlorophyll a	----	1	mg/m ³	<1	<1	<1	<1	<1
Volume	----	0.01	L	1	1	1	1	1
Volume Extract	----	0.01	mL	10	10	10	10	10
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	0.018	0.018	0.016	0.014	0.019
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Nitrate as N	14797-55-8	0.002	mg/L	0.051	0.052	0.044	0.043	0.044
Nitrite + Nitrate as N	----	0.002	mg/L	0.051	0.052	0.044	0.043	0.044
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	0.09	0.09	0.09	0.06	0.11
Dissolved Total Nitrogen as N	----	0.01	mg/L	0.15	0.11	0.15	0.14	0.14
Total Nitrogen as N	----	0.01	mg/L	0.14	0.14	0.13	0.10	0.15
Reactive Phosphorus as P	----	0.001	mg/L	0.019	0.015	0.014	0.013	0.013
Dissolved Total Phosphorus as P	----	0.005	mg/L	0.027	0.024	0.016	0.020	0.018
Total Phosphorus as P	----	0.005	mg/L	0.041	0.026	0.026	0.025	0.023



Analytical Results

Sub-Matrix: WATER

Client sample ID

Client sampling date / time

				SITE 4F 0-0.1	SITE 4F 7.5	SITE 3F 0-0.1	SITE 3F 6.5	SITE 2F 0
				26-SEP-2012 08:30	26-SEP-2012 08:45	26-SEP-2012 09:00	26-SEP-2012 09:10	26-SEP-2012 09:30
Compound	CAS Number	LOR	Unit	ES1223029-006	ES1223029-007	ES1223029-008	ES1223029-009	ES1223029-010
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	12	10	10	6	<5
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA								
Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP008: Chlorophyll a & Pheophytin a								
Chlorophyll a	----	1	mg/m ³	<1	<1	<1	<1	<1
Volume	----	0.01	L	1	1	1	1	1
Volume Extract	----	0.01	mL	10	10	10	10	10
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	0.025	0.023	0.025	0.014	0.014
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Nitrate as N	14797-55-8	0.002	mg/L	0.063	0.050	0.054	0.049	0.058
Nitrite + Nitrate as N	----	0.002	mg/L	0.063	0.050	0.054	0.049	0.058
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	0.07	0.06	0.07	0.06	0.06
Dissolved Total Nitrogen as N	----	0.01	mg/L	0.12	0.13	0.13	0.13	0.10
Total Nitrogen as N	----	0.01	mg/L	0.13	0.11	0.12	0.11	0.12
Reactive Phosphorus as P	----	0.001	mg/L	0.016	0.014	0.016	0.015	0.022
Dissolved Total Phosphorus as P	----	0.005	mg/L	0.018	0.021	0.019	0.021	0.020
Total Phosphorus as P	----	0.005	mg/L	0.030	0.028	0.037	0.026	0.037



Analytical Results

Sub-Matrix: WATER

Client sample ID

Client sampling date / time

				SITE 1F 0	SITE QC1_F_0_0.1	SITE QC2_F_BLANK	SITE 1JET_F_0_0.1	
				26-SEP-2012 10:00	26-SEP-2012 10:30	26-SEP-2012 10:45	26-SEP-2012 11:00	
Compound	CAS Number	LOR	Unit	ES1223029-011	ES1223029-012	ES1223029-013	ES1223029-014	
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	----	<5	<5	5	----
Suspended Solids (SS)	----	5	mg/L	<5	----	----	----	----
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA								
Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
EP008: Chlorophyll a & Pheophytin a								
Chlorophyll a	----	1	mg/m ³	<1	<1	<1	<1	----
Volume	----	0.01	L	1	1	1	1	----
Volume Extract	----	0.01	mL	10	10	10	10	----
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	0.016	0.018	<0.005	0.017	----
Nitrite as N	----	0.002	mg/L	<0.002	0.002	<0.002	0.003	----
Nitrate as N	14797-55-8	0.002	mg/L	0.036	0.034	0.002	0.029	----
Nitrite + Nitrate as N	----	0.002	mg/L	0.036	0.036	0.002	0.032	----
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	0.18	0.19	<0.01	0.22	----
Dissolved Total Nitrogen as N	----	0.01	mg/L	0.24	0.27	<0.01	0.29	----
Total Nitrogen as N	----	0.01	mg/L	0.22	0.23	<0.01	0.25	----
Reactive Phosphorus as P	----	0.001	mg/L	0.030	0.031	0.001	0.030	----
Dissolved Total Phosphorus as P	----	0.005	mg/L	0.028	0.039	<0.005	0.032	----
Total Phosphorus as P	----	0.005	mg/L	0.050	0.049	0.008	0.050	----

Environmental Division

QUALITY CONTROL REPORT

Work Order	: ES1223028	Page	: 1 of 6
Client	: URS AUSTRALIA (VIC) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR HEATH FIDOCK	Contact	: Loren Schiavon
Address	: 155A HOGAN ST TATURA VIC, AUSTRALIA 3616	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: heath.fidock@urs.com	E-mail	: loren.schiavon@alsglobal.com
Telephone	: +61 03 5824 3322	Telephone	: +61 2 8784 8503
Facsimile	: +61 03 5824 3563	Facsimile	: +61 2 8784 8500
Project	: 43177771	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: NEWCASTLE		
C-O-C number	: ----	Date Samples Received	: 26-SEP-2012
Sampler	: H.F	Issue Date	: 04-OCT-2012
Order number	: ----		
Quote number	: ME/465/12 V4	No. of samples received	: 12
		No. of samples analysed	: 12

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Hoa Nguyen	Inorganic Chemist	Sydney Inorganics
Sarah Millington	Senior Inorganic Chemist	Sydney Inorganics



General Comments

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

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

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

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

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC



Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA025: Suspended Solids (QC Lot: 2525678)									
ES1223012-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	93	57	48.0	0% - 50%
ES1223028-007	SITE4R 7.5	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA (QC Lot: 2522264)									
ES1223028-001	SITE 1R 0-0.1	EK069FG: Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES1223028-011	SITE 6R 2	EK069FG: Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 2519465)									
ES1223028-001	SITE 1R 0-0.1	EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	0.029	0.027	7.5	0% - 50%
ES1223028-011	SITE 6R 2	EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	0.047	0.048	0.0	0% - 20%
Ultra-Trace Nutrients (QC Lot: 2519466)									
ES1223028-001	SITE 1R 0-0.1	EK257A-CM: Nitrite as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
ES1223028-011	SITE 6R 2	EK257A-CM: Nitrite as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 2519467)									
ES1223028-001	SITE 1R 0-0.1	EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	0.017	0.010	57.2	No Limit
ES1223028-011	SITE 6R 2	EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	0.021	0.022	6.9	No Limit
Ultra-Trace Nutrients (QC Lot: 2519468)									
ES1223028-001	SITE 1R 0-0.1	EK271A-CM: Reactive Phosphorus as P	----	0.001	mg/L	0.028	0.029	4.6	0% - 20%
ES1223028-011	SITE 6R 2	EK271A-CM: Reactive Phosphorus as P	----	0.001	mg/L	0.016	0.015	0.0	0% - 50%
Ultra-Trace Nutrients (QC Lot: 2519474)									
ES1223028-001	SITE 1R 0-0.1	EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.01	mg/L	0.29	0.33	14.0	0% - 20%
ES1223028-011	SITE 6R 2	EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.01	mg/L	0.15	0.16	7.4	0% - 50%
Ultra-Trace Nutrients (QC Lot: 2519475)									
ES1223028-001	SITE 1R 0-0.1	EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.005	mg/L	0.039	0.028	32.5	No Limit
ES1223028-011	SITE 6R 2	EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.005	mg/L	0.025	0.023	9.1	No Limit
Ultra-Trace Nutrients (QC Lot: 2519478)									
ES1223028-001	SITE 1R 0-0.1	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	0.064	0.049	25.6	No Limit
ES1223028-011	SITE 6R 2	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	0.044	0.037	17.4	No Limit
Ultra-Trace Nutrients (QC Lot: 2519479)									
ES1223028-001	SITE 1R 0-0.1	EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	0.28	0.28	0.0	0% - 20%
ES1223028-011	SITE 6R 2	EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	0.12	0.12	8.8	0% - 50%

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA025: Suspended Solids (QCLot: 2525678)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	103	82	132
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA (QCLot: 2522264)								
EK069FG: Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	1.0 mg/L	99.3	----	----
EP008: Chlorophyll a & Pheophytin a (QCLot: 2523338)								
EP008: Chlorophyll a	----	1	mg/m³	<1	20 mg/m³	110	61	131
EP008: Volume	----	0.01	L	1	----	1	----	----
EP008: Volume Extract	----	0.01	mL	10	----	10	----	----
Ultra-Trace Nutrients (QCLot: 2519465)								
EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	0.1 mg/L	102	82	130
Ultra-Trace Nutrients (QCLot: 2519466)								
EK257A-CM: Nitrite as N	----	0.002	mg/L	<0.002	0.1 mg/L	98.9	91	133
Ultra-Trace Nutrients (QCLot: 2519467)								
EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.1 mg/L	91.0	68	130
Ultra-Trace Nutrients (QCLot: 2519468)								
EK271A-CM: Reactive Phosphorus as P	----	0.001	mg/L	<0.001	0.1 mg/L	88.7	76	116
Ultra-Trace Nutrients (QCLot: 2519474)								
EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.01	mg/L	<0.01	1.0 mg/L	89.4	76	106
Ultra-Trace Nutrients (QCLot: 2519475)								
EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.005	mg/L	<0.005	0.44 mg/L	93.3	77	99
Ultra-Trace Nutrients (QCLot: 2519478)								
EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	<0.005	0.44 mg/L	119	80	122
Ultra-Trace Nutrients (QCLot: 2519479)								
EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	<0.01	----	----	----	----
		0.05	mg/L	----	1.0 mg/L	90.6	73	109

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	MS	Low	High	
Ultra-Trace Nutrients (QCLot: 2519465)							

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	MS	Low	High	
Ultra-Trace Nutrients (QCLot: 2519465) - continued							
ES1223028-001	SITE 1R 0-0.1	EK259A-CM: Nitrite + Nitrate as N	----	0.1 mg/L	104	70	130
Ultra-Trace Nutrients (QCLot: 2519466)							
ES1223028-001	SITE 1R 0-0.1	EK257A-CM: Nitrite as N	----	0.1 mg/L	106	70	130
Ultra-Trace Nutrients (QCLot: 2519467)							
ES1223028-001	SITE 1R 0-0.1	EK255A-CM: Ammonia as N	7664-41-7	0.1 mg/L	78.7	70	130
Ultra-Trace Nutrients (QCLot: 2519468)							
ES1223028-001	SITE 1R 0-0.1	EK271A-CM: Reactive Phosphorus as P	----	0.1 mg/L	113	70	130
Ultra-Trace Nutrients (QCLot: 2519474)							
ES1223028-001	SITE 1R 0-0.1	EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.5 mg/L	92.4	70	130
Ultra-Trace Nutrients (QCLot: 2519475)							
ES1223028-001	SITE 1R 0-0.1	EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.5 mg/L	99.5	70	130
Ultra-Trace Nutrients (QCLot: 2519478)							
ES1223028-001	SITE 1R 0-0.1	EK267PA-CM: Total Phosphorus as P	----	0.5 mg/L	99.6	70	130
Ultra-Trace Nutrients (QCLot: 2519479)							
ES1223028-001	SITE 1R 0-0.1	EK262PA-CM: Total Nitrogen as N	----	0.5 mg/L	89.1	70	130

The quality control term Matrix Spike (MS) and Matrix Spike Duplicate (MSD) refers to intralaboratory split samples spiked with a representative set of target analytes. The purpose of these QC parameters are to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: WATER				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report							
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)		
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit	
Ultra-Trace Nutrients (QCLot: 2519465)											
ES1223028-001	SITE 1R 0-0.1	EK259A-CM: Nitrite + Nitrate as N		----	0.1 mg/L	104	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519466)											
ES1223028-001	SITE 1R 0-0.1	EK257A-CM: Nitrite as N		----	0.1 mg/L	106	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519467)											
ES1223028-001	SITE 1R 0-0.1	EK255A-CM: Ammonia as N		7664-41-7	0.1 mg/L	78.7	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519468)											
ES1223028-001	SITE 1R 0-0.1	EK271A-CM: Reactive Phosphorus as P		----	0.1 mg/L	113	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519474)											
ES1223028-001	SITE 1R 0-0.1	EK262PA-F-CM: Dissolved Total Nitrogen as N		----	0.5 mg/L	92.4	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519475)											
ES1223028-001	SITE 1R 0-0.1										



Sub-Matrix: WATER

Sub-Matrix: WATER				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report							
				Spike	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)		
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	Concentration	MS	MSD	Low	High	Value	Control Limit	
Ultra-Trace Nutrients (QCLot: 2519475) - continued											
ES1223028-001	SITE 1R 0-0.1	EK267PA-F-CM: Dissolved Total Phosphorus as P		----	0.5 mg/L	99.5	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519478)											
ES1223028-001	SITE 1R 0-0.1	EK267PA-CM: Total Phosphorus as P		----	0.5 mg/L	99.6	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519479)											
ES1223028-001	SITE 1R 0-0.1	EK262PA-CM: Total Nitrogen as N		----	0.5 mg/L	89.1	----	70	130	----	----

Environmental Division

QUALITY CONTROL REPORT

Work Order	: ES1223029	Page	: 1 of 8
Client	: URS AUSTRALIA (VIC) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR HEATH FIDOCK	Contact	: Loren Schiavon
Address	: 155A HOGAN ST TATURA VIC, AUSTRALIA 3616	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: heath.fidock@urs.com	E-mail	: loren.schiavon@alsglobal.com
Telephone	: +61 03 5824 3322	Telephone	: +61 2 8784 8503
Facsimile	: +61 03 5824 3563	Facsimile	: +61 2 8784 8500
Project	: 43177771	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: NEWCASTLE		
C-O-C number	: ----	Date Samples Received	: 26-SEP-2012
Sampler	: H.F	Issue Date	: 04-OCT-2012
Order number	: ----		
Quote number	: ME/465/12 V4	No. of samples received	: 14
		No. of samples analysed	: 14

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Sarah Millington	Senior Inorganic Chemist	Sydney Inorganics



General Comments

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

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

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

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

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC



Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA025: Suspended Solids (QC Lot: 2524915)									
ES1223029-001	SITE 7F 0-0.1	EA025H: Suspended Solids (SS)	----	5	mg/L	7	6	24.0	No Limit
ES1223029-004	SITE 5F 0-0.1	EA025H: Suspended Solids (SS)	----	5	mg/L	12	7	48.6	No Limit
EA025: Suspended Solids (QC Lot: 2527056)									
ES1223029-011	SITE 1F 0	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	6	18.2	No Limit
ES1223029-012	SITE QC1_F_0_0.1	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA (QC Lot: 2522264)									
ES1223028-001	Anonymous	EK069FG: Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES1223028-011	Anonymous	EK069FG: Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA (QC Lot: 2522265)									
ES1223029-009	SITE 3F 6.5	EK069FG: Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 2519465)									
ES1223028-001	Anonymous	EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	0.029	0.027	7.5	0% - 50%
ES1223028-011	Anonymous	EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	0.047	0.048	0.0	0% - 20%
Ultra-Trace Nutrients (QC Lot: 2519466)									
ES1223028-001	Anonymous	EK257A-CM: Nitrite as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
ES1223028-011	Anonymous	EK257A-CM: Nitrite as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 2519467)									
ES1223028-001	Anonymous	EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	0.017	0.010	57.2	No Limit
ES1223028-011	Anonymous	EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	0.021	0.022	6.9	No Limit
Ultra-Trace Nutrients (QC Lot: 2519468)									
ES1223028-001	Anonymous	EK271A-CM: Reactive Phosphorus as P	----	0.001	mg/L	0.028	0.029	4.6	0% - 20%
ES1223028-011	Anonymous	EK271A-CM: Reactive Phosphorus as P	----	0.001	mg/L	0.016	0.015	0.0	0% - 50%
Ultra-Trace Nutrients (QC Lot: 2519469)									
ES1223029-009	SITE 3F 6.5	EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	0.049	0.050	0.0	0% - 20%
Ultra-Trace Nutrients (QC Lot: 2519470)									
ES1223029-009	SITE 3F 6.5	EK257A-CM: Nitrite as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 2519471)									
ES1223029-009	SITE 3F 6.5	EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	0.014	0.019	29.4	No Limit
Ultra-Trace Nutrients (QC Lot: 2519472)									
ES1223029-009	SITE 3F 6.5	EK271A-CM: Reactive Phosphorus as P	----	0.001	mg/L	0.015	0.016	0.0	0% - 50%
Ultra-Trace Nutrients (QC Lot: 2519474)									
ES1223028-001	Anonymous	EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.01	mg/L	0.29	0.33	14.0	0% - 20%
ES1223028-011	Anonymous	EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.01	mg/L	0.15	0.16	7.4	0% - 50%

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 Work Order : ES1223029
 Client : URS AUSTRALIA (VIC) PTY LTD
 Project : 43177771



Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
Ultra-Trace Nutrients (QC Lot: 2519475)									
ES1223028-001	Anonymous	EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.005	mg/L	0.039	0.028	32.5	No Limit
ES1223028-011	Anonymous	EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.005	mg/L	0.025	0.023	9.1	No Limit
Ultra-Trace Nutrients (QC Lot: 2519476)									
ES1223029-009	SITE 3F 6.5	EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.01	mg/L	0.13	0.15	12.5	0% - 50%
Ultra-Trace Nutrients (QC Lot: 2519477)									
ES1223029-009	SITE 3F 6.5	EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.005	mg/L	0.021	0.019	10.0	No Limit
Ultra-Trace Nutrients (QC Lot: 2519478)									
ES1223028-001	Anonymous	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	0.064	0.049	25.6	No Limit
ES1223028-011	Anonymous	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	0.044	0.037	17.4	No Limit
Ultra-Trace Nutrients (QC Lot: 2519479)									
ES1223028-001	Anonymous	EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	0.28	0.28	0.0	0% - 20%
ES1223028-011	Anonymous	EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	0.12	0.12	8.8	0% - 50%
Ultra-Trace Nutrients (QC Lot: 2519480)									
ES1223029-009	SITE 3F 6.5	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	0.026	0.034	27.4	No Limit
Ultra-Trace Nutrients (QC Lot: 2519481)									
ES1223029-009	SITE 3F 6.5	EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	0.11	0.12	0.0	0% - 50%

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%) Low High	
Method: Compound	CAS Number	LOR	Unit	Result				
EA025: Suspended Solids (QCLot: 2524915)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	105	82	132
EA025: Suspended Solids (QCLot: 2527056)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	94.4	82	132
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA (QCLot: 2522264)								
EK069FG: Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	1.0 mg/L	99.3	----	----
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA (QCLot: 2522265)								
EK069FG: Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	1.0 mg/L	99.4	----	----
EP008: Chlorophyll a & Pheophytin a (QCLot: 2523338)								
EP008: Chlorophyll a	----	1	mg/m³	<1	20 mg/m³	110	61	131
EP008: Volume	----	0.01	L	1	----	1	----	----
EP008: Volume Extract	----	0.01	mL	10	----	10	----	----
EP008: Chlorophyll a & Pheophytin a (QCLot: 2523339)								
EP008: Chlorophyll a	----	1	mg/m³	<1	20 mg/m³	85.0	61	131
EP008: Volume	----	0.01	L	1	----	1	----	----
EP008: Volume Extract	----	0.01	mL	10	----	10	----	----
Ultra-Trace Nutrients (QCLot: 2519465)								
EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	0.1 mg/L	102	82	130
Ultra-Trace Nutrients (QCLot: 2519466)								
EK257A-CM: Nitrite as N	----	0.002	mg/L	<0.002	0.1 mg/L	98.9	91	133
Ultra-Trace Nutrients (QCLot: 2519467)								
EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.1 mg/L	91.0	68	130
Ultra-Trace Nutrients (QCLot: 2519468)								
EK271A-CM: Reactive Phosphorus as P	----	0.001	mg/L	<0.001	0.1 mg/L	88.7	76	116
Ultra-Trace Nutrients (QCLot: 2519469)								
EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	0.1 mg/L	102	82	130
Ultra-Trace Nutrients (QCLot: 2519470)								
EK257A-CM: Nitrite as N	----	0.002	mg/L	<0.002	0.1 mg/L	102	91	133
Ultra-Trace Nutrients (QCLot: 2519471)								
EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.1 mg/L	112	68	130
Ultra-Trace Nutrients (QCLot: 2519472)								
EK271A-CM: Reactive Phosphorus as P	----	0.001	mg/L	<0.001	0.1 mg/L	93.4	76	116
Ultra-Trace Nutrients (QCLot: 2519474)								

Matrix Spike (MS) Report

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
					MS	Low	High
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number				
Ultra-Trace Nutrients (QCLot: 2519465)							
ES1223028-001	Anonymous	EK259A-CM: Nitrite + Nitrate as N	----	0.1 mg/L	104	70	130
Ultra-Trace Nutrients (QCLot: 2519466)							
ES1223028-001	Anonymous	EK257A-CM: Nitrite as N	----	0.1 mg/L	106	70	130
Ultra-Trace Nutrients (QCLot: 2519467)							
ES1223028-001	Anonymous	EK255A-CM: Ammonia as N	7664-41-7	0.1 mg/L	78.7	70	130
Ultra-Trace Nutrients (QCLot: 2519468)							
ES1223028-001	Anonymous	EK271A-CM: Reactive Phosphorus as P	----	0.1 mg/L	113	70	130
Ultra-Trace Nutrients (QCLot: 2519469)							
ES1223029-009	SITE 3F 6.5	EK259A-CM: Nitrite + Nitrate as N	----	0.1 mg/L	109	70	130
Ultra-Trace Nutrients (QCLot: 2519470)							

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 Work Order : ES1223029
 Client : URS AUSTRALIA (VIC) PTY LTD
 Project : 43177771



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number		MS	Low	High
Ultra-Trace Nutrients (QCLot: 2519470) - continued							
ES1223029-009	SITE 3F 6.5	EK257A-CM: Nitrite as N	----	0.1 mg/L	97.3	70	130
Ultra-Trace Nutrients (QCLot: 2519471)							
ES1223029-009	SITE 3F 6.5	EK255A-CM: Ammonia as N	7664-41-7	0.1 mg/L	82.8	70	130
Ultra-Trace Nutrients (QCLot: 2519472)							
ES1223029-009	SITE 3F 6.5	EK271A-CM: Reactive Phosphorus as P	----	0.1 mg/L	117	70	130
Ultra-Trace Nutrients (QCLot: 2519474)							
ES1223028-001	Anonymous	EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.5 mg/L	92.4	70	130
Ultra-Trace Nutrients (QCLot: 2519475)							
ES1223028-001	Anonymous	EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.5 mg/L	99.5	70	130
Ultra-Trace Nutrients (QCLot: 2519476)							
ES1223029-009	SITE 3F 6.5	EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.5 mg/L	97.9	70	130
Ultra-Trace Nutrients (QCLot: 2519477)							
ES1223029-009	SITE 3F 6.5	EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.5 mg/L	112	70	130
Ultra-Trace Nutrients (QCLot: 2519478)							
ES1223028-001	Anonymous	EK267PA-CM: Total Phosphorus as P	----	0.5 mg/L	99.6	70	130
Ultra-Trace Nutrients (QCLot: 2519479)							
ES1223028-001	Anonymous	EK262PA-CM: Total Nitrogen as N	----	0.5 mg/L	89.1	70	130
Ultra-Trace Nutrients (QCLot: 2519480)							
ES1223029-009	SITE 3F 6.5	EK267PA-CM: Total Phosphorus as P	----	0.5 mg/L	119	70	130
Ultra-Trace Nutrients (QCLot: 2519481)							
ES1223029-009	SITE 3F 6.5	EK262PA-CM: Total Nitrogen as N	----	0.5 mg/L	96.2	70	130

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

The quality control term Matrix Spike (MS) and Matrix Spike Duplicate (MSD) refers to intralaboratory split samples spiked with a representative set of target analytes. The purpose of these QC parameters are to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
					MS	MSD	Low	High	Value	Control Limit
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number							
Ultra-Trace Nutrients (QCLot: 2519465)										
ES1223028-001	Anonymous	EK259A-CM: Nitrite + Nitrate as N	----	0.1 mg/L	104	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519466)										
ES1223028-001	Anonymous	EK257A-CM: Nitrite as N	----	0.1 mg/L	106	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519467)										
ES1223028-001	Anonymous	EK255A-CM: Ammonia as N	7664-41-7	0.1 mg/L	78.7	----	70	130	----	----

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 Work Order : ES1223029
 Client : URS AUSTRALIA (VIC) PTY LTD
 Project : 43177771



Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number		MS	MSD	Low	High	Value	Control Limit
Ultra-Trace Nutrients (QCLot: 2519468)										
ES1223028-001	Anonymous	EK271A-CM: Reactive Phosphorus as P	----	0.1 mg/L	113	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519469)										
ES1223029-009	SITE 3F 6.5	EK259A-CM: Nitrite + Nitrate as N	----	0.1 mg/L	109	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519470)										
ES1223029-009	SITE 3F 6.5	EK257A-CM: Nitrite as N	----	0.1 mg/L	97.3	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519471)										
ES1223029-009	SITE 3F 6.5	EK255A-CM: Ammonia as N	7664-41-7	0.1 mg/L	82.8	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519472)										
ES1223029-009	SITE 3F 6.5	EK271A-CM: Reactive Phosphorus as P	----	0.1 mg/L	117	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519474)										
ES1223028-001	Anonymous	EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.5 mg/L	92.4	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519475)										
ES1223028-001	Anonymous	EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.5 mg/L	99.5	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519476)										
ES1223029-009	SITE 3F 6.5	EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.5 mg/L	97.9	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519477)										
ES1223029-009	SITE 3F 6.5	EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.5 mg/L	112	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519478)										
ES1223028-001	Anonymous	EK267PA-CM: Total Phosphorus as P	----	0.5 mg/L	99.6	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519479)										
ES1223028-001	Anonymous	EK262PA-CM: Total Nitrogen as N	----	0.5 mg/L	89.1	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519480)										
ES1223029-009	SITE 3F 6.5	EK267PA-CM: Total Phosphorus as P	----	0.5 mg/L	119	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519481)										
ES1223029-009	SITE 3F 6.5	EK262PA-CM: Total Nitrogen as N	----	0.5 mg/L	96.2	----	70	130	----	----

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: ES1223028	Page	: 1 of 9
Client	: URS AUSTRALIA (VIC) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR HEATH FIDOCK	Contact	: Loren Schiavon
Address	: 155A HOGAN ST TATURA VIC, AUSTRALIA 3616	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: heath.fidock@urs.com	E-mail	: loren.schiavon@alsglobal.com
Telephone	: +61 03 5824 3322	Telephone	: +61 2 8784 8503
Facsimile	: +61 03 5824 3563	Facsimile	: +61 2 8784 8500
Project	: 43177771	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: NEWCASTLE		
C-O-C number	: ----	Date Samples Received	: 26-SEP-2012
Sampler	: H.F	Issue Date	: 04-OCT-2012
Order number	: ----		
Quote number	: ME/465/12 V4	No. of samples received	: 12
		No. of samples analysed	: 12

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers



Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non-volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA025: Suspended Solids								
Clear Plastic Bottle - Natural (EA025H) SITE 1R 0-0.1, SITE 2R 0-0.1, SITE 3R 6.5, SITE4R 7.5, SITE 5R 1, SITE 6R 2,	SITE 1R 0-0.1, SITE 3R 0-0.1, SITE 4R 0-0.1, SITE 5R 0-0.1, SITE 6R 0-0.1, SITE 7R 0-0.1	26-SEP-2012	---	03-OCT-2012	----	02-OCT-2012	03-OCT-2012	✓
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA								
Clear Plastic Bottle - Natural (EK069FG) SITE 1R 0-0.1, SITE 2R 0-0.1, SITE 3R 6.5, SITE4R 7.5, SITE 5R 1, SITE 6R 2,	SITE 1R 0-0.1, SITE 3R 0-0.1, SITE 4R 0-0.1, SITE 5R 0-0.1, SITE 6R 0-0.1, SITE 7R 0-0.1	26-SEP-2012	02-OCT-2012	28-SEP-2012	✖	02-OCT-2012	28-SEP-2012	✖
Ultra-Trace Nutrients								
Clear Plastic - Filtered (AS) - for UT Nut. (EK255A-CM) SITE 1R 0-0.1, SITE 2R 0-0.1, SITE 3R 6.5, SITE4R 7.5, SITE 5R 1, SITE 6R 2,	SITE 1R 0-0.1, SITE 3R 0-0.1, SITE 4R 0-0.1, SITE 5R 0-0.1, SITE 6R 0-0.1, SITE 7R 0-0.1	26-SEP-2012	---	27-SEP-2012	----	26-SEP-2012	27-SEP-2012	✓
Ultra-Trace Nutrients								
Clear Plastic - Filtered (AS) - for UT Nut. (EK257A-CM) SITE 1R 0-0.1, SITE 2R 0-0.1, SITE 3R 6.5, SITE4R 7.5, SITE 5R 1, SITE 6R 2,	SITE 1R 0-0.1, SITE 3R 0-0.1, SITE 4R 0-0.1, SITE 5R 0-0.1, SITE 6R 0-0.1, SITE 7R 0-0.1	26-SEP-2012	---	27-SEP-2012	----	26-SEP-2012	27-SEP-2012	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
Ultra-Trace Nutrients								
Clear Plastic - Filtered (AS) - for UT Nut. (EK259A-CM)		26-SEP-2012	---	27-SEP-2012	----	26-SEP-2012	27-SEP-2012	✓
SITE 1R 0-0.1, SITE 2R 0-0.1, SITE 3R 6.5, SITE4R 7.5, SITE 5R 1, SITE 6R 2,	SITE 1R 0-0.1, SITE 3R 0-0.1, SITE 4R 0-0.1, SITE 5R 0-0.1, SITE 6R 0-0.1, SITE 7R 0-0.1							
Ultra-Trace Nutrients								
Clear Plastic Bottle - Natural (AS) (EK262PA-CM)		26-SEP-2012	26-SEP-2012	27-SEP-2012	✓	26-SEP-2012	27-SEP-2012	✓
SITE 1R 0-0.1, SITE 2R 0-0.1, SITE 3R 6.5, SITE4R 7.5, SITE 5R 1, SITE 6R 2,	SITE 1R 0-0.1, SITE 3R 0-0.1, SITE 4R 0-0.1, SITE 5R 0-0.1, SITE 6R 0-0.1, SITE 7R 0-0.1							
Ultra-Trace Nutrients								
Clear Plastic - Filtered (AS) - for UT Nut. (EK262PA-F-CM)		26-SEP-2012	26-SEP-2012	27-SEP-2012	✓	26-SEP-2012	27-SEP-2012	✓
SITE 1R 0-0.1, SITE 2R 0-0.1, SITE 3R 6.5, SITE4R 7.5, SITE 5R 1, SITE 6R 2,	SITE 1R 0-0.1, SITE 3R 0-0.1, SITE 4R 0-0.1, SITE 5R 0-0.1, SITE 6R 0-0.1, SITE 7R 0-0.1							
Ultra-Trace Nutrients								
Clear Plastic Bottle - Natural (AS) (EK267PA-CM)		26-SEP-2012	26-SEP-2012	27-SEP-2012	✓	26-SEP-2012	27-SEP-2012	✓
SITE 1R 0-0.1, SITE 2R 0-0.1, SITE 3R 6.5, SITE4R 7.5, SITE 5R 1, SITE 6R 2,	SITE 1R 0-0.1, SITE 3R 0-0.1, SITE 4R 0-0.1, SITE 5R 0-0.1, SITE 6R 0-0.1, SITE 7R 0-0.1							
Ultra-Trace Nutrients								
Clear Plastic - Filtered (AS) - for UT Nut. (EK267PA-F-CM)		26-SEP-2012	26-SEP-2012	27-SEP-2012	✓	26-SEP-2012	27-SEP-2012	✓
SITE 1R 0-0.1, SITE 2R 0-0.1, SITE 3R 6.5, SITE4R 7.5, SITE 5R 1, SITE 6R 2,	SITE 1R 0-0.1, SITE 3R 0-0.1, SITE 4R 0-0.1, SITE 5R 0-0.1, SITE 6R 0-0.1, SITE 7R 0-0.1							

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
Ultra-Trace Nutrients								
Clear Plastic - Filtered (AS) - for UT Nut. (EK271A-CM)		26-SEP-2012	---	27-SEP-2012	----	26-SEP-2012	27-SEP-2012	✓
SITE 1R 0-0.1,								
SITE 2R 0-0.1,								
SITE 3R 6.5,								
SITE4R 7.5,								
SITE 5R 1,								
SITE 6R 2,								
SITE 7R 0-0.1								
EP008: Chlorophyll a & Pheophytin a								
White Plastic Bottle - Unpreserved (EP008)		26-SEP-2012	----	----	----	28-SEP-2012	28-SEP-2012	✓
SITE 1R 0-0.1,								
SITE 2R 0-0.1,								
SITE 3R 6.5,								
SITE4R 7.5,								
SITE 5R 1,								
SITE 6R 2,								
SITE 7R 0-0.1								



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER** Evaluation: * = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Acid Hydrolyzable Phosphorus as P by DA	EK069FG	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Nitrogen as N (Persulfate) - UT for CM	EK262PA-F-CM	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Phosphorus (Persulfate) - UT for CM	EK267PA-F-CM	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	2	20	10.0	9.5	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a and Pheophytin a	EP008	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Acid Hydrolyzable Phosphorus as P by DA	EK069FG	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Nitrogen as N (Persulfate) - UT for CM	EK262PA-F-CM	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Phosphorus (Persulfate) - UT for CM	EK267PA-F-CM	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	2	20	10.0	9.5	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a and Pheophytin a	EP008	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Acid Hydrolyzable Phosphorus as P by DA	EK069FG	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Nitrogen as N (Persulfate) - UT for CM	EK262PA-F-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Phosphorus (Persulfate) - UT for CM	EK267PA-F-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	1	20	5.0	4.8	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) Ultra-Trace for CM	EK267PA-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement



Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Matrix Spikes (MS)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	1	20	5.0	5.0	✔	ALS QCS3 requirement
Dissolved Total Nitrogen as N (Persulfate) - UT for CM	EK262PA-F-CM	1	20	5.0	5.0	✔	ALS QCS3 requirement
Dissolved Total Phosphorus (Persulfate) - UT for CM	EK267PA-F-CM	1	20	5.0	5.0	✔	ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	1	20	5.0	5.0	✔	ALS QCS3 requirement
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	1	20	5.0	5.0	✔	ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	1	20	5.0	5.0	✔	ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	1	20	5.0	5.0	✔	ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	1	20	5.0	5.0	✔	ALS QCS3 requirement



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Suspended Solids (High Level)	EA025H	WATER	In-House, APHA 21st ed., 2540D A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Acid Hydrolyzable Phosphorus as P by DA	EK069FG	WATER	APHA 21st ed., 4500-P B&G. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	WATER	APHA 21st ed., 4500-NH3 H Ammonia is determined by direct colorimetry by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by FIA.
Nitrate as N - Ultra-Trace for Catchment Monitoring	EK258A-CM	WATER	APHA 21st ed., 4500-NO3- I Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by FIA. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results.
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	WATER	APHA 21st ed., 4500-NO3- I. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by FIA.
TKN (Total N - NOx-N). (FIA - UT) for Catchment Monitoring	EK261PA-CM	WATER	APHA 21st ed., 4500-P J. & 4500-NO3- I . Calculated by difference from total Nitrogen and NOx. Contributing method parameters are determined by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Nitrogen as N (Persulfate digestion) -Ultra-Trace - CM	EK262PA-CM	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Total Nitrogen as N (Persulfate) - UT for CM	EK262PA-F-CM	WATER	APHA 21st ed., 4500-P J. Dissolved forms of Total Nitrogen is digested in a 0.45um filtered sample by Persulfate Method (Simultaneous Determination of Total Nitrogen and Total Phosphorus). As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Total Phosphorus (Persulfate) - UT for CM	EK267PA-F-CM	WATER	APHA 21st ed., 4500-P J. Dissolved forms of Total Phosphorus is digested in a 0.45um filtered sample by Persulfate Method (Simultaneous Determination of Total Nitrogen and Total Phosphorus). As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	WATER	APHA 21st ed., 4500-P E Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chlorophyll a and Pheophytin a	EP008	WATER	In-house (APHA 21st ed., 10200 H mod.) The pigments are extracted into aqueous acetone. The optical density of the extract before and after acidification at both 664 nm and 665 nm is determined spectrometrically.

Preparation Methods	Method	Matrix	Method Descriptions



Preparation Methods	Method	Matrix	Method Descriptions
Total Acid Hydrolysable Phosphorus as P	EK069-PR	WATER	APHA 21st ed., 4500 P - B&G. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Persulfate Digestion for UT Dissolved TN and TP for FIA fin	EK262/267-PA F Prep	WATER	APHA 21st ed., 4500 P - J. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)



Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- For all matrices, no Method Blank value outliers occur.
- For all matrices, no Duplicate outliers occur.
- For all matrices, no Laboratory Control outliers occur.
- For all matrices, no Matrix Spike outliers occur.

Regular Sample Surrogates

- For all regular sample matrices, no surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: WATER

Method		Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA							
Clear Plastic Bottle - Natural							
SITE 1R 0-0.1, SITE 2R 0-0.1, SITE 3R 6.5, SITE4R 7.5, SITE 5R 1, SITE 6R 2,	SITE 1R 0-0.1, SITE 3R 0-0.1, SITE 4R 0-0.1, SITE 5R 0-0.1, SITE 6R 0-0.1, SITE 7R 0-0.1	02-OCT-2012	28-SEP-2012	4	02-OCT-2012	28-SEP-2012	4

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- No Quality Control Sample Frequency Outliers exist.

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: ES1223029	Page	: 1 of 9
Client	: URS AUSTRALIA (VIC) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR HEATH FIDOCK	Contact	: Loren Schiavon
Address	: 155A HOGAN ST TATURA VIC, AUSTRALIA 3616	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: heath.fidock@urs.com	E-mail	: loren.schiavon@alsglobal.com
Telephone	: +61 03 5824 3322	Telephone	: +61 2 8784 8503
Facsimile	: +61 03 5824 3563	Facsimile	: +61 2 8784 8500
Project	: 43177771	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: NEWCASTLE		
C-O-C number	: ----	Date Samples Received	: 26-SEP-2012
Sampler	: H.F	Issue Date	: 04-OCT-2012
Order number	: ----		
Quote number	: ME/465/12 V4	No. of samples received	: 14
		No. of samples analysed	: 14

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers



Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non-volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA025: Suspended Solids								
Clear Plastic Bottle - Natural (EA025H) SITE 7F 0-0.1, SITE 6F 2.5, SITE 5F 1, SITE 4F 7.5, SITE 3F 6.5,	SITE 6F 0-0.1, SITE 5F 0-0.1, SITE 4F 0-0.1, SITE 3F 0-0.1, SITE 2F 0	26-SEP-2012	---	03-OCT-2012	----	02-OCT-2012	03-OCT-2012	✓
Clear Plastic Bottle - Natural (EA025H) SITE 1F 0, SITE QC2_F_BLANK,	SITE QC1_F_0_0.1, SITE 1JET_F_0_0.1	26-SEP-2012	---	03-OCT-2012	----	03-OCT-2012	03-OCT-2012	✓
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA								
Clear Plastic Bottle - Natural (EK069FG) SITE 7F 0-0.1, SITE 6F 2.5, SITE 5F 1, SITE 4F 7.5, SITE 3F 6.5, SITE 1F 0, SITE QC2_F_BLANK,	SITE 6F 0-0.1, SITE 5F 0-0.1, SITE 4F 0-0.1, SITE 3F 0-0.1, SITE 2F 0, SITE QC1_F_0_0.1, SITE 1JET_F_0_0.1	26-SEP-2012	02-OCT-2012	28-SEP-2012	✖	02-OCT-2012	28-SEP-2012	✖
Ultra-Trace Nutrients								
Clear Plastic - Filtered (AS) - for UT Nut. (EK255A-CM) SITE 7F 0-0.1, SITE 6F 2.5, SITE 5F 1, SITE 4F 7.5, SITE 3F 6.5, SITE 1F 0, SITE QC2_F_BLANK,	SITE 6F 0-0.1, SITE 5F 0-0.1, SITE 4F 0-0.1, SITE 3F 0-0.1, SITE 2F 0, SITE QC1_F_0_0.1, SITE 1JET_F_0_0.1	26-SEP-2012	---	27-SEP-2012	----	26-SEP-2012	27-SEP-2012	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
Ultra-Trace Nutrients								
Clear Plastic - Filtered (AS) - for UT Nut. (EK257A-CM)		26-SEP-2012	---	27-SEP-2012	----	26-SEP-2012	27-SEP-2012	✓
SITE 7F 0-0.1, SITE 6F 2.5, SITE 5F 1, SITE 4F 7.5, SITE 3F 6.5, SITE 1F 0, SITE QC2_F_BLANK,	SITE 6F 0-0.1, SITE 5F 0-0.1, SITE 4F 0-0.1, SITE 3F 0-0.1, SITE 2F 0, SITE QC1_F_0_0.1, SITE 1JET_F_0_0.1							
Ultra-Trace Nutrients								
Clear Plastic - Filtered (AS) - for UT Nut. (EK259A-CM)		26-SEP-2012	---	27-SEP-2012	----	26-SEP-2012	27-SEP-2012	✓
SITE 7F 0-0.1, SITE 6F 2.5, SITE 5F 1, SITE 4F 7.5, SITE 3F 6.5, SITE 1F 0, SITE QC2_F_BLANK,	SITE 6F 0-0.1, SITE 5F 0-0.1, SITE 4F 0-0.1, SITE 3F 0-0.1, SITE 2F 0, SITE QC1_F_0_0.1, SITE 1JET_F_0_0.1							
Ultra-Trace Nutrients								
Clear Plastic Bottle - Natural (AS) (EK262PA-CM)		26-SEP-2012	26-SEP-2012	27-SEP-2012	✓	26-SEP-2012	27-SEP-2012	✓
SITE 7F 0-0.1, SITE 6F 2.5, SITE 5F 1, SITE 4F 7.5, SITE 3F 6.5, SITE 1F 0, SITE QC2_F_BLANK,	SITE 6F 0-0.1, SITE 5F 0-0.1, SITE 4F 0-0.1, SITE 3F 0-0.1, SITE 2F 0, SITE QC1_F_0_0.1, SITE 1JET_F_0_0.1							
Ultra-Trace Nutrients								
Clear Plastic - Filtered (AS) - for UT Nut. (EK262PA-F-CM)		26-SEP-2012	26-SEP-2012	27-SEP-2012	✓	26-SEP-2012	27-SEP-2012	✓
SITE 7F 0-0.1, SITE 6F 2.5, SITE 5F 1, SITE 4F 7.5, SITE 3F 6.5, SITE 1F 0, SITE QC2_F_BLANK,	SITE 6F 0-0.1, SITE 5F 0-0.1, SITE 4F 0-0.1, SITE 3F 0-0.1, SITE 2F 0, SITE QC1_F_0_0.1, SITE 1JET_F_0_0.1							
Ultra-Trace Nutrients								
Clear Plastic Bottle - Natural (AS) (EK267PA-CM)		26-SEP-2012	26-SEP-2012	27-SEP-2012	✓	26-SEP-2012	27-SEP-2012	✓
SITE 7F 0-0.1, SITE 6F 2.5, SITE 5F 1, SITE 4F 7.5, SITE 3F 6.5, SITE 1F 0, SITE QC2 F BLANK.	SITE 6F 0-0.1, SITE 5F 0-0.1, SITE 4F 0-0.1, SITE 3F 0-0.1, SITE 2F 0, SITE QC1_F_0_0.1, SITE 1JET F_0_0.1							



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
Ultra-Trace Nutrients							
Clear Plastic - Filtered (AS) - for UT Nut. (EK267PA-F-CM) SITE 7F 0-0.1, SITE 6F 2.5, SITE 5F 1, SITE 4F 7.5, SITE 3F 6.5, SITE 1F 0, SITE QC2_F_BLANK, SITE 6F 0-0.1, SITE 5F 0-0.1, SITE 4F 0-0.1, SITE 3F 0-0.1, SITE 2F 0, SITE QC1_F_0_0.1, SITE 1JET_F_0_0.1	26-SEP-2012	26-SEP-2012	27-SEP-2012	✔	26-SEP-2012	27-SEP-2012	✔
Ultra-Trace Nutrients							
Clear Plastic - Filtered (AS) - for UT Nut. (EK271A-CM) SITE 7F 0-0.1, SITE 6F 2.5, SITE 5F 1, SITE 4F 7.5, SITE 3F 6.5, SITE 1F 0, SITE QC2_F_BLANK, SITE 6F 0-0.1, SITE 5F 0-0.1, SITE 4F 0-0.1, SITE 3F 0-0.1, SITE 2F 0, SITE QC1_F_0_0.1, SITE 1JET_F_0_0.1	26-SEP-2012	---	27-SEP-2012	----	26-SEP-2012	27-SEP-2012	✔
EP008: Chlorophyll a & Pheophytin a							
White Plastic Bottle - Unpreserved (EP008) SITE 7F 0-0.1, SITE 6F 2.5, SITE 5F 1, SITE 4F 7.5, SITE 3F 6.5, SITE 1F 0, SITE QC2_F BLANK, SITE 6F 0-0.1, SITE 5F 0-0.1, SITE 4F 0-0.1, SITE 3F 0-0.1, SITE 2F 0, SITE QC1_F_0_0.1, SITE 1JET_F_0_0.1	26-SEP-2012	----	----	----	28-SEP-2012	28-SEP-2012	✔



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER** Evaluation: * = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	3	26	11.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Acid Hydrolyzable Phosphorus as P by DA	EK069FG	3	26	11.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Nitrogen as N (Persulfate) - UT for CM	EK262PA-F-CM	3	26	11.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Phosphorus (Persulfate) - UT for CM	EK267PA-F-CM	3	26	11.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	3	26	11.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	3	26	11.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	3	26	11.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	4	38	10.5	9.5	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	3	26	11.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	3	26	11.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	2	26	7.7	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a and Pheophytin a	EP008	2	28	7.1	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Acid Hydrolyzable Phosphorus as P by DA	EK069FG	2	26	7.7	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Nitrogen as N (Persulfate) - UT for CM	EK262PA-F-CM	4	26	15.4	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Phosphorus (Persulfate) - UT for CM	EK267PA-F-CM	4	26	15.4	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	2	26	7.7	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	2	26	7.7	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	2	26	7.7	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	4	38	10.5	9.5	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	2	26	7.7	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	2	26	7.7	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	2	26	7.7	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a and Pheophytin a	EP008	2	28	7.1	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Acid Hydrolyzable Phosphorus as P by DA	EK069FG	2	26	7.7	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Nitrogen as N (Persulfate) - UT for CM	EK262PA-F-CM	2	26	7.7	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Phosphorus (Persulfate) - UT for CM	EK267PA-F-CM	2	26	7.7	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	2	26	7.7	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	2	26	7.7	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	2	26	7.7	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	2	38	5.3	4.8	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	2	26	7.7	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) Ultra-Trace for CM	EK267PA-CM	2	26	7.7	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement



Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Matrix Spikes (MS)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	2	26	7.7	5.0	✔	ALS QCS3 requirement
Dissolved Total Nitrogen as N (Persulfate) - UT for CM	EK262PA-F-CM	2	26	7.7	5.0	✔	ALS QCS3 requirement
Dissolved Total Phosphorus (Persulfate) - UT for CM	EK267PA-F-CM	2	26	7.7	5.0	✔	ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	2	26	7.7	5.0	✔	ALS QCS3 requirement
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	2	26	7.7	5.0	✔	ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	2	26	7.7	5.0	✔	ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	2	26	7.7	5.0	✔	ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	2	26	7.7	5.0	✔	ALS QCS3 requirement



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Suspended Solids (High Level)	EA025H	WATER	In-House, APHA 21st ed., 2540D A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Acid Hydrolyzable Phosphorus as P by DA	EK069FG	WATER	APHA 21st ed., 4500-P B&G. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	WATER	APHA 21st ed., 4500-NH3 H Ammonia is determined by direct colorimetry by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by FIA.
Nitrate as N - Ultra-Trace for Catchment Monitoring	EK258A-CM	WATER	APHA 21st ed., 4500-NO3- I Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by FIA. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results.
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	WATER	APHA 21st ed., 4500-NO3- I. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by FIA.
TKN (Total N - NOx-N). (FIA - UT) for Catchment Monitoring	EK261PA-CM	WATER	APHA 21st ed., 4500-P J. & 4500-NO3- I . Calculated by difference from total Nitrogen and NOx. Contributing method parameters are determined by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Nitrogen as N (Persulfate digestion) -Ultra-Trace - CM	EK262PA-CM	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Total Nitrogen as N (Persulfate) - UT for CM	EK262PA-F-CM	WATER	APHA 21st ed., 4500-P J. Dissolved forms of Total Nitrogen is digested in a 0.45um filtered sample by Persulfate Method (Simultaneous Determination of Total Nitrogen and Total Phosphorus). As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Total Phosphorus (Persulfate) - UT for CM	EK267PA-F-CM	WATER	APHA 21st ed., 4500-P J. Dissolved forms of Total Phosphorus is digested in a 0.45um filtered sample by Persulfate Method (Simultaneous Determination of Total Nitrogen and Total Phosphorus). As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	WATER	APHA 21st ed., 4500-P E Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chlorophyll a and Pheophytin a	EP008	WATER	In-house (APHA 21st ed., 10200 H mod.) The pigments are extracted into aqueous acetone. The optical density of the extract before and after acidification at both 664 nm and 665 nm is determined spectrometrically.

Preparation Methods	Method	Matrix	Method Descriptions

Page : 8 of 9
Work Order : ES1223029
Client : URS AUSTRALIA (VIC) PTY LTD
Project : 43177771



Preparation Methods	Method	Matrix	Method Descriptions
Total Acid Hydrolysable Phosphorus as P	EK069-PR	WATER	APHA 21st ed., 4500 P - B&G. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Persulfate Digestion for UT Dissolved TN and TP for FIA fin	EK262/267-PA F Prep	WATER	APHA 21st ed., 4500 P - J. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)



Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- For all matrices, no Method Blank value outliers occur.
- For all matrices, no Duplicate outliers occur.
- For all matrices, no Laboratory Control outliers occur.
- For all matrices, no Matrix Spike outliers occur.

Regular Sample Surrogates

- For all regular sample matrices, no surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: WATER

Method	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)	Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue	
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA							
Clear Plastic Bottle - Natural							
SITE 7F 0-0.1, SITE 6F 2.5, SITE 5F 1, SITE 4F 7.5, SITE 3F 6.5, SITE 1F 0, SITE QC2_F_BLANK,	SITE 6F 0-0.1, SITE 5F 0-0.1, SITE 4F 0-0.1, SITE 3F 0-0.1, SITE 2F 0, SITE QC1_F_0_0.1, SITE 1JET_F_0_0.1	02-OCT-2012	28-SEP-2012	4	02-OCT-2012	28-SEP-2012	4

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- No Quality Control Sample Frequency Outliers exist.

CHAIN OF CUSTODY DOCUMENTATION - Rising Tide

COC Page 1 of 1

CLIENT: URS VIC

ADDRESS / OFFICE: Level 6, Southbank Boulevard, Southbank, Vic 3006

PROJECT MANAGER (PM): Heath Fidock

PROJECT ID: 43177771

SITE: Newcastle

P.O. NO:

RESULTS REQUIRED (Date): 5 DAY TAT

QUOTE NO.: ME-465-12 V4

FOR LABORATORY USE ONLY

COOLERS: 2A (if applicable)

Intact: Yes No N/A

SAMPLE TEMPERATURE

CHILLED: Yes No

COMMENTS:

Analyse within 24hr

SAMPLER:

MOBILE: 0438 098 066

PHONE: 03-5824 6110

EMAIL REPORT TO: Heath Fidock, Peter McGowan

EMAIL INVOICE TO: heath.fidock@urs.com

ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)



Australian Laboratory Services Pty Ltd

Notes:

Rising Tide Samples

Field filtered - mark on label

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Total bottles	UTN-04 (TN, TP, NH3, TKN, NOx, NO2, NO3, React P)	EK262PA-F-CM (Total Dissolved N)	EK267PA-F-CM (Total Dissolved P)	EK069FG* (Dissolved Acid Hydrolyzable P)	EP008 (Chlorophyll)	EA025H (TSS)
Site 1R	0 - 0.1	W	26/9/12	12:15	6	x	x	x	x	x	x
Site 1R	0 - 0.1	W	26/9/12	12:30	6	x	x	x	x	x	x
Site 2R	0 - 0.1	W	"	12:45	6	x	x	x	x	x	x
Site 3R	0 - 0.1	W	"	13:05	6	x	x	x	x	x	x
Site 3R	6.5 -	W	"	13:20	6	x	x	x	x	x	x
Site 4R	0 - 0.1	W	"	13:35	6	x	x	x	x	x	x
Site 4R	7.5 -	W	"	13:45	6	x	x	x	x	x	x
Site 5R	0 - 0.1	W	"	14:10	6	x	x	x	x	x	x
Site 5R	1 -	W	"	14:15	6	x	x	x	x	x	x
Site 6R	0 - 0.1	W	"	14:30	6	x	x	x	x	x	x
Site 6R	2 -	W	"	14:45	6	x	x	x	x	x	x
Site 7R	0 - 0.1	W	"	15:00	6	x	x	x	x	x	x

RELINQUISHED BY:

Name: Thomas Doyle

Of: Date: 26/9/12

Name: Time:

Of: Date:

Of: Time:

RECEIVED BY:

Name: BEOA

Of: ALS

Name: Sep

Of: ALS

Date: 26/9

Time: 16:15

Date: 26/9/12

Time: 20:10

Water Containers required:

Filtered samples will require field filtration to fill 1 x 125 ml green unpreserved plastic, 1 x 60 ml turquoise and white stripe unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.
Unfiltered sample will require 1 x 1 lt green unpreserved plastic (solid white), 1 x 500 ml green unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

Environmental Division
Sydney
Work Order

ES1223028



Telephone: +61-2-8784 8555

CHAIN OF CUSTODY DOCUMENTATION - Falling Tide

COC Page 1 of 2



Australian Laboratory Services Pty Ltd

CLIENT: URS VIC		SAMPLER:	
ADDRESS / OFFICE: Level 6, Southbank Boulevard, Southbank, Vic 3006		MOBILE: 0438 098 086	
PROJECT MANAGER (PM): Heath Fidock		PHONE: 03-5824 6110	
PROJECT ID: 43177771		EMAIL REPORT TO: Heath Fidock, Peter McGowan	
SITE: Newcastle		P.O. NO:	
RESULTS REQUIRED (Date): 5 DAY TAT		QUOTE NO.: ME-465-12 V4	
		ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)	

FOR LABORATORY USE ONLY		COMMENTS:	
COOLER SEAL (circle appropriate)		Analyse within 24hr	
Intact: Yes No N/A			
SAMPLE TEMPERATURE			
CHILLED: Yes No			

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Total bottles	UTN-04 (TN, TP, NH3, TKN, NOx, NO2, NO3, Reac.P.)	EK262PA-F-CM (Total Dissolved N)	EK267PA-F-CM (Total Dissolved P)	EK089FG* (Dissolved Acid Hydrolyzable P)	EP008 (Chlorophyll)	EA025H (TSS)	Notes:
	Site 7F 0 - 0.1	W	26/9/12	7.00	6	x	x	x	x	x	x	
	Site 6F 0 - 0.1	W	26/9/12	7.30	6	x	x	x	x	x	x	
	Site 6F 2.5 -	W	26/9/12	7.45	6	x	x	x	x	x	x	
	Site 5F 0 - 0.1	W	26/9/12	8.00	6	x	x	x	x	x	x	
	Site 5F 1 -	W	"	8.10	6	x	x	x	x	x	x	
	Site 4F 0 - 0.1	W	"	8.30	6	x	x	x	x	x	x	
	Site 4F 7.5 -	W	"	8.45	6	x	x	x	x	x	x	
	Site 3F 0 - 0.1	W	"	9.00	6	x	x	x	x	x	x	
	Site 3F 6.5 -	W	"	9.10	6	x	x	x	x	x	x	
	Site 3F 0 -	W	"	9.30	6	x	x	x	x	x	x	
	Site 1F 0 -	W	"	10.00	6	x	x	x	x	x	x	
	Site F -	W				x	x	x	x	x	x	

Environmental Division
Sydney
Work Order

ES1223029



Telephone : +61-2-8784 8555

RELINQUISHED BY:		RECEIVED BY:		METHOD OF SHIPMENT	
Name: <u>Thom Doyle</u>	Date: <u>26/9/12</u>	Name: <u>Bea</u>	Date: <u>26/9</u>	ALS Internal Courier	
Of:	Time:	Of: <u>ALS</u>	Time: <u>16.15</u>		
Name:	Date:	Name: <u>Sep</u>	Date: <u>26/9/12</u>		
Of:	Time:	Of: <u>ALS</u>	Time: <u>10.20</u>		

Water Containers required:
Filtered samples will require field filtration to fill 1 x 125 ml green unpreserved plastic, 1 x 60 ml turquoise and white stripe unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.
Unfiltered sample will require 1 x 1 lt green unpreserved plastic (solid white), 1 x 500 ml green unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

CHAIN OF CUSTODY DOCUMENTATION - Falling Tide

COC Page 2 of 2



Australian Laboratory Services Pty Ltd

CLIENT: URS VIC		SAMPLER:	
ADDRESS / OFFICE: Level 6, Southbank Boulevard, Southbank, Vic 3006		MOBILE: 0438 098 066	
PROJECT MANAGER (PM): Heath Fidock		PHONE: 03-5824 6110	
PROJECT ID: 43177771		EMAIL REPORT TO: Heath Fidock, Peter McGowan	
SITE: Newcastle		P.O. NO:	
RESULTS REQUIRED (Date): 5 DAY TAT		QUOTE NO.: ME-465-12 V4	
EMAIL INVOICE TO: heath.fidock@urs.com		ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)	

FOR LABORATORY USE ONLY		COMMENTS: Analyse within 24hr	Notes: Falling Tide Samples
COOLER SEAL (circle appropriate)			
Intact: Yes No N/A			
SAMPLE TEMPERATURE			
CHILLED: Yes No			

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Total bottles	UTN-04 (TN, TP, NH3, TKN, NOx, NO2, NO3, Resac.P.)	EK262PA-F-CM (Total Dissolved N)	EK267PA-F-CM (Total Dissolved P)	EK068FG* (Dissolved Acid Hydrolyzable P)	EP008 (Chlorophyll)	EA025H (TSS)	Field filtered - mark on label
	Site 2LF 0 - 0.1	W	26/9/12	10:30	6	x	x	x	x	x	x	
	Site 2LF BLANK	W	11	10:45	6	x	x	x	x	x	x	
	Site 1LF 0 - 0.1	W	11	11:00	6	x	x	x	x	x	x	
	Site F	W				x	x	x	x	x	x	
	Site F	W				x	x	x	x	x	x	
	Site F	W				x	x	x	x	x	x	
	Site F	W				x	x	x	x	x	x	
	Site F	W				x	x	x	x	x	x	
	Site F	W				x	x	x	x	x	x	
	Site F	W				x	x	x	x	x	x	
	Site F	W				x	x	x	x	x	x	
	Site F	W				x	x	x	x	x	x	
	Site F	W				x	x	x	x	x	x	
	Site F	W				x	x	x	x	x	x	

RELINQUISHED BY:		RECEIVED BY:		METHOD OF SHIPMENT	
Name: <i>Thomas Doyle</i>	Date: 26/9/12	Name: <i>Sep</i>	Date: 26/9/12	ALS Internal Courier	
Of:	Time:	Of: <i>A2S</i>	Time: 2010		
Name:	Date:	Name:	Date:		
Of:	Time:	Of:	Time:		

Water Containers required:

Filtered samples will require field filtration to fill 1 x 125 ml green unpreserved plastic, 1 x 60 ml turquoise and white stripe unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

Unfiltered sample will require 1 x 1 lt green unpreserved plastic (solid white), 1 x 500 ml green unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: ES1224114	Page	: 1 of 7
Client	: URS AUSTRALIA (VIC) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR HEATH FIDOCK	Contact	: Loren Schiavon
Address	: 155A HOGAN ST TATURA VIC, AUSTRALIA 3616	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: heath.fidock@urs.com	E-mail	: loren.schiavon@alsglobal.com
Telephone	: +61 03 5824 3322	Telephone	: +61 2 8784 8503
Facsimile	: +61 03 5824 3563	Facsimile	: +61 2 8784 8500
Project	: 43177771	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 10-OCT-2012
Sampler	: ----	Issue Date	: 19-OCT-2012
Site	: NEWCASTLE		
Quote number	: ME/465/12 V4	No. of samples received	: 24
		No. of samples analysed	: 24

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Ashesh Patel	Inorganic Chemist	Sydney Inorganics
Hoa Nguyen	Senior Inorganic Chemist	Sydney Inorganics
Sarah Millington	Senior Inorganic Chemist	Sydney Inorganics



General Comments

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

- **EK262PA-CM It has been noted that Dissolved Total Nitrogen is greater than Total Nitrogen on various samples, however this difference is within the limits of experimental variation.**
- **EK267PA-F Repeated results confirm that Dissolved TP is positive in field filtered sample in sample ID SITE QC2R**
- **EK271A-CM It has been noted that Reactive P is greater than Dissolved Reactive P on various samples, however this difference is within the limits of experimental variation.**
- **Results have been confirmed for sample ID SITE QC2R**



Analytical Results

Sub-Matrix: WATER

Client sample ID

Client sampling date / time

				SITE 7F-0.0-0.1	SITE 6F-0.0-0.1	SITE 6F-2	SITE 5F-0.0-0.1	SITE 5F-8
				10-OCT-2012 07:10	10-OCT-2012 08:00	10-OCT-2012 08:10	10-OCT-2012 08:30	10-OCT-2012 08:40
Compound	CAS Number	LOR	Unit	ES1224114-001	ES1224114-002	ES1224114-003	ES1224114-004	ES1224114-005
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	5
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA								
Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP008: Chlorophyll a & Pheophytin a								
Chlorophyll a	----	1	mg/m ³	2	<1	2	1	2
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	0.022	0.020	0.021	0.018	0.014
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Nitrate as N	14797-55-8	0.002	mg/L	0.057	0.046	0.043	0.049	0.029
Nitrite + Nitrate as N	----	0.002	mg/L	0.057	0.046	0.043	0.049	0.029
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	0.10	0.08	0.23	0.22	0.04
Dissolved Total Nitrogen as N	----	0.01	mg/L	0.18	0.07	0.11	0.11	0.09
Total Nitrogen as N	----	0.01	mg/L	0.16	0.13	0.27	0.27	0.07
Reactive Phosphorus as P	----	0.001	mg/L	0.028	0.015	0.014	0.016	0.011
Dissolved Total Phosphorus as P	----	0.005	mg/L	0.036	0.020	0.017	0.014	0.029
Total Phosphorus as P	----	0.005	mg/L	0.050	0.032	0.021	0.050	0.032



Analytical Results

Sub-Matrix: WATER

Client sample ID

Client sampling date / time

				SITE 4F-0.0-0.1	SITE 4F-6	SITE 3F-0.0-0.1	SITE 3F-7	SITE 2F-0.0-0.1
				10-OCT-2012 09:00	10-OCT-2012 09:10	10-OCT-2012 09:30	10-OCT-2012 09:40	10-OCT-2012 10:10
Compound	CAS Number	LOR	Unit	ES1224114-006	ES1224114-007	ES1224114-008	ES1224114-009	ES1224114-010
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	<5
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA								
Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP008: Chlorophyll a & Pheophytin a								
Chlorophyll a	----	1	mg/m ³	2	<1	1	<1	<1
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	0.017	0.024	0.026	0.025	0.007
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Nitrate as N	14797-55-8	0.002	mg/L	0.048	0.044	0.046	0.044	0.068
Nitrite + Nitrate as N	----	0.002	mg/L	0.048	0.044	0.046	0.044	0.068
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	0.06	0.08	0.31	0.17	0.14
Dissolved Total Nitrogen as N	----	0.01	mg/L	0.12	0.12	0.10	0.08	0.10
Total Nitrogen as N	----	0.01	mg/L	0.11	0.12	0.36	0.21	0.21
Reactive Phosphorus as P	----	0.001	mg/L	0.016	0.015	0.016	0.016	0.027
Dissolved Total Phosphorus as P	----	0.005	mg/L	0.020	0.020	0.015	0.018	0.052
Total Phosphorus as P	----	0.005	mg/L	0.040	0.035	0.058	0.050	0.052



Analytical Results

Sub-Matrix: WATER

Client sample ID

Client sampling date / time

Compound	CAS Number	LOR	Unit	SITE 1F-0.0-0.1	SITE QC1F	SITE QC2R	SITE 1R-0.0-0.1	SITE 2R-0.0-0.1
				10-OCT-2012 10:45	10-OCT-2012 10:50	10-OCT-2012 11:00	10-OCT-2012 12:10	10-OCT-2012 12:40
				ES1224114-011	ES1224114-012	ES1224114-013	ES1224114-014	ES1224114-015
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	<5
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA								
Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP008: Chlorophyll a & Pheophytin a								
Chlorophyll a	----	1	mg/m ³	<1	2	<1	<1	<1
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	0.010	0.007	0.030	0.006	0.007
Nitrite as N	----	0.002	mg/L	<0.002	0.002	<0.002	<0.002	<0.002
Nitrate as N	14797-55-8	0.002	mg/L	0.074	0.071	0.066	0.085	0.072
Nitrite + Nitrate as N	----	0.002	mg/L	0.074	0.073	0.066	0.085	0.072
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	0.12	0.13	<0.01	0.10	0.13
Dissolved Total Nitrogen as N	----	0.01	mg/L	0.17	0.21	<0.01	0.21	0.11
Total Nitrogen as N	----	0.01	mg/L	0.19	0.20	<0.01	0.19	0.20
Reactive Phosphorus as P	----	0.001	mg/L	0.034	0.034	0.004	0.031	0.027
Dissolved Total Phosphorus as P	----	0.005	mg/L	0.051	0.048	0.041	0.038	0.029
Total Phosphorus as P	----	0.005	mg/L	0.056	0.054	<0.005	0.048	0.050



Analytical Results

Sub-Matrix: WATER

Client sample ID

Client sampling date / time

Compound	CAS Number	LOR	Unit	SITE 3R-0.0-0.1	SITE 3R-7	SITE 4R-0.0-0.1	SITE 4R-7	SITE 5R-0.0-0.1
				10-OCT-2012 13:00	10-OCT-2012 13:15	10-OCT-2012 13:40	10-OCT-2012 13:50	10-OCT-2012 14:15
				ES1224114-016	ES1224114-017	ES1224114-018	ES1224114-019	ES1224114-020
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	<5
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA								
Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP008: Chlorophyll a & Pheophytin a								
Chlorophyll a	----	1	mg/m ³	1	1	<1	1	<1
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	0.022	0.025	0.035	0.015	0.010
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Nitrate as N	14797-55-8	0.002	mg/L	0.056	0.052	0.057	0.038	0.031
Nitrite + Nitrate as N	----	0.002	mg/L	0.056	0.052	0.057	0.038	0.031
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	0.07	0.09	0.12	0.04	0.10
Dissolved Total Nitrogen as N	----	0.01	mg/L	0.08	0.07	0.11	0.05	0.05
Total Nitrogen as N	----	0.01	mg/L	0.13	0.14	0.18	0.08	0.13
Reactive Phosphorus as P	----	0.001	mg/L	0.016	0.015	0.024	0.014	0.010
Dissolved Total Phosphorus as P	----	0.005	mg/L	0.025	0.017	0.031	0.023	0.020
Total Phosphorus as P	----	0.005	mg/L	0.038	0.031	0.053	0.034	0.035



Analytical Results

Sub-Matrix: WATER

Client sample ID

Client sampling date / time

				SITE 5R-8	SITE 6R-0.0-0.1	SITE 6R-2.5	SITE 7R-0.0-0.1	----
				10-OCT-2012 14:25	10-OCT-2012 14:40	10-OCT-2012 14:50	10-OCT-2012 15:15	----
Compound	CAS Number	LOR	Unit	ES1224114-021	ES1224114-022	ES1224114-023	ES1224114-024	----
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	<5	<5	<5	<5	----
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA								
Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
EP008: Chlorophyll a & Pheophytin a								
Chlorophyll a	----	1	mg/m ³	2	<1	3	3	----
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	0.011	0.010	0.010	<0.005	----
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	----
Nitrate as N	14797-55-8	0.002	mg/L	0.031	0.039	0.035	0.054	----
Nitrite + Nitrate as N	----	0.002	mg/L	0.031	0.039	0.035	0.054	----
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	0.06	0.24	0.04	0.08	----
Dissolved Total Nitrogen as N	----	0.01	mg/L	0.02	0.07	0.07	0.08	----
Total Nitrogen as N	----	0.01	mg/L	0.09	0.28	0.08	0.13	----
Reactive Phosphorus as P	----	0.001	mg/L	0.010	0.015	0.013	0.018	----
Dissolved Total Phosphorus as P	----	0.005	mg/L	0.019	0.026	0.024	0.024	----
Total Phosphorus as P	----	0.005	mg/L	0.028	0.036	0.022	0.034	----

Environmental Division

QUALITY CONTROL REPORT

Work Order	: ES1224114	Page	: 1 of 8
Client	: URS AUSTRALIA (VIC) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR HEATH FIDOCK	Contact	: Loren Schiavon
Address	: 155A HOGAN ST TATURA VIC, AUSTRALIA 3616	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: heath.fidock@urs.com	E-mail	: loren.schiavon@alsglobal.com
Telephone	: +61 03 5824 3322	Telephone	: +61 2 8784 8503
Facsimile	: +61 03 5824 3563	Facsimile	: +61 2 8784 8500
Project	: 43177771	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: NEWCASTLE		
C-O-C number	: ----	Date Samples Received	: 10-OCT-2012
Sampler	: ----	Issue Date	: 19-OCT-2012
Order number	: ----		
Quote number	: ME/465/12 V4	No. of samples received	: 24
		No. of samples analysed	: 24

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Ashesh Patel	Inorganic Chemist	Sydney Inorganics
Hoa Nguyen	Senior Inorganic Chemist	Sydney Inorganics
Sarah Millington	Senior Inorganic Chemist	Sydney Inorganics



General Comments

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

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

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

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

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
= Indicates failed QC

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Laboratory Duplicate (DUP) Report

Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA025: Suspended Solids (QC Lot: 2548296)									
ES1224191-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	92	86	6.7	0% - 50%
ES1224233-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	12	14	14.8	No Limit
EA025: Suspended Solids (QC Lot: 2548494)									
ES1224114-007	SITE 4F-6	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
ES1224178-004	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EA025: Suspended Solids (QC Lot: 2548768)									
ES1224114-015	SITE 2R-0.0-0.1	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EA025: Suspended Solids (QC Lot: 2549266)									
ES1224114-016	SITE 3R-0.0-0.1	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
ES1224230-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	5	<5	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 2540701)									
ES1224114-001	SITE 7F-0.0-0.1	EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.01	mg/L	0.18	0.15	17.0	0% - 50%
ES1224114-011	SITE 1F-0.0-0.1	EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.01	mg/L	0.17	0.16	9.0	0% - 50%
Ultra-Trace Nutrients (QC Lot: 2540702)									
ES1224114-001	SITE 7F-0.0-0.1	EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.005	mg/L	0.036	0.027	29.7	No Limit
ES1224114-011	SITE 1F-0.0-0.1	EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.005	mg/L	0.051	0.053	4.8	0% - 50%
Ultra-Trace Nutrients (QC Lot: 2540703)									
ES1224114-021	SITE 5R-8	EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.01	mg/L	0.02	0.03	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 2540704)									
ES1224114-021	SITE 5R-8	EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.005	mg/L	0.019	0.016	17.5	No Limit
Ultra-Trace Nutrients (QC Lot: 2540712)									
ES1224114-001	SITE 7F-0.0-0.1	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	0.050	0.051	3.2	0% - 50%
ES1224114-011	SITE 1F-0.0-0.1	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	0.056	0.055	0.0	0% - 50%
Ultra-Trace Nutrients (QC Lot: 2540713)									
ES1224114-001	SITE 7F-0.0-0.1	EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	0.16	0.13	22.3	0% - 50%
ES1224114-011	SITE 1F-0.0-0.1	EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	0.19	0.18	6.4	0% - 50%
Ultra-Trace Nutrients (QC Lot: 2540714)									
ES1224114-021	SITE 5R-8	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	0.028	0.026	6.0	No Limit
Ultra-Trace Nutrients (QC Lot: 2540715)									
ES1224114-021	SITE 5R-8	EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	0.09	0.06	33.9	No Limit
Ultra-Trace Nutrients (QC Lot: 2540719)									

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 Work Order : ES1224114
 Client : URS AUSTRALIA (VIC) PTY LTD
 Project : 43177771



Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
Ultra-Trace Nutrients (QC Lot: 2540719) - continued									
ES1224114-001	SITE 7F-0.0-0.1	EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	0.057	0.060	5.3	0% - 20%
ES1224114-011	SITE 1F-0.0-0.1	EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	0.074	0.074	0.0	0% - 20%
Ultra-Trace Nutrients (QC Lot: 2540720)									
ES1224114-001	SITE 7F-0.0-0.1	EK271A-CM: Reactive Phosphorus as P	----	0.001	mg/L	0.028	0.024	18.5	0% - 20%
ES1224114-011	SITE 1F-0.0-0.1	EK271A-CM: Reactive Phosphorus as P	----	0.001	mg/L	0.034	0.034	0.0	0% - 20%
Ultra-Trace Nutrients (QC Lot: 2540721)									
ES1224114-001	SITE 7F-0.0-0.1	EK257A-CM: Nitrite as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
ES1224114-011	SITE 1F-0.0-0.1	EK257A-CM: Nitrite as N	----	0.002	mg/L	<0.002	0.002	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 2540722)									
ES1224114-001	SITE 7F-0.0-0.1	EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	0.022	0.020	8.5	No Limit
ES1224114-011	SITE 1F-0.0-0.1	EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	0.010	0.010	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 2540723)									
ES1224114-021	SITE 5R-8	EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	0.031	0.032	4.4	0% - 50%
EW1202789-007	Anonymous	EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	0.005	0.007	42.6	No Limit
Ultra-Trace Nutrients (QC Lot: 2540724)									
ES1224114-021	SITE 5R-8	EK271A-CM: Reactive Phosphorus as P	----	0.001	mg/L	0.010	0.010	0.0	0% - 50%
EW1202789-007	Anonymous	EK271A-CM: Reactive Phosphorus as P	----	0.001	mg/L	0.013	0.013	0.0	0% - 50%
Ultra-Trace Nutrients (QC Lot: 2540725)									
ES1224114-021	SITE 5R-8	EK257A-CM: Nitrite as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
EW1202789-007	Anonymous	EK257A-CM: Nitrite as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 2540726)									
ES1224114-021	SITE 5R-8	EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	0.011	0.010	0.0	No Limit
EW1202789-007	Anonymous	EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	0.008	0.010	20.8	No Limit



Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result			LCS	Low
EA025: Suspended Solids (QCLot: 2548296)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	97.0	82	132
EA025: Suspended Solids (QCLot: 2548494)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	98.2	82	132
EA025: Suspended Solids (QCLot: 2548768)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	150 mg/L	97.3	82	132
EA025: Suspended Solids (QCLot: 2549266)								
EA025H: Suspended Solids (SS)	----	5	mg/L	<5	1000 mg/L	97.4	82	132
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA (QCLot: 2541901)								
EK069FG: Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	1.0 mg/L	81.0	70	130
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA (QCLot: 2541903)								
EK069FG: Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	1.0 mg/L	82.0	70	130
EP008: Chlorophyll a & Pheophytin a (QCLot: 2541938)								
EP008: Chlorophyll a	----	1	mg/m³	<1	20 mg/m³	100	61	131
EP008: Chlorophyll a & Pheophytin a (QCLot: 2541939)								
EP008: Chlorophyll a	----	1	mg/m³	<1	20 mg/m³	90.0	61	131
EP008: Chlorophyll a & Pheophytin a (QCLot: 2541948)								
EP008: Chlorophyll a	----	1	mg/m³	<1.0	20 mg/m³	100	61	131
Ultra-Trace Nutrients (QCLot: 2540701)								
EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.01	mg/L	<0.01	1.0 mg/L	77.8	76	106
Ultra-Trace Nutrients (QCLot: 2540702)								
EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.005	mg/L	<0.005	0.44 mg/L	86.4	77	99
Ultra-Trace Nutrients (QCLot: 2540703)								
EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.01	mg/L	<0.01	1.0 mg/L	76.0	76	106
Ultra-Trace Nutrients (QCLot: 2540704)								
EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.005	mg/L	<0.005	0.44 mg/L	92.4	77	99
Ultra-Trace Nutrients (QCLot: 2540712)								
EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	<0.005	0.44 mg/L	107	80	122
Ultra-Trace Nutrients (QCLot: 2540713)								
EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	<0.01	----	----	----	----
		0.05	mg/L	----	1.0 mg/L	74.5	73	109
Ultra-Trace Nutrients (QCLot: 2540714)								
EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	<0.005	0.44 mg/L	94.2	80	122



Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike Concentration	Spike Recovery (%) LCS	Recovery Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result			Low	High
Ultra-Trace Nutrients (QCLot: 2540715)								
EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	<0.01	----	----	----	----
		0.05	mg/L	----	1.0 mg/L	76.2	73	109
Ultra-Trace Nutrients (QCLot: 2540719)								
EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	0.1 mg/L	102	82	130
Ultra-Trace Nutrients (QCLot: 2540720)								
EK271A-CM: Reactive Phosphorus as P	----	0.001	mg/L	<0.001	0.1 mg/L	84.3	76	116
Ultra-Trace Nutrients (QCLot: 2540721)								
EK257A-CM: Nitrite as N	----	0.002	mg/L	<0.002	0.1 mg/L	101	91	133
Ultra-Trace Nutrients (QCLot: 2540722)								
EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.1 mg/L	96.1	68	130
Ultra-Trace Nutrients (QCLot: 2540723)								
EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	<0.002	0.1 mg/L	103	82	130
Ultra-Trace Nutrients (QCLot: 2540724)								
EK271A-CM: Reactive Phosphorus as P	----	0.001	mg/L	<0.001	0.1 mg/L	84.2	76	116
Ultra-Trace Nutrients (QCLot: 2540725)								
EK257A-CM: Nitrite as N	----	0.002	mg/L	<0.002	0.1 mg/L	101	91	133
Ultra-Trace Nutrients (QCLot: 2540726)								
EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	<0.005	0.1 mg/L	98.9	68	130

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery (%) MS	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number			Low	High
Ultra-Trace Nutrients (QCLot: 2540701)							
ES1224114-001	SITE 7F-0.0-0.1	EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.5 mg/L	73.0	70	130
Ultra-Trace Nutrients (QCLot: 2540702)							
ES1224114-001	SITE 7F-0.0-0.1	EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.5 mg/L	109	70	130
Ultra-Trace Nutrients (QCLot: 2540703)							
ES1224114-021	SITE 5R-8	EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.5 mg/L	88.2	70	130
Ultra-Trace Nutrients (QCLot: 2540704)							
ES1224114-021	SITE 5R-8	EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.5 mg/L	115	70	130
Ultra-Trace Nutrients (QCLot: 2540712)							
ES1224114-001	SITE 7F-0.0-0.1	EK267PA-CM: Total Phosphorus as P	----	0.5 mg/L	104	70	130

Sub-Matrix: WATER				Matrix Spike (MS) Report			
				Spike Concentration	Spike Recovery (%)	Recovery Limits (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	MS	Low	High	
Ultra-Trace Nutrients (QCLot: 2540713)							
ES1224114-001	SITE 7F-0.0-0.1	EK262PA-CM: Total Nitrogen as N	----	0.5 mg/L	74.2	70	130
Ultra-Trace Nutrients (QCLot: 2540714)							
ES1224114-021	SITE 5R-8	EK267PA-CM: Total Phosphorus as P	----	0.5 mg/L	115	70	130
Ultra-Trace Nutrients (QCLot: 2540715)							
ES1224114-021	SITE 5R-8	EK262PA-CM: Total Nitrogen as N	----	0.5 mg/L	113	70	130
Ultra-Trace Nutrients (QCLot: 2540719)							
ES1224114-001	SITE 7F-0.0-0.1	EK259A-CM: Nitrite + Nitrate as N	----	0.1 mg/L	116	70	130
Ultra-Trace Nutrients (QCLot: 2540720)							
ES1224114-001	SITE 7F-0.0-0.1	EK271A-CM: Reactive Phosphorus as P	----	0.1 mg/L	107	70	130
Ultra-Trace Nutrients (QCLot: 2540721)							
ES1224114-001	SITE 7F-0.0-0.1	EK257A-CM: Nitrite as N	----	0.1 mg/L	72.7	70	130
Ultra-Trace Nutrients (QCLot: 2540722)							
ES1224114-001	SITE 7F-0.0-0.1	EK255A-CM: Ammonia as N	7664-41-7	0.1 mg/L	72.1	70	130
Ultra-Trace Nutrients (QCLot: 2540723)							
ES1224114-021	SITE 5R-8	EK259A-CM: Nitrite + Nitrate as N	----	0.1 mg/L	117	70	130
Ultra-Trace Nutrients (QCLot: 2540724)							
ES1224114-021	SITE 5R-8	EK271A-CM: Reactive Phosphorus as P	----	0.1 mg/L	111	70	130
Ultra-Trace Nutrients (QCLot: 2540725)							
ES1224114-021	SITE 5R-8	EK257A-CM: Nitrite as N	----	0.1 mg/L	76.2	70	130
Ultra-Trace Nutrients (QCLot: 2540726)							
ES1224114-021	SITE 5R-8	EK255A-CM: Ammonia as N	7664-41-7	0.1 mg/L	74.6	70	130

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

The quality control term Matrix Spike (MS) and Matrix Spike Duplicate (MSD) refers to intralaboratory split samples spiked with a representative set of target analytes. The purpose of these QC parameters are to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: WATER				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
					MS	MSD	Low	High	Value	Control Lim
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number							
Ultra-Trace Nutrients (QCLot: 2540701)										
ES1224114-001	SITE 7F-0.0-0.1	EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.5 mg/L	73.0	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2540702)										
ES1224114-001	SITE 7F-0.0-0.1	EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.5 mg/L	109	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2540703)										

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 Client : URS AUSTRALIA (VIC) PTY LTD
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Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number		MS	MSD	Low	High	Value	Control Limit
Ultra-Trace Nutrients (QCLot: 2540703) - continued										
ES1224114-021	SITE 5R-8	EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.5 mg/L	88.2	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2540704)										
ES1224114-021	SITE 5R-8	EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.5 mg/L	115	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2540712)										
ES1224114-001	SITE 7F-0.0-0.1	EK267PA-CM: Total Phosphorus as P	----	0.5 mg/L	104	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2540713)										
ES1224114-001	SITE 7F-0.0-0.1	EK262PA-CM: Total Nitrogen as N	----	0.5 mg/L	74.2	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2540714)										
ES1224114-021	SITE 5R-8	EK267PA-CM: Total Phosphorus as P	----	0.5 mg/L	115	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2540715)										
ES1224114-021	SITE 5R-8	EK262PA-CM: Total Nitrogen as N	----	0.5 mg/L	113	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2540719)										
ES1224114-001	SITE 7F-0.0-0.1	EK259A-CM: Nitrite + Nitrate as N	----	0.1 mg/L	116	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2540720)										
ES1224114-001	SITE 7F-0.0-0.1	EK271A-CM: Reactive Phosphorus as P	----	0.1 mg/L	107	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2540721)										
ES1224114-001	SITE 7F-0.0-0.1	EK257A-CM: Nitrite as N	----	0.1 mg/L	72.7	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2540722)										
ES1224114-001	SITE 7F-0.0-0.1	EK255A-CM: Ammonia as N	7664-41-7	0.1 mg/L	72.1	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2540723)										
ES1224114-021	SITE 5R-8	EK259A-CM: Nitrite + Nitrate as N	----	0.1 mg/L	117	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2540724)										
ES1224114-021	SITE 5R-8	EK271A-CM: Reactive Phosphorus as P	----	0.1 mg/L	111	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2540725)										
ES1224114-021	SITE 5R-8	EK257A-CM: Nitrite as N	----	0.1 mg/L	76.2	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2540726)										
ES1224114-021	SITE 5R-8	EK255A-CM: Ammonia as N	7664-41-7	0.1 mg/L	74.6	----	70	130	----	----

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: ES1224114	Page	: 1 of 10
Client	: URS AUSTRALIA (VIC) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR HEATH FIDOCK	Contact	: Loren Schiavon
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Project	: 43177771	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: NEWCASTLE		
C-O-C number	: ----	Date Samples Received	: 10-OCT-2012
Sampler	: ----	Issue Date	: 19-OCT-2012
Order number	: ----		
Quote number	: ME/465/12 V4	No. of samples received	: 24
		No. of samples analysed	: 24

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers



Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non-volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA025: Suspended Solids									
Clear Plastic Bottle - Natural (EA025H)	SITE 7F-0.0-0.1, SITE 6F-2, SITE 5F-8, SITE 4F-6, SITE 3F-7, SITE 1F-0.0-0.1, SITE QC2R, SITE 2R-0.0-0.1, SITE 3R-7, SITE 4R-7, SITE 5R-8, SITE 6R-2.5,	SITE 6F-0.0-0.1, SITE 5F-0.0-0.1, SITE 4F-0.0-0.1, SITE 3F-0.0-0.1, SITE 2F-0.0-0.1, SITE QC1F, SITE 1R-0.0-0.1, SITE 3R-0.0-0.1, SITE 4R-0.0-0.1, SITE 5R-0.0-0.1, SITE 6R-0.0-0.1, SITE 7R-0.0-0.1	10-OCT-2012	---	17-OCT-2012	----	16-OCT-2012	17-OCT-2012	✓
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA									
Clear Plastic Bottle - Natural (EK069FG)	SITE 7F-0.0-0.1, SITE 6F-2, SITE 5F-8, SITE 4F-6, SITE 3F-7, SITE 1F-0.0-0.1, SITE QC2R, SITE 2R-0.0-0.1, SITE 3R-7, SITE 4R-7, SITE 5R-8, SITE 6R-2.5,	SITE 6F-0.0-0.1, SITE 5F-0.0-0.1, SITE 4F-0.0-0.1, SITE 3F-0.0-0.1, SITE 2F-0.0-0.1, SITE QC1F, SITE 1R-0.0-0.1, SITE 3R-0.0-0.1, SITE 4R-0.0-0.1, SITE 5R-0.0-0.1, SITE 6R-0.0-0.1, SITE 7R-0.0-0.1	10-OCT-2012	11-OCT-2012	12-OCT-2012	✓	11-OCT-2012	12-OCT-2012	✓



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
Ultra-Trace Nutrients							
Clear Plastic - Filtered (AS) - for UT Nut. (EK255A-CM) SITE 7F-0.0-0.1, SITE 6F-2, SITE 5F-8, SITE 4F-6, SITE 3F-7, SITE 1F-0.0-0.1, SITE QC2R, SITE 2R-0.0-0.1, SITE 3R-7, SITE 4R-7, SITE 5R-8, SITE 6R-2.5, SITE 6F-0.0-0.1, SITE 5F-0.0-0.1, SITE 4F-0.0-0.1, SITE 3F-0.0-0.1, SITE 2F-0.0-0.1, SITE QC1F, SITE 1R-0.0-0.1, SITE 3R-0.0-0.1, SITE 4R-0.0-0.1, SITE 5R-0.0-0.1, SITE 6R-0.0-0.1, SITE 7R-0.0-0.1	10-OCT-2012	---	11-OCT-2012	----	10-OCT-2012	11-OCT-2012	✔
Ultra-Trace Nutrients							
Clear Plastic - Filtered (AS) - for UT Nut. (EK257A-CM) SITE 7F-0.0-0.1, SITE 6F-2, SITE 5F-8, SITE 4F-6, SITE 3F-7, SITE 1F-0.0-0.1, SITE QC2R, SITE 2R-0.0-0.1, SITE 3R-7, SITE 4R-7, SITE 5R-8, SITE 6R-2.5, SITE 6F-0.0-0.1, SITE 5F-0.0-0.1, SITE 4F-0.0-0.1, SITE 3F-0.0-0.1, SITE 2F-0.0-0.1, SITE QC1F, SITE 1R-0.0-0.1, SITE 3R-0.0-0.1, SITE 4R-0.0-0.1, SITE 5R-0.0-0.1, SITE 6R-0.0-0.1, SITE 7R-0.0-0.1	10-OCT-2012	---	11-OCT-2012	----	10-OCT-2012	11-OCT-2012	✔
Ultra-Trace Nutrients							
Clear Plastic - Filtered (AS) - for UT Nut. (EK259A-CM) SITE 7F-0.0-0.1, SITE 6F-2, SITE 5F-8, SITE 4F-6, SITE 3F-7, SITE 1F-0.0-0.1, SITE QC2R, SITE 2R-0.0-0.1, SITE 3R-7, SITE 4R-7, SITE 5R-8, SITE 6R-2.5, SITE 6F-0.0-0.1, SITE 5F-0.0-0.1, SITE 4F-0.0-0.1, SITE 3F-0.0-0.1, SITE 2F-0.0-0.1, SITE QC1F, SITE 1R-0.0-0.1, SITE 3R-0.0-0.1, SITE 4R-0.0-0.1, SITE 5R-0.0-0.1, SITE 6R-0.0-0.1, SITE 7R-0.0-0.1	10-OCT-2012	---	11-OCT-2012	----	10-OCT-2012	11-OCT-2012	✔



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
Ultra-Trace Nutrients							
Clear Plastic Bottle - Natural (AS) (EK262PA-CM) SITE 7F-0.0-0.1, SITE 6F-2, SITE 5F-8, SITE 4F-6, SITE 3F-7, SITE 1F-0.0-0.1, SITE QC2R, SITE 2R-0.0-0.1, SITE 3R-7, SITE 4R-7, SITE 5R-8, SITE 6R-2.5, SITE 6F-0.0-0.1, SITE 5F-0.0-0.1, SITE 4F-0.0-0.1, SITE 3F-0.0-0.1, SITE 2F-0.0-0.1, SITE QC1F, SITE 1R-0.0-0.1, SITE 3R-0.0-0.1, SITE 4R-0.0-0.1, SITE 5R-0.0-0.1, SITE 6R-0.0-0.1, SITE 7R-0.0-0.1	10-OCT-2012	10-OCT-2012	11-OCT-2012	✔	10-OCT-2012	11-OCT-2012	✔
Ultra-Trace Nutrients							
Clear Plastic - Filtered (AS) - for UT Nut. (EK262PA-F-CM) SITE 7F-0.0-0.1, SITE 6F-2, SITE 5F-8, SITE 4F-6, SITE 3F-7, SITE 1F-0.0-0.1, SITE QC2R, SITE 2R-0.0-0.1, SITE 3R-7, SITE 4R-7, SITE 5R-8, SITE 6R-2.5, SITE 6F-0.0-0.1, SITE 5F-0.0-0.1, SITE 4F-0.0-0.1, SITE 3F-0.0-0.1, SITE 2F-0.0-0.1, SITE QC1F, SITE 1R-0.0-0.1, SITE 3R-0.0-0.1, SITE 4R-0.0-0.1, SITE 5R-0.0-0.1, SITE 6R-0.0-0.1, SITE 7R-0.0-0.1	10-OCT-2012	10-OCT-2012	11-OCT-2012	✔	10-OCT-2012	11-OCT-2012	✔
Ultra-Trace Nutrients							
Clear Plastic Bottle - Natural (AS) (EK267PA-CM) SITE 7F-0.0-0.1, SITE 6F-2, SITE 5F-8, SITE 4F-6, SITE 3F-7, SITE 1F-0.0-0.1, SITE QC2R, SITE 2R-0.0-0.1, SITE 3R-7, SITE 4R-7, SITE 5R-8, SITE 6R-2.5, SITE 6F-0.0-0.1, SITE 5F-0.0-0.1, SITE 4F-0.0-0.1, SITE 3F-0.0-0.1, SITE 2F-0.0-0.1, SITE QC1F, SITE 1R-0.0-0.1, SITE 3R-0.0-0.1, SITE 4R-0.0-0.1, SITE 5R-0.0-0.1, SITE 6R-0.0-0.1, SITE 7R-0.0-0.1	10-OCT-2012	10-OCT-2012	11-OCT-2012	✔	10-OCT-2012	11-OCT-2012	✔



Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
Ultra-Trace Nutrients							
Clear Plastic - Filtered (AS) - for UT Nut. (EK267PA-F-CM)	10-OCT-2012	10-OCT-2012	11-OCT-2012	✔	10-OCT-2012	11-OCT-2012	✔
SITE 7F-0.0-0.1, SITE 6F-2, SITE 5F-8, SITE 4F-6, SITE 3F-7, SITE 1F-0.0-0.1, SITE QC2R, SITE 2R-0.0-0.1, SITE 3R-7, SITE 4R-7, SITE 5R-8, SITE 6R-2.5,	SITE 6F-0.0-0.1, SITE 5F-0.0-0.1, SITE 4F-0.0-0.1, SITE 3F-0.0-0.1, SITE 2F-0.0-0.1, SITE QC1F, SITE 1R-0.0-0.1, SITE 3R-0.0-0.1, SITE 4R-0.0-0.1, SITE 5R-0.0-0.1, SITE 6R-0.0-0.1, SITE 7R-0.0-0.1						
Ultra-Trace Nutrients							
Clear Plastic - Filtered (AS) - for UT Nut. (EK271A-CM)	10-OCT-2012	---	11-OCT-2012	----	10-OCT-2012	11-OCT-2012	✔
SITE 7F-0.0-0.1, SITE 6F-2, SITE 5F-8, SITE 4F-6, SITE 3F-7, SITE 1F-0.0-0.1, SITE QC2R, SITE 2R-0.0-0.1, SITE 3R-7, SITE 4R-7, SITE 5R-8, SITE 6R-2.5,	SITE 6F-0.0-0.1, SITE 5F-0.0-0.1, SITE 4F-0.0-0.1, SITE 3F-0.0-0.1, SITE 2F-0.0-0.1, SITE QC1F, SITE 1R-0.0-0.1, SITE 3R-0.0-0.1, SITE 4R-0.0-0.1, SITE 5R-0.0-0.1, SITE 6R-0.0-0.1, SITE 7R-0.0-0.1						
EP008: Chlorophyll a & Pheophytin a							
White Plastic Bottle - Unpreserved (EP008)	10-OCT-2012	----	----	----	11-OCT-2012	12-OCT-2012	✔
SITE 7F-0.0-0.1, SITE 6F-2, SITE 5F-8, SITE 4F-6, SITE 3F-7, SITE 1F-0.0-0.1, SITE QC2R, SITE 2R-0.0-0.1, SITE 3R-7, SITE 4R-7, SITE 5R-8, SITE 6R-2.5,	SITE 6F-0.0-0.1, SITE 5F-0.0-0.1, SITE 4F-0.0-0.1, SITE 3F-0.0-0.1, SITE 2F-0.0-0.1, SITE QC1F, SITE 1R-0.0-0.1, SITE 3R-0.0-0.1, SITE 4R-0.0-0.1, SITE 5R-0.0-0.1, SITE 6R-0.0-0.1, SITE 7R-0.0-0.1						

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER** Evaluation: **x** = Quality Control frequency not within specification ; **✓** = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	4	31	12.9	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Nitrogen as N (Persulfate) - UT for CM	EK262PA-F-CM	3	24	12.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Phosphorus (Persulfate) - UT for CM	EK267PA-F-CM	3	24	12.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	4	25	16.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	4	31	12.9	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	4	32	12.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	7	60	11.7	9.5	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	3	24	12.5	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	3	25	12.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	2	31	6.5	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a and Pheophytin a	EP008	3	40	7.5	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Acid Hydrolyzable Phosphorus as P by DA	EK069FG	2	24	8.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Nitrogen as N (Persulfate) - UT for CM	EK262PA-F-CM	4	24	16.7	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Phosphorus (Persulfate) - UT for CM	EK267PA-F-CM	4	24	16.7	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	2	25	8.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	2	31	6.5	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	2	32	6.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	8	60	13.3	9.5	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	2	24	8.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	2	25	8.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	2	31	6.5	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a and Pheophytin a	EP008	3	40	7.5	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Acid Hydrolyzable Phosphorus as P by DA	EK069FG	2	24	8.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Nitrogen as N (Persulfate) - UT for CM	EK262PA-F-CM	2	24	8.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Phosphorus (Persulfate) - UT for CM	EK267PA-F-CM	2	24	8.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	2	25	8.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	2	31	6.5	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	2	32	6.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	4	60	6.7	4.8	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	2	24	8.3	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	2	25	8.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							



Matrix: **WATER**

Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Matrix Spikes (MS) - Continued							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	2	31	6.5	5.0	✔	ALS QCS3 requirement
Dissolved Total Nitrogen as N (Persulfate) - UT for CM	EK262PA-F-CM	2	24	8.3	5.0	✔	ALS QCS3 requirement
Dissolved Total Phosphorus (Persulfate) - UT for CM	EK267PA-F-CM	2	24	8.3	5.0	✔	ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	2	25	8.0	5.0	✔	ALS QCS3 requirement
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	2	31	6.5	5.0	✔	ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	2	32	6.3	5.0	✔	ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	2	24	8.3	5.0	✔	ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	2	25	8.0	5.0	✔	ALS QCS3 requirement



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Suspended Solids (High Level)	EA025H	WATER	In-House, APHA 21st ed., 2540D A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Acid Hydrolyzable Phosphorus as P by DA	EK069FG	WATER	APHA 21st ed., 4500-P B&G. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	WATER	APHA 21st ed., 4500-NH3 H Ammonia is determined by direct colorimetry by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by FIA.
Nitrate as N - Ultra-Trace for Catchment Monitoring	EK258A-CM	WATER	APHA 21st ed., 4500-NO3- I Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by FIA. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results.
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	WATER	APHA 21st ed., 4500-NO3- I. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by FIA.
TKN (Total N - NOx-N). (FIA - UT) for Catchment Monitoring	EK261PA-CM	WATER	APHA 21st ed., 4500-P J. & 4500-NO3- I . Calculated by difference from total Nitrogen and NOx. Contributing method parameters are determined by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Nitrogen as N (Persulfate digestion) -Ultra-Trace - CM	EK262PA-CM	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Total Nitrogen as N (Persulfate) - UT for CM	EK262PA-F-CM	WATER	APHA 21st ed., 4500-P J. Dissolved forms of Total Nitrogen is digested in a 0.45um filtered sample by Persulfate Method (Simultaneous Determination of Total Nitrogen and Total Phosphorus). As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Total Phosphorus (Persulfate) - UT for CM	EK267PA-F-CM	WATER	APHA 21st ed., 4500-P J. Dissolved forms of Total Phosphorus is digested in a 0.45um filtered sample by Persulfate Method (Simultaneous Determination of Total Nitrogen and Total Phosphorus). As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	WATER	APHA 21st ed., 4500-P E Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chlorophyll a and Pheophytin a	EP008	WATER	In-house (APHA 21st ed., 10200 H mod.) The pigments are extracted into aqueous acetone. The optical density of the extract before and after acidification at both 664 nm and 665 nm is determined spectrometrically.

Preparation Methods	Method	Matrix	Method Descriptions

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Client : URS AUSTRALIA (VIC) PTY LTD
Project : 43177771



Preparation Methods	Method	Matrix	Method Descriptions
Total Acid Hydrolysable Phosphorus as P	EK069-PR	WATER	APHA 21st ed., 4500 P - B&G. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Persulfate Digestion for UT Dissolved TN and TP for FIA fin	EK262/267-PA F Prep	WATER	APHA 21st ed., 4500 P - J. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)



Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- For all matrices, no Method Blank value outliers occur.
- For all matrices, no Duplicate outliers occur.
- For all matrices, no Laboratory Control outliers occur.
- For all matrices, no Matrix Spike outliers occur.

Regular Sample Surrogates

- For all regular sample matrices, no surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

- No Analysis Holding Time Outliers exist.

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- No Quality Control Sample Frequency Outliers exist.

CHAIN OF CUSTODY DOCUMENTATION - Falling Tide

COC Page 1 of 2



Australian Laboratory Services Pty Ltd

CLIENT: URS VIC	SAMPLER:
ADDRESS / OFFICE: Level 6, Southbank Boulevard, Southbank, Vic 3006	MOBILE: 0438 098 066
PROJECT MANAGER (PM): Heath Fidock	PHONE: 03-5824 6110
PROJECT ID: 43177771	EMAIL REPORT TO: Heath Fidock, Peter McGowan
SITE: Newcastle	EMAIL INVOICE TO: heath.fidock@urs.com
P.O. NO:	

RESULTS REQUIRED (Date): 5 DAY TAT QUOTE NO.: ME-465-12 V4

FOR LABORATORY USE ONLY

COOLER SEAL (circle appropriate):

Intact ☒ Yes ☐ No ☐ N/A

SAMPLE TEMPERATURE: 3.6°C

CHILLED ☒ Yes ☐ No

COMMENTS:

Analyse within 24hr

ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)

Notes:

Falling Tide Samples

Field filtered - mark on label

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Total bottles	UTN-04 (TN, TP, NH3, TKN, NOx, NO2, NO3, React P)	EK262PA-F-CM (Total Dissolved N)	EK267PA-F-CM (Total Dissolved P)	EK069FG* (Dissolved Acid Hydrolyzable P)	EP008 (Chlorophyll)	EA025H (TSS)
1	Site 7_F 0.0 - 0.1	W	10/10	7:00	6	x	x	x	x	x	x
2	Site 6_F 0.0 - 0.1	W	10/10	8:00	6	x	x	x	x	x	x
3	Site 6_F 2 -	W	10/10	8:10	6	x	x	x	x	x	x
4	Site 5_F 0.0 - 0.1	W	"	8:30	6	x	x	x	x	x	x
5	Site 5_F 8 -	W	"	8:40	6	x	x	x	x	x	x
6	Site 4_F 0.0 - 0.1	W	"	9:00	6	x	x	x	x	x	x
7	Site 4_F 6 -	W	"	9:10	6	x	x	x	x	x	x
8	Site 3_F 0.0 - 0.1	W	"	9:30	6	x	x	x	x	x	x
9	Site 3_F 1 -	W	"	9:40	6	x	x	x	x	x	x
10	Site 2_F 0.0 - 0.1	W	"	10:10	6	x	x	x	x	x	x
11	Site 1_F 0.0 - 0.1	W	"	10:45	6	x	x	x	x	x	x
12	Site 01_F -	W	"	10:50	6	x	x	x	x	x	x

Environmental Division
Sydney
Work Order
ES1224114



Telephone : + 61-2-8784 8555

RELINQUISHED BY:

RECEIVED BY:

METHOD OF SHIPMENT

Name: <u>Sharon Doyle</u>	Date: <u>10/10/12</u>	Name: <u>Bea</u>	Date: <u>10/10/12</u>
Of:	Time: <u>16:20</u>	Of: <u>ALS</u>	Time: <u>16:20</u>
Name:	Date:	Name: <u>Sebastian</u>	Date: <u>10-10-12</u>
Of:	Time:	Of: <u>W</u>	Time: <u>12:00</u>

Water Containers required:

Filtered samples will require field filtration to fill 1 x 125 ml green unpreserved plastic, 1 x 60 ml turquoise and white stripe unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.
Unfiltered sample will require 1 x 1 lt green unpreserved plastic (solid white), 1 x 500 ml green unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

CHAIN OF CUSTODY DOCUMENTATION - Rising Tide

COC Page 2 of 2



Australian Laboratory Services Pty Ltd

CLIENT: URS VIC

ADDRESS / OFFICE: Level 6, Southbank Boulevard, Southbank, Vic 3006

PROJECT MANAGER (PM): Heath Fidock

PROJECT ID: 43177771

SITE: Newcastle

P.O. NO:

RESULTS REQUIRED (Date): 5 DAY TAT

QUOTE NO.: ME-465-12 V4

SAMPLER:

MOBILE: 0438 098 066

PHONE: 03-5824 6110

EMAIL REPORT TO: Heath Fidock, Peter McGowan

EMAIL INVOICE TO: heath.fidock@urs.com

ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)

FOR LABORATORY USE ONLY

COOLER SEAL (circle appropriate)

Intact ☒ Yes ☐ No ☐ N/A

SAMPLE TEMPERATURE 36.0

CHILLED: ☒ Yes ☐ No

COMMENTS:

Analyse within 24hr

Notes:

Rising Tide Samples

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Total bottles	UTN-04 (TN, TP, NH ₃ , TKN, NO _x , NO ₂ , NO ₃ , Reac.P.)	EK262PA-F-CM (Total Dissolved N)	EK267PA-F-CM (Total Dissolved P)	EK069FG* (Dissolved Acid Hydrolyzable P)	EP008 (Chlorophyll)	EA025H (TSS)	Field filtered - mark on label
13	Site <u>2</u> R <u>0</u> - <u>0.1</u>	W	<u>10/10</u>	<u>11:00</u>	<u>6</u>	x	x	x	x	x	x	
14	Site <u>1</u> R <u>0</u> - <u>0.1</u>	W	<u>10/10</u>	<u>12:10</u>	<u>6</u>	x	x	x	x	x	x	
15	Site <u>2</u> R <u>0</u> - <u>0.1</u>	W	<u>10/10</u>	<u>12:40</u>	<u>6</u>	x	x	x	x	x	x	
16	Site <u>3</u> R <u>0</u> - <u>0.1</u>	W	<u>10/10</u>	<u>13:00</u>	<u>6</u>	x	x	x	x	x	x	
17	Site <u>3</u> R <u>7</u> - <u>0.1</u>	W	<u>10/10</u>	<u>13:15</u>	<u>6</u>	x	x	x	x	x	x	
18	Site <u>4</u> R <u>0</u> - <u>0.1</u>	W	<u>10/10</u>	<u>13:40</u>	<u>6</u>	x	x	x	x	x	x	
19	Site <u>4</u> R <u>7</u> - <u>0.1</u>	W	<u>10/10</u>	<u>13:50</u>	<u>6</u>	x	x	x	x	x	x	
20	Site <u>5</u> R <u>0</u> - <u>0.1</u>	W	<u>10/10</u>	<u>14:15</u>	<u>6</u>	x	x	x	x	x	x	
21	Site <u>5</u> R <u>8</u> - <u>0.1</u>	W	<u>10/10</u>	<u>14:25</u>	<u>6</u>	x	x	x	x	x	x	
22	Site <u>6</u> R <u>0</u> - <u>0.1</u>	W	<u>10/10</u>	<u>14:40</u>	<u>6</u>	x	x	x	x	x	x	
23	Site <u>6</u> R <u>2.5</u> - <u>0.1</u>	W	<u>10/10</u>	<u>14:50</u>	<u>6</u>	x	x	x	x	x	x	
24	Site <u>7</u> R <u>0</u> - <u>0.1</u>	W	<u>10/10</u>	<u>15:15</u>	<u>6</u>	x	x	x	x	x	x	

RELINQUISHED BY:

Name: Shawn O'Neil

Date: 10/10/12

Of:

Time: 16:20

Name:

Date:

Of:

Time:

RECEIVED BY:

Name: Bea

Date: 10-10

Of:

Time: 16:20

Name: Sally

Date: 10/10/12

Of:

Time: 1900

METHOD OF SHIPMENT

ALS Internal Courier

Water Containers required:

Filtered samples will require field filtration to fill 1 x 125 ml green unpreserved plastic, 1 x 60 ml turquoise and white stripe unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

Unfiltered sample will require 1 x 1 lt green unpreserved plastic (solid white), 1 x 500 ml green unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: ES1223028	Page	: 1 of 5
Amendment	: 1		
Client	: URS AUSTRALIA (VIC) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR HEATH FIDOCK	Contact	: Loren Schiavon
Address	: 155A HOGAN ST TATURA VIC, AUSTRALIA 3616	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: heath.fidock@urs.com	E-mail	: loren.schiavon@alsglobal.com
Telephone	: +61 03 5824 3322	Telephone	: +61 2 8784 8503
Facsimile	: +61 03 5824 3563	Facsimile	: +61 2 8784 8500
Project	: 43177771	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 26-SEP-2012
Sampler	: H.F	Issue Date	: 27-FEB-2013
Site	: NEWCASTLE		
Quote number	: ME/465/12 V4	No. of samples received	: 12
		No. of samples analysed	: 12

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Hoa Nguyen	Senior Inorganic Chemist	Sydney Inorganics
Sarah Millington	Senior Inorganic Chemist	Sydney Inorganics



General Comments

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

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

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

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

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

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.

LOR = Limit of reporting

^ = This result is computed from individual analyte detections at or above the level of reporting

- It has been noted that FTN is greater than TN in various samples , however this difference is within the limits of experimental variation.
- This report has been amended to correct a false holding time breach for Dissolved Acid Hydrolysable Phosphorous.



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				SITE 1R 0-0.1	SITE 1R 0-0.1	SITE 2R 0-0.1	SITE 3R 0-0.1	SITE 3R 6.5
				26-SEP-2012 12:15	26-SEP-2012 12:30	26-SEP-2012 12:45	26-SEP-2012 13:05	26-SEP-2012 13:20
Compound	CAS Number	LOR	Unit	ES1223028-001	ES1223028-002	ES1223028-003	ES1223028-004	ES1223028-005
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	6	<5	<5	<5	<5
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA								
Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP008: Chlorophyll a & Pheophytin a								
Chlorophyll a	----	1	mg/m ³	<1	<1	<1	<1	<1
Volume	----	0.01	L	1	0.75	1	1	1
Volume Extract	----	0.01	mL	10	10	10	10	10
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	0.017	0.008	<0.005	0.020	0.021
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Nitrate as N	14797-55-8	0.002	mg/L	0.029	0.026	0.060	0.053	0.052
Nitrite + Nitrate as N	----	0.002	mg/L	0.029	0.026	0.060	0.053	0.052
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	0.25	0.22	0.08	0.07	0.05
Dissolved Total Nitrogen as N	----	0.01	mg/L	0.29	0.22	0.15	0.13	0.12
Total Nitrogen as N	----	0.01	mg/L	0.28	0.25	0.14	0.12	0.10
Reactive Phosphorus as P	----	0.001	mg/L	0.028	0.029	0.024	0.016	0.014
Dissolved Total Phosphorus as P	----	0.005	mg/L	0.039	0.032	0.033	0.024	0.021
Total Phosphorus as P	----	0.005	mg/L	0.064	0.053	0.047	0.034	0.031



Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

Client sample ID

Client sampling date / time

				SITE 4R 0-0.1	SITE4R 7.5	SITE 5R 0-0.1	SITE 5R 1	SITE 6R 0-0.1
				26-SEP-2012 13:35	26-SEP-2012 13:45	26-SEP-2012 14:10	26-SEP-2012 14:15	26-SEP-2012 14:30
Compound	CAS Number	LOR	Unit	ES1223028-006	ES1223028-007	ES1223028-008	ES1223028-009	ES1223028-010
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	----	<5	<5	<5	8
Suspended Solids (SS)	----	5	mg/L	<5	----	----	----	----
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA								
Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EP008: Chlorophyll a & Pheophytin a								
Chlorophyll a	----	1	mg/m ³	<1	<1	<1	<1	<1
Volume	----	0.01	L	1	1	1	1	1
Volume Extract	----	0.01	mL	10	10	10	10	10
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	0.022	0.038	0.026	0.034	0.022
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	<0.002	<0.002	<0.002
Nitrate as N	14797-55-8	0.002	mg/L	0.057	0.065	0.050	0.049	0.050
Nitrite + Nitrate as N	----	0.002	mg/L	0.057	0.065	0.050	0.049	0.050
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	0.14	0.04	0.09	0.07	0.08
Dissolved Total Nitrogen as N	----	0.01	mg/L	0.19	0.12	0.16	0.09	0.15
Total Nitrogen as N	----	0.01	mg/L	0.20	0.11	0.14	0.12	0.13
Reactive Phosphorus as P	----	0.001	mg/L	0.017	0.015	0.021	0.014	0.017
Dissolved Total Phosphorus as P	----	0.005	mg/L	0.024	0.021	0.038	0.022	0.026
Total Phosphorus as P	----	0.005	mg/L	0.037	0.029	0.035	0.036	0.042



Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Client sample ID

Client sampling date / time

				SITE 6R 2	SITE 7R 0-0.1	----	----	----
				26-SEP-2012 14:45	26-SEP-2012 15:00	----	----	----
Compound	CAS Number	LOR	Unit	ES1223028-011	ES1223028-012	----	----	----
EA025: Suspended Solids								
Suspended Solids (SS)	----	5	mg/L	<5	<5	----	----	----
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA								
Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	----	----	----
EP008: Chlorophyll a & Pheophytin a								
Chlorophyll a	----	1	mg/m ³	<1	<1	----	----	----
Volume	----	0.01	L	1	1	----	----	----
Volume Extract	----	0.01	mL	10	10	----	----	----
Ultra-Trace Nutrients								
Ammonia as N	7664-41-7	0.005	mg/L	0.021	0.005	----	----	----
Nitrite as N	----	0.002	mg/L	<0.002	<0.002	----	----	----
Nitrate as N	14797-55-8	0.002	mg/L	0.047	0.046	----	----	----
Nitrite + Nitrate as N	----	0.002	mg/L	0.047	0.046	----	----	----
Total Kjeldahl Nitrogen as N	----	0.01	mg/L	0.07	0.11	----	----	----
Dissolved Total Nitrogen as N	----	0.01	mg/L	0.15	0.19	----	----	----
Total Nitrogen as N	----	0.01	mg/L	0.12	0.16	----	----	----
Reactive Phosphorus as P	----	0.001	mg/L	0.016	0.020	----	----	----
Dissolved Total Phosphorus as P	----	0.005	mg/L	0.025	0.029	----	----	----
Total Phosphorus as P	----	0.005	mg/L	0.044	0.045	----	----	----

Environmental Division

QUALITY CONTROL REPORT

Work Order	: ES1223028	Page	: 1 of 6
Amendment	: 1		
Client	: URS AUSTRALIA (VIC) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR HEATH FIDOCK	Contact	: Loren Schiavon
Address	: 155A HOGAN ST TATURA VIC, AUSTRALIA 3616	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
E-mail	: heath.fidock@urs.com	E-mail	: loren.schiavon@alsglobal.com
Telephone	: +61 03 5824 3322	Telephone	: +61 2 8784 8503
Facsimile	: +61 03 5824 3563	Facsimile	: +61 2 8784 8500
Project	: 43177771	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: NEWCASTLE		
C-O-C number	: ----	Date Samples Received	: 26-SEP-2012
Sampler	: H.F	Issue Date	: 27-FEB-2013
Order number	: ----		
Quote number	: ME/465/12 V4	No. of samples received	: 12
		No. of samples analysed	: 12

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits



NATA Accredited Laboratory 825

Accredited for compliance with
ISO/IEC 17025.

Signatories

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

Signatories	Position	Accreditation Category
Ankit Joshi	Inorganic Chemist	Sydney Inorganics
Hoa Nguyen	Senior Inorganic Chemist	Sydney Inorganics
Sarah Millington	Senior Inorganic Chemist	Sydney Inorganics



General Comments

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

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

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

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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
 CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
 LOR = Limit of reporting
 RPD = Relative Percentage Difference
 # = Indicates failed QC



Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR:- No Limit; Result between 10 and 20 times LOR:- 0% - 50%; Result > 20 times LOR:- 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EA025: Suspended Solids (QC Lot: 2525678)									
ES1223012-001	Anonymous	EA025H: Suspended Solids (SS)	----	5	mg/L	93	57	48.0	0% - 20%
ES1223028-007	SITE4R 7.5	EA025H: Suspended Solids (SS)	----	5	mg/L	<5	<5	0.0	No Limit
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA (QC Lot: 2522264)									
ES1223028-001	SITE 1R 0-0.1	EK069FG: Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
ES1223028-011	SITE 6R 2	EK069FG: Dissolved Acid Hydrol. Phos. as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 2519465)									
ES1223028-001	SITE 1R 0-0.1	EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	0.029	0.027	7.5	0% - 20%
ES1223028-011	SITE 6R 2	EK259A-CM: Nitrite + Nitrate as N	----	0.002	mg/L	0.047	0.048	0.0	0% - 20%
Ultra-Trace Nutrients (QC Lot: 2519466)									
ES1223028-001	SITE 1R 0-0.1	EK257A-CM: Nitrite as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
ES1223028-011	SITE 6R 2	EK257A-CM: Nitrite as N	----	0.002	mg/L	<0.002	<0.002	0.0	No Limit
Ultra-Trace Nutrients (QC Lot: 2519467)									
ES1223028-001	SITE 1R 0-0.1	EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	0.017	0.010	57.2	0% - 20%
ES1223028-011	SITE 6R 2	EK255A-CM: Ammonia as N	7664-41-7	0.005	mg/L	0.021	0.022	6.9	No Limit
Ultra-Trace Nutrients (QC Lot: 2519468)									
ES1223028-001	SITE 1R 0-0.1	EK271A-CM: Reactive Phosphorus as P	----	0.001	mg/L	0.028	0.029	4.6	0% - 20%
ES1223028-011	SITE 6R 2	EK271A-CM: Reactive Phosphorus as P	----	0.001	mg/L	0.016	0.015	0.0	0% - 20%
Ultra-Trace Nutrients (QC Lot: 2519474)									
ES1223028-001	SITE 1R 0-0.1	EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.01	mg/L	0.29	0.33	14.0	0% - 20%
ES1223028-011	SITE 6R 2	EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.01	mg/L	0.15	0.16	7.4	0% - 50%
Ultra-Trace Nutrients (QC Lot: 2519475)									
ES1223028-001	SITE 1R 0-0.1	EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.005	mg/L	0.039	0.028	32.5	0% - 20%
ES1223028-011	SITE 6R 2	EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.005	mg/L	0.025	0.023	9.1	0% - 20%
Ultra-Trace Nutrients (QC Lot: 2519478)									
ES1223028-001	SITE 1R 0-0.1	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	0.064	0.049	25.6	0% - 20%
ES1223028-011	SITE 6R 2	EK267PA-CM: Total Phosphorus as P	----	0.005	mg/L	0.044	0.037	17.4	0% - 20%
Ultra-Trace Nutrients (QC Lot: 2519479)									
ES1223028-001	SITE 1R 0-0.1	EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	0.28	0.28	0.0	0% - 20%
ES1223028-011	SITE 6R 2	EK262PA-CM: Total Nitrogen as N	----	0.01	mg/L	0.12	0.12	8.8	0% - 20%

Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report

Sub-Matrix: **WATER**

Sub-Matrix: WATER				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
					MS	MSD	Low	High	Value	Control Lim
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number							
Ultra-Trace Nutrients (QCLot: 2519465)										
ES1223028-001	SITE 1R 0-0.1	EK259A-CM: Nitrite + Nitrate as N	----	0.1 mg/L	104	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519466)										
ES1223028-001	SITE 1R 0-0.1	EK257A-CM: Nitrite as N	----	0.1 mg/L	106	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519467)										
ES1223028-001	SITE 1R 0-0.1	EK255A-CM: Ammonia as N	7664-41-7	0.1 mg/L	78.7	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519468)										
ES1223028-001	SITE 1R 0-0.1	EK271A-CM: Reactive Phosphorus as P	----	0.1 mg/L	113	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519474)										
ES1223028-001	SITE 1R 0-0.1	EK262PA-F-CM: Dissolved Total Nitrogen as N	----	0.5 mg/L	92.4	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519475)										
ES1223028-001	SITE 1R 0-0.1									



Sub-Matrix: WATER

Sub-Matrix: WATER				Matrix Spike (MS) and Matrix Spike Duplicate (MSD) Report						
				Spike Concentration	Spike Recovery (%)		Recovery Limits (%)		RPDs (%)	
					MS	MSD	Low	High	Value	Control Limit
Laboratory sample ID	Client sample ID	Method: Compound	CAS Number							
Ultra-Trace Nutrients (QCLot: 2519475) - continued										
ES1223028-001	SITE 1R 0-0.1	EK267PA-F-CM: Dissolved Total Phosphorus as P	----	0.5 mg/L	99.5	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519478)										
ES1223028-001	SITE 1R 0-0.1	EK267PA-CM: Total Phosphorus as P	----	0.5 mg/L	99.6	----	70	130	----	----
Ultra-Trace Nutrients (QCLot: 2519479)										
ES1223028-001	SITE 1R 0-0.1	EK262PA-CM: Total Nitrogen as N	----	0.5 mg/L	89.1	----	70	130	----	----

Environmental Division

INTERPRETIVE QUALITY CONTROL REPORT

Work Order	: ES1223028	Page	: 1 of 9
Amendment	: 1		
Client	: URS AUSTRALIA (VIC) PTY LTD	Laboratory	: Environmental Division Sydney
Contact	: MR HEATH FIDOCK	Contact	: Loren Schiavon
Address	: 155A HOGAN ST TATURA VIC, AUSTRALIA 3616	Address	: 277-289 Woodpark Road Smithfield NSW Australia 2164
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Project	: 43177771	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Site	: NEWCASTLE		
C-O-C number	: ----	Date Samples Received	: 26-SEP-2012
Sampler	: H.F	Issue Date	: 27-FEB-2013
Order number	: ----		
Quote number	: ME/465/12 V4	No. of samples received	: 12
		No. of samples analysed	: 12

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Interpretive Quality Control Report contains the following information:

- Analysis Holding Time Compliance
- Quality Control Parameter Frequency Compliance
- Brief Method Summaries
- Summary of Outliers



Analysis Holding Time Compliance

The following report summarises extraction / preparation and analysis times and compares with recommended holding times. Dates reported represent first date of extraction or analysis and precludes subsequent dilutions and reruns. Information is also provided re the sample container (preservative) from which the analysis aliquot was taken. Elapsed period to analysis represents number of days from sampling where no extraction / digestion is involved or period from extraction / digestion where this is present. For composite samples, sampling date is assumed to be that of the oldest sample contributing to the composite. Sample date for laboratory produced leachates is assumed as the completion date of the leaching process. Outliers for holding time are based on USEPA SW 846, APHA, AS and NEPM (1999). A listing of breaches is provided in the Summary of Outliers.

Holding times for leachate methods (excluding elutriates) vary according to the analytes being determined on the resulting solution. For non-volatile analytes, the holding time compliance assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These soil holding times are: Organics (14 days); Mercury (28 days) & other metals (180 days). A recorded breach therefore does not guarantee a breach for all non-volatile parameters.

Matrix: **WATER**

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method	Sample Date	Extraction / Preparation			Analysis			
Container / Client Sample ID(s)		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation	
EA025: Suspended Solids								
Clear Plastic Bottle - Natural (EA025H)	26-SEP-2012	---	03-OCT-2012	----	02-OCT-2012	03-OCT-2012	✔	
SITE 1R 0-0.1, SITE 2R 0-0.1, SITE 3R 6.5, SITE4R 7.5, SITE 5R 1, SITE 6R 2,								SITE 1R 0-0.1, SITE 3R 0-0.1, SITE 4R 0-0.1, SITE 5R 0-0.1, SITE 6R 0-0.1, SITE 7R 0-0.1
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA								
Clear Plastic Bottle - Natural (EK069FG)	26-SEP-2012	28-SEP-2012	28-SEP-2012	✔	02-OCT-2012	28-SEP-2012	✘	
SITE 1R 0-0.1, SITE 2R 0-0.1, SITE 3R 6.5, SITE4R 7.5, SITE 5R 1, SITE 6R 2,								SITE 1R 0-0.1, SITE 3R 0-0.1, SITE 4R 0-0.1, SITE 5R 0-0.1, SITE 6R 0-0.1, SITE 7R 0-0.1
Ultra-Trace Nutrients								
Clear Plastic - Filtered (AS) - for UT Nut. (EK255A-CM)	26-SEP-2012	---	27-SEP-2012	----	26-SEP-2012	27-SEP-2012	✔	
SITE 1R 0-0.1, SITE 2R 0-0.1, SITE 3R 6.5, SITE4R 7.5, SITE 5R 1, SITE 6R 2,								SITE 1R 0-0.1, SITE 3R 0-0.1, SITE 4R 0-0.1, SITE 5R 0-0.1, SITE 6R 0-0.1, SITE 7R 0-0.1
Ultra-Trace Nutrients								
Clear Plastic - Filtered (AS) - for UT Nut. (EK257A-CM)	26-SEP-2012	---	27-SEP-2012	----	26-SEP-2012	27-SEP-2012	✔	
SITE 1R 0-0.1, SITE 2R 0-0.1, SITE 3R 6.5, SITE4R 7.5, SITE 5R 1, SITE 6R 2,								SITE 1R 0-0.1, SITE 3R 0-0.1, SITE 4R 0-0.1, SITE 5R 0-0.1, SITE 6R 0-0.1, SITE 7R 0-0.1



Matrix: **WATER**

Evaluation: * = Holding time breach ; ✓ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
Ultra-Trace Nutrients								
Clear Plastic - Filtered (AS) - for UT Nut. (EK259A-CM)		26-SEP-2012	---	27-SEP-2012	----	26-SEP-2012	27-SEP-2012	✓
SITE 1R 0-0.1,	SITE 1R 0-0.1,							
SITE 2R 0-0.1,	SITE 3R 0-0.1,							
SITE 3R 6.5,	SITE 4R 0-0.1,							
SITE4R 7.5,	SITE 5R 0-0.1,							
SITE 5R 1,	SITE 6R 0-0.1,							
SITE 6R 2,	SITE 7R 0-0.1							
Ultra-Trace Nutrients								
Clear Plastic Bottle - Natural (AS) (EK262PA-CM)		26-SEP-2012	26-SEP-2012	27-SEP-2012	✓	26-SEP-2012	27-SEP-2012	✓
SITE 1R 0-0.1,	SITE 1R 0-0.1,							
SITE 2R 0-0.1,	SITE 3R 0-0.1,							
SITE 3R 6.5,	SITE 4R 0-0.1,							
SITE4R 7.5,	SITE 5R 0-0.1,							
SITE 5R 1,	SITE 6R 0-0.1,							
SITE 6R 2,	SITE 7R 0-0.1							
Ultra-Trace Nutrients								
Clear Plastic - Filtered (AS) - for UT Nut. (EK262PA-F-CM)		26-SEP-2012	26-SEP-2012	27-SEP-2012	✓	26-SEP-2012	27-SEP-2012	✓
SITE 1R 0-0.1,	SITE 1R 0-0.1,							
SITE 2R 0-0.1,	SITE 3R 0-0.1,							
SITE 3R 6.5,	SITE 4R 0-0.1,							
SITE4R 7.5,	SITE 5R 0-0.1,							
SITE 5R 1,	SITE 6R 0-0.1,							
SITE 6R 2,	SITE 7R 0-0.1							
Ultra-Trace Nutrients								
Clear Plastic Bottle - Natural (AS) (EK267PA-CM)		26-SEP-2012	26-SEP-2012	27-SEP-2012	✓	26-SEP-2012	27-SEP-2012	✓
SITE 1R 0-0.1,	SITE 1R 0-0.1,							
SITE 2R 0-0.1,	SITE 3R 0-0.1,							
SITE 3R 6.5,	SITE 4R 0-0.1,							
SITE4R 7.5,	SITE 5R 0-0.1,							
SITE 5R 1,	SITE 6R 0-0.1,							
SITE 6R 2,	SITE 7R 0-0.1							
Ultra-Trace Nutrients								
Clear Plastic - Filtered (AS) - for UT Nut. (EK267PA-F-CM)		26-SEP-2012	26-SEP-2012	27-SEP-2012	✓	26-SEP-2012	27-SEP-2012	✓
SITE 1R 0-0.1,	SITE 1R 0-0.1,							
SITE 2R 0-0.1,	SITE 3R 0-0.1,							
SITE 3R 6.5,	SITE 4R 0-0.1,							
SITE4R 7.5,	SITE 5R 0-0.1,							
SITE 5R 1,	SITE 6R 0-0.1,							
SITE 6R 2,	SITE 7R 0-0.1							

Evaluation: ✖ = Holding time breach ; ✔ = Within holding time.

Method		Sample Date	Extraction / Preparation			Analysis		
Container / Client Sample ID(s)			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
Ultra-Trace Nutrients								
Clear Plastic - Filtered (AS) - for UT Nut. (EK271A-CM)		26-SEP-2012	---	27-SEP-2012	----	26-SEP-2012	27-SEP-2012	✓
SITE 1R 0-0.1,								
SITE 2R 0-0.1,								
SITE 3R 6.5,								
SITE4R 7.5,								
SITE 5R 1,								
SITE 6R 2,								
SITE 7R 0-0.1								
EP008: Chlorophyll a & Pheophytin a								
White Plastic Bottle - Unpreserved (EP008)		26-SEP-2012	----	----	----	28-SEP-2012	28-SEP-2012	✓
SITE 1R 0-0.1,								
SITE 2R 0-0.1,								
SITE 3R 6.5,								
SITE4R 7.5,								
SITE 5R 1,								
SITE 6R 2,								
SITE 7R 0-0.1								



Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(where) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER** Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Duplicates (DUP)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Acid Hydrolyzable Phosphorus as P by DA	EK069FG	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Nitrogen as N (Persulfate) - UT for CM	EK262PA-F-CM	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Phosphorus (Persulfate) - UT for CM	EK267PA-F-CM	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	2	20	10.0	9.5	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Laboratory Control Samples (LCS)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a and Pheophytin a	EP008	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Acid Hydrolyzable Phosphorus as P by DA	EK069FG	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Nitrogen as N (Persulfate) - UT for CM	EK262PA-F-CM	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Phosphorus (Persulfate) - UT for CM	EK267PA-F-CM	2	20	10.0	10.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Suspended Solids (High Level)	EA025H	2	20	10.0	9.5	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Method Blanks (MB)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Chlorophyll a and Pheophytin a	EP008	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Acid Hydrolyzable Phosphorus as P by DA	EK069FG	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Nitrogen as N (Persulfate) - UT for CM	EK262PA-F-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Dissolved Total Phosphorus (Persulfate) - UT for CM	EK267PA-F-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement



Matrix: **WATER** Evaluation: ✖ = Quality Control frequency not within specification ; ✔ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Method Blanks (MB) - Continued							
Suspended Solids (High Level)	EA025H	1	20	5.0	4.8	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	1	20	5.0	5.0	✓	NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Matrix Spikes (MS)							
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	1	20	5.0	5.0	✓	ALS QCS3 requirement
Dissolved Total Nitrogen as N (Persulfate) - UT for CM	EK262PA-F-CM	1	20	5.0	5.0	✓	ALS QCS3 requirement
Dissolved Total Phosphorus (Persulfate) - UT for CM	EK267PA-F-CM	1	20	5.0	5.0	✓	ALS QCS3 requirement
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	1	20	5.0	5.0	✓	ALS QCS3 requirement
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	1	20	5.0	5.0	✓	ALS QCS3 requirement
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	1	20	5.0	5.0	✓	ALS QCS3 requirement
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	1	20	5.0	5.0	✓	ALS QCS3 requirement
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	1	20	5.0	5.0	✓	ALS QCS3 requirement



Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
Suspended Solids (High Level)	EA025H	WATER	In-House, APHA 21st ed., 2540D A gravimetric procedure employed to determine the amount of 'non-filterable' residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Acid Hydrolyzable Phosphorus as P by DA	EK069FG	WATER	APHA 21st ed., 4500-P B&G. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Ammonia as N - Ultra-Trace for Catchment Monitoring	EK255A-CM	WATER	APHA 21st ed., 4500-NH3 H Ammonia is determined by direct colorimetry by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Nitrite as N - Ultra-Trace for Catchment Monitoring	EK257A-CM	WATER	APHA 21st ed., 4500-NO2- B. Nitrite is determined by direct colourimetry by FIA.
Nitrate as N - Ultra-Trace for Catchment Monitoring	EK258A-CM	WATER	APHA 21st ed., 4500-NO3- I Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by FIA. Nitrite is determined separately by direct colourimetry and result for Nitrate calculated as the difference between the two results.
Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M	EK259A-CM	WATER	APHA 21st ed., 4500-NO3- I. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by FIA.
TKN (Total N - NOx-N). (FIA - UT) for Catchment Monitoring	EK261PA-CM	WATER	APHA 21st ed., 4500-P J. & 4500-NO3- I . Calculated by difference from total Nitrogen and NOx. Contributing method parameters are determined by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM	EK262PA-CM	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Total Nitrogen as N (Persulfate) - UT for CM	EK262PA-F-CM	WATER	APHA 21st ed., 4500-P J. Dissolved forms of Total Nitrogen is digested in a 0.45um filtered sample by Persulfate Method (Simultaneous Determination of Total Nitrogen and Total Phosphorus). As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM	EK267PA-CM	WATER	APHA 21st ed., 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Dissolved Total Phosphorus (Persulfate) - UT for CM	EK267PA-F-CM	WATER	APHA 21st ed., 4500-P J. Dissolved forms of Total Phosphorus is digested in a 0.45um filtered sample by Persulfate Method (Simultaneous Determination of Total Nitrogen and Total Phosphorus). As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)



<i>Analytical Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Reactive Phosphorus as P - Ultra-Trace for Catchment M	EK271A-CM	WATER	APHA 21st ed., 4500-P E Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with orthophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by FIA. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Chlorophyll a and Pheophytin a	EP008	WATER	In-house (APHA 21st ed., 10200 H mod.) The pigments are extracted into aqueous acetone. The optical density of the extract before and after acidification at both 664 nm and 665 nm is determined spectrometrically.
<i>Preparation Methods</i>	<i>Method</i>	<i>Matrix</i>	<i>Method Descriptions</i>
Total Acid Hydrolysable Phosphorus as P	EK069-PR	WATER	APHA 21st ed., 4500 P - B&G. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)
Persulfate Digestion for UT Dissolved TN and TP for FIA fin	EK262/267-PA F Prep	WATER	APHA 21st ed., 4500 P - J. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)



Summary of Outliers

Outliers : Quality Control Samples

The following report highlights outliers flagged in the Quality Control (QC) Report. Surrogate recovery limits are static and based on USEPA SW846 or ALS-QWI/EN/38 (in the absence of specific USEPA limits). This report displays QC Outliers (breaches) only.

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

- For all matrices, no Method Blank value outliers occur.
- For all matrices, no Duplicate outliers occur.
- For all matrices, no Laboratory Control outliers occur.
- For all matrices, no Matrix Spike outliers occur.

Regular Sample Surrogates

- For all regular sample matrices, no surrogate recovery outliers occur.

Outliers : Analysis Holding Time Compliance

This report displays Holding Time breaches only. Only the respective Extraction / Preparation and/or Analysis component is/are displayed.

Matrix: WATER

Method		Extraction / Preparation			Analysis		
Container / Client Sample ID(s)		Date extracted	Due for extraction	Days overdue	Date analysed	Due for analysis	Days overdue
EK069FG: Dissolved Acid Hydrolyzable Phosphorus as P by DA							
Clear Plastic Bottle - Natural							
SITE 1R 0-0.1,	SITE 1R 0-0.1,	----	----	----	02-OCT-2012	28-SEP-2012	4
SITE 2R 0-0.1,	SITE 3R 0-0.1,						
SITE 3R 6.5,	SITE 4R 0-0.1,						
SITE4R 7.5,	SITE 5R 0-0.1,						
SITE 5R 1,	SITE 6R 0-0.1,						
SITE 6R 2,	SITE 7R 0-0.1						

Outliers : Frequency of Quality Control Samples

The following report highlights breaches in the Frequency of Quality Control Samples.

- No Quality Control Sample Frequency Outliers exist.

CHAIN OF CUSTODY DOCUMENTATION - Rising Tide

COC Page 1 of 1

CLIENT: URS VIC

ADDRESS / OFFICE: Level 6, Southbank Boulevard, Southbank, Vic 3006

PROJECT MANAGER (PM): Heath Fidock

PROJECT ID: 43177771

SITE: Newcastle

P.O. NO:

RESULTS REQUIRED (Date): 5 DAY TAT

QUOTE NO.: ME-465-12 V4

FOR LABORATORY USE ONLY

COOLERS: 2A (if applicable)

Intact: Yes No N/A

SAMPLE TEMPERATURE

CHILLED: Yes No

COMMENTS:

Analyse within 24hr

SAMPLER:

MOBILE: 0438 098 066

PHONE: 03-5824 6110

EMAIL REPORT TO: Heath Fidock, Peter McGowan

EMAIL INVOICE TO: heath.fidock@urs.com

ANALYSIS REQUIRED including SUITES (note - suite codes must be listed to attract suite prices)



Australian Laboratory Services Pty Ltd

Notes:

Rising Tide Samples

Field filtered - mark on label

ALS ID	SAMPLE ID	MATRIX	DATE	Time	Total bottles	UTN-04 (TN, TP, NH3, TKN, NOx, NO2, NO3, React P)	EK262PA-F-CM (Total Dissolved N)	EK267PA-F-CM (Total Dissolved P)	EK069FG* (Dissolved Acid Hydrolyzable P)	EP008 (Chlorophyll)	EA025H (TSS)
Site 1R	0 - 0.1	W	26/9/12	12:15	6	x	x	x	x	x	x
Site 1R	0 - 0.1	W	26/9/12	12:30	6	x	x	x	x	x	x
Site 2R	0 - 0.1	W	"	12:45	6	x	x	x	x	x	x
Site 3R	0 - 0.1	W	"	13:05	6	x	x	x	x	x	x
Site 3R	6.5 -	W	"	13:20	6	x	x	x	x	x	x
Site 4R	0 - 0.1	W	"	13:35	6	x	x	x	x	x	x
Site 4R	7.5 -	W	"	13:45	6	x	x	x	x	x	x
Site 5R	0 - 0.1	W	"	14:10	6	x	x	x	x	x	x
Site 5R	1 -	W	"	14:15	6	x	x	x	x	x	x
Site 6R	0 - 0.1	W	"	14:30	6	x	x	x	x	x	x
Site 6R	2 -	W	"	14:45	6	x	x	x	x	x	x
Site 7R	0 - 0.1	W	"	15:00	6	x	x	x	x	x	x

RELINQUISHED BY:

Name: Thomas Doyle

Of: Date: 26/9/12

Name: Time:

Of: Date:

Of: Time:

RECEIVED BY:

Name: BEOA

Of: ALS

Name: Sep

Of: ALS

Date: 26/9

Time: 16:15

Date: 26/9/12

Time: 20:10

Water Containers required:

Filtered samples will require field filtration to fill 1 x 125 ml green unpreserved plastic, 1 x 60 ml turquoise and white stripe unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.
Unfiltered sample will require 1 x 1 lt green unpreserved plastic (solid white), 1 x 500 ml green unpreserved plastic & 1 x 60 ml light green and white stripe unpreserved plastic.

Environmental Division
Sydney
Work Order

ES1223028



Telephone: +61-2-8784 8555

Appendix C Agreed Monitoring Plan



Monitoring Plan

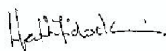
Lower Hunter River Water Quality
Proposed Ammonium Nitrate Facility
Heron Road, Kooragang Island

6 SEPTEMBER 2012

Prepared for
Incitec Pivot Limited
28 Freshwater Place
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Senior Water Resource
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Engineer

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Senior Principal,
Catchments and Water

Date:

6 September 2012

Reference:

43177771/01/12

Status:

Final

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Abbreviations

Abbreviation	Description
AN	Ammonium Nitrate
AQC	Analytical Quality Control
COC	Chain of Custody
DQO	Data Quality Objectives
EIS	Environmental Impact Statement
EPA	Environment Protection Authority
FQC	Field Quality Control
FRP	Filterable Reactive Phosphorus
IPL	Incitec Pivot Limited
LCS	Laboratory Control Sample
LOR	Level of Reporting
LQC	Laboratory Quality Control
MS	Matrix Spike
NFR	Non Filterable Residue
QA/QC	Quality Assurance/Quality Control
QMS	Quality Management System
RO	Reverse Osmosis
SAP	Sampling and Analytical Programme
SRN	Sample Receipt Notification
TKN	Total Kjeldahl Nitrogen
TSS	Total Suspended Solids
URS	URS Australia Pty Ltd

Introduction

1.1 Introduction

URS Australia Pty Ltd (URS) has been commissioned by Incitec Pivot Limited (IPL) to prepare a monitoring plan to address NSW Environment Protection Authority (EPA) concerns regarding the lack of recent water quality monitoring available for the surface waters of the Lower Hunter River, specifically in relation to nutrients.

IPL is proposing to discharge wastewater from its proposed Ammonium Nitrate (AN) Facility site to the South Arm of the Hunter River. IPL has prepared its Environmental Impact Statement (EIS) for the proposed Facility, in which it considered the potential impact of its proposed discharge to background water quality. After extensive searches and discussions with agencies it was concluded that the best currently available water quality data set for the Hunter River around Kooragang Island is that compiled by Sanderson and Redden (2001)¹. This is discussed further in Section 1.2.

In correspondence dated 30th July 2012, in which EPA provided feedback on its review of the draft EIS, EPA indicated that they considered the age of the data used to establish the adopted background water quality was such that EPA did not consider that it was adequate for regulatory purposes in establishing water quality objectives for discharge. In this context, IPL intends to conduct additional monitoring and commissioned the development of this plan accordingly.

A draft of the monitoring plan was emailed to EPA for consideration, and comments were received by email on 17/8/12. Further discussion of the monitoring plan was held at the meeting between IPL and EPA on 28/8/12. Broadly all of the EPA comments on the draft plan have been accepted, although a proposed fortnightly sampling frequency in an eight week campaign was discussed at the meeting, rather than the originally nominated weekly sampling.

1.2 Existing Background Quality

The data presented by Sanderson and Redden consists of a variety of samples from sites in estuarine and freshwater areas, collected between 1972 and 2000. It classified sites into water quality zones as shown in Figure 1-1.

Three of the water quality zones are relevant to the proposed wastewater discharge:

- Zone A: This zone is found predominantly at the mouth of the Hunter River and includes the area around Walsh Point.
- Zone B: This zone includes most of the South Arm of the Hunter River.
- Zone C: This zone includes most of the North Arm of the Hunter River.

Data from each zone were amalgamated and statistics produced. Table 1-1 provides 90th percentile water quality (nutrients and non-filterable residue data only) for each of the relevant zones. In addition, the 90th percentile water quality statistics for the four monitoring locations closest to the currently preferred discharge location into the South Arm of the Hunter River adjacent to the IPL site are listed.

¹ Sanderson, B.G. and Redden, A.M. (2001). Hunter River Estuary Water Quality Data Review and Analysis, University of Newcastle, Report submitted to Manly Hydraulics Laboratory, December 2001

1 Introduction

Table 1-1 90th Percentile Nutrients and Non-Filterable Residue (Sanderson & Redden, 2001)

Parameter	Units	90 th Percentile Water Quality			
		Zone A	Zone B	P.D.L.*	Zone C
Total Phosphorus	mg/L	0.53	0.15	0.64	0.27
Non Filterable Residual	mg/L	190	76	39	104
Nitrate	mg/L	0.63	0.39	1.96	0.33
Nitrite	mg/L	0.03	0.07	0.07	0.04
Total Kjeldahl Nitrogen	mg/L	14.50	7.00	9.42	10.30
Total Nitrogen**	mg/L	15.16	7.46	11.45	10.67

Notes:

* P.D.L. refers to the preferred discharge location adjacent to IPL's plant. Data shown reflects the 90th percentile water quality from four sites close to this location.

** Total Nitrogen was calculated as the sum of the other observed forms of nitrogen.

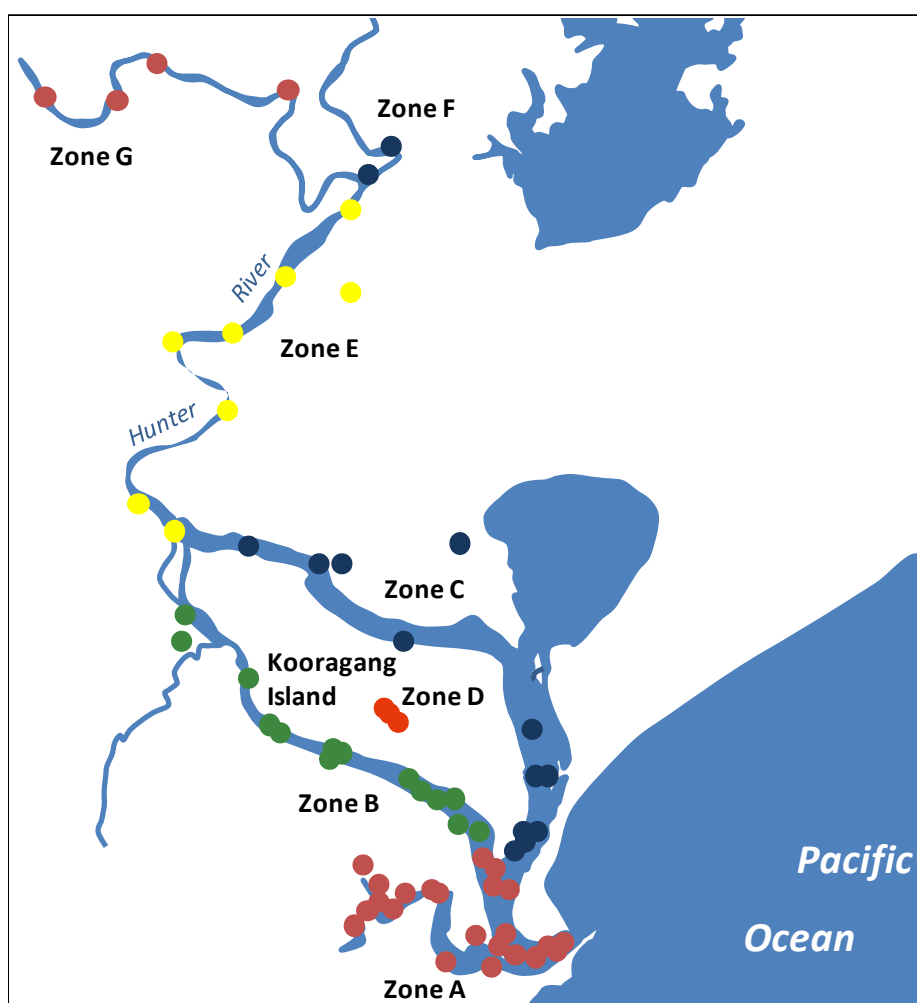


Figure 1-1 Water Quality Zones in the Hunter Estuary (Sanderson & Redden, 2001)

1 Introduction

1.3 Monitoring Plan Overview

It is proposed to conduct surface water monitoring at seven (7) locations (shown in Figure 3-1) within the Lower Hunter River.

The monitoring programme will comprise fortnightly monitoring rounds over an eight (8) week period. Each round will comprise two (2) monitoring events at each location, one event each on a rising and falling tide.

During each event, a monitoring instrument, a Hydrolab, will be deployed to measure the following within the water column: conductivity; pH; temperature; dissolved oxygen; turbidity; and depth.

A composite surface sample will be collected at each monitoring location during each monitoring event.

Additional water column water samples will be collected during each of the monitoring events at the four monitoring locations adjacent to or immediately downstream of lower Kooragang Island. The water column samples will be collected using a Van Dorn Sampler. The number and sampling location of these samples will depend on the identified presence and type of stratification that is present at each location by the initial water column Hydrolab monitoring. If no stratification is present then a single sample will be collected from the mid-point of the water column. If salinity based stratification is present, then two (2) samples will be collected, one from near the mid-point of the epilimnion and one from the middle of the hyperlimnion/salt wedge. If temperature stratification is also identified by the Hydrolab monitoring, an additional sample will be collected in the mid-point of the thermocline/halocline.

In addition, two quality assurance/quality control (QA/QC) samples will be collected each sampling event: a field duplicate and a rinsate blank (measuring the effectiveness of instrument/sampler decontamination procedures).

All samples will be analysed for the following parameters:

- Total Kjeldahl Nitrogen (TKN)
- Ammonia (NH₃)
- Oxidised Nitrogen (NO_x), Nitrate (NO₃) and Nitrite (NO₂)
- Total Phosphorus
- Filterable Reactive Phosphorus
- Total Dissolved Nitrogen (Field filtration)
- Total Dissolved Phosphorus (Field filtration)
- Dissolved Inorganic Phosphorus (includes Acid Hydrolysable Phosphorus)
- Chlorophyll α
- Suspended Solids (SS)

1 Introduction

The samples will be prepared and submitted for analysis to Australian Laboratory Services laboratory. The programme will be conducted in accordance with a formal documented Sampling and Analytical Programme, incorporating the following key components:

- Sampling Procedures and Field Quality Control;
- Laboratory Analytical Program;
- Data Reporting; and
- Data Verification and Validation

Objective

The objective of the monitoring programme is to provide additional and more recent characterisation of the water quality within potential receiving waters of discharge wastewater from the proposed IPL Ammonium Nitrate (AN) Facility Site.

Monitoring and Sampling Locations

It is proposed to conduct monitoring at 7 locations within the Lower Hunter system. These are shown in Figure 3-1.

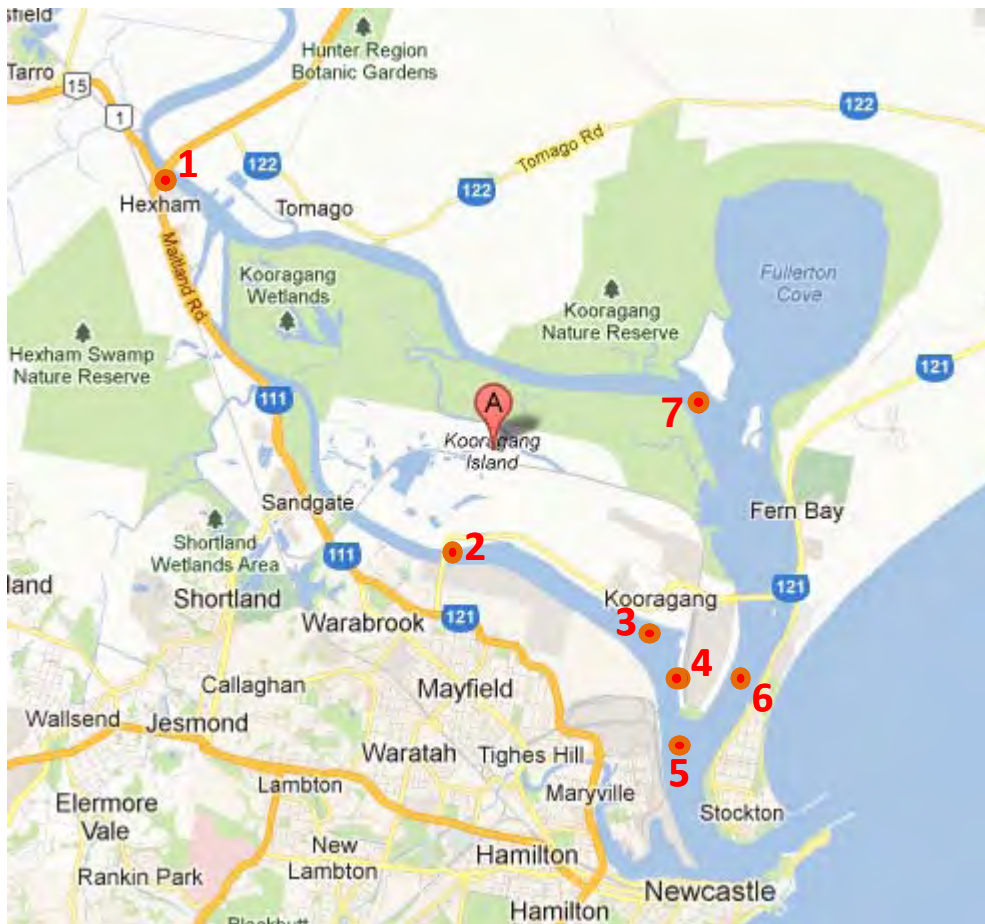


Figure 3-1 Proposed Monitoring and Sampling Locations

The seven sampling sites are proposed to:

- link to existing water quality monitoring data sets (Hexham, site 1);
- provide background in the South Arm away from the immediate port area (site 2);
- provide background in the North Arm upstream of Fullerton Cove and Kooragang Island (site 7);
- capture water quality upstream, at, and downstream of the proposed discharge (sites 3, 4, 5)
- capture samples from the North Arm adjacent to the site (site 6).

It is proposed that sampling will be conducted approximately mid-channel at all locations except site 4, which is targeting a site close to a possible discharge locations.

It is also notable that the proposed locations include sampling locations in four of the water quality zones identified by Sanderson and Redden (refer to Figure 1-1), A (site 5), B (sites 2, 3 & 4), C (sites 6 & 7), and E (site 1).

Field Monitoring and Sample Collection

4.1 Frequency

It is proposed to conduct sampling on a fortnightly basis for an eight week period.

Sampling will be conducted from a boat at each location, on two occasions each sampling event over a full tidal cycle i.e samples collected at each location on rising and falling tides.

If the opportunity arises, at least one of the sampling events will be conducted to coincide with the inflow from a significant storm-event within the catchment.

It is recognised that the duration of this campaign is insufficient to provide any indication of seasonable variability, but it will provide a current snapshot and allow comparison with the much more extensive Sanderson and Redden data set (and other available data sets) to allow consideration of the representativeness of this relative to contemporary conditions.

4.2 Location

The sampling location will be initially located by GPS, and this reference will be used to locate the sampling site for subsequent events.

4.3 Physical Water Quality Monitoring

Physical water quality will be measured in the vertical at each site on each sampling event. This will be undertaken prior to the collection of any samples.

A weighted and submersible multi-parameter probe with inbuilt data logger will be used for this monitoring. The instrument to be used for this campaign will be a Hydrolab.

The parameters that will be measured within the water column at each location will be:

- Conductivity/Salinity;
- pH;
- Temperature;
- Dissolved Oxygen;
- Turbidity; and
- Depth

Physical data will be measured from top to bottom of the sampling site and from bottom to top. If anomalies exist in the record a further deployment of the Hydrolab will be undertaken.

This monitoring will, in part, be utilised to determine the presence and characteristics of stratification and/or tidal wedge present at each location.

4 Field Monitoring and Sample Collection

4.4 Surface Sampling

A surface sample will be collected at each of the seven sampling locations on each event. Collection of surface samples will allow comparison with the equivalent data in the historical Sanderson and Redden data set.

The surface sample will comprise a composite sample of three samples collected through the top meter of the water column. The samples will be collected in a metre long tube held vertically at the surface and transferred to a bucket. Once three samples have been collected in the bucket, the composite subsample will be transferred into the sample container for submission for analysis.

4.5 Water Column Sampling

At locations 3, 4, 5, & 6, additional water samples will be collected from specific depths within the water column during each sampling event. At each location, the number of water column samples and specific sampling depths will be selected based on the results of the water column monitoring conducted using the Hydrolab (described in Section 4.2). The water column samples will be collected using a Van Dorn Sampler. The purpose of this sampling is to provide water quality data with depth, and particularly to characterise the quality in specific water strata that may be present within the water column at different locations.

Up to three (3) water column samples will be collected at each location, although it is expected that only two (2) samples will normally be collected.

One sample will be collected near the mid-point of the epilimnion and one in the middle of the hyperlimnion/salt wedge, as shown in Figure 4-1.

4 Field Monitoring and Sample Collection

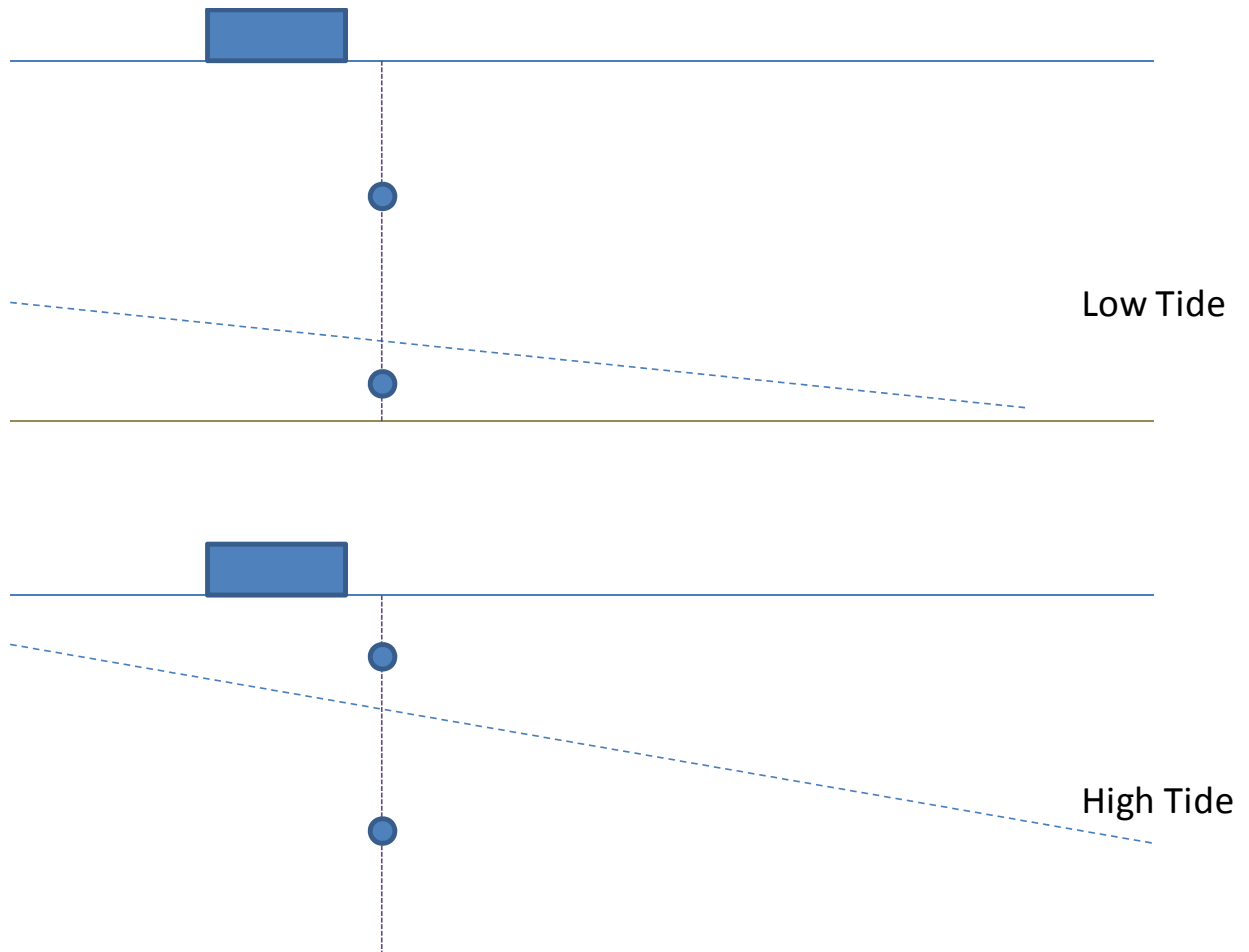


Figure 4-1 Water Column Sampling Depth Selection

If, in addition to salinity based stratification, which is expected at some of the locations, temperature stratification is also identified by the Hydrolab monitoring, an additional sample will be collected in the mid-point of the thermocline/halocline. If no stratification is identified, then a single sample will be collected at mid-depth within the water column.

4 Field Monitoring and Sample Collection

4.6 QA/QC Samples

The QA/QC protocols for this water quality monitoring programme are set out in Section 5.4.3 of this plan. As part of this programme, during each sampling event, the following QA/QC samples will be collected and submitted for analysis:

- 1 field duplicate sample;
- 1 rinsate blank

The adopted analyte suite for these samples will be the same as for the primary samples, as described in Section 5.1.

4.7 Summary

The field monitoring and sample collection to be conducted at each location during each event is summarised in Table 4-1 as follows:

Table 4-1 Monitoring and Sample Collection at Each Location during each Event

	Monitoring Site						
	1	2	3	4	5	6	7
Hydrolab Water Column Monitoring	✓	✓	✓	✓	✓	✓	✓
Composite Surface Sample	1	1	1	1	1	1	1
Water Column Samples							
- Salinity strata			2	2	2	2	
- Temperature strata			+1	+1	+1	+1	
- Mid-point*			1	1	1	1	
Total Samples	1	1	2-4	2-4	2-4	2-4	1
QA/QC Samples	1 field duplicate & 1 rinsate blank						

*Only if no stratification present.

The total number of samples to be collected during each monitoring event is therefore in the range 13 to 21, including QA/QC samples.

Sample Handling and Analysis

5.1 Analyte Suite

Each of the samples collected and submitted for analysis will be analysed for the following analytes, using the corresponding methods, nominated in Table 5-1.

- Total Kjeldahl Nitrogen (TKN)
- Ammonia (NH₃)
- Oxidised Nitrogen (NO_x), Nitrate (NO₃) and Nitrite (NO₂)
- Total Nitrogen
- Total Dissolved Nitrogen (Field filtration)
- Total Phosphorus
- Total Dissolved Phosphorus (Field filtration)
- Filterable Reactive Phosphorus
- Dissolved Inorganic Phosphorus (includes Acid Hydrolysable Phosphorus)
- Chlorophyll α
- Suspended Solids (SS)

The Total Nitrogen and Organic Nitrogen concentrations in the samples will be derived from the analytes above.

5.2 Laboratory

URS propose to use Australian Laboratory Services Pty Ltd (ALS) for the analytical program. Samples will be delivered to the ALS Newcastle laboratory (located in near vicinity to the Hunter Estuary) and then transported to ALS Sydney. The address details of both facilities are as follows:

- ALS Newcastle: 5 Rosegum Close, Warabrook, Newcastle NSW 2304
- ALS Sydney: 277-289 Woodpark Road, Smithfield, Sydney, NSW 2164

5.3 Analytical Methods

5.3.1 Standard Reference Methods

The standard reference methods to be applied for this programme are adopted from:

- *Standard Methods for the Examination of Water and Wastewater*, 21st Edition 2005, American Public Health Association (APHA).

The analytical methods to be adopted for the analytes described in Section 5.1 are as follows:

Total Kjeldahl Nitrogen (ug/L as N)

The current analytical method for the determination of Total Kjeldahl Nitrogen (TKN) is Standard Method No. 4500 N org C (APHA, 2005). The analysis is performed using a segmented flow autoanalyser. The sample is digested with sulphuric acid and potassium sulphate in the presence of a copper sulphate catalyst, followed by an automated phenate colorimetric technique for the

5 Sample Handling and Analysis

determination of ammonium. The ammonium ion produced by the digestion is reacted sulphuric acid and measured as per the ammonia method.

Ammonia (ug/L as N)

The current analytical method for the determination of ammonia is Standard Method 4500-NH₃ H. (APHA, 2005). The analysis is performed using a segmented flow autoanalyser. Ammonia in the sample is reacted with alkaline phenol and hypochlorite to form indophenol, an intensely blue-coloured compound, proportional to the ammonia concentration. The blue colour is intensified with sodium nitroferricyanide, and the reaction is accelerated by heating. The absorbency of the indophenol is measured at 630 nm.

Oxidised Nitrogen, Nitrate and Nitrite (ug/L as N)

The current analytical method for the determination of Oxidised Nitrogen (NO_x) is Standard Method No 4500-NO₃ (APHA, 2005). The analysis is performed using a segmented flow auto analyser.

The current analytical method for the determination of Nitrate and Nitrite is Standard Method No 4500-NO₃ (APHA, 2005). The conversion of nitrate to nitrite prior to colorimetric determination is achieved using an in line copper coated cadmium reduction column. The colorimetric reaction involves diazotising the nitrite with sulphanilamide and coupling the N-(1-naphthyl)ethylenediamine dihydrochloride. The absorbency is measured at 543 nm. Ion Chromatography following Standard Method No. 4110 is also acceptable.

Total Nitrogen (ug/L as N)

The current analytical method for the determination of total phosphorus is Standard Method No. 4500-P J (after digestion) (APHA, 2005). The analysis is performed using a segmented flow auto analyser. Total nitrogen is determined by digesting the sample with sodium hydroxide and potassium sulphate in the presence of a mercuric sulphate catalyst, followed by an automated colorimetric technique for the determination of the oxidised nitrogen as nitrate.

Total Dissolved Nitrogen (ug/L as N)

Analysed as per Total Nitrogen on a field filtered (0.45 µm) sample volume.

Total Phosphorus (mg/L as P)

The current analytical method for the determination of total phosphorus is Standard Method No. 4500-P J (after digestion) (APHA, 2005). The analysis is performed using a segmented flow auto analyser. Total phosphorus is determined by digesting the sample with sulphuric acid and potassium sulphate in the presence of a mercuric sulphate catalyst, followed by an automated colorimetric technique for the determination of the phosphate produced.

Total Dissolved Phosphorus (ug/L as P)

Analysed as per Total Phosphorus on a field filtered (0.45 µm) sample volume.

5 Sample Handling and Analysis

Filterable Reactive Phosphorus (mg/L as P)

The current analytical method for the determination of filterable reactive phosphorus is Standard Method No. 4500-P G (APHA, 2005). The analysis is performed using a segmented flow auto analyser. The phosphate is reacted with ammonium molybdate and antimony potassium tartrate, in acid medium, to form phosphomolybdic acid. This is reduced by ascorbic acid. The absorbency of the resultant blue complex is then measured at 880 nm.

Dissolved Inorganic Phosphorus (ug/L as P)

Dissolved Inorganic Phosphorus (DIP) is not analysed and reported directly. DIP is calculated as the sum of Dissolved Reactive Phosphorus and Dissolved Acid-Hydrolysable Phosphorus which includes condensed polyphosphates. The Dissolved Acid-Hydrolysable Phosphorus is determined by Standard Method No. APHA 4500-P Methods B and H.

Chlorophyll α (ug/L)

The current analytical method for the determination of Chlorophyll α is APHA 10200 H. Chlorophyll and associated photosynthetic pigments are removed from water samples using filtration. The filtered residue is extracted into acetone. The chlorophyll α concentrations in the extract are then determined spectrophotometrically.

Suspended Solids (ug/L)

The current analytical method for the determination of suspended solids is Standard Method No. 2540 D&E (APHA, 2005). The analysis is performed by filtering a measured volume of sample through a pre-washed, dried and weighed Whatman GFC 2.0 μm filter. After adequate rinsing with distilled water to ensure removal of dissolved salts, the filter is dried (103–105 °C) desiccated and reweighed.

5.3.2 Laboratory Analytical Methods

URS note that water testing laboratories deviate to some extent from standard reference methods nominated in Section 5.3.1. The laboratory contracted by URS will be requested to supply copies of documented methods and relevant Standard Operating Procedures (also termed Quality Work Instructions) to allow for an assessment of any deviations from protocols. For inorganics testing the common deviations relate to the extent to which the laboratory applies matrix correction steps in sample pre-treatment. Any deviations from standard methods will be documented and evaluated prior to the analysis of samples.

As indicated in Section 5.2, the laboratory that has been nominated for the programme is ALS and the analytical methods adopted are specified in Table 5-1.

5 Sample Handling and Analysis

Table 5-1 Analytical Methods and Sample Requirements

	ALS LOR* (µg/L)	ALS Method Reference	Sample Volume (mL)	Field Filtered	Preservation: H ₂ SO ₄ and Chill <4°C	Max Holding Time
Australian Standard 5667.1						
Nitrogen						
Ammonia	5	APHA 4500 NH ₃ H	60 a	Yes	Yes	28 day
Nitrate	2	APHA 4500 NO ₃	60 a	Yes	No	2 day
Nitrite	2	APHA 4500 NO ₂	60 a	Yes	No	2 day
NOx	2	APHA 4500 N	60 a	Yes	Yes	28 day
TKN	10	APHA 4500 N org	60 a	No	Yes	28 day
Total Nitrogen	10	APHA 4500 N	60 c	No	Yes	28 day
Total Dissolved Nitrogen	10	APHA 4500N	60 b	Yes	Yes	28 day
Phosphorus						
Filterable Reactive Phosphorus	1	APHA 4500 P G	60 a	Yes	No	
Dissolved Inorganic Phosphorus (calculated including Acid Hydrolysable P)	10	APHA 4500 P B&H	125 d	Yes	No	2 day
Total Phosphorus	5	APHA 4500- P J	60 c	No	Yes	28 day
Total Dissolved Phosphorus	5	APHA 4500 PH	60 b	Yes	Yes	28 day
Suspended Solids	10,000	APHA 2540 D	500 e	No	No	7 day
Chlorophyll α	1	APHA 10200 H	1000 f	No	No	2 day

*LOR = Level of reporting

All Nitrogen and phosphorus data reported as corrected to N or P

Sample 6 separate bottled volumes as follows: a = 60ml filtered; b = 60ml filtered; c = 60ml unfiltered; d = 125ml filtered; e = 500ml unfiltered; f = 1000ml unfiltered

5 Sample Handling and Analysis

5.4 Sampling Procedures

5.4.1 Introduction

The Sampling and Analytical Programme (SAP) proposed to monitor surface water of the Lower Hunter River will be performed according to documented procedures, with the primary objective of ensuring surface water chemistry data are representative of field conditions. The SAP is considered as comprising four distinct phases as follows:

- Sampling Procedures and Field Quality Control;
- Laboratory Analytical Program;
- Data Reporting; and
- Data Verification and Validation

5.4.2 Sampling Procedures and Field Quality Control

5.4.2.1 Sampling and Analytical Programme

Key elements defined for the sampling program include:

- Water sample bottles of appropriate volume;
- Water sample bottles pre-treatment;
- Preservatives;
- Project specific chain of custody (COC) forms;
- Project specific field data collection forms;
- Sample identification protocol including date and time, COC cross reference number;
- Definitive analytical suites;
- Immediate chilling of samples in transport containers;
- Security seal (signed by sampler) on transport containers;
- Transport arrangements to ensure analysis holding times are maintained;
- Field filtration procedure (as appropriate to analytes of interest);

The SAP will adopt the sample preservation protocols defined in the appropriate reference methods or as otherwise defined in Section 1060C of *Standard Methods for the Examination of Water and Wastewater*, 21st Edition 2005, American Public Health Association (APHA) - water sample preservation procedures.

Where not adequately defined, URS and laboratory will reference *Australian Standard AS/NZS 5667.1 (1998) Water Quality Sampling: Part 1 - Guidance on the Design of Sampling Programs, Sampling Techniques and the Preservation and Handling of Samples*; and the Australian and New Zealand Environmental and Conservation Council (ANZECC), 2000.

5 Sample Handling and Analysis

The Laboratory has in place a thorough procedure for validating that sample bottles are clean, such that no residual concentrations of target analytes (or other interferent which may contribute a potential false positive) are above the method detection limits.

A standard operating procedure for the pre-treatment and validation process including definition of a minimum testing interval, documentation of results, and traceability of batches of sample bottles will be requested during the sampling program. No sample bottles will be reused for this sampling program.

The sample volumes, preservatives, filtration requirements and analyte specific holding times are nominated in Table 5-1. The overall requirement for each separate sample is for the collection of 1,805 mL of sample (practically ~2L), which will be divided into six (6) separate plastic sample containers (one of which is required to be opaque) as follows:

- 60mL, filtered, sulphuric acid preserved;
- 60mL, filtered, unpreserved;
- 60mL unfiltered, sulphuric acid preserved;
- 125mL, filtered, unpreserved;
- 500mL, unfiltered, unpreserved;
- 1000mL, unfiltered, unpreserved.

5.4.2.2 Field Quality Control (FQC)

In addition to thorough sampling and sample management protocols, URS will include several field quality control (FQC) protocols in the sampling program.

Field Duplicates

Field Duplicates are used to assess the repeatability of the primary sample analysis data, and therefore provide for an assessment of the precision (random error) inherent in the sampling procedures, and ultimately provides for an estimate of the representativeness of the sample data.

Field Duplicates will be monitored at an interval of 1 per 20 samples (one per sampling event).

Equipment (or Rinsate) Blanks

Equipment Blanks (also referred to as Equipment Rinsates) are used to assess the potential for false positives or positively biased sample concentrations resulting from the field sampling procedures. False positive contributions may result from contaminated sample bottles, contaminated sampling equipment, poor sampling technique, airborne contaminants (normally soil particles) and cross contamination between individual samples.

Equipment blanks will be monitored at an interval of 1 per 20 samples (one per sampling event).

5 Sample Handling and Analysis

5.4.2.3 Sample Management and Transport

All water samples collected by URS will be filtered as appropriate, labelled with a unique identifier, packaged under ice in order to immediately cool (with a target temperature of $\leq 4^{\circ}\text{C}$ as soon as is practicable after sampling), and delivered to the ALS Laboratory's Newcastle facility within 2 hours of completion of the sampling round.

Commensurate with current guidance documented in ANZECC (2000), Australian Standard 5667.1 and water quality sampling procedures adopted by Sanderson and Redden (2011), URS will filter sample volumes for the determination of soluble nutrient concentrations using a hand held filter device with filtration through a $0.45\ \mu\text{m}$ filter paper. As shown in Table 5-1, the nutrients to be analysed on field filtered samples are:

- Ammonia (NH_3);
- Oxidised Nitrogen (NO_x), Nitrate (NO_3) and Nitrite (NO_2);
- Total Dissolved Nitrogen;
- Reactive Phosphorus;
- Dissolved Inorganic Phosphorus (includes Acid Hydrolysable Phosphorus); and
- Total Dissolved Phosphorus

The samples will be transferred to the Sydney facility overnight in order to ensure analysis within the analyte specific Holding Times. Prior to dispatch to Sydney each sample container will have a security seal (signed by sampler and / or appropriate sample custodian).

The Laboratory is responsible for monitoring of compliance, completeness and effectiveness of these sample transportation and delivery protocols. Upon receipt of samples the Laboratory, having taken custody of the samples, will sign-off the COC for batches of water samples delivered by URS.

The Laboratory will return an electronic copy of the COC, and a Sample Receipt Notification (SRN) to the URS. The SRN will include enough detail for URS to be assured that the transportation to laboratory was satisfactory such that the integrity of the sample volumes have not been compromised during transport to the laboratory. The temperature of the samples will be recorded immediately upon receipt and reported on the SRN.

The Laboratory is responsible for immediate and continued storage of the water samples prior to analysis in temperature controlled conditions ($\leq 4^{\circ}\text{C}$). Samples will not be left in transport containers for extended periods prior to controlled temperature storage.

5.4.2.4 Chain of Custody

A key element of the SAP is that from time of sampling, sample receipt by the laboratory, through to permanent data archive, all elements of the sampling and analytical process must be suitably recorded, so that, under subsequent investigation, quantitative analyte data is traceable to the samples supplied.

URS will utilise a project specific COC form.

The COC records sample identifiers, date and time, sampler identifications and other critical information to ensure all sample data is readily traceable to the samples taken in the field. The COC will travel with the samples to the laboratory.

5 Sample Handling and Analysis

5.4.3 Laboratory Analytical Program

The laboratory has in place an appropriately defined and documented Quality Management System (QMS) which has been independently assessed by NATA (and URS) to be compliant with the laboratory management principles defined in AS ISO/IEC 17025. Furthermore, the laboratory will be NATA accredited for the analytical methods to be employed in this analysis program.

5.4.3.1 Holding Time Compliance

Holding Time is analyte specific and is defined as the maximum permitted time interval between taking a sample in the field and commencement of the analytical process (either direct instrumental detection or transfer of the analyte from the sample matrix into a stable intermediate solution such as a metal acid digest).

Laboratory will make every effort to extract and analyse samples within the holding time. Due consideration will be given to addition of appropriate preservatives (or possibly freezing samples) in order to extend holding times (only in compliance with reference method protocols). Sample volumes for some analytes may be frozen prior to analysis, but must be thawed in a controlled manner (same procedure to all samples) prior to analysis, in order to ensure the sample volume is homogeneous prior to sub sampling.

If, for any reason, there is a holding time breach or the Laboratory determines that it will not be possible to extract and analyse the samples within holding times, for any reason that that may or may not be within Laboratory's control, the URS Project manager will be informed immediately to determine an appropriate course of action.

5.4.3.2 Analytical Quality Control (AQC)

Analytical Quality Control (AQC) procedures will be incorporated into all analysis methods. The maximum size of a laboratory quality control batch will be ≤ 20 primary samples. Thus each method specific QC monitoring parameter must be assessed at an interval equal to or greater than a minimum interval of 1:20 primary samples. AQC data generated will be monitored by the laboratory, and where QC failures are observed, immediate corrective actions will be taken. Minimum AQC protocols are detailed below:

Method Blank

Deionised, reverse osmosis (RO), distilled or double distilled water, previously determined to not contain target analyte concentrations above the method detection limit, will be analysed with each sample QC batch. Method Blanks must be put through the entire preparation procedure using the same reagents and randomly chosen labware (glassware) as are the associated primary samples. The method blank must be analysed on the same instrument as the associated QC batch of samples. Under no circumstances should all or part of a QC batch of samples be analysed on a different instrument without the blank also being analysed. Wherever a repeat analysis or analysis of a diluted sample extract/digest is performed, the method blank should also be reanalysed, or an appropriate instrumental blank be analysed, to allow for a rugged assessment of the potential for false positives due to instrument contamination.

5 Sample Handling and Analysis

Laboratory Duplicates

A randomly selected second aliquot of one sample in each QC batch should be extracted and analysed. Laboratory duplicate data is used primarily to assess the precision (repeatability) of the method for the particular matrix type, and secondly, as an assessment of the variability within the sample volume, which may result from the high concentration of the analyte of interest, concentration of other dissolved components, and concentration of suspended sediment or other particulate matter.

The relative percent difference (RPD) between sample duplicates should not exceed 20% unless the reported analyte concentration is <10 times the Method Detection Limit. Where RPD values are calculated in excess of 20%, the laboratory must thoroughly investigate possible cause for the anomaly. Where an inspection of the retained sample volume suggests no obvious heterogeneity, re-extraction or re-digestion and analysis of retained sample volume should be used to confirm the anomaly.

Laboratory Control Sample (LCS)

Deionised, reverse osmosis (RO), distilled or double distilled water should be spiked with the analyte of interest at a concentration typical of surface water samples or at the mid-point of the working range of the method. The LCS must be put through the entire extraction procedure using the same reagents and labware (glassware) as are the associated primary samples. The LCS must be analysed on the same instrument and calibration period as the associated primary samples. LCS recovery data provides for an assessment of method bias not including that resulting from sample matrix effects. Long term data may be used to assess accuracy and precision incorporating all sources of random error. Typical recoveries for methods employed in the Laboratory should readily fall between 80 - 120%; however the Laboratory data should be assessed against statistically derived QC limits.

Matrix Spikes (MS):

A second aliquot of one sample in a QC batch should be spiked with the analyte of interest at a concentration typical of surface water samples or at the mid-point of the working range of the method. The MS must be put through the entire extraction procedure using the same reagents and labware (glassware) as are the associated primary samples. The MS must be analysed on the same instrument and within the same calibration period as the associated primary samples. In addition to matrix effects, poor recoveries can result from poor laboratory or operator proficiency. For matrix spike failures the Laboratory must thoroughly investigate to determine the nature of the matrix interference before assigning the anomalous recovery to unavoidable matrix interference.

Linear and Continuing Calibration Verification:

Prior to analysis, all instrumentation used for quantitative target analyte data must be calibrated in order to prove the analytical instrument gives a linear response over an appropriate calibration range. Linear calibration curves must have one calibration point that is less than or equal to the Limit of Reporting (Estimated Quantitation Limit or EQL).

5 Sample Handling and Analysis

Continuing calibration verification must be performed at regular intervals and may not exceed 24 hours. The laboratory protocols for procurement and use of primary and secondary verification instrument calibration standards must endeavour to comply with the requirements of ISO 17025. Calibrations must be verified by an independent 'second source' reference obtained from a separate supplier to the primary standard (when available). In situations where a single vendor is used to provide the primary and secondary standard, the Laboratory must obtain written warranties that they were not prepared from the same reference material.

Calibration verification is normally deemed acceptable when instrumental response is within $\pm 20\%$ deviation of that determined for the linear calibration, for all analytes. Samples must not be quantified when a calibration verification standard has failed.

After any maintenance or changes to instrument operating conditions, instruments must be re-calibrated, or the continuance of the previous linear calibration proven by analysis of a suitable continuing calibration verification standard. Initial linear and continuing calibration verification data must be documented and filed for future reference.

AQC Monitoring and Corrective Actions

In the event of an AQC failure the Laboratory must investigate the source of the variance from the acceptable QC range and initiate documented corrective action. Corrective action may include the re-extraction and/or re-analysis of all of the associated samples, provided sufficient sample volume exists. In the event of insufficient sample volume for re-extraction and re-analysis, the Laboratory must contact the URS providing a detailed description of the AQC failure and the subsequent uncertainty in the appropriate primary sample data. The Laboratory will take immediate steps to return the method to within previously determined QC limits, that is, return to within a state of 'statistical control' prior to analysis of other samples from the project site.

NATA Signatories

All laboratory data will be subject to data validation by senior analytical chemists, who as NATA registered Signatories, take responsibility on behalf of the Laboratory for the accuracy and representativeness of the data reporting.

5.4.4 Data Reporting

The following raw data, final sample analysis summary and all associated records, will be included in the analysis report, and will include as a minimum:

- Identification of the test facility
- Chain of Custody
- Condition upon Receipt and login forms
- Analysis start and completion dates
- Summary of the Analytical method
- Summary of Deviations from the Analytical Method
- Sample preparation details for example dilutions, extraction date, analysis date

5 Sample Handling and Analysis

- Data tables for sample analysis presented as parts per billion to two significant figures.
- Method Protocol Limits of Reporting (LOR)
- Less than LORs reported where no concentrations are detectable above the LOR
- Sample and analyte specific deviations from protocol LORs
- Reason for deviations from protocol LORs
- Reference to URS correspondence, including sampler's notes and other communications.
- Quality Assurance Quality Control compliance Statement

The final 'Certificate of Analysis' will be reported as electronic copy only. A report package will be presented for each sample delivery group (represents one report for each day of sampling, and is inclusive of all supporting sample management and AQC data). All laboratory reports will be included in URS final report.

5.4.5 Data Validation Procedures

Analytical data validation is the process of assessing the degree of compliance with the project specific sampling and analysis protocols and whether data are of a suitable quality to fulfil the overall project objectives. It is not satisfactory to assume data provided by the laboratory are fit for purpose.

Thus from a range of quality control measures generated during sampling and laboratory programs, estimates of the accuracy and precision should be used to assess whether data are representative of the surface water chemistry.

Accuracy and precision measurements from the appropriate QC check samples should be compared with the data quality objectives (DQOs) (normally method specific based on statistically derived QC limits) to assess the quality of the analytical data. Should data be found to fall outside acceptable DQOs, appropriate corrective actions should be instigated, including re-analysis. Should the corrective actions not be successful, the data reported will be flagged appropriately.

The analytical data validation guidelines will be based on the general guidance defined in AS/NZS 5667.1 (1998) and ANZECC (2000).

Specific data validation elements assessed by URS for compliance with project objectives will include:

- Verification check of all data transfers to the database (100% check recommended);
- Preservation and storage of samples upon collection and during transport to the laboratory;
- Sample holding times;
- Use of appropriate analytical and field sampling procedures;
- Reporting units for all analytes are as previously prescribed;
- Limits of reporting appropriate for comparison water quality assessment criteria;
- Frequency of conducting quality control measurements;
- Equipment rinsate blank results;
- Laboratory blank results;

5 Sample Handling and Analysis

- Field duplicate results;
- Laboratory duplicate results;
- Matrix spike results where appropriate;
- Anomalous results that appear to be inconsistent with field observations and measurements;
- Anomalous results that appear to be inconsistent with previous project data trends;
- Flagging protocols to ensure data limitations are recognised when viewing long term data;

An appropriate Data Validation summary will be documented, subject to a technical peer review and archived with all other records specific to the sampling event, including all sampling record detail.

Reporting

A report of the results of the monitoring programme will be prepared during and at the completion of the programme which will include the following:

- Monitoring and sampling methodology;
- Monitoring results;
- Sampling results;
- Data quality assessment;
- Analysis of data, including interpretation and trend analysis;
- Comparison of monitoring results with the Sanderson and Redden data set, and any identified other relevant data sets.

Limitations

URS Australia Pty Ltd (URS) has prepared this report in accordance with the usual care and thoroughness of the consulting profession for the use of Incitec Pivot Limited and only those third parties who have been authorised in writing by URS to rely on this 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.

Where this Report indicates that information has been provided to URS by third parties, URS has made no independent verification of this information except as expressly stated in the Report. URS assumes no liability for any inaccuracies in or omissions to that information.

This Report was prepared between 13 August 2012 and 6 September 2012 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.

Except as required by law, no third party may use or rely on this Report unless otherwise agreed by URS in writing. Where such agreement is provided, URS will provide a letter of reliance to the agreed third party in the form required by URS.

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It is the responsibility of third parties to independently make inquiries or seek advice in relation to their particular requirements and proposed use of the site.

Any estimates of potential costs which have been provided are presented as estimates only as at the date of the Report. Any cost estimates that have been provided may therefore vary from actual costs at the time of expenditure.



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Appendix D Figures - Variation of Water Quality in the Hunter River Estuary

Appendix D - Figures - Variation of Water Quality in the Hunter River Estuary

The following Figures show the median and range of concentrations in milligrams per litre of phosphorus and nitrogen forms at each site as derived from all samples collected under this program. Where samples returned concentrations at the Limit of Reporting the samples were assigned that value.

The following acronyms are used:

TP – Total Phosphorus

DTP – Dissolved Total Phosphorus

DRP – Dissolved Reactive Phosphorus

TN – Total Nitrogen

NOx – Nitrate + Nitrite

TKN – Total Kjeldahl Nitrogen

Appendix D - Figures - Variation of Water Quality in the Hunter River Estuary

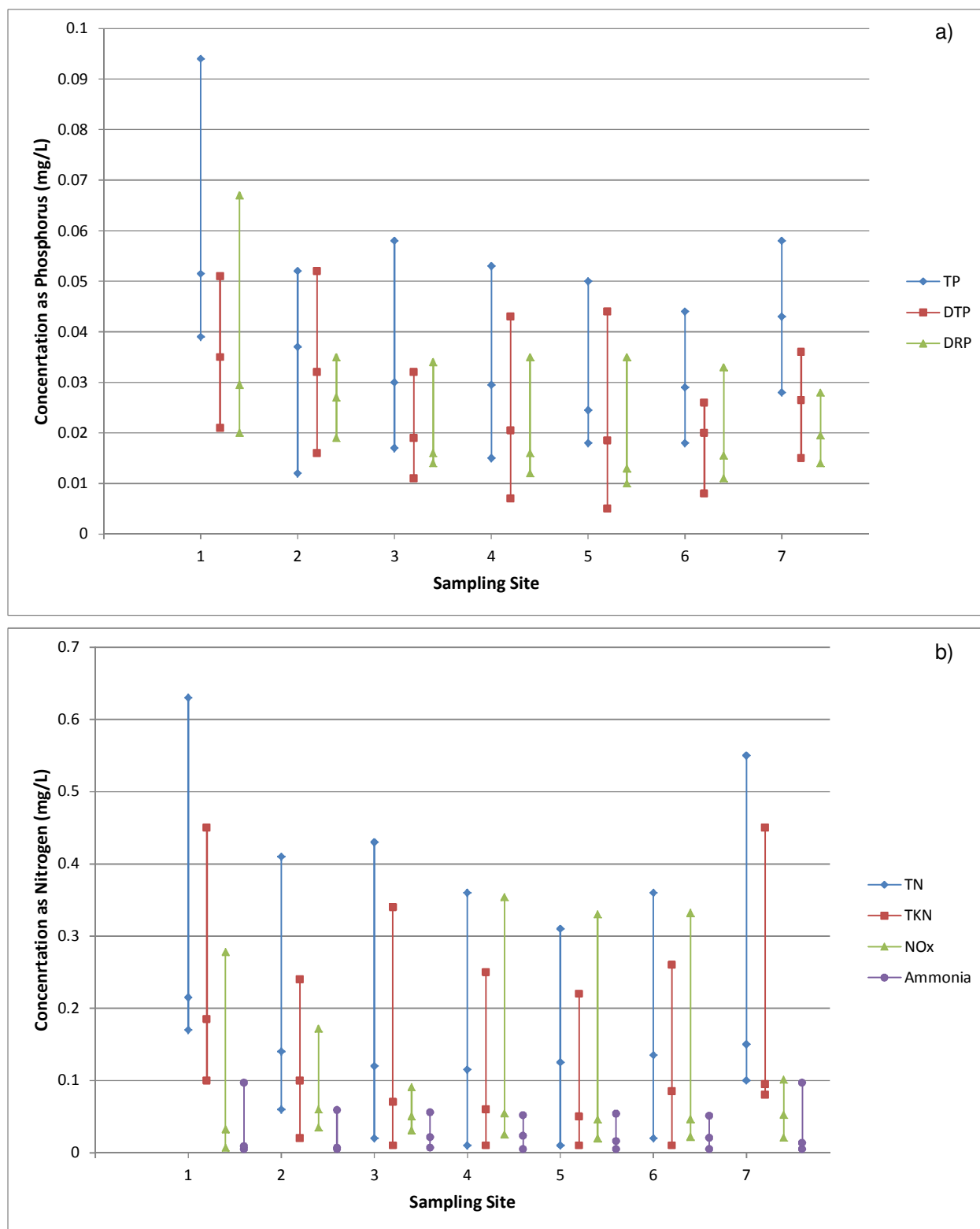


Figure Appendix D-9 Variation of (a) Phosphorus & (b) Nitrogen Forms by Sampling Site 2012 – 2013

Appendix E Figures - Comparison of Current and Historic Nutrient Data

Appendix E - Figures - Comparison of Current and Historic Nutrient Data

The following time series plots show historic data reported by Sanderson and Redden (2001). The dashed lines represent the maximum, median, and minimum concentrations from the four rounds of sampling for the nominated site as undertaken by URS on behalf of Incitec Pivot Ltd. All concentrations are expressed as milligrams per litre.

Appendix E - Figures - Comparison of Current and Historic Nutrient Data

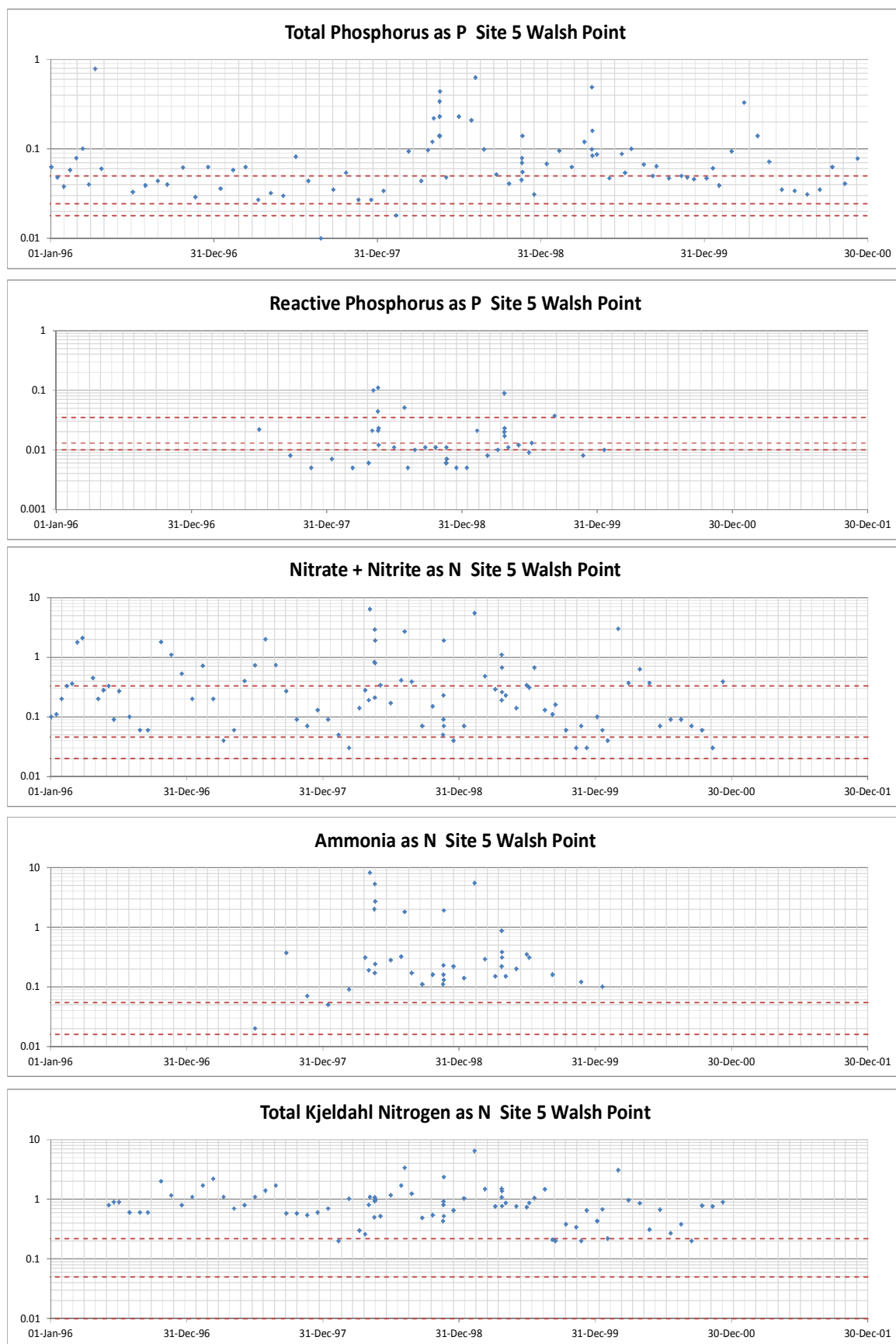


Figure Appendix E-10 Comparison of Historic and Recent Concentrations (mg/L) - Walsh Point

Appendix E - Figures - Comparison of Current and Historic Nutrient Data

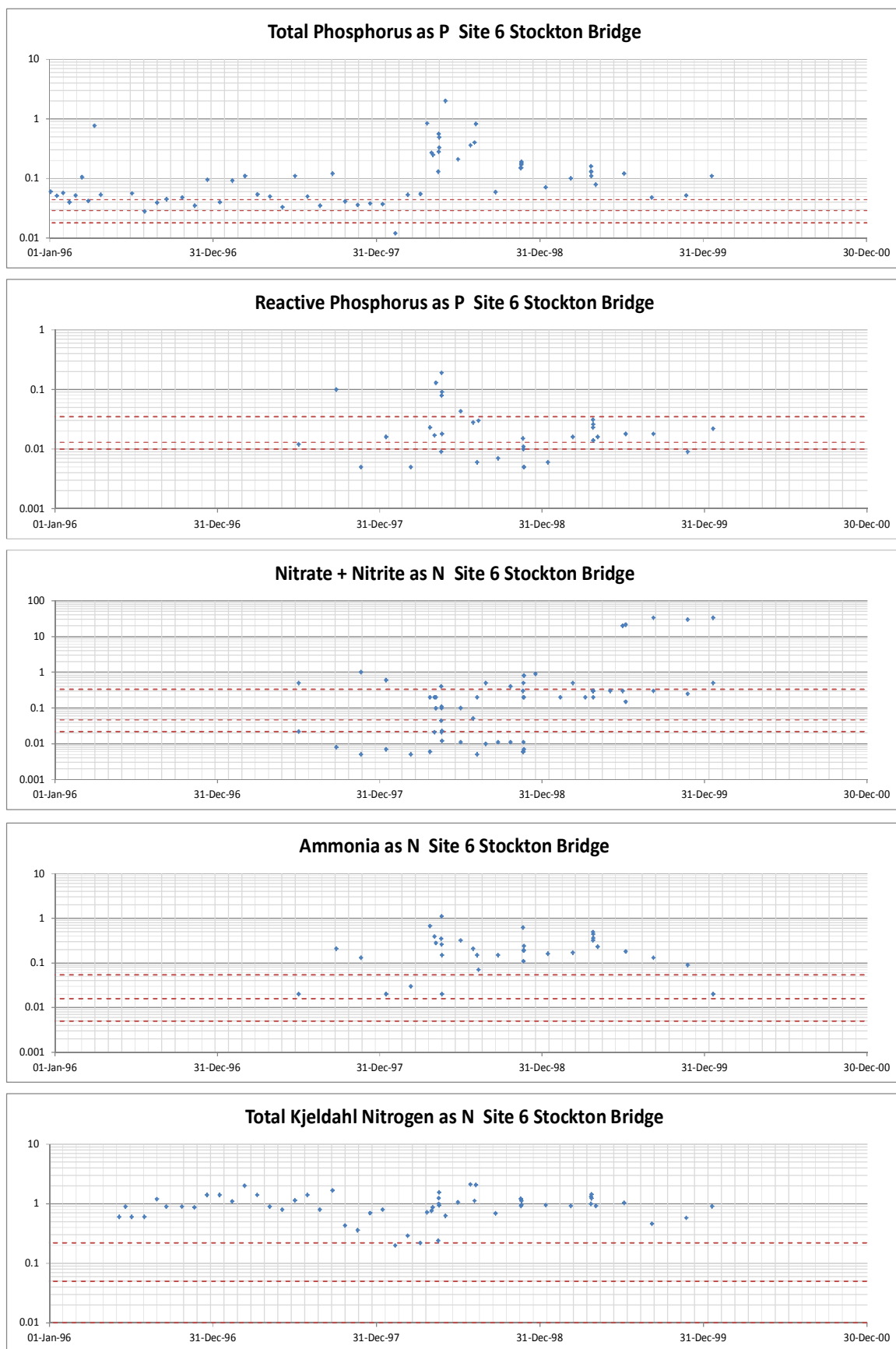


Figure Appendix E-11 Comparison of Historic and Recent Concentrations (mg/L) - Stockton Bridge

Appendix E - Figures - Comparison of Current and Historic Nutrient Data

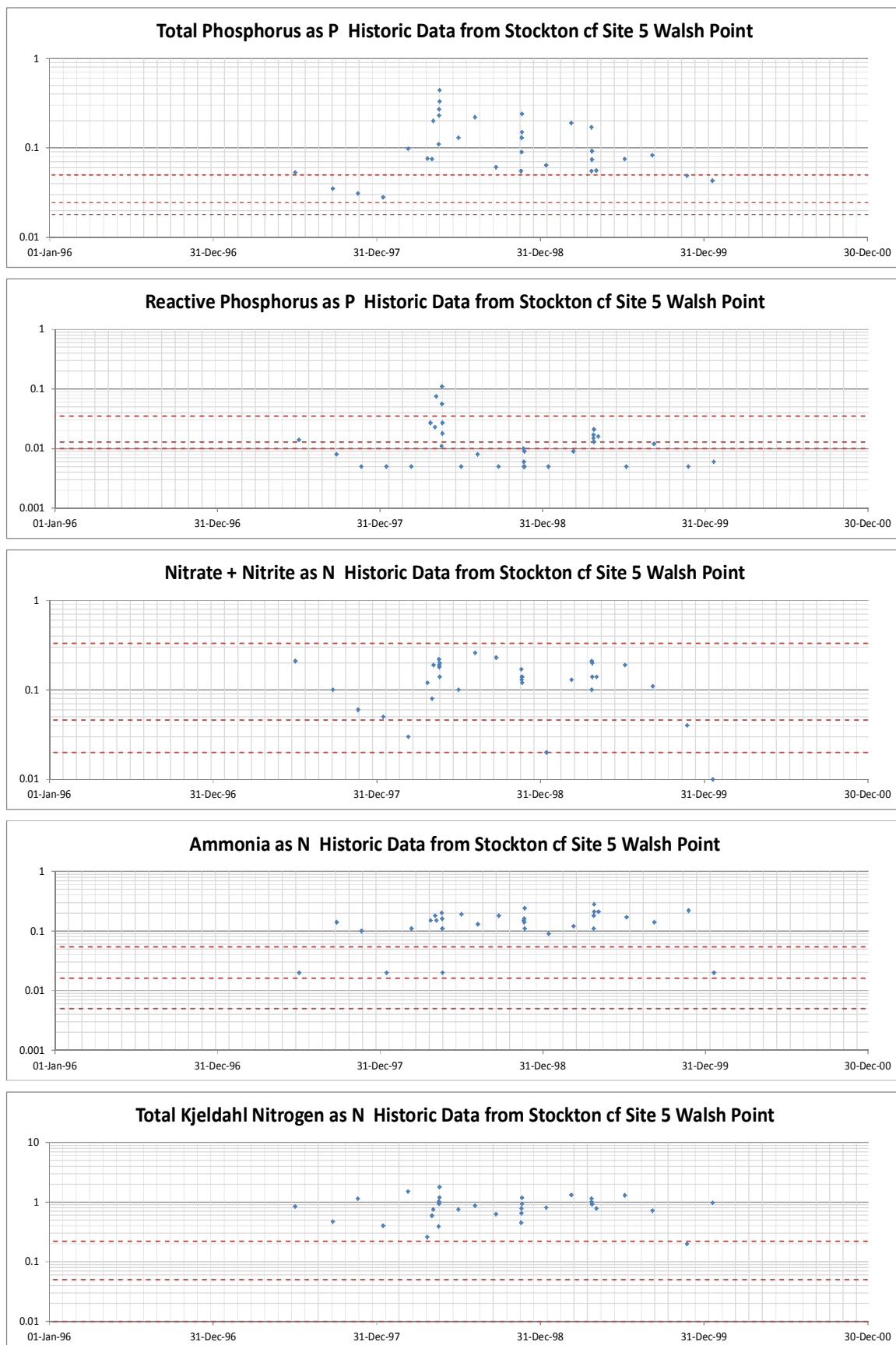


Figure Appendix E-12 Comparison of Historic and Recent Concentrations (mg/L) – Site 5 cf Stockton

Appendix E - Figures - Comparison of Current and Historic Nutrient Data

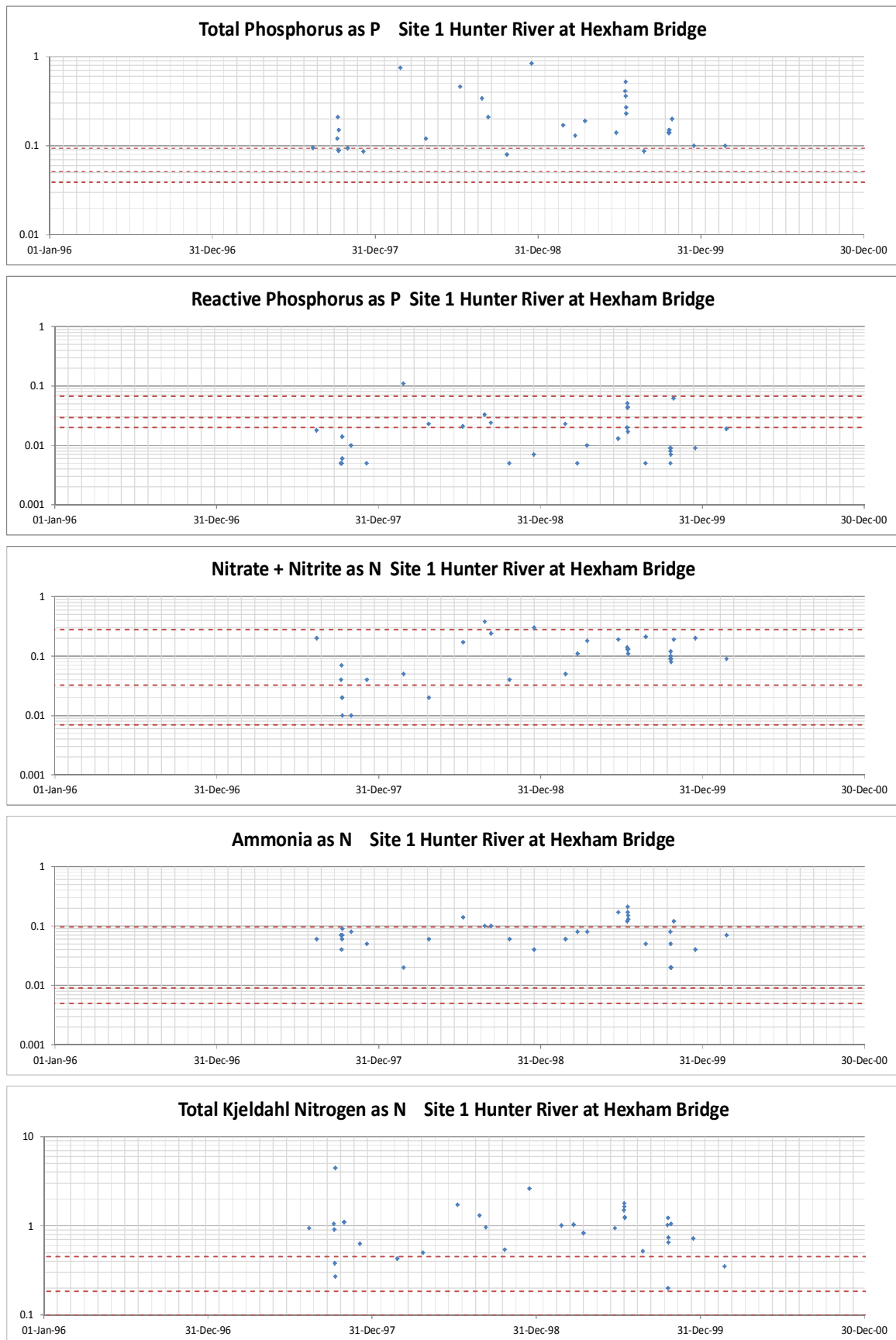


Figure Appendix E-13 Comparison of Historic and Recent Concentrations (mg/L) – Hexham Bridge

Appendix E - Figures - Comparison of Current and Historic Nutrient Data

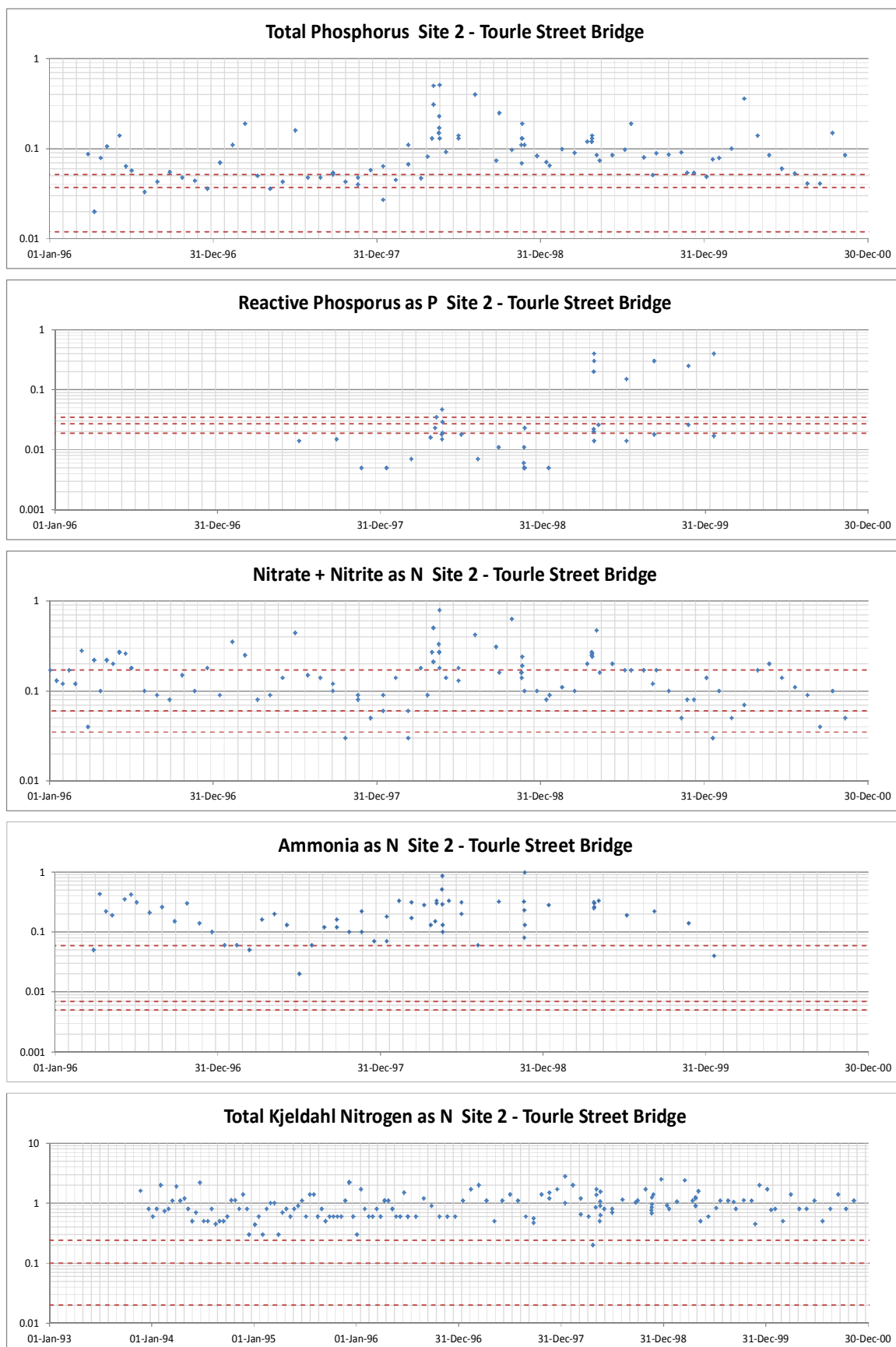


Figure Appendix E-14 Comparison of Historic and Recent Concentrations (mg/L) – Tourle St Bridge

Appendix F Discharge Plots - Hunter River at Singleton

Appendix F - Discharge Plots - Hunter River at Singleton

This Appendix contains plots of flow volume over time for Hunter River at Singleton. This stream gauging station was chosen to provide a representation of long term runoff conditions compared with short term conditions.

Appendix F - Discharge Plots - Hunter River at Singleton

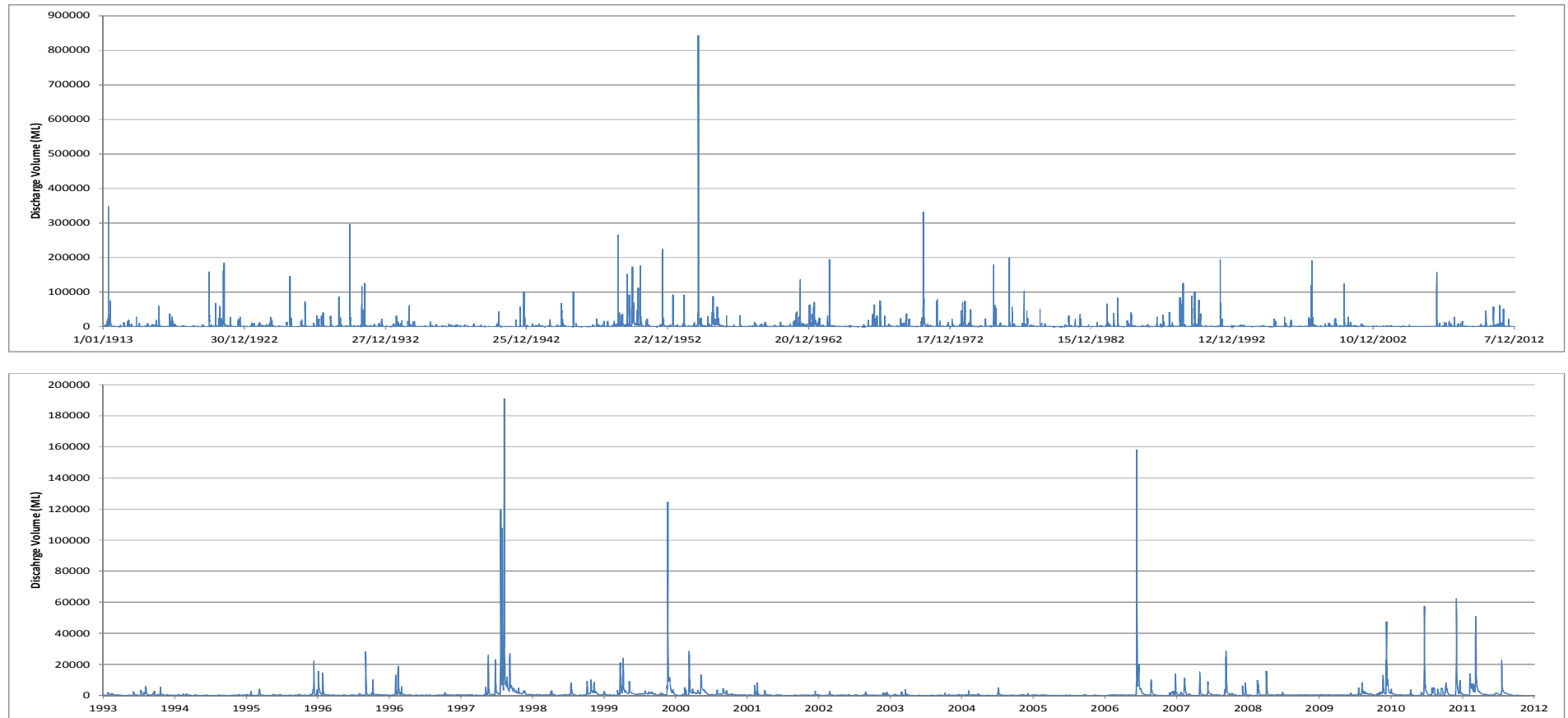


Figure Appendix F-15 Time Series Plots of Catchment Discharge - Hunter River at Singleton



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Appendix B2 – Receiving Water Modelling Assessment for a Proposed Wastewater Discharge on the Hunter River Estuary

Receiving Water Modelling Assessment for a Proposed Wastewater Discharge on the Hunter River Estuary

Prepared For: Incitec Pivot Limited

Prepared By: BMT WBM Pty Ltd (Member of the BMT group of companies)

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	Client : Incitec Pivot Limited Client Contact: Graham Woods Client Reference PO 4500670125

Title :	Receiving Water Modelling Assessment for a Proposed Wastewater Discharge on the Hunter River Estuary
Author :	Luke Kidd, Rohan Hudson, Ryan Shojinaga
Synopsis :	This report outlines near-field and far-field modelling assessments of a proposed wastewater discharge to the Hunter River Estuary

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EXECUTIVE SUMMARY

Background

Incitec Pivot Limited (IPL) propose to build an Ammonium Nitrate / Nitric Acid Manufacturing Facility at Kooragang Island. As part of the environmental approvals process, a draft Environmental Impact Statement (EIS) was prepared by URS on behalf of IPL for the State Significant Development (SSD-4986) and submitted to the Department of Planning (DoP) for adequacy review.

Public exhibition of the draft EIS was undertaken over a period of 8 weeks between September and October 2012. During that time, additional computer modelling and analysis was undertaken to provide further information on specific issues identified by the adequacy review relating to receiving water quality and tidal mixing processes.

This report documents near-field and far-field modelling assessments of a proposed wastewater discharge to the Hunter River Estuary. The proposed discharge was previously assessed for a single effluent discharge site in the South Arm approximately 1.2 km upstream of Walsh Point. The current study considers two potential outfall locations, i.e. the effluent discharge site located in the South Arm previously considered by the draft EIS and another site identified within the North Arm of the Hunter River. The proposed outfall locations are being considered as either/or, and this assessment will be used to determine the relative mixing potential of the two locations.

Modelling Approach

The assessment includes near-field (large scale mixing) modelling to assess impacts of the discharge within a zone of initial dilution. Near-field modelling was conducted with respect to the potential toxic effects of constituents in the discharge and primarily accounts for the configuration of the outfall, properties of the discharge and the receiving environment immediately adjacent to the discharge location.

The near-field modelling assessment was undertaken using the UM3 modelling software, which is capable of modelling zero velocity conditions consistently and reliably. Two general conditions were considered by the near-field modelling assessment i) an average condition and ii) a worst-case condition. Based on these two general conditions, the proposed discharge, diffuser and receiving water parameters were selected to provide an understanding of near-field mixing during high discharge load conditions with a low probability of occurrence and average discharge conditions with an a greater probability of occurrence.

Beyond the area immediately adjacent to the outfall, far-field (small scale mixing) modelling was undertaken to account for additional environmental factors such as dynamic tidal conditions, oceanic boundary influences, wind and upstream river inflows. The far-field modelling assessment was undertaken using a calibrated and validated three dimensional computer model (TUFLOW-FV) to simulate the movement (hydrodynamics) and mixing (advection-dispersion) between tidal saltwater and a proposed freshwater effluent discharge. Model scenarios were prepared to simulate a number of discharge scenarios investigating differences between i) a South Arm or North Arm release location ii) the influence of a bed diffuser or a surface discharge option and iii) the influence of wind. Importantly, far-field modelling has investigated the influence of tidal hydrodynamics on the proposed

effluent discharge and the potential for transport and accumulation within the receiving water environment.

Receiving Water Quality

The lower reaches of the Hunter River are influenced by both sea and freshwater. The information from Sanderson and Redden (2001) represents the best available dataset and has therefore been selected as a starting point for the Project assessment. URS are in the process of conducting sampling in the Hunter Estuary to validate this dataset on behalf of IPL. As part of the near-field assessment, receiving water quality data collated by Sanderson and Redden (2001) and URS (2012b) were reviewed.

The review of available water quality data indicates that the Sanderson and Redden dataset (2001) for the period August to October exhibits more variable ammonia and nitrate concentrations than the URS (2012b) dataset. While the maximum values are not as high as those observed in the entire dataset, some of the results are 1 to 2 orders of magnitude greater than the URS data. The median concentration of the seasonal (August to October) Sanderson and Redden (2001) data are about 5 times those observed in the URS data.

Overall, the URS ammonia and nitrate data are noticeably less than the historical Sanderson and Redden (2001) dataset, which could be indicative of low flows from upstream and more open ocean conditions, (as were present during the URS sampling events) and/or as a consequence of reporting limitations present in the historical data. In light of the notable discrepancy between the two datasets, background nitrogen concentrations were determined as the median concentration of the combined Sanderson and Redden (2001) and URS (2012b) ammonia and nitrate data. The median (combined) background nitrogen concentrations adopted by the current study are preliminary and subject to possible change based on the findings of additional water quality data collection during wet-weather conditions.

Conclusions and Recommendations

This report describes the setup, execution and results from near-field modelling of a diffuser system in the Hunter River for the proposed Ammonium Nitrate / Nitric Acid Manufacturing Facility. The outcomes of the near-field modelling assessment should be treated as preliminary and intended only for first pass analysis and understanding of the likely performance of the proposed discharge and diffuser. If further optimisation of the diffuser is required during the detailed design of the outfall, Computation Fluid Dynamic (CFD) modelling is recommended to better specify mixing boundaries and model the complex (large scale) velocity patterns and dispersion processes occurring within the mixing zone.

With this in mind, however, the following key conclusions were drawn from the near-field modelling assessment:

- From a hydrodynamic and near-field mixing perspective, the South Arm is shown to be a better location for discharge than the North Arm, especially during worst-case and near-worst-case conditions. The greater depth of water at the South Arm discharge location allows for rapid initial dilution within a short lateral distance from the outfall. Additionally, the increased discharge

buoyancy promotes more ambient water entrainment and therefore additional mixing of the plume;

- With respect to concentrations, the most restrictive discharge location was found to be the North Arm site during slackwater conditions;
- Sufficient dilution at neither discharge location was achieved to disperse ammonia to concentrations less than the TTVs during worst-case conditions;
- Diffuser port diameter is important in mixing dynamics, because the port diameter controls the jet velocity (momentum) of the discharge to which mixing and dilution is related. This study considered the preliminary design diameter of 25 mm, however further consideration of fewer and/or other port diameters could be undertaken as part of a subsequent detailed diffuser design phase. The inclusion of duckbill (one-way) valves to increase port discharge velocities may also be a worthwhile consideration;
- Background constituent concentrations are important in determining the assimilative capacity in the river to accept additional constituent concentrations. While the Sanderson and Redden (2001) data are comprehensive at capturing seasonal water quality characteristics, these data have may not represent present-day conditions. The URS (2012b) data, while current and representative of present-day conditions, are not a sufficient dataset to summarise the overall long-term conditions in the Lower Estuary;
- Background pH values are important in determining the TTVs of ammonia. The current study demonstrates that differing background pH values, and therefore TTVs may result in the discharge satisfying the ammonia TTV in one location, but not in the other even when similar dilution/mixing ratios are achieved; and
- Near-field modelling results represent static conditions and cannot completely reflect dilution caused by shifting current velocities and direction. Referral to the far-field modelling assessment is recommended for consideration of dynamic receiving water conditions (i.e. water depth and current velocity).

With respect to the far-field modelling assessment, results of the scenario simulations indicate that:

- o the Lower Estuary is well flushed by regular semi-diurnal tides;
- o wind influences the spread and accumulation of effluent in the Estuary and as such should be included in assessment of outfall performance;
- o the near-bed diffuser performs better in terms of far-field as well as near-field mixing dynamics than an equivalent discharge near the surface;
- o a South Arm release is more favourable. This is partly due to the 3D model's prediction of an anti-clockwise net circulation around Kooragang Island under low (90%ile) river discharge conditions. This anti-clockwise circulation produces a long-term net upstream advective transport along the North Arm and a long-term net downstream current along the South Arm;
- o apart from deeper sections of the South Arm, the effluent is generally vertically mixed throughout the water column;

- o accumulation of conservative additional TN and TP during 90%ile (low) river flow conditions would be less for a South Arm diffuser release than a North Arm diffuser release; and
- o a fluvial (freshwater) event with a peak daily flow rate (equivalent to a 3%ile exceedance condition) provides considerable additional flushing (>75%) of accumulated TN* and TP* from the Estuary.

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1 INTRODUCTION

1.1 Background

Incitec Pivot Limited (IPL) propose to build an Ammonium Nitrate / Nitric Acid Manufacturing Facility at Kooragang Island. As part of the environmental approvals process, a draft Environmental Impact Statement (EIS) was prepared by URS on behalf of IPL for the State Significant Development (SSD-4986) and submitted to the Department of Planning (DoP) for adequacy review.

The information from Sanderson and Redden (2001) represents the best available dataset and has therefore been selected as a starting point for the Project assessment. IPL are in the process of conducting sampling in the Hunter Estuary to validate this dataset. The results of this work are ongoing and will be reported whilst responding to submissions following the exhibition period.

The hydrodynamics of the North and South Arm of the Hunter River are currently being further investigated by IPL, in consultation with the EPA, to confirm the results of the initial round of modelling. The results of this work are ongoing and will be reported whilst responding to submissions following the exhibition period.

Public exhibition of the draft EIS was undertaken over a period of 8 weeks between September and October 2012. During that time, additional computer modelling and analysis was undertaken to provide further information on specific issues identified by the adequacy review relating to receiving water quality and tidal mixing processes (the focus of this report).

1.2 Previous Investigations

In relation to effluent discharges to the Hunter River Estuary, the Water Management Study presented in Appendix H of the EIS includes an assessment of a proposed wastewater discharge to the South Arm of the Hunter River near Kooragang No.2 (K2) berth. A preliminary discharge assessment was carried out by the Water Research Laboratory (WRL) at the University of New South Wales (UNSW) to investigate the impacts of a proposed wastewater discharge at that location. Consideration of flows in the South Arm and wider estuary (i.e. far-field modelling) was undertaken based on gauged flows and WRL's previous (qualitative) modelling experiences of the Hunter River.

The assessment by WRL provides a comparison of freshwater inflow to cumulative South Arm discharge to aid with establishing and justifying the selection of reference water quality data. A timeseries of receiving water velocity adjacent to the South Arm effluent discharge location was extracted from 1-dimensional hydrodynamic modelling previously carried out by WRL. No new modelling was undertaken for their study.

To assess far-field dispersion, WRL used the near-field model JETLAG to determine a layer thickness. Far-field dispersion was assessed based on a constant layer thickness, the expected effluent characteristics and a typical receiving water condition. Consideration of discharge and dilution from a subsurface diffuser was also undertaken using the near-field model JETLAG. The maximum concentration of a plume and its width was calculated for a continuous point source discharge.

1.3 Adequacy Review

The NSW EPA's adequacy review of the draft EIS highlighted a number of gaps in the Water Management Study. The main concerns outlined by the adequacy review include:

- No detailed modelling has been undertaken. Velocities values were determined from sparse gauging data and 1-dimensional model results from previous modelling by WRL;
- Selection of the optimal discharge site requires further consideration of suitable water quality objectives. The two potential discharge sites are located in separate 'water quality zones' as defined by Sanderson and Redden (2001). The assessment by WRL is particularly sensitive to differences in background water quality data compiled for each zone, but in reality it would be difficult to set such strong delineation between zone areas especially where zones are defined by spatially aggregated datasets;
- The proposed discharge site is close to the confluence of the South Arm and North Arm of the Hunter River. In this area, plume behaviour would be governed by velocities that are spatially variable which cannot be adequately represented by a 1-dimensional hydrodynamic model. Velocity magnitude and direction from a 2-dimensional or 3-dimensional model are needed to indicate the potential areas of impact of the plume over time. Discharge at outfall sites are to be modelled under full dynamic conditions to capture tidal hydrodynamic and dispersion processes;
- The behaviour of the plume under wind conditions has not been included in the previous assessment, but is considered by the NSW EPA to be significant for a site in proximity to the entrance of the harbour and ocean. Furthermore, the discharge may result in all or part of the plume being located near the surface and under certain wind conditions may be transported upstream along the South Arm where the opportunity for mixing may be somewhat less than the North Arm. The effects of wind should be included; and
- It is unclear how a plume created from a bottom mounted diffuser near the bed of the channel would be dispersed by local currents and wind action.

The current study has been undertaken to provide additional information and address data gaps of the previous assessment. Other matters covered by the adequacy review relating to stormwater, ambient nutrient concentration data and further data collection were not considered by this study.

1.4 Study Aims

The aim of this study was to assess potential impacts of a proposed effluent discharge on the receiving water environment of the South Arm and North Arm of the Hunter River downstream of Hexham.

The study includes consideration of the following:

- Available data and background information (how the system operates) to assist with preparation of computer models;
- Two potential effluent discharge sites (namely Discharge Site 1 (South Arm) and Discharge Site 2 (North Arm)); and
- Simulation of near-field and far-field interactions between the proposed discharge sites and receiving water environment.

This report summarises relevant background information, as well as the methodology and results of a mixing modelling assessment (using both far-field and near-field models) to address requirements relating to potential water quality impacts and accumulation of effluent as noted in the adequacy review.

1.5 Limitations of Assessment

The assessment is based on a preliminary, high-level study that provides broad guidance on these matters. This assessment has been largely based on the use of numerical (computational) modelling, and provides sufficient detail for the approvals process. If further optimisation of the diffuser is required during the detailed design of the outfall, Computation Fluid Dynamic (CFD) modelling is recommended.

The computational representation of the Hunter River Estuary is limited by the accuracy of the information used to develop the models. One of the critical model inputs is detail regarding the bathymetry of the Estuary. Information used to describe bathymetry in the model has various sources – within the lower reaches information has come from recent multibeam sonar of the river channel (considered to have a relatively high level of accuracy), while in the upper reaches, bathymetry is described by simple cross section surveys spaced approximately 1 km apart (considered to have a relatively low level of accuracy). Furthermore, surveys represent conditions at a given point in time, and may not necessarily represent present day conditions, or conditions that will occur in the future. Dredging in Newcastle Harbour, in response to ongoing sedimentation as well as periodic capital infrastructure development, and commercial extraction of sand and gravel from the upper reaches of the river, are two examples where bathymetry can change suddenly, which may influence tidal hydrodynamics. Nevertheless, calibration and validation results obtained for the far-field model (refer Appendix B) demonstrate that the model provides a good representation of tidal hydrodynamics and advection / dispersion processes particularly downstream of Hexham which is the main focus area of the study.

There are likely to be other factors that influence real-world estuarine hydraulics and water quality within the Hunter River that are not included in the numerical analysis. This includes for example the impact of storm surge, which has the potential to raise tidal levels well above predicted levels (and thus can have significant impacts on inundation of low-lying wetland environments). For all model scenarios considered by the assessment, the possible 'worst-case' condition(s) for the study area were adopted which is consistent with a best practice methodology for assessment of this nature.

The far-field modelling methodology does not include simulation of temperature and detailed physio-chemical dynamics (i.e. individual nutrient species). As such the far-field model has not been used to calculate background (or actual (i.e. including proposed additional load)) TN or TP, but instead simulates additional (conservative (i.e. with no breakdown processes)) TN or TP added to the Estuary by the proposed outfall. In the lower reaches of the Hunter River, density should dominate through differences in salinity between the estuarine receiving water (high salinity) and the proposed effluent discharge (low salinity).

2 DESCRIPTION OF THE EXISTING ENVIRONMENT

2.1 Hunter River Estuary

2.1.1 Extents

The Hunter River Estuary (herein referred to as the 'Estuary') is a large riverine estuary system at the downstream end of the extensive Hunter River catchment (size ~ 22,000km²), which flows into the Tasman Sea through the Port of Newcastle (DWE, 2008) (refer Figure 2-1). The proposed ammonium nitrate facility is located near the confluence of the North and South Arms of the Hunter River. Three major rivers discharge into the Estuary, namely the Hunter River, the Paterson River and the Williams River. The lower reaches of these rivers are tidal and form the upper sections of the Estuary. The confluence of the Williams River and Hunter River is at Raymond Terrace approximately 30 km upstream of the Estuary mouth (i.e. Newcastle Harbour). The Paterson River joins the Hunter River between Morpeth and Hinton some 15 km upstream of Raymond Terrace, which is approximately the centre of the tidal pool area. The Estuary extends a further 20 km along the Hunter River to the tidal limit at Oakhampton, near Maitland. The tidal limit in the Paterson River is at Gostwyck (approximately 70 km from the ocean), while the tidal limit in the Williams River is at Seaham Weir (46 km from the ocean) (MHL, 2003b).

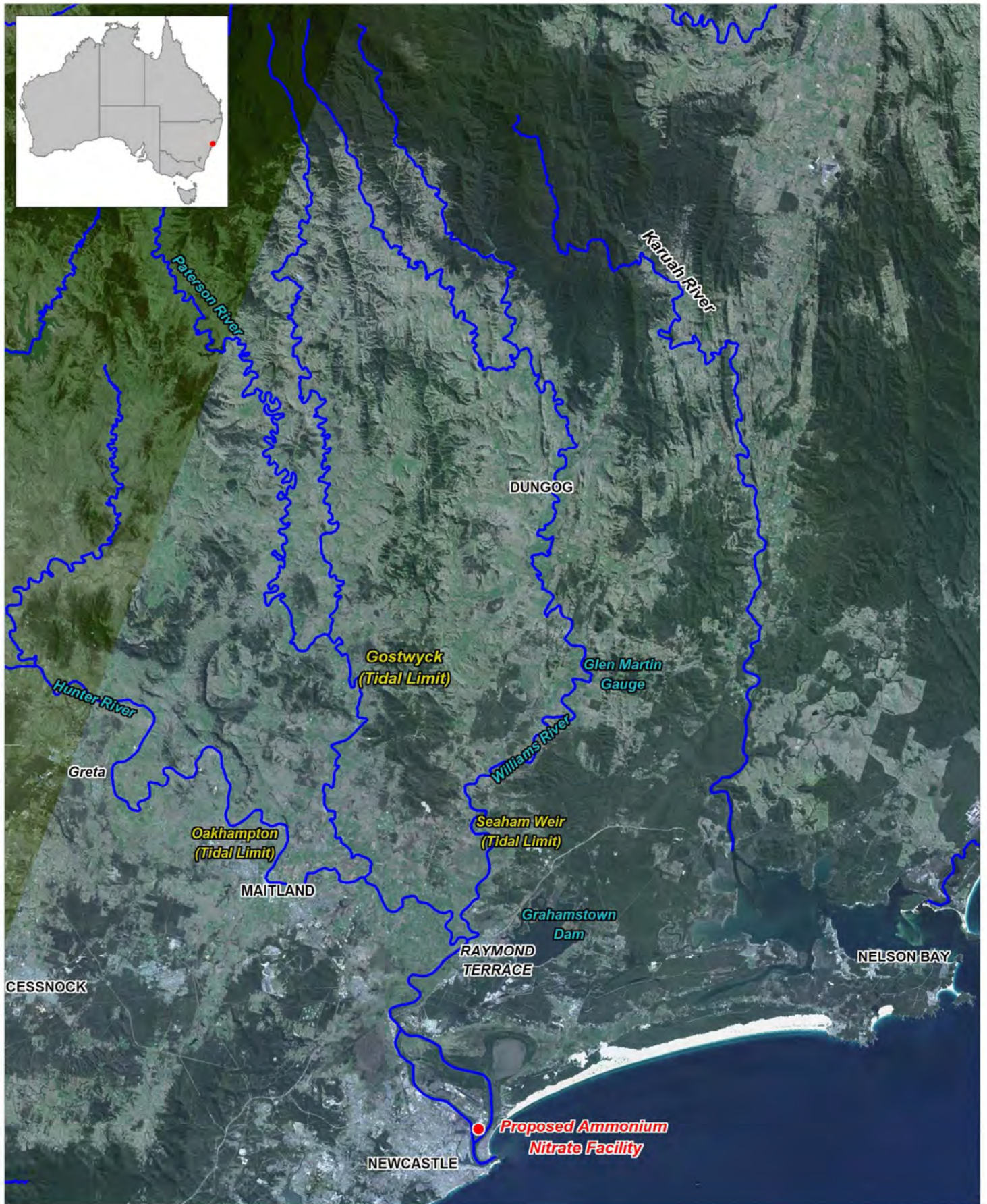
2.1.2 Bathymetry

Water depths within the Port of Newcastle are maintained at around -14 to -16m AHD to accommodate commercial shipping (MHL, 2003b). Upstream of the Port in the South Arm (i.e. immediately upstream of Toule Street bridge), the depth quickly decreases to approximately -4m AHD, reducing further to a depth of approximately -1m AHD at the upstream confluence of the North and South Arms. Water depths in the North Arm are in the order of -5m AHD, extending to -7m to -9m AHD on the outside of bends (MHL, 2003b). Fullerton Cove is a large shallow (approx. -2m AHD) embayment (semi-occluded lake) located adjacent to the North Arm upstream of Stockton Bridge.

Between Hexham and Maitland, the river varies in depth, typically between 3 and 9 metres, with deeper waters on the outside of river bends where higher velocities and helical flow patterns are experienced. The upper reaches of the Estuary are typically about 50 – 80 metres wide, with steep riverbanks and flanked predominantly by agricultural lands.

2.1.3 River entrance

The ocean entrance to the Estuary is fixed by twin rock breakwaters constructed in the late 19th century. The entrance is approximately 400 metres wide and 16 metres deep, allowing full ocean tides to penetrate into the Harbour.



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Hunter River Estuary Locality Map

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Approx. Scale



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2.1.4 Estuary classification

The Estuary is classified as a geomorphologically mature wave-dominated estuary (Digby, 1998, Geoscience Australia 2007), similar to other 'big rivers' on the mid north coast of NSW (e.g., Manning River, Macleay River). Contemporary sedimentation has primarily been restricted to the lower estuary, where the waterway expands and velocities reduce, which has led to the establishment of low-lying estuarine wetlands. In more upstream reaches the river channel is more 'in-regime', where periodic floods maintain a channel section that approximately balances flow and sediment loads (within geological timeframes).

2.1.5 Site history

The Port of Newcastle is one of Australia's largest tonnage ports and accommodates over 3000 shipping movements per year. During the early development of port infrastructure in the region, many estuarine wetlands and shallow fluvial channels were altered or reclaimed. The land now known as Kooragang Island (which contains extensive heavy industry and port infrastructure) formerly comprised up to 21 individual islands (Ecology Lab, 2001).

In addition to dredging associated with the Port of Newcastle, flows within and into the Estuary have been altered as a result of extensive clearing of the natural forested catchment (MHL, 2003b). Further modifications to estuarine flows include approximately 200 floodgates in and around the Estuary, including many in the grazing areas north of Hexham and around Fullerton Cove (MHL, 2003b). There are approximately 59 culverts in the waterways of the Hunter Estuary and these occur predominantly in the lower estuary on Kooragang Island, around Fullerton Cove and around Newcastle (MHL, 2003b). Man-made levees also occur extensively along the upper estuary and across the low-lying floodplains, which alter overbank flood behaviour (MHL, 2003b).

The lower reaches of the South Arm are bounded by suburbs of Newcastle to the south and heavy industry on Kooragang Island to the north. The lower reach of the South Arm receiving environment is classified as a highly disturbed ecosystem, or a Condition 3 Ecosystem as defined in ANZECC and ARMCANZ (2000). The North Arm of the Hunter River is also bounded by heavy industry along its western bank between Walsh Point and Stockton Bridge. Upstream of Stockton Bridge, however, dense mangrove forest is present along both sides of the main waterway. The boundary of the Kooragang Wetlands Ramsar site encompasses that segment of the North Arm and as such is considered to be a more sensitive receptor than the South Arm receiving environment.

2.1.6 Wetlands

The Hunter Estuary Wetlands are located in the lower reaches of the Hunter River Estuary, downstream of Hexham Bridge (refer Figure 2-2). The lower reaches are dominated by muddy sediments and extensive mangrove forests along low-lying intertidal and supra-tidal foreshores. The estuarine wetlands are also largely protected through NSW State Environmental Protection Policy – 14 (SEPP-14) Coastal Wetlands. Wetland reserve also extends beyond the Ramsar boundary encompassing upper waterway areas of the South and North Arms as shown in Figure 2-3.

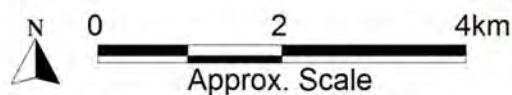


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Lower Hunter River Estuary Ramsar Wetlands

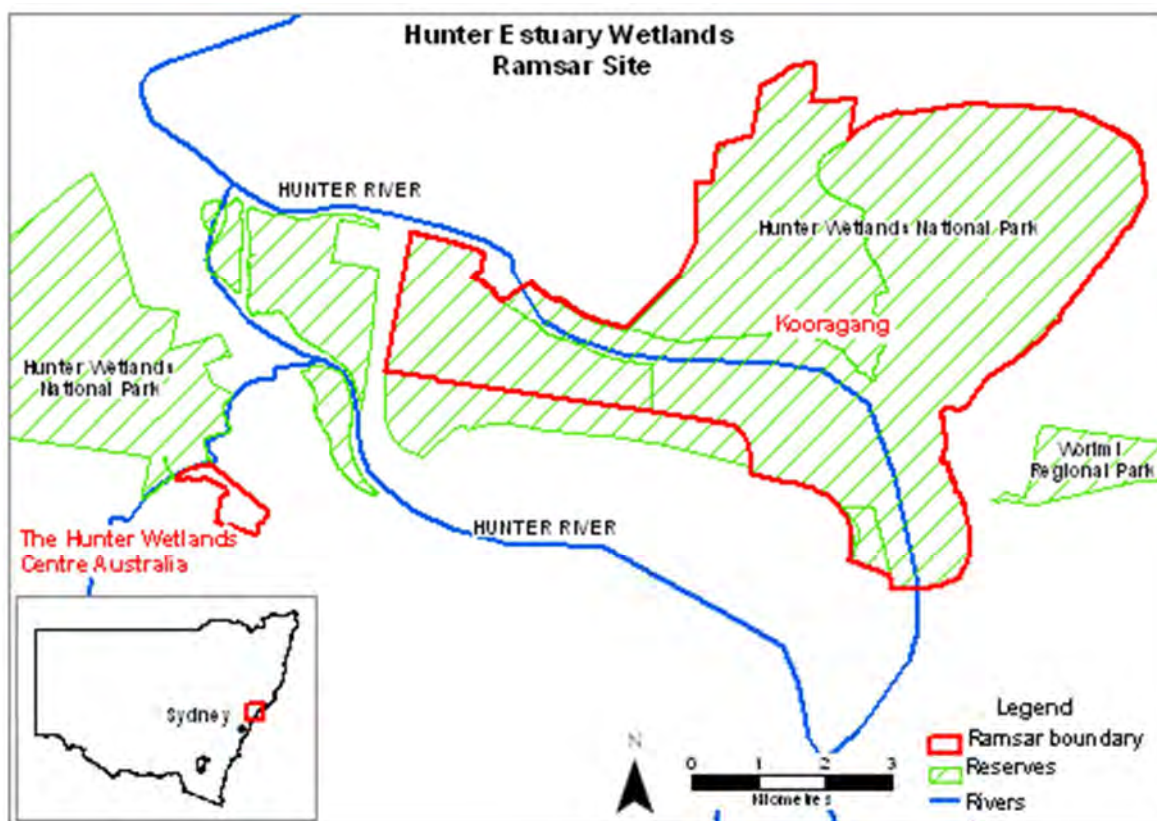
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Source: Environment and Heritage (2012)

Figure 2-3 Hunter Estuary Wetlands Ramsar Site Map

The estuarine wetlands experience full ocean tide conditions and other oceanic influences, such as storm surge. Freshwater flooding of the wetlands is largely controlled by the ocean levels – that is, set-up of ocean water levels will cause ‘backwater’ along the river with inundation of adjacent low-lying lands. If freshwater flooding does not coincide with ocean set-up, then river levels along the lower estuary remain largely within the normal tidal range (although waters can become totally fresh with floodwaters displacing previously saline or brackish waters within the estuary channel).

2.2 Estuarine Processes

Estuaries are very complex environments, with interactions occurring between various physical, chemical and biological processes. The Hunter River Estuary is one of the most complex estuaries in Australia, given its size, its diverse catchment landuse pressures, its diverse waterway use, and its ecological values (BMT WBM, 2010a).

Estuarine processes can broadly be considered hierarchical, with physical processes mostly driving water quality processes; and physical and water quality processes mostly driving biological processes. There are of course exceptions to this basic structure.

The Ramsar wetlands of the Lower Hunter River include estuarine wetlands on Kooragang Island and surrounding Fullerton Cove. These wetlands are important habitats for migratory and resident shorebirds. Water levels within the wetlands are driven almost exclusively by astronomical tides and various tidal anomalies, such as storm surge.

2.2.1 Tidal hydrodynamics

Full ocean tides are able to penetrate the entrance of the Hunter River Estuary with little attenuation. Tidal planes for Stockton Bridge (approximately 8 km from the entrance) and Hexham Bridge (approximately 16 km from the entrance) are presented in Table 2-1, representing broadly the downstream and upstream boundaries of the Ramsar wetlands, respectively. As shown in this table, there is only a small difference in tidal levels between the two locations, and both are essentially the same as ocean tide conditions.

Table 2-1 Summary of Tidal Plane (average 1990 – 2000) (source: MHL, 2003a)

Tidal Plane	Acronym	Stockton	Hexham
Higher Solstice High Water Spring	HHWSS	997 ± 27	992 ± 48
Mean Higher Water Spring	MHWS	634 ± 28	643 ± 49
Mean High Water	MHW	508 ± 28	539 ± 49
Mean High Water Neap	MHWN	382 ± 28	436 ± 49
Mean Sea Level	MSL	-21 ± 31	43 ± 48
Mean Low Water Neap	MLWN	-424 ± 34	-349 ± 47
Mean Low Water	MLW	-551 ± 34	-453 ± 47
Mean Low Water Spring	MLWS	-677 ± 34	-556 ± 47
Indian Spring Low Water	ISLW	-936 ± 35	-806 ± 48

Note: Tidal plane amplitudes in millimetres relative to Australian Height Datum

Tides within the Estuary therefore have the same characteristics as ocean tides, these being semi-diurnal unequal tides, with strong fortnightly variations between spring and neap stages of the tidal cycle (associated with coinciding lunar conditions). “King tides” are very large spring tides that approximately coincide with summer and winter solstice periods. These higher spring tides are important for wetlands as they assist in preventing the establishment of freshwater species on low-lying saltmarsh areas.

The conveyance of tides upstream is dependent on the water level in the channel and the channel dimensions. As a consequence of dredging in the 1950's and 1980's, the water levels and tidal ranges within the Hunter River have changed. An analysis of tidal data from 1955 and 2000 showed that the spring tide range has increased in upstream reaches (MHL, 2003a).

Moving upstream there is a gradual reduction in the mean tidal range along the Hunter River, with a range of approximately 1.0 m at the entrance and 0.4 m at Belmore Bridge, Maitland (MHL, 2003a). Along the Paterson River there is a slight amplification of the mean tidal range (0.7 m at Dunmore) (MHL, 2003a), while on the Williams River there is a slight amplification of the tidal range (0.91 m recorded at Raymond Terrace, increasing to 0.96 m at Seaham) (MHL 2003a). Along the Williams River, the weir at Seaham acts as a reflective barrier and the tides are therefore expected to act like a standing (or stationary) wave. Standing waves are produced when a wave is confined within boundaries such as an upstream structure or control (e.g. weir). As a consequence the tides in the Williams River are weaker (by a factor of 0.3), when compared to the Hunter River (MHL, 2003).

Tidal lags also vary within the three tributaries of the Estuary. Along the Hunter River at Bolwarra the low tides lag 8.8 to 6.3 hrs after the entrance tide and the high lags 3.8 hrs. Along the Paterson River at the Paterson Railway Bridge the low tides are 6.1 to 5.3 hrs after the entrance tide and the high tide lags by 4.3 hrs, and along the Williams River at Seaham Weir the low tides are 3.3 to 2.5 hrs after the entrance tide and the high tide is 1.8 hrs after (MHL, 1995). In the Lower Estuary, the tidal excursion is around 10 km during spring tides (MHL, 1995).

Maximum tidal velocities decrease upstream with values of around 1.0 m/s near the entrance during the ebb tide to around 0.5 m/s at Morpeth (48km upstream) (MHL, 2003a). During the flood tide the maximum velocities are similar, at around 0.9 m/s near the entrance.

Low frequency oscillations in tidal level of about 3 to 10 days period with amplitudes of 0.1 m have been recorded within the Estuary (MHL, 2003a).

Tidal levels are recorded at several locations along the Estuary. Tidal level data has been used to help validate numerical models of the Estuary (refer Section 3.3.4).

Tidal inflows to the Estuary from the ocean have been estimated at 18,250 GL/yr. This equates to an average volume of 26 GL per tide (i.e. equivalent of 10,000 Olympic size swimming pools every 12 hours). Tidal flows have been gauged within the Estuary on a few occasions. Tidal flow data has also been used to help validate the Estuary models (refer Section 3.3.4).

2.2.2 Typical long-term river discharge conditions

Available water level data for sites within the Hunter River catchment were extracted from the PINEENA database Version 9.3 and converted to streamflow based on rating curves established for the each gauging location. A summary of the average monthly river flow volume for the Hunter River (Greta, 210064), Paterson River (Oakhampton, 210079) and Williams River (Glen Martin, 210010) is presented in Figure 2-4. Monthly river flow data presented below were obtained based on records collected over a period of 40 years for the Hunter River and 81 years for the Paterson River and Williams River.

The data show that the Hunter River contributes a greater volume of flow consistently over the year than the other two river systems. Monthly river flow volumes for the Paterson River and Williams River are on average approximately 62% and 50% less, respectively, than those recorded for the Hunter River.

Using the PINEENA streamflow data, flow exceedance curves have been generated for the Hunter River, Paterson River and Williams River (refer Figure 2-5). Whilst the curves show substantial difference in flow for the highest and lowest 5%, the vast majority of time can be characterised by relatively persistent flow conditions (illustrated by the 'flatness' of the flow exceedance curves). Within the Hunter River for example, flows are within one order of magnitude for some 65% of the time. It is reasonable to say therefore that the freshwater flow behaviour can be defined as an approximately consistent baseflow interspersed by periodic episodes of high flow event, and occasional drought conditions.

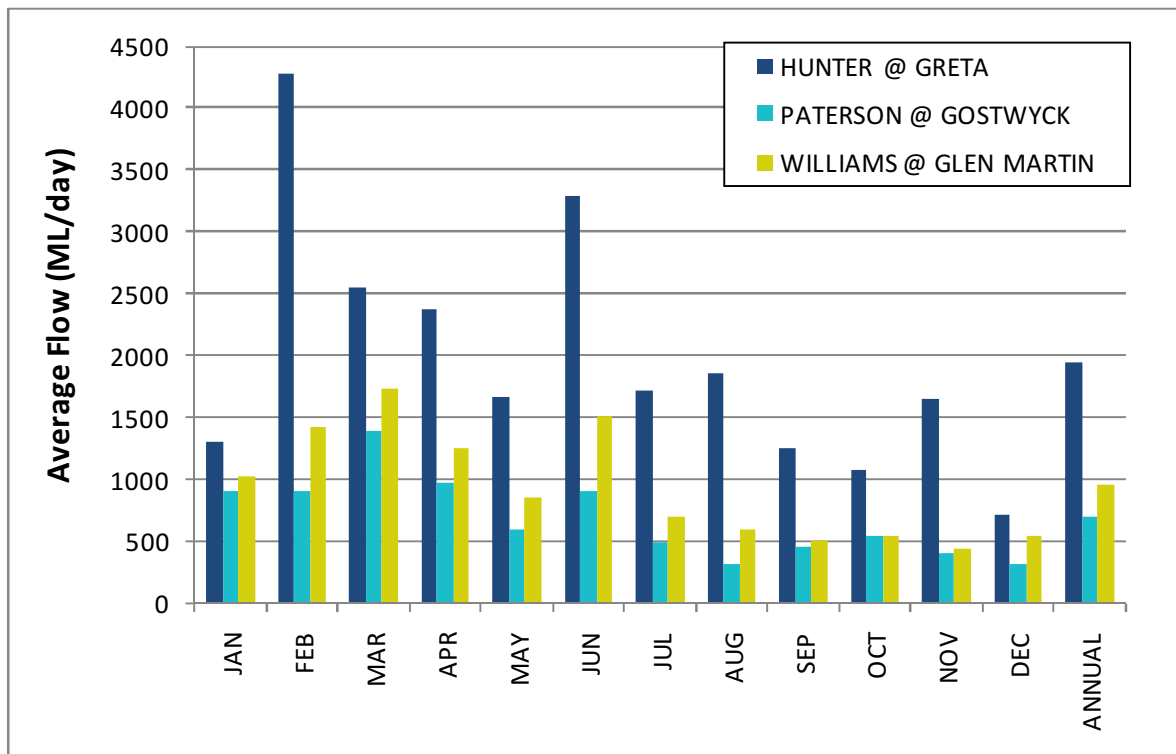


Figure 2-4 Historical Average River Flow Condition (Source: PINEENA v9.3)

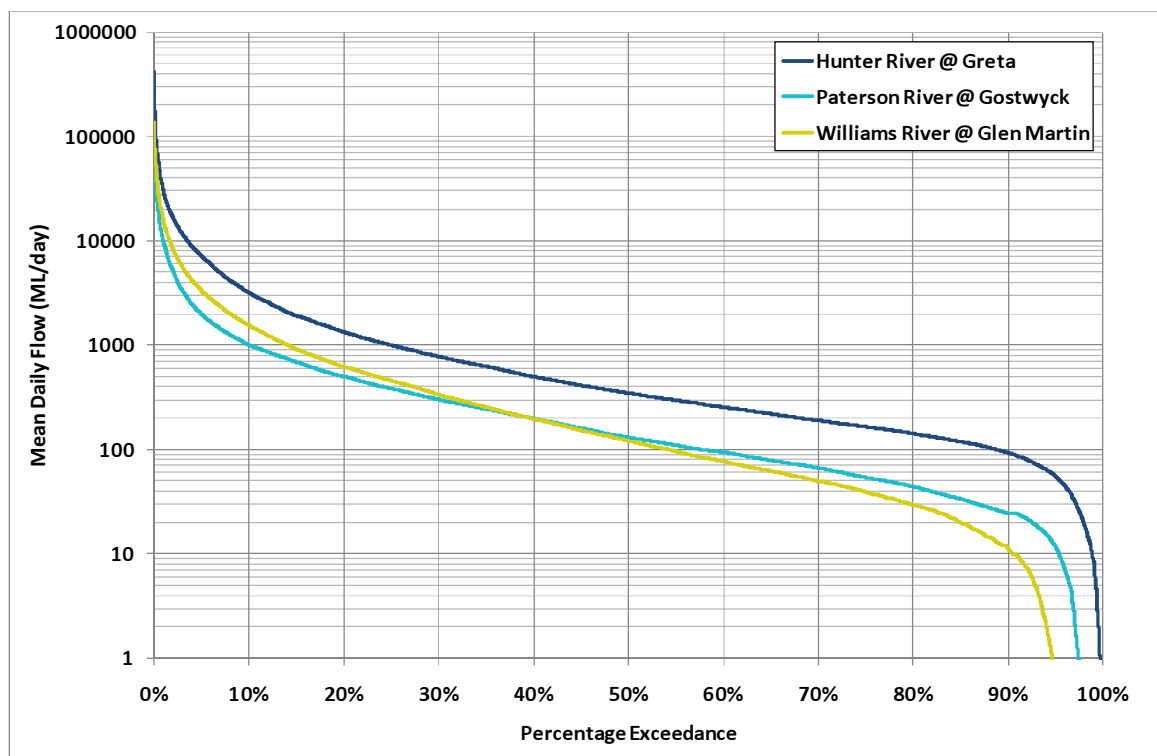


Figure 2-5 Flow Exceedance Curves for Major River Flow Systems

2.2.3 Flood hydrodynamics

The Hunter River has experienced many floods during its recorded history. The largest flood on record was in 1955. After this event, the Hunter Valley Flood Mitigation Scheme was established, which has subsequently instigated 160 km of levees, 3.8 km of spillways, 40 km of control banks, 245 floodgates and 120 km of drainage canals (DNR, 2007).

Within the Lower Hunter Estuary, the 1955 flood caused extensive overbank inundation, with flood depths of up to three metres across the Kooragang Island wetlands. This flood has been estimated at approximately a 100-year Average Recurrence Interval (ARI) event (PWD, 1994).

Ocean water levels, influenced by storm surge and the tide, have an effect on flood levels within the Lower Estuary, up to Green Rocks, upstream of Raymond Terrace (PBP, 1996a). In higher frequency low discharge floods, the flow is contained within the rivers banks and levees. As flood severity increases, floodwaters overtop the natural and man-made levees and flow across the floodplain.

When the floodwaters reach the upstream end of Kooragang Island, approximately 75% of the flow continues down the North Arm, and 25% down the South Arm. During large flood events (exceeding approximately 200 GL/day, or ~10-year ARI event), freshwater inflows can flush the majority of the estuary of salt water, except at depth in the dredged Port of Newcastle areas, where saline waters become trapped by overlying freshwater flows (Sanderson and Redden, 2002).

Numerous floodgates along the Estuary (e.g. Purgatory Creek, Ironbark Creek and Wallis Creek) prevent backwater inundation of floodplain areas during smaller flood events, however, in larger events the floodgate structures are overtopped and the floodplains inundated.

2.2.4 Salinity and stratification

Analysis of historical data (Sanderson and Redden, 2001) demonstrates the Lower Estuary can exhibit significant variability in salinity, ranging from full oceanic salt values (~ 36 ppt) to complete freshwater (during large flood events). Salinity concentrations within the Estuary are influenced by the relative balance between freshwater inflows (catchment runoff, groundwater flows, direct rainfall and artificial discharges) and oceanic / saltwater inflows through the river mouth each tide.

When freshwater conditions dominate (e.g. during a flood), freshwater flows can completely displace the saltwater in the Estuary (for river flows exceeding 200 GL/day, refer Sanderson and Redden, 2002). Following a fresh event, tides quickly return salt to the Estuary, starting at the downstream end and propagating upstream through the process of tidal advection and turbulent diffusion. Stratification has been recorded within the Lower Estuary during and immediately after flood events, with this stratification mostly dissipated within about 2 weeks due to tidally generated turbulence (Sanderson and Redden, 2002). Following fresh events, saline conditions in the Lower Estuary are restored quickly given the large volume of saline oceanic water entering through the river mouth each tide.

Typical of most river systems in South-Eastern Australia, low flow conditions dominate in the Hunter River. The median flow for the period 1975 – 2000 was 716 ML/day, compared to the mean flow of 3,120 ML/day. During the typical low flow periods, the Estuary is characterised as well mixed with little vertical stratification, seldom exceeding 3 ppt (Sanderson and Redden, 2002). In the vicinity of

the Lower Hunter Ramsar wetlands (i.e. the lower 15 km of the Estuary), the horizontal salinity gradient is small, indicating the dominance of the oceanic inputs, assisted by a tidal excursion of approximately 8-10 km across the Lower Estuary (Sanderson and Redden, 2002).

Characterisation of the Estuary as well mixed is supported by the relative effect of river inflows compared to tidal flows (i.e. $R < 0.1$, refer Luketina, 1998; Schultz and Simmons, 1957).

A 'steady state' salinity structure can be established throughout the Estuary within about 30 days. That is, when flows are approximately consistent for 30 days or more, a relatively consistent salinity gradient will be present in the Estuary, which balances the down-estuary advective transport of freshwater flows and the up-estuary diffusive transport of tides (Sanderson and Redden, 2002). In the vicinity of the Lower Hunter Ramsar wetlands, however, this timeframe is reduced substantially, as indicated by observed rapid post-flood saline recovery (within about 2 weeks, incorporating the tail of a flood hydrograph).

For the wetlands on Kooragang Island, freshwater inputs would be most common from direct rainfall, while for the wetlands around Fullerton Cove, freshwater inputs are also influenced by local catchment runoff. The influence of freshwater conditions within the river channel on the wetlands is considered small, as infrequent large flood events are required in order to displace saltwater from the lower reaches of the Estuary (i.e. floods exceeding 200 GL/day: a probability of occurrence of ~10% per annum, or ~10-year ARI event).

Overall, vertical salinity stratification in the Hunter Estuary is generally weak (as supported by recent water quality monitoring data presented in Appendix A) and occurs for periods of a few days to a week only, after flood events (i.e. while there is still a weak outflow of fresh floodwater overlying a strong return of saline tidal waters) (Sanderson and Redden, 2001). It is noted that in backwater areas such as wetlands in the upper reaches where tidal currents are weaker, stratification may last for longer periods, however, there is insufficient data available to confirm or quantify this (Sanderson *et al.* 2001).

2.2.5 Water quality

The water quality of the Lower Estuary is typically dominated by high loads of suspended solids, due to the strong tidal currents (causing re-suspension of fine bed sediments), the small wetland areas (which would otherwise act as sinks for particulate matter) and the relatively large and mostly developed (cleared) catchment area (providing a ready source of sediment) (Sanderson and Redden, 2001). In many estuarine systems, the phytoplankton (as represented by chlorophyll-a) growth rates are dependent on available nutrients in the water column, however, in the Hunter River the high suspended solids levels appears to limit phytoplankton growth despite high nutrient levels (Sanderson and Redden, 2001). This is highlighted by low average chlorophyll-a levels within the lower, saline, section of the Estuary, which are documented as being within ANZECC guidelines (Sanderson and Redden, 2001). High background turbidity in the Estuary is also considered to be the main factor for the absence of estuarine macrophytes (seagrasses).

After heavy rainfall, the Estuary is subject to river inflows and local runoff from surrounding land; and the water may become quite brown and turbid (Ecology Lab, 2001). Levels of turbidity and non-filterable residue are both highest in the winter months after six months of typically higher flows in the

Hunter River (refer Section 2.2.3). This is attributed to the source of the waters with higher levels of turbidity found in rivers compared to the ocean (MHL, 1995).

Turbidity is generally higher in the Upper Estuary than the Lower Estuary, with mean turbidity levels of 15 NTU and maximum values of 260 NTU. The EPA interim guidelines (1999) suggest the turbidity should be less than 5 NTU for the protection of aquatic ecosystems.

Dissolved Oxygen profiles indicate a slight increase downstream but generally show that the Estuary is well oxygenated throughout. During and immediately following wet weather/flood events, the Lower Estuary exhibits a temporary decline in dissolved oxygen (DO), especially at depth, where DO levels of 10% have been observed in freshwater (Sanderson and Redden, 2002). Saline water intruding back into the Estuary following an event carries high dissolved oxygen, which restores depleted oxygen levels relatively quickly, although initially (within the first few days) it is the saltwater from the bottom of the dredged harbour that is advected upstream into the Estuary, which is also oxygen deprived (Sanderson and Redden, 2002). Sanderson and Redden (2001) found that sustained periods of low flow in the Hunter River Estuary do not exhibit reduced oxygen levels. This is because of the shallow nature of the Estuary combined with strong tidal and wind-generated currents, resulting in strong vertical mixing of tidal waters.

Dissolved Inorganic Nitrogen (DIN) tends to increase towards the mouth before the dilution effect of sea water near the mouth dominates (up to 10km from the mouth) (Sanderson and Redden, 2001).

Chlorophyll-a is higher in the upstream reaches and decreases towards the mouth, which could be explained by a number of processes including a spatial shift from freshwater species upstream to saltwater species downstream, coupled with the effects of dilution in the lower reaches (Sanderson and Redden, 2006).

2.2.6 Interactions between hydrodynamics and salinity / water quality

Sanderson and Redden (2001) have summarised the interaction between the estuarine hydrodynamics and salinity / water quality within the Hunter River, as discussed below, and presented in Figure 2-6.

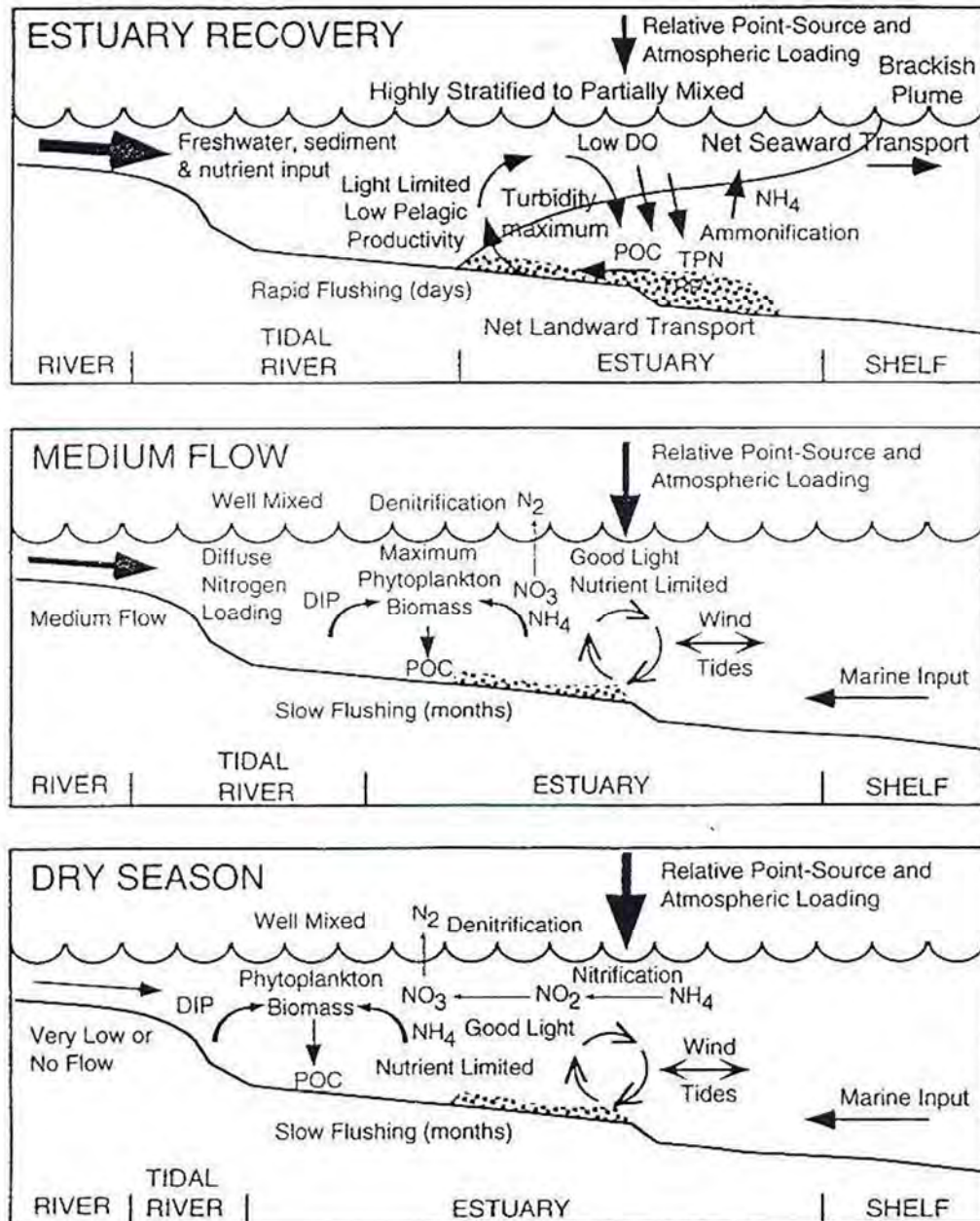


Figure 2-6 Water Quality and Flushing Model (Sanderson and Redden, 2001)

2.2.6.1 During flood events

- The estuary is flushed fresh to the mouth. Floodwaters, sediment and nutrients discharge directly to the adjacent coastal waters and spill over the lower floodplain and backwater areas. During the flood, turbidity at the mouth is very high (~180 NTU) compared to normal (1-10 NTU);
- During sufficiently large events, the mouth may stay fresh for a number of days, and significant scouring of the river channel may occur; and
- If even just a small amount of the salinity remains within the lower reaches there may be significant flocculation of fine particles, deposition and processing of material within the lower Estuary.

2.2.6.2 During post-flood recovery

- As the estuary recovers from floods it quickly progresses from a short-lived stratified salt wedge to a partially mixed system with a well-developed two layered circulation and finally back to a vertically homogeneous system. The Estuary returns to vertical homogeneity within about 2 weeks of a flood event;
- Immediately following floods, some of the sediment in the upper layers settles through the halocline at slack water where it is caught in the lower layer, transported landward, and deposited near the salt/freshwater interface;
- DO is reduced due to the breakdown of organic material mobilised by the floodwaters, including NH_4 production by ammonification processes;
- The amount of material trapped will depend on the flushing timescale;
- Early in the recovery stage organic material passes through relatively conservatively due to short flushing times, but the biological processing of organic material increases with an increase in flushing time; and
- The location of the fresh/salt water interface dictates where the maximum deposition occurs in the estuary. During this stage nutrients are typically very high due to diffuse runoff from the catchment. However, phytoplankton growth is not generally stimulated due to light limitation and/or rapid flushing.

2.2.6.3 During medium flow and extended dry periods

- Dominated by a vertically homogeneous system due to low freshwater inflow and strong tidal mixing;
- Point source inputs upstream are mostly retained within the system due to very long flushing times;
- The highest phytoplankton biomass probably occurs during the dry periods due to lower turbidity and slow flushing, however, the resultant rapid uptake of nutrients may result in phytoplankton growth being nutrient limited;
- Medium flows can provide diffuse sources of nutrients which in turn stimulate phytoplankton growth. Because of the high turbidity, however, the phytoplankton growth is likely to be light limited with short periods of nitrogen limitation; and
- Small diffuse loading events are likely to support primary productivity when the benthic supply of nitrogen is exhausted.

During extended dry periods the point sources (e.g. sewage treatment plant discharges) contribute largely to the nutrient loading. There may also be some N and P loading from the ocean during these periods.

3 INTERACTIONS BETWEEN THE PROPOSED OUTFALL AND RECEIVING WATER ENVIRONMENT

3.1 Overview

The proposed discharge was previously assessed for a single effluent discharge site in the South Arm approximately 1.2 km upstream of Walsh Point. Presently, there are two potential outfall locations being considered by IPL. The proposed outfall locations are being considered as either/or, and this assessment will be used to determine the relative impacts of the two locations.

The assessments conducted in the following sections include:

- Near-field (mixing) modelling of the proposed discharge within a zone of initial dilution. This modelling was conducted with respect to the potential toxic effects of constituents in the discharge. Near-field modelling primarily accounts for the configuration of the outfall, properties of the discharge and the receiving environment immediately adjacent to the outfall (refer Section 3.2); and
- Far-field (water quality) modelling of the discharge beyond the area immediately adjacent to the outfall. Far-field modelling was conducted to account for additional environmental factors such as dynamic tidal conditions, oceanic boundary influences, wind and upstream river inflows (refer Section 3.3).

3.2 Modelling of Near-Field Interactions

3.2.1 Modelling and discharge overview

Near-field mixing modelling is typically conducted with respect to substances having the potential to be toxic to organisms within aquatic environments. In particular, the assessments are carried out with respect to the potential toxic effects of given constituents within effluent discharged to waters of the state.

The proposed effluent discharge as described in IPL facility Water Management Plan (URS, 2012a) includes species of nitrogen, i.e. ammonia and nitrate, both of which demonstrate toxic effects at threshold concentrations under conditions. No other constituents (including phosphate) included or anticipated in the effluent stream have a published toxic effect or guideline discharge limit. If additional species of concern come to light, then this modelling work will need to be revised accordingly.

The proposed discharge was modelled at two locations in the Lower Estuary, one in the middle of the North Arm channel (immediately adjacent to the proposed ammonium nitrate facility), and the other near the K2 berth in the South Arm of the Hunter River. The two proposed discharge locations are shown in Figure 3-1.



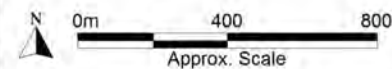
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Proposed Discharge Locations

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3.2.2 Water quality objectives

In order to assess the impacts of the constituents of concern on receiving water quality, the limits of discharge needed to be established through regulatory water quality criteria. The NSW Office of Environment and Heritage (OEH) has established water quality objectives based on the Australia / New Zealand Environmental and Conservation Council / Agriculture and Resource Management Council of Australia and New Zealand (DEC NSW 2005; ANZECC/ARMCANZ 2000) fresh and marine water quality guidelines.

These guidelines establish limits of acceptable concentrations for the chemicals with the potential to have lethal effects to a range of aquatic organisms. For the purposes of this study, aquatic toxicity can be generally defined as adverse effects of exposure to a given substance in a single dose or multiple doses within a brief period of time (IUPAC, 2011). These water quality criteria are referred to as Toxicant Trigger Values (TTVs).

Table 3-1 lists the TTVs for the parameters in the discharge likely requiring a mixing zone. In the case of ammonia, its toxicity is dependent on pH (see Table 3.4.1 in the ANZECC/ARMCANZ (2000) guidelines). The TTV was therefore adapted to the two proposed discharge locations based on median pH values expected (pH 8.1 to 8.2; refer Section 3.2.5.2 below).

For nitrate, a low reliability marine TTV was used in this study based on the freshwater TTV of moderate reliability. While a TTV of 13.0 mg/L has been derived, the dataset used to determine this value was deemed insufficient for higher reliability, and the guidelines recommend using the freshwater TTV as a conservative interim value (ANZECC 2000, Volume 2 Section 8.3.7.2, p. 8.3-169).

Table 3-1 ANZECC/ARMCANZ (2000) TTVs

Parameter	ANZECC TTV
Ammonia as N (mg/L)	0.62 - 0.75 ^a
Nitrate as N (mg/L)	0.16 ^{bc}

^a TTV adjusted for ambient pH range of 8.1 - 8.2

^b Freshwater TTV of low reliability used as interim marine TTV

^c TTV converted to a TOTAL nitrate-N concentration

3.2.3 Discharge water quality

3.2.3.1 Salinity, temperature and pH

Similar to establishing density properties of the receiving water, density properties of the discharge were also calculated using water quality values reported in the accompanying EIS. The EIS reports two scenarios, a worst-case and indicative (average) case. Salinity, temperature and pH of the proposed discharge for the two scenarios are presented in Table 3-2. Salinity was calculated using the UNESCO algorithm (Fofono and Millard, 1983) based on temperature and conductivity values available for the proposed discharge.

Table 3-2 Discharge Water Quality: Salinity, Temperature and pH

Parameter	Indicative	Worst Case
Temperature (°C)	28	35
Salinity (psu)	0.83	1.10
pH	7.0 – 8.5	6.5 – 8.5

3.2.3.2 Ammonia and nitrate

Ammonia and nitrate speciation in the discharge were provided in the Water Management Report (URS, 2012a) for worst case and indicative conditions. A summary of these is provided in Table 3-3.

Table 3-3 Discharge Nitrogen Concentrations

Parameter	Indicative	Worst Case
Ammonia as N (mg/L)	< 37.5	75.0
Nitrate as N (mg/L)	< 37.5	75.0

Additionally, Total Nitrogen (TN) concentrations in the discharge were presented in the Water Management Report (WMR) in terms of 75th, 90th, maximum and mean values. The mean value, 67.5 mg/L, was used in the modelling for the average conditions (URS, 2012a). The speciation of this value was assumed to be the same as that of the worst case conditions. That is, 50% ammonia-N (33.8 mg/L) and 50% nitrate-N (33.8 mg/L).

3.2.4 Receiving water quality

Characterisation of receiving water quality provides an understanding of the conditions into which the effluent is to be discharged but also assists with quantifying background ammonia and nitrate concentrations in order to determine the assimilative capacity of receiving waters to accept additional quantities of those constituents. The assimilative capacity is defined as the difference between the allowable receiving water concentration, i.e. TTVs and the actual or background receiving water concentration.

In addition to ammonia and nitrate, consideration of temperature, salinity and pH are also required for the present assessment. Temperature and salinity were used to calculate the density of the discharge and receiving water, which is important in determining the buoyancy (negative, positive or neutral) of the discharge relative to the receiving water (in this case a marine environment). The background pH of the receiving water was used to establish TTVs at the propose discharge locations.

The EIS sourced water quality data collected by Sanderson and Redden (2001). Attachment 1 of the EPA Adequacy Review of the EIS stated that the Sanderson and Redden (2001) receiving water quality used in the WRL study was not current and should not be used as standard for assessment of impacts. The subsequent recommendation was to implement an intensive water quality monitoring program to establish current water quality conditions throughout part of the Lower Estuary over a range of tidal conditions (e.g. falling tide and rising tide). URS has undertaken a receiving water monitoring programme (URS, 2012b) and provided three rounds of monitoring results in the South Arm and North Arm collected in September/October 2012. Water column sampling data provided to BMT WBM is presented in Appendix A.

While the URS data are informative, they represent only a snapshot of the conditions at the time of sampling, rather than long-term conditions that capture seasonal and temporal trends. The other dataset used in the EIS (Sanderson and Redden 2001), represents historical conditions that, while not necessarily representing present conditions, characterised seasonal conditions including the influence of catchment runoff and associated nutrient loads. As such, to characterise background nitrogen concentrations, the two datasets were combined and analysed for both ammonia and nitrate.

From the Sanderson and Redden data (2001), a subset of sites was selected based on of their proximity to the proposed diffuser locations. Both the URS and the selected Sanderson and Redden (2001) sampling locations are shown in Figure 3-2. Of the Sanderson and Redden data, receiving water quality in the South Arm was deemed to be characterised by the sites presented in Table 3-4 for both the North and South Arm.

It should be noted that Sanderson and Redden (2001) did not monitor all the physical and water quality constituents in all their sampling locations. Table 3-4 also provides a summary of the monitored physical and water quality constituents at each site. Salinity, temperature and nitrate were only monitored at Sites 55 and 10 for the North and South Arms, respectively. Additionally, at those locations and for those constituents, data collection began after December 1995. Therefore, for characterisation of background water quality, only data collected after December 1995 were used to adopt the most recent data available and to maintain temporal consistency in selection of background concentrations.

Table 3-4 Sanderson and Redden (2001) Water Quality Sites and Constituents

Site	Location	Salinity	Temp	pH	Ammonia	Nitrate
55	North	√	√	√	√	√
63	North			√	√	
64	North			√	√	
65	North			√	√	
66	North			√	√	
87	North			√	√	
88	North			√	√	
94	North			√	√	
95	North			√	√	
98	North			√	√	
10	South	√	√	√	√	√
23	South			√	√	
29	South			√	√	
38	South			√	√	
39	South			√	√	
48	South			√	√	
52	South			√	√	



Image Source: NearMap

Legend

- ◆ Sanderson and Redden, 2001
- ◆ URS 2012
- Proposed Discharge Sites

Title:

Receiving Water Quality Sites

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



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3.2.4.1 Sanderson and Redden 2001

Hunter River characteristics at the locations of the discharge are influenced by both sea and freshwater. Figure 3-3 presents box and whisker plots of the characteristics of the water in terms of salinity, temperature and pH, and Table 3-5 summarises some statistical values (count, min/max, quartiles, mean and median) of the receiving water for physical and water quality.

Box and whiskers plots of the Sanderson and Redden (2001) ammonia and nitrate data (from December 1995 to December 2000) are also provided in Figure 3-4. For nitrate, only data at Sites 10 and 55 were available. With respect to which values to use for modelling, no federal or state level guidance on the characterisation of background conditions was found, nor could international conventions be identified. As such the respective median values, provided in Table 3-5, were used to characterise the background concentrations.

To facilitate comparison between the Sanderson and Redden (2001) data and recent data collected by URS (2012), descriptive statistics of the Sanderson and Redden (2001) dataset were calculated for the months of August through October (refer Table 3-6).

3.2.4.2 URS 2012

Box and whisker plots of salinity, temperature and pH data collected by URS in September of 2012 at Site 3 (South Arm), and Site 6 (North Arm) are shown in Figure 3-5. Typically, the range of values observed were within a smaller range than those observed in Sanderson and Redden (2001), suggesting minimal stratification and good mixing throughout the water column. Table 3-7 provides summary statistics for the URS data. Salinity was derived from conductivity and temperature profiles using the UNESCO algorithm for converting conductivity to salinity (Fofono and Millard, 1983). It should be noted that the Sanderson and Redden (2001) data were reported in parts per thousand (ppt), and as such, to enable comparison the URS (2012) conductivity data (expressed in $\mu\text{S}/\text{cm}$) were converted to an equivalent salinity (psu).

With regard to ammonia and nitrate, URS collected grab samples in September and October 2012 at two depths in the water column such that representative samples of the epilimnion (surface layer) and hypolimnion (bottom layer characterised by a salt wedge) could be obtained. Table 3-8 presents the URS monitoring results for ammonia and nitrate at each site. Sites 3 and 4 were used to calculate the median of the South Arm, and Site 6 for the North Arm.

For background nitrogen concentrations, Table 3-8 presents the median concentration of the combined Sanderson and Redden (2001) and URS (2012b) ammonia and nitrate data. The combined (median) background nitrogen concentrations adopted here are preliminary and subject to possible change based on the findings of additional water quality data collection to be undertaken during wet-weather conditions.

It should be noted that measurements of physio-chemical parameters including salinity, temperature and pH data were not combined in the same manner. Data available for these three parameters encompass longer-term seasonal variations and are considered to adequately characterise conditions experienced in the Lower Estuary.

Table 3-5 Receiving Water Quality Statistics (Sanderson and Redden 2001)

	Statistic	Salinity ppt	Temperature °C	pH	Ammonia as N mg/L	Nitrate as N mg/L
North Arm	Count	34	33	89	102	34
	Mean	19.2	18.5	8.04	1.08	0.19
	Min	0.4	12.8	7.10	0.02	0.01
	Q1	7.1	17.4	7.90	0.10	0.09
	Median	21.0	18.5	8.10	0.23	0.18
	Q3	30.5	20.0	8.20	0.67	0.26
	Max	40.5	24.0	8.80	6.20	0.51
South Arm	Count	39	39	79	88	40
	Mean	24.1	18.9	8.10	1.46	0.74
	Min	1.1	12.3	7.30	0.02	0.02
	Q1	17.3	17.4	8.00	0.16	0.08
	Median	27.3	18.8	8.20	0.30	0.23
	Q3	32.7	20.4	8.20	1.73	0.56
	Max	39.1	24.3	8.50	8.20	6.13

Table 3-6 Receiving Water quality Statistics for August through October (Sanderson and Redden (2001))

	Statistic	Salinity ppt	Temperature °C	pH	Ammonia as N mg/L	Nitrate as N mg/L
North Arm	Count	5	4	17	26	5
	Mean	19.3	16.1	8.14	0.44	0.20
	Min	0.4	14.0	7.50	0.05	0.08
	Q1	7.3	14.8	8.20	0.12	0.11
	Median	21.2	15.9	8.20	0.18	0.24
	Q3	32.9	17.2	8.20	0.61	0.26
	Max	34.9	18.5	8.80	1.50	0.33
South Arm	Count	6	5	14	19	6
	Mean	27.2	17.2	8.13	0.67	0.60
	Min	13.3	14.5	7.30	0.11	0.06
	Q1	18.7	16.0	8.05	0.17	0.11
	Median	32.3	17.0	8.20	0.30	0.20
	Q3	33.4	18.3	8.20	1.35	0.35
	Max	37.3	20.2	8.40	1.80	2.63

Table 3-7 Median Receiving Water Quality Statistics (URS 2012)

	Statistic	Salinity psu	Temperature °C	pH	Ammonia as N mg/L	Nitrate as N mg/L
North Arm	Count	201	201	201	12	12
	Mean	39.9	17.6	8.07	0.019	0.040
	Min	36.8	17.0	7.72	0.006	0.022
	Q1	39.5	17.1	7.91	0.012	0.033
	Median	40.0	17.5	7.94	0.019	0.044
	Q3	40.4	18.1	8.24	0.021	0.048
	Max	40.8	18.9	8.50	0.044	0.059
South Arm	Count	257	258	258	24	24
	Mean	40.3	18.2	7.97	0.019	0.047
	Min	39.2	17.1	7.39	0.003	0.025
	Q1	40.1	18.3	7.83	0.014	0.043
	Median	40.3	18.3	7.90	0.021	0.049
	Q3	40.4	18.3	7.93	0.025	0.053
	Max	41.7	19.1	8.37	0.038	0.065

Table 3-8 Combined Sanderson & Redden (2001) and URS (2012b) Background Nitrogen Concentrations

Discharge Location	Ammonia as N mg/L	Nitrate as N mg/L
North Arm	0.200	0.115
South Arm	0.200	0.064



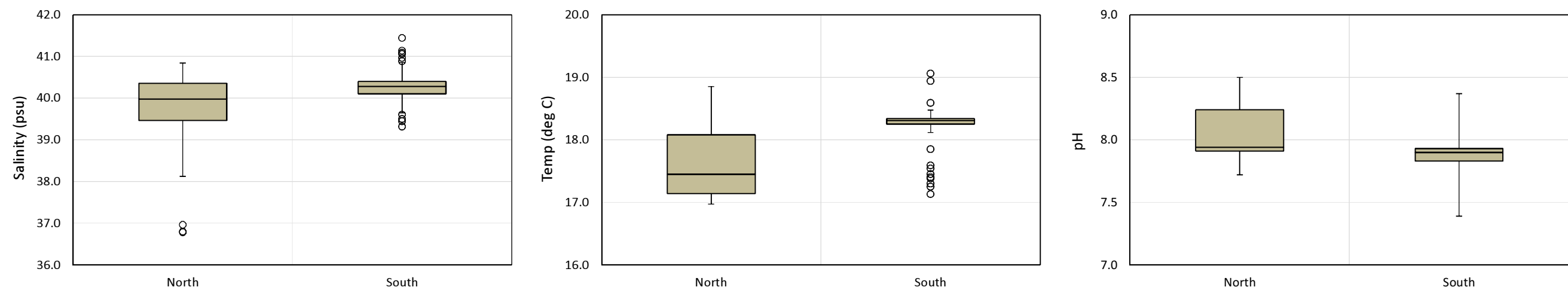


Figure 3-5 Hunter River Water Quality: Salinity, Temperature and pH (URS, 2012)

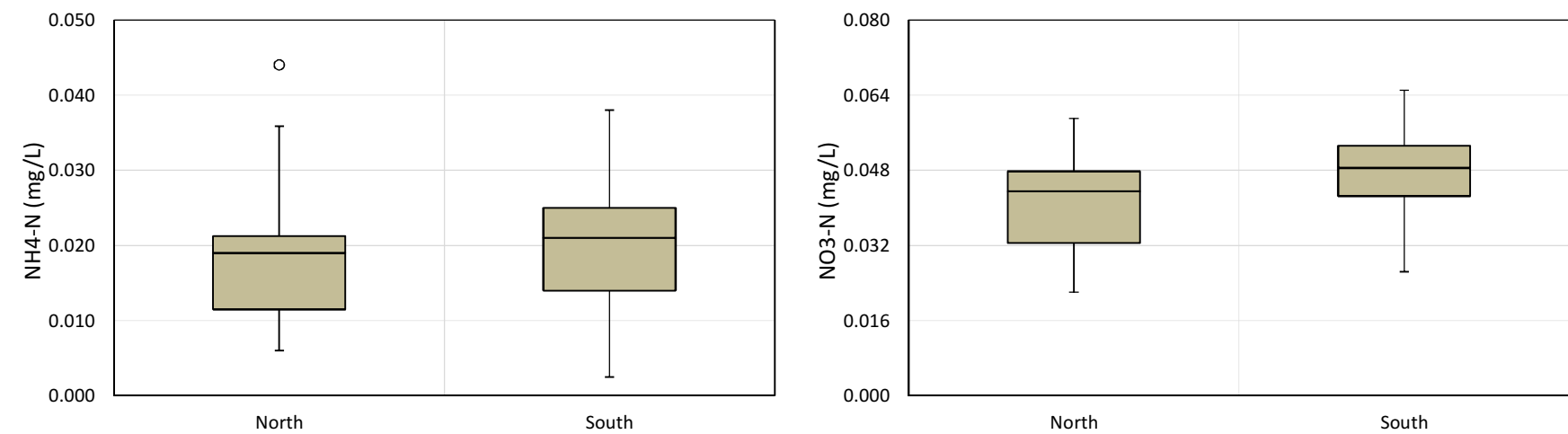


Figure 3-6 Hunter River Water Quality: Ammonia and Nitrates (URS 2012)

3.2.4.3 Water quality trends

The following trends were identified from a review of the receiving water quality data:

- Sanderson and Redden (2001) data demonstrate differences in median salinities and nutrient concentrations at the two locations. The median salinity in the North Arm is approximately 6 psu less than in the South Arm. Median concentrations of ammonia and nitrate are 0.05 to 0.07 mg/L less in the North Arm than in the South Arm. While acknowledging the potential difficulties in separating the North and South sites in terms of water quality, it is likely that both locations are under the influence of different hydrodynamic conditions, and catchment land use and associated pollutant loads;
- The seasonal Sanderson and Redden data (2001) from August to October appears to have a wide range of variation in the data, particularly with regard to ammonia and nitrate. While the maximum values are not as high as those observed in the entire dataset, some of the results are 1 to 2 orders of magnitude greater than the URS data. The median concentrations of the seasonal Sanderson and Redden (2001) data are about 5 times those observed in the URS data;
- URS data demonstrated no appreciable differences in North and South Arms results. Salinities in both reaches were high (~40 psu) while temperature and pH were similar to the results observed in the Sanderson and Redden (2001) data. This applies to both the total Sanderson and Redden dataset and the Aug/Oct dataset. It should be noted that only 10 mm of rainfall occurred in the 30 days prior to the first URS monitoring event (12/09/2012), about 9 mm of rainfall between the first and second monitoring events (26/09/2012), and practically dry conditions (0.2 mm of rainfall) between the second and third monitoring events. Therefore, both reaches are likely to be characterised as sea water (i.e. salinity at or above 36 psu);
- Of the Sanderson and Redden data, ammonia and nitrate concentrations are approximately one-third to a half of the TTVs. Nitrates demonstrate slightly lower concentrations than ammonia in the receiving water. The North Arm demonstrates higher assimilative capacity for both nitrogen constituents; and
- The URS ammonia and nitrate data are much lower than both the total Sanderson and Redden (2001) dataset and the seasonal (Aug/Oct) Sanderson and Redden (2001) dataset. This could be indicative of low flows from upstream and more open ocean conditions, as were present during the URS sampling events, where nutrient levels are typically lower.

3.2.5 Modelled development

The following sections detail the development and data sources used to parameterise the near-field mixing model. These parameters relate to the configuration of the outfall, discharge rates and physio-chemical conditions of the receiving water.

3.2.5.1 Model selection

The two main commercially and publically available models for modelling diffusers and initial dilutions are the Update Merge 3-dimensional (UM3) model and CORMIX. The UM3 model was developed by

the U.S. EPA (Frick *et al.*, 2003) and CORMIX is an U.S. EPA-approved dispersion model developed to model a wide range of discharge conditions (Jirka *et al.*, 1996).

For this study, UM3 was selected as the primary tool for modelling as UM3 is capable of modelling zero velocity conditions consistently and reliably whereas CORMIX occasionally provides unstable results under such conditions.

It should be noted that computational fluid dynamic (CFD) numerical modelling would likely provide more accurate dispersion modelling results, because complex velocity conditions and mixing boundaries can be more precisely specified (refer Section 1.5).

3.2.5.2 Modelled scenarios

Two general conditions were considered when developing the scenarios for modelling, namely an average condition and a worst-case condition. Based on these two general conditions, the proposed discharge, diffuser and receiving water parameters were selected to provide an understanding of near-field mixing in:

- High discharge loads (i.e. concentration and flow rates) conditions with a low probability of occurrence; and
- Average discharge conditions with an average probability of occurrence.

The selected scenario conditions are summarised in Table 3-9. The selected conditions adopted in the scenarios are described below:

1. Discharge location (refer Figure 3-1):
 - North Arm approximately mid-channel; and
 - South Arm under the K2 berth, approximately 30 metres offshore.
2. Water surface elevation:
 - Mean Low Water Spring (MLWS) tide representing worst-case conditions; and
 - Mean Sea Level (MSL) for average conditions.
3. Background (receiving water) velocities:
 - Slack water (nil background velocity) as worst-case;
 - Low background velocity (90th percentile exceedance) as near-worst-case; and
 - Median background velocity (50th percentile exceedance) as average case.
4. Discharge flow rates:
 - Maximum expected daily flow rate of 1.5 Megalitres per day (MLD) as worst-case; and
 - Typical expected daily flow rate of 0.75 MLD as average case.

5. Discharge concentration (refer Section 3.2.3.2. for ratio of ammonia to nitrate scenarios):

- Ammonia-N and nitrate-N concentrations of 75 mg/L each as worst-case; and
- Ammonia-N and nitrate-N concentrations of 33.8 mg/L each as average condition.

Table 3-9 Modelled Scenarios

Scenario	Discharge			Receiving Water	
	Location	Flow Rate	Concentration	Velocity	Water Level
1	North	Maximum	Maximum	Slack	MLWS
2	North	Maximum	Maximum	90 th %ile	MLWS
3	North	Average	Average	50 th %ile	MSL
4	South	Maximum	Maximum	Slack	MLWS
5	South	Maximum	Maximum	90 th %ile	MLWS
6	South	Average	Average	50 th %ile	MSL

3.2.5.3 Receiving water hydrodynamic conditions

Density

Densities were calculated from temperature and salinity for both discharge and receiving water. In the case of the proposed effluent, the discharge is fresher than the receiving water and consequently will rise through the water column as a buoyant plume. The larger the density difference is between effluent and receiving water the greater the buoyancy and resultant mixing will be.

It should be noted, too, that there were observed density differences between the North and South Arm that would result in some differences in mixing. Density was calculated at both locations from the Sanderson and Redden (2001) median data (refer Table 3-5).

Table 3-10 Background Density Properties

Location	Density (kg/m ³)
North Channel	1014.5
South Channel	1019.2

Water Surface and Bed Elevations

The degree of mixing achieved by an outfall discharge often depends greatly on the depth of receiving water, especially for a buoyant (positive and negative) discharge. The depth of water is dependent upon the bed elevation and water (tide) level. Water surface elevations were sourced from average gauged tide levels available at the Stockton Bridge (MHL, 2003). River bathymetry was sourced from previous modelling projects undertaken by BMT WBM in the study area (BMT WBM, 2010b), with good coverage of the two proposed discharge locations.

The tidal planes and the channel cross section of the North Arm are presented in Figure 3-7 and the South Arm in Figure 3-8. Water levels, bed elevations and water depths are presented in Table 3-11. It is worth noting that the South Arm is more than three times as deep as the North Arm, and that

density differences between the receiving water and proposed discharge are greatest at this location (refer Section 3.2.3.1 and Section 3.2.4.1).

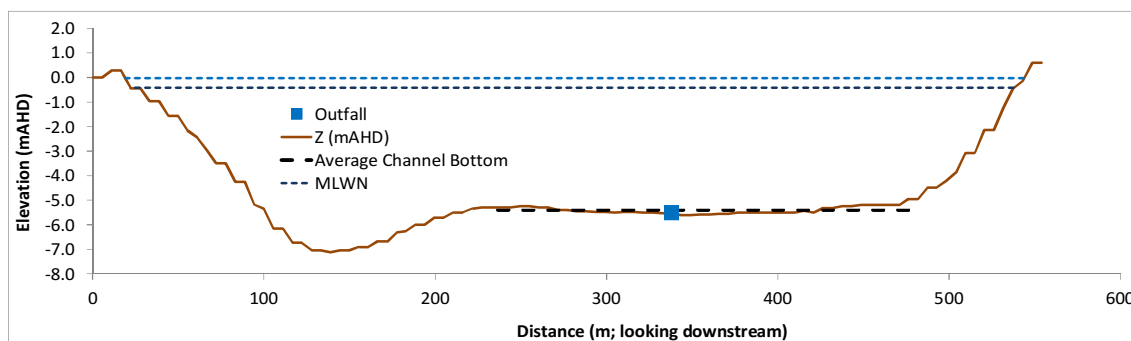


Figure 3-7 Outfall Bathymetry and Elevations, North Arm

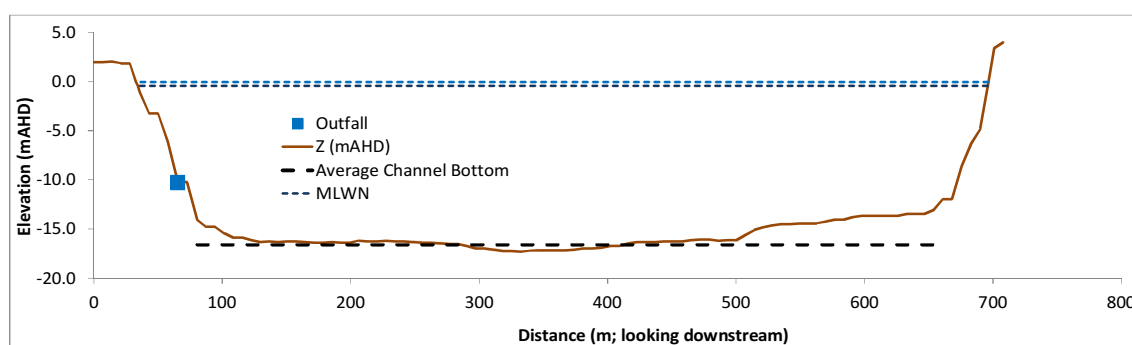


Figure 3-8 Outfall Bathymetry and Elevations, South Arm

Table 3-11 Receiving Water Bathymetry and Elevations

Parameter	North Arm		South Arm	
Scenario	1 & 2	3	4 & 5	6
Conditions	Worst-case	Average	Worst-case	Average
Tide	MLWN	MSL	MLWN	MSL
Water Level (m AHD)	-0.42	-0.02	-0.42	-0.02
Bottom Elevation (m AHD)	-5.40	-5.40	-16.62	-16.62
Total Water Depth (m)	4.98	5.38	16.19	16.59

Background Velocities

Background (ambient) velocity can also be a significant factor in the mixing achieved by the discharge. Larger background velocities lead to greater turbulence, and therefore mixing, however it can also result in longer mixing zones as a result of background currents advecting and dispersing the mixing zone upstream during flood and downstream during ebb tides.

Background current velocity and direction were extracted from the TUFLOW-FV model (refer Section 3.3) at the proposed outfall locations. As discussed, three background velocity conditions were selected for each location to represent worst-case and average conditions. Cumulative velocity profiles for North Arm are shown in Figure 3-9, and the South Arm in Figure 3-10. Modelled background velocities are presented in Table 3-12.

It is worth noting that background velocities are small in the South Arm in the vicinity of the proposed diffuser location. The proposed outfall is situated along the eastern side of the Steelworks Channel Swinging Basin, which is outside of the main portion of the channel where velocities are typically greater. Additionally, water depth in the South Arm near the K2 berth is relatively deep compared to most locations within the Estuary, and consequently background velocities are expected to be smaller than other shallower locations situated in the main channel. At both locations, the typical background current direction for flood conditions is 10 degrees from true north, and 190 degrees for ebb conditions.

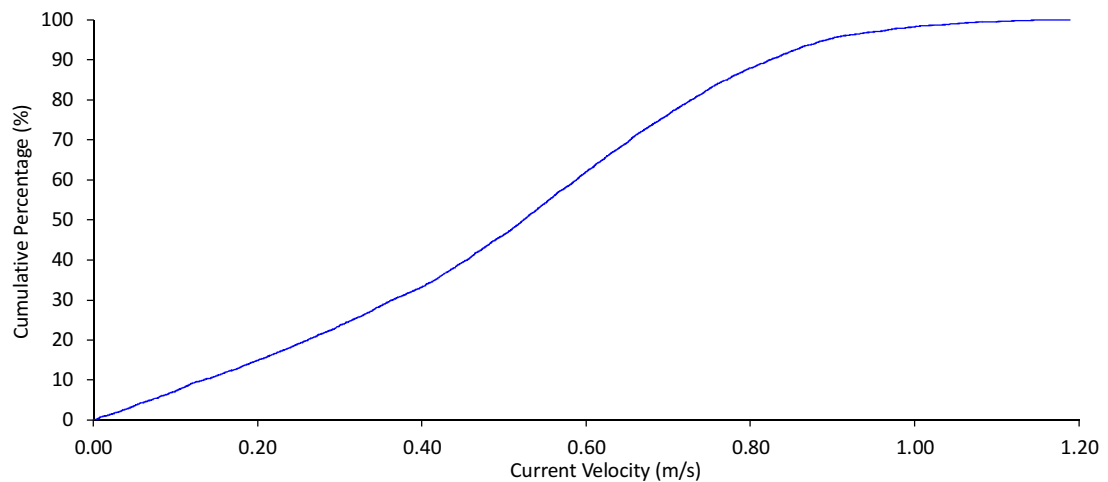


Figure 3-9 Cumulative Exceedance Background Velocities, North Arm

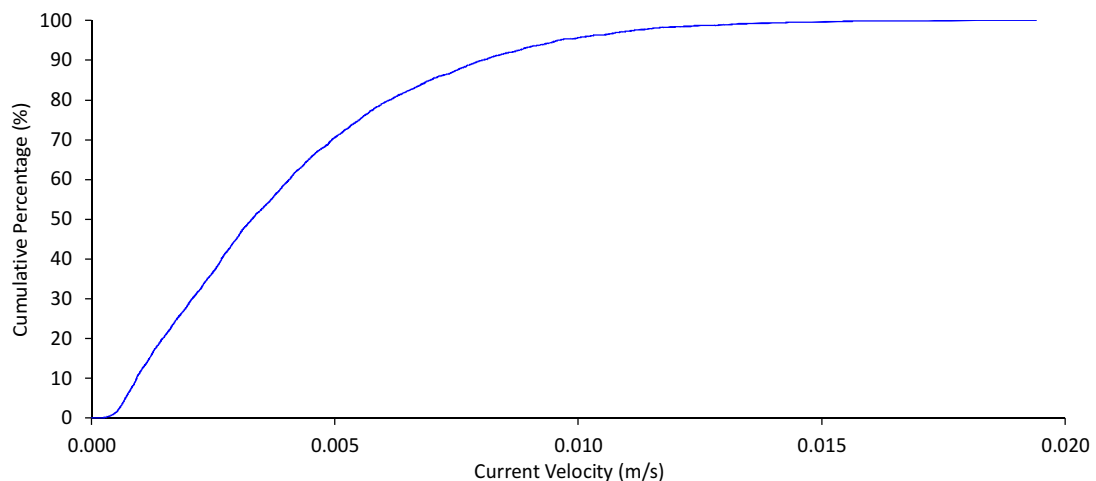


Figure 3-10 Cumulative Exceedance Background Velocities, South Arm

Table 3-12 Background Velocities

Scenario	Condition	Location	Velocity (m/s)
1	Slack	North	0.000
2	90 th %ile	North	0.135
3	50 th %ile	North	0.524
4	Slack	South	0.000
5	90 th %ile	South	0.001
6	50 th %ile	South	0.003

3.2.5.4 Discharge and outfall characteristics

Outfall Configuration

The preliminary outfall design adopted in this study was located at the South Arm and consisted of a 9 metre long diffuser manifold mounted with four 25 mm diameter ports. This same design was adapted for the North Arm discharge site, assuming the ports were mounted on 0.5 m risers protruding from the channel bed. Modelled outfall configurations are summarised in Table 3-13.

Sensitivity analysis was conducted to verify the effect of the port discharge velocity (discussed in the following section) on mixing. The same outfall configurations adopted for Scenario 1 and Scenario 4 were considered in these tests and the port diameter was adjusted by $\pm 25\%$.

Preliminary modelling of the diffuser in the South Arm also demonstrated that there would likely be only a small interaction between the plumes from adjacent ports prior to the termination of the near-field. Overlapping of plumes would likely result in lower dilution due to decreased surface area available for entrainment. The preliminary modelling revealed that by increasing the distance between the ports by 1 metre between each port (i.e. 4 m in total) would eliminate this potential overlap and result in improvised mixing conditions. However, the increased port spacing improved mixing in the South Arm by approximately 3%, and decreased mixing in the North Arm by 3%. For the purposes of this assessment (i.e. near-field mixing), scenarios were run for individual ports rather than all four ports.

Finally, the major difference in the outfall at each location is the orientation of the ports relative to the background current directions. In the North Arm, it was assumed the diffuser manifold was oriented perpendicular to direction of flow in the river and the ports parallel to flow facing south. In the South Arm, the diffuser was assumed to be oriented parallel to flow with the ports directed perpendicularly to background flow direction. Preliminary modelling demonstrated that due to small background velocities in the South Arm, the plumes from adjacent ports were not deflected by the current into each other.

Table 3-13 Modelled Outfall Configuration

Diffuser	North Arm		South Arm	
Scenario	1 & 2	3	4 & 5	6
Condition	Worst-case	Average	Worst-case	Average
Length (m)	9	9	9	9
No. of Ports ^a	4	4	4	4
Port Diameter (m)	0.025	0.025	0.025	0.025
Total Port Area (m ²)	0.0020	0.0020	0.0020	0.0020
Nozzle Direction ^b	190	190	260	260
Vertical Angle ^c	30	30	30	30
Port Elevation (m)	0.50	0.50	6.33	6.33
Port Depth (m)	4.48	4.88	9.86	10.26

^a ports modelled individually^b measured from true north^c measured up from horizontal

Discharge Flow Rates and Characteristics

Discharge flow rates and characteristics were provided by IPL or sourced, where appropriate, from the previous EIS modelling investigations (URS, 2012a). These values are presented in Table 3-14. As per the sensitivity analysis discussed above, modification of the port diameter resulted in discharge velocities of 5.66 m/s in the case of a larger port, and 15.72 m/s in the case of the smaller port. Mixing results are discussed in Section 3.2.6.

Table 3-14 Discharge Flow Rates and Characteristics

Scenario	Worst case	Average
Flow Rate (m ³ /hr)	62.5	31.3
Flow Rate/Port (m ³ /hr)	15.6	7.8
Discharge Velocity (m/s)	8.84	4.42
Density (kg/m ³)	994.9	996.9

3.2.6 Near-field modelling results

The modelling results for each scenario, including the sensitivity analysis, are presented in terms of:

1. The total horizontal near-field distances downstream (away) from the diffuser (note: this does not account for the vertical distance travelled by the plume);
2. Diameters of the plume at the end of the near-field;
3. The centreline dilution factors achieved at the end of the near-field; and
4. The concentrations of ammonia and nitrate at the end of the near-field based on the achieved dilution factor and the concentrations of the discharge and receiving water.

3.2.6.1 Near-field mixing

For this assessment the near-field is defined as the region of mixing in the immediate vicinity of the outfall that is dominated by the momentum and buoyancy of the discharge. In the case of a buoyant discharge, the near-field typically terminates when the plume impacts a boundary, such as the surface or the channel bottom. Table 3-15 presents the near-field distances away from the diffuser, diameters and dilutions for each scenario.

In general terms, the modelling demonstrated the following:

- The effluent ascended rapidly in the water column with a termination of near-field mixing within approximately 5 to 10 metres from the outfall;
- The momentum of the discharge combined with its positive buoyancy resulted in rapid initial mixing and high dilution factors as the effluent mixes vertically over the water column;
- Dilution increased as background velocities increased; and
- Plume diameters were in the order of a few metres wide at most.

Specifically, under the worst-case conditions (Scenarios 1 and 4), the diffuser in the South Arm achieved more than twice the dilution than the diffuser in the North Arm.

When compared to the other scenarios, the plume in Scenario 3 was advected considerably downstream prior to reaching the surface due to high background velocity in the North Arm. Consequently, Scenario 3 results for the near-field were also reported at 5 and 10 m in order to understand how the plume geometry and mixing at distances similar to what was observed in the other scenarios. These “standardised” results are presented in Table 3-16.

In comparison of Scenarios 2 and 3, the model results show dilution factors and near-field distances are different, however, the plume diameters are similar. It is likely that due to the higher ambient velocity modelled in Scenario 3, the plume is advected further downstream while generally spreading at a rate similar as the other scenarios. The discharge in Scenario 3 achieves greater dilution because of additional mixing from the ambient velocity and less overall discharge volume (i.e. Scenario 3 discharge rate is half of Scenario 2 discharge rate).

Table 3-15 Plume Characteristics – Dilution Factors and Dimensions

Scenario	Near-field Distance (m)	Plume Diameter (m)	Dilution Factor
1	5	2.3	59
2	11	3.9	130
3	94	3.9	755
4	7	3.8	132
5	7	3.8	135
6	5	3.5	175

Table 3-16 Scenario 3 – North Arm 50th %ile Velocity Results at 5 m and 10 m

Plume Diameter (m)	Distance (m)	Plume Depth (m)	Dilution Factor
0.8	5	4.3	33
1.1	10	4.1	63

3.2.6.2 Sensitivity analysis

The results of the sensitivity analysis are presented in Table 3-17. The larger port diameter did not demonstrate considerably different results to those of the original case, however, decreasing the port diameter showed a marked increase in the dilution factors achieved at both locations.

Table 3-17 Scenarios 1 and 4 – Sensitivity Analysis Results: $\pm 25\%$ Diameter

Scenario	Location	Sensitivity Adjustment	Adjusted Port Diameter (m)	Near-field Distance (m)	Dilution Factor	Percentage Change
1	North	+25%	0.031	4	47	-21%
		-25%	0.019	6	81	37%
4	South	+25%	0.031	6	111	-16%
		-25%	0.019	9	171	29%

3.2.6.3 Constituent concentrations

Near-field mixing results for ammonia and nitrate concentrations are presented in Table 3-18 for Scenarios 1, 2, 4 and 5 and Table 3-19 for Scenarios 3 and 6. These results are presented in terms of the distance required to satisfy the applicable TTVs outlined in Section 3.2.2 based on the receiving water quality and discharge conditions. Table 3-20 presents the maximum concentrations of ammonia and nitrogen in the discharge that would result in meeting the TTVs at the end of the near-field. Discharge concentrations were not presented in Table 3-20 in the instance that the TTVs were met at the maximum discharge concentration (75 mg/L N) within the near-field distance (e.g., nitrates in Scenarios 2, 4 and 5).

Figure 3-11 illustrates an example of dilution factors and resulting concentrations for Scenario 5. The charts show the concentration of ammonia and nitrate resulting from dilution as a function of distance downstream. These concentrations are presented in relation to background concentrations and TTVs. The results highlight that the discharge does not satisfy the TTVs since the effluent concentration is greater than what can be assimilated within the near-field mixing zone.

Furthermore, downstream distance is not a total distance as it only accounts for the horizontal (lateral) distance away from the outfall, and not the vertical distance the plume travels vertically in the water column. In light of these results, the following general findings are considered important:

- Under worst-case conditions, the ammonia TTV was not met at either location. In order for the discharge to satisfy the TTVs at the end of the near-field for the most restrictive condition in terms of dilution (i.e. Scenario 1), the discharge concentrations must be less than 32 mg/L and 2.7 mg/L for ammonia-N and nitrate-N respectively;
- For Scenario 4, i.e. the worst-case condition in the South Arm, the discharge concentrations of ammonia-N and nitrate-N must be less than 55 mg/L and 12 mg/L, respectively, to achieve the TTVs at the end of the near field. It should be noted that while similar dilutions are achieved for

Scenarios 2 and 5 (90th %ile velocities), the TTV in the South Arm is lower than that in the North Arm due to different background pH (refer to Sections 3.2.2 and 3.2.4). Consequently, to satisfy the TTV for the South Arm, an ammonia-N concentration of less than 55 mg/L would be required;

- The TTV used for nitrate is of a low reliability for marine waters (see Volume 2 Section 8.3.7.2, p. 8.3-169 of ANZECC 2000). The TTV adopted for nitrate has been used as an interim value until a TTV based on a sufficient number of data points is available. Using the marine low reliability TTV of 2.94 mg/L of nitrate-N, all scenarios demonstrate compliance with the TTV at a distance no greater than 3 m (refer to Section 3.2.2);
- When smaller port diameters were modelled for Scenario 1, neither ammonia nor nitrate met the TTVs at the end of the modelled near-fields; and
- When smaller port diameters were modelled in Scenario 4, the discharge did not meet the TTV for ammonia in the near-field, however, the mixed concentration was only 0.015 mg/L above the TTV at the end of the near-field. The maximum discharge concentration for ammonia-N to meet the TTV at the end of the near-field with smaller ports is 72 mg/L. The TTV for nitrate was not met with smaller port.

When considering the average condition scenarios, the following were observed:

- For Scenarios 3 and 6, the greatest distance to satisfy the ammonia TTVs (~10 m) was under Scenario 3 conditions; and
- Concentrations of nitrate-N exceeded the freshwater TTV for both scenarios.

Table 3-18 Worst-Case Scenarios: Distance (m) to Satisfy TTVs Based on Discharge Concentration Ratios

Scenario	Ammonia	Nitrate
1	NM	NM
2	NM	NM
4	NM	NM
5	NM	NM

NM - TTV Not met

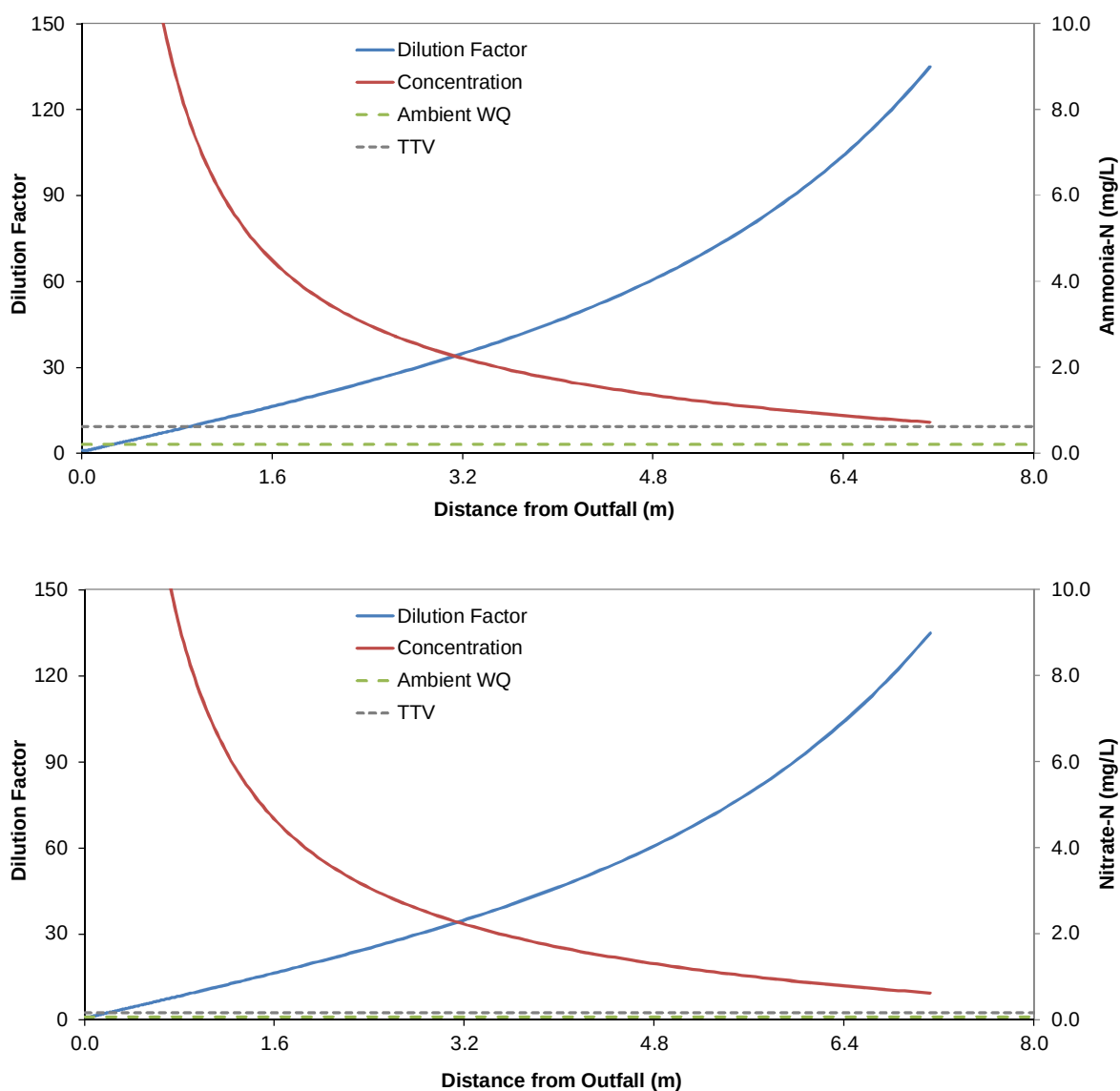
Table 3-19 Average Scenarios: Distance (m) to Satisfy TTVs Based on Discharge Concentration Ratios

Scenario	Ammonia	Nitrate
3	9.6	NM
6	3.7	NM

Table 3-20 Maximum Discharge Concentrations (mg/L) to Meet TTVs

Scenario	Ammonia-N	Nitrate-N
1	32.0	2.7
2	70.0	5.7
3	NA	32.6
4	55.0	12.0
5	56.0	12.8
6	NA	16.5

NA - Not applicable. Discharge meets TTV in near field at maximum concentration (75 mg/L N)

**Figure 3-11 Example: Scenario 5 – Discharge Ammonia-N = 50 mg/L and Nitrate-N = 100 mg/L**

3.3 Modelling of Far-Field Interactions

3.3.1 Scope and objectives

For this study, a three dimensional computer model was used to simulate the movement (hydrodynamics) and mixing (advection-dispersion) between tidal saltwater and a proposed freshwater effluent discharge. Model scenarios (10) were prepared to simulate a number of different discharge scenarios investigating:

- A South Arm or North Arm release location;
- The influence of a bed diffuser or a surface discharge option; and
- The influence of wind.

The above scenarios used the 3D model with low flow (90%ile) discharge conditions on the Hunter River, Paterson River and Williams River for a three month period to determine the potential for the accumulation of pollutants within the Estuary due to the proposed effluent release. An additional scenario with a minor flood flow was also simulated.

A 2D model simulation was also undertaken to determine the typical flushing (e-folding) time of the Estuary.

A summary of the computer model software, its application and scenarios considered by this study is provided below in the following sections.

3.3.2 Model overview (TUFLOW-FV)

The TUFLOW - Finite Volume (FV) numerical scheme solves the conservative integral form of the Non-Linear Shallow Water Equations (NLSWE) (i.e. assuming that pressure varies hydrostatically with depth), including viscous flux terms and source terms for Coriolis force, bottom-friction and various surface and volume stresses. The scheme is also capable of simulating the advection and dispersion of multiple scalar constituents within the model domain.

The spatial domain is discretised using contiguous, non-overlapping but irregular triangular and quadrilateral “cells”. Advantages of an irregular flexible mesh include:

- The ability to smoothly resolve bathymetric features of varying spatial scales (e.g. dredged channels adjacent to broad shoaled areas);
- The ability to smoothly and flexibly resolve boundaries such as coastlines;
- The ability to adjust model resolution to suit the requirements of particular parts of the model domain without resorting to a “nesting” approach; and
- The flexible mesh approach has significant benefits when applied to study areas involving complex coastlines and embayments, varying bathymetries and sharply varying flow and scalar concentration gradients.

A cell-centred spatial discretisation is currently employed in TUFLOW-FV, and requires the calculation of numerical fluxes across cell boundaries. As with many finite volume schemes non-viscous boundary fluxes are calculated using Roe’s approximate Riemann solver (e.g. Glaister, 1988). The source terms due to bed elevation changes between adjacent cells are “up-winded” as

part of the Roe flux solver, in order to maintain numerical consistency with the pressure gradient momentum flux terms (Hubbard & Garcia-Navarro, 2000).

Viscous flux terms are calculated using the traditional gradient-diffusion model with a variety of options available for the calculation of eddy-viscosity and scalar diffusivity. The Smagorinsky eddy-viscosity model and the non-isotropic Elder diffusivity model are the options most commonly adopted by BMT WBM.

Both first-order and second-order spatial discretisation schemes are available in TUFLOW-FV. The first-order scheme assumes a piecewise constant value of each conservative constituent in a model cell. The second-order scheme assumes a 2D linear polynomial reconstruction of the conservative constituents within the cell (i.e. a MUSCL scheme). The Total Variation Diminishing (TVD) property (and hence stability) of the solution is ensured using a choice of gradient limiter schemes.

The second-order spatial reconstruction scheme allows for much sharper resolution of gradients in the conserved constituents for a given level of spatial resolution. This is important for resolving relatively short waves (e.g. tsunamis) without excessive numerical diffusion or without over-refining the spatial mesh discretisation. The numerical resolution of sharply varying current distributions and sharp scalar concentration fronts are also much improved with the second-order scheme.

Spatial integration is performed using a midpoint quadrature rule. Temporal integration is performed with an explicit Euler scheme and must therefore maintain a stable time step bounded by the Courant-Friedrich-Levy (CFL) criterion. A variable time step scheme is implemented to ensure that the CFL criterion is satisfied with the largest possible time step. Outputs providing information relating to performance of the model with respect to the CFL criterion are provided to enable informed refinement of the model mesh in accordance with the constraints of computational time.

In very shallow regions ($\sim < 0.05\text{m}$ depth), the momentum terms are dropped, in order to maintain stability as the NLSWE approach the zero-depth singularity. Mass conservation is maintained both locally and globally to the limit of numerical precision across the entire numerical domain, including wetting and drying fronts. A conservative mass re-distribution scheme is used to ensure that negative depths are avoided at numerically challenging wetting and drying fronts without recourse to adjusting the time step. Regions of the model domain that are effectively dry are readily dropped from the computations. Mixed sub/super-critical flow regimes are well handled by the FV scheme which intrinsically accounts for flow discontinuities such as hydraulic jumps or bores that may occur in trans-critical flows.

Transport of scalar constituents is solved in a fully-coupled fashion with the NLWSE solution. Simple linear decay and settling are optionally accommodated as source/sink terms in the scalar transport equations. Bed friction is modelled using a Manning's roughness formulation and Coriolis force is also included in the model formulation.

3.3.3 Model application

An 'estuary-wide' two-dimensional hydrodynamic (TUFLOW-FV) model of the Hunter River Estuary (refer Figure 3-12) has previously been developed by BMT WBM. The model includes the full tidal prism of the Estuary up to the tidal limits of the Hunter River, Paterson River and Williams River. The

model also includes the north and south arms of the Hunter River as well as the shallow embayment of Fullerton Cove.

The proposed IPL discharge is to occur within the downstream reaches of the Hunter River Estuary. This region of the river is dominated by tidal processes. Tides in this reach of the river are comparable to full ocean tides, with typical magnitudes of between 1 and 2 metres. The 'estuary-wide' model has previously been calibrated and validated against measured water level, tidal discharge and salinity data (refer Appendix B). The existing TUFLOW-FV model provides an excellent tool for simulating tidal hydrodynamics and advection-dispersion processes within the immediate study area, and consequently the fate and potential impact of the proposed effluent discharge on the receiving water environment.

For this study, the existing TUFLOW-FV model was used to undertake a far-field modelling assessment of the proposed wastewater discharge site(s). Using this model, discharge at potential outfall site(s) were modelled under full dynamic conditions to capture tidal hydrodynamic and advection-dispersion (AD) (mixing) processes. Given the buoyant properties of the effluent (i.e. warm freshwater) capturing the influence of density anomalies on both hydrodynamic and horizontal/vertical mixing processes was important. As such, the existing two-dimensional hydrodynamic model was adapted and refined to be a vertical layered model capable of simulating these more complex three-dimensional processes.

The three-dimensional model was configured to account for salinity dynamics in response to river inflow and water level variations caused by ocean tide conditions. The model was configured using the hydrostatic assumption and the buoyancy term included so that density anomalies due to differences in salinity (i.e. a freshwater discharge into estuarine receiving waters) could be simulated.

Further details of the model domain, bathymetry, configuration and boundary conditions are provided below.

3.3.3.1 Model domain

The numerical model geometry consists of nodes interconnected by a series of triangular and quadrilateral elements to form a two-dimensional mesh of the Hunter River Estuary (refer Figure 3-12). The model mesh resolution has been configured to maintain good calibration of hydrodynamics while minimising simulation runtimes.

The model mesh includes a good representation of channel conveyance along the main waterway areas, which has been provided through increased mesh resolution where abrupt changes to bathymetry occur (thus the advantage of using a flexible mesh system). Additional mesh resolution has also been provided in the vicinity of the proposed discharge sites to better resolve mixing and dilution processes occurring close to the discharge location.



Title:
Extents of the Estuary Wide Model

Figure:
3-11

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



0 3.75 7.5km
Approx. Scale



Filepath : K:\N2422_Incitec_Pivot_WQ_Assessment\MI\Workspaces\DRG_003_121025 Model\Geometry.WOR

3.3.3.2 Vertical model resolution

The vertical resolution of the model is 1 m between -3 and -15 m AHD. In parts of the model deeper than -15m AHD, additional layers at -17.5, -20.0, -25.0 and -30.0 were specified. Additional surface layers were specified at -2.5 and -2.0 m AHD and four surface sigma layers (which can vary with water level) were specified. Given maximum and minimum water levels of 1 to -1 m AHD are expected, a maximum and minimum surface layer thickness of 0.75 m and 0.25 m is possible.

The number of vertical layers and their thickness was selected to ensure sufficient resolution to resolve baroclinic processes of saline stratification.

3.3.3.3 Model bathymetry

Bathymetric data are used to describe the topography of the waterway over the domain of a numerical model system. A number of data sources have been utilised in the development of the model bathymetry for the Hunter River system. Sources of data used in preparing a Digital Elevation Model (DEM) for the Hunter River Estuary include:

- Newcastle Port Corporation (NPC) – Hydro surveys of the lower estuary;
- Department of Commerce (DoC) – River transects upstream from Green Rocks, extending along the Paterson and the Hunter River. The data was sourced from hard copy transects, which were manually entered and converted from Newcastle Sewerage datum;
- Roads and Traffic Authority (RTA) – Hydro surveys between Heatherbrae to Raymond Terrace; and
- DECCW / Department of Natural Resources (DNR) – River transects along the Williams River and Paterson Rivers.
- NSW Maritime - Bed elevations were lowered to account for recent dredging in the south arm based on online boating charts published by NSW Maritime.

The hydro survey data for the Paterson River extends approximately 4 km upstream from Woodville, (~7.5 km downstream from Paterson). An additional 15 km of river were required to extend the model to the tidal limit along the Paterson tributary. The extension of the model over these last 15 km has been approximated based on the thalweg depths of the river upstream to this point.

Hydro survey data exist along the full length of the tidal reach along the Williams River, to Seaham Weir, with the Weir acting as an upstream boundary with limited inflow. A deep pool exists upstream of Seaham Weir.

Along the Hunter River, hydro survey data exist from the mouth all the way up to Oakhampton. A further ~2 km of river was required to extend the model to the tidal limit along the Hunter River and was estimated from the thalweg depths surveyed along the river immediately downstream from this location.

Throughout the lower estuary, downstream of Hexham, there are extensive sections of mangroves and wetlands, covering approximately 17 km². The majority of this area lies within the upper tidal range, which can be subject to frequent wetting and drying interactions. The model incorporates mangrove areas within Fullerton Cove adjacent to the North Arm of the Hunter River, which are

regularly inundated at high tide. Other notable areas near the anabranch of the South Arm of the Hunter River have also been included within the model to include regular wetting and drying. At this stage, for simplicity, mangrove areas within Kooragang Island have been excluded from the model domain on the basis that a majority of this area is generally above mean high tide and is typically inundated only during very high tides (i.e. king tides) or flood flow conditions.

3.3.3.4 Model configuration

The TUFLOW-FV model was configured to account for salinity dynamics in response to river inflow and water level variations caused by ocean tides. The influence of the Coriolis force was calculated with latitude of -32.6°S.

Salinity was modelled as an active transport scalar (i.e. the influence of salinity changes to density are included in hydrodynamic calculations). The horizontal scalar and momentum mixing model adopted was the Smagorinsky formulation with a coefficient of 0.2. The vertical scalar and momentum mixing model utilises the k-omega approach as specified in the Global Ocean Turbulence Model (GOTM) numerical library (see www.gotm.org).

TUFLOW-FV has an adaptive timestep algorithm which automatically adjusts the model timestep to resolve hydrodynamic and advection dispersion processes based on a Courant-Friedrichs-Lewy (CFL) stability criterion value of 1.3. TUFLOW-FV accounts for wetting and drying dynamically based on cell depths of 0.005 m and 0.05 m respectively. The drying value corresponds to a minimum depth below which the cell is dropped from computations (subject to the status of surrounding cells). The wet value corresponds to a minimum depth below which cell momentum is set to zero, in order to avoid unphysical velocities at very low depths. Bottom drag is specified as a Manning's *n* roughness, which is standard for many three-dimensional numerical models.

3.3.3.5 Boundary forcing

In order to simulate estuary-wide hydrodynamics and advection / dispersion processes, the following boundary conditions were applied to the model:

- Upstream flow and salinity at Greta for the Hunter River;
- Upstream flow and salinity at Gostwyck for the Paterson River;
- Upstream flow and salinity at Seaham Weir for the Williams River;
- Downstream water level (tide) at offshore to Newcastle Harbour; and
- Surface wind stresses based on observed winds at a Bureau of Meteorology (BoM) gauge at Norah Head.

3.3.4 Modelled calibration and validation

Calibration of the 2D model is presented in BMT-WBM (2010b). A check of the updated 3D model against observed datasets is presented in Appendix B.

As presented in Appendix B, a number of successful validation checks on the model were made including:

- The models ability to reproduce observed water levels at Hexham and Stockton Bridge for the period 1/10/1995 to 31/12/1995 and 14/1/2001 – 14/3/2001;
- The models ability to reproduce observed flows collected by ADCP on 10/10/1995;
- The models ability to reproduce a number of observed salinity profiles along the North Arm over the period 14/1/2001 – 14/3/2001.

The success of these validation checks indicates that the model performs well in simulating the estuary's hydrodynamics and salt transport. On the basis of these validation checks, it is considered that the model is capable of simulating transport of a conservative constituent from the proposed outfall locations.

3.3.5 Modelled scenarios

Model scenarios have been used to assist with evaluation of two potential discharge sites. A combination of 2-dimensional modelling (to characterise existing tidal flushing conditions) and 3-dimensional modelling (to predict the behaviour of a freshwater (buoyant) plume when discharged at the surface or near the bed of the river) was undertaken. The ten outfall simulations are summarised in Table 3-21.

A low flow 90thile river discharge condition was adopted for most scenarios to represent a typical worst-case condition where pollutant export from the Estuary is greatly reduced. The influence of wind on pollutant transport was assessed by running the model both with and without an applied wind boundary condition. The scenario simulation period uses observed tidal, wind (as necessary) and river flow (for scenario 9 & 10 only) for 1st October to 31 December 1995.

Table 3-21 Far-field Modelling Scenarios

Scenario	Discharge Condition	Wind Included?	River Flow
1	South Arm, at surface	No	90 th ile
2	South Arm, near bed	No	90 th ile
3	North Arm, at surface	No	90 th ile
4	North Arm, near bed	No	90 th ile
5	South Arm, at surface	Yes	90 th ile
6	South Arm, near bed	Yes	90 th ile
7	North Arm, at surface	Yes	90 th ile
8	North Arm, near bed	Yes	90 th ile
9	South Arm, near bed	Yes	Observed (with minor flood event)
10	North Arm, near bed	Yes	Observed (with minor flood event)

3.3.5.1 River discharge boundary condition

A low flow (90thile exceedance) river discharge was adopted to investigate the potential for effluent to accumulate in the estuary. Using the PINEENA streamflow data (refer Section 2.2.2), flow exceedance curves have been generated for the Hunter River, Paterson River and Williams River (refer Figure 2-5). Based on these curves the adopted low flow (90thile exceedance flow) for the Hunter River, Paterson River and Williams River is 100 ML/Day, 25 ML/Day and 5 ML/Day

respectively. Given that a 3 month simulation period was used, the adoption of a continuous (90%ile exceedance flow) will provide a conservative estimate of effluent accumulation in the Estuary.

A flushing simulation was also undertaken using an observed river flows (Figure 3-13). A comparison of the observed flow to the flow exceedance curve (Figure 2-5) indicates that lower flows for the first two months are lower than median flow conditions (~350 ML/Day) on the Hunter, while the flood peak in mid-December (15000 ML/Day) is approximately a 3%ile exceedance condition (which means flow should typically be of this size or greater for 10 days per year).

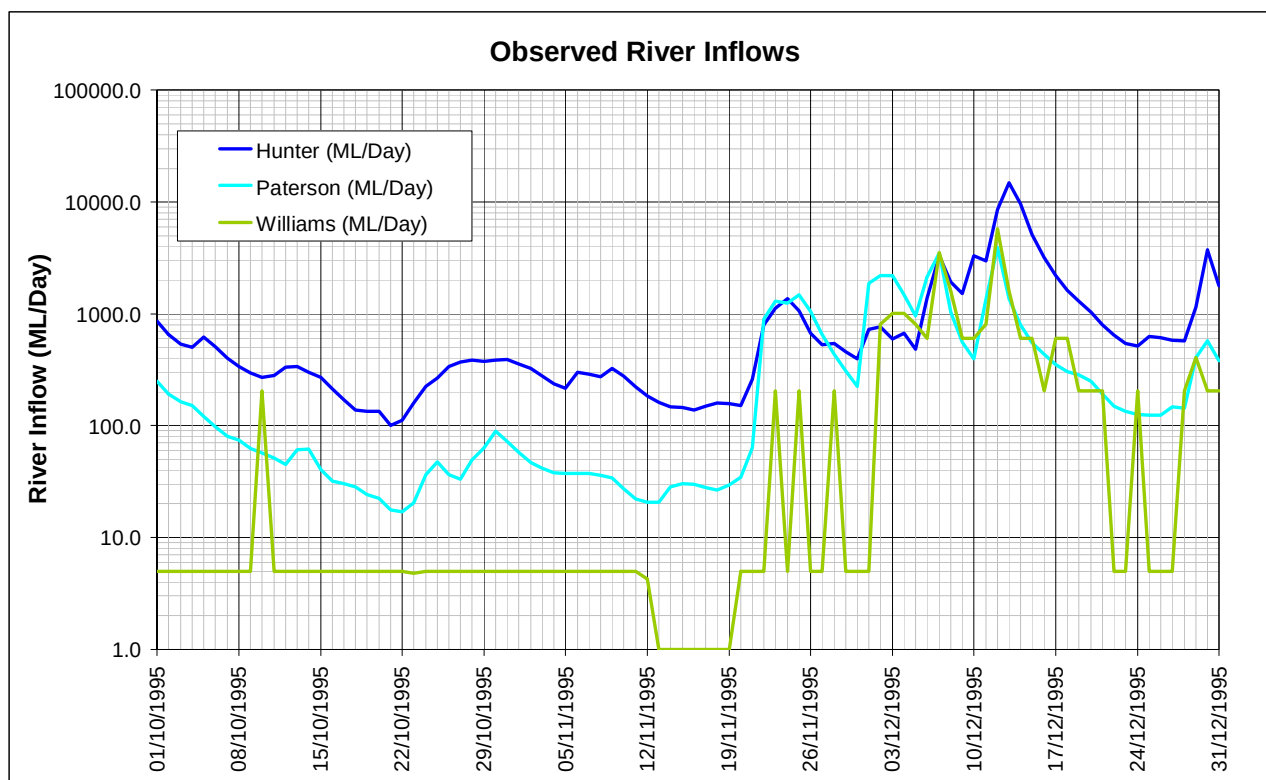


Figure 3-13 Observed River Flow Condition (1st October to 31 December 1995)

3.3.5.2 Applied wind stress boundary condition

The influence of wind driven currents and vertical mixing processes was investigated by applying a surface wind stress boundary to the with wind simulations. Three hourly recorded BoM wind data for Norah Head for the period 1/10/1995 to 31/12/1995 (as presented in Figure 3-14) was used as a model boundary condition.

The Norah Head wind gauge is located on the coast some 45 km south of the study site. The Norah Head gauge was adopted for use by the model in preference to the Nobby's Head wind gauge (located adjacent to the study area) due to presence of data irregularities in the Nobby's dataset in the period of interest. A comparison of the Norah Head data to that observed at Nobby's Head wind gauge revealed the gauges record similar wind speed and direction though a time lag of 1-2 hours is common.

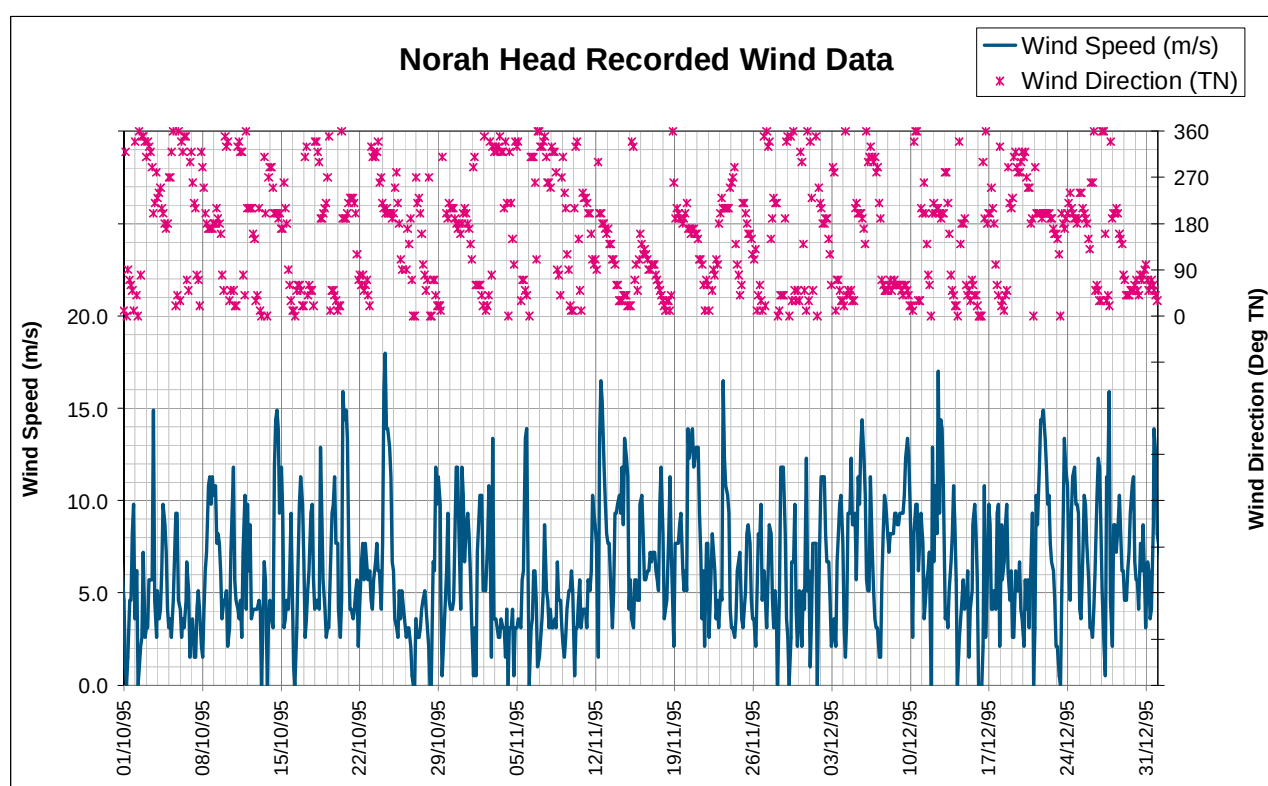


Figure 3-14 Recorded Norah Head Wind Data

3.3.5.3 Tidal boundary condition

Water level data (as presented in Figure 3-15) collected at the entrance to Port Stephens (Tomaree) was used to drive the model tidal boundary. Tomaree is approximately 90 km north east of Newcastle Harbour. Offshore salinity was assumed to be 35 ppt.

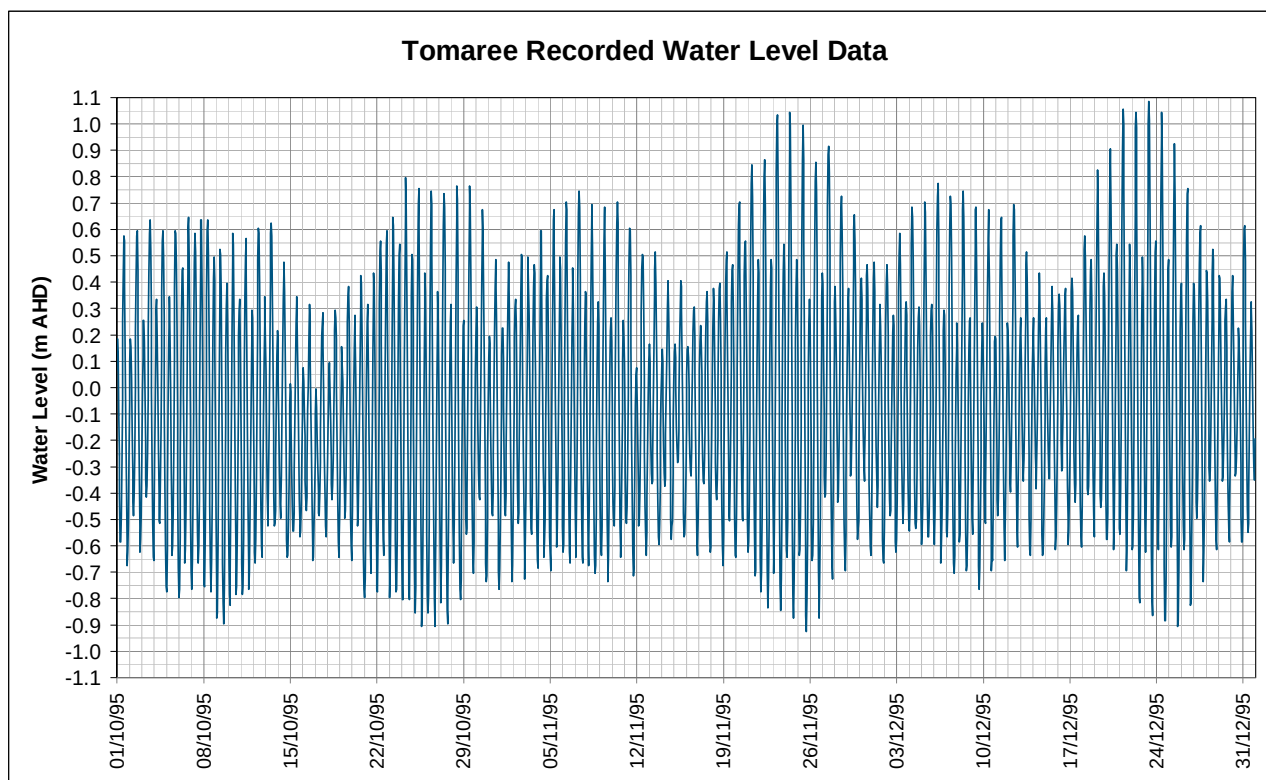


Figure 3-15 Recorded Tidal Water Level Data (Tomaree)

3.3.5.4 Effluent discharge characteristics and inflow location

Important effluent discharge characteristics used in the model scenarios based on data presented in URS (2012a) is:

- Average effluent discharge rate: 750 kL/day ($0.00868 \text{ m}^3/\text{s}$ or 8.68 L/s);
- Average effluent TN concentration: 67.5 mg/L (0.00675 kg/m^3 or g/L);
- Average effluent TP concentration: 3.8 mg/L (0.00038 kg/m^3 or g/L); and
- Average effluent salinity: 1750 micro Siemens/cm (approximately 1 ppt).

The location of the proposed South and North Arm near bed diffuser locations are presented in Figure 3-16. For the scenario investigating an alternative surface outfall option, the South Arm discharge location was unaltered.

The three-dimensional far-field model is unable to adequately simulate the near-field dynamics of a buoyant plume discharged from an outfall diffuser. However, the initial buoyant rise and dilution that

was predicted to occur by the near-field modelling assessment (refer Section 3.2.6) was incorporated into the far-field modelling by assuming a conservative dilution factor of 100 (consistent with near-field modelling results) and that the resultant plume would reside in the top 0.5 m of the water column as previously discussed by WRL (2012).

For the surface discharge simulations, no additional initial mixing was assumed to occur and the discharge was assumed to reside in the top 0.5 m of the water column.

It should be noted that as the three-dimensional hydrodynamic (TUFLOW-FV) model used in this assessment was configured to investigate estuary-wide impacts of the effluent from the proposed outfall. The selected model resolution (refer Figure 3-12) was unable to provide an accurate assessment of actual concentrations immediately surrounding the outfall (due to the high volumetric dilution that occurs at very low effluent discharge rates). Estimates of effluent concentration in proximity to the release point will have a lower accuracy compared to predictions of concentration outside of this initial mixing zone.



Title:
**Far-Field Model Surface and Near-Bed Diffuser
 Outfall Locations**

Figure:
3-15

Rev:
A

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



0 375 750m
 Approx. Scale

3.3.6 Results

Scenario modelling was undertaken to assess existing tidal conditions and the fate (i.e. spatial extent, concentration and mass) of proposed point source discharges in the Lower Estuary near Walsh Point. The far-field modelling assessment was undertaken to provide information relating to the:

- Existing tidal flushing potential in the vicinity of the proposed discharge site(s);
- Fate and concentration of a proposed effluent discharge in the broader environment; and
- Potential accumulation of proposed effluent discharge in the Hunter River.

3.3.6.1 Tidal flushing potential

The estuary-wide two-dimensional hydrodynamic model was used to investigate the potential for ocean exchange and flushing, by assessing e-folding flushing times. The e-folding time corresponds to the time taken for average tidal conditions to reduce the concentration of a conservative constituent at every model point inside the lower estuary from a value of 1.0 to a value of 0.368 ($1/e$) under the forcing of ocean water (concentration of 0.0) and the physical processes of advection and dispersion. Generally, areas close to the ocean will have a very short flushing time (indicative of the time it takes for water particles at these locations to be advected out of the estuary system), while areas near the tidal limits of the estuary have long flushing times (and are much more influenced by freshwater inflows to the estuary).

The results from the hydrodynamic model presented in Figure 3-17 indicate that the Lower Estuary has a very short flushing time, in the order of 1-5 days, suggesting that the daily tidal motions are quite effective at flushing the waters of the Lower Estuary. Moving further upstream to Hexham the flushing time increases to around approximately 20 days.

Given that tidal flushing within the study area is largely dominated by tidal processes, the proposed effluent discharge site(s) in the South Arm and North Arm of the Hunter River will experience regular (diurnal) flushing of marine water. The influence of tidal flushing (i.e. advection and dispersion) on a conservative tracer over two tidal cycles is presented in Figure 3-18 to Figure 3-21. In this simulation an initial tracer concentration of 100 was present in the Estuary, while marine waters outside the breakwaters were defined to have a concentration of 0. The results indicate that there is significant advection of marine water along the North Arm at the first high tide (Figure 3-18) and by the second low tide (Figure 3-21) there is also evidence of tidal flushing in the lower reach of the South Arm.

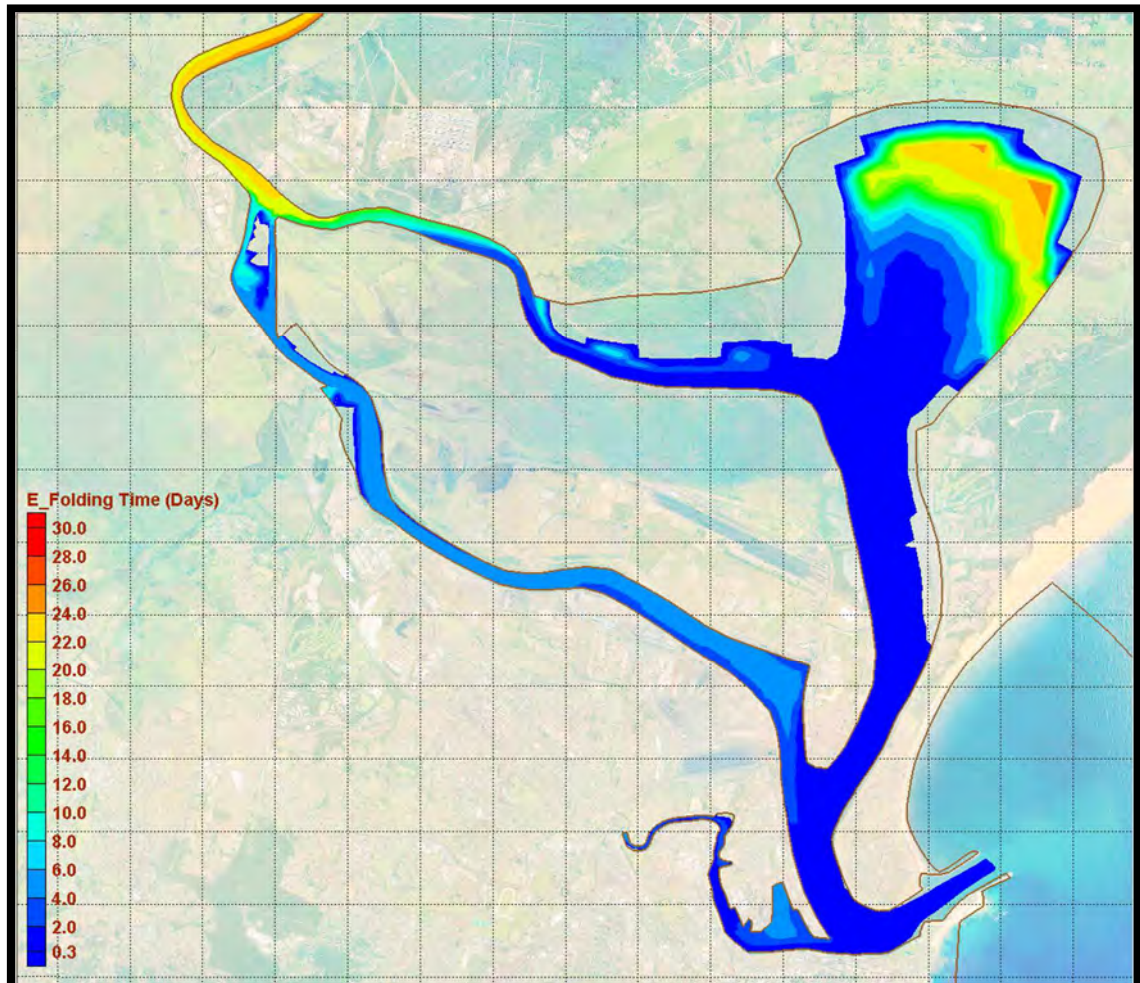


Figure 3-17 E-folding Flushing Time for the Lower Hunter River Estuary

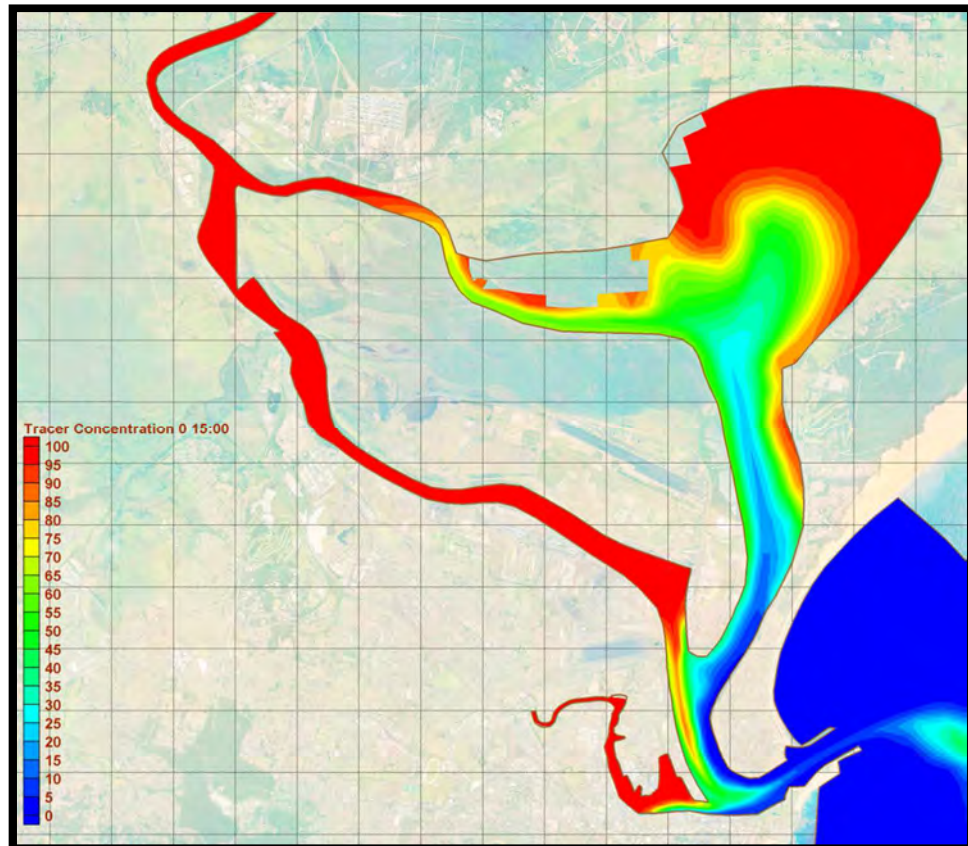


Figure 3-18 Tracer Concentration at First High Tide

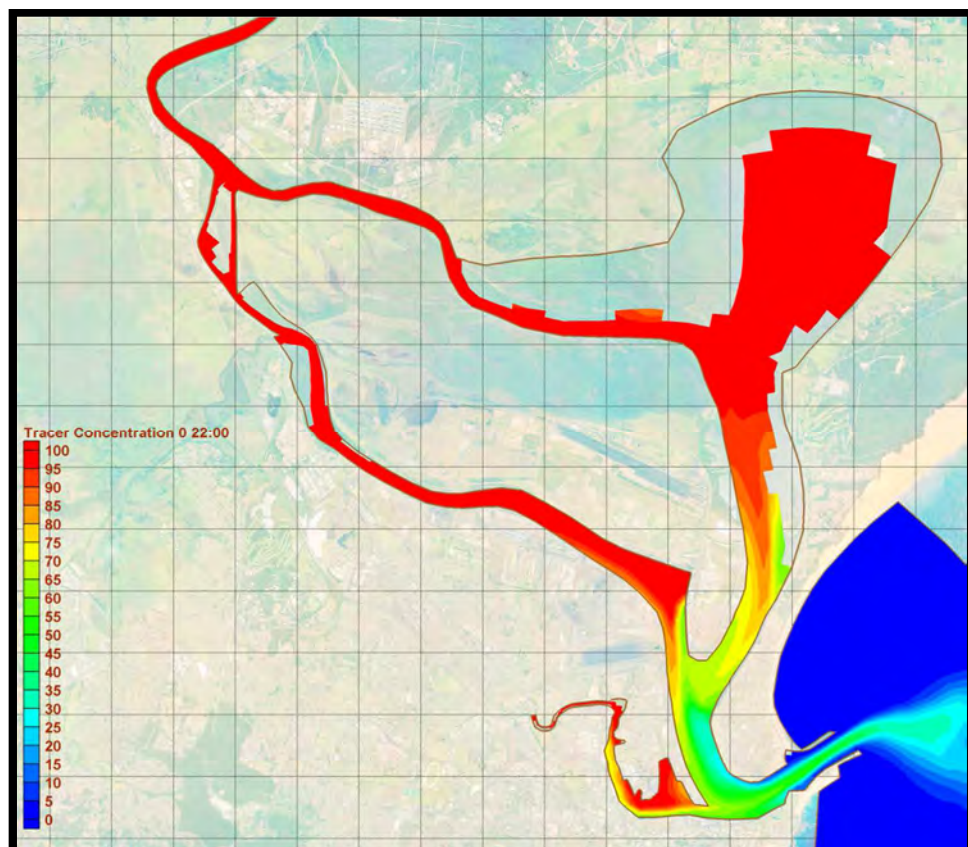


Figure 3-19 Tracer Concentration at Second Low Tide

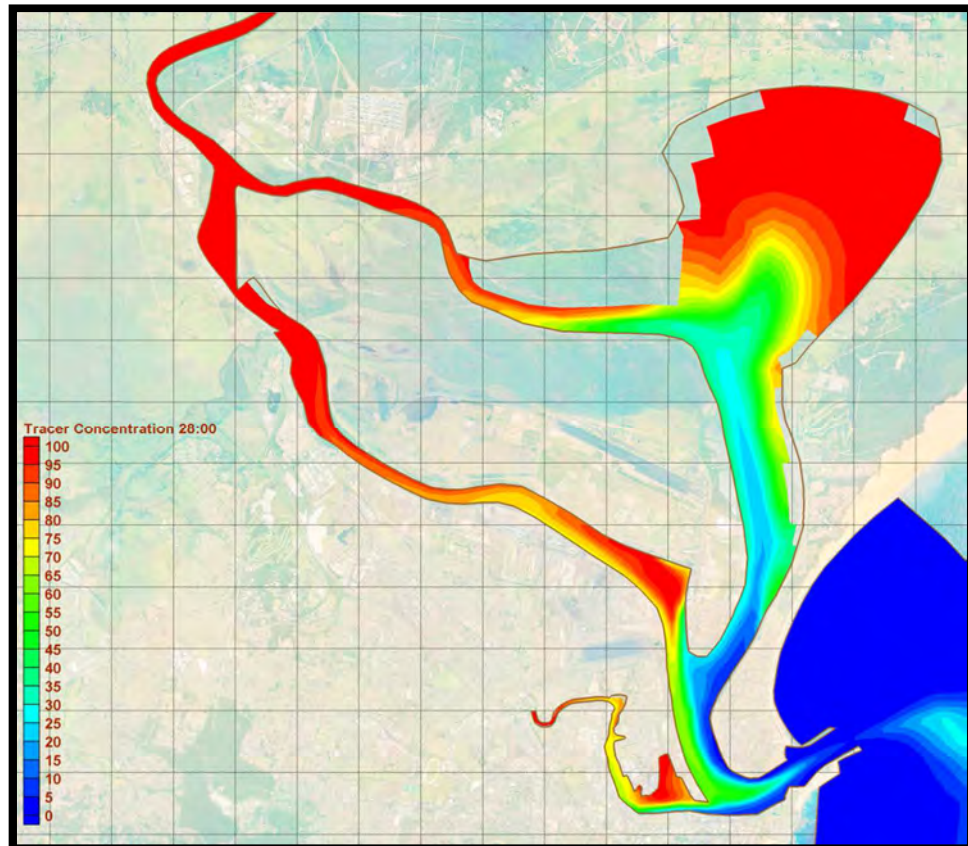


Figure 3-20 Tracer Concentration at Second High Tide

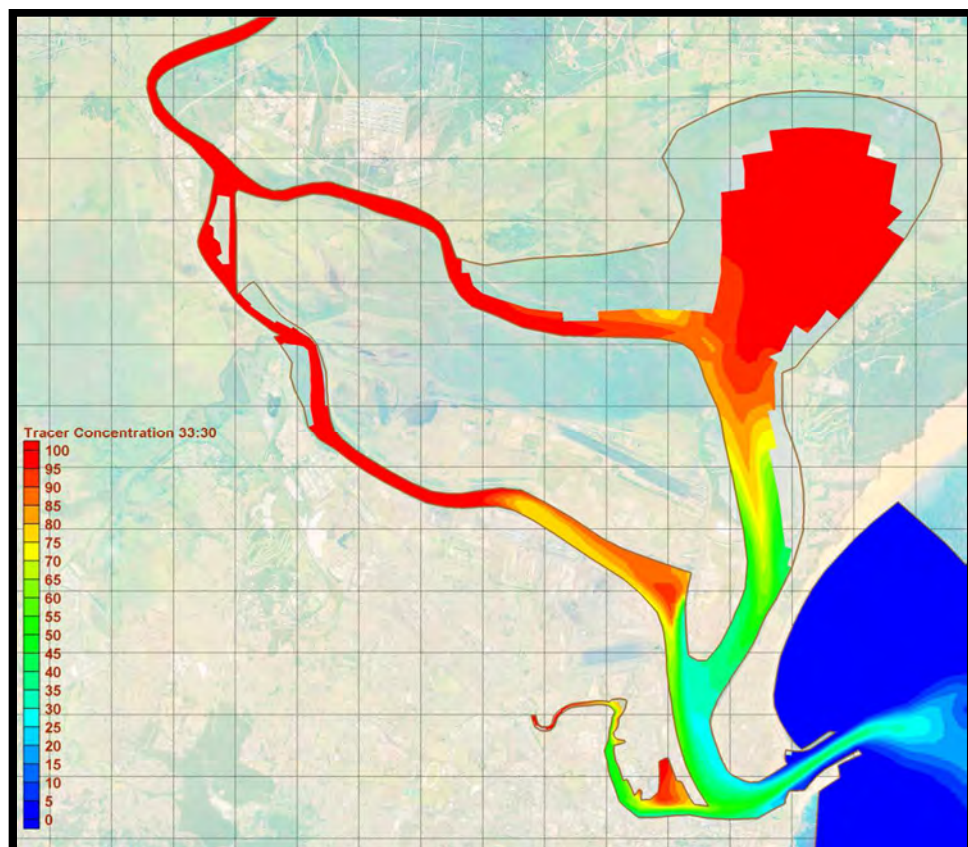


Figure 3-21 Tracer Concentration at Third Low Tide

3.3.6.2 Fate and concentration of effluent discharge

For eight of the simulations detailed in Table 3-22, maps showing the predicted concentration of additional conservative TN (TN*) have been produced 1 month and 3 months into the simulation. In total, 16 maps (as presented in Figure 3-22 to Figure 3-37) and 5 groups of concentration time-series plots (as presented in Figure 3-38 to Figure 3-42) have been generated to illustrate the fate and concentration of effluent from the proposed outfall. The maps show predicted TN* concentration in the top 25% of the water column. Due to the buoyant nature of the discharge, the surface layers were found to have the highest concentration of effluent, and so are presented here as 'worst-case' conditions.

Time-series of the predicted concentration of additional conservative TN at four locations have been produced for all ten outfall simulations as summarised in Table 3-22. Time-series of concentration have been presented separately for the top, middle and bottom 1/3rd of the water column.

The location of the four sites used to present time-series of predicted concentrations is presented in Figure 3-22 and includes:

- Hexham Bridge – this location provides an indication of concentration at the upstream extent of the readily flushed zone of the Estuary. Concentration upstream of this point will be lower than that predicted at this location and will be flushed by fluvial discharges. At this location the water depth is ~5m;
- Fullerton Cove (entrance) – this location provides an indication of the concentration of the effluent at the entrance to Fullerton Cove. At this location the water depth is ~1.5m;
- South Arm (500 metres from outfall) – this location provides an indication of the concentration of the effluent in an area of deepwater some 500 m from the proposed South Arm outfall. At this location the water depth is ~15 m; and
- Iron Bark Flood Gates – this location provides an indication of the concentration of the effluent midway along the South Arm. The flood gates have been opened to as part of the Hexham Swamp Rehabilitation project so an understanding of potential impact of effluent at this location is required. At this location the water depth is ~2.5 m.

It is important to note that the results are presented in terms of additional conservative TN based on the outfall effluent characteristics presented in Section 3.3.5.4. The results are defined as “additional” because they do not include existing background concentrations of TN. The results are also defined as ‘conservative’ because no nutrient uptake or breakdown transformations have been included in the model. The results are presented in g/L (kg/m³). Please note that a concentration of 1 e⁻⁶ g/L on the maps figures is 1x10⁻⁶ g/L which is the same as 1x10⁻³ mg/L or 1 µg/L.

The results have only been presented for TN*. To determine the equivalent prediction of additional conservative TP (TP*) divide the TN* results by 18 (i.e. 67.5/3.8).

Table 3-22 Summary of Effluent Spreading Maps and Concentration Timeseries Plots

Discharge Condition	Wind Included?	River Flow	Effluent Spread after 1 Month	Effluent Spread after 3 Months	Concentration Time-series
South Arm, diffuser	No	90 %ile	Figure 3-22	Figure 3-23	Figure 3-38 (top)
South Arm, diffuser	Yes	90 %ile	Figure 3-24	Figure 3-25	Figure 3-39 (top)
North Arm, diffuser	No	90 %ile	Figure 3-26	Figure 3-27	Figure 3-38 (bottom)
North Arm, diffuser	Yes	90 %ile	Figure 3-28	Figure 3-29	Figure 3-39 (bottom)
South Arm, at surface	Yes ¹	90 %ile	Figure 3-30	Figure 3-31	Figure 3-40 (top)
North Arm, at surface	Yes ¹	90 %ile	Figure 3-32	Figure 3-33	Figure 3-41 (bottom)
South Arm, diffuser	Yes	Observed (with minor flood event)	Figure 3-34	Figure 3-35	Figure 3-42 (top)
North Arm, diffuser	Yes	Observed (with minor flood event)	Figure 3-36	Figure 3-37	Figure 3-42 (bottom)

¹ South and North Arm, surface discharges (without wind) time-series plots are presented in Figure 3-41

An interpretation and discussion of the map and time-series results is presented in Section 3.3.6.4.

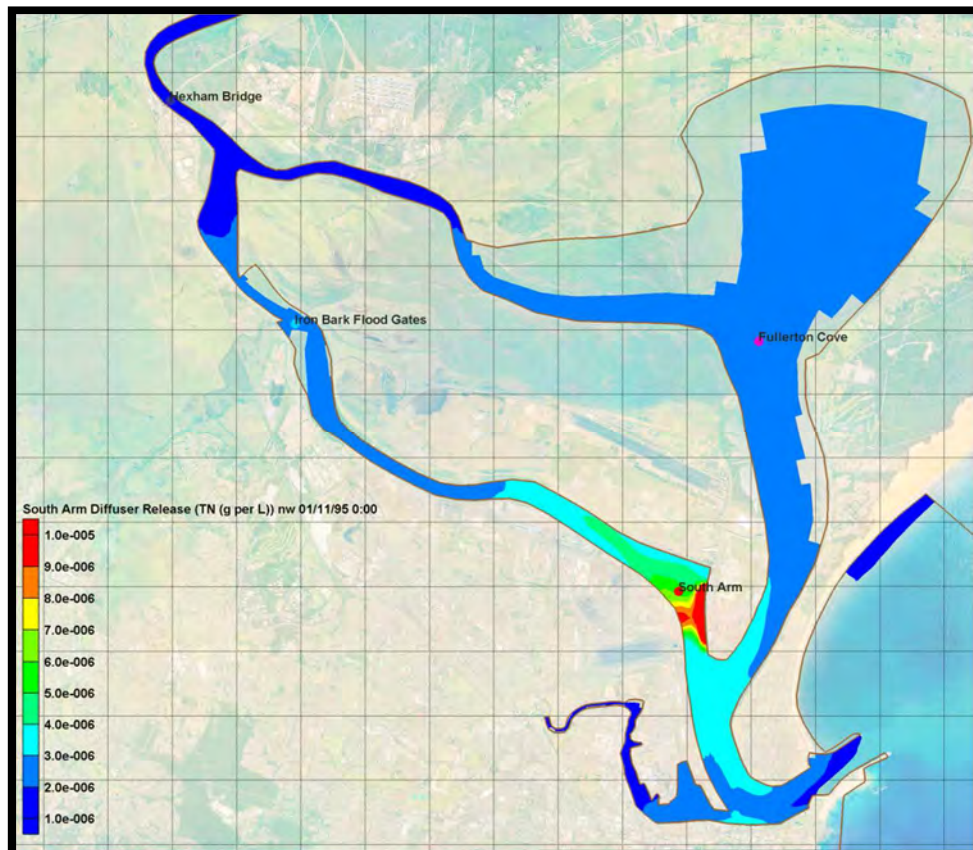


Figure 3-22 South Arm Diffuser Release (TN* (g/L)) – No Wind – After 1 Month

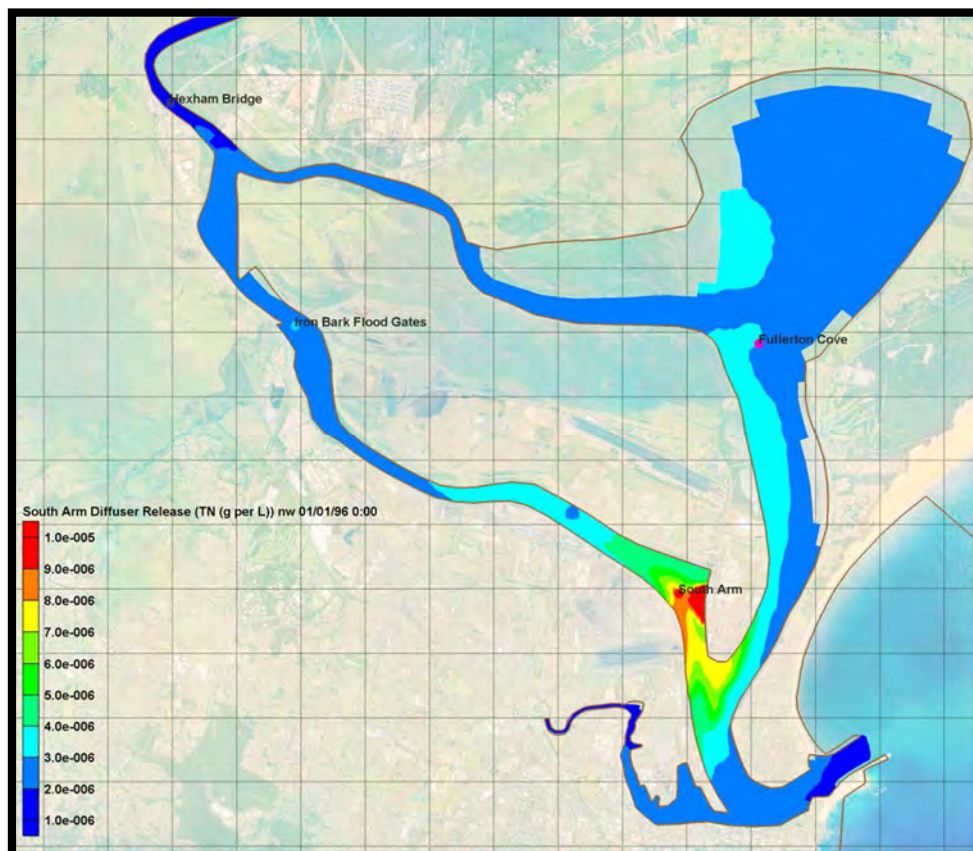


Figure 3-23 South Arm Diffuser Release (TN* (g/L)) – No Wind – After 3 Months

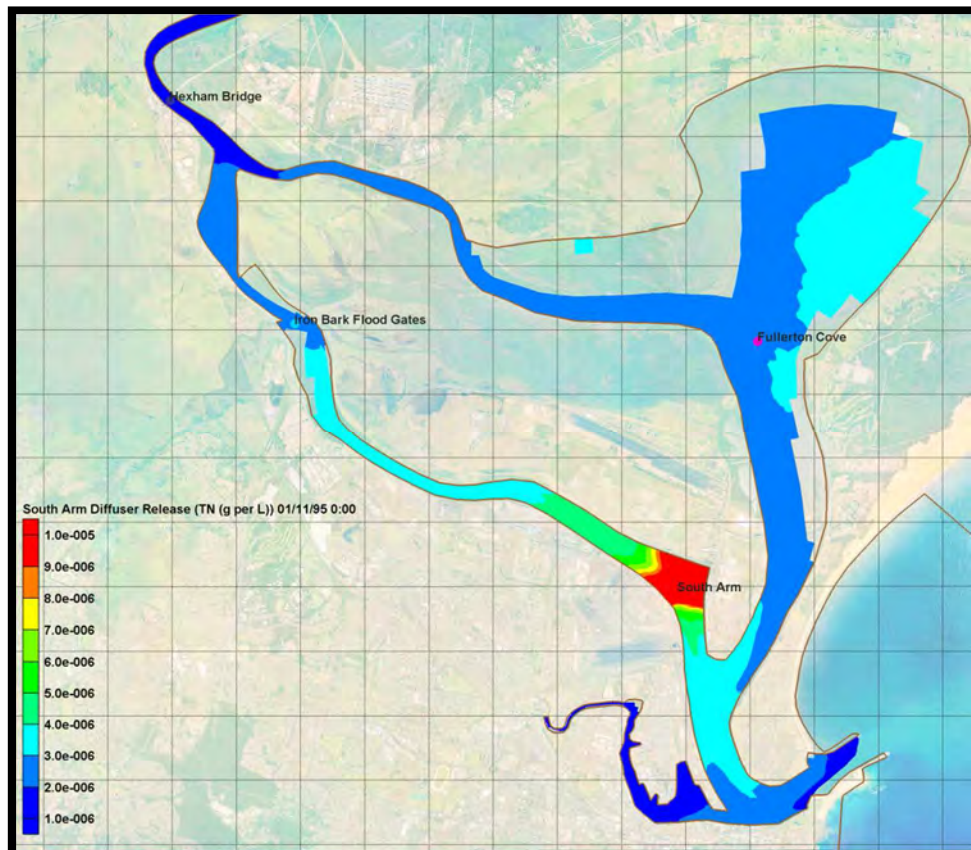


Figure 3-24 South Arm Diffuser Release (TN* (g/L)) – With Wind – After 1 Month

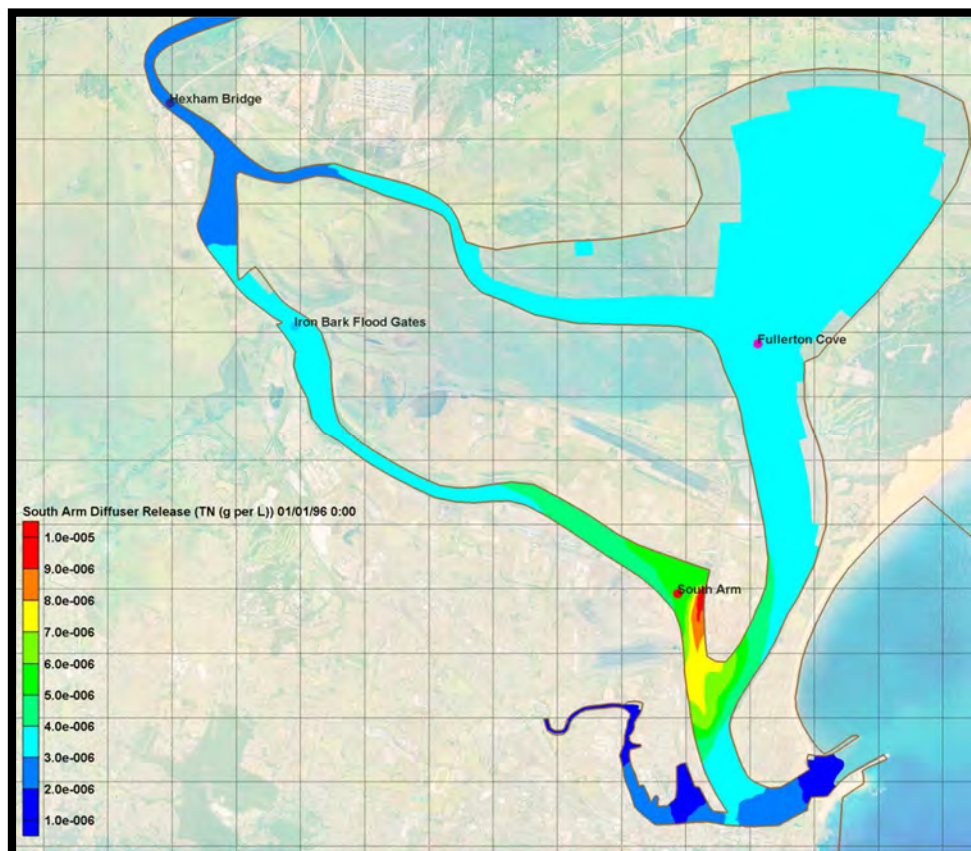


Figure 3-25 South Arm Diffuser Release (TN* (g/L)) – With Wind – After 3 Months

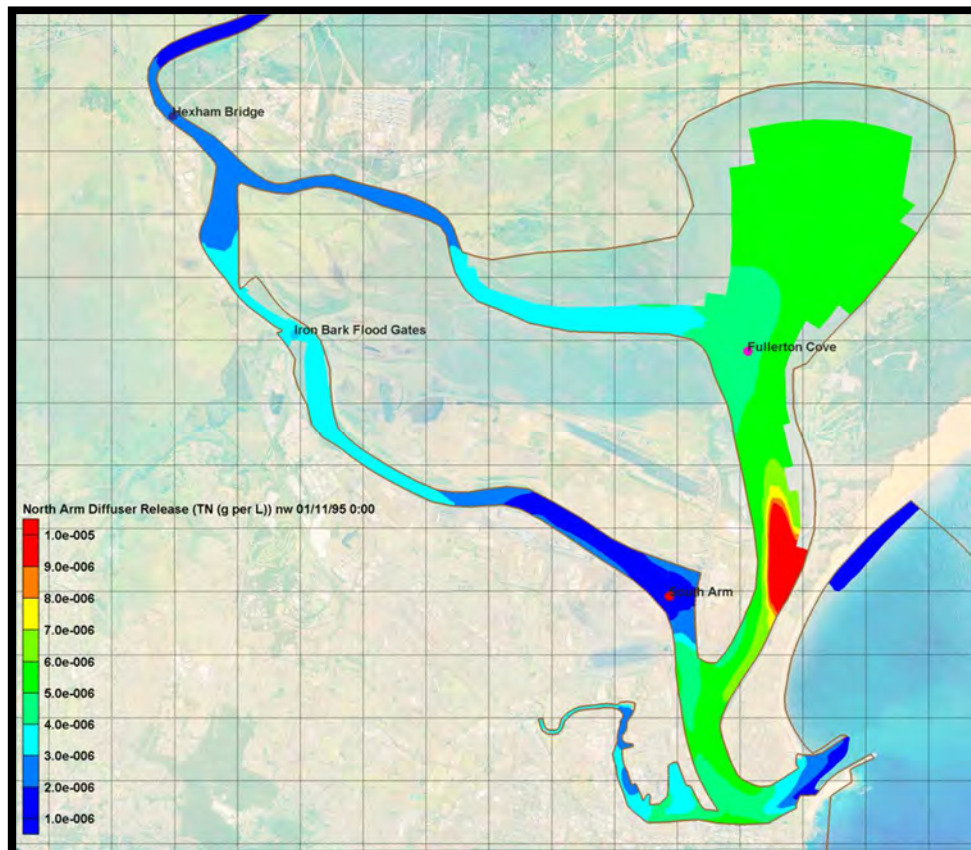


Figure 3-26 North Arm Diffuser Release (TN* (g/L)) – No Wind – After 1 Month

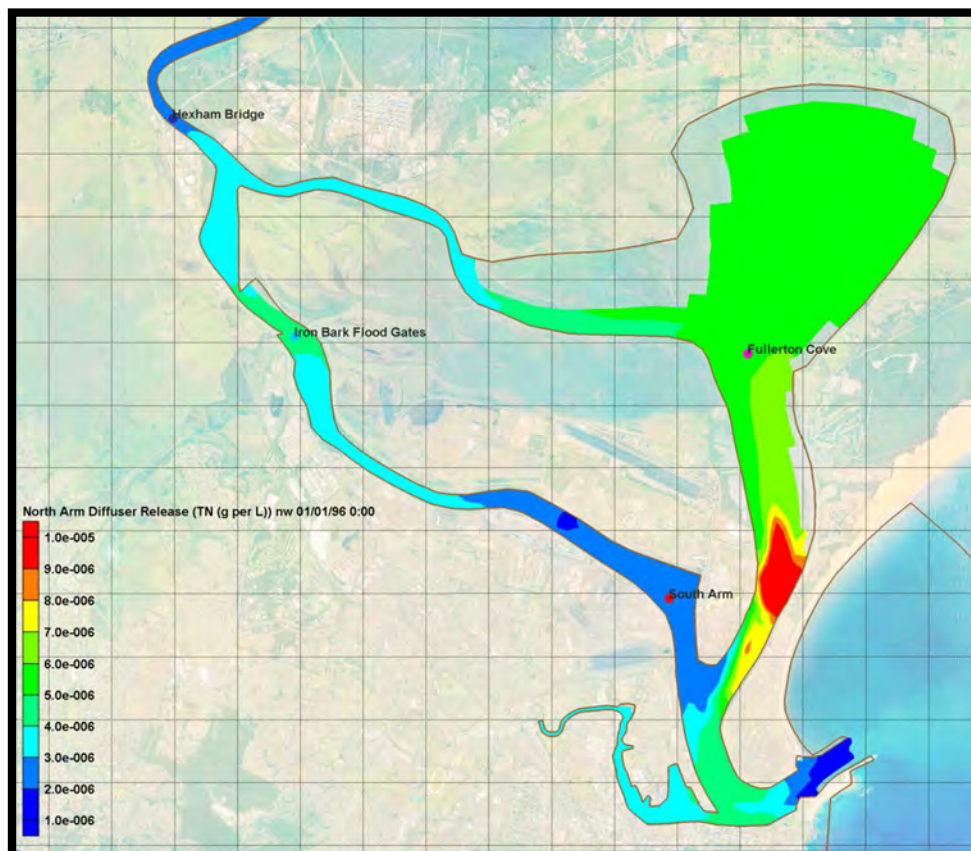


Figure 3-27 North Arm Diffuser Release (TN* (g/L)) – No Wind – After 3 Months

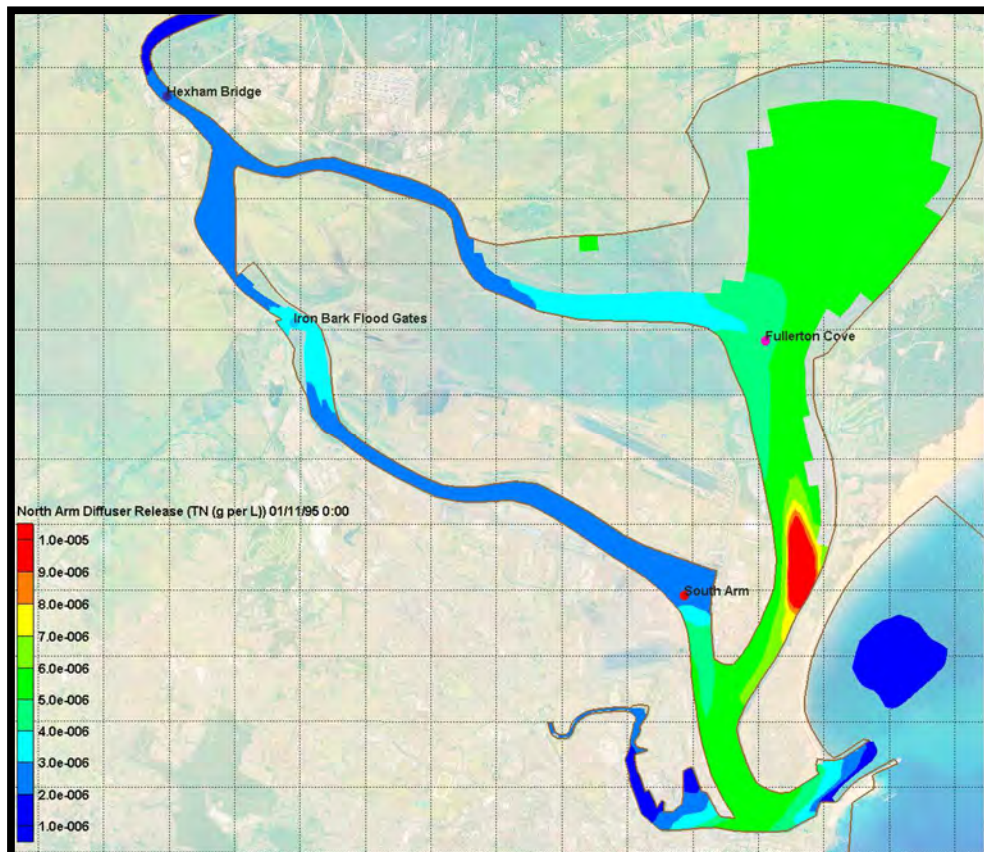


Figure 3-28 North Arm Diffuser Release (TN* (g/L)) – With Wind – After 1 Month

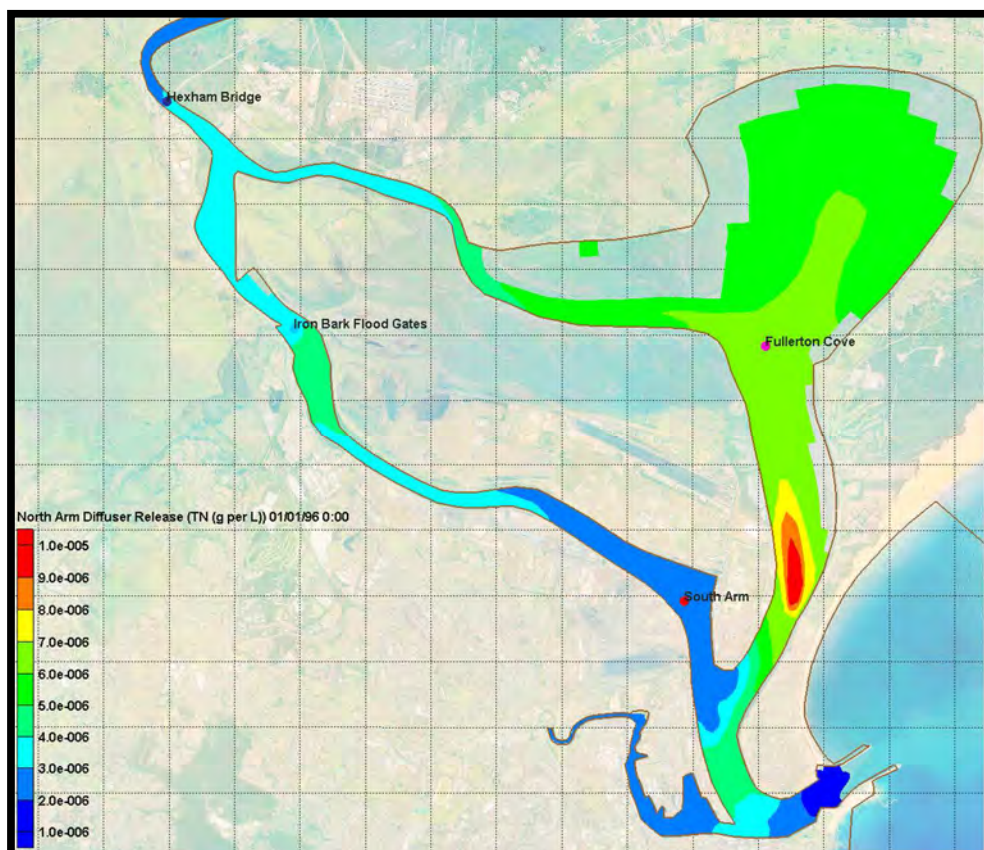


Figure 3-29 North Arm Diffuser Release (TN* (g/L)) – With Wind – After 3 Months



Figure 3-30 South Arm Surface Release (TN* (g/L)) – With Wind – After 1 Month

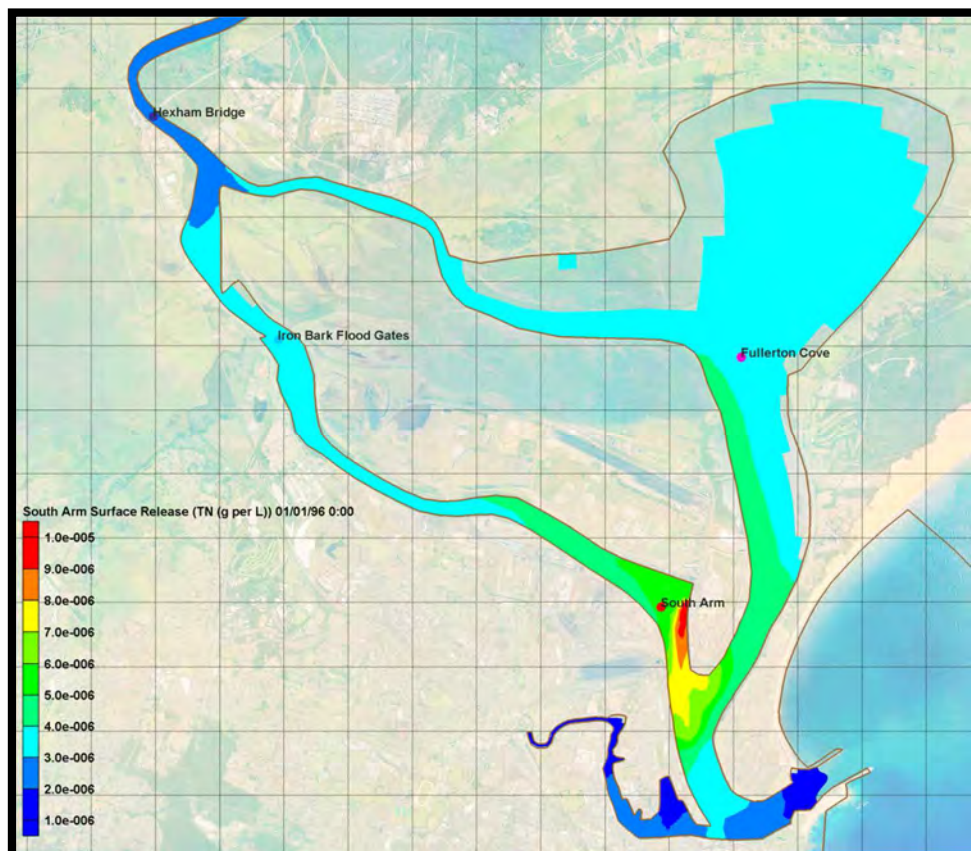


Figure 3-31 South Arm Surface Release (TN* (g/L)) – With Wind – After 3 Months

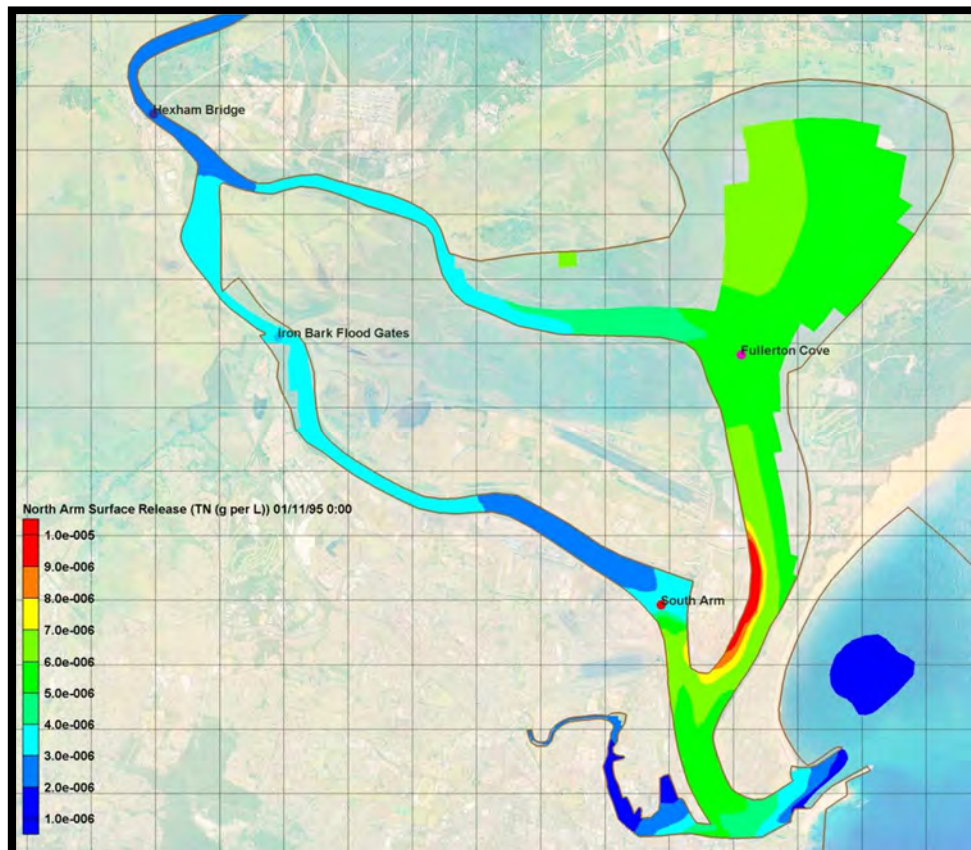


Figure 3-32 North Arm Surface Release (TN* (g/L)) – With Wind – After 1 Month

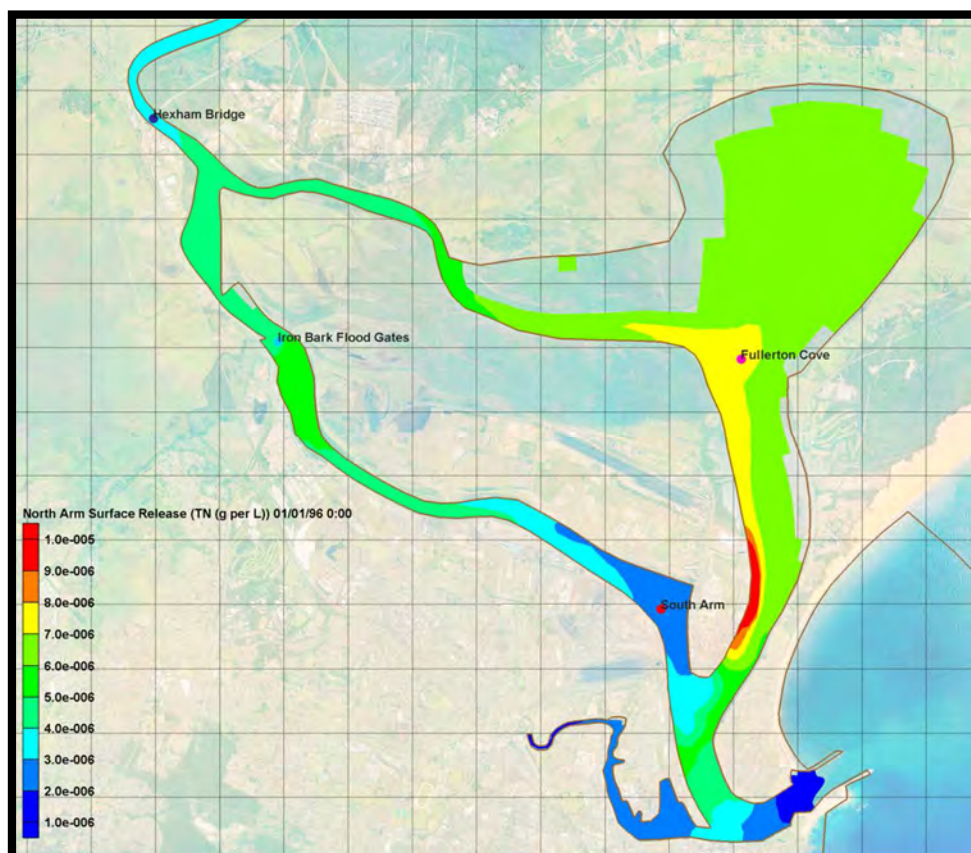


Figure 3-33 North Arm Surface Release (TN* (g/L)) – With Wind – After 3 Months



Figure 3-34 South Arm Diffuser Release (TN* (g/L)) – Wind and Observed Flow– After 1 Month

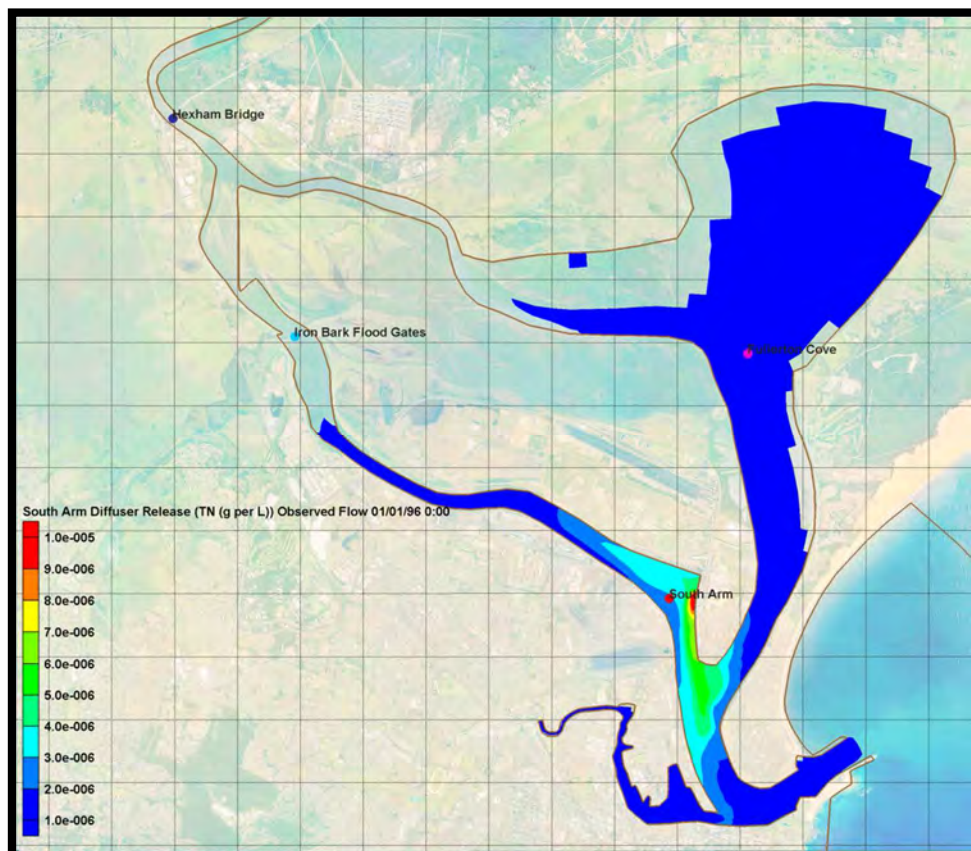


Figure 3-35 South Arm Diffuser Release (TN* (g/L)) – Wind and Observed Flow – After 3 Month

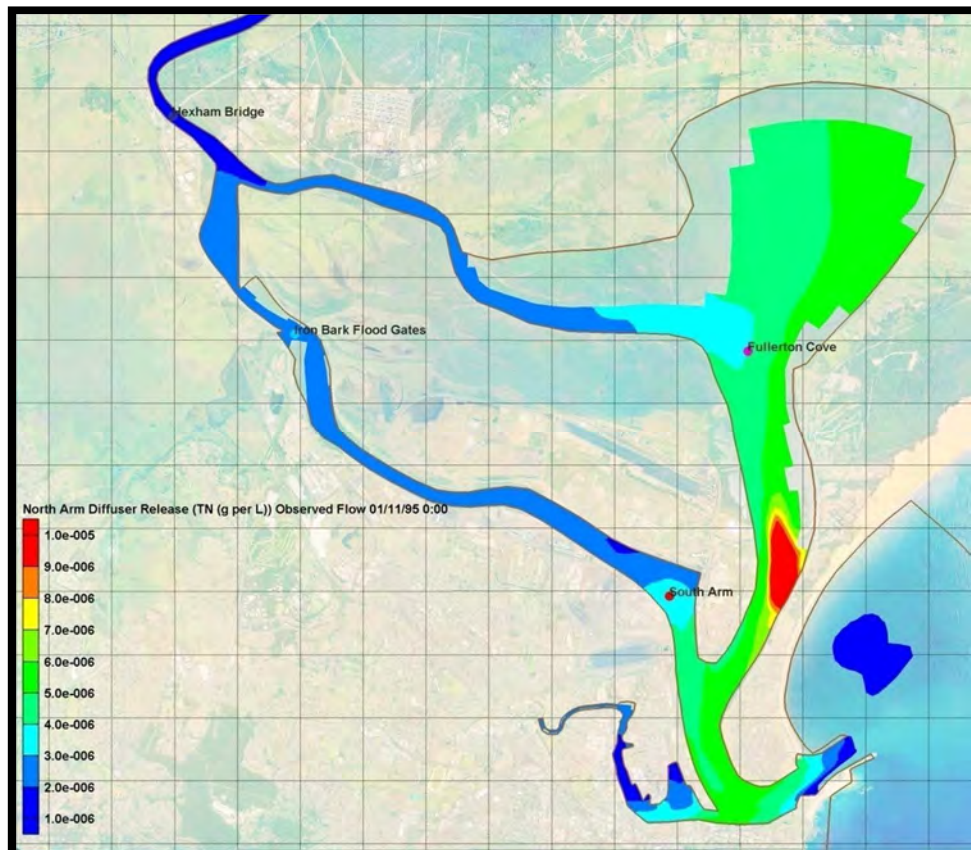


Figure 3-36 North Arm Diffuser Release (TN* (g/L)) – Wind and Observed Flow – After 1 Month

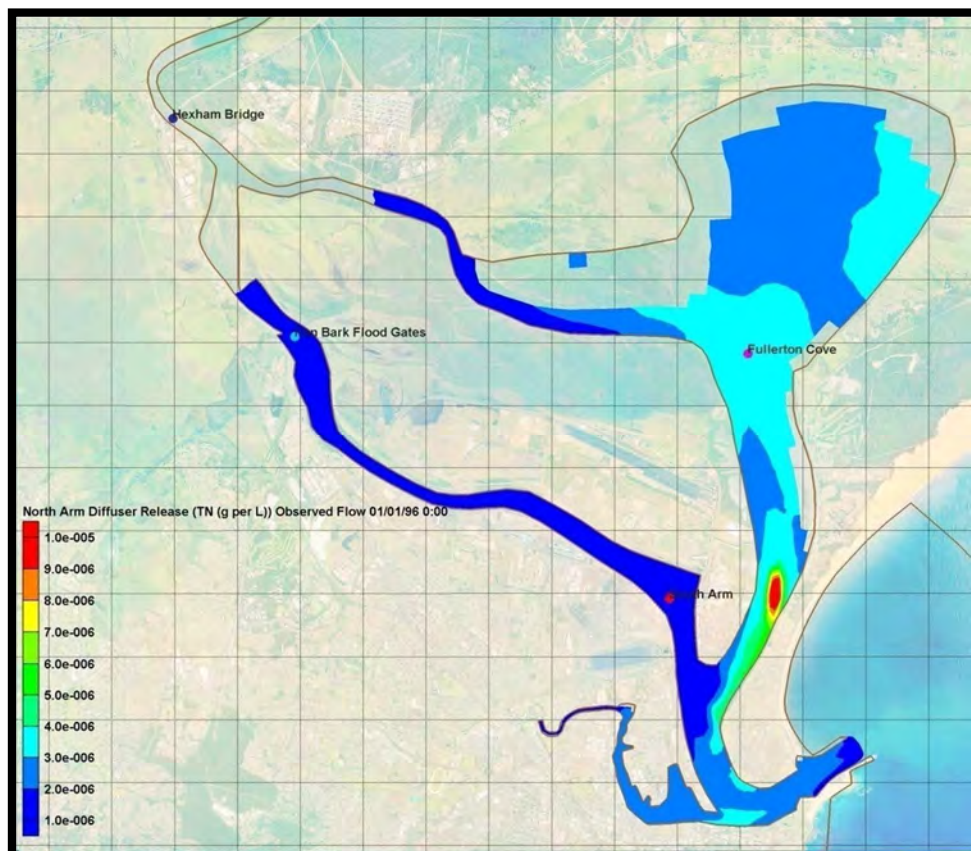


Figure 3-37 North Arm Diffuser Release (TN* (g/L)) – Wind and Observed Flow – After 3 Months

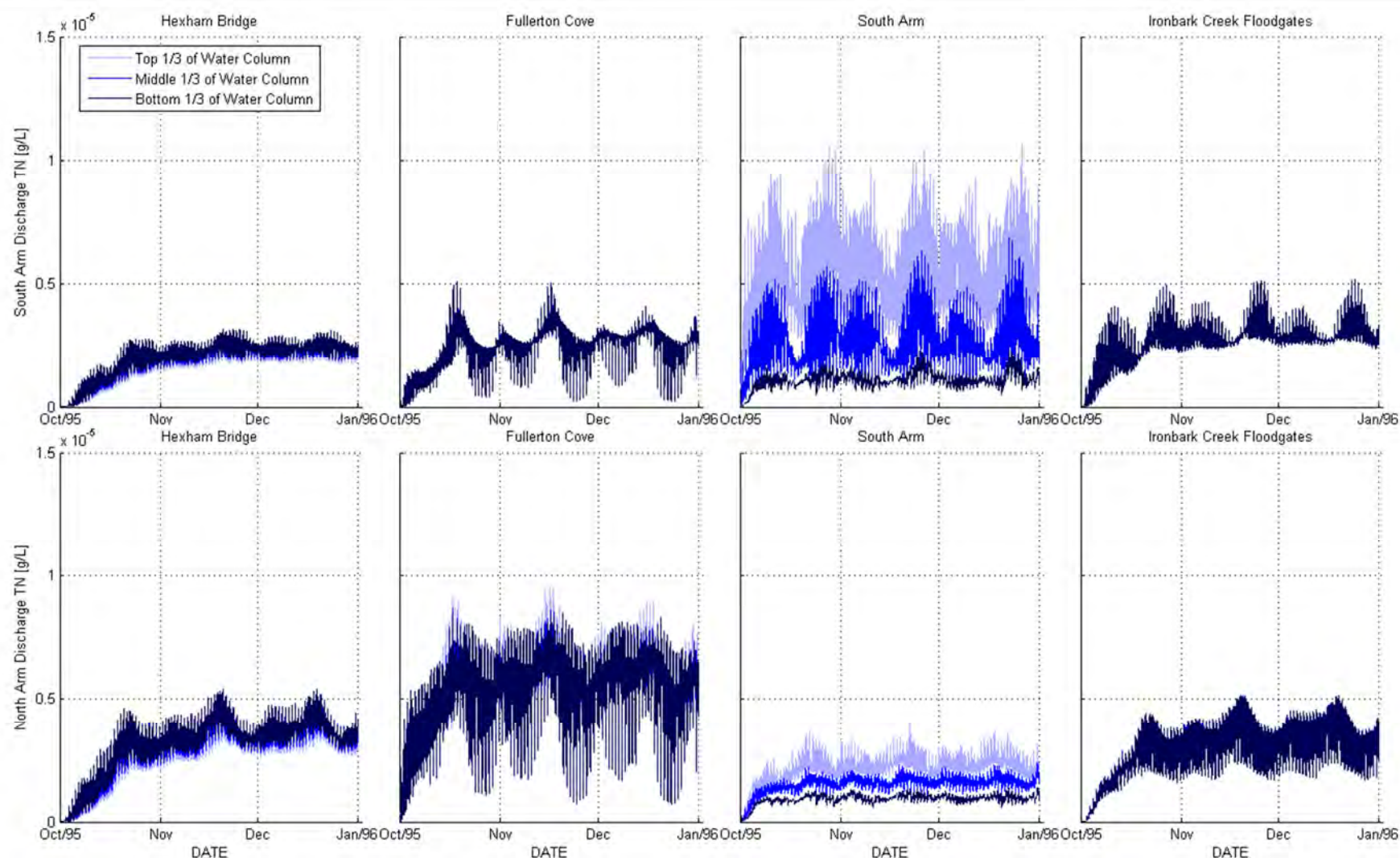


Figure 3-38 South and North Arm Diffuser Release – 90%ile River Flow no Wind, Timeseries of Additional Conservative TN (g/L)

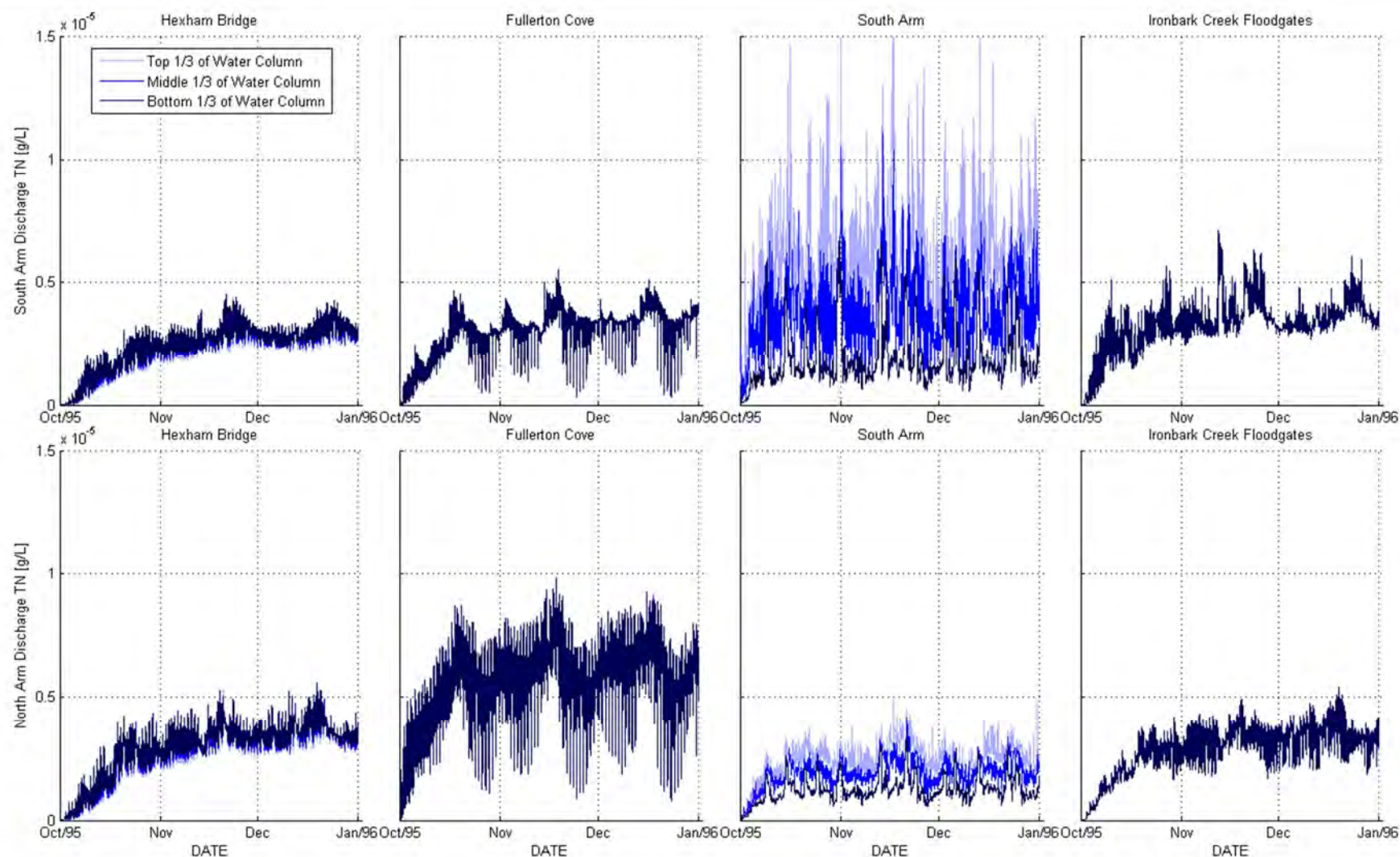


Figure 3-39 South and North Arm Diffuser Release – 90%ile River Flow with Wind, Timeseries of Additional Conservative TN (g/L)

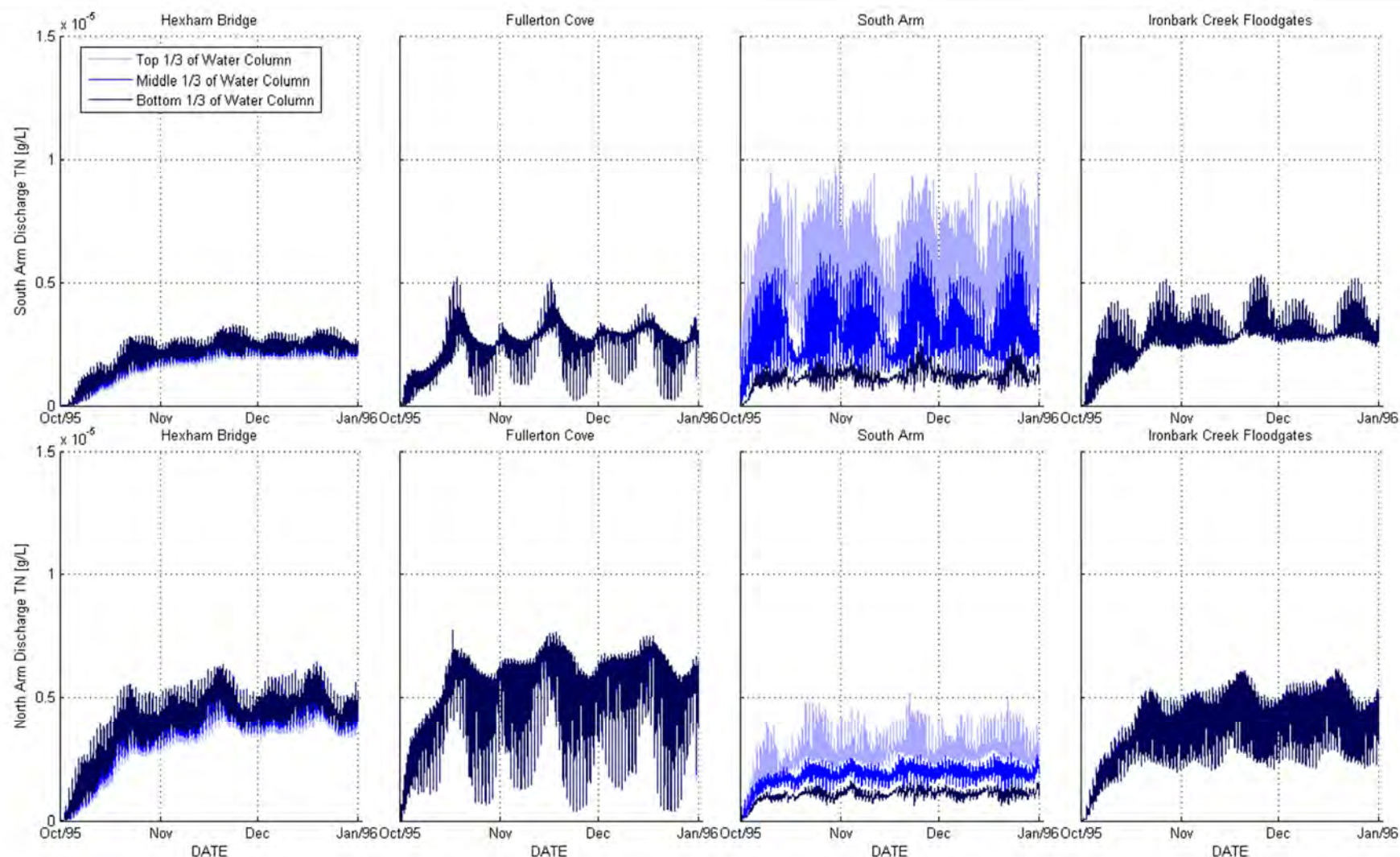


Figure 3-40 South and North Arm Surface Release – 90%ile River Flow no Wind, Timeseries of Additional Conservative TN (g/L)

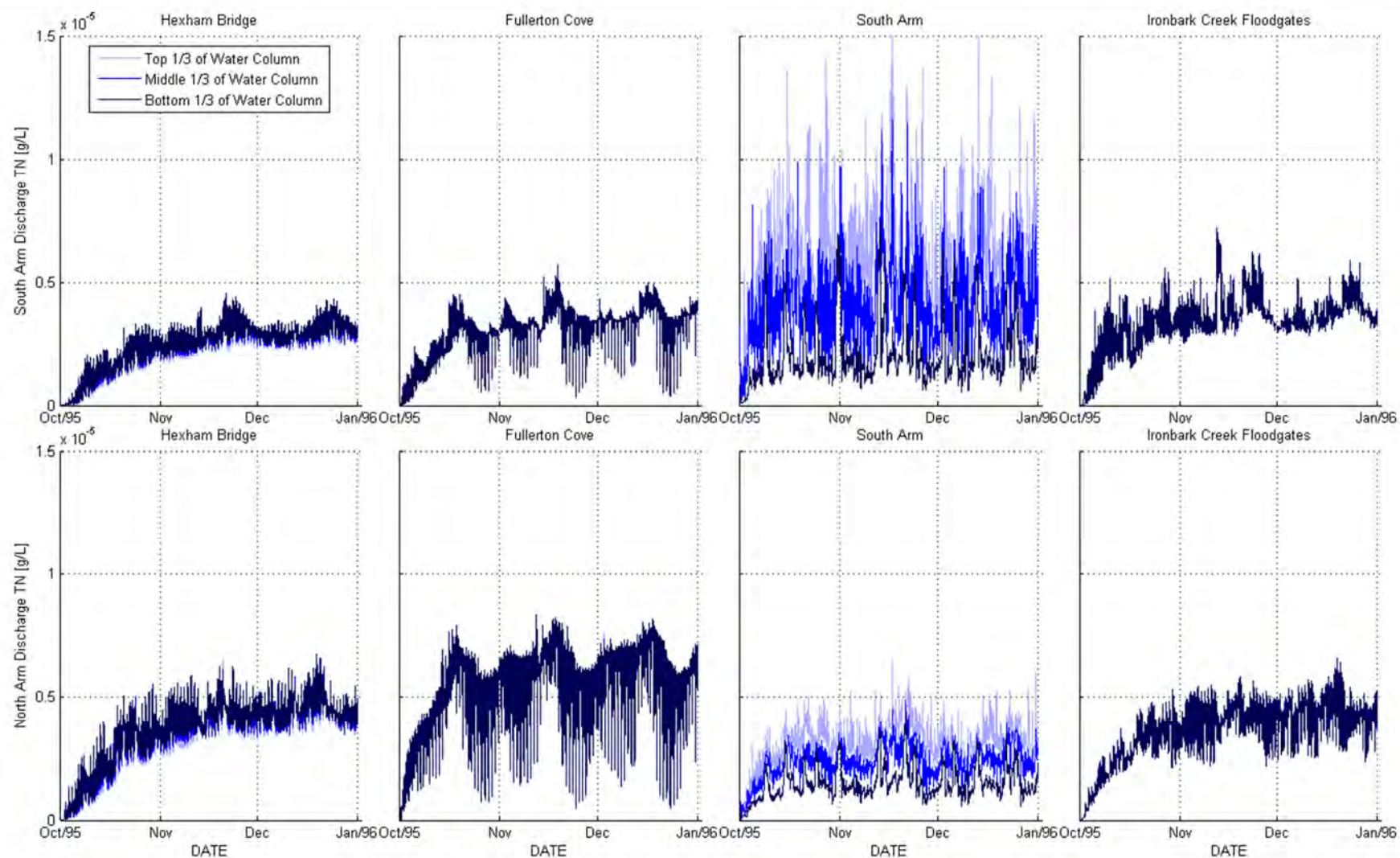


Figure 3-41 South and North Arm Surface Release – 90%ile River Flow with Wind, Timeseries of Additional Conservative TN (g/L)

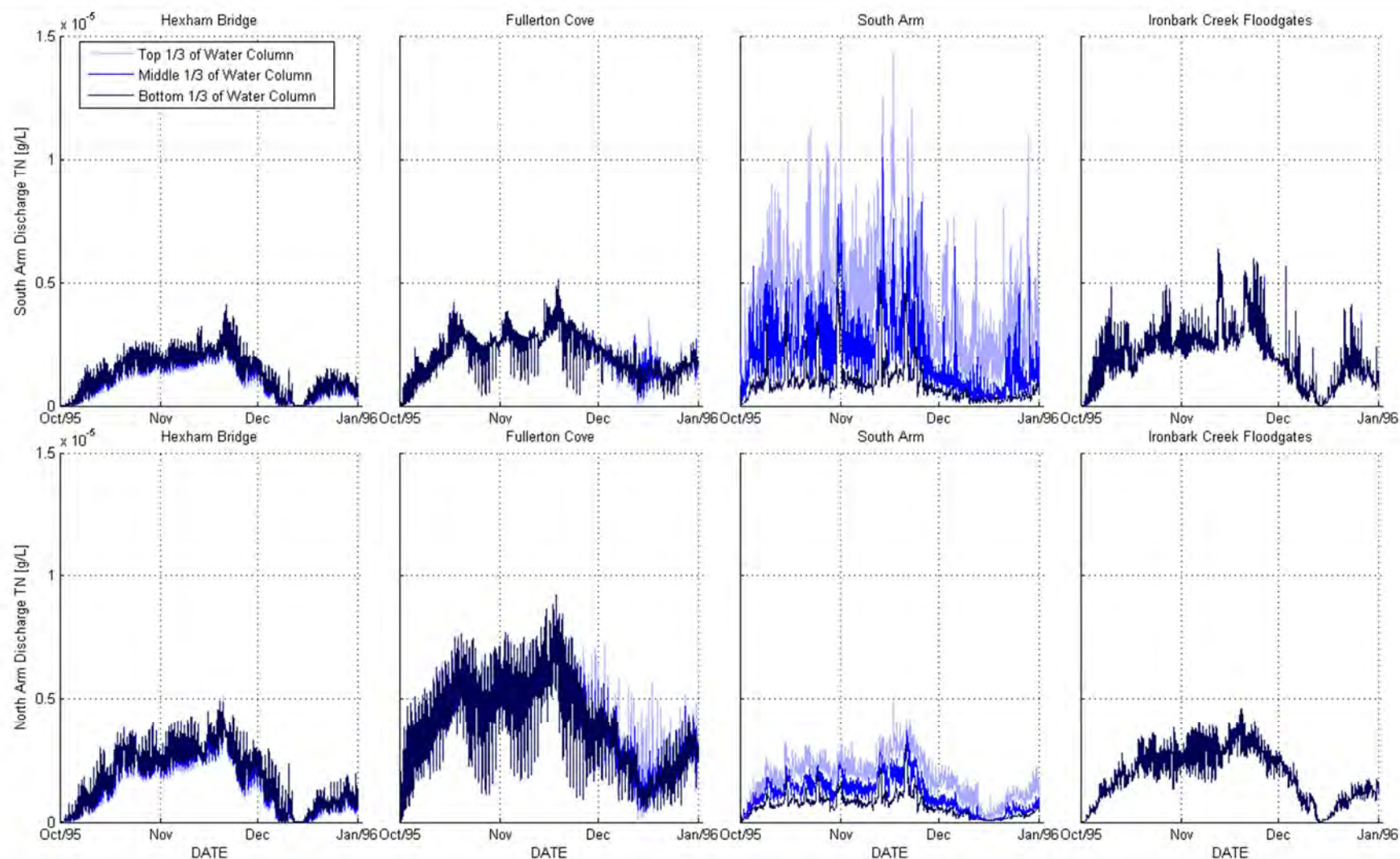


Figure 3-42 South and North Arm Diffuser Release – Observed River Flow with Wind, Timeseries of Additional Conservative TN (g/L)

3.3.6.3 *Potential accumulation of effluent within the receiving water environment*

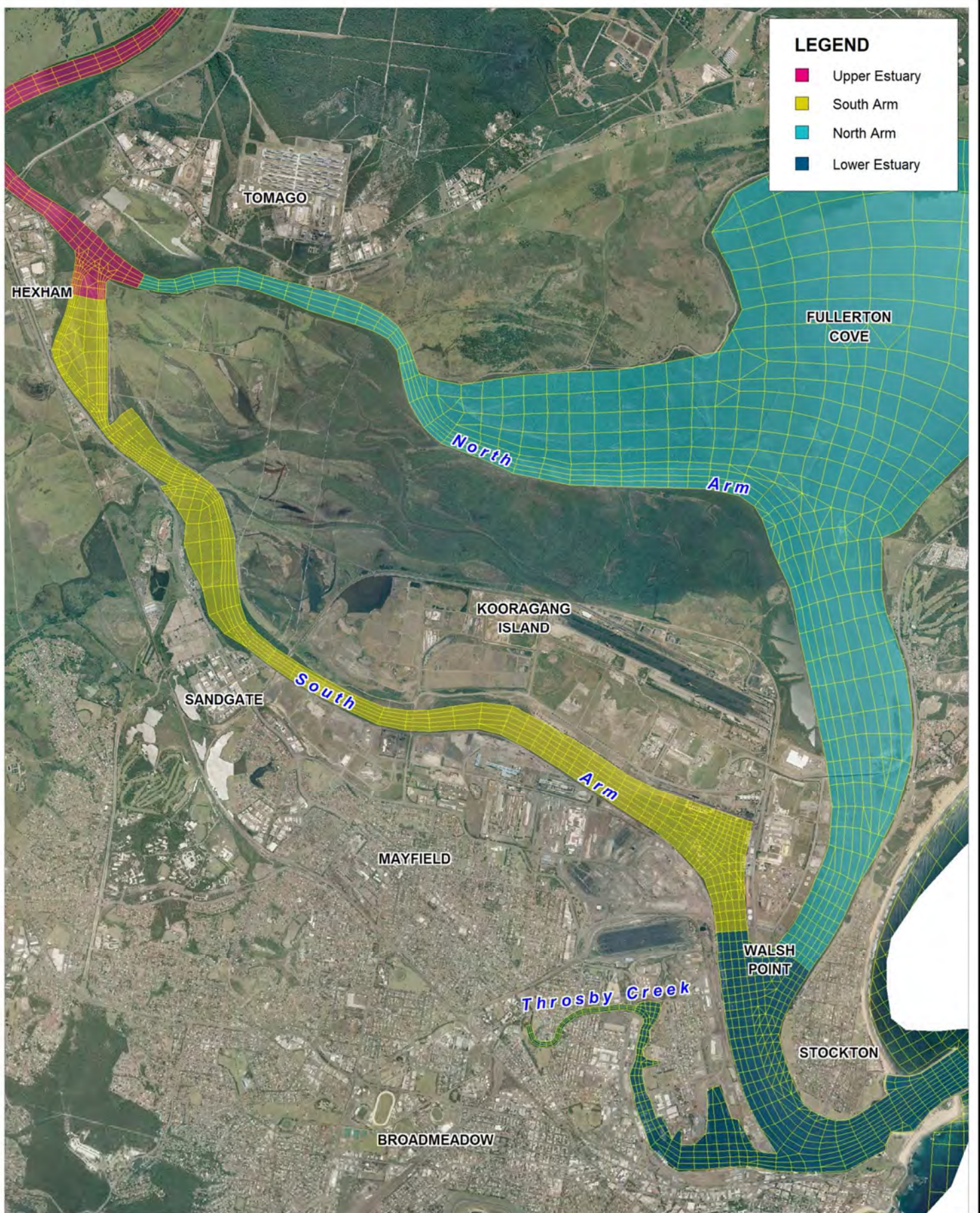
The potential for accumulation of effluent accumulating within the Hunter Estuary has been assessed by calculating the mass of additional (conservative) TN* predicted by the far-field model in the Estuary (as defined at the end of the breakwaters). Time-series of mass accumulation are presented for the 10 scenarios in Figure 3-44, Figure 3-45 and Figure 3-48. A discussion of effluent accumulation for the outfall scenarios is presented in Section 3.3.6.4.

In order to compare the mass of additional TN* and TP* retained in the Estuary from the proposed outfall it is useful to consider an approximation of the mass of TN and TP present in the Estuary. An integration of model bathymetry between the breakwaters and Hexham Bridge indicates that the volume of water within the lower estuary below 0 m AHD (~mean sea level) is 91,000,000 m³ (91 GL). If we assume an estuary wide TN concentration of 1 mg/L there would be 91,000 kg of nitrogen in the Estuary. However, if background TN concentrations were only 0.05 mg/L (a typical observed TN reading in the 2012 dataset) there would be 4550 kg of TN in the estuary. This is ~10-11 times the mass of TN* that may accumulate in the Estuary if a North Arm surface release was adopted and consistent low flow (> 90%ile conditions) occurred for a considerable period of time (i.e. 4-6 weeks) and no nitrogen breakdown processes occurred.

Calculations of the mass of TN* within four specific areas (refer Figure 3-43) of the model was also undertaken to further assess differences in the location of accumulating effluent for an outfall located on the North or South Arm. A description of the four different areas is given below:

- The Lower Estuary (defined as downstream of Walsh Point);
- The South Arm;
- The North Arm (including Fullerton Cove); and
- The Upper Estuary (i.e. approximately the area upstream of Hexham Bridge).

A discussion of different location of effluent accumulation between the North Arm and South Arm diffuser option is presented in Section 3.3.6.4.



Title:
Far-field Cumulative Mass Reporting Zones

Figure:
3-42

Rev:
A

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



0 1.25 2.5km
Approx. Scale



Filepath : K:\N2422_Inciter_Pivot_WQ_Assessment\MI\Workspaces\DRG_007_121029 ReportingZones.WOR

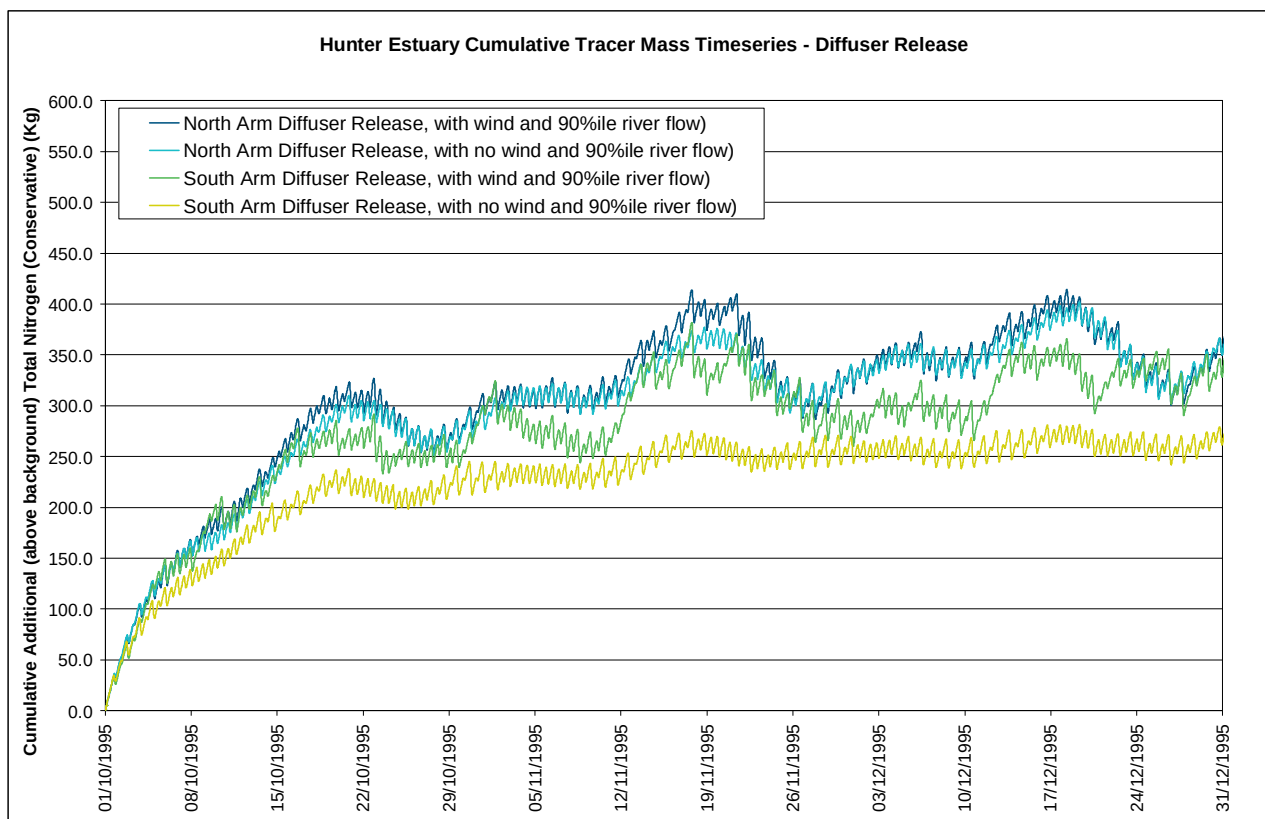


Figure 3-44 Cumulative Tracer Mass in Estuary - South and North Arm Diffuser Release – Wind vs No Wind

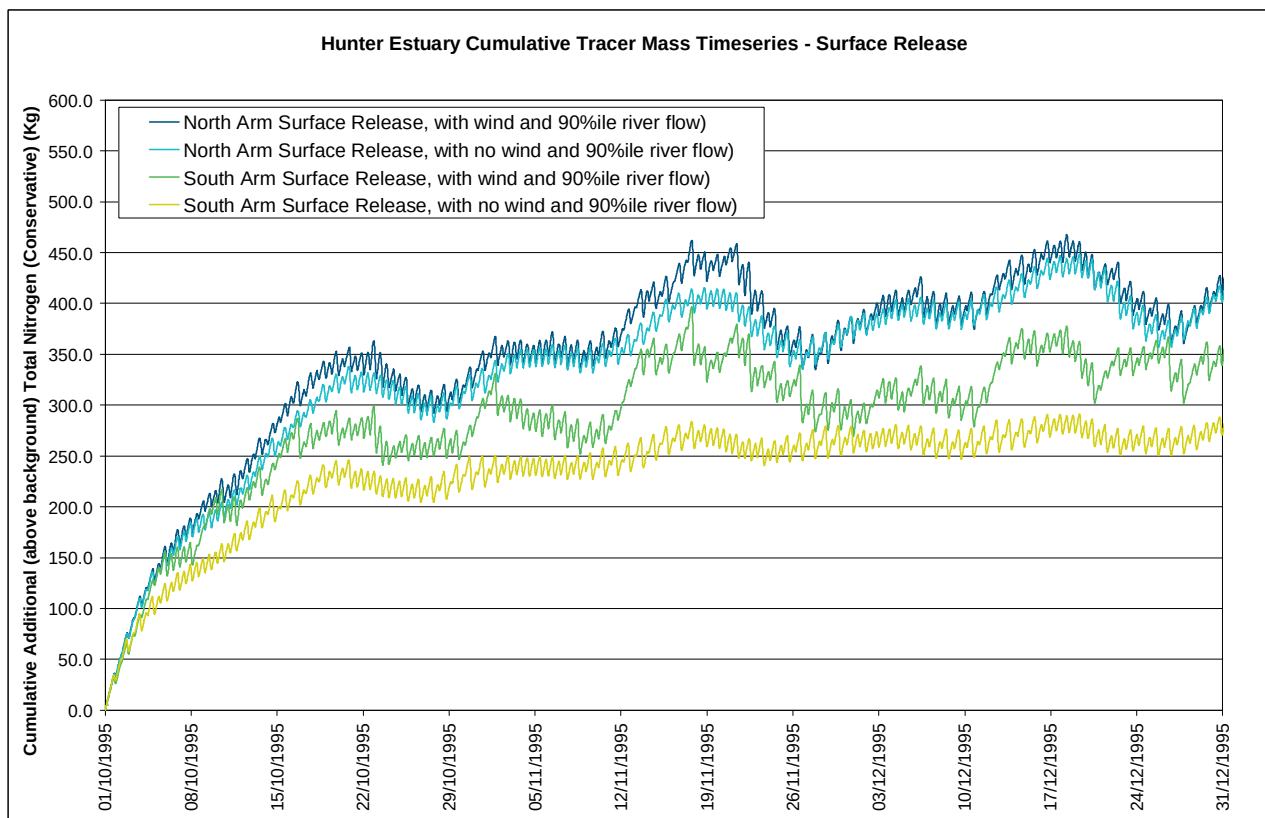


Figure 3-45 Cumulative Tracer Mass in Estuary - South and North Arm Surface Release – Wind vs No Wind

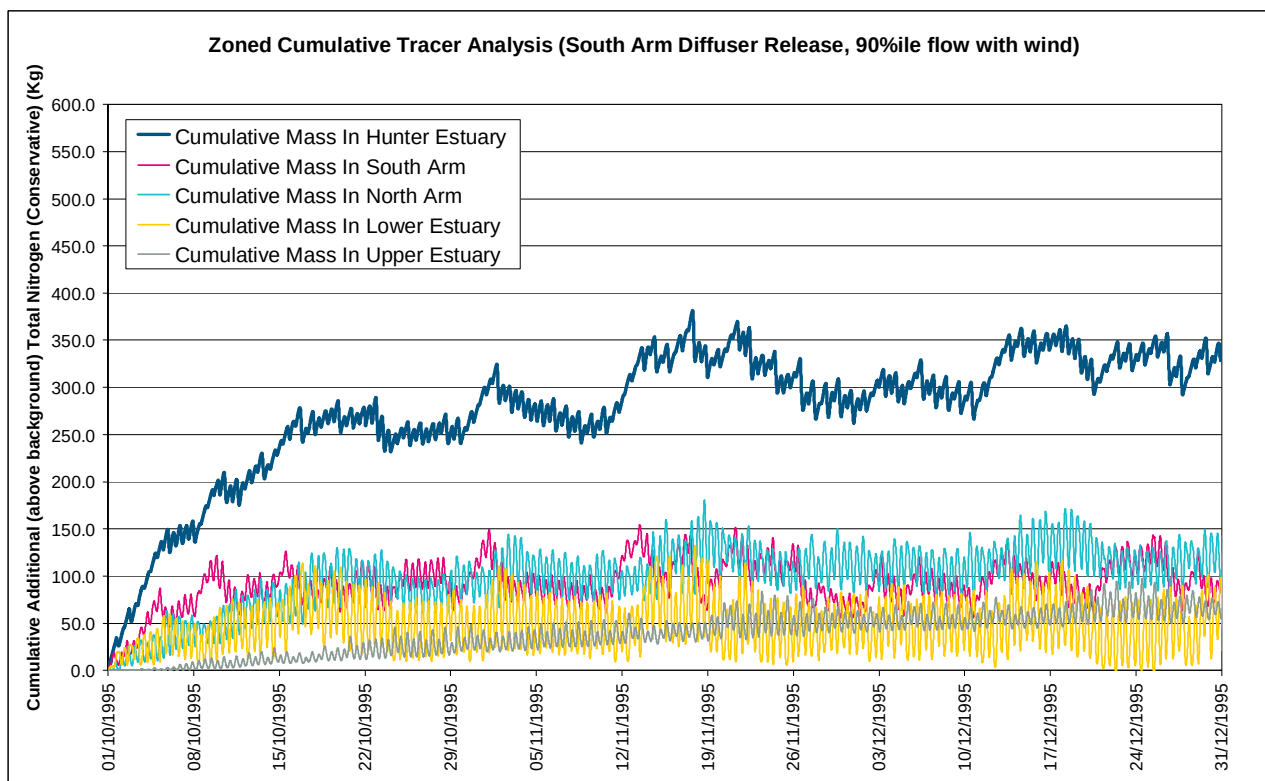


Figure 3-46 Breakdown of Cumulative Tracer Mass in Estuary - South Arm Diffuser Release – 90%ile River Flow with Wind

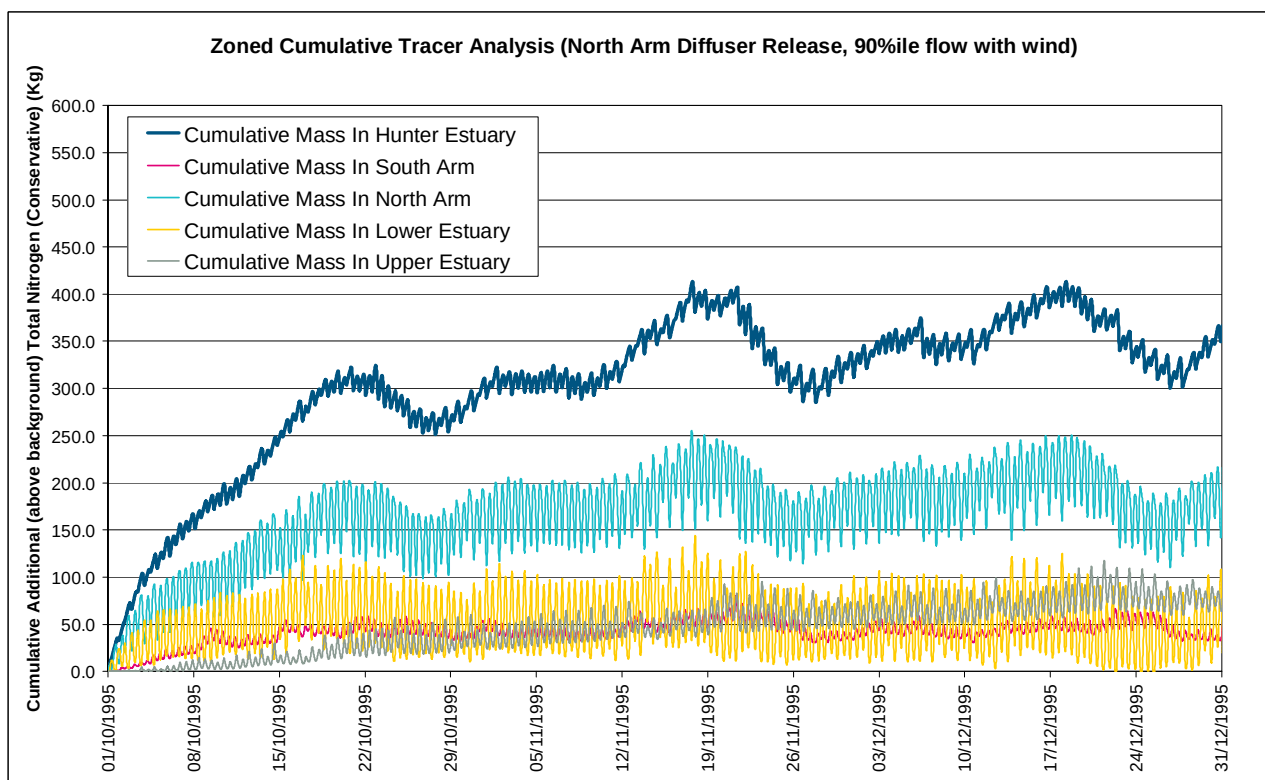


Figure 3-47 Breakdown of Cumulative Tracer Mass in Estuary - North Arm Diffuser Release – 90%ile River Flow with Wind

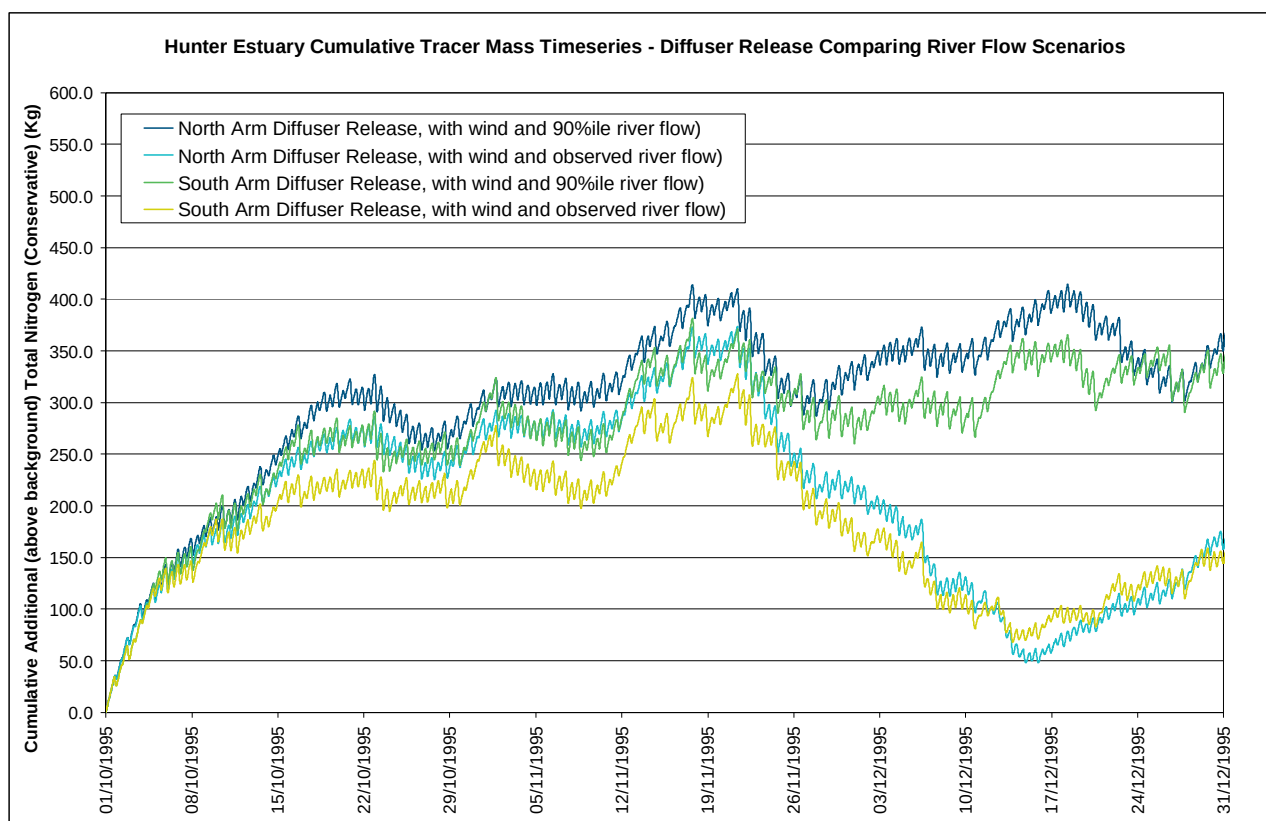


Figure 3-48 Cumulative Tracer Mass in Estuary - South and North Arm Diffuser Release – 90%ile vs Observed River Flow with Wind

3.3.6.4 Discussion of fate, concentration and mass accumulation of effluent discharge results

Comparison of South Arm Diffuser Release with and without Wind

Predicted concentrations of TN* after 1 and 3 months for the South Arm diffuser scenario without wind are presented in Figure 3-22 and Figure 3-23 while the equivalent with wind scenarios are presented in Figure 3-24 and Figure 3-25. The results show that while, TN* concentrations above 7 µg/L are limited to less than 2 km from the South Arm outfall, the effluent does spread along much of the North and South Arms albeit at low concentrations of 2-4 µg/L. A comparison of the with wind and without wind results show that wind can influence mixing and that wind will tend to spread a slightly higher concentration of effluent throughout the Estuary with concentrations being more typically 3-4 µg/L if the influence of wind is included in the model simulation.

The influence of wind in the time-series concentration results can be seen by comparing Figure 3-38 to Figure 3-39. These results show that wind provides vertical mixing (evident at South Arm) and also dampens the strong tidal signal from the hydrodynamics resulting in slightly less effluent being flushed from the Estuary. Figure 3-44 shows that after a period of 3 months in the absence of wind, the proposed South Arm diffuser release would result in ~270 kg of TN* accumulating in the Estuary. If wind is applied to the model the accumulated TN* mass is predicted to increase to ~350 kg.

Comparison of South Arm and North Arm Diffuser Release (with Wind)

Predicted concentrations of TN* after 1 and 3 months for the South Arm diffuser scenario with wind are presented in Figure 3-24 and Figure 3-25 while the equivalent with wind North Arm diffuser scenarios are presented in Figure 3-28 and Figure 3-29. The time-series concentration results for the two scenarios are presented in Figure 3-39.

The results show that as expected TN* concentrations in the North Arm are higher for the North Arm release (~6 µg/L) than for the South Arm (~3 µg/L). The results also indicate that in the upstream section of the South Arm, the North Arm discharge options results in a higher concentration (~3-6 µg/L) than the South Arm discharge option (2-5 µg/L). This indicates that the 3D model predicts a net anti-clockwise circulation around Kooragang Island during periods of low river flow.

A comparison of the effluent mass accumulation between the two scenarios is presented in Figure 3-45. After 3 months (under the influence of wind) a North Arm diffuser release would result in the potential accumulation of ~360 kg of TN* in the Estuary compared to ~350 kg if a South Arm diffuser release was adopted. Differences in the location of where the effluent mass accumulates within the Estuary are evident by comparing Figure 3-46 and Figure 3-47. For the South Arm diffuser option the effluent spreads along both the North and South Arms, whereas for the North Arm diffuser option there is a much higher accumulation of effluent in the North Arm (including Fullerton Cove) than in the South Arm and also a more rapid spread of effluent to the upper Estuary (above Hexham Bridge) than for a South Arm diffuser release option.

Comparison of South Arm Diffuser and Surface Releases (with Wind)

Predicted concentrations of TN* after 1 and 3 months for the South Arm diffuser scenario with wind are presented in Figure 3-24 and Figure 3-25 while the equivalent with South Arm surface release scenarios are presented in Figure 3-30 and Figure 3-31. The time-series concentration results for the two scenarios are presented in Figure 3-39 and Figure 3-40.

The results show that as expected TN* concentrations do not significantly differ between a South Arm diffuser or a surface release option. This is because there is no difference in the location of the two releases and while a surface release will have a significantly lower near-field initial dilution, this will not be apparent in the far-field results.

A comparison of the effluent mass accumulation between the two scenarios can be seen by comparing Figure 3-44 and Figure 3-45. Approximately 350 kg of TN would be retained in the estuary if a South Arm diffuser or surface release was adopted.

Comparison of North Arm Diffuser and Surface Releases (with Wind)

Predicted concentrations of TN* after 1 and 3 months for the North Arm diffuser scenario with wind are presented in Figure 3-28 and Figure 3-29, while the equivalent North Arm surface release scenario results are presented in Figure 3-32 and Figure 3-33. The time-series concentration results for the two scenarios are presented in Figure 3-39 and Figure 3-40.

The results show that due to the difference in location of the North Arm diffuser and surface release scenarios there is a noticeable difference in the fate and concentration of TN* in the Estuary. Because the North Arm diffuser is located slightly closer to Fullerton Cove, predicted peak concentrations are slightly higher than for the surface release option. However, because the diffuser

option is able to export a greater mass of effluent from the system, concentrations from the North Arm diffuser are lower in the South Arm and upper estuary.

A comparison of the effluent mass accumulation between the two scenarios can be seen by comparing Figure 3-44 and Figure 3-45. Approximately 360 kg of TN would be retained in the Estuary if a North Arm diffuser release was adopted, whereas a North Arm surface release option would result in 420 kg of TN* being retained in the Estuary.

Comparison of South Arm Diffuser Release with 90%ile vs Observed (with minor flood) River Flow

Predicted concentrations of TN* after 1 and 3 months for the South Arm diffuser, 90%ile river inflow scenario are presented in Figure 3-24 and Figure 3-25 while the equivalent with observed river flow scenario is presented in Figure 3-34 and Figure 3-35. While the concentrations of effluent in the system are similar after 1 month, there is significantly less TN in the system for the with observed flow scenario at the end of the 3 month simulation.

The influence of wind in the time-series concentration results is evident by comparing to Figure 3-39 to Figure 3-42. The results show that while concentrations are slightly lower in the observed flow scenario, for the first 6 weeks they are similar. However, the ability of the higher flows that arrive in late-November to flush effluent from the Estuary is apparent with significant reductions in effluent concentrations occurring at all four reporting sites. At the peak of the flow in mid-December, all effluent is temporarily flushed from upstream of Hexham Bridge. As river flow begins to decrease in the final 2 weeks of December, effluent from the outfall begins to spread back upstream through the Estuary.

A comparison of the effluent mass accumulation between the two scenarios can be seen by comparing Figure 3-44 and Figure 3-48. Approximately 350 kg of TN would be retained in the estuary for a South Arm diffuser under 90%ile river flow conditions. However if the observed river flows for 1995 were applied (refer Figure 3-13) which include a flood peak expected to occur greater than 3% of the time (i.e. this flow should be exceeded on average for approximately 10 days per year) than at the end of the three month simulation period, only 150 kg of additional TN would be retained in the Estuary. Approximately 275 kg of TN* is flushed from the Estuary from a peak of a ~350 kg on 19/11 to the 16/12 (three days after the peak of the river inflow into the upstream extent of the Hunter River). As the flow subsides an additional 75 kg is retained in the Estuary during the final two weeks of the simulation.

Comparison of North Arm Diffuser Release with 90%ile vs Observed (with minor flood) River Flow

Predicted concentrations of TN* after 1 and 3 months for the North Arm diffuser, 90%ile river inflow scenario are presented in Figure 3-28 and Figure 3-29 while the equivalent with observed river flow scenarios are presented in Figure 3-36 and Figure 3-37. While the concentrations of effluent in the system are similar after 1 month, there is significantly less TN in the system for the with observed flow scenario at the end of the 3 month simulation.

The influence of wind in the time-series concentration results can be seen by comparing to Figure 3-39 to Figure 3-42.

A comparison of the effluent mass accumulation between the two scenarios can be seen by comparing Figure 3-44 and Figure 3-48. Approximately 360 kg of TN would be retained in the estuary for a North Arm diffuser release under 90%ile river flow conditions. However, if the observed

river flows for 1995 were applied (which include a flood peak expected to occur greater than 3% of the time (i.e. this flow should be exceeded on average for approximately 10 days per year)) than at the end of the three month simulation period only 160 kg of additional TN would be retained in the Estuary.

4 CONCLUSION AND RECOMMENDATIONS

4.1 Near-Field Modelling

This report describes the setup, execution and results from near-field modelling of a diffuser system in the Hunter River for the proposed Ammonium Nitrate / Nitric Acid Manufacturing Facility. Because of the preliminary nature of the diffuser design the outcomes presented herein should be treated as preliminary and intended only for first pass analysis and understanding of the likely performance of the proposed discharge and diffuser.

With this in mind, the following discussion and conclusions can be drawn from the findings of this study:

- From a hydrodynamic near-field mixing perspective, the South Arm is shown to be a better location for discharge than the North Arm in spite of low background velocities, especially in worst-case and near-worst-case conditions. The depth of water in which the discharge can be dispersed allows for rapid initial dilution within a short lateral distance from the outfall. Additionally, the increased discharge buoyancy promoted more ambient water entrainment and therefore additional mixing of the plume;
- During slackwater conditions, in order for the discharge to achieve the TTVs (refer Table 3-1) at the edge of the near-field, the maximum discharge concentration (end-of-pipe) were calculated to be approximately 32 mg/L for ammonia-N and 2.7 mg/L for nitrate-N in the North Arm; and 55 mg/L for ammonia-N and 12 mg/L for nitrate-N in the South Arm. These values were determined based on the dilution achieved and the background concentrations while still meeting the TTVs at the end of the near field;
- With respect to concentrations, the most restrictive location was in the North Arm (maximum allowable concentration of 32 and 2.7 mg/L for both ammonia-N and nitrate-N, respectively) during slackwater conditions, which is a consequence of poorer mixing in the North Arm. Nevertheless, at neither location was sufficient dilution achieved to disperse ammonia to concentrations less than the TTVs during worst-case conditions;
- Diffuser port diameter is important in mixing dynamics, because the port diameter controls the jet velocity (momentum) of the discharge to which the mixing and dilution achieved is related. This study considered the preliminary design diameter of 25 mm, however further consideration of modelling fewer and/or other port diameters could be undertaken as part of a subsequent detailed design phase. The inclusion of duckbill (one-way) valves to increase port discharge velocities may also be a worthwhile consideration;
- The results of the near-field modelling demonstrate two important points with respect to background conditions:
 - Background constituent concentrations are important in determining the assimilative capacity in the river to accept additional constituent concentrations. While the Sanderson and Redden (2001) data are comprehensive at capturing seasonal water quality characteristics, these data have may not represent present-day conditions. The

URS (2012b) data, while current and representative of present-day conditions, are not a sufficient dataset to summarise the overall conditions in the Lower Estuary; and

- Background pH values are important in determining the TTVs of ammonia. The current study demonstrated that differing background pH values, and therefore TTVs may result in the discharge satisfying the ammonia TTV in one location, but not in the other even when similar dilution/mixing ratios are achieved (e.g. Scenarios 2 and 5).
- It is recommended that port spacing be increased from the preliminary design of 3 m to no less than 4 m to reduce or eliminate interactions between plumes from adjacent ports, thereby allowing for greater surface area of the plumes to entrain receiving water; and
- These results represent static conditions and cannot completely reflect dilution as a result of shifting current velocities and direction. Referral to the far-field modelling assessment is recommended for consideration of dynamic receiving water conditions (i.e. water depth and current velocity).

4.2 Far-Field Modelling

Far-field modelling of the proposed outfall has investigated the influence of tidal hydrodynamics on the proposed effluent discharge and the potential for transport and accumulation within the receiving water environment. Key findings from the far-field numerical modelling study include:

- A 3D numerical model has been developed based on an existing 2D model of the river and Estuary system. The model has been verified against a number of observed datasets and is suitable for the assessment of far-field process for an outfall in the Lower Estuary;
- The model indicates that the Lower Estuary is well flushed with an e-folding time of 1 – 5 days;
- Both with and without wind scenarios have been undertaken and indicate that the simulation of wind influences the spreading and accumulation of effluent in the Estuary and as such should be included in assessment of outfall performance;
- A comparison of the far-field performance of a surface discharge in preference to a near-bed diffuser indicates that the near bed diffuser performs better in terms of far-field as well as near-field water quality dynamics;
- A comparison of a North Arm and South Arm outfall release option indicates that in terms of far-field water quality, a South Arm release is more favourable. This is partly due to the 3D model's prediction of an anti-clockwise net circulation around Kooragang Island under low (90%ile) river discharge conditions. This anti-clockwise circulation produces a long-term net upstream advective transport along the North Arm and a long-term net downstream current along the South Arm;
- Apart from deeper sections of the South Arm, the effluent is generally vertically mixed throughout the water column;
- Under sustained low (90%ile) river flow conditions increases in TN above background levels (and assuming no nitrogen breakdown) in the Estuary are below 7 µg/L outside an approximately 2 km distance from the outfall. Closer to the outfall concentration up to 15 µg/L are predicted by the far-field model. Far-field model prediction of concentrations within ~500 m of the outfall

should be considered with care as the far-field model cannot resolve near-field mixing processes. Equivalent conservative additional TP predictions are 0.39 µg/L and 0.83 µg/L;

- Accumulation of conservative additional TN and TP has also been assessed. For a North Arm diffuser release during 90%ile river flow conditions, up to ~400 kg of TN (or ~22 kg of TP) would be retained in the Estuary. Whereas for a South Arm release, the model predicts the accumulation of up to ~350 kg of TN (or ~16 kg of TP) in the Estuary. With respect to TN concentration, the accumulation of conservative additional TN after 3 months (with wind) was estimated to be less than 7 µg/L above background concentration for both a South Arm and North Arm diffuser release. Similarly, the accumulation of conservative additional TP was estimated to be less than 0.4 µg/L above background concentration; and
- The ability of a fluvial (freshwater) event to flush effluent from the Estuary has also been assessed in the study. The model predicts that an observed freshwater event with a peak daily flow rate (equivalent to a 3%ile exceedance condition) provides considerable additional flushing (more than 75%) of accumulated TN* and TP* from the Estuary.

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APPENDIX A: URS 2012 WATER COLUMN SAMPLING DATA

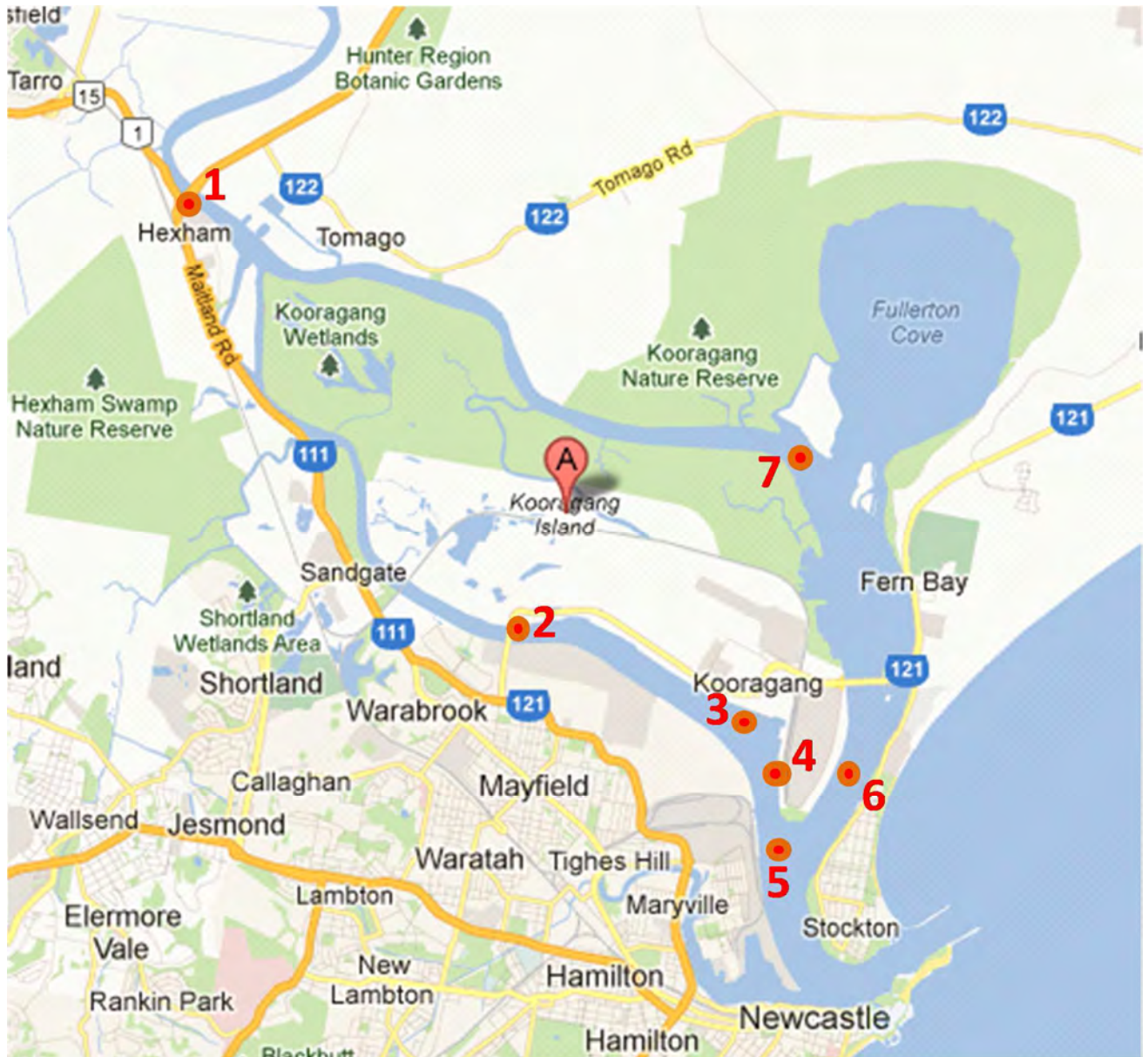


Figure A-1 URS Monitoring and Sampling Locations

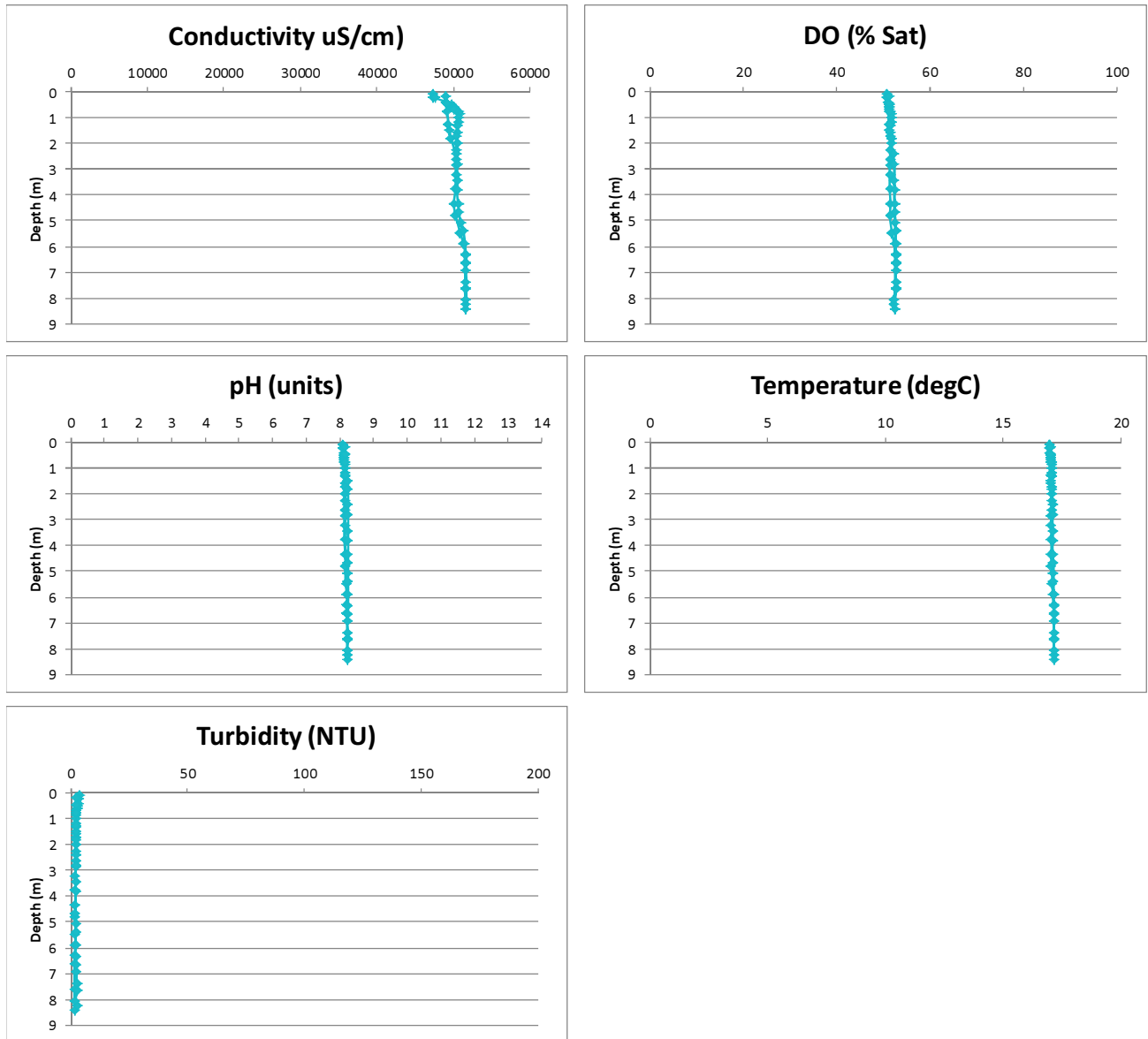


Figure A-2 Round 1 Site 6, Falling Tide 12 September 2012 08:00

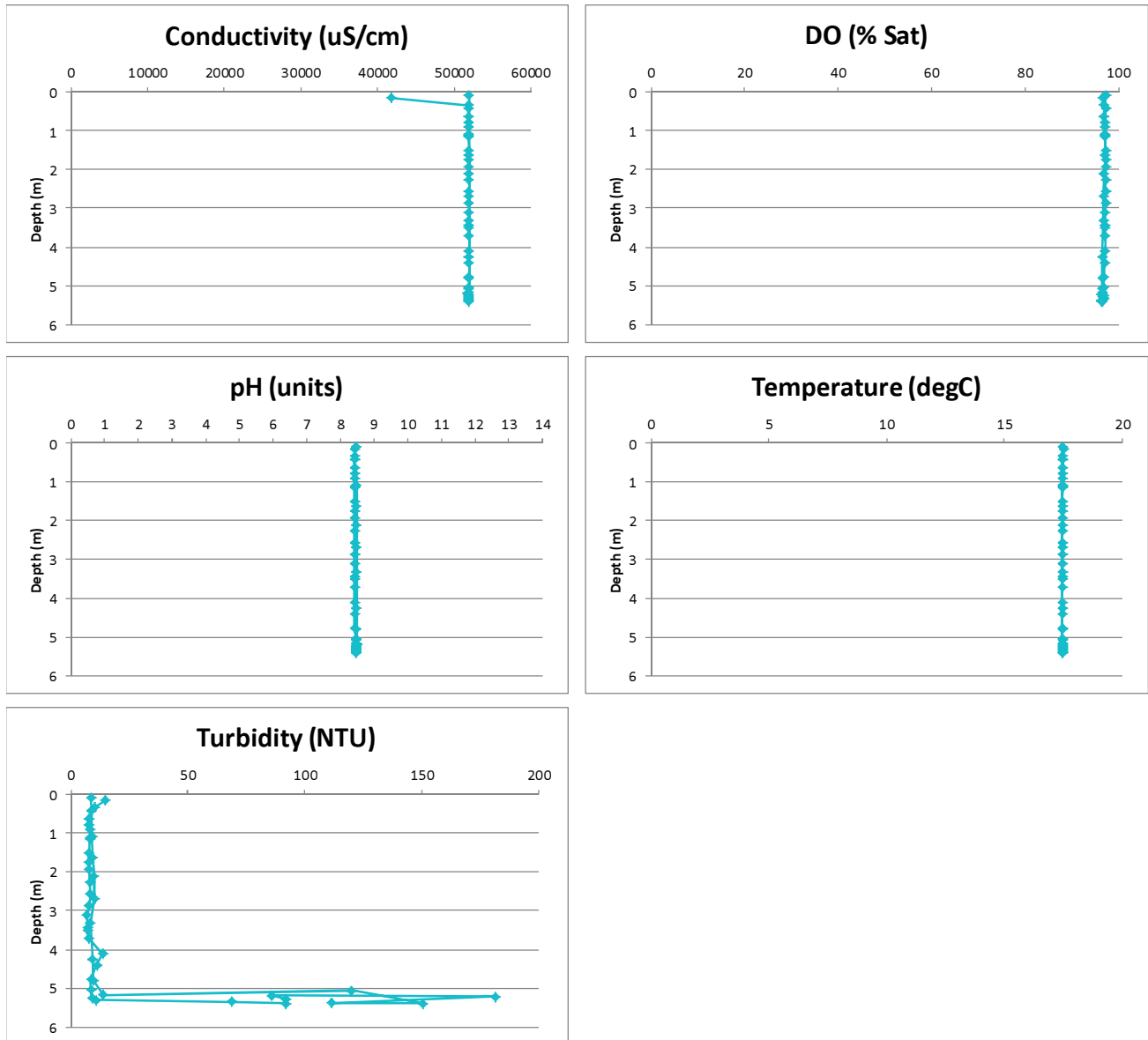


Figure A-3 Round 1 Site 6, Rising Tide 12 September 2012 16:00

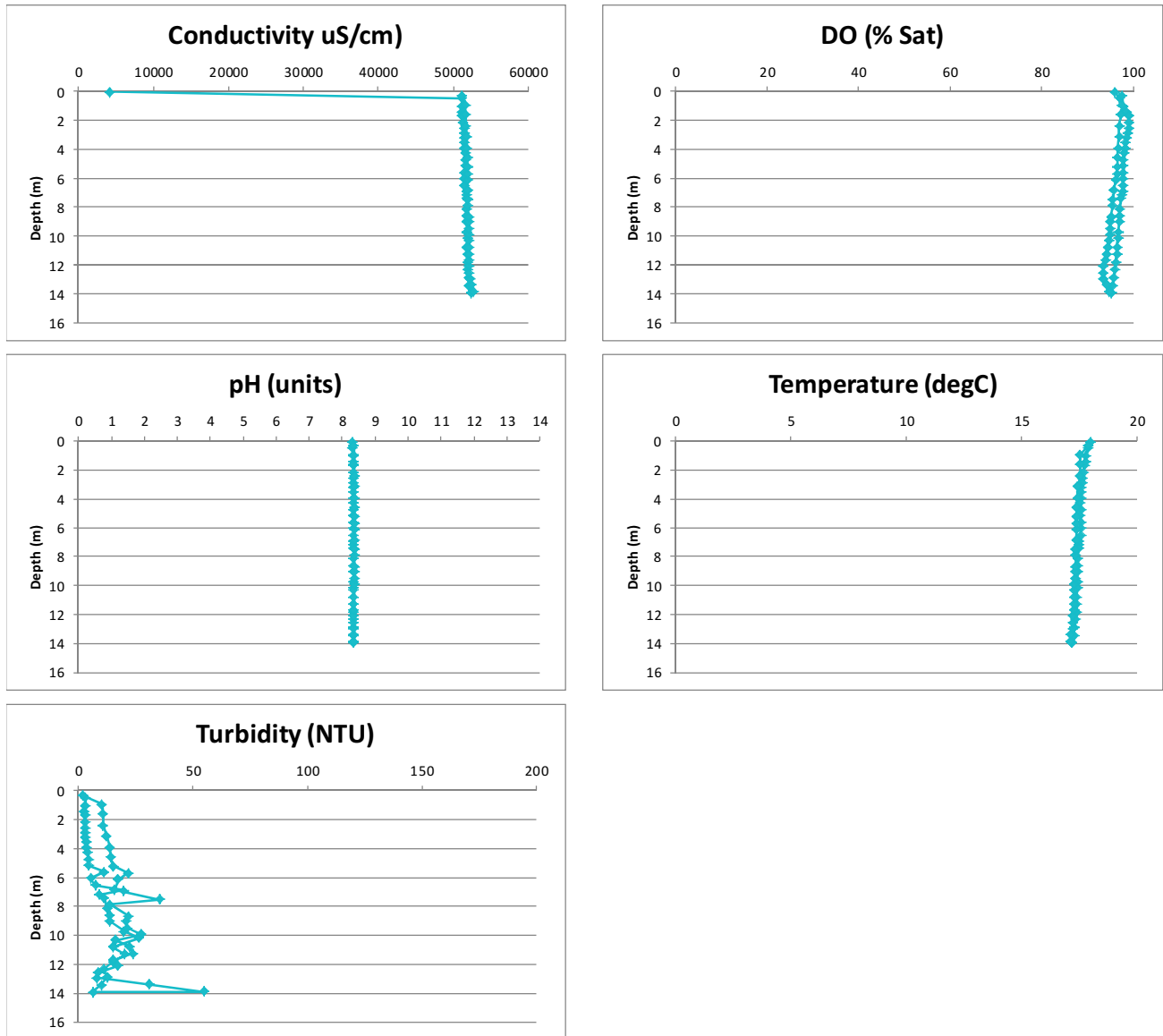


Figure A-4 Round 1 Site 3, Rising Tide 12 September 2012 14:30

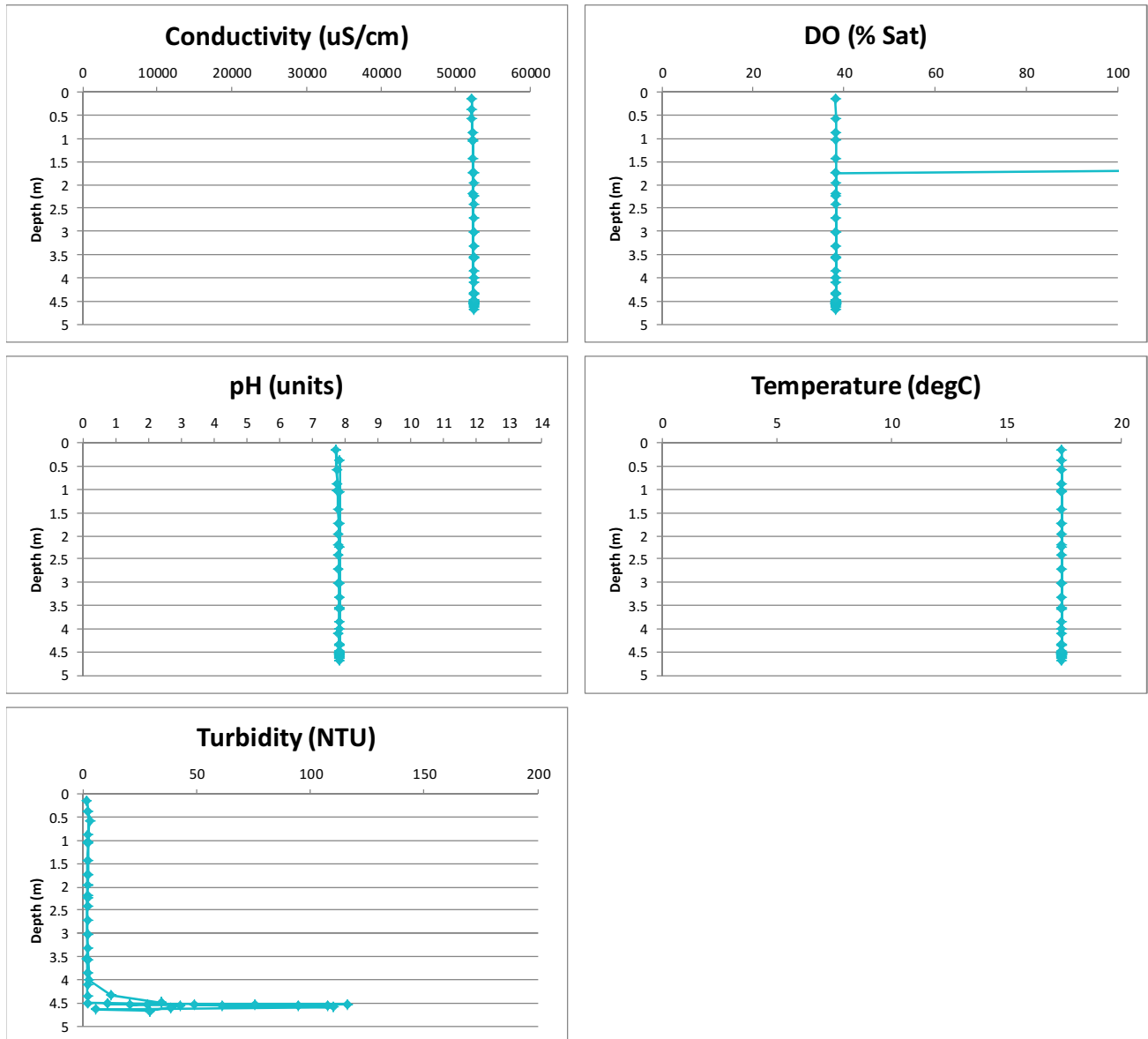


Figure A-5 Round 2 Site 6, Falling Tide 26 September 2012 07:30

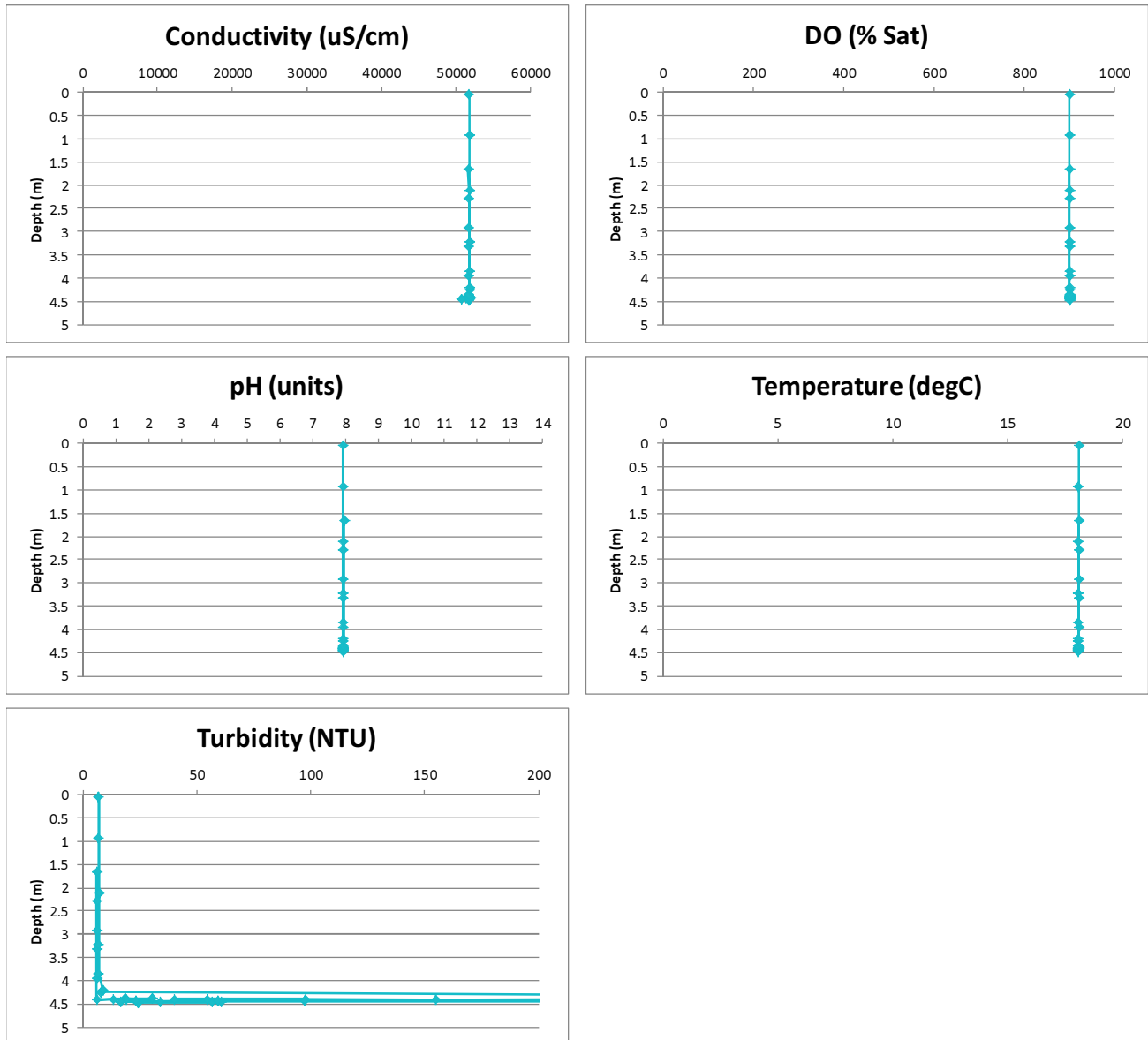


Figure A-6 Round 2 Site 6, Rising Tide 26 September 2012 14:30

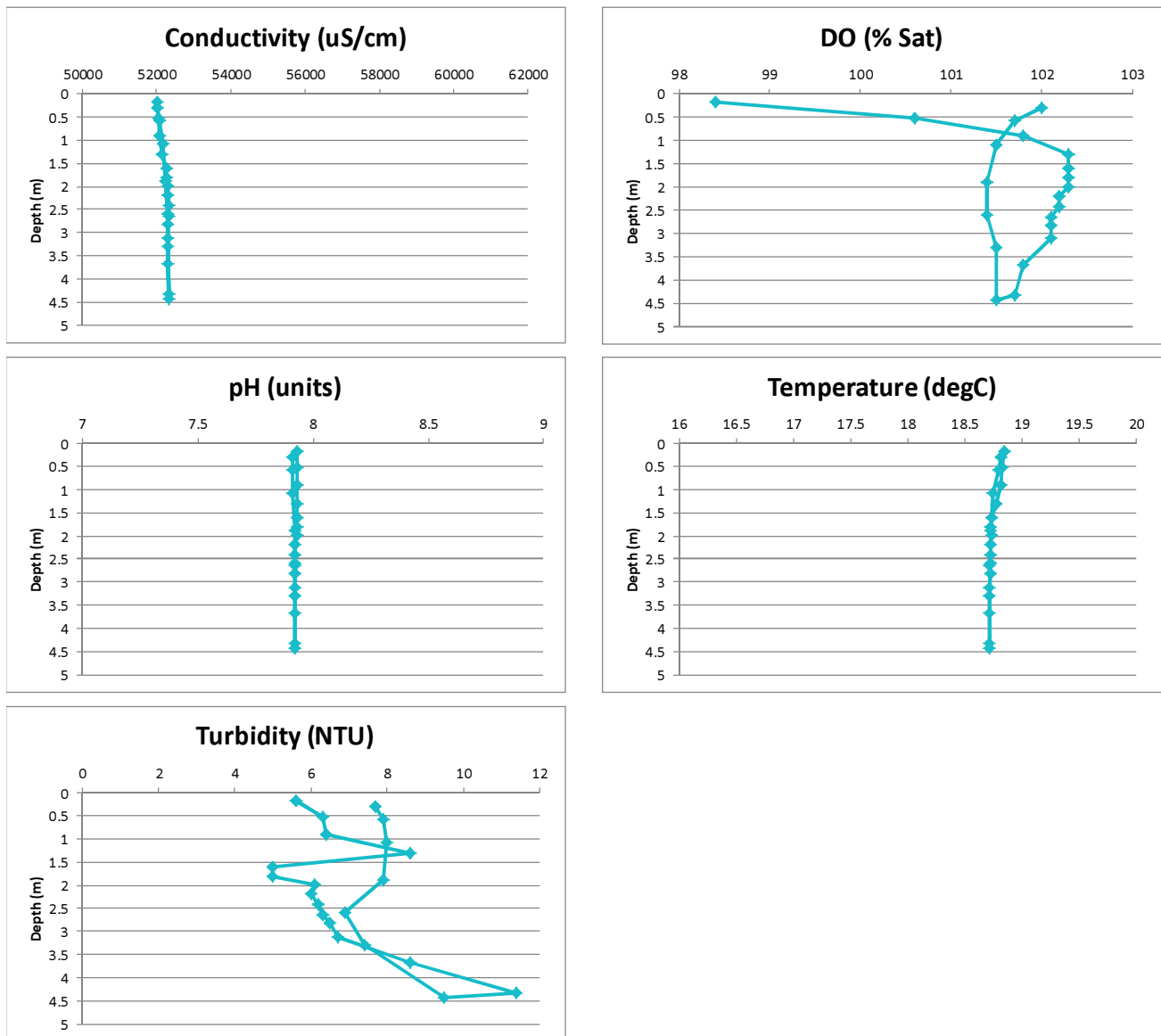


Figure A-7 Round 3 Site 6, Rising Tide 10 October 2012 14:30

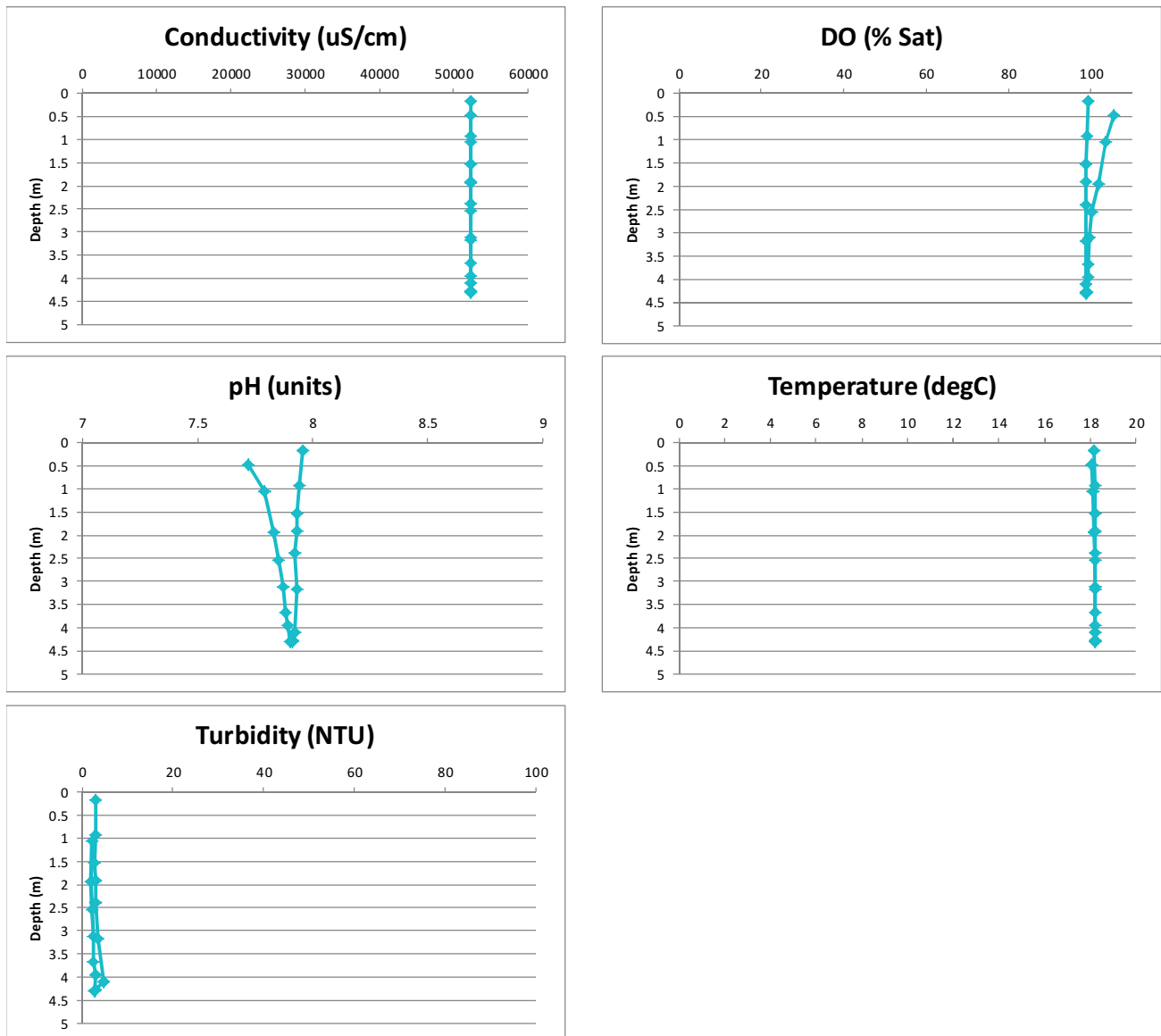


Figure A-8 Round 3 Site 6, Falling Tide 10 October 2012 08:00

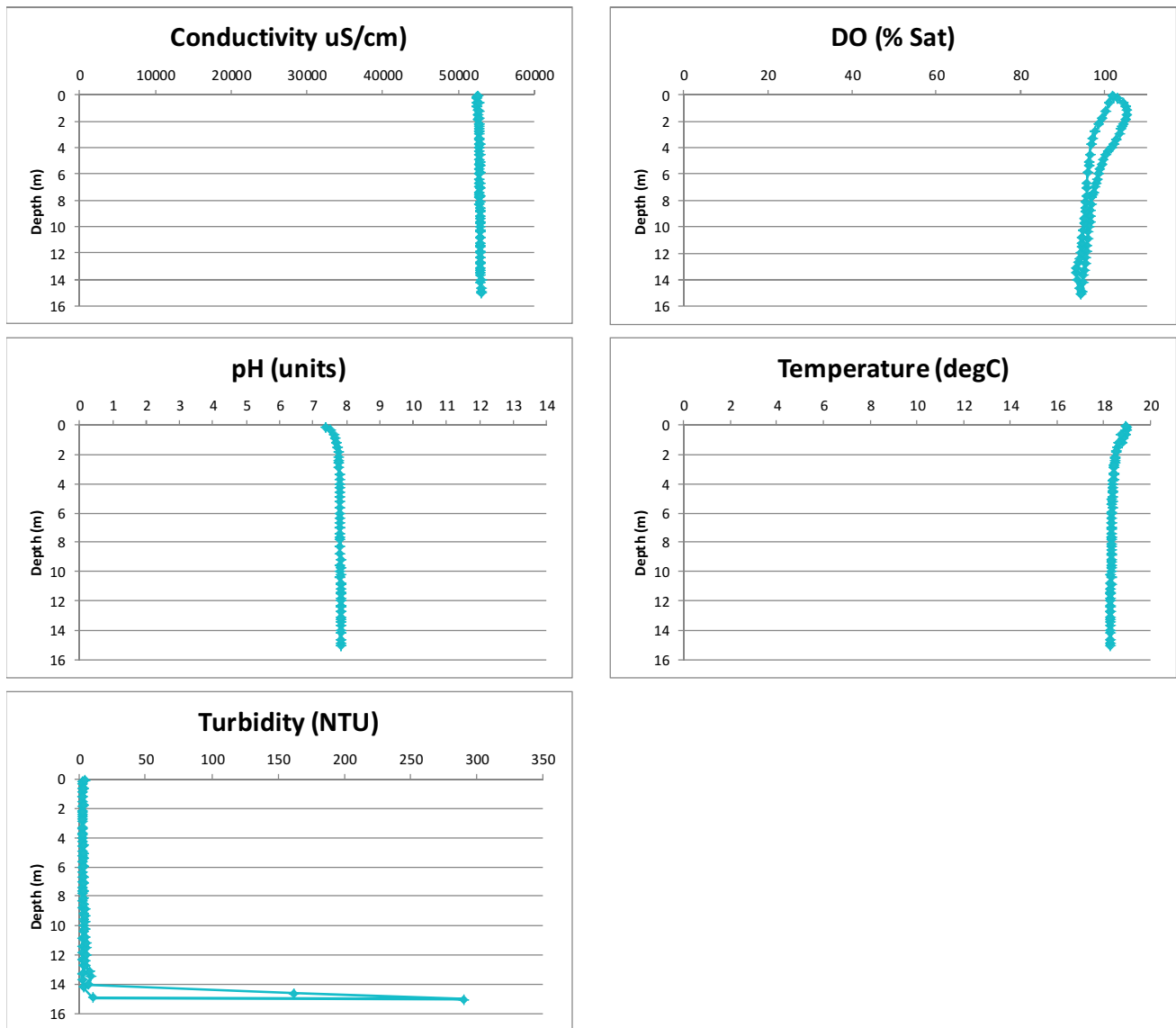


Figure A-9 Round 3 Site 3, Rising Tide 10 October 2012 13:00

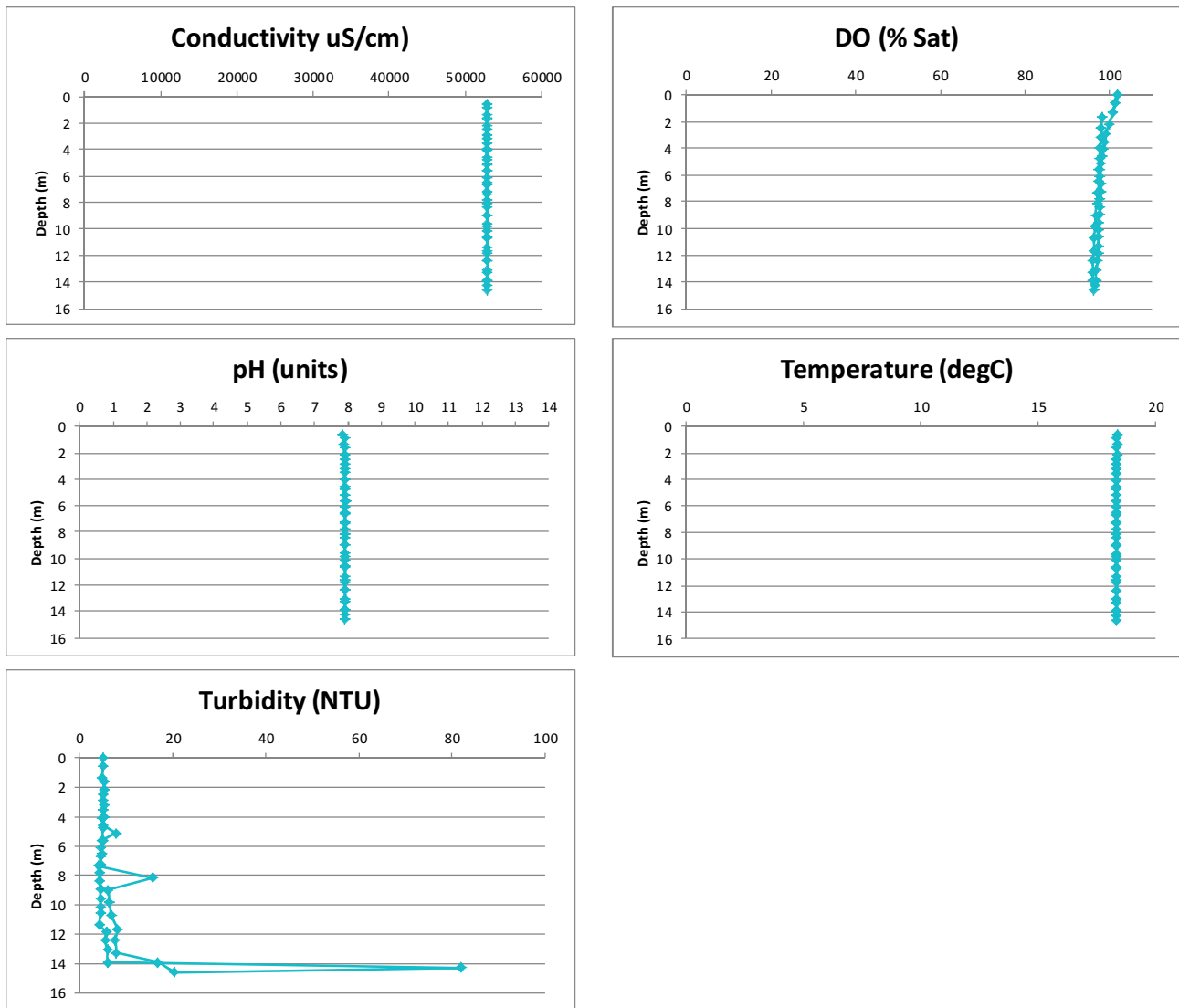


Figure A-10 Round 3 Site 3, Falling Tide 10 October 2012 09:30

APPENDIX B: 3D MODEL VALIDATION

Calibration of the two-dimensional Hunter Estuary hydrodynamic model is presented in BMT-WBM (2010b). A number of validation checks on the three-dimensional (3D) hydrodynamic TUFLOW-FV model have been made for the study including:

- The models ability to reproduce observed water levels at Hexham and Stockton Bridge for the period 1/10/1995 to 31/12/1995 and 14/1/2001 – 11/4/2001;
- The models ability to reproduce observed flows collected by ADCP on 9/10/1995;
- The models ability to reproduce a number of observed salinity profiles along the North Arm over the period 14/1/2001 – 28/3/2001.

An outline of the validation checks is presented below.

Water Level Validation

The ability of the 3D TUFLOW-FV model to reproduce observed water levels is presented in Figure B-1 (Stockton Bridge) and Figure B-2 (Hexham) for the 1st October to the 1st November, 1995. The figures show that the model is able to closely match observed water levels for both a spring and neap tide period.

A further check on water level validation is presented for the period 14/1/2001 – 11/4/2001 (the same period used in the salinity response validation described below). Comparisons of observed and modelled water levels at Stockton Bridge and Hexham are presented in Figure B-3 to B-8. A substantial freshwater event occurring between 7 March and 15 April can be seen in Figure B-6 (Hexham) and to a lesser extent in Figure B-5 (Stockton). The models over-prediction of water levels at Hexham is likely to be due to the omission of over-bank flood storage from the model mesh.

Flow (ADCP) Validation

The results of modelled and observed flows at gauging locations in South Arm and North Arm at Walsh Point are presented in Figure B-9 (South Arm) and Figure B-10 (North Arm) which compare ADCP data (collected by MHL) to flows predicted by both the 2D and 3D models. The modelled flows for the South Arm and North Arm at Walsh Point indicate that both the 2D and 3D TUFLOW-FV models are able to accurately represent the relative proportion of flow conveyed by these two channels. There is some temporal lag between the observed and modelled flows which may be attributed in part to adoption of tides being measured at Port Stephens (i.e. in the absence of other local data during the validation period).

Overall, the flow validation indicates the model adequately predicts the magnitude and volume of flow through various sections of the Hunter River Estuary. These results offer confidence in predictions of water level and flow in the context of an estuary wide hydrodynamic model applied for the purpose of assessing pollutant transport in the Hunter Estuary.

Vertical Salinity Response Validation

Vertical profiles of salinity, temperature, turbidity and dissolved oxygen were measured along the channel of the Hunter River estuary on 23 separate days in early 2001 (Sanderson et al, 2002). These data provide a valuable set of observed salinity conditions and other water quality variables before and after a substantial freshwater event occurring between 7 March and 15 April (refer Figure B-6).

The results of the 3D TUFLOW-FV validation are presented in Figures B-11 to B-22 as a series of comparisons between model predictions (bottom plot) and the vertical profile data presented by Sanderson et al, (2002) (top plot). The salinity scale adopted and labelling of key station positions recorded by Sanderson et al, (2002) have been included to enable direct comparison between observed and modelled datasets.

The validation results show good agreement between observed and modelled salinity profiles. The location of the salt wedge and periods of stratification are captured well by the 3D TUFLOW-FV model. The results are considered to validate the performance of the 3D TUFLOW-FV model in predicting a measured event that includes stratification and periods of low and high flow conditions.

Discussion of 3D TUFLOW-FV Model Validation

A good model validation to observed water levels, channel discharge and salinity response indicates that the model can be used to simulate hydrodynamic and pollutant transport processes in the Hunter Estuary.

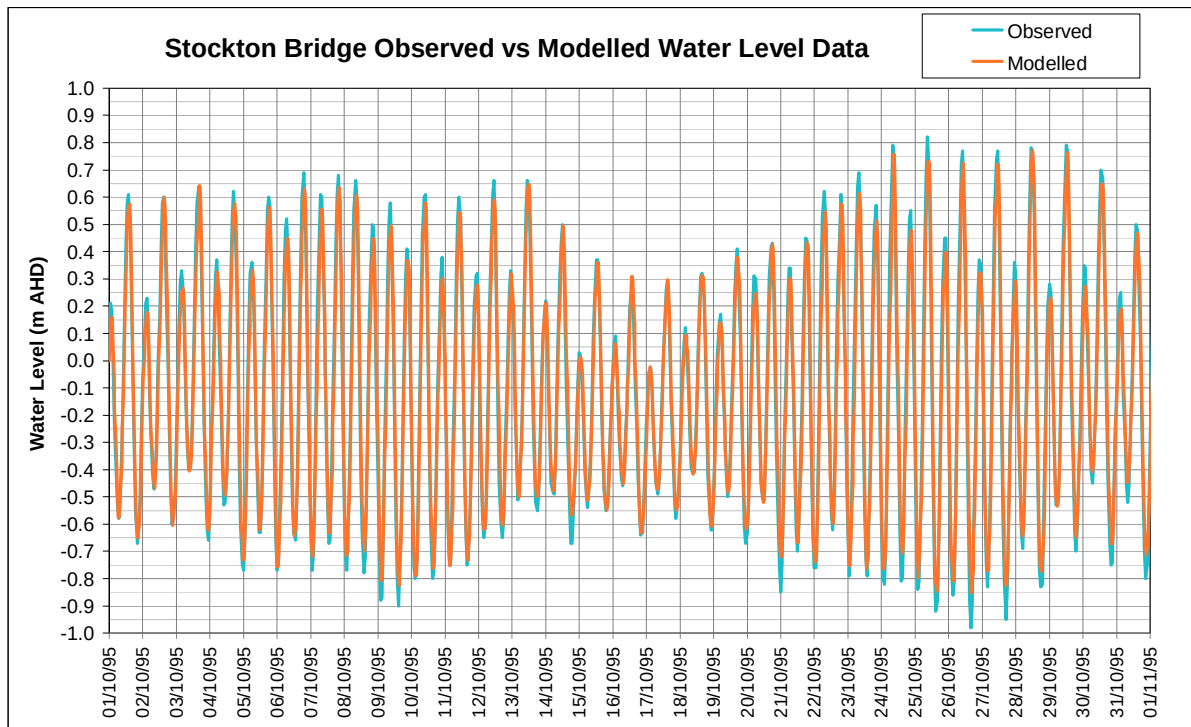


Figure B-1 Observed vs Modelled Water Levels, Stockton Bridge, October 1995

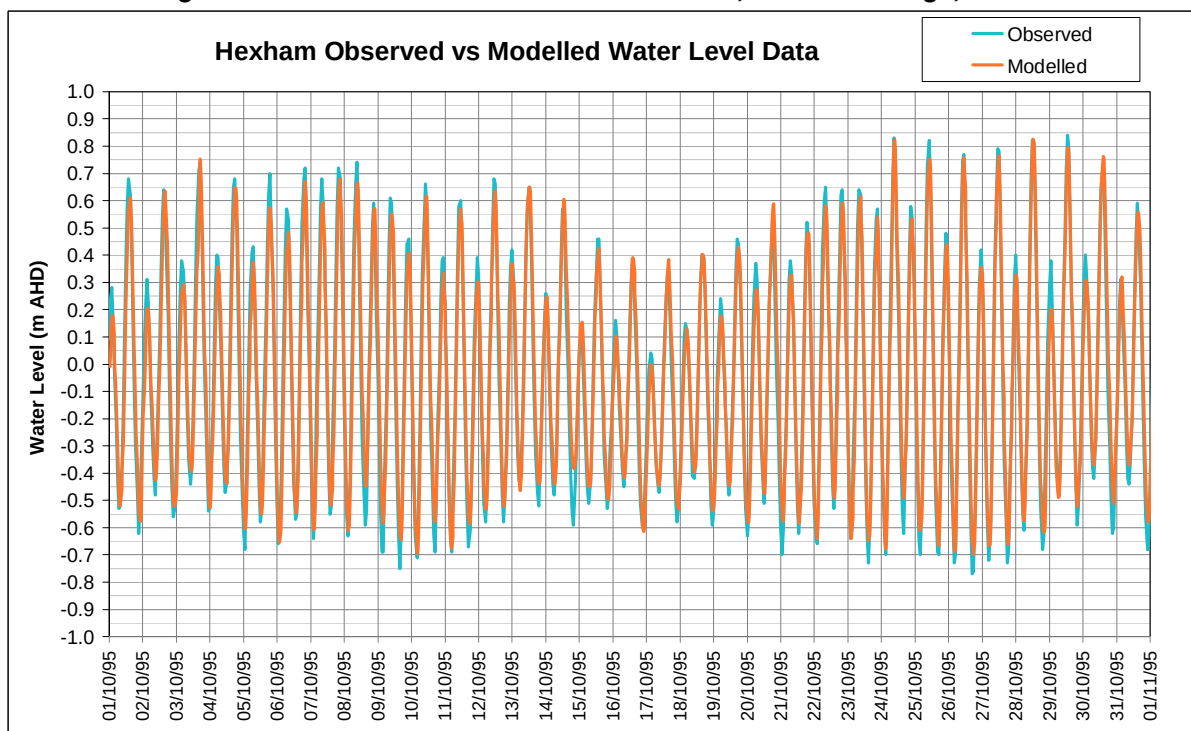


Figure B-2 Observed vs Modelled Water Levels, Hexham, October 1995

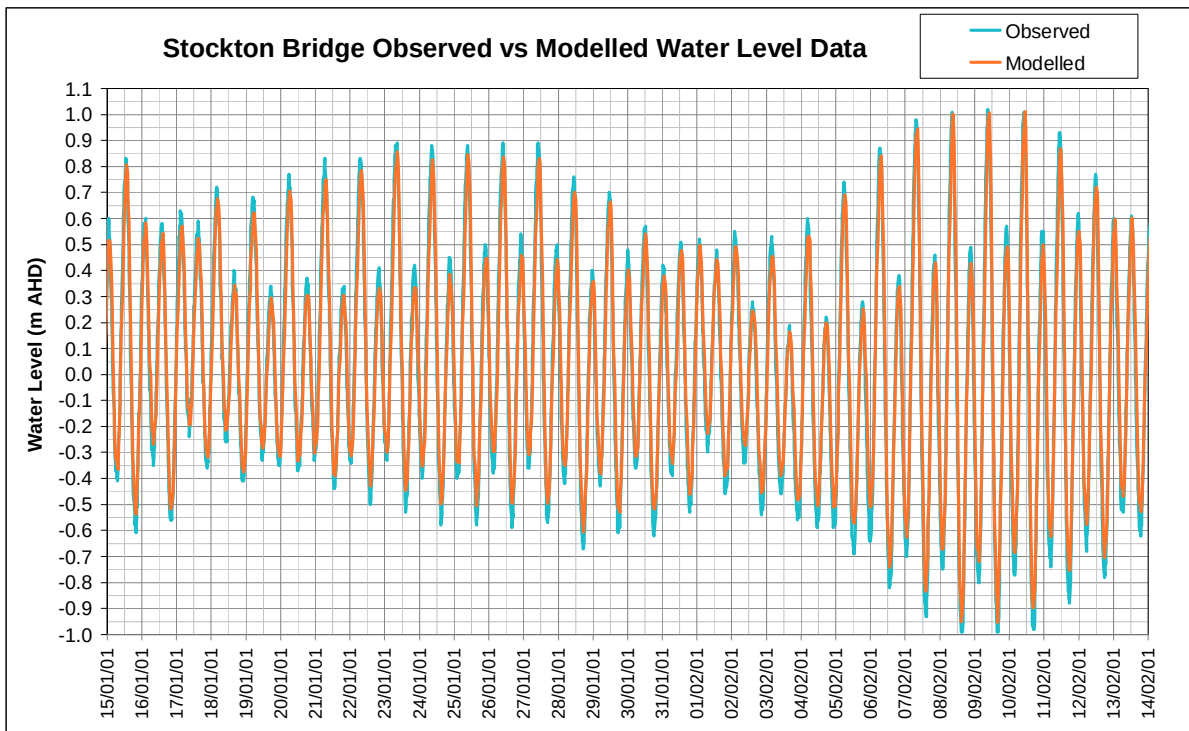


Figure B-3 Observed vs Modelled Water Levels, Stockton Bridge, January 2001

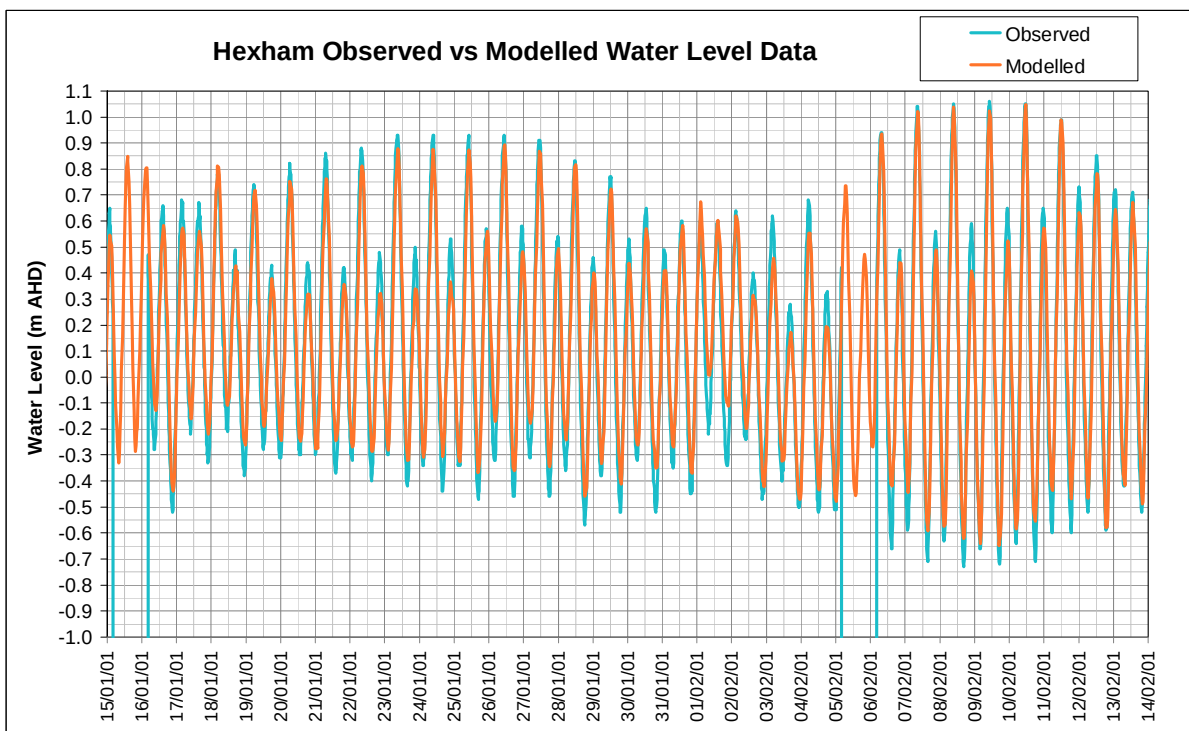


Figure B-4 Observed vs Modelled Water Levels, Hexham, January 2001

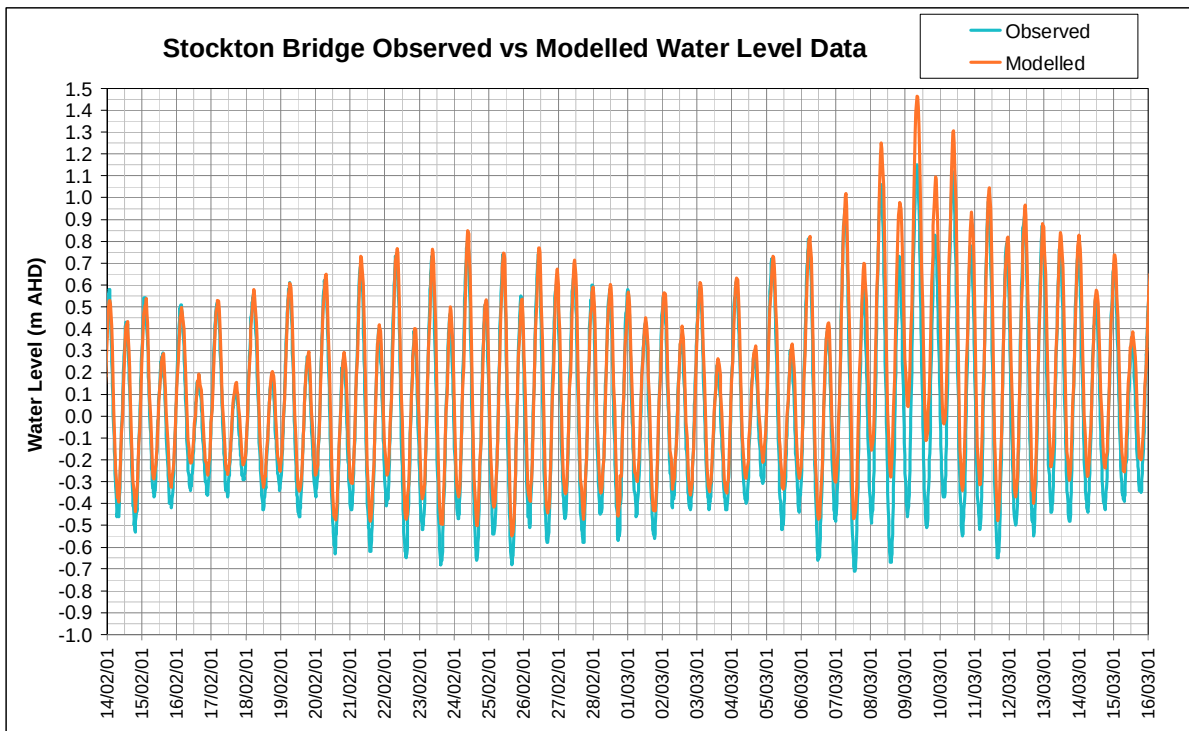


Figure B-5 Observed vs Modelled Water Levels, Stockton Bridge, February 2001

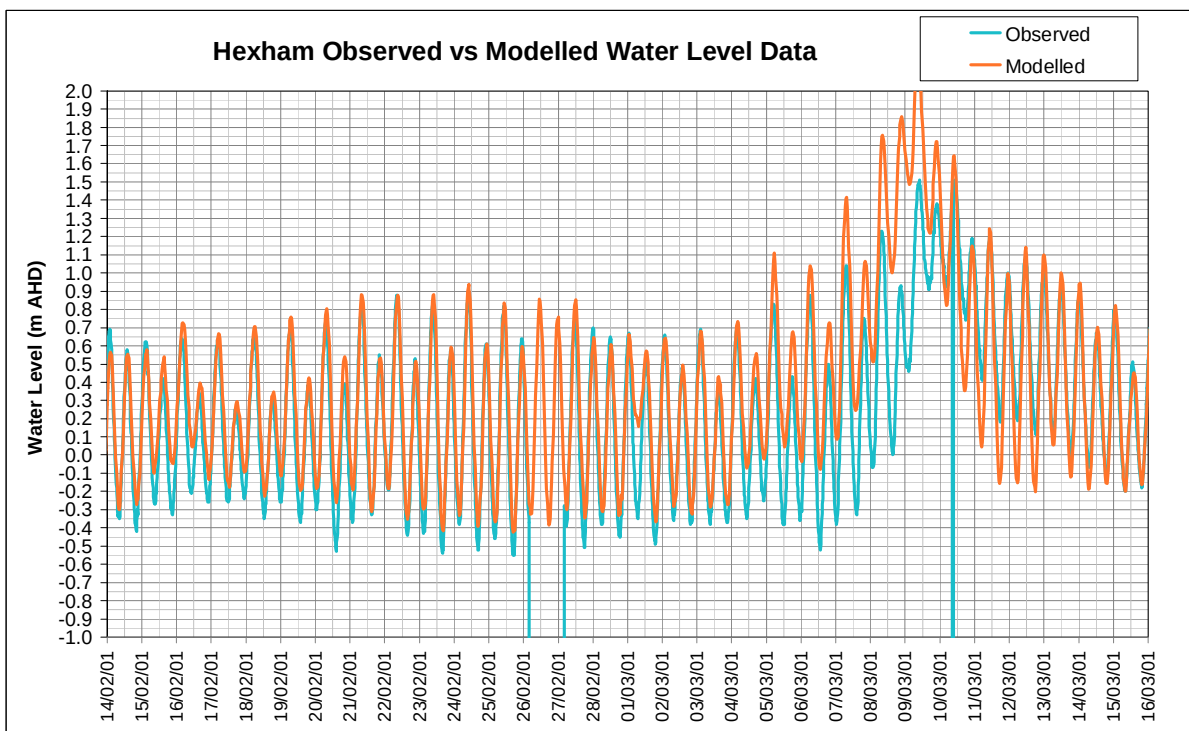


Figure B-6 Observed vs Modelled Water Levels, Hexham, February 2001

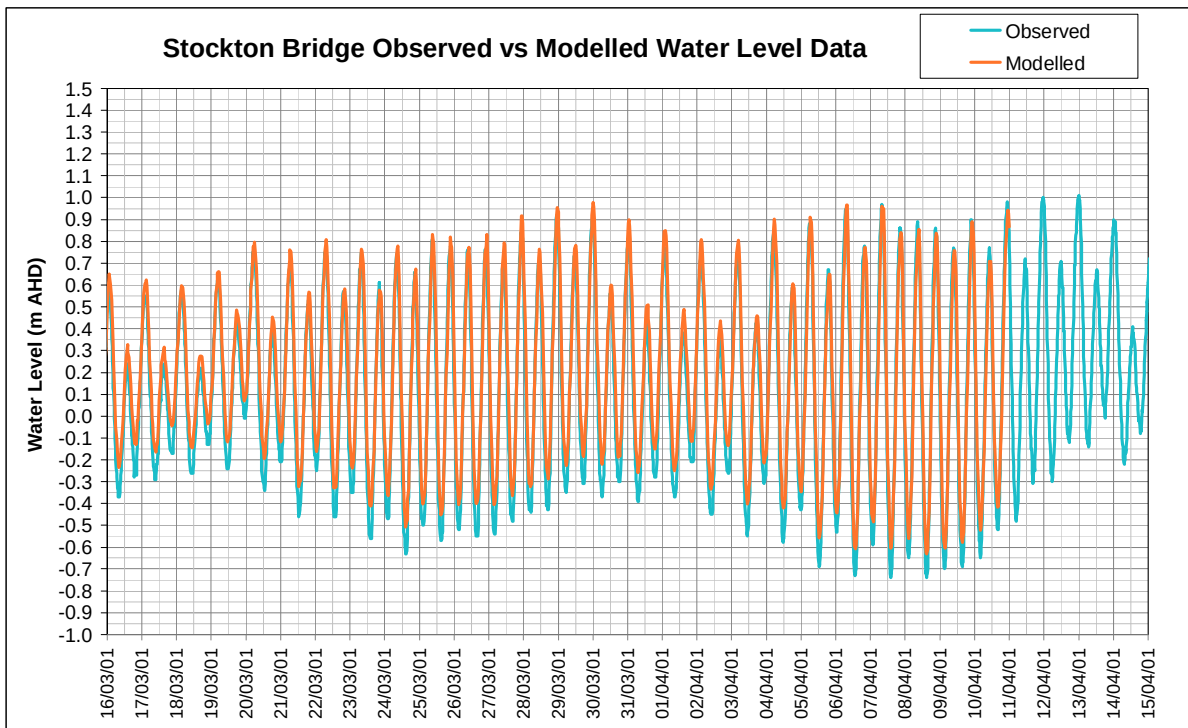


Figure B-7 Observed vs Modelled Water Levels, Stockton Bridge, March 2001

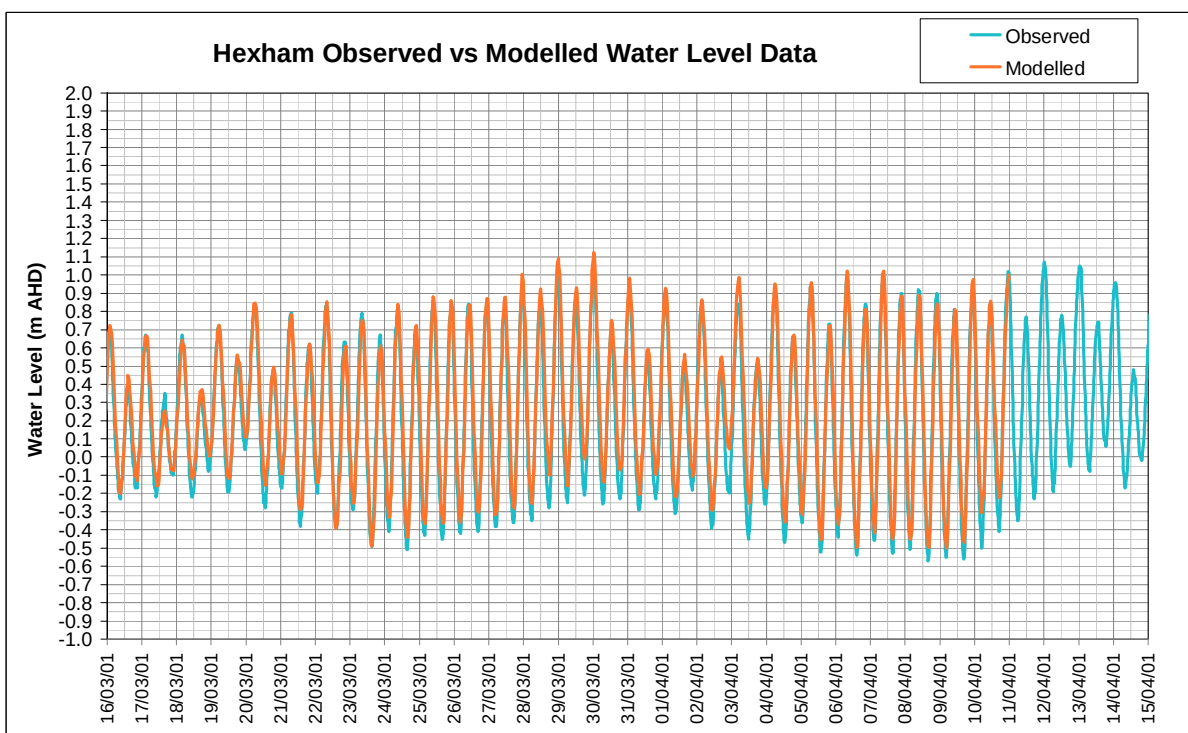


Figure B-8 Observed vs Modelled Water Levels, Hexham, March 2001

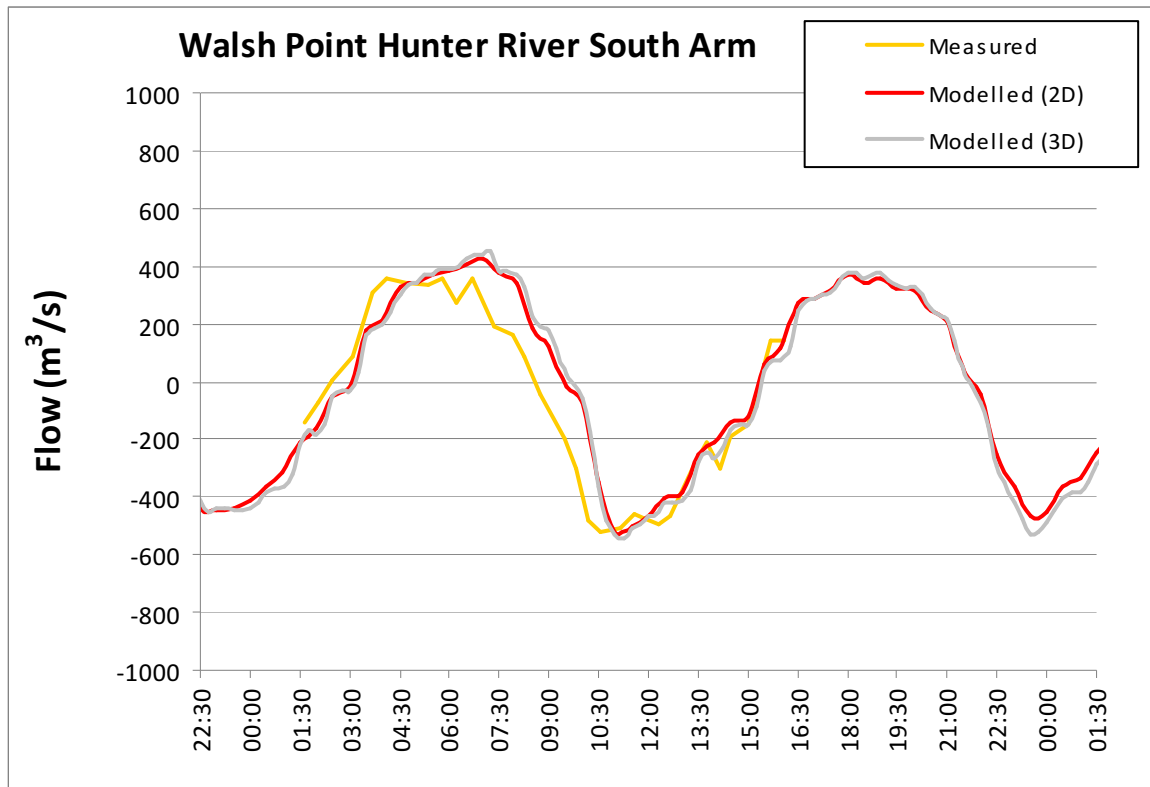


Figure B-9 Observed vs Modelled Flow, South Arm, 9th October 1995

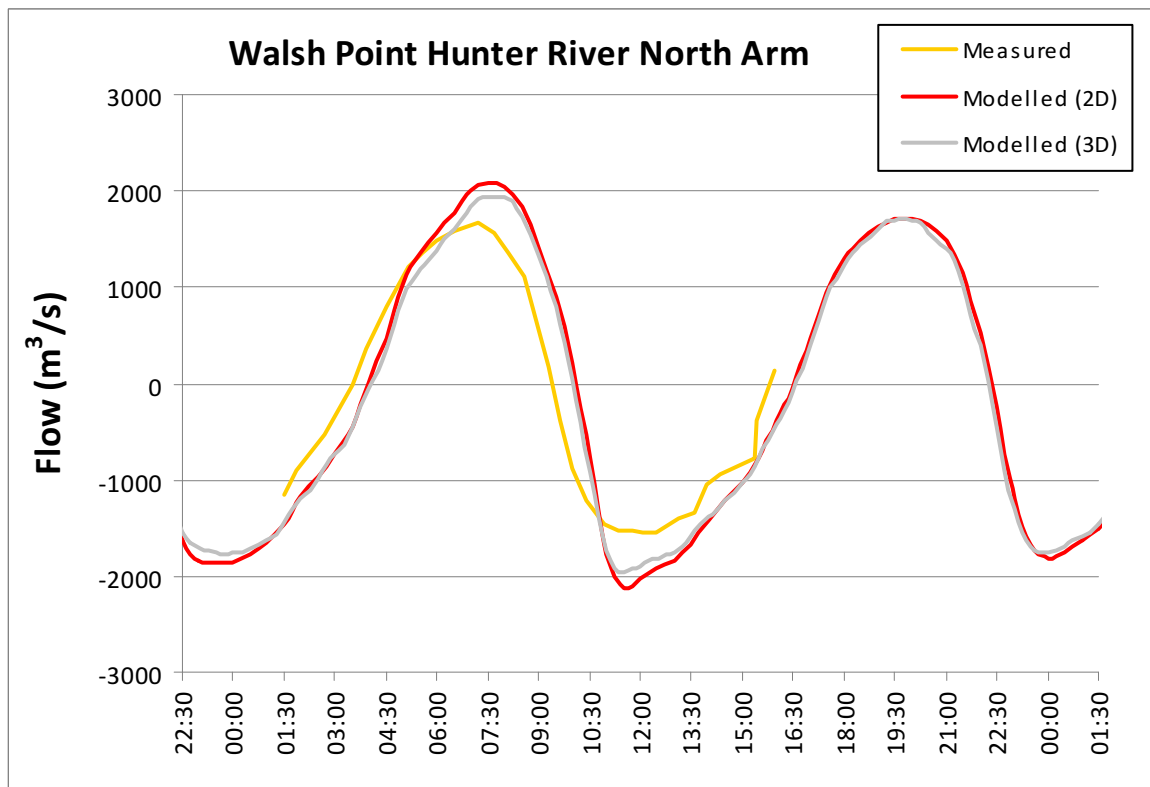


Figure B-10 Observed vs Modelled Flow, North Arm, 9th October 1995

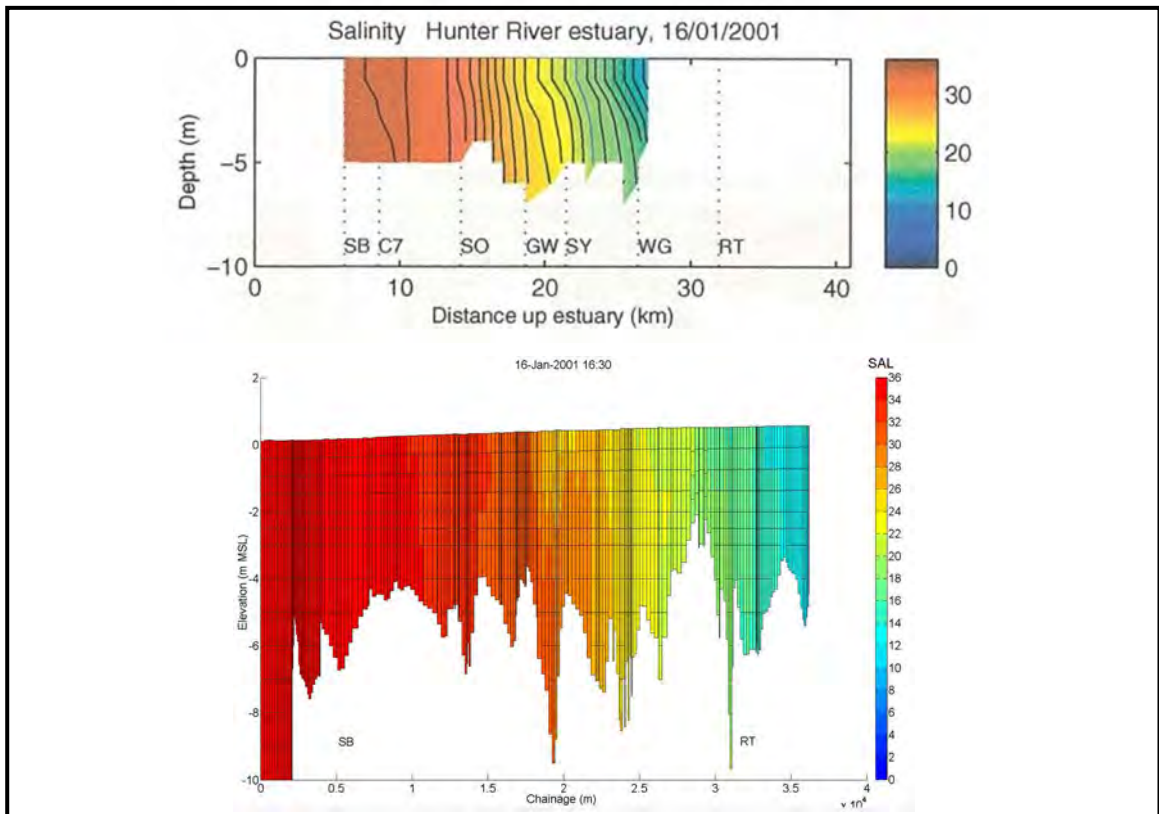


Figure B-11 Vertical Salinity Profile (16 January 2001)

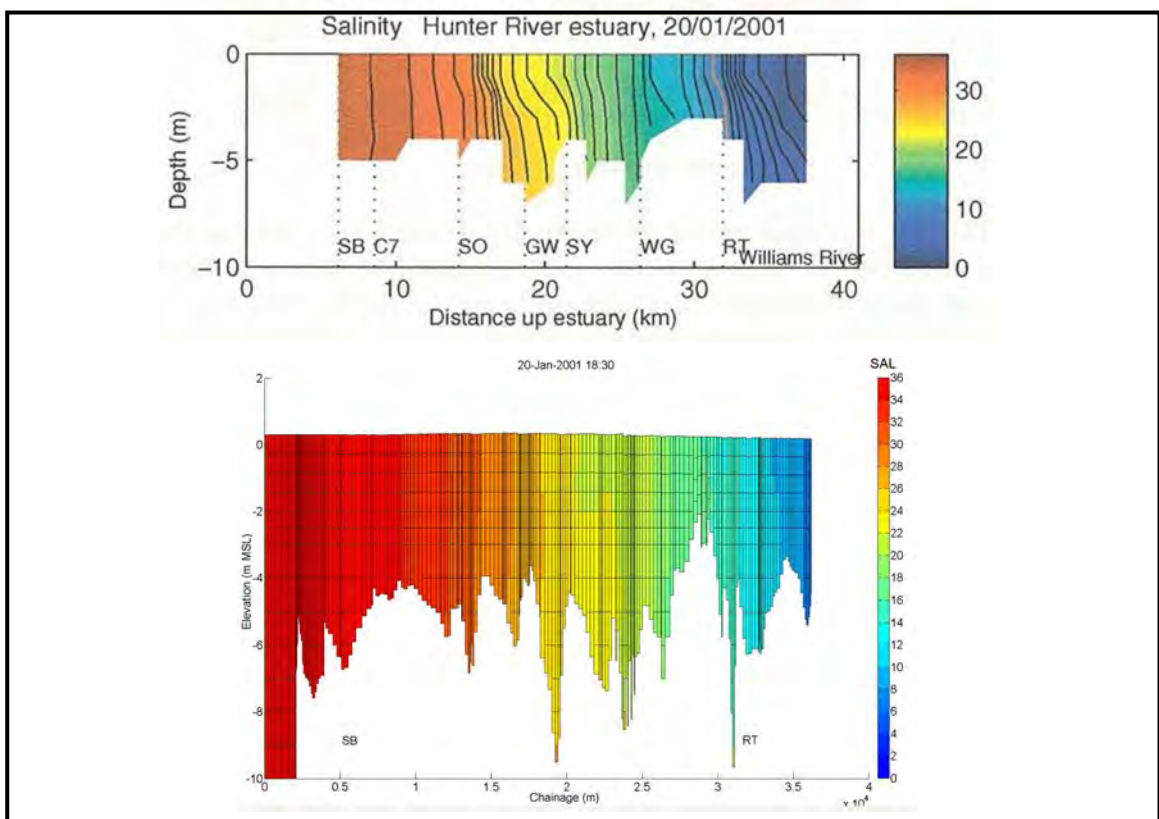


Figure B-12 Vertical Salinity Profile (20 January 2001)

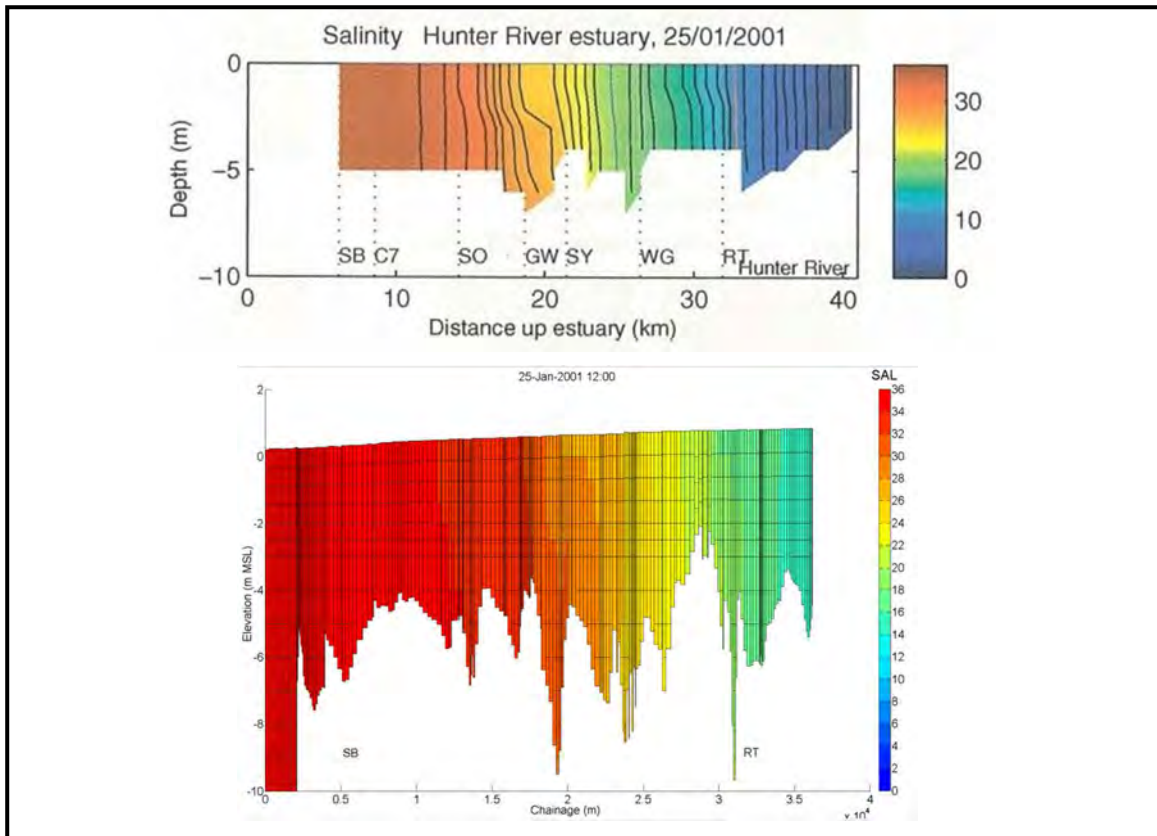


Figure B-13 Vertical Salinity Profile (25 January 2001)

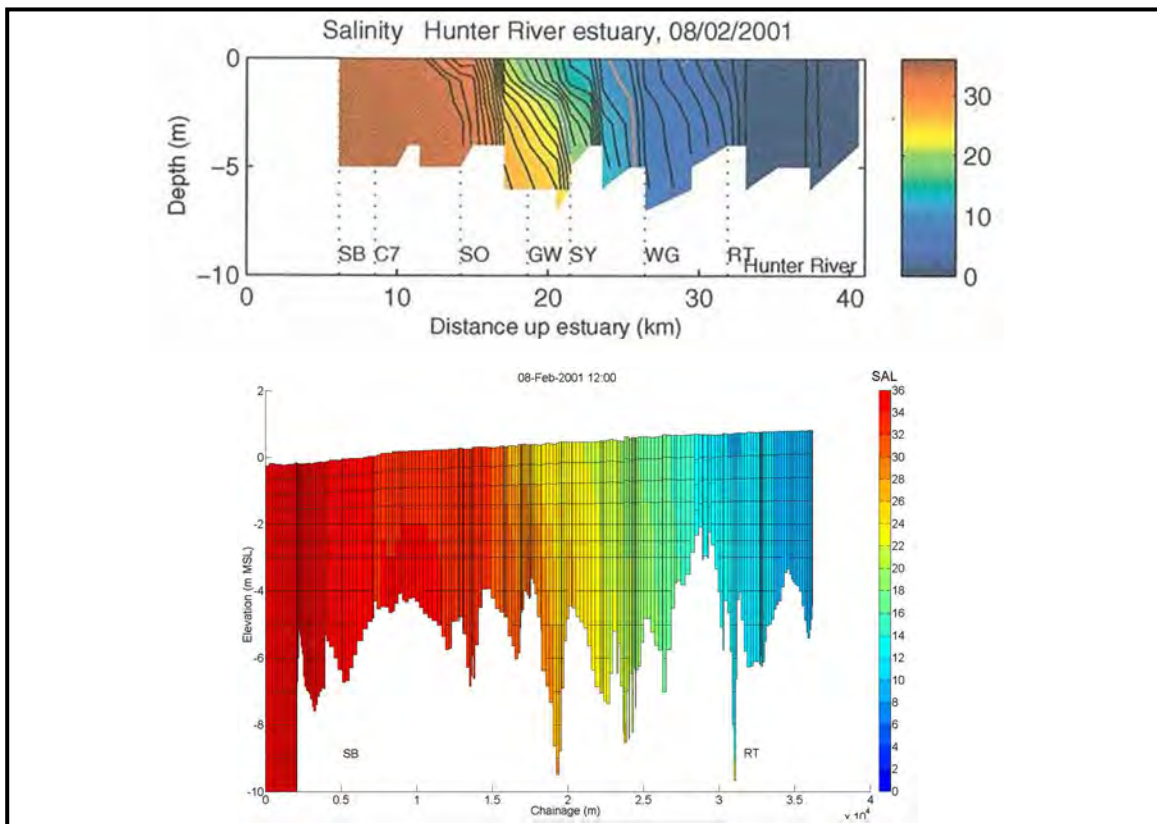


Figure B-14 Vertical Salinity Profile (8 February 2001)

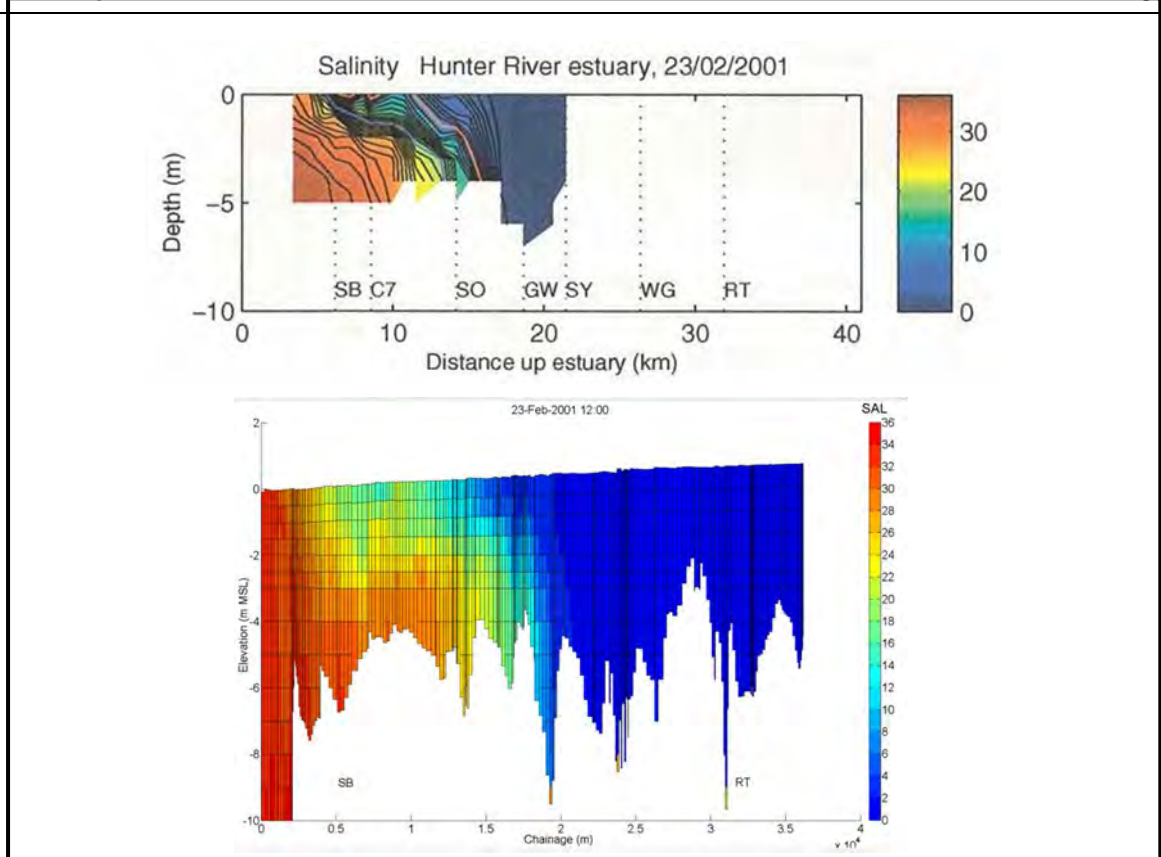


Figure B-15 Vertical Salinity Profile (23 February 2001)

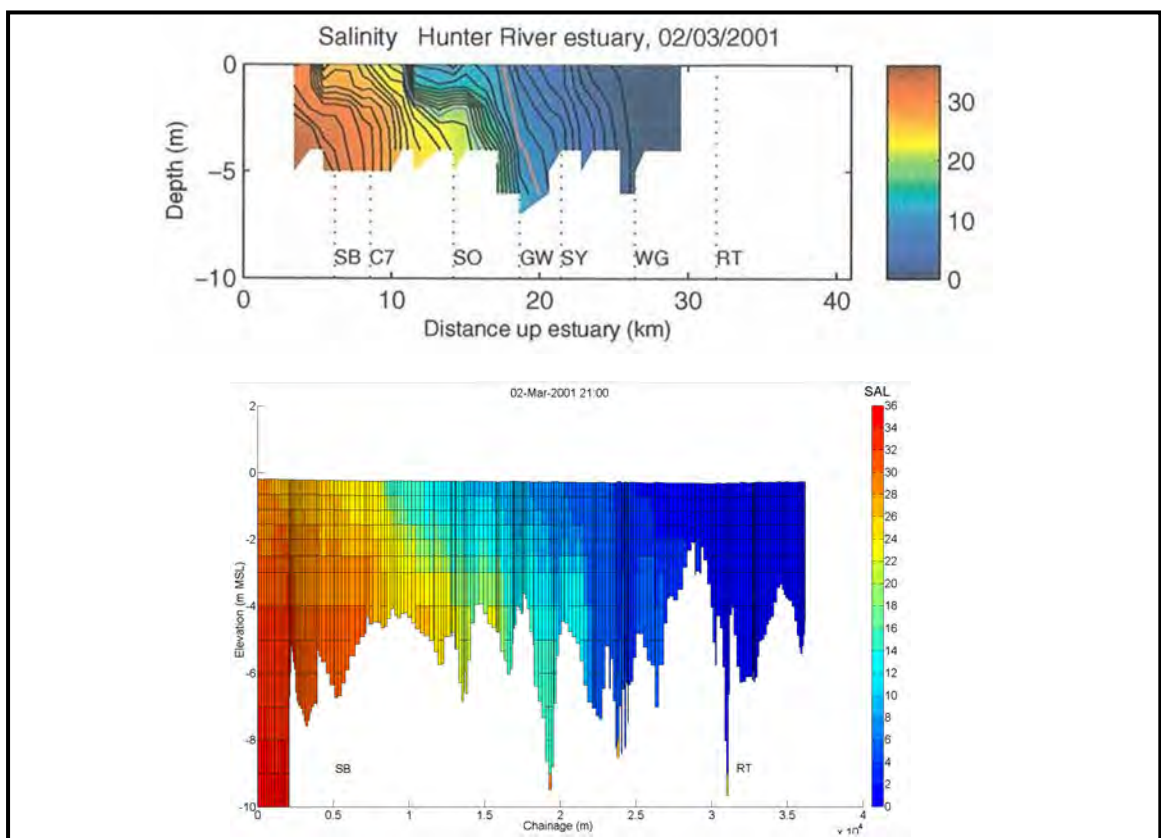


Figure B-16 Vertical Salinity Profile (2 March 2001)

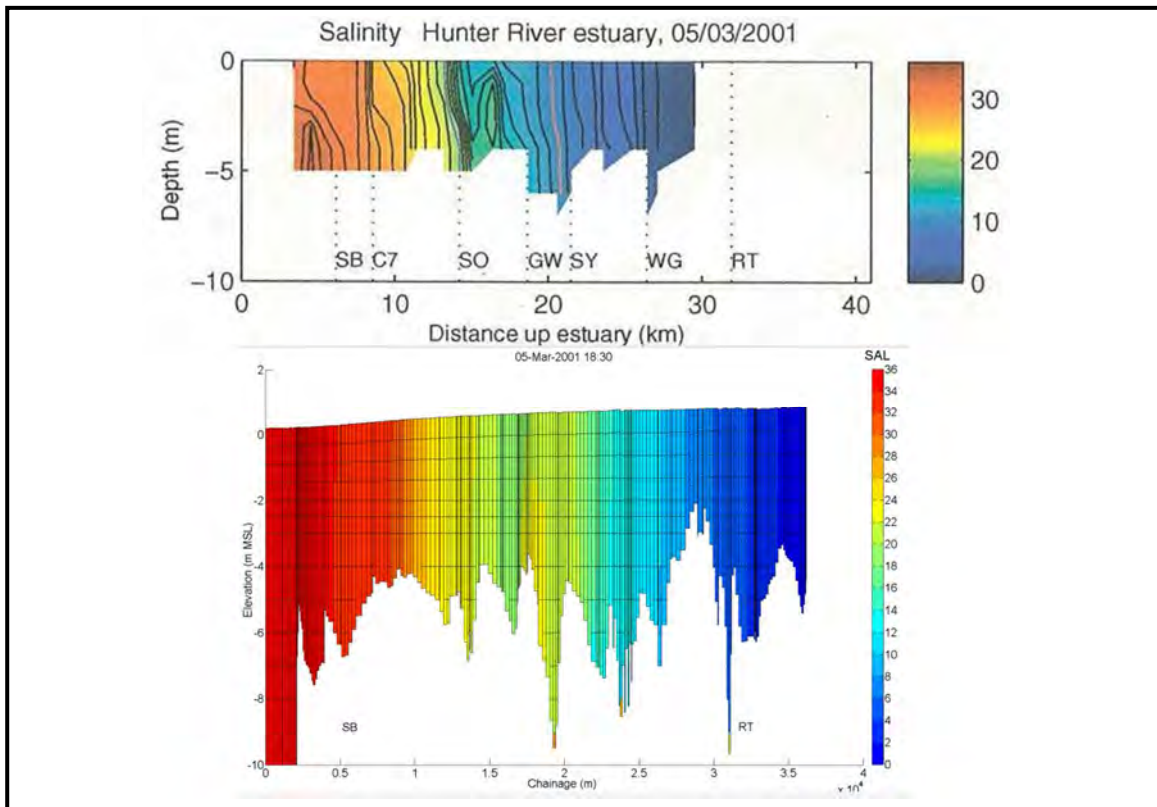


Figure B-17 Vertical Salinity Profile (5 March 2001)

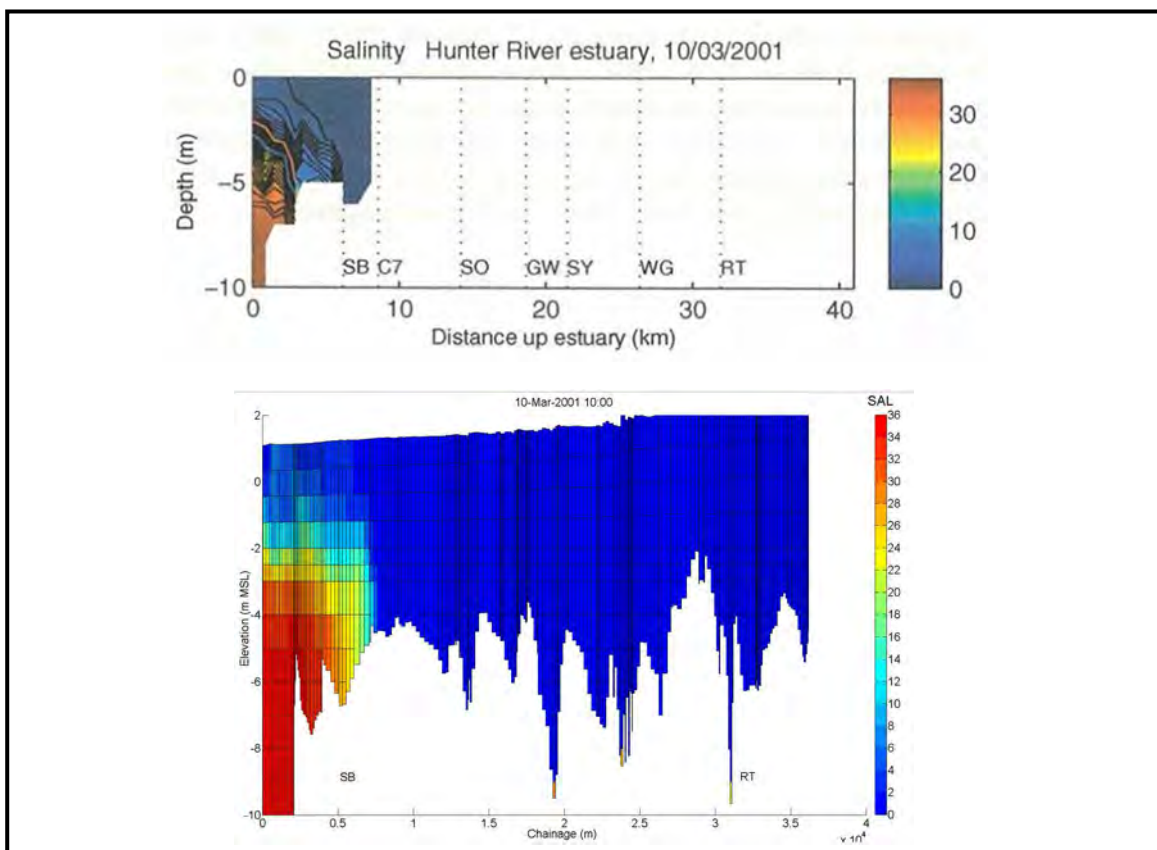


Figure B-18 Vertical Salinity Profile (10 March 2001)

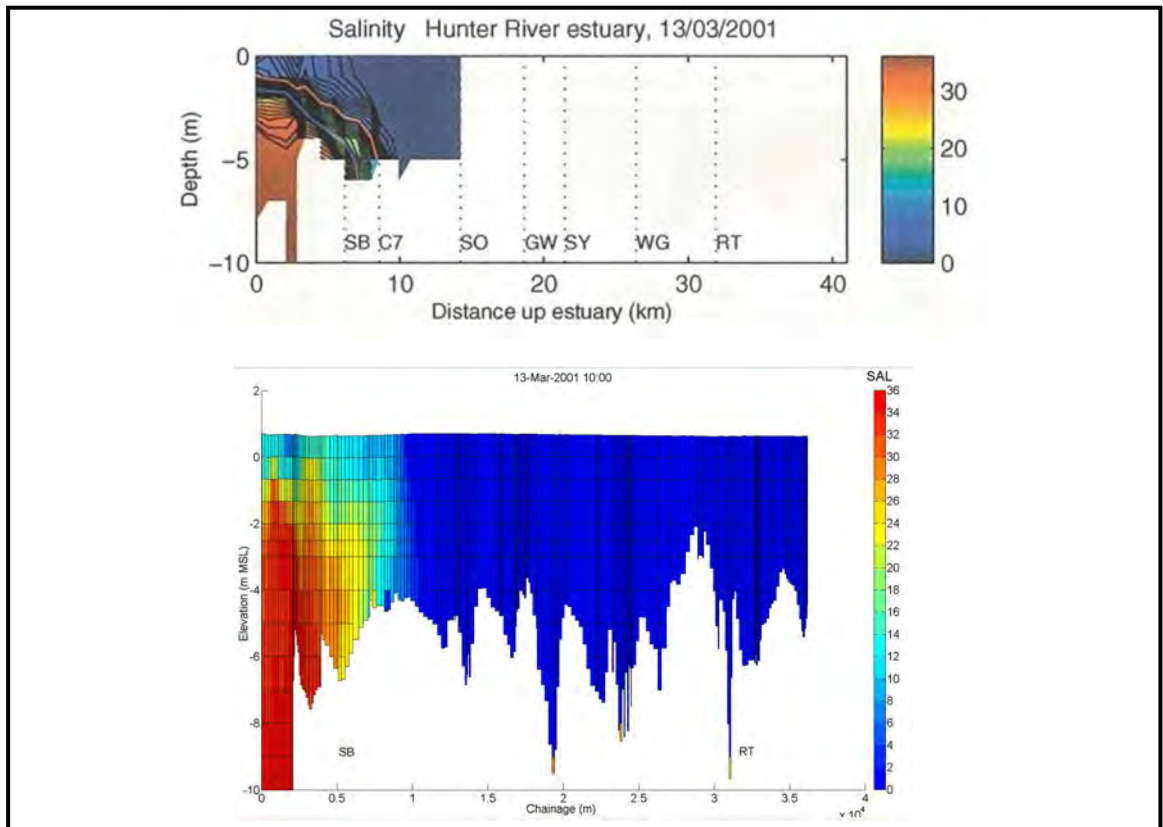


Figure B-19 Vertical Salinity Profile (13 March 2001)

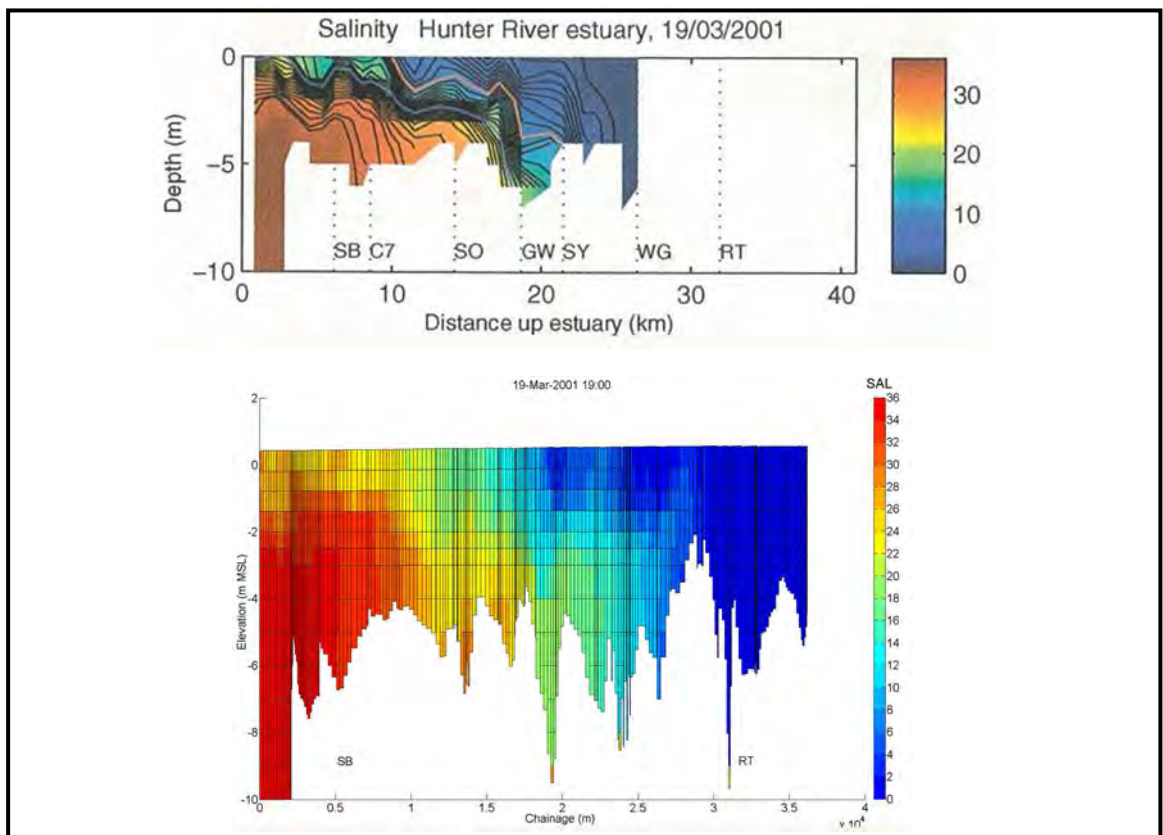


Figure B-20 Vertical Salinity Profile (19 March 2001)

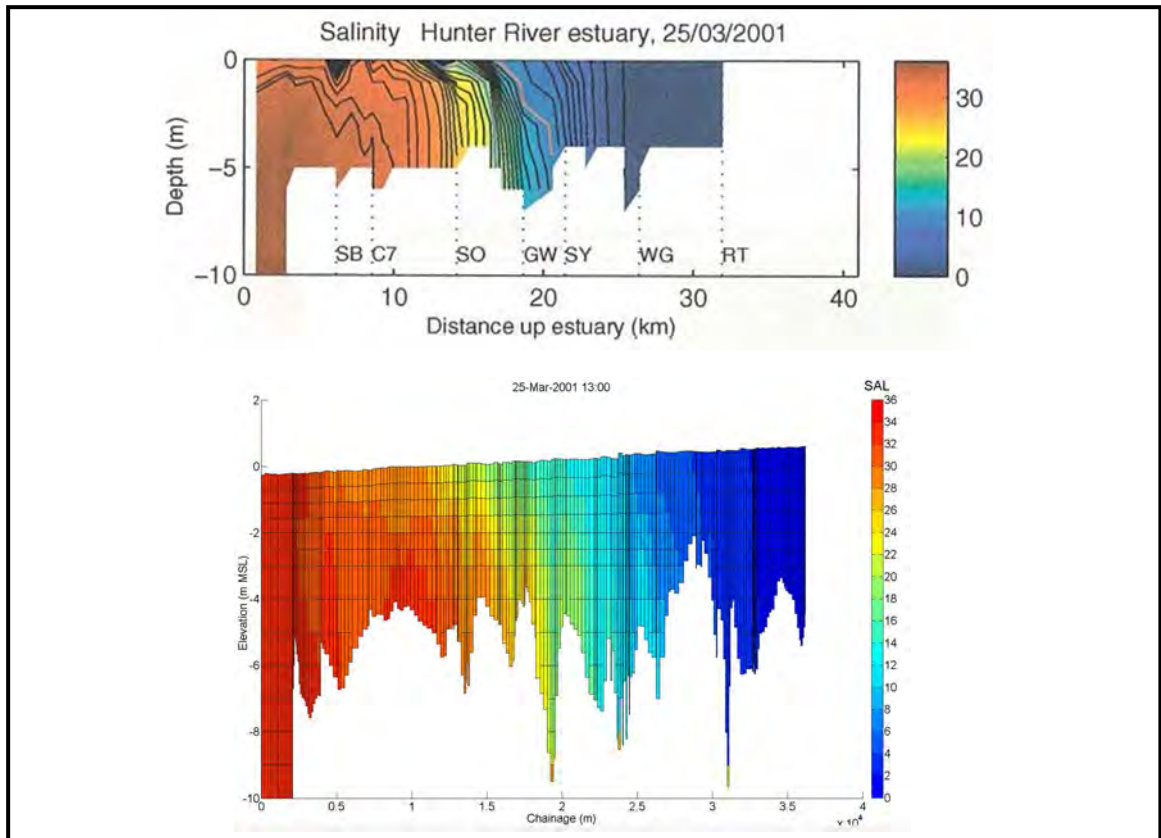


Figure B-21 Vertical Salinity Profile (25 March 2001)

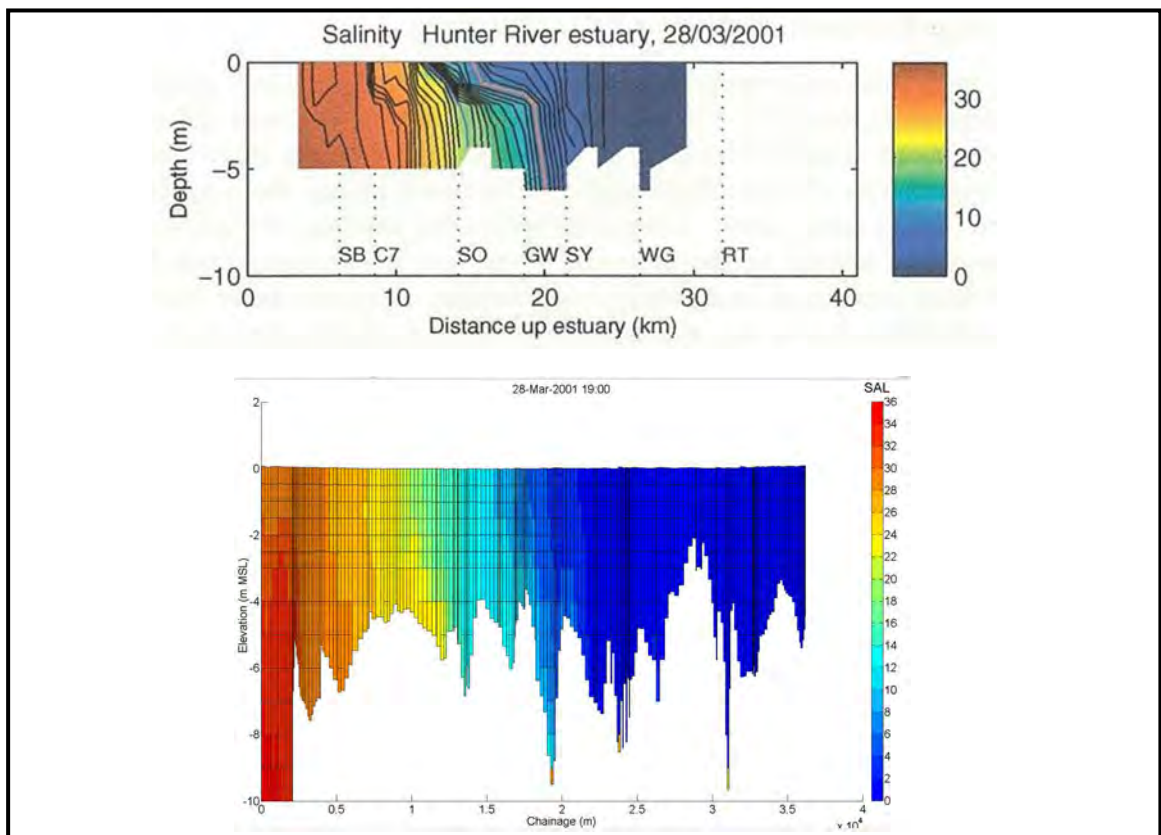


Figure B-22 Vertical Salinity Profile (28 March 2001)



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