Appendix A – Summary of Consistency Assessment

Appendix A – Summary of Consistency Assessment

A.1 Consistency with the Concept Approval

The following sections assess consistency with the Concept Approval. The Concept Approval includes a number of conditions that relate to administrative conditions, compliance tracking, community information consultation and involvement, complaints management and environmental management. The following sections only address those conditions relevant to the proposed change in the context of the approved project.

A.1.1 Schedule 1

As stated in Schedule 1 of the Concept Approval, on 16 November 2006, the Minister for Planning approved the concept of:

'Construction and operation of a desalination plant on the Kurnell Peninsula and associated infrastructure for the supply of an annual daily average production of up to 500 megalitres of drinking water per day, including:

a) Intake and outlet pipelines to draw raw seawater into the plant and return seawater concentrate to the ocean (including tunnelling under Botany Bay National Park);

b) Pipelines and/ or tunnels from the plant across Botany Bay to the Sydney Water Corporation water supply system for the distribution of drinking water;

c) Connection of the plant to the electricity grid; and

d) *Temporary laydown areas for construction use.*

The change is consistent with the concept defined by the Concept Approval (Schedule 1) in that the delivery system will be able to supply up to an annual daily average of 500 ML of desalinated water per day. It is consistent with item (b) above as it involves a pipeline from the plant across Botany Bay to Sydney Water's water supply system.

Items a) and c) above do not relate to the delivery system and so are not relevant to this consistency assessment.

A.1.2 Schedule 2 – Condition 1.1

Condition 1.1 requires that:

The Proponent shall carry out the concept plan and all related projects generally in accordance with the:

a) Major Project Application 05_0082;

b) Environmental Assessment of the Concept Plan for Sydney's Desalination Project, dated November 2005, and prepared by Sydney Water Corporation;

c) *Sydney's Desalination Project, Preferred Project Report, dated August 2006, and prepared by Sydney Water Corporation; and*

d) *The conditions of this approval.*

The following sections discuss whether the proposed changes are generally in accordance with these documents.

Condition 1.1(a) - Major Project Application

The Major Project Application dated 10 November 2005 and its attachment (Sydney's Desalination Project; Major Projects Application Attachment; Project Description Report), contains the following key references to the delivery system:

- On page 2 of 4 – '*pipelines and/or tunnels from the plant across Botany Bay to the Sydney Water Corporation water supply system for the distribution of drinking water*';

The change is consistent with this reference as the project involves finalising the works for a pipeline from the plant to the existing water supply system for the distribution of drinking water.

- On page 2 of the attachment – '*Infrastructure to deliver water to the existing distribution network, allowing any of the following:*
    - *50 ML/day delivered locally to Caringbah;*
    - *125 ML/day delivered to Kyeemagh and then to the existing distribution network; and*
    - *Up to 500 ML/day delivered to the major water distribution system consisting of the City and Pressure Tunnels via a pipeline or tunnel across Botany Bay*.'

The proposed change is consistent with this reference as the project involves delivery of up to an annual daily average of 500 ML/day of desalinated water to the City Tunnel via a pipeline via a pipeline or tunnel across Botany Bay.

On the basis of the above, it is considered that the proposed changes are generally in accordance with the Major Project Application.

Condition 1.1(b) - Environmental Assessment of the Concept Plan for Sydney's Desalination Project

Section 2.1 (page 2.2) of the EA of the Concept Plan identified one of the main components as being:

'Infrastructure to deliver water to the existing distribution network, allowing any of the following:

- *50 ML/day delivered locally to Caringbah;*
- *125 ML/day delivered to Kyeemagh and then to the existing distribution network; and*
- *Up to 500 ML/day delivered to the major water distribution system consisting of the City and Pressure Tunnels via a pipeline or tunnel across Botany Bay.'*

The proposed changes are consistent with this reference as desalinated water will be delivered to the major water distribution system.

Section 2.1 of the EA for the Concept Plan also states that:

> *'To date, two water distribution methods (that is, distribution route and method of construction) are under consideration to connect the desalination plant to the water network. A pipeline and/or tunnel could be used to distribute the water. Figures 2.2 and 2.3 show examples of routes that have been investigated. Other distribution methods will be considered.*
>
> *Alternative distribution methods may arise during the detailed design process. Decisions on the route and method of construction will be made during detailed design.*
>
> *The precise details of the site layout, distribution routes and other infrastructure will not be available until further investigation and design are undertaken as part of the detailed design in the project procurement strategy. This will be subject to the applicable environmental approval process.'*

Section 2.1 of the EA of the Concept Plan states that the delivery infrastructure presented therein is indicative and may be changed during subsequent design stages. A range of studies, assessments and investigations were undertaken during development of the Blueprint Design, EA of the delivery system, PPR for the delivery system, and following Project Approval being granted for the desalinated water delivery system. The studies, assessments and investigations have proposed changes to a number of construction methods. The proposed change is described in Section 2.2 of the Application for Modification and has not altered the overall concept of delivering desalinated water to the water supply system using pipelines.

On the basis of the above, it is considered that the proposed change is generally in accordance with the EA of the Concept Plan.

Condition 1.1(c) - Preferred Project Report for Sydney's Desalination Project

Chapter 1.4 of the PPR for Sydney's Desalination Project (August 2006) outlined the following refinements to the delivery system proposed in the EA of the Concept Plan:

- A tunnel may not be required for a plant greater than 125 ML/day. Methods to deliver greater than 125 ML/day include one or more pipelines once across Botany Bay or a tunnel, both of which were described in the EA of the Concept Plan; and
- A pipeline to Miranda/Caringbah will not now form part of the project, as water can be supplied across Botany Bay more cost effectively.

Section 11.1.2 of the PPR for Sydney's Desalination Project stated that:

"Sydney Water will seek subsequent Project Approval/s for the remaining components of the desalination project, namely the desalinated water distribution methods (that is, distribution route and method of construction) from the desalination plant. This will be sought at a time that would allow construction to commence when storages are depleted to around 30 percent. Further studies, investigations and assessments will occur to better understand constraints and identify the preferred delivery route(s)."

Further studies, investigations and assessments were undertaken following exhibition of the EA of the Concept Plan. The results of these investigations were considered when changing the project, culminating in the development of the project using an approach that remains consistent with that presented in the PPR for Sydney's Desalination Project.

The project, including the proposed change, is consistent with that presented in the PPR for Sydney's Desalination Project as:

- A tunnel is not required and a pipeline is able to cater for the ultimate design capacity of the desalination plant of 500 ML/day; and
- It does not involve a pipeline to Miranda/Caringbah.

Condition 1.1(d) – Conditions of the Approval

Condition 1.1d of Schedule 2 requires that the project be consistent with the requirements of the Concept Approval. There are a number of Conditions of Approval that do not relate to the design or assessment of the project. These are:

- Administrative conditions (Condition 1);
- Compliance monitoring and tracking (Condition 3);
- Community information, consultation and involvement (Condition 4); and
- Environmental management (Condition 5).

Where relevant, these conditions were incorporated into the Statement of Commitments in the PPR to ensure consistency with the Concept Approval.

Condition 2.1 (schedule 2) of the Concept Approval specifies assessment requirements for the project (refer to Table 3.1). These requirements were addressed by the EA and PPR for the desalinated water delivery system. In instances where the project has been changed since submission of the PPR, the table also refers to the section of the Application for Modification where the requirements are addressed.

Table 3.1 Environmental assessment requirements

Requirement (as per condition 2.1 of the Concept Approval)	Consistency assessment
(a) details of the project, including route, capacity and proposed construction methods	The construction methods are detailed in Section 2 of the Application for Modification. The capacity and route is detailed in the PPR.
(b) a detailed project-specific Statement of Commitments, consistent with the Statement of Commitments prepared for the Kurnell Desalination Plant concept plan, with a clear indication of any new or amended commitments relating to the project	Chapter 11 of the PPR.
(c) a demonstration that the project is consistent with the requirements of this approval and generally consistent with the scope and intent of the concept outlined in the documents under condition 1.1 of this approval	This appendix.
(d) a demonstration that the project has been designed to take into account and, where relevant, mitigate against, the impacts of wave action and coastal processes both on project integrity and as a result of the project on	Section 4.3 of the Application for Modification.

Requirement (as per condition 2.1 of the Concept Approval)	Consistency assessment
surrounding areas	
(e) a demonstration that the project has been designed to minimise the loss of seagrasses during the construction and operation of the project	Not applicable to this Application for Modification.
(f) a framework Compensatory Seagrass Package, developed in consultation with the DPI, detailing a framework for how any loss of seagrass associated with the project will be offset. The Package shall include consideration of new and/or protected seagrass areas, or other compensatory measures agreed by the DPI, commensurate with the extent of seagrass impacts. The Package shall also consider how the compensatory measures will be implemented, timing for any proposed works, responsibilities for on-going maintenance and monitoring and funding arrangements	Not applicable to this Application for Modification.
(g) a demonstration that the project has been designed to minimise water quality impacts particularly turbidity in Botany Bay	Section 8.3 of the EA, and Section 2.2.2 of the Application for Modification.
(h) a comprehensive water quality impact assessment for the project, undertaken in consultation with the Department of Environment and Conservation (DEC) and DPI, considering how the project will be constructed and operated to meet the outcomes specified in Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ, 2000) and to contribute to the achievement of the objectives in Marine Water Quality Objectives for NSW Ocean Water (DEC, 2006). The assessment shall make specific references to the prevention of adverse impacts on the Towra Point Reserve and commercial and recreational fishing activities in and around Botany Bay	Not applicable to this Application for Modification.
(i) an assessment of potential noise and vibration impacts associated with construction of the project, and how these impacts will be mitigated, monitored and managed	Not applicable to this Application for Modification.

A.2 Consistency with the Project Approval

The following sections assess consistency with the Project Approval. The Project Approval includes a number of conditions, however not all are relevant to the proposed changes to the construction methods. These conditions relate to matters such as, but not limited to:

- Botany Bay Cumulative Impacts and Coordination (Condition 3);
- Environmental Monitoring and Auditing (Condition 4);
- Environmental Management (Condition 5); and
- Environmental Reporting (Condition 6).

The following sections only address those conditions relevant to the proposed changes in the context of the approved project. Condition 1 was considered relevant to this consistency assessment and is assessed below.

A.2.1 Condition 1.1 – Terms of the Project Approval

The Project Approval does not define the project for which approval was sought and Condition 1.1 requires that:

The Proponent shall carry out the concept plan and all related projects generally in accordance with the:

a) *Environmental Assessment of the Desalinated Water Delivery System, dated April 2007, and prepared by GHD on behalf of the Proponent;*
b) *Desalinated Water Delivery System: Preferred Project Report, dated August 2007, and prepared by Sydney Water Corporation;*
c) *Desalinated Water Delivery System: Application for Modification of Project Approval for the Urban Sydney Sector: Sydney North, prepared by the Water Delivery Alliance for Sydney's Desalination Project and dated 5 May 2008;*
d) *Desalinated Water Delivery System: Application for Modification of Project Approval for the Botany Bay Sector, prepared by the Water Delivery Alliance and dated 15 July 2008, and additional information dated 2 September 2008;*
e) *Desalinated Water Delivery System: Application for Modification of Conditions 2.18 and 2.19 of the Project Approval, Relating to the Botany Bay Sector, prepared by the Water Delivery Alliance for Sydney's Desalination Project and dated 24 November 2008;*
f) *Desalinated Water Delivery System: Application for Modification of Condition 2.6 of the Project Approval, Relating to Vibration, prepared by the Water Delivery Alliance for Sydney's Desalination Project and dated 6 February 2009;*
g) *the concept plan approval granted with respect to the Kurnell Desalination Plant concept plan (05_0082); and*
h) *the conditions of this approval.*

Consistency with the documents (a), (b), and (e) is discussed below. The proposed changes are not applicable to document (c). Section A.1.2 above discussed consistency with document (d).

Condition 1.1(a) - Environmental Assessment of the Desalinated Water Delivery System

The delivery system was described in Chapter 5 of the EA for the delivery system. Section 5.4 of the EA described the construction methods associated with the works in the Botany Bay Sector and stated that:

"The following description is indicative of construction methods that could be used and may be refined by the constructor during detailed design...

Construction methods will vary along the route at the following locations:

- *At the Silver Beach crossing and through the seagrass beds offshore;*
- *From the end of the seagrass beds offshore from Silver Beach to the beach at Kyeemagh;*
- *Through the beach at Kyeemagh.*

The construction methods have been designed to minimise impacts to coastal processes and the seagrass beds near Silver Beach".

Section 5.4 of the EA reflects that the construction methods described in the EA for the delivery system were indicative and intended to be optimised during detailed design. The proposed change is consistent with this intention.

Condition 1.2 states that in the event of any inconsistency between the documents identified in condition 1.1a) and 1.1b), the most recent document prevails to the extent of the inconsistency. Chapter 2 of the PPR changed the construction methods in the Botany Bay Sector from that presented in the EA for the delivery system. As such, the PPR prevails over the EA to the extent of any inconsistency. The following section assesses the consistency of the proposed change with the PPR.

Condition 1.1 (b) – Desalinated Water Delivery System Preferred Project Report

Chapter 10 of the PPR defined the project for which Sydney Water sought approval. This was based on the project described in Chapter 5 of the EA as refined and changed by Chapter 2 of the PPR. The description of the project in Chapter 10 includes:

The delivery system will:

Require a range of construction related activities and facilities such as temporary lay down areas, temporary jetties, quays or work platforms, barges, site compounds, spoil stockpiles, connection to utility services and infrastructure, environmental controls, etc.

The proposed change is generally consistent with the project description; however the volume of clean sand and the overall storage footprint has increased compared to the description in the EA, PPR and subsequent Modification (12/9/08).

During preparation of the PPR it was envisaged that further changes and refinements may be required during detailed design. To accommodate this scenario, Chapter 2 of the PPR outlined "*indicative refinements to the route and changes to the construction method relative to the project presented in the Environmental Assessment*" that were subsequently included in Chapter 10 of the PPR. These changes were not considered to be final as further environmental and engineering investigations were required to be undertaken to inform the detailed design, hence their "*indicative*" status. The project description therefore made provision for changes during detailed design.

Section 4 of the Application for Modification assesses the potential environmental impacts of the proposed change and concludes that overall, the potential environmental impacts associated with the proposed change will be equivalent to those described in the PPR. In addition, the potential impacts are able to be managed by implementing the Minister's Conditions of Approval and Statements of Commitment. As such, the changes are consistent with the Statements of Commitment and they do not require modification.

Condition 1.1(g) – Concept Plan granted approval with respect to the Kurnell Desalination Plant concept plan (05_0082)

Condition 1.1(g) is addressed in Section A.1.2 of this Appendix.

Condition 1.1(h) – Conditions of the Project Approval

The Project Approval includes a number of conditions with which the project must comply. These conditions relate to requirements such as environmental monitoring and auditing, etc, or to other parts of the project, for example land pipeline impacts and coordination. The change is consistent with the existing conditions of the Project Approval and conditions do not require modification.

Appendix B – Copy of Project Approval 07_0054 (Including modifications)

Project Approval

Section 75J of the *Environmental Planning and Assessment Act 1979*

I, the Minister for Planning, approve the project referred to in Schedule 1, subject to the conditions in Schedule 2.

These conditions are required to:
- prevent, minimise, and/or offset adverse environmental impacts;
- set standards and performance measures for acceptable environmental performance;
- require regular monitoring and reporting; and
- provide for the ongoing environmental management of the project.

Mod 1 shown in red
Mod 2 shown in green
Mod 3 shown in blue
Mod 4 shown in yellow

Frank Sartor MP
Minister for Planning

Sydney 2007 File No: 9039739

SCHEDULE 1

Application No:	07_0054
Proponent:	Sydney Water Corporation
Approval Authority:	Minister for Planning
Project:	"the desalinated water delivery system" project
Concept Plan:	the project is a component of the approved concept plan for the Kurnell Desalination Plant (05_0082)
Part 3A Project:	On 25 October 2005, the Minister for Planning formed the opinion pursuant to clause 6 of *State Environmental Planning Policy (Major Projects) 2005* that the proposal is for the purpose of development described in clause 25(2) of Schedule 1 to that Policy. The proposal is thus declared to be a project to which Part 3A of the *Environmental Planning and Assessment Act 1979* applies.
Concept Plan Authorisation:	On 16 November 2005, the Minister for Planning authorised the submission of a concept plan for the proposal.
Critical Infrastructure:	On 16 November 2005, the Minister for Planning formed the opinion pursuant to clause 6A of the *State Environmental Planning Policy (Major Projects) 2005* that the proposal is for the purpose of development described in Schedule 5 to that Policy (clause 1 – Kurnell desalination project). The proposal is thus declared to be a critical infrastructure project within the meaning of section 75C of the Act.

KEY TO CONDITIONS

SCHEDULE 2

Act, the	*Environmental Planning and Assessment Act 1979*
Conditions of Approval	The Minister's conditions of approval for the project
DECC	Department of Environment and Climate Change
Department, the	Department of Planning
Director-General, the	Director-General of the Department of Planning, or delegate.
DPI	Department of Primary Industries
EA	*Environmental Assessment of the Desalinated Water Delivery System*, dated April 2007, and prepared by GHD on behalf of Sydney Water Corporation
Minister, the	Minister for Planning.
Proponent	Sydney Water Corporation, or any party acting under authorisation from and on behalf of the Sydney Water Corporation
Publicly Available	Available for inspection by a member of the general public (for example available on an internet site or at a display centre).
RTA	NSW Roads and Traffic Authority
Site	The land to which this approval applies

1. ADMINISTRATIVE CONDITIONS

Terms of Project Approval

1.1 The Proponent shall carry out the project generally in accordance with the:

a) *Environmental Assessment of the Desalinated Water Delivery System*, dated April 2007, and prepared by GHD on behalf of the Proponent;

b) *Desalinated Water Delivery System: Preferred Project Report*, dated August 2007, and prepared by Sydney Water Corporation;

c) *Desalinated Water Delivery System: Application for Modification of Project Approval for the Urban Sydney Sector: Sydney North*, prepared by the Water Delivery Alliance for Sydney's Desalination Project and dated 5 May 2008;

d) *Desalinated Water Delivery System: Application for Modification of Project Approval for the Botany Bay Sector*, prepared by the Water Delivery Alliance and dated 15 July 2008, and additional information dated 2 September 2008;

e) *Desalinated Water Delivery System: Application for Modification of Conditions 2.18 and 2.19 of the Project Approval, Relating to the Botany Bay Sector*, prepared by the Water Delivery Alliance for Sydney's Desalination Project and dated 24 November 2008;

f) *Desalinated Water Delivery System: Application for Modification of Condition 2.6 of the Project Approval, Relating to Vibration*, prepared by the Water Delivery Alliance for Sydney's Desalination Project and dated 6 February 2009;

g) the concept plan approval granted with respect to the Kurnell Desalination Plant concept plan (05_0082); and

h) the conditions of this approval.

1.2 In the event of an inconsistency between:

a) the conditions of this approval and any document listed from condition 1.1a) to 1.1f) inclusive, the conditions of this approval shall prevail to the extent of the inconsistency; and

b) any document listed from condition 1.1a) to 1.1f) inclusive, and any other document listed from condition 1.1a) to 1.1f) inclusive, the most recent document shall prevail to the extent of the inconsistency.

1.3 Notwithstanding condition 1.2, if there is any inconsistency between this project approval and the concept plan approval for the Kurnell Desalination Plant concept plan, the concept approval shall prevail to the extent of the inconsistency.

1.4 The Proponent shall comply with any reasonable requirement(s) of the Director-General arising from the Department's assessment of:

a) any reports, plans or correspondence that are submitted in accordance with this approval; and

b) the implementation of any actions or measures contained in these reports, plans or correspondence.

Limits of Approval

1.5 This project approval shall lapse on 31 December 2015, unless works the subject of this project approval or any other project approval granted with respect to the Kurnell Desalination Plant concept approval are physically commenced on or before that date. The Director-General may extend this lapse date if the Proponent demonstrates to the satisfaction of the Director-General that the desalination plant technology remains current, appropriate and reflective of best practice at the date the approval would otherwise lapse.

Project Sectors

1.6 For the purpose of this approval, the project shall be considered in three sectors:

a) the **Kurnell Sector**, being the dry-land component of the project between the desalination plant site and Silver Beach (approximately 2.0 kilometres);

b) the **Botany Bay Sector**, being the water-based component of the project between Silver Beach and Kyeemagh, including construction compounds at Silver Beach and Kyeemagh (approximately 8.0 kilometres); and

c) the **Urban Sydney Sector**, being the dry-land component of the project between Kyeemagh and Erskineville (approximately 8.3 kilometres).

2. SPECIFIC ENVIRONMENTAL CONDITIONS

Construction Methods

2.1 Without limiting or restricting the selection of a construction method for other parts of the project, the Proponent shall ensure that the project parts identified in Table 1 are only constructed using a trenchless technology.

Table 1 - Trenchless Technology Project Segments

Sector	Description	Location
Kurnell Sector	Under residential streets	From under Captain Cook Drive (near the Kurnell subtransmission substation) to the corner of Tasman Street and Dampier Street, and along Dampier Street to Silver Beach (Figure 10-1 of the document referred to under condition 1.1b))
Botany Bay Sector	Under seagrass beds	From Silver Beach to a point around 800 metres from the mean high water mark into Botany Bay along the pipeline alignment (Figure 10-2 of the document referred to under condition 1.1b))
Urban Sydney Sector	Under residential streets and watercourses	From Cook Park along Tancred Avenue and under Muddy Creek to Riverine Park (Figure 10-3 of the document referred to under condition 1.1b))
	Under watercourses	Under Cooks River (near Marsh Street) to Tempe Recreation Reserve (Figure 10-3 of the document referred to under condition 1.1b))
	Under major rail infrastructure	Under Botany Freight Line (Figure 10-3 of the document referred to under condition 1.1b))
	Under major road infrastructure	Under Canal Road (Figure 10-3 of the document referred to under condition 1.1b))
	Under residential streets	From Sydney Park, near the intersectiom of Euston Road and Campbell Road, along Euston Lane to Maddox Street and through Ashmore and Mitchell Industrial Estates (Figure 2.2 of the document referred to under condition 1.1c))

Noise and Vibration Impacts

Construction Hours

2.2 Construction activities associated with the Botany Bay Sector (excluding trenching activities within one kilometre of the nearest residences) (refer to condition 1.6) and those parts of the Kurnell Sector and Urban Sydney Sector employing a trenchless construction technology (refer to condition 2.1), but not including establishment of launch and receival pits, may be undertaken 24-hours per day, seven days per week, subject to:

a) compliance with the relevant Construction Noise Management Plan (refer to condition 5.2b)); and

b) in the case of works associated with the Kurnell Sector or the Urban Sydney Sector, notification of the local council and potentially-affected residential landowners and occupiers at least 48 hours prior to any works being undertaken outside of the hours specified in condition 2.3.

2.3 The Proponent shall only undertake construction activities associated with the project, other than those referred to under condition 2.2, that would generate an audible noise at any residential premises during the following hours:

a) 7:00 am to 6:00 pm, Mondays to Fridays, inclusive;
b) 8:00 am to 1:00 pm on Saturdays; and
c) at no time on Sundays or public holidays.

This condition does not apply in the event of a direction from police or other relevant authority for safety reasons or where required in an emergency to avoid the loss of lives, property and/ or to prevent environmental harm.

2.4 The hours of construction activities specified under condition 2.3 of this approval may be varied with the prior written approval of the Director-General. Any request to alter these hours of construction shall be:

a) considered on a case by case basis or activity-specific basis;
b) accompanied by details of the nature and need for activities to be undertaken during the varied construction hours;
c) accompanied by written evidence to the Director-General that activities undertaken during the varied construction hours are justified; appropriate consultation with potentially affected receivers and notification of the relevant local council has occurred; and all practicable and reasonable mitigation measures will be put in place; and
d) accompanied by any information necessary for the Director-General to reasonably determine that the noise impact of activities undertaken during the varied construction hours will not unreasonably impact on the acoustic amenity of receptors in the vicinity of the works.

Noise and Vibration Goals and Limits

2.5 The following construction noise goals shall apply to the project:

a) with respect to airborne noise, a construction noise goal:
   i) developed in accordance with the DECC's *Noise Control Guideline Construction Site Noise* during the hours of construction specified under condition 2.3 of this approval;
   ii) established on the basis of what can reasonably and feasibly be achieved using best practice noise mitigation outside of the hours specified under condition 2.3 of this approval. Where applying such mitigation measures results in a noise level exceeding more than 5dB(A) ($L_{A10(15\text{-minute})}$) above rating background noise levels at sensitive receiver locations, the requirements of condition 5.2b) i) 3 apply; and
b) with respect to ground-borne noise, a construction noise goal of:
   i) 45dB(A) ($L_{Aeq(15\text{-minute})}$) between the hours of 7:00 am and 6:00 pm;
   ii) 40dB(A) ($L_{Aeq(15\text{-minute})}$) between the hours of 6:00pm and 7:00am; except where ground-borne noise is predicted to occur for more than seven consecutive days in which case, 35dB(A) ($L_{Aeq(15\text{-minute})}$) between the hours of 10:00pm and 7:00am applies.

   Ground-borne noise is to be assessed within any habitable room.

2.6 The Proponent shall establish vibration goals for construction and operation of the trenchless technology consistent with the guidelines contained in *Environmental Noise Management – Assessing Vibration: A Technical Guideline* (DEC, 2006).

Impacts on Buildings and Structures

2.7 Subject to the agreement of the landowner, building condition surveys shall be completed on the following buildings/ structures prior to proximate tunnelling or excavation associated with the project:

a) all buildings/ structures above the excavation/ tunnel and other buildings/ structures likely to be affected by tunnel/ excavation works or other major vibration-inducing

construction activities in the vicinity of the buildings and structures in the Kurnell Sector and the Urban Sydney Sector. A suitably qualified person is required to certify that the survey area (and the buildings surveyed within) encompasses the maximum area that could reasonably be expected to be affected by tunnelling/ excavation or other major vibration-inducing construction works associated with the project; and

b) all buildings/ structures of heritage significance listed in Table 9.18 of the document referred to under condition 1.1a) of this approval, unless otherwise determined following geotechnical and vibration analysis endorsed by a suitably qualified person that the building/ structure(s) is not likely to be adversely affected by tunnel/ excavation works or other major vibration-inducing construction works associated with the project.

2.8 All property owners of buildings/ structures to be surveyed, as required under condition 2.7, shall be advised at least 48 hours prior to the commencement of the survey of their property of the scope and methodology of the surveys and the process for making a claim in relation to any property damage attributable to the construction of the project. A copy of the final survey shall be provided to each affected landowner upon request. A register of all properties surveyed shall be maintained by the Proponent and provided to the Director-General upon request.

2.9 Any damage to buildings/ structures, attributable to the construction of the project, either directly and indirectly (that is, including as a result of vibration or changes in groundwater) shall be rectified by the Proponent within a reasonable period, at no cost to the owner(s).

Traffic Impacts

2.10 Prior to the commencement of construction of the Kurnell Sector and the Urban Sydney Sector, the Proponent shall provide to the relevant road authority, the following information:

a) where directional drilling/boring is proposed under roads, detailed plans (including vertical and horizontal alignment) of the pipeline route and mitigation measures proposed to reduce impacts to traffic and pedestrian safety during construction works on either side of the road. An indication of timing of works, hours of construction and maintenance arrangements during operation should also be outlined;

b) where trenching is proposed to cross roads or where trenching is proposed to occur within the road reserve, detailed design plans for the road works (including vertical and horizontal alignment) is to be provided as well as information regarding plant and equipment proposed to be used, construction compound locations, construction schedule and hours of construction, localised traffic diversions, need for short-term closure of roads or traffic lanes and restricted or modified access to adjacent properties.

c) details of all works that impact upon classified roads, including proposed mitigation measures to be implemented to reduce construction impacts such as traffic control measures for peak traffic periods (i.e. detours/diversions) and measures to ensure traffic and pedestrian safety during construction activities are required to be outlined. Ongoing maintenance arrangements for the operational phase should also be provided.

2.11 The Proponent shall ensure that any measures to restore roads to pre-existing conditions are undertaken in a timely manner, in accordance with the requirements of and to the satisfaction of the relevant road authority, at the full expense of the Proponent.

2.12 The Proponent shall ensure that all road crossings of classified roads, as defined in the *Roads Act 1993*, are constructed using underboring/directional drilling construction techniques unless otherwise agreed with the RTA. The construction method and depth of cover shall be determined in consultation with the RTA.

2.13 At all locations at which the project crosses:

a) an existing road corridor (or future road corridors) between the Cooks River and Campbell Road (inclusive), Alexandria,

b) at Marsh Street, along the Alexandra Canal north of the bridge crossing near the Tempe Recreation Reserve, and
c) at General Holmes Drive,

the project shall be concrete encased, or equivalent, in order to protect the project from future road transport infrastructure, in consultation with the RTA.

2.14 Prior to the commencement of construction of the Urban Sydney Sector the Proponent shall consult with the RTA with respect to construction methods, project alignment, methods for protecting the pipeline infrastructure and future on-going maintenance of the project in that area. The consultation shall specifically address and resolve the potential for the project to adversely affect the RTA's future plans for road enhancement and development in order to minimise the potential for conflicts between the project and existing and any future major road transport infrastructure.

2.15 The Proponent shall ensure that the project is designed and constructed to be maintenance free within any RTA road reservations identified in environmental planning instruments and any future corridors identified by the RTA, or as otherwise agreed with the RTA. The Proponent shall ensure that pits, valves, hydrants, access structures or other related fittings are only located within areas of the project which are not within an existing or future road corridor, or as otherwise agreed with the RTA.

2.16 The Proponent shall provide the RTA with "as built" plans of the project where it is located within classified roads, as defined under the *Roads Act 1993,* and RTA road corridors (existing and future), showing the horizontal and vertical alignment and provisions for the protection of the project including locations of concrete encasement, or equivalent, if applicable, within six months of completion of construction of the project within those locations.

Soil and Water Quality Impacts

2.17 The Proponent shall employ soil and water management controls to minimise soil erosion and the discharge of sediment and other pollutants to lands and/or waters during construction of the Kurnell Sector and the Urban Sydney Sector, in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004).

2.18 Construction and maintenance activities associated with the Botany Bay Sector shall be carried out in a manner that minimises the potential for the re-suspension and dispersal of marine sediments and associated biota, including installation of silt curtains around the Silver Beach and Kyeemagh construction sites and dredge discharge barges within the Botany Bay Sector.

Where silt curtains have been installed, they shall remain in place until the turbidity of the water within the silt curtains returns to background levels of turbidity in waters immediately outside the silt curtains.

All reasonable and feasible mitigation measures shall be employed during operation of the cutter suction dredges where monitoring demonstrates that turbidity levels at a point 2 metres from the cutter section dredges, due to dredging activities, exceed the background turbidity by more than an equivalent suspended sediment concentration of 50mg/L. These measures shall be detailed within the Botany Bay Sector Construction Water Management Plan as described under condition 5.2e.

2.19 The Proponent shall ensure that construction of the Botany Bay Sector, including all dredging, subsurface storage and reclamation works, is carried out in a manner such that turbidity outside the silt curtains (as required under condition 2.18) does not exceed the background turbidity by more than an equivalent suspended sediment concentration of 50mg/L at a point of approximately 0.2 metre depth for Silver Beach and between 1 and 1.5

metre depth in the water column for all other sites and equipment and a distance of less than 10 metres from the silt curtain.

All reasonable and feasible mitigation measures shall be employed so as to minimise prolonged visible surface plumes (outside silt curtains) in the Bay, and shall be detailed within the Botany Bay Sector Construction Water Management Plan as described under condition 5.2e.

2.20 All equipment associated with the construction and operation of the project shall be operated and maintained in a manner that minimises the potential for oil and grease spills/ leaks.

2.21 During construction of the Botany Bay Sector, the Proponent shall ensure that equipment capable of responding to a worst case oil spill is available at all times.

2.22 Prior to the commencement of construction of the Botany Bay Sector seaward of the mean high water mark, the Proponent shall develop work practices and procedures to be applied during construction to mitigate potential impacts on water quality and aquatic ecology. The work practices and procedures shall be consistent with the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC, 2000) and shall include, but not be limited to management of sediment-bound contaminants and acid sulfate soils located along the pipeline route. The Proponent shall consult DECC and DPI in development of these work practices and procedures. The Proponent shall submit a copy of the final work practices and procedures to the Director-General, prior to their implementation.

Impacts on Ecology

2.23 The Proponent shall ensure that construction of the Botany Bay Sector is carried out in a manner that minimises the potential for disturbance and/ or the spread of *Caulerpa taxifolia*.

2.24 The Proponent shall ensure that construction and maintenance of the Botany Bay Sector, particularly dredging and land reclamation works, is carried out in a manner that minimises the potential for impacts on seagrass beds, water quality, aquatic ecology and estuarine wetland systems.

2.25 Where practicable, noisy or other potentially disturbing activities associated with the construction of the project within Botany Bay shall cease or be scaled back when cetaceans and other marine mammals are approaching or in the area of construction activities.

2.26 The Proponent shall ensure that all revegetation and rehabilitation works are undertaken, in consultation with the relevant local council, using locally native species. The Proponent shall ensure that the regeneration of revegetated/rehabilitated areas is managed for a period of six months, or as agreed by the Director-General, until the newly planted vegetation has fully established.

Air Quality Impacts

2.27 The Proponent shall construct the project in a manner that minimises dust emissions from construction areas, including wind-blown and traffic-generated dust. All construction shall be undertaken with the objective of preventing visible emissions of dust from the site.

Waste Management

2.28 All wastes generated by the project shall be beneficially reused, recycled or directed to a waste facility lawfully permitted to accept the materials.

3. BOTANY BAY CUMULATIVE IMPACTS AND COORDINATION

3.1 Prior to the commencement of construction of the project, the Proponent shall consult with Sydney Ports Corporation (with respect to the timing of construction works associated with the expansion of Port Botany) and with EnergyAustralia (with respect to the timing of construction works associated with the Botany Bay electricity cable) to identify any potential

coincident construction works between the project and those developments. Should construction works coincide, the Proponent shall consult with Sydney Ports Corporation and EnergyAustralia, as relevant, for the purposes of the development of a **Coordinated Environmental Monitoring and Management Protocol**. The Protocol shall provide a framework for identification of reasonable and feasible opportunities for the coordinated and cooperative monitoring and management of environmental impacts from the developments. The Protocol shall include, but not necessarily be limited to:

a) procedures for access to, and provision of, monitoring data from each development, particularly in relation to water quality and ecological health;
b) identify and implement reasonable and feasible opportunities for coordinated and cooperative approach to the management of cumulative environmental impacts from the developments, with particular reference to water quality, noise impacts, construction traffic, dust impacts, aquatic ecology and reuse of spoil;
c) arrangements for communication between the parties, including designated contact persons and contact details;
d) notification procedures in the event of an incident at either development that may impact on the other development(s), or generate a significant common or cumulative impact;
e) mechanism for review of the Protocol from time to time; and
f) such other matters as parties may agree.

The Proponent shall provide a copy of the Protocol to the Director-General as soon as practicable after agreement on the terms of the Protocol.

4. ENVIRONMENTAL MONITORING AND AUDITING

Ecosystem Monitoring

4.1 Prior to the commencement of construction of the Botany Bay Sector seaward of the mean high water mark, the Proponent shall prepare an **Ecosystem Monitoring Program** to monitor the impacts of the project on ecosystems of Botany Bay. The Program shall be developed in consultation with the DECC and the DPI, and shall include, but not necessarily be limited to:

a) a sampling, data collection and assessment regime to establish baseline ecological health, with particular reference to seagrasses, sygnathid species and benthic biota and for ongoing monitoring of ecological health during construction of the Botany Bay Sector. The monitoring program should include specific provisions for monitoring in and around construction works, including Towra Point Aquatic Reserve and its mangrove habitat, and should also take into account spatial variability in species types and distribution;
b) criteria against which the impact of the project on the ecological health of Botany Bay will be assessed;
c) water quality monitoring in the context of potential ecological impacts, particularly in relation to turbidity;
d) mitigation measures to be implemented in the event that reduced ecological health is identified with reference to established assessment criteria, including a timetable for implementation; and
e) monitoring for ecological health and biodiversity outcomes following completion of construction works, and for the recovery of biodiversity within the areas directly and indirectly affected by the Botany Bay Sector for a period of at least twelve months, unless otherwise agreed or directed by the Director-General.

Beach and Foreshore Monitoring

4.2 Prior to the commencement of construction of the Botany Bay Sector, the Proponent shall prepare a **Beach and Foreshore Monitoring Program** to monitor the impacts of the project on beach and foreshore erosion and quality where it is likely to be materially affected by the project. The Program shall be developed in consultation with the DECC and DPI and shall include, but not necessarily be limited to:

a) surveys of beaches and foreshore areas around Botany Bay, including those areas likely to be materially affected by the construction of the project and at least one reference site to establish baseline profiles for those areas;
b) monitoring of those beaches and foreshore areas around Botany Bay referred to under part a) during construction of the project and following completion of construction to identify any changes in beach and foreshore profiles;
c) provisions to determine "source" and "sink" areas and to ameliorate any damage to habitat determined as a "sink" area for erosion sourced sediment;
d) contingency measures to be implemented in the event that beach and foreshore profile changes attributable to the project are identified, and a timetable for implementation; and
e) provision for amelioration of any damage to beach and foreshore areas as a result of the construction of the project.

Noise and Vibration Monitoring

4.3 Prior to the commencement of construction of the project, the Proponent shall prepare a **Construction Noise and Vibration Monitoring Program** for the purpose of assessing compliance with the goals and limits referred to under conditions 2.5 and 2.6. The Program shall be developed in consultation with the DECC.

5. ENVIRONMENTAL MANAGEMENT

Construction Environmental Management

5.1 The Proponent shall apply the **Construction Environmental Management System** required to be developed under the concept approval for the Kurnell Desalination Project during construction of the project.

5.2 In addition to the general requirements of the Construction Environmental Management System, the Proponent shall prepare and implement the following project-specific Construction Environmental Management Plans and Protocols during the construction of the project:

a) where soil testing prior to the commencement of construction identifies the presence of acid sulfate soils, an **Acid Sulfate Soil Management Plan** prepared in accordance with guidance provided in *Acid Sulfate Soil Manual* (Acid Sulfate Soil Management Advisory Committee, 1998);
b) a **Construction Noise and Vibration Management Plan**, in consultation with DECC, to detail how construction noise and vibration impacts would be minimised and managed, including, but not necessarily limited to:
    i) as primary objectives:
        1. attainment of the construction noise and vibration goals specified under this approval at all times;
        2. where construction noise and vibration goals cannot be met, to achieve best practice noise control (including, for example, acoustic enclosures over micro tunnelling launch and receival pits), in terms of noise and vibration level and duration of noise and vibration emissions at affected receivers at all times;
        3. where the use of best practice noise and vibration control cannot substantially achieve the construction noise and vibration goals, alternative measures to resolve noise and vibration impacts on affected receivers (including, for example, temporary relocation of receivers);
    ii) details of construction activities and a schedule for construction works;
    iii) identification of construction activities that have the potential to generate noise and/ or vibration impacts on surrounding land uses, particularly residential areas;
    iv) a program for the periodic monitoring of noise emissions and vibration during construction, as required under condition 4.3;
    v) procedures for notifying residents of construction activities that are likely to affect their noise and vibration amenity;

vi) development of reactive and pro-active strategies for dealing promptly with any noise and vibration complaints, including documentation of a fast response, the completed action on a complaint and feedback from the complainant;

vii) a description of how the effectiveness of these actions and measures would be monitored during the proposed works, clearly indicating how often this monitoring would be undertaken, how the results of this monitoring would be recorded; and, if any non-compliance is detected with the goals and limits specified under this approval; and

viii) mechanisms to consider and address cumulative noise and vibration impacts, particularly from other construction work potentially occurring in the area;

c) a **Construction Traffic Management Protocol** to detail how heavy vehicle movements associated with the project (other than in relation to spoil management) will be managed during construction. The Protocol shall specifically address the movement of oversize loads to and from the site, the management of construction traffic, restrictions to the hours of heavy vehicle movements to avoid road use conflicts, and the transport of construction waste materials;

d) a **Spoil Management Plan**, consistent with the Spoil Management and Disposal Strategy required under the concept plan approval for the Kurnell Desalination Project. The Plan shall include procedures for undertaking further sediment samples at various depths along the trenched portion of the Botany Bay Sector to provide detail on particle size and quality of sediments to be disturbed;

e) a **Construction Water Management Plan** (for the Botany Bay Sector), in consultation with DECC, to detail how water quality will be managed during construction of the Botany Bay Sector, with specific reference to the minimisation and control of turbidity/ suspended solids. In particular, a turbidity criterion is to be established to enable instantaneous measurements to be obtained and used operationally.

f) an **Erosion and Sedimentation Management Protocol** (for the Kurnell Sector and Urban Sydney Sector), in consultation with DECC, to detail how surface water and stormwater will be managed during construction. The Protocol shall include use of appropriately-sized stormwater controls, in accordance with *Managing Urban Stormwater: Soils and Construction* (Landcom, 2004).

g) a **Groundwater Management Protocol** (for the Kurnell Sector and Urban Sydney Sector), in consultation with DECC, to detail how groundwater will be managed during construction, with specific reference to identification and management of any contaminated groundwater along the pipeline route.

5.3 The Plans and Protocols referred to under condition 5.2 shall be submitted for the approval of the Director-General prior to the commencement of construction, or within such period otherwise agreed by the Director-General.

5.4 Nothing in this approval precludes the Proponent from developing the Plans and Protocols referred to under condition 5.2 as separate plans/ protocols, or as a single plan/ protocol, nor does it preclude the staging of submission of any of these plans/ protocols consistent with the staging of any construction works. Construction of the relevant component of the project must not commence until written approval of all Plans and Protocols relevant to that component of the project has been received from the Director-General.

Operation Environmental Management

5.5 The Proponent shall apply the **Operational Environmental Management System** required to be developed under the concept approval for the Kurnell Desalination Project during operation of the project.

6. ENVIRONMENTAL REPORTING

Incident Reporting

6.1 The Proponent shall notify the Director-General of any incident with actual or potential significant off-site impacts on people or the biophysical environment as soon as practicable and within 24 hours after the occurrence of the incident. The Proponent shall provide full

written details of the incident to the Director-General within seven days of the date on which the incident occurred.

6.2 The Proponent shall meet the requirements of the Director-General to address the cause or impact of any incident, as it relates to this approval, reported in accordance with condition 6.1 of this approval, within such period as the Director-General may require.

Appendix C – Advice on Spoil Borrow Pit Impact on Coastal Processes (Cardno Lawson Treloar, 2009)

Our Ref LJ2654/L2006v2 :sge

Contact A. Berthot/P.D. Treloar

13 November 2009

Water Delivery Alliance
Cook Park
KYEEMAGH NSW 2216

Attention: Mr Craig Dengate

Dear Sir,

PIPELINE CROSSING OF BOTANY BAY
SPOIL BORROW PIT
IMPACT ON COASTAL PROCESSES

Preamble

During the trenching and pipeline laying work across Botany Bay undertaken for the Sydney Desalination Plant, the dredged area west of the main north-south airport runway has been used for storage of dredged sandy material. The spoil area referred to as the spoil borrow pit was chosen to be along the north-south batter on the western side of the pit in order to minimise impacts on the coastal processes and shoreline. It was first thought that 35,000m^3 of material would remain permanently in the borrow pit after completion of the pipeline crossing works. Cardno Lawson Treloar (CLT) have previously investigated the potential impact on coastal processes of the long-term storage of this material (see Report 2383).

Recent bathymetric surveys of the spoil and borrow pit area have shown that the total quantity of material remaining is larger and in the order of ~150,000m^3. Furthermore the placed spoil is irregular in crest level.

Following discussions between CLT and the Water Delivery Alliance (WDA), and in order to minimise the impact on coastal processes of the longterm storage of the actual placed material, it is proposed for the material to be reworked into a thinner placed layer (below -6.5mCD) by expanding the existing storage eastward, thereby extending the footprint from 100m x 680m to 200m x 680m. Cardno Lawson Treloar have been engaged to investigate the potential impact on coastal processes of the long-term storage of the actual reworked material. This letter describes the analyses and presents the results of these investigations.

In summary, the storage of about 150,000m^3 of dredged spoil in the borrow pit in accordance with the profile recommended in this report will result in shoreline changes that are within the range of natural beach width variability and consistent with the impacts described in the previous report for the storage of 35,000m^3 in the same general location.

Study Approach

Cardno Lawson Treloar have previously addressed a range of coastal process matters associated with the potential short and long term impacts of the Sydney Desalination Project works in Botany Bay. This investigation of the

Cardno Lawson Treloar Pty Ltd
ABN 55 001 882 873

Level 2, 910 Pacific Highway
Gordon New South Wales
2072 Australia
Telephone: 02 9499 3000
Facsimile: 02 9499 3033
International: +61 2 9499 3000
Email: cltnsw@cardno.com.au
Web: www.cardno.com.au

Cardno Offices
Brisbane
Sydney
Canberra
Melbourne
Perth
Darwin

Cairns
Townsville
Mackay
Rockhampton
Hervey Bay
Sunshine Coast
Toowoomba
Gold Coast
Gosford
Baulkham Hills
Wollongong
Busselton

Papua New Guinea
Indonesia
Vietnam
China
Kenya
United Arab Emirates
United Kingdom
United States

effect of the wave and current processes on the stability of the placed spoil mound within the Bay has adopted model systems the same as those used for the previous studies undertaken by Cardno Lawson Treloar (2007a, b and c).

The SWAN model was used to investigate the propagation of swell into the Bay and across the placed spoil to northern lady Robinsons Beach from the Tasman Sea, as well as the generation of local sea within the Bay. This model system was developed at the Delft Technical University and includes wind input, (local sea cases), combined sea and swell, offshore wave parameters (swell cases), refraction, diffraction, shoaling, non-linear wave-wave interaction, a full directional spectral description of wave propagation, bed friction, white capping, currents and wave breaking. It can include nesting of finer grid areas within an overall coarser grid model.

For this study a constant grid size of 50m was used, covering the whole Bay from the 100m depth contour offshore to Sandringham Bay on the northern side of the Georges River entrance near Sans Souci, together with a range of nested finer grid model areas.

The model system set up for this study is shown in Figure 1 and is based on a 50m grid. Four finer grids (with grid sizes varying from 20m to 5m), were nested within the main grid in order to describe pipeline trench and borrow pit area. The fine grid size used near the spoil disposal area allowed for the model to describe the potential change in wave propagation due to the seabed variations there.

Note that the spoil mound batters will need to be as smooth as possible on the northern and southern ends of the spoil mound with slopes in the order of 1V:10H, but may be steeper along the eastern side of the mound at 1V:3H.

More details on the model setup can be found in Cardno Lawson Treloar (2007c).

Other wave model systems are available for wave propagation investigations, including Boussinesq model systems such as MIKE-21 that Cardno Lawson Treloar have applied in other investigations. That model system is suited to many port studies but in this case, where diffraction is relatively minor, it is not needed. Moreover, it would have two practical difficulties for this analysis; they being:-

- Boussinesq wave models require a constant depth along a boundary and that is not realistic
- Boussinesq wave models do not allow variations in wave conditions along the boundaries
- Boussinesq wave models include reflections, and even including sponge layers, reflections from the shoreline would affect the model result interpretation in terms of nearshore wave directions
- Boussinesq wave models require very small grid sizes, in the order of 1 to 2m.

Swell Investigations

For swell wave investigations, waves from nine offshore directions from north through east to south, combined with 9 wave periods (T_z) from 3 to 11 seconds were applied. These combinations amount to 81 basic simulation cases, which are consistent with the offshore parametric wave climate described in Appendix D of Rep2383. In each case offshore wave height was adopted to be 1.5m. This approach is similar to the one presented in Report 2383.

Model application with offshore H_s = 1.5m provides realistic wave transfer coefficients, K_w, between offshore and inshore locations.

K_w is defined by: -

$$H_i = H_o \times K_w \qquad (1)$$

where H_i is inshore wave height
H_o is offshore wave height

K_w depends on offshore wave period and direction and includes the wave transformation processes.

A large number of locations along the shorelines of the Bay and near port and runway facilities were selected for model output. Shoreline locations were generally in a depth of 2m CD, typically, see Figure 2.

The results of SWAN modelling of swell wave propagation into Botany Bay for each bathymetric case provided a 9 x 9 matrix of wave coefficients and weighted average wave directions at all of these model output locations. These wave coefficients and inshore wave directions were then combined with the parameterised offshore Botany Bay wave climate to provide inshore wave parameters in terms of H_e (effective significant wave height) and ϕ_m (weighted mean wave direction), see Appendix F of Report 2383 (Cardno Lawson Treloar 2007c).

Results

Results from the previous investigation (Report 2383) of the long-term storage of 35,000m^3 are also included here for comparison.

Figure 3 shows the proposed location of the storage of 35,000m^3 of previously proposed spoil material.

Two seabed surveys of the borrow pit were available for this study, namely: survey before the disposal of spoil and recent survey (TSSA_091008) of the borrow pit showing the spoil mound (Figure 4).

In order to minimise the impact on the coastal processes, it is proposed that the material will be reworked into a thinner seabed layer expanding to the east of the existing storage and all below -6.5mCD. The volume of material currently above -6.5mCD was calculated to be about 70,000m^3. This sand is proposed to be reworked by extending the footprint to the east from 100m x 680m to 200m x 680m below -6.5mCD. A model bathymetry was therefore prepared in order to investigate the impact of this proposed storage plan.

Two model bathymetries were considered in this study, namely:-

- Pre-Spoil Disposal Bathymetry
- Reworked Spoil Disposal Bathymetry below -6.5mCD.

Figure 5 describes the pre- and reworked spoil disposal bathymetries. The reworked area (below -6.5mCD) covers an area of approximately 100,000m^2 and is therefore slightly less than the nominal total footprint of 200m x 680m = 136000m^2. The surface of the reworked spoil (at or below -6.5mCD) was not perfectly smooth in the model in order to account for the anticipated surface variations of the reworked deposit, variations of +/- 0.3m were included in the model seabed.

Figures 6 to 9 show typical results for offshore waves from the south-east with a peak period of 12.6 seconds (T_p) and the median offshore wave height (H_s) of 1.5m. The plots are in terms of wave-height (H_s) contours.

Figures 6 and 7 show wave propagation into Botany Bay for the pre-spoil disposal bathymetry, each at a different scale.

Figure 8 shows the significant wave height near the spoil borrow pit for the reworked spoil disposal bathymetry, at the same scale as Figure 7.

Figure 9 show the difference in significant wave height between the pre- and reworked spoil disposal bathymetries. There are areas of increased and decreased wave heights, up to about 0.06m, for the offshore wave conditions adopted.

Results from the model simulations show that changes in the wave parameters occur mainly north and south of the storage area and consequently along the northern shoreline on Lady Robinsons Beach. Figure 10 presents the changes in terms of the effective significant wave height (H_e) and the mean direction at the selected locations for the different cases. Generally, directional changes between

Locations 57 and 75, where H_e is also high enough to cause sediment transport (see the top panel of Figure 10) are significant. The results show that the reworked spoil disposal bathymetry causes slightly greater directional changes than the 35,000m^3 storage case, in particular near Locations 69 and 70.

Sediment transport rates at Locations 59 to 75, where the changes in wave parameters were the most significant, were then estimated using the LITDRIFT module of the LITPACK coastal processes modelling system developed by the Danish Hydraulics Institute. The shore normal direction at each location was estimated approximately using the Sydney Ports Authority, May 1992 Survey and Aerial Image (Google Earth, Image SKM October 2009). This may lead to some inaccuracy in the total sediment transport rate magnitude; however, the differences in the sediment transport rates and potential shoreline evolution between the different bathymetric cases will reflect the change in the wave parameters, which is the purpose of this investigation.

Longshore sediment transport and potential shoreline changes over a 12 months period were determined. These changes may modify in the longer term, but are only for the first 12 months.

Tables 1 and 2 present the results for the existing bathymetry and for the proposed (idealized) 35,000m^3 storage case investigated in Cardno Lawson Treloar (2007c) – that is, with a crest level of -4m LAT.

Tables 3 and 4 present the difference in terms of sediment transport rates and potential shoreline changes between the model simulation with the pre- and reworked spoil disposal bathymetries.

Note that although the changes shown in Table 1 may not be entirely reliable, the differences shown in Table 2 will be; as will those in Table 4.

The shoreline change calculations were undertaken without considering structures such as groynes present along the shoreline and it is important to note that south of President Avenue (~ Location 69) there is a series of groynes and walls. Therefore, the shoreline changes in this area would be constrained by the groynes and longshore transport and potential shoreline changes are limited. Nevertheless, these calculations provide an insight into the potential changes in the sediment transport processes. Note that southward transport is negative.

Table 1: Wave Parameters (Effective Wave Height and Mean Wave Direction), Sediment Transport Rates and Potential Shoreline Change for the Existing Bathymetry

	EXISTING			Shoreline Change (12months)
	He (m)	Dir (deg)	Q(m^3/year)	DQ/DX=(h+B)DY/DT (m)
59	0.10	79.1	-107.6	0.00
60	0.13	98.6	-537.7	1.02
61	0.16	100.6	-850.5	0.73
62	0.17	111.7	1067.5	-4.97
63	0.22	101.6	551.6	1.21
64	0.23	96.3	1272.8	-1.66
65	0.23	98.9	1651.2	-0.76
66	0.22	100.0	1915.2	-0.61
67	0.20	111.5	1990.2	-0.17
68	0.24	113.2	3510.0	-3.22
69	0.19	116.5	2172.5	3.07
70	0.18	116.2	1553.1	1.50
71	0.16	106.9	29.8	3.63
72	0.17	106.6	321.0	-0.71
73	0.18	114.2	508.4	-0.44
74	0.19	120.4	591.3	-0.18
75	0.14	124.4	474.6	0.27

Table 2: Wave Parameters (Effective Wave Height and Mean Wave Direction), Sediment Transport Rates and Potential Shoreline Change for the Long-Term Storage of 35,000m^3 along the North-South Batter of the Existing Dredged Basin below -4mCD

LONG TERM STORAGE 35000m^3 NORTH-SOUTH BATTER (Below 4mCD)				Shoreline Change (12months)		
	He (m)	Dir (deg)	Q(m^3/year)	DQ/DX=(h+B)DY/DT (m)	$Q_{storage} - Q_{existing}$ (m^3/year)	Shoreline change ($Y_{storage} - Y_{existing}$) (m)
59	0.10	79.1	-107.6	0.00	0.0	0.00
60	0.13	98.6	-537.7	1.02	0.0	0.00
61	0.16	100.7	-842.3	0.72	8.2	-0.02
62	0.17	111.9	1087.0	-5.00	19.6	-0.03
63	0.22	102.0	659.7	1.00	108.2	-0.21
64	0.23	96.2	1246.9	-1.35	-25.9	0.31
65	0.23	99.0	1675.8	-0.86	24.6	-0.10
66	0.22	100.0	1915.2	-0.55	0.0	0.06
67	0.20	111.4	1977.3	-0.14	-12.9	0.03
68	0.24	112.9	3428.0	-3.07	-82.0	0.15
69	0.20	116.5	2172.5	2.88	0.0	-0.19
70	0.18	115.5	1471.8	1.69	-81.4	0.20
71	0.16	106.7	78.8	3.32	49.1	-0.31
72	0.17	106.4	348.8	-0.66	27.8	0.05
73	0.18	113.7	387.3	-0.09	-121.1	0.35
74	0.19	120.4	591.3	-0.45	0.0	-0.27
75	0.14	124.4	474.6	0.27	0.0	0.00

Table 3: Wave Parameters (Effective Wave Height and Mean Wave Direction), Sediment Transport Rates and Potential Shoreline Change for the Pre-Spoil Disposal Bathymetry Survey

PRE-SPOIL DISPOSAL				Shoreline Change (12months)
	He (m)	Dir (deg)	Q(m^3/year)	DQ/DX=(h+B)DY/DT (m)
59	0.11	77.01	-696.6	0.00
60	0.14	97.79	-695.7	0.00
61	0.17	99.68	-1126.2	1.01
62	0.19	108.15	-879.5	-0.64
63	0.24	99.73	-54.6	-1.94
64	0.26	94.76	1076.6	-2.61
65	0.25	98.51	1958.7	-1.78
66	0.24	99.17	2173.5	-0.49
67	0.20	110.92	1910.1	0.60
68	0.23	111.34	2402.7	-1.04
69	0.19	119.25	2140.0	0.60
70	0.19	114.88	1632.9	1.22
71	0.17	109.36	454.7	2.81
72	0.18	109.50	338.1	0.28
73	0.19	114.69	572.1	-0.55
74	0.19	120.44	542.4	0.07
75	0.13	124.40	474.6	0.16

Table 4: Wave Parameters (Effective Wave Height and Mean Wave Direction), Sediment Transport Rates and Potential Shoreline Change for the Long-Term Storage for the Reworked Spoil Disposal below -6.5mCD Bathymetry

LONG TERM STORAGE REWORKED SPOIL DISPOSAL				Shoreline Change (12months)		
	He (m)	Dir (deg)	Q(m^3/year)	DQ/DX=(h+B)DY/DT (m)	$Q_{storage} - Q_{existing}$ (m^3/year)	Shoreline change ($Y_{storage} - Y_{existing}$) (m)
59	0.11	77.22	-693.5	0.00	3.2	0.00
60	0.14	97.86	-737.3	0.10	-41.6	0.11
61	0.17	99.73	-1126.2	0.91	0.0	-0.10
62	0.20	107.78	-828.1	-0.77	51.4	-0.13
63	0.24	99.85	7.8	-1.96	62.4	-0.03
64	0.26	94.86	1113.5	-2.55	36.9	0.06
65	0.25	98.50	1958.7	-1.70	0.0	0.07
66	0.23	99.41	2235.0	-0.63	61.5	-0.14
67	0.20	110.78	1896.6	0.78	-13.6	0.17
68	0.23	111.65	2469.9	-1.21	67.2	-0.17
69	0.19	119.75	2130.6	0.78	-9.5	0.18
70	0.19	115.83	1507.1	1.51	-125.8	0.28
71	0.16	108.51	286.1	2.91	-168.7	0.10
72	0.17	108.70	169.0	0.28	-169.1	0.00
73	0.19	114.63	572.1	-0.95	0.0	-0.40
74	0.19	120.42	542.4	0.07	0.0	0.00
75	0.13	124.34	466.7	0.18	-7.9	0.02

Discussion

When considering the long-term storage of the reworked residual material, the change in wave climate occurs near the same locations for the 35,000m^3 case and the reworked spoil disposal cases. For the long-term storage of the originally proposed residual material (35,000m^3 case), the change in wave climate that occurs is minimal. Changes in the effective wave height are negligible and the mean direction may adjust by less than 1 degree. Note that there are changes of up to 5 degrees in the wave direction near Locations 78 to 81, but swell wave heights near these locations are very small and no sediment transport and shoreline changes would occur.

The consequent changes to potential sediment transport rates are in the order of hundreds of cubic meters per year and shoreline evolution is expected to be in the order of 0.2-0.3m over a 12 months period.

For the long-term storage of the reworked spoil (reworked spoil disposal case below -6.5mCD), the changes in the effective wave height are generally minimal and mean wave direction may change by up to ~1 degrees at some locations.

The potential changes to sediment transport rates are in the order of 100 to 150m^3/year and shoreline changes in beach width are expected to be in the order of 0.2m to 0.4m over a 12 months period; but without any trend along the shoreline.

South of Location 69, the impact of the changes in wave parameters, and therefore sediment transport, will be minimised due to the presence of groynes. As the shoreline evolution calculations undertaken here do not account for the presence of the groynes, it is expected that sediment would be contained within each groyne compartment. However, changes will also occur north of President Avenue (near Location 69) and would be in the order of about 0.4m per year - maximum.

These potential changes in longshore sediment transport would not all occur uniformly along the beach (that is, not a total increase in northward or southward transport). They will lead to longshore perturbations of the shoreline and localised areas of narrowed/widened beach width. It is likely that as these perturbations occur they will be self-smoothing

Conclusion

Overall it appears that the reworked spoil disposal below -6.5mCD will lead to a change in wave parameters and consequently a change in the longshore sediment transport of the same order of magnitude as the previously proposed 35,000m^3 spoil disposal along the north south batter (below -4mCD)..

The potential changes in longshore transport are not expected to modify the net northward longshore drift occurring along Lady Robinsons Beach (north of Ramsgate). These potential changes in longshore transport would mainly be manifested as longshore perturbations of the shoreline and localised areas of narrowed/widened beach width. It is likely that as these perturbations occur they will be self-smoothing. These changes (up to 0.4m) are expected to remain generally unidentifiable compared to the natural yearly beach width variability.

Based on this investigation and the previous Cardno Lawson Treloar (2007c) investigation, it is expected that long-term storage of the excess dredged spoil in the borrow pit may present the least change, in terms of longshore sediment transport, if the dredged spoil is reworked as a smooth storage below -6.5mCD along the north-south batter as proposed. The north and south batters of this low mound should be as flat as possible (flatter than 1V:10H) to minimise end-effects.

We hope that this report fulfils your requirements.

Yours faithfully,

A. Berthot - P.D. Treloar
Coastal, Ocean & Estuarine Studies
for **Cardno Lawson Treloar**

References

Cardno Lawson Treloar (2007a): Desalinated Water Delivery System. Pipeline Crossing of Botany Bay. Sediment Plume Simulations. Report (LJ2609/R2331) Prepared for Sydney Water.

Cardno Lawson Treloar (2007b): Desalinated Water Delivery System. Pipeline Crossing of Botany Bay - Coastal Processes. Report (LJ2609/R2330) Prepared for Sydney Water.

Cardno Lawson Treloar (2007c): Pipeline Crossing of Botany Bay - Coastal Processes. Report (LJ2654/R2383) Prepared for Patterson Britton & Partners.

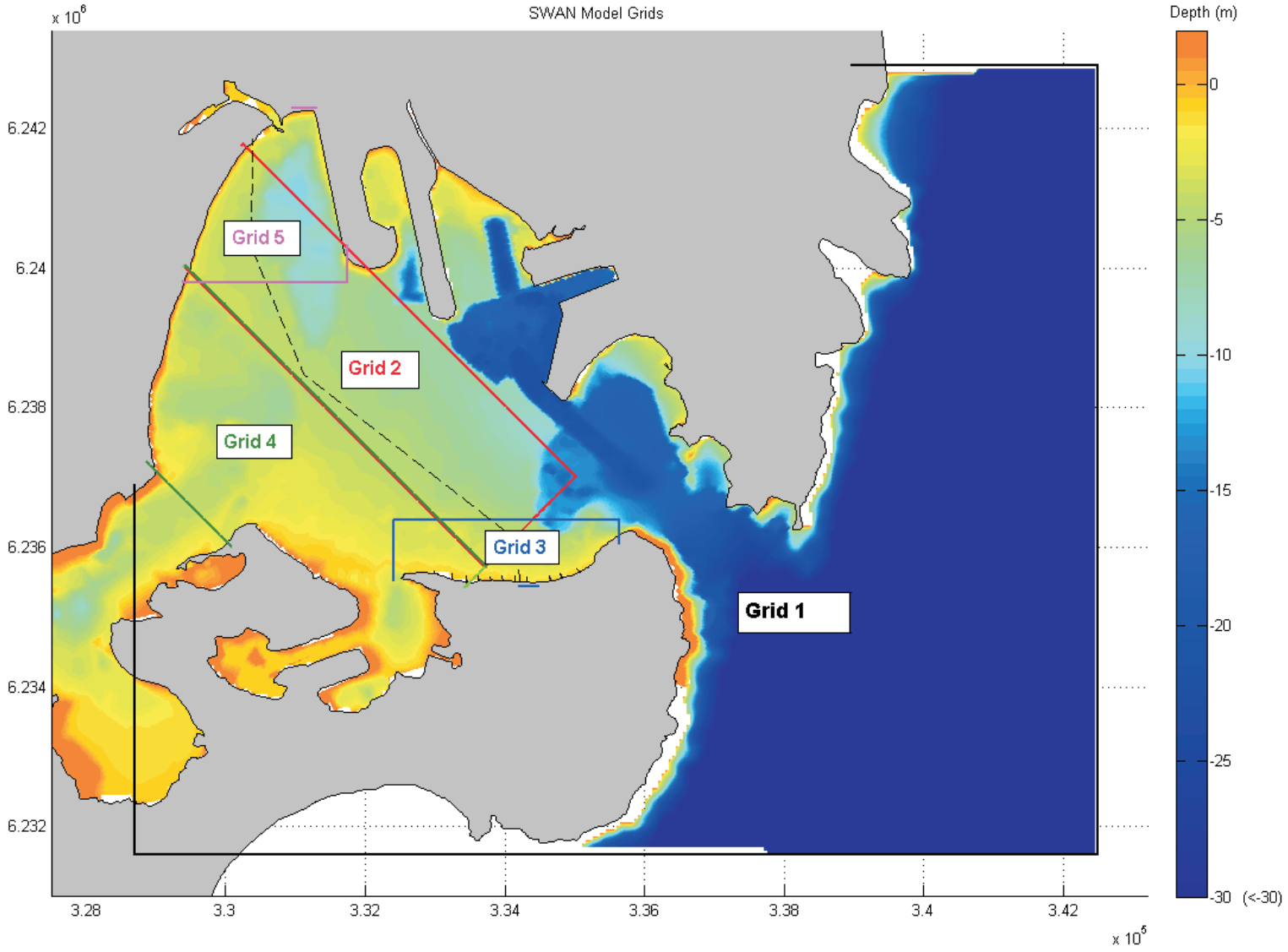
Manly Hydraulics Laboratory (1992): Mid New South Wales Coastal Region. Tide-Storm Surge Analysis. Report MHL 621.

APPENDIX A

Wave Parameters PRE- and Reworked Spoil Disposal

Table E1: Comparison of Nearshore Swell Parameters for Pre and Reworked Spoil Disposal Bathymetry

PRE- SPOIL DISPOSAL			REWORKED SPOIL DISPOSAL		
	H_e (m)	φ_m (°TN)		H_e (m)	φ_m (°TN)
54	0.13	94.05	**54**	0.13	94.03
55	0.19	85.84	**55**	0.19	85.81
56	0.22	72.06	**56**	0.22	72.10
57	0.16	69.03	**57**	0.17	68.77
58	0.11	83.44	**58**	0.11	82.87
59	0.10	78.48	**59**	0.10	78.02
60	0.13	98.38	**60**	0.13	98.12
61	0.16	100.15	**61**	0.16	99.98
62	0.17	111.11	**62**	0.18	109.87
63	0.22	101.59	**63**	0.22	101.38
64	0.23	96.15	**64**	0.23	95.40
65	0.23	98.76	**65**	0.24	98.00
66	0.23	99.32	**66**	0.21	100.03
67	0.19	111.02	**67**	0.19	111.10
68	0.23	111.60	**68**	0.21	112.68
69	0.15	102.08	**69**	0.15	101.79
70	0.18	115.73	**70**	0.18	116.04
71	0.16	106.87	**71**	0.18	108.59
72	0.18	106.60	**72**	0.18	106.41
73	0.19	114.16	**73**	0.19	114.58
74	0.20	120.33	**74**	0.20	120.27
75	0.14	124.32	**75**	0.14	124.47
76	0.06	133.26	**76**	0.06	133.26
77	0.05	139.01	**77**	0.05	139.03
78	0.02	146.13	**78**	0.03	146.82
79	0.02	153.81	**79**	0.02	154.58
80	0.01	176.20	**80**	0.01	176.96
81	0.01	184.66	**81**	0.01	184.63
82	0.02	204.03	**82**	0.02	204.97

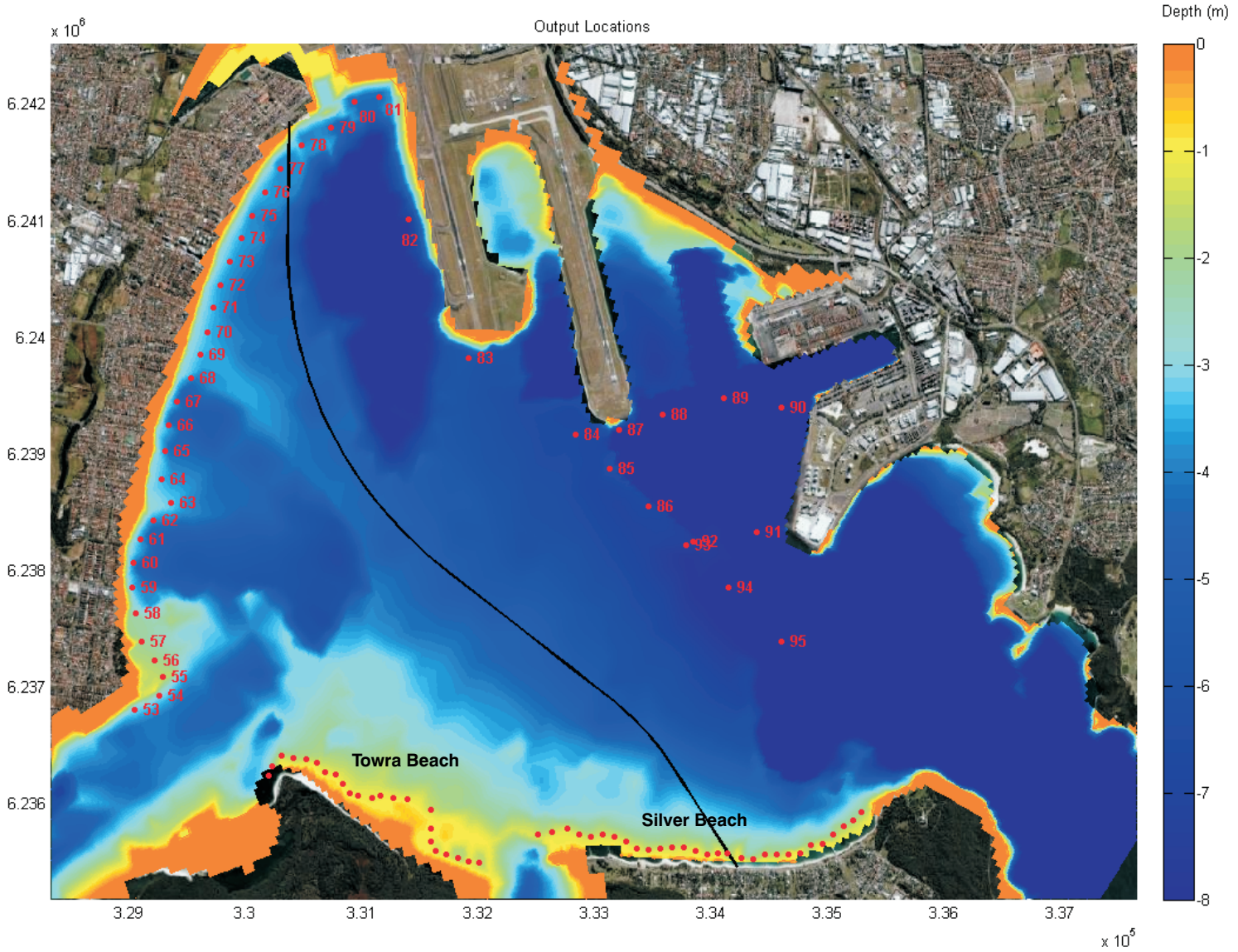


Cardno Lawson Treloar

Pipeline Crossing Of Botany Bay - WDA - Spoil Borrow Pit impact on Coastal Processes
SWAN MODEL GRIDS

Figure 1

LJ2654/L2006 11/10/2009
File: J/CM/LJ2654-BotanyPipeline/Docs/Figures/LJ2654_L2006Figures.cdr

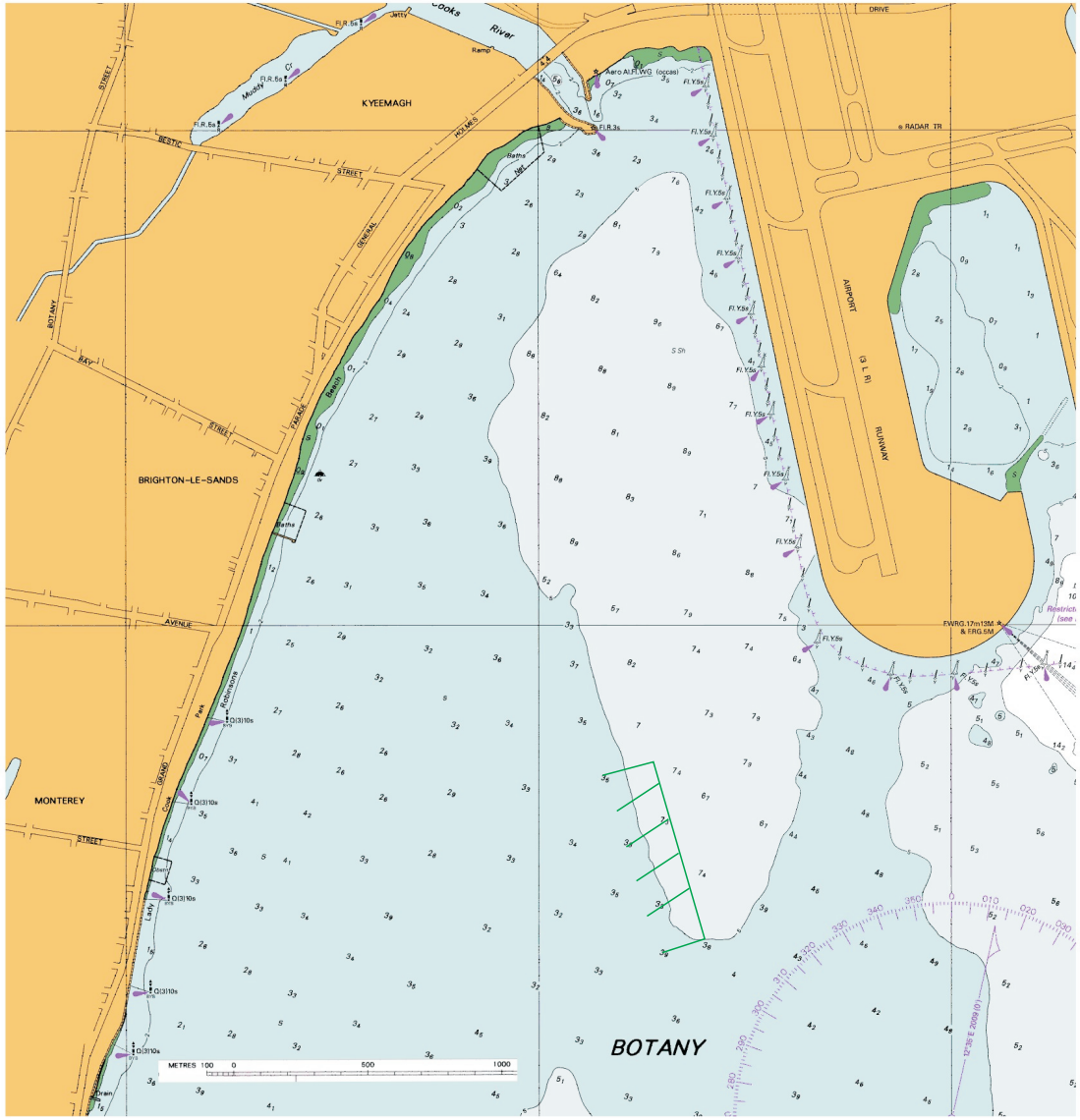


Cardno Lawson Treloar

Pipeline Crossing Of Botany Bay - WDA - Spoil Borrow Pit impact on Coastal Processes
PIPELINE ROUTE AND WAVE MODEL OUTPUT LOCATIONS

Figure 2

LJ2654/L2006 11/10/2009
File: J/CM/LJ2654-BotanyPipeline/Docs/Figures/LJ2654_L2006Figures.cdr



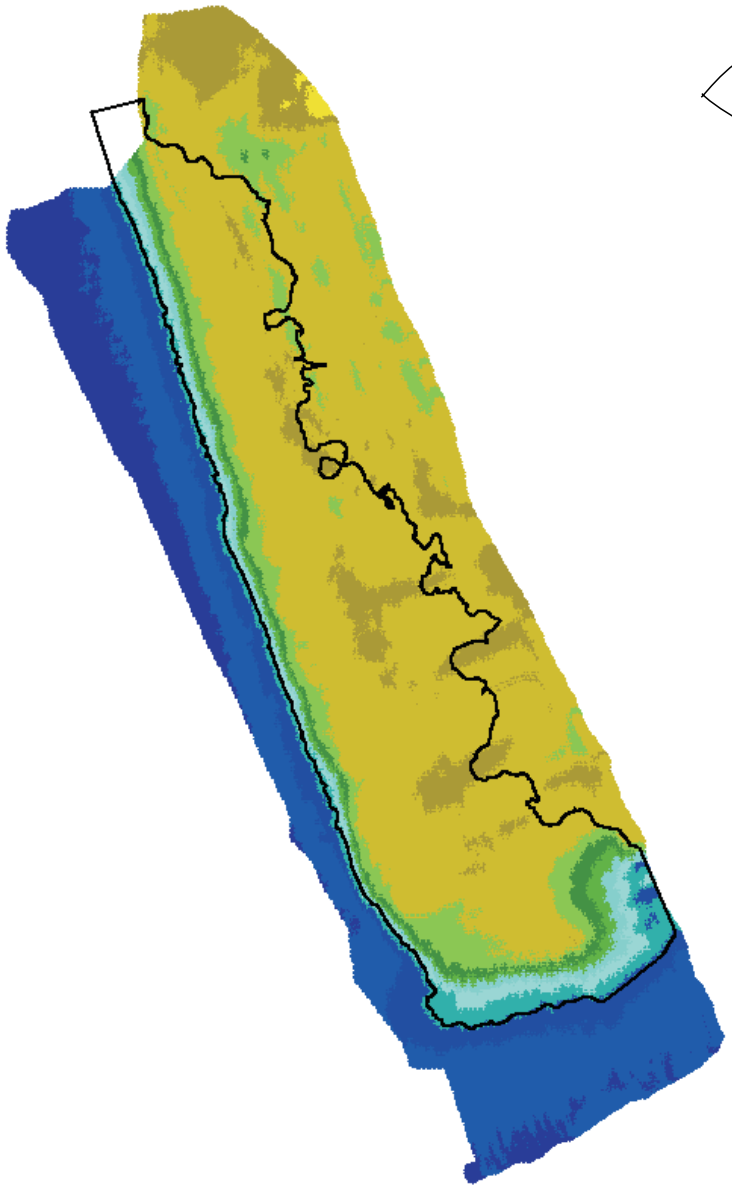
Storage Along North-South Batter (35000m3)

Cardno Lawson Treloar

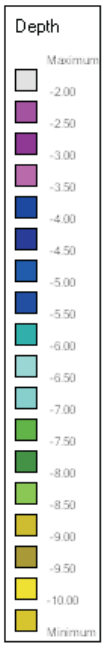
Pipeline Crossing Of Botany Bay - WDA - Spoil Borrow Pit impact on Coastal Processes
PROPOSED STORAGE LOCATION FOR DREDGED MATERIAL

LJ2654/L2006 11/10/2009
File: J/CM/LJ2654-BotanyPipeline/Docs/Figures/LJ2654_L2006Figures.cdr

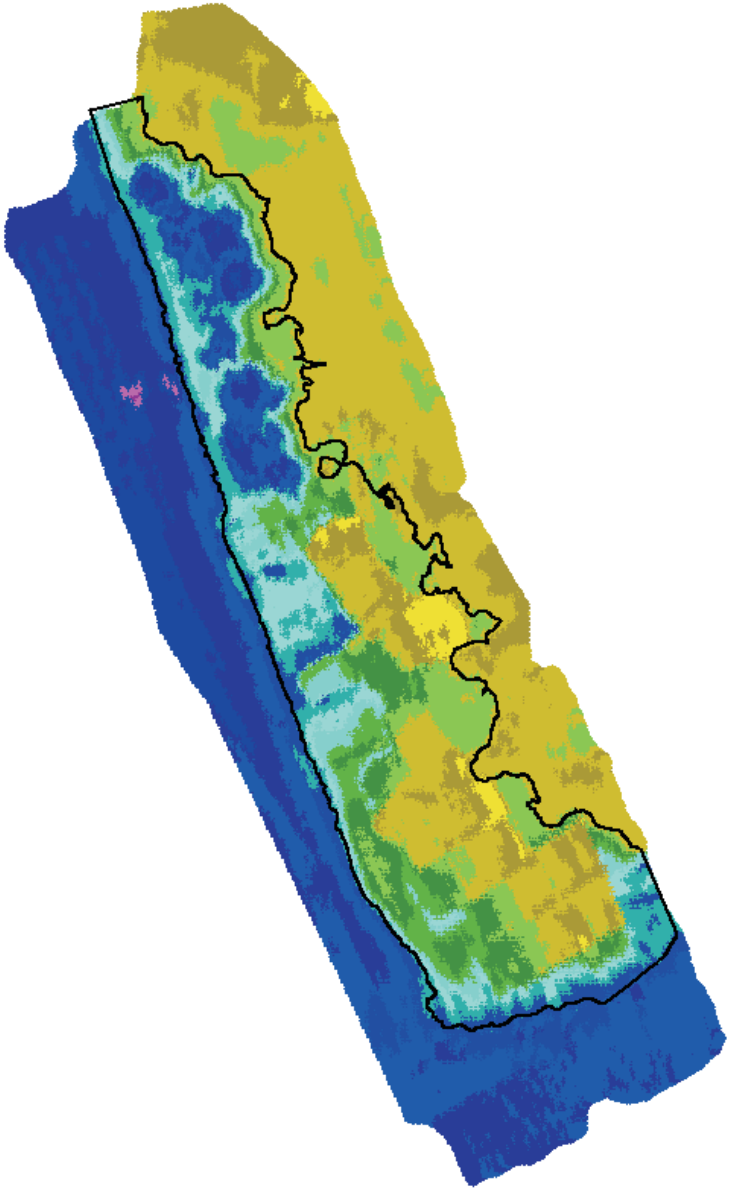
Figure 3

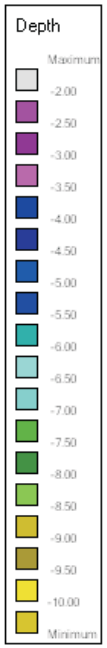


Spoil Disposal Area



PRE- SPOIL DISPOSAL





POST- SPOIL DISPOSAL

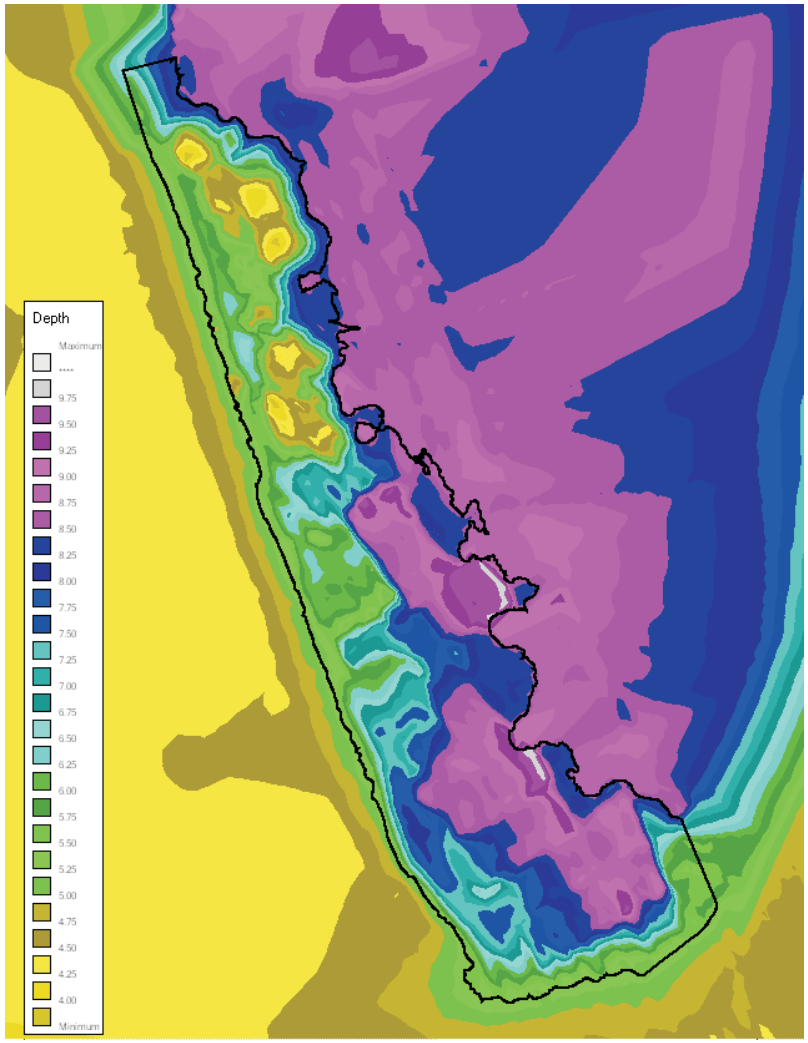
Cardno Lawson Treloar

Pipeline Crossing Of Botany Bay - WDA - Spoil Borrow Pit impact on Coastal Processes
PRE- AND POST- PIPELINE BATHYMETRY SURVEY OF SPOIL BORROW PIT

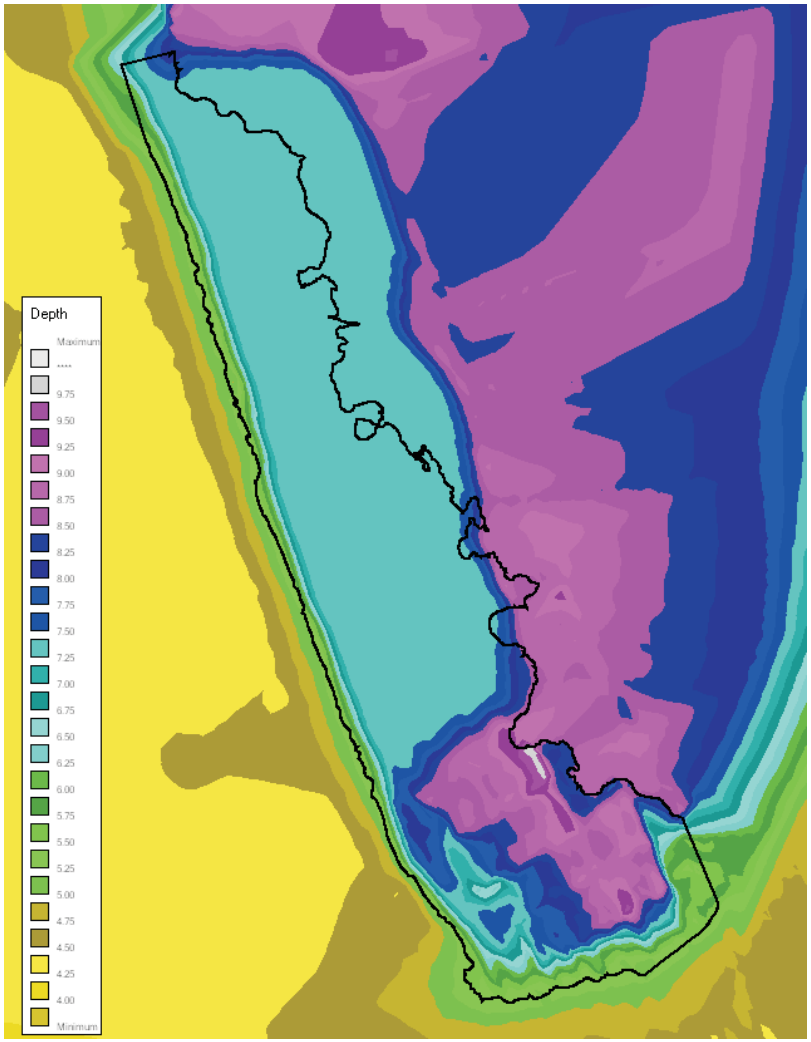
LJ2654/L2006 11/10/2009
File: J/CM/LJ2654-BotanyPipeline/Docs/Figures/LJ2654_L2006Figures.cdr

Figure 4

Spoil Disposal Area



POST- SPOIL DISPOSAL



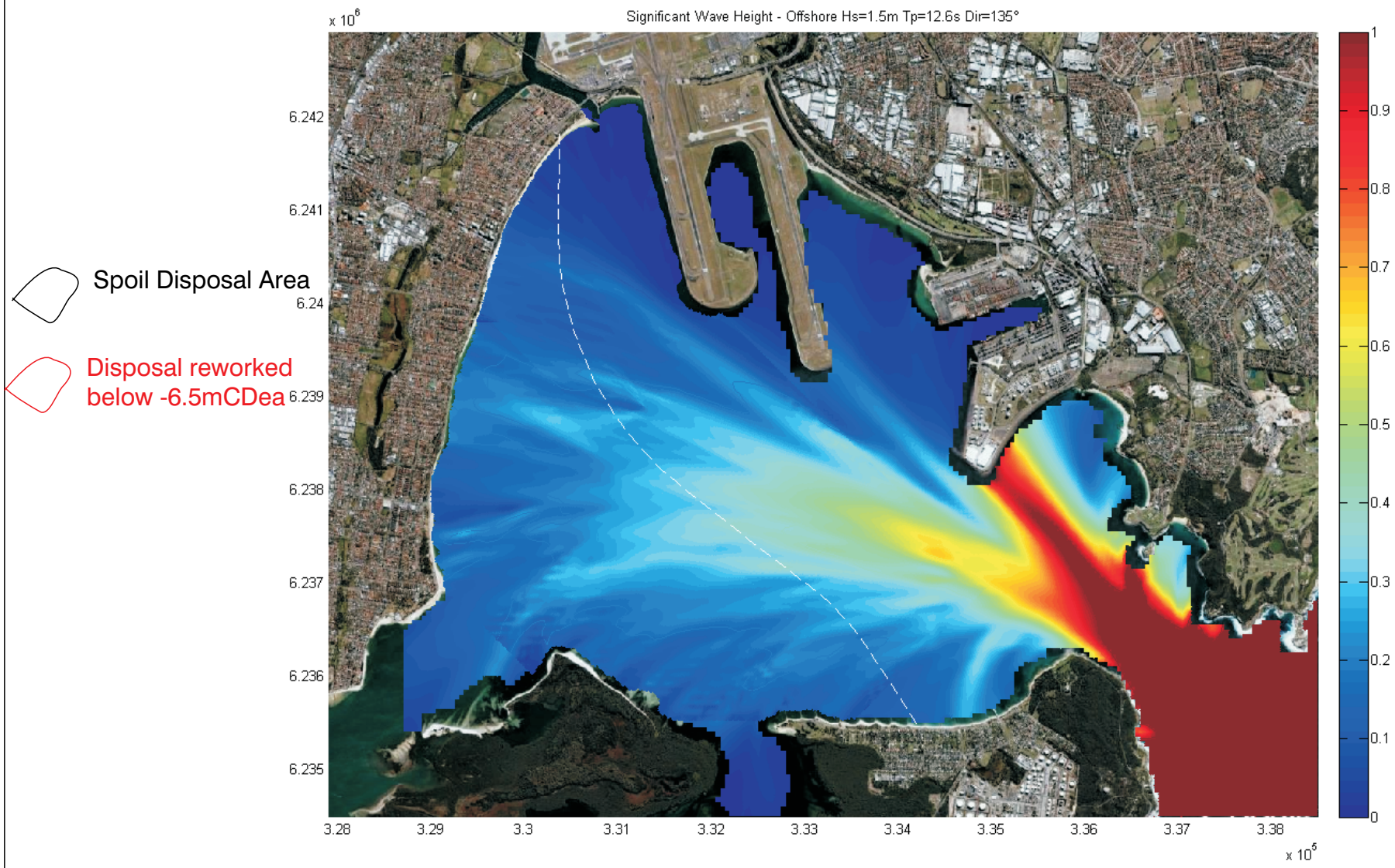
SPOIL DISPOSAL (Below -6.5mCD)

Cardno Lawson Treloar

Pipeline Crossing Of Botany Bay - WDA - Spoil Borrow Pit impact on Coastal Processes
POST- SPOIL DISPOSAL AND REWORKED SPOIL DISPOSAL (BELOW -6.5m CD) BATHYMETRY OF SPOIL BORROW PIT

LJ2654/L2006 11/10/2009
File: J/CM/LJ2654-BotanyPipeline/Docs/Figures/LJ2654_L2006Figures.cdr

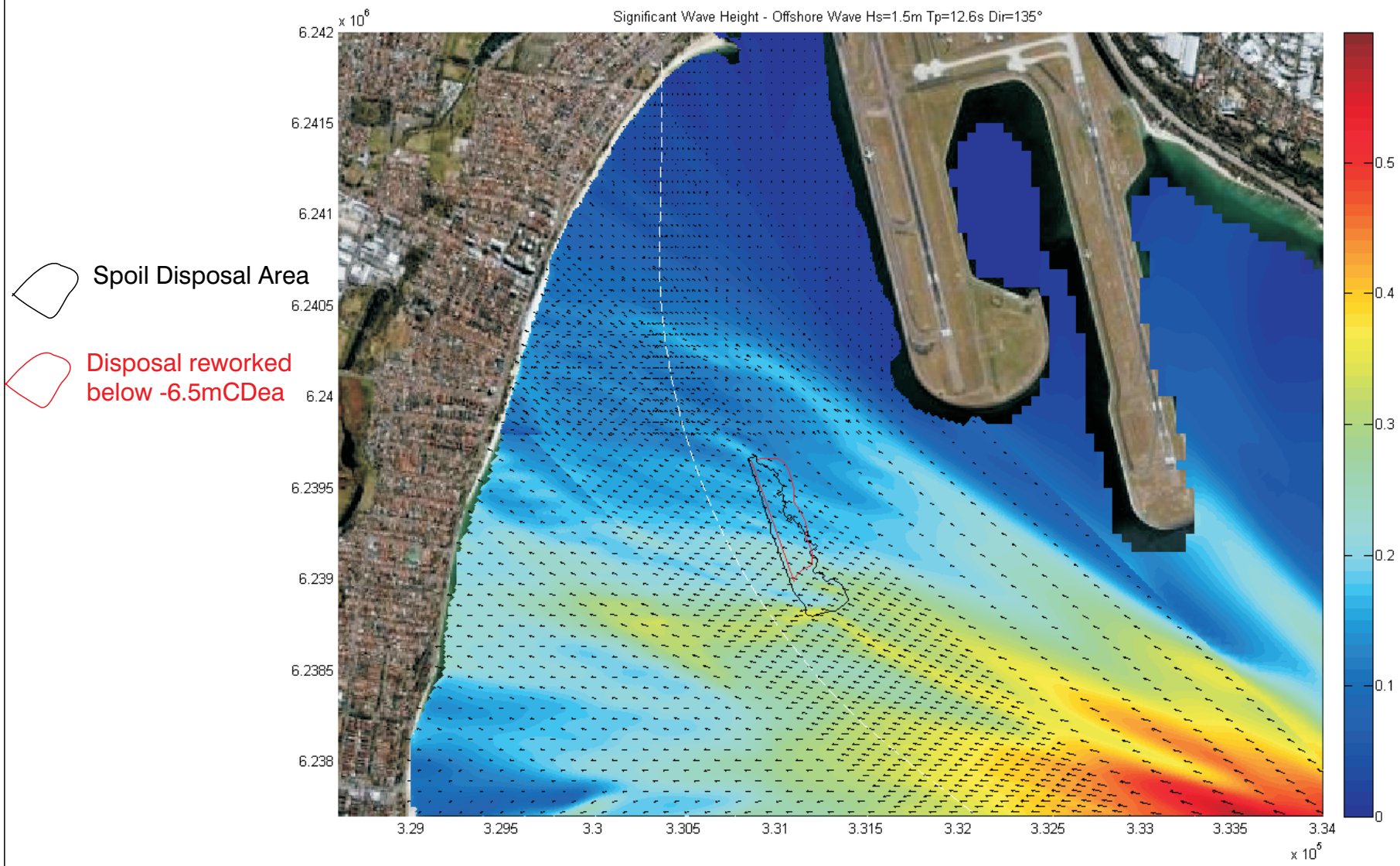
Figure 5



Cardno Lawson Treloar

LJ2654/L2006 11/10/2009
File: J/CM/LJ2654-BotanyPipeline/Docs/Figures/LJ2654_L2006Figures.cdr

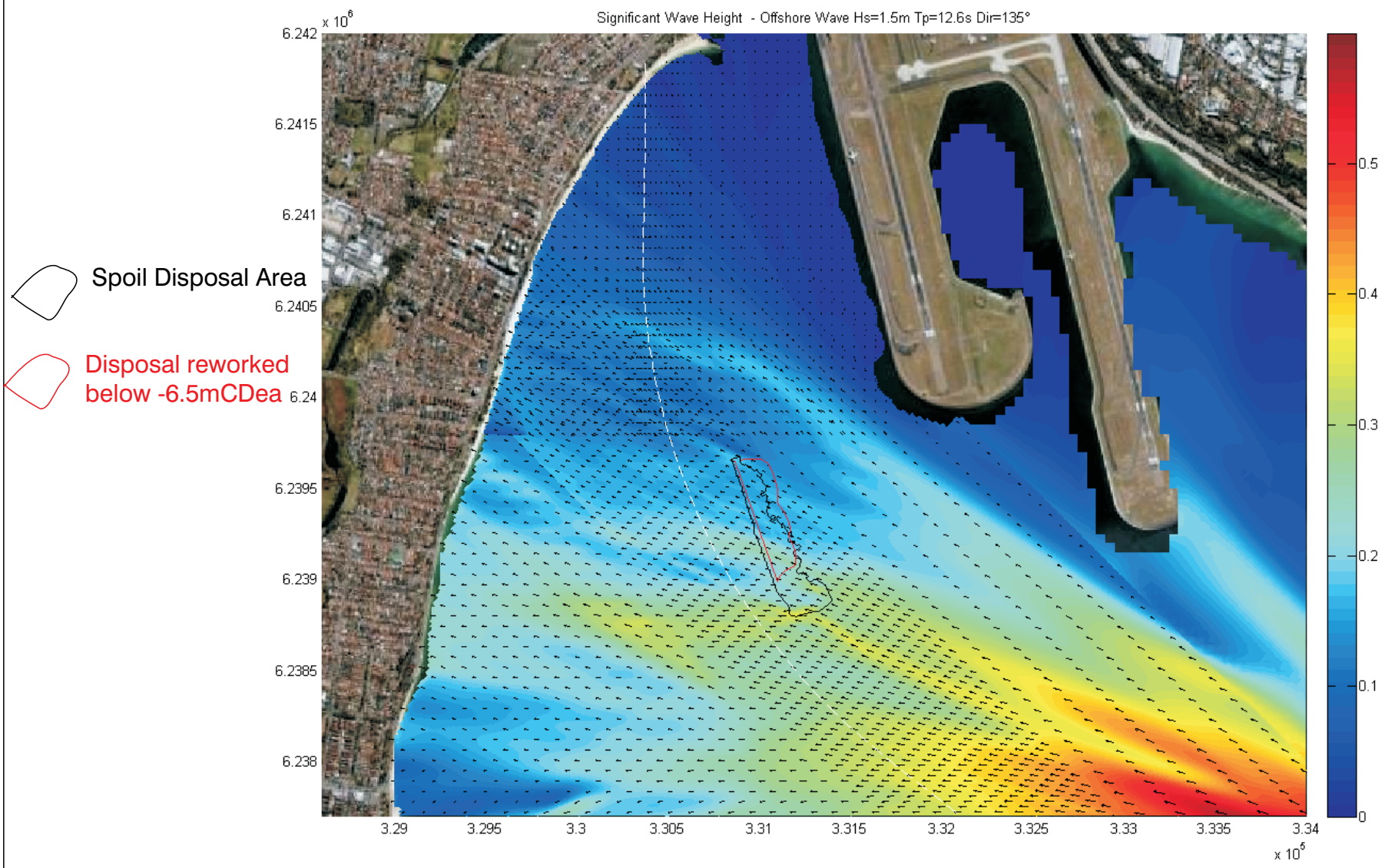
Pipeline Crossing Of Botany Bay - WDA - Spoil Borrow Pit impact on Coastal Processes
WAVE PROPAGATION INTO BOTANY BAY
PRE- SPOIL DISPOSAL SEABED
Figure 6



Cardno Lawson Treloar

LJ2654/L2006 11/10/2009
File: J/CM/LJ2654-BotanyPipeline/Docs/Figures/LJ2654_L2006Figures.cdr

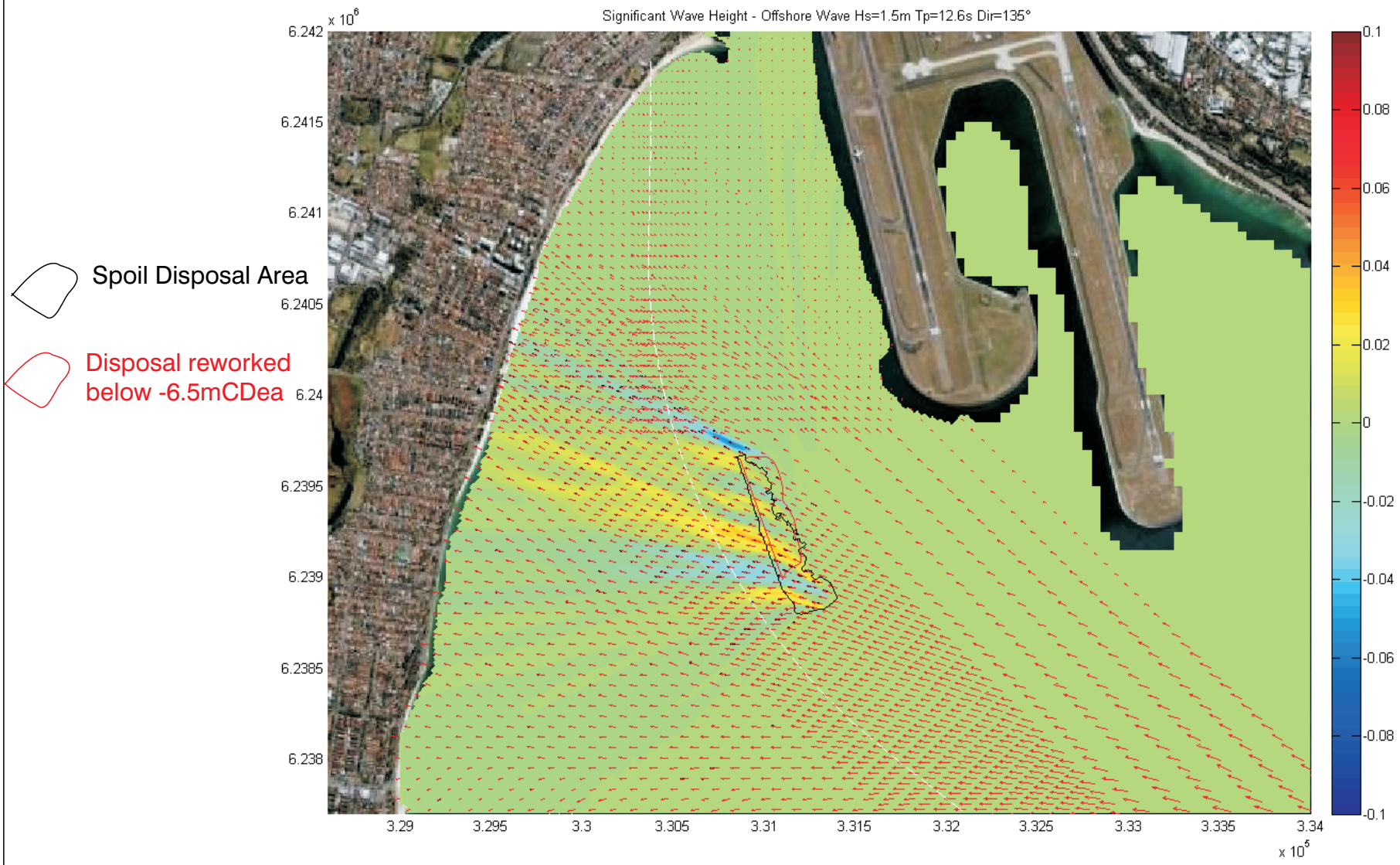
Pipeline Crossing Of Botany Bay - WDA - Spoil Borrow Pit impact on Coastal Processes
SIGNIFICANT WAVE HEIGHT IN BOTANY BAY
PRE- SPOIL DISPOSAL SEABED
Figure 7



Cardno Lawson Treloar

LJ2654/L2006 11/10/2009
File: J/CM/LJ2654-BotanyPipeline/Docs/Figures/LJ2654_L2006Figures.cdr

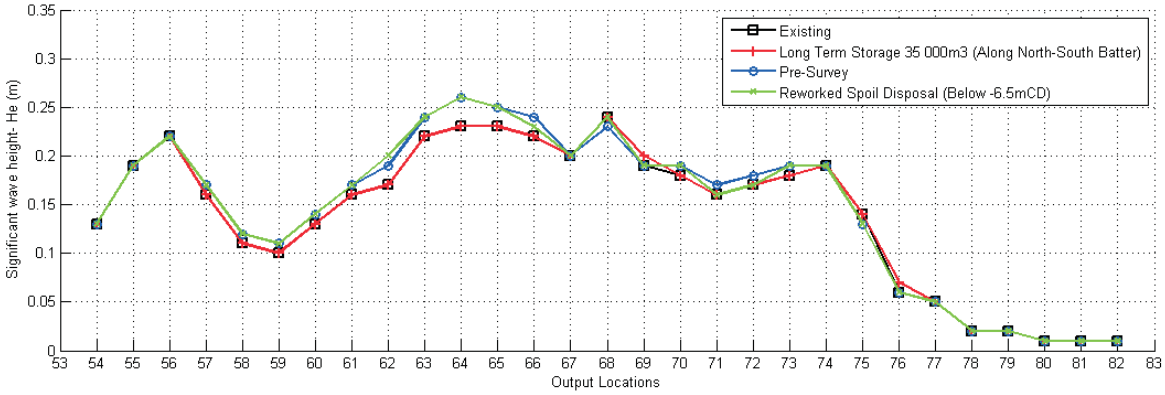
Pipeline Crossing Of Botany Bay - WDA - Spoil Borrow Pit impact on Coastal Processes
SIGNIFICANT WAVE HEIGHT IN BOTANY BAY
POST- SPOIL REWORKED DISPOSAL (BELOW -6.5mCD) SEABED
Figure 8

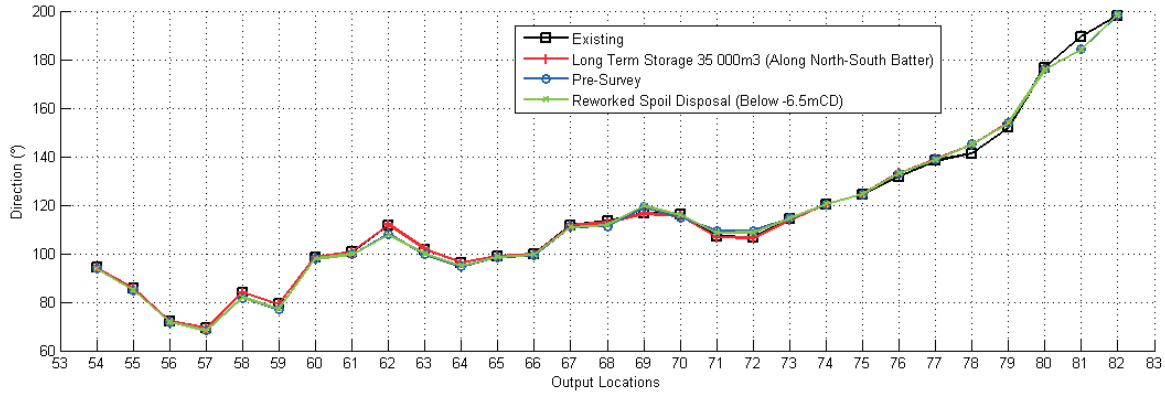


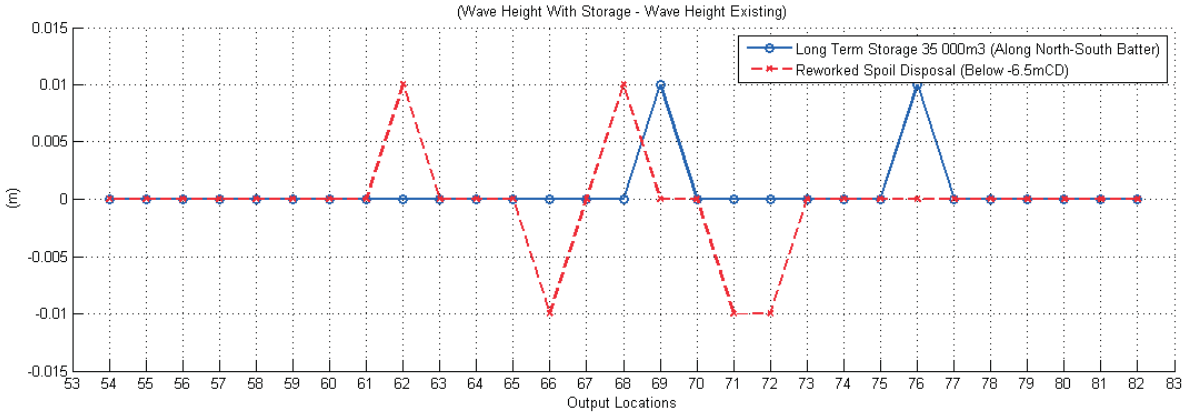
Cardno Lawson Treloar

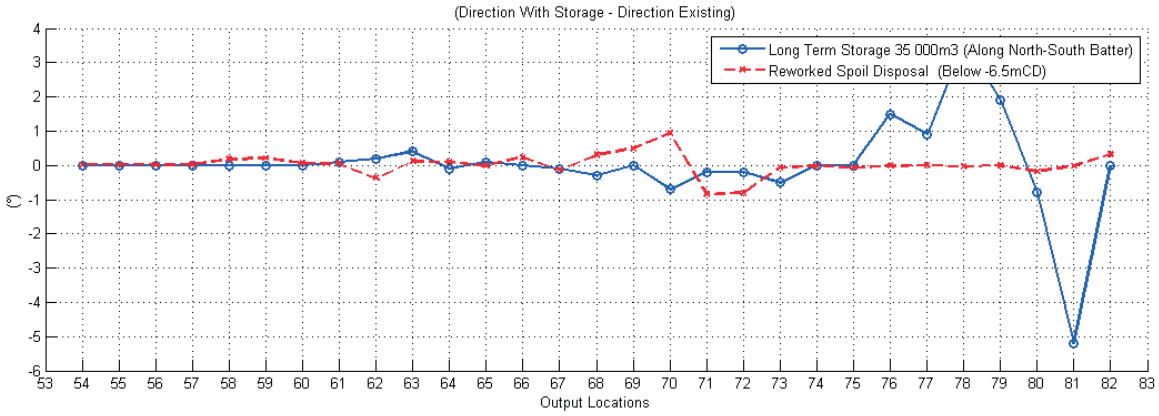
LJ2654/L2006 11/10/2009
File: J/CM/LJ2654-BotanyPipeline/Docs/Figures/LJ2654_L2006Figures.cdr

Pipeline Crossing Of Botany Bay - WDA - Spoil Borrow Pit impact on Coastal Processes
DIFFERENCE IN SIGNIFICANT WAVE HEIGHT IN BOTANY BAY
(POST REWORKED SPOIL DISPOSAL SEABED - PRE SPOIL DISPOSAL SEABED)
Figure 9









Cardno Lawson Treloar

Pipeline Crossing Of Botany Bay - WDA - Spoil Borrow Pit impact on Coastal Processes
EFFECTIVE WAVE HEIGHT AND MEAN DIRECTION - LONG TERM STORAGE
Proposed N-S Batter 35000m3 Storage) - Post- Reworked Spoil Disposal (Below -6..5mCD) Seabed

Figure 10

LJ2654/L2006 11/10/2009
File: J/CM/LJ2654-BotanyPipeline/Docs/Figures/LJ2654_L2006Figures.cdr

Appendix D – Relevant Statements of Commitment (PPR)

Appendix D - Relevant Statements of Commitment

Aquatic Ecology

Desired Outcome	Action	Timing
Water Quality and Aquatic Ecology		
Control potential dispersion of existing contaminated sediments during construction of Botany Bay pipeline.	3. Work practices will be developed to manage sediment-bound contaminants and acid sulphate soils located along the pipeline route (as detected by geotechnical testing) for implementation during construction. This may include where possible, the adoption of least impact construction dredging and the use of controls such as silt curtains.	During design (before construction commences).
No significant or irreversible impacts from dredging on sensitive natural ecosystems, oyster leases or aquaculture activities during construction of the Botany Bay pipeline.	6. Dredging activities will be carried out to minimise turbidity in Botany Bay immediately adjacent to the dredging area and to minimise potential impacts on sensitive natural ecosystems, oyster leases or aquaculture activities.	During design (before construction commences).

Noise

Desired Outcome	Action	Timing
Communications Processes		
The community and stakeholders have a high level of awareness of all processes and activities associated with the delivery system; Provision of accurate and accessible information; and A high level of responsiveness to issues and concerns raised by the community.	34. Communities directly impacted by construction will be provided with detailed information on the nature and timing of the proposed works including: a. Sydney Water will work with local Councils, stakeholder groups and the community to identify local issues and concerns prior to the commencement of construction to ensure that appropriate measures are put in place to mitigate local impacts; b. Measures will address issues such as access, local amenity, safety and traffic management; and c. Local communities will be consulted should site restoration works be required following construction.	During design (before construction commences).
	35. Communications processes will be developed and implemented at appropriate times with impacted communities throughout delivery of the delivery system. These will include: a. Opportunities to input to mitigation measures for construction or operations; a. Methods to inform the community of the progress and performance of the project and issues of interest to the community; b. Notification of construction activities to potentially affected local residents and businesses; c. Processes to receive and manage complaints in accordance with Sydney Water's customer contract; d. Consultation with affected property owners including property inspections, where appropriate; e. Induction and training of construction personnel in communications requirements; and f. Protocols to notify stakeholders of relevant activities and any incidents should they occur.	During design (before construction commences).