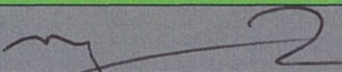
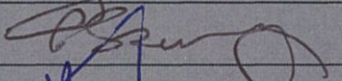



Construction Heritage Management Sub Plan

Appendix B3

NorthConnex & M2 Integration Projects Lend Lease Bouygues Joint Venture

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Glossary / Abbreviations

CEMP	Construction Environmental Management Plan
CHMP	Construction Heritage Management Plan
CoA	Condition of Approval
DP&E	Department of Planning and Environment
EIS	Environmental Impact Statement
EMS	Environmental Management System
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
EPL	Environment Protection Licence
ER	Environmental Representative
EWMS	Environmental Work Method Statements
GTLAC	Guringai Tribal Link Aboriginal Corporation
LALC	Local Aboriginal Land Council
LLBJV	Lend Lease Bouygues Joint Venture
MLALC	Metropolitan Local Aboriginal Land Council
NPW Act	<i>National Parks and Wildlife Act 1974</i>
OEH	Office of Environment and Heritage
PAD	Potential Archaeological Deposit
Project, the	The NorthConnex Project
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation (Roads and Maritime, 2011)
RAP	Registered Aboriginal Parties
SAPs	Sensitive Area Plans
Secretary	Secretary of the NSW Department of Planning and Environment (or delegate)
SPIR	Submissions and Preferred Infrastructure Report

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1 Introduction

1.1 Context

This Construction Heritage Management Sub Plan (CHMP or Plan) forms part of the Construction Environmental Management Plan (CEMP) for the construction of the NorthConnex Project. The NorthConnex Project was approved by the Minister for Planning on 13 January 2015.

The NorthConnex Project involves the construction of a multi-lane motorway linking the M1 Pacific Motorway at Wahroonga to the Hills M2 Motorway at West Pennant Hills, including integration works with the Hills M2 Motorway (the Project).

The Project comprises twin road tunnels generally following the alignment of Pennant Hills Road (the main alignment tunnels), with interchanges at the northern and southern end of the Project and the provision of a new westbound lane on the Hills M2 Motorway extending through to the Windsor Road off-ramp. The Project is being constructed by a joint venture partnership comprising Lend Lease and Bouygues (the LLBJV).

The Project consists of the following key features:

- Twin motorway tunnels around nine kilometres in length with two lanes in each direction and provision for a third lane in each direction if required in the future.
- A northern interchange with the M1 Pacific Motorway and Pennant Hills Road, including sections of tunnel for on-ramps and off-ramps, which also facilitate access to and from the Pacific Highway.
- A southern interchange with the Hills M2 Motorway and Pennant Hills Road including sections of on-ramps and off-ramps.
- Integration works with the Hills M2 Motorway including alterations to the eastbound carriageway to accommodate traffic leaving the Hills M2 Motorway to connect the Project travelling northbound and the provision of a new westbound lane on the Hills M2 Motorway extending through to the Windsor Road off-ramp.
- Tie-in works with the M1 Pacific Motorway extending to the north of Edgeworth David Avenue.
- A motorway control centre located near the southern interchange on the corner of Eaton Road and Pennant Hills Road that includes operation and maintenance facilities.
- Two tunnel support facilities incorporating emergency smoke extraction outlets and substations.
- Ancillary facilities for motorway operation, such as electronic tolling facilities, signage, ventilation systems and fire and life safety systems including emergency evacuation infrastructure.
- Modifications to service utilities and associated works at surface roads near the two interchanges and operational ancillary facilities.
- Modifications to local roads, including widening of Eaton Road near the southern interchange and repositioning of the Hewitt Avenue cul-de-sac near the northern interchange.
- Ancillary temporary construction facilities and temporary works to facilitate the construction of the Project.

This CHMP has been prepared to address the requirements of the Minister's Conditions of Approval (CoA), the mitigation measures listed in the NorthConnex Environmental Impact Statement (EIS), the Submissions and Preferred Infrastructure Report (SPIR) and all applicable legislation.

1.2 Background

In October 2013, the NorthConnex Project was declared to be State significant infrastructure and critical State significant infrastructure (SSI 6136) under Part 5.1 the *Environmental Planning and Assessment Act 1979*. The *NorthConnex - Environmental Impact Statement* (AECOM July 2014) assessed the impacts of construction and operation of the Project on Aboriginal and non-Aboriginal heritage, within chapter 7.

The EIS identified two areas of archaeological sensitivity each containing a number of Aboriginal heritage sites adjacent to the Project, however concluded that impacts would be avoided through the design of the Project and indirect impacts to these items were unlikely. The level of impacts and management requirements for each of these Aboriginal Heritage areas is detailed within Table 5-1 of this plan. Sites are identified in the project Sensitive Area Plans (SAPs).

Construction of the Project is anticipated to result in direct, potentially direct, or indirect impacts to a total of 62 listed non-Aboriginal heritage items, as determined by the EIS. Of the 62 heritage items:

- One item, being a garden containing two Canary Island Palms (Hornsby LEP reference: I762), is expected to be directly impacted from future surface works and is located within a property that would be acquired. Feasible and reasonable options for avoidance and translocation are currently being investigated, as per CoA B21.
- Two listed heritage items expected to be partially and directly impacted by the project. These items are:
 - The Thornleigh Maltworks (ID No A66 under the Hornsby LEP) in Thornleigh would be impacted by the construction of the Pioneer Avenue compound. Due to the significance of this location, the project has adopted the following mitigation and management approaches for the site:
 - Demolition of non-significant structures;
 - Retention of the germination building (a structure of importance);
 - Subject to safety clearance, retention of additional structures such as the silos;
 - Completion of archival recording and on-site archaeological test excavations (where appropriate) under the guidance of an appropriately qualified excavation director;
 - Appropriate safe working distances from retained structures, exclusion fencing and sensitive area signage; and
 - Additional reasonable and feasible measures as recommended following completion of the archaeological investigations.
 - Curtilage of the heritage street trees (ID No I769), at Woonona Avenue, Wahroonga would be impacted by the northern interchange.
- Two heritage conservation areas would be partially and directly impacted by the project:
 - The Wahroonga North heritage conservation area (ID No C8 under the Hornsby LEP), in which part of the northern interchange would be located.
 - The Beecroft-Cheltenham heritage conservation area (ID No C2 under the Hornsby LEP), in which the Wilson Road compound (C6) and the southern emergency smoke extraction facility would be located.

The EIS also identified the potential of indirect impacts from construction/permanent impacts from the project, namely vibration, settlement and groundwater drawdown, in addition to acoustic treatments. The level of impact and indicative management requirements for each of the non-Aboriginal heritage sites is detailed within Table 5-2 of this plan. Mitigation measures are detailed in Table 6-1.

1.3 Environmental Management Systems Overview

The overall Environmental Management System (EMS) for the Project is described in the Construction Environmental Management Plan (CEMP). The CHMP is part of the LLBJV environmental management framework for the Project, as described in Section 4.1 of the CEMP. Management measures identified in this Plan will be incorporated into site or activity specific Environmental Work Method Statements (EWMS).

Used together, the CEMP, sub plans, SAP and EWMS form management approaches that clearly identify required environmental management actions for implementation by LLBJV personnel and contractors.

The review and document control processes for this Plan are described in Chapter 10 of the CEMP.

2 Purpose and Objectives

2.1 Purpose

The purpose of this Plan is to describe how Aboriginal and non-Aboriginal heritage will be protected and managed during construction of the Project.

2.2 Objectives

The key objective of the CHMP is to ensure that impacts to Aboriginal and non-Aboriginal heritage are minimised and within the scope permitted by the planning approval. To achieve this objective, the following will be undertaken:

- Ensure appropriate controls and procedures are implemented during construction activities to minimise or avoid potential adverse impacts to Aboriginal and non-Aboriginal heritage within and adjacent to the Project. These heritage areas and sites include those that have been identified within the EIS or any unexpected heritage items that are discovered during construction.
- Ensure appropriate measures are implemented to address the relevant CoA and the safeguards detailed in the SPIR.
- Ensure appropriate measures are implemented to comply with all relevant legislation and other requirements as described in Section 3 of this Plan.
- Follow the Roads and Maritime Standard Management Procedure – Unexpected Heritage Items (Appendix A) to ensure the correct procedure and notification requirements are followed if any unexpected heritage objects/places uncovered during construction.
- Ensure training is provided in the form of inductions to relevant Project personnel on heritage items, protection measures and unexpected heritage items procedures before they begin work on site.

3 Environmental Requirements

3.1 Relevant Legislation and Guidelines

3.1.1 Legislation

Legislation relevant to heritage management for this project includes:

- *Environmental Planning and Assessment Act 1979* (EP&A Act).
- *National Parks and Wildlife Act 1974* (NPW Act).
- *Heritage Act 1977* (Heritage Act).
- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Commonwealth).
- *Ku-ring-gai Local Environment Plan 2015* (Ku-ring-gai LEP), as well as the superseded *Draft Ku-ring-gai Local Environmental Plan 2013* (Draft Ku-ring-gai LEP)
- *The Hills Local Environmental Plan 2012* (Hills LEP)
- *Hornsby Local Environmental Plan 2013* (Hornsby LEP)

Relevant provisions of the above legislation are explained in the register of legal and other requirements included in Appendix A2 of the CEMP. It should be noted that references to the Ku-ring-gai Planning Scheme Ordinance 1971 has been replaced with Ku-ring-gai Local Environmental Plan 2015, as the previously identified items are not located in land identified as a 'Deferred Area', but are listed in the Ku-ring-gai LEP.

3.1.2 Guidelines

The main guidelines, specifications and policy documents relevant to this Plan include:

- *Specification D&C G36 – Environmental Protection* (Roads and Maritime, 2013).
- *Standard Management Procedure Unexpected Heritage Items* (Roads and Maritime, 2013).
- *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (Roads and Maritime, 2011).
- *Assessing Significance for Historical Archaeological Sites and Relics* (DP&E, 2009).
- *How to Prepare Archival Recording of Heritage Items* (NSW Heritage Office, 1998).
- *Photographic Recording of Heritage Items Using Film or Digital Capture* (DP&E, 2006).
- *Archaeological Assessments Guideline* (Heritage Council, 1996)
- *Criteria for the Assessment of Excavation Directors* (Heritage Council, 2011))
- Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC, July 2005);
- Hornsby Development Control Plan, Chapter 9 (Heritage, 2013)

3.2 Minister's Conditions of Approval

The CoA relevant to this Plan is listed in Table 3-1 below. A cross reference is also included to indicate where the condition is addressed in this Plan or other Project management documents.

Table 3-1 Conditions of Approval relevant to the CHMP

CoA No.	Condition Requirements	CHMP Reference
B18	The Proponent shall not destroy, modify or otherwise impact any heritage items outside the SSI footprint.	Table 6-1
B19	The Proponent shall detail avoidance, mitigation and management measures for all heritage items in the study area adopted in Volume 6, Technical Working Paper: Non-Aboriginal Heritage Assessment and Technical Working Paper: Aboriginal Cultural Heritage, of the document listed in condition A2(b), and any heritage item in the vicinity of the study area that may be affected by the SSI, noting the provisions of condition B18. The avoidance, mitigation and management measures are to be detailed in the Construction Heritage Management Plan required by condition D57(c) and the Construction Noise and Vibration Management Plan required by condition D57(b).	This Heritage Management Plan including Table 5-1, Table 5-2, Table 6-1 and Section 7.3.
B20	Identified impacts to heritage items shall be minimised where feasible and reasonable through both detailed design and construction, particularly with regard to the Thornleigh Maltworks. Where impacts are unavoidable, works shall be undertaken in accordance with the actions to manage heritage construction impacts specified in the Construction Heritage Management Plan required by condition D57(c) and under the guidance of a suitably qualified and experienced heritage specialist.	Table 6-1
B21	<p>The Proponent shall, where feasible and reasonable, design and construct the SSI to avoid trees that are heritage items or are associated with the heritage significance of heritage items or heritage conservation areas. In particular, the Proponent is to consider the avoidance of impacts to the Canary Island Palms associated with the Garden at 1 Pacific Highway, Wahroonga (1762) and street trees on Woonona Avenue, Wahroonga (1769).</p> <p>Where impacts to the Canary Island Palms cannot be avoided, the Proponent shall further investigate options for relocation of those trees in consultation with the relevant Council, prior to the commencement of works impacting the relevant trees.</p> <p>Where impacts to the street trees cannot be avoided, the Proponent shall further investigate options for replacement of those trees in consultation with the relevant Council, prior to the commencement of works impacting the relevant trees.</p>	Table 6-1
B22	Prior to conducting acoustic treatment at any heritage item in accordance with this approval, the Proponent shall obtain and implement the advice of a suitably qualified and experienced built heritage expert to ensure any such work is carried out in a manner sympathetic to the heritage values of the item.	Table 6-1.
B33	Prior to completion of detailed design, or as otherwise agreed by the Secretary, an Urban Design and Landscape Plan shall be prepared and implemented for the SSI. The Plan shall be prepared by suitably qualified and experienced person(s), in consultation with the relevant Council and community, for the approval of the Secretary. The Plan shall present an integrated urban and landscape design for the SSI, and shall include, but not necessarily be limited to:	Urban Design and Landscape Plan

Construction Heritage Management Sub Plan (Appendix B3)

CoA No.	Condition Requirements	CHMP Reference
	<p>(a) identification of design objectives, principles and standards based on:</p> <ul style="list-style-type: none">i) local environmental and heritage values,ii) urban design context,iii) sustainable design and maintenance,iv) community safety, amenity and privacy, including 'safer by design' principles where relevant,v) relevant design standards and guidelines; andvi) the urban design objectives outlined in Section 7.5.4 of the EIS; <p>(b) landscaping and building design opportunities to mitigate the visual impacts of the operational fixed facilities, including the ventilation facilities, emergency smoke extraction outlets and the Motorway Operations Complex, in accordance with the following design considerations:</p> <ul style="list-style-type: none">i) design and proportions of building facades, fences and landscaping should have regard to the surrounding urban context and built form and streetscape character,ii) opportunities for deep soil zone should be retained to sustain vegetation, including large trees,iii) design should have regard to breaking up building massing and articulating buildings and fences,iv) variations in materials and finishes should be used, andv) retention of a minimum of three (3) hours of direct sunlight in habitable rooms and in at least 50% of the principal private open space area at residential properties impacted by overshadowing from the SSI between 9.00am and 3.00pm on 21 June, or avoidance of unreasonably reduced access to sunlight where existing residential properties currently receive less than this requirement; <p>(c) the location of existing vegetation and proposed landscaping (including use of endemic and advanced tree species where practicable). Details of species to be replanted/ revegetated shall be provided, including their appropriateness to the area and habitat for threatened species. Where feasible and reasonable, cleared vegetation shall be reused;</p> <p>(d) a description of disturbed areas (including compounds) and details of the strategies to progressively rehabilitate, regenerate and/ or revegetate these areas;</p> <p>(e) design features, built elements, lighting and building materials;</p> <p>(f) an assessment of the visual screening effects of existing vegetation and the proposed landscaping and built elements. Where receivers have been identified as likely to experience high visual impact as a result of the SSI, the Proponent shall in consultation with affected receivers, identify opportunities for providing at-receiver landscaping to further screen views of the SSI. Where agreed to with the landowner, these measures shall be implemented during the construction of the SSI;</p> <p>(g) graphics such as sections, perspective views and sketches for key elements of the SSI, including, but not limited to, built elements of the SSI;</p> <p>(h) monitoring and maintenance procedures for the built elements, rehabilitated vegetation and landscaping (including weed control) including performance indicators, responsibilities, timing and duration and contingencies where rehabilitation of vegetation and landscaping measures fail; and</p> <p>(i) evidence of consultation with the relevant Council and community on the proposed urban design and landscape measures prior to its finalisation.</p>	

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CoA No.	Condition Requirements	CHMP Reference
C1	<p>Prior to the commencement of construction, or as otherwise agreed by the Secretary, the Proponent shall prepare and implement a Community Communication Strategy to the satisfaction of the Secretary. The Strategy shall provide mechanisms to facilitate communication between the Proponent (and its contractor(s)), the Environmental Representative (see condition D1), the relevant Council and community stakeholders (particularly adjoining landowners) on the design and construction environmental management of the SSI. The Strategy shall include, but not be limited to:</p> <ul style="list-style-type: none"> (a) identification of stakeholders to be consulted as part of the Strategy, including affected and adjoining landowners, key community and business groups, and community and social service organisations; (b) procedures and mechanisms for the regular distribution of accessible information to community stakeholders on construction progress and matters associated with environmental management, including provision of information in appropriate community languages; (c) the formation of community-based forums that focus on key environmental management issues for the SSI. The Strategy shall provide detail on the structure, scope, objectives and frequency of the community-based forums; (d) procedures and mechanisms through which the community stakeholders can discuss or provide feedback to the Proponent and/or Environmental Representative in relation to the environmental management and delivery of the SSI; (e) procedures and mechanisms through which the Proponent can respond to enquiries or feedback from the community stakeholders in relation to the environmental management and delivery of the SSI; and (f) procedures and mechanisms that would be implemented to resolve issues/ disputes that may arise between parties on the matters relating to environmental management and the delivery of the SSI, including but not limited to disputes regarding rectification or compensation for impacts to third party property and infrastructure. These procedures and mechanisms may include the use of a suitably qualified and experienced independent mediator. <p>Issues that shall be addressed through the Community Communication Strategy include (but are not necessarily limited to):</p> <ul style="list-style-type: none"> (i) traffic management (including property access, pedestrian access); (ii) air quality; (iii) heritage matters; (iv) landscaping and urban design matters; (v) construction staging, hours and activities; (vi) noise and vibration mitigation and management; (vii) water quality, hydrology and flooding matters; and (viii) biodiversity matters. <p>The Proponent shall maintain and implement the Strategy throughout construction of the SSI.</p>	Community Communication Strategy
D5	<p>A geotechnical model of representative geological and groundwater conditions shall be prepared prior to excavation and tunnelling in subject area(s) to identify geological structures and groundwater features. This model shall include details of proposed excavations and tunnels, construction staging, and identify surface and sub-surface structures and infrastructure which may be impacted by the SSI, including the specific attributes of those structures. The Proponent shall use this model to assess the predicted settlement, ground movement, stress redistribution and horizontal strain profiles caused by excavation and tunnelling on adjacent property and infrastructure.</p>	Table 6-1.

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CoA No.	Condition Requirements	CHMP Reference															
D6	The Proponent shall undertake a review of property and infrastructure at risk from damage to determine appropriate settlement criteria to prevent damage.	Table 6-1.															
D7	Should the geotechnical model in condition D5 identify exceedances of the criteria established in condition D8 or in Table 1 (whichever is the lower), the Proponent shall identify and implement mitigation measures such as appropriate support and stabilisation structures in consultation with the relevant land and/or infrastructure owners prior to the commencement of construction to ensure where possible that underground services, infrastructure and adjacent buildings will not experience settlements exceeding the criteria.	Table 6-1.															
	<table border="1"> <thead> <tr> <th>Beneath Structure/Facility</th> <th>Maximum Settlement</th> <th>Maximum Angular Distortion</th> </tr> </thead> <tbody> <tr> <td>Buildings - Low or non sensitive properties (i.e. ≤ 2 levels and carpark)</td> <td>30 mm</td> <td>1 in 350</td> </tr> <tr> <td>Buildings - High or sensitive properties (i.e. ≥ 3 levels and heritage items)</td> <td>20 mm</td> <td>1 in 500</td> </tr> <tr> <td>Roads and Parking areas</td> <td>40 mm</td> <td>1 in 250</td> </tr> <tr> <td>Parks</td> <td>50 mm</td> <td>1 in 250</td> </tr> </tbody> </table> <p>The above criteria does not remove any responsibility from the Proponent for the protection of existing structures or for rectifying any damage resulting from the SSI.</p>	Beneath Structure/Facility	Maximum Settlement	Maximum Angular Distortion	Buildings - Low or non sensitive properties (i.e. ≤ 2 levels and carpark)	30 mm	1 in 350	Buildings - High or sensitive properties (i.e. ≥ 3 levels and heritage items)	20 mm	1 in 500	Roads and Parking areas	40 mm	1 in 250	Parks	50 mm	1 in 250	
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Roads and Parking areas	40 mm	1 in 250															
Parks	50 mm	1 in 250															
D30	<p>Prior to the commencement of construction affecting the Thornleigh Maltworks, and subject to condition B20, the Proponent shall carry out an archival recording of the heritage item to record the connection of the original structures to the modern upgraded structures of the Thornleigh Maltworks. Where archaeological test excavations are carried out, in accordance with the documents listed in condition A2, those investigations shall be undertaken in consultation with the relevant Council and OEH (Heritage Division), and shall:</p> <ol style="list-style-type: none"> be conducted in accordance with the Archaeological Assessments Guideline (Heritage Council, 1996) using a methodology prepared in consultation with the OEH (Heritage Division). The archaeological investigation shall be undertaken by an archaeological heritage consultant, a suitably qualified and experienced heritage expert with demonstrated ability to comply with the Criteria for the Assessment of Excavation Directors (Heritage Council July 2011); provide for the detailed analysis of any heritage items discovered during the investigations; include management options for these heritage items (including options for relocation and display); and if the findings of the investigations are significant, provide for the preparation and implementation of a heritage interpretation plan. <p>Within 12 months of completing the above work, or as otherwise agreed by the Secretary, the Proponent shall prepare a report containing the findings of the excavations, including artefact analysis, and the identification of a final repository for finds, prepared in consultation with the OEH (Heritage Division) and to the satisfaction of the Secretary. The final approved report shall be submitted to the Secretary, the Heritage Council of NSW, and the local library and the local Historical Society in the relevant local government area(s).</p>	Table 6-1															

Construction Heritage Management Sub Plan (Appendix B3)

CoA No.	Condition Requirements	CHMP Reference
D31	The Proponent shall not harm, modify or otherwise impact the heritage items listed as receiving 'No Impact' from the SSI under the column heading 'Degree of Impact' in Table 7 of Volume 6, Technical Working Paper: Non-Aboriginal Heritage Assessment, of the document listed in condition A2(b).	Table 5-2 and Table 6-1
D32	The Proponent shall take all reasonable steps so as not to harm, modify or otherwise impact any Aboriginal heritage item associated with Archaeological Sensitive Area 1 management zone or Archaeological Sensitive Area 2 management zone.	Table 5-1 and Table 6-1
D33	This approval does not allow the Proponent to harm, modify or otherwise impact human remains as part of the SSI.	In accordance with Table 6-1, if any unexpected heritage items (including human remains) are encountered, works potentially affecting the find would cease immediately and the Roads and Maritime Standard Management Procedure – Unexpected Heritage Items (August 2013) (refer Appendix A) would be followed.
D34	Where previously un-identified heritage items are discovered during construction of the SSI, the Proponent shall implement appropriate procedures for managing those impacts as specified in the Construction Heritage Management Plan required by condition D57(c).	Table 6-1 and Appendix A.
D57	As part of the CEMP for the SSI, the Proponent shall prepare and implement:	
D57 c)	a Construction Heritage Management Plan to ensure construction impacts on Aboriginal and non-Aboriginal heritage will be appropriately avoided, minimised and managed. The Plan shall be developed in consultation with OEH, the relevant Council, the NSW Heritage Council (for non-Aboriginal State heritage items) and the relevant Local Aboriginal Land Councils (for Aboriginal heritage), and include, but not necessarily be limited to:	This Heritage Management Plan including Table 6-1. Further detail on consultation is included within Section 4.1.
D57 c)i)	in relation to Aboriginal Heritage:	
D57 c)i)(A)	details of management measures to be carried out in relation to Aboriginal heritage, including a detailed methodology and strategies for protection, monitoring, and conservation of sites and items;	Table 5-2 and Table 6-1.
D57 c)i)(B)	procedures for dealing with previously unidentified Aboriginal objects (excluding human remains), including cessation of works in the vicinity, assessment of the significance of the item(s) and determination of appropriate mitigation measures, including when works can recommence, by a suitably qualified and experienced archaeologist in consultation with the Secretary and Aboriginal stakeholders, assessment of the consistency of any Aboriginal heritage impacts against the approved impacts of the SSI, and, where relevant, registration in the OEH's Aboriginal Heritage Information Management System (AHIMS) register;	Table 6-1 and Appendix A.

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CoA No.	Condition Requirements	CHMP Reference
D57 c)i)(C)	procedures for dealing with human remains, including cessation of works in the vicinity, notification of Secretary, NSW Police Force, OEH and Aboriginal stakeholders, and commitment to cease recommencing any works in the area unless authorised by the OEH and/or the NSW Police Force;	Table 6-1 and Appendix A.
D57 c)i)(D)	details of monitoring and management measures to ensure impacts on rock shelter and overhang sites are avoided;	Table 6-1 and Table 5-1
D57 c)i)(E)	heritage training and induction processes for construction personnel (including procedures for keeping records of inductions) and obligations under the conditions of this approval including site identification, protection and conservation of Aboriginal cultural heritage; and	Table 6-1 and Section 7.2.
D57 c)i)(F)	procedures for ongoing Aboriginal consultation and involvement for the duration of the SSI; and	Section 4.2.
D57 c)ii)	in relation to non-Aboriginal Heritage:	
D57 c)ii)(A)	identification of heritage Items directly and indirectly affected by the SSI;	Table 5-2 and the Sensitive Area Plans.
D57 c)ii)(B)	consideration of methods to prevent damage to retained heritage items, including:	Table 6-1
D57 c)ii)(B)I.	procedures for identifying minimum working distances to retained heritage items (including, at minimum, vibration testing and monitoring),	Section 7.3.1 and Table 6-1.
D57 c)ii)(B)II.	detailed options for alteration of construction methodology should preferred values for vibration be exceeded, and	Table 6-1 and Section 7.4.
D57 c)ii)(B)III.	commitment to implementing those options if preferred values for vibration are likely to be exceeded;	Table 6-1 and Section 7.5.
D57 c)ii)(C)	details of management measures to be implemented to prevent and minimise impacts on heritage items (including further heritage investigations, archival recordings and/or measures to protect unaffected sites during construction works in the vicinity);	Table 6-1.
D57 c)ii)(D)	details of monitoring and reporting requirements for impacts on heritage items;	Table 6-1 and Section 7
D57 c)ii)(E)	procedures for dealing with previously unidentified heritage objects, (including cessation of works in the vicinity, assessment of the significance of the item(s) and determination of appropriate mitigation measures including when works can re-commence by a suitably qualified and experienced archaeologist in consultation with the OEH, NSW Heritage Council and the Secretary, assessment of the consistency of any heritage impacts against the approved impacts of the SSI, and, where relevant, notification of the Heritage Council of NSW in accordance with section 146 of the Heritage Act 1977; and	Table 6-1 and Appendix A.
D57 c)ii)(F)	heritage training and induction processes for construction personnel (including procedures for keeping records of inductions and obligations under this approval including site identification, protection and conservation of non-Aboriginal cultural heritage; and	Table 6-1 and Section 7.2.
D57 c)iii)	mechanisms for the monitoring, review and amendment of this plan.	Section 8.

3.3 Revised Environmental Management Measures

The revised environmental management measures from the SPIR relevant to this Plan are listed in Table 3-2 below. A cross reference is also included to indicate where the condition is addressed in this Plan. Where conditions are not specifically addressed in this Plan, justification is provided. The timing of when the commitment applies has also been included.

Table 3-2 Revised Environmental Management Measures relevant to this CHMP

Ref #	Commitment	Timing	CHMP Reference
SPIR environmental management measures – non-Aboriginal heritage:			
REMM NAH1	In the event of an unexpected cultural heritage find, the Standard Management Procedure – Unexpected Archaeological Finds (Roads and Maritime, 2012d) would be followed. This would include notification to the NSW Heritage Branch.	Prior to construction and construction	Table 6-1 and Appendix A
REMM NAH2	Construction personnel would be made aware of non-Aboriginal heritage sites as part the site induction. These sites would be identified on sensitive area plans and in the CEMP.	Prior to construction and construction	Table 6-1, Section 7.2, Sensitive Area Plans included in the CEMP
REMM NAH3	Feasible and reasonable options for the relocation of the two mature Canary Island Palms (I762) would be investigated. If the trees cannot be relocated: <ul style="list-style-type: none"> Archival samples would be collected in accordance with NSW Royal Botanic Gardens collection procedures. Options would be investigated to collect seed samples for later propagation. Oral histories (if relevant) would be obtained. 	Detailed design Construction	Table 6-1
REMM NAH4	Feasible and reasonable options to avoid direct impacts to identified heritage listed vegetation along Woonona Ave, Wahroonga (I769) would be investigated during detailed design. If impacts cannot be avoided: <ul style="list-style-type: none"> The street frontage would be revegetated in consultation with the landowner (Hornsby Shire Council). Plantings that are representative species of the Blue Gum High Forest ecological community would be considered. 	Detailed design Construction	Table 6-1
REMM NAH5	Where non-Aboriginal heritage items have been identified as having the potential to be impacted by construction vibration or ground settlement, the following would be implemented: <ul style="list-style-type: none"> A ground settlement assessment would be undertaken during detailed design to confirm predicted impacts on heritage structures. Completion of existing condition surveys prior to the commencement of construction for heritage items within the project corridor or that have been identified during detailed design to be within recommended safe 	Prior to construction, construction and post-construction	Table 6-1

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Ref #	Commitment	Timing	CHMP Reference
	<p>working distances to surface works. A post-construction condition survey would also be undertaken of these items to identify if impacts have occurred.</p> <p>Additional feasible and reasonable mitigation and management measures to be implemented would be identified based on the above assessments. This would include the use of vibration monitoring where recommended maximum levels are predicted to be exceeded. The placement of vibration monitors would consider the heritage fabric of the item.</p>		
REMM NAH6	Landscaping of ancillary infrastructure sites would be undertaken with consideration of the heritage values of the Wairoonga North heritage conservation area and Beecroft Cheltenham heritage conservation area.	Detailed design	Table 6-1
REMM NAH7	The heritage values of items 1771, 1953, 1956, 1957 (including views and vistas from the items) would be considered during the detailed design of built elements of the project and the development of the landscaping plan.	Detailed design Prior to construction	Table 6-1
REMM NAH8	<p>The germination building at the Thornleigh Maltworks (A66) would be conserved. Prior to demolition of other structures:</p> <ul style="list-style-type: none"> A structural assessment of the germination structure would be conducted to ascertain the possible impact of the demolition of adjacent structures and to identify suitable mitigation methods to ensure the germination structure remains intact. Additional measures would be identified and implemented, if required, to treat the newly exposed surfaces of the germination structure to protect it from the elements as a result of the demolition of adjacent structures. An archival recording of the industrial site would be undertaken to record the connection of the original structures to the modern upgraded structures. An archaeological test excavation program would be undertaken to assess the archaeological potential of identifying evidence of the early malting industry in this area, and the relationship of the industrial to the urban site and evidence of the occupation of the Manager's house by the Chilvers family. 	Prior to construction	Table 6-1
REMM OpNAH9	The heritage values of items 1771, 1953, 1956, 1957 (including views and vistas from the items) would be considered during the detailed design of built elements of the project and the development of the landscaping plan.	Detailed design / Prior to construction	Table 6-1
SPIR environmental management measures – Aboriginal heritage:			
REMM AH1	The detailed design of the project would be developed to avoid direct impacts on ASA1 or ASA2 management zones. If direct impacts to ASA1 or ASA2 management zones cannot be avoided, a Stage 3 assessment would be conducted with reference to the Roads and Maritime PACHCI process (Roads and Maritime, 2011c).	Prior to construction and construction	Table 6-1
REMM AH2	In the event that the project is required to extend outside the assessed construction footprint or study area, these additional areas would be assessed in accordance with PACHCI prior to the commencement of construction within those identified areas.	Prior to construction and construction	Table 6-1

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Ref #	Commitment	Timing	CHMP Reference
REMM AH3	<p>The identified rockshelter sites and overhangs located within 200 metres of the Hills M2 Motorway integration works should be clearly delineated prior to construction works.</p> <p>NOTE: Under the terms of the SSI approval, the Project can only impact, (including fencing) within the approved Project footprint, and under the terms of CoA B18, the Project is not permitted to harm, modify, or otherwise impact any heritage items outside of the SSI footprint. To protect offsite rock shelters and overhangs from potential impacts during construction, the Project boundary would be clearly delineated and identified as an environmentally sensitive area where these items are located within 200 metres of the SSI footprint, as per Management Measure H9 in Table 6-1</p>	Construction	Table 6-1
REMM AH4	<p>During construction, vibration monitoring would be conducted for vibration intensive works within 50 metres of rockshelter sites and associated overhangs within management zone ASA2. The need for vibration monitoring would be informed by a preliminary screening of activities at this location to identify activities which have the potential for vibration at these areas of sensitivity.</p>	Construction	Table 6-1
REMM AH5	<p>If an Aboriginal object(s) is discovered during construction it would be managed in accordance with the standard management procedure: Unexpected Archaeological Finds (Roads and Maritime, 2012d), including:</p> <ul style="list-style-type: none"> • Relevant works in the vicinity of the object(s), with the potential to directly or indirectly impact on the object(s), would cease. • The construction Environmental Representative, OEH and Registered Aboriginal Parties (RAPs) would be notified of the discovery. • A qualified archaeologist would be engaged to determine the nature, extent and scientific significance of the object(s). • Management recommendations would be developed in consultation with the qualified archaeologist, OEH and RAPs. 	Construction	Table 6-1 and Appendix A
REMM AH6	<p>If human remains are discovered during construction would be managed in accordance with the standard management procedure: Unexpected Archaeological Finds (Roads and Maritime, 2012d), including:</p> <ul style="list-style-type: none"> • Relevant works in the vicinity of the remains, with the potential to directly or indirectly impact on the remains, would cease. • The construction Environmental Representative, OEH and NSW Police would be notified of the discovery. • Directions from the NSW Police and / or OEH, as relevant, would be followed depending on the nature of the remains and the outcomes of forensic investigations. 	Construction	Table 6-1 and Appendix A

4 Consultation

4.1 Consultation Undertaken to Date

Extensive consultation with government authorities, the public (including community groups and adjoining and affected landowners) and Aboriginal stakeholders was conducted during the development of the EIS.

The Aboriginal heritage assessment conducted during the EIS involved consultation with the representatives of the relevant Aboriginal stakeholders, which included the Metropolitan Local Aboriginal Land Council (MLALC) and the Guringai Tribal Link Aboriginal Corporation (GTLAC).

Aboriginal heritage consultation was facilitated by Roads and Maritime and was undertaken consistent with the requirements of the Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation (DEC, 2005b) and the Roads and Maritime Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI, 2011). Representatives from MLALC and GTLAC participated in the site inspections held in late 2013.

This Plan has been developed in consultation with Aboriginal stakeholders, NSW Office of Environment and Heritage (OEH), the NSW Heritage Council, Hornsby Shire Council, Hills Shire Council and Ku-ring-gai Municipal Council.

4.2 Ongoing Aboriginal Consultation

As detailed in the EIS, the Project has been designed to ensure that there are no direct impacts to known Aboriginal objects, places or cultural features. As such, no further consultation or investigation is required.

However, in the event that an unexpected Aboriginal object is discovered during construction, further consultation with the Aboriginal Stakeholders, DP&E and in accordance with the Standard Management Procedure, Unexpected Heritage Items (Roads and Maritime, 2013) will be conducted.

During construction, if additional land outside the assessed construction footprint is required for the construction of the Project, an investigation will be carried out by the project archaeologist, in accordance with the Procedure for Aboriginal Cultural Heritage Consultation and Investigation (Roads and Maritime, 2011) (PACHCI). This process will determine if further consultation and/or approval is required prior to works being conducted.

Table 6-1 should be referred for detail on consultation requirements.

4.3 Ongoing Consultation in regards to Non-Aboriginal Heritage

The management of impacts and potential impacts to non-Aboriginal heritage items will require further consultation with:

- The relevant Council if heritage listed trees are going to be impacted.
- Council and OEH in relation to the Thornleigh Maltworks test excavation.
- Relevant land owners if support and stabilization of heritage structures is required.
- OEH, NSW Heritage Council and DP&E In the event that previously unidentified heritage items are encountered.

5 Environmental Aspects and Impacts

5.1 Construction Activities

Key aspects of the Project that could result in adverse impacts to Aboriginal and Non-Aboriginal heritage include:

- Clearing and grubbing (removal of heritage vegetation).
- Change in heritage conservation area values (i.e construction of new elements within heritage conservation areas).
- Construction of new road infrastructure or ancillary facilities.
- Earthworks (vibration).
- Piling (vibration).
- Excavation and cavern construction (vibration and settlement).
- Tunnelling activities (vibration, settlement and groundwater drawdown).
- Acquisition and associated demolition of properties that contain heritage items.
- At-property acoustic treatment of heritage listed buildings.

Refer also to Appendix A2 of the CEMP – Aspects and Impacts Register.

5.2 Identified and Impacted Aboriginal Cultural and Archaeological Heritage

It is detailed within the EIS that there are two broad areas of Aboriginal archaeological and cultural heritage significance adjacent to the Project that have the potential to be impacted upon by construction works, however impacts are not anticipated as they are situated outside of the construction footprint.

These areas are known as the Archaeological Sensitivity Area 1 (ASA1) and Archaeological Sensitivity Area 2 (ASA2) management zones and are located adjacent to the M2. Table 5-1 summarises the level of impact and impact mitigation measures in relation to these Aboriginal management zones.

Additional registered Aboriginal heritage areas have been identified within the EIS however these are not included in Table 5-1 as they are outside the zone of potential impact (50 metres on the surface from the outer edge of the tunnels or 50 metres of surface works). The zone of potential impact is determined by the EIS.

A further AHIMS Register search has been carried out on the project to ensure that no additional Aboriginal heritage sites had been registered since the EIS. The search identified that no further sites have been registered within 50m of the sites since the EIS.

The Sensitive Area Plans included in the CEMP detail the locations of Aboriginal heritage items, Archaeological Sensitivity Areas and other sensitive areas adjacent to the corridor.

Table 5-1 Impacts and Management of Aboriginal cultural and archaeology areas

Name	Management Zone Summary	Impact	Mitigation
Archaeological Sensitivity Area 1 (ASA1) Management Zone	<ul style="list-style-type: none"> ASA1 was identified within Bidjigal Reserve on the northern side of Hills M2 Motorway and the southern side of Westmore Drive, West Pennant Hills. This area contains three registered AHIMS sites (#45-6-2097, #45-6-2160 and #45-6-2163) There is potential for further sites to be located within the area. Aboriginal consultation identified this area as containing areas of cultural significance. This area is located outside of the construction footprint for the Project. 	Minor potential for indirect impacts (as a result of vibration).	Avoidance, delineation and vibration monitoring (Refer to H21, H22 and H23 of Table 6-1 for specific detail on management measures)
Archaeological Sensitivity Area 2 (ASA2) Management Zone	<ul style="list-style-type: none"> ASA2 was identified within Bidjigal Reserve on the northern side of Hills M2 Motorway near Darling Mills Creek, Baulkham Hills. The area contains five previously registered AHIMS sites (#45-6-0923, #45-6-2548/45-5-0886, #45-6-2543, #45-6-2544 and #45-6-2542) There are two rock shelters sites and rock overhangs near Darling Mills Creek, located north of the Hills M2 Motorway. There is potential for further Aboriginal archaeological sites to be located in this area. This area is located outside of the construction footprint for the Project 	Minor potential for indirect impacts (as a result of vibration).	Avoidance, delineation and vibration monitoring (Refer to H21, H22 and H23 of Table 6-1 for specific detail on management measures)

5.3 Identified and Impacted Non-Aboriginal Heritage

During the EIS development various data base searches (e.g. The State Heritage Register and LEPs) were completed which identified 67 non-Aboriginal heritage items located within or adjacent to the works and are listed in Table 5-2. The location of these heritage items are shown within the Sensitive Area Plans (SAPs) included in the CEMP.

The main database sources listed in Table 5-2 are; Schedule 5 of The Hills Local Environmental Plan 2012 (Hills LEP); Schedule 5 of the Hornsby Local Environmental Plan 2013 (Hornsby LEP); Schedule 5 of the Ku-ring-gai Local Environment Plan 2015 (Ku-ring-gai LEP) and Schedule 5 of the Draft Ku-ring-gai Local Environmental Plan 2013 (Draft Ku-ring-gai LEP). More detail on the individual heritage items can be sourced from the relevant LEP or the EIS.

Construction of the Project is anticipated to result in direct, potentially direct, or indirect impacts to a total of 62 of these listed non-Aboriginal heritage items as determined by the EIS. Of the 62 heritage items:

- One item, being a garden containing two Canary Island Palms (Hornsby LEP reference: 1762), is expected to be directly impacted from future surface works and is located within a property that would be acquired. Feasible and reasonable options for avoidance and translocation of the palms are currently being investigated as part of detail design, as per CoA B21 however, the impacts to this item are likely to be significant.
- Two items would be partially and directly impacted with:
 - The demolition of structures associated with the Thornleigh Maltworks site (Hornsby LEP reference: A66), due to the establishment of the Pioneer Avenue construction compound. Feasible and reasonable options have been investigated during design of the project to date with the aim of retaining the original industrial structure (germination building) associated with this site; however, the impacts to the overall site complex are likely to be significant. The majority of the structures onsite including, the Managers House, are required to be demolished and this would change the context of the original use of the site. Although, except for the Manager's House, the remaining structures to be demolished are of the late 20th century and have no intrinsic heritage value apart from their connection to the site as a whole.

It is noted that the main original structure of the Thornleigh Maltworks site, the germination building, would be retained allowing for future conservation of the unique building. Further measures being considered include:

- Subject to safety clearance, retention of additional structures such as the silos;
 - Completion of archival recording and on-site archaeological test excavations (where appropriate) under the guidance of an appropriately qualified excavation director;
 - Appropriate safe working distances from retained structures, exclusion fencing and sensitive area signage; and
 - Additional reasonable and feasible measures as recommended following completion of the archaeological investigations.
- Impacts to the curtilage of heritage listed street trees at Woonona Avenue, Wahroonga (Hornsby LEP reference: I769). Feasible and reasonable options would be investigated to avoid or minimise the impact. If it is necessary to remove the trees, this would have some impact to the heritage value of the item. This impact could be mitigated through sympathetic plantings of similar species through re-vegetation efforts.
- Two heritage conservation areas would be partially and directly impacted, being the North Wahroonga heritage conservation area (Hornsby LEP reference: C2) due to the establishment of the Bareena Avenue construction compound, and the Beecroft-Cheltenham heritage conservation area (Hornsby LEP reference: C8) due to the establishment of the Wilson Road construction compound. Landscaping of the project within these areas would minimise the potential impacts. The overall heritage value of the heritage conservation areas would not be significantly impacted by the project.
 - Due to construction vibration from surface works, there is potential to directly impact 11 items. These impacts are anticipated to have a negligible to minor risk of affecting the value of the heritage items (Ku-ring-gai Local Environment Plan 2015 reference: I897, I898, I900, I901 and I902, Draft Ku-ring-gai Local Environmental Plan 2013 reference: I855, and Hornsby LEP reference: I767, I750, I770, I771, and I791). The degree of impact to these items is anticipated to be minor to negligible. The overall heritage value of the heritage items would not be significantly impacted by the project.
 - 44 items would be potentially directly impacted due to vibration, settlement and groundwater drawdown as a result of tunnelling works. These items are primarily located within the project corridor. Impacts to these items are anticipated to be minor to negligible. Two of these items would also be potentially directly impacted by construction vibration due to surface works. The overall heritage value of the heritage items would not be significantly impacted by the project. Potential direct impacts due to vibration and settlement is determined by the EIS as a zone on the surface equal to a distance of 50 meters from the outer edge of tunnelling or surface works.
 - 21 items may also be indirectly impacted by the project, due to temporary and / or permanent visual impacts. Of the 21 items, 19 items would also be directly impacted as outlined above. Impacts to the heritage items as a result of visual effects are anticipated to be minor to negligible. The overall heritage value of the heritage items would not be significantly impacted by the project.
 - There is also the potential for direct impacts due to implementation of at-property acoustic treatment of heritage items. Impacts to the heritage items as a result of conducting acoustic treatment are anticipated to be minor to negligible.

Table 5-2 summarises the level of these impacts and the available minimum management measures for identified properties as per the EIS, for each of the 67 heritage sites. Additional measures are detailed in Table 6-1 which provides a consolidated set of mitigation measures for the project generally.

It should be noted that the commencement of the *Ku-ring-gai Local Environment Plan 2015*, which supersedes the *Draft Ku-ring-gai Local Environment Plan 2013*, sees a number of changes to the heritage listing of items assessed in the EIS. Items that are no longer listed include items with Draft Ku-ring-gai reference: I855, I954, I957, I959 and I960, as well as item with Ku-ring-gai Planning Scheme Ordinance 1971 reference: I902.

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Table 5-2 Non-Aboriginal heritage – impacts and summary of management requirements

LEP	LEP / ID No.	Name	Significance	Impact	Minimum mitigation measures item as per Table 6.1
The Hills LEP	I28	Windsor Road from Baulkham Hills to Box Hill	Local	No Impact	<ul style="list-style-type: none"> No management required.
Hornsby LEP	C2	Beecroft – Cheltenham heritage conservation area	Local	Direct – change in heritage conservation area values	<ul style="list-style-type: none"> Ancillary infrastructure sites would be revegetated with consideration of the heritage values of the area. Where reasonable and feasible, avoid direct impacts to trees that are associated with the heritage significance of the conservation area. Where impacts to the street trees cannot be avoided, options for replacement of those trees in consultation with the relevant Council to be investigated.
Hornsby LEP	I710	Street Trees (Loch Maree Ave)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> Ground settlement assessment. Pre and post construction condition survey Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1). Where reasonable and feasible, design and construct the Project to avoid direct impacts to trees that are heritage items. Where impacts to the street trees cannot be avoided, further investigate options for replacement of those trees in consultation with the relevant Council, prior to the commencement of works impacting the relevant trees.
Hornsby LEP	A66	Thornleigh Malt Works	Local	Direct – Acquisition	<ul style="list-style-type: none"> Partial preservation – the germination building and silos to be conserved. Structural assessment of the germination structure to ascertain the possible impact of the demolition of adjacent structures and to identify suitable mitigation methods to ensure the germination structure remains intact. Additional measures to be identified and implemented, if required. Archival recording / sampling. Archaeological test excavation.
Hornsby LEP	A61	Blackwood Memorial Sanctuary, including North Road culvert	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> Ground settlement assessment Pre and post construction condition survey. Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Hornsby LEP	I68	Street trees (Cardinal Ave)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> Ground settlement assessment Pre and post construction condition survey Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1). Where reasonable and feasible, design and construct the Project to avoid direct impacts to trees that are heritage items. Where impacts to the street trees cannot be avoided, further investigate options for replacement of those trees in consultation with the relevant Council, prior to the commencement of works impacting the relevant trees.
Hornsby LEP	I98	Street trees (Hannah Street)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> Ground settlement assessment Pre and post construction condition survey Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1). Where reasonable and feasible, design and construct the Project to avoid direct impacts to trees that are heritage items. Where impacts to the street trees cannot be avoided, further investigate options for replacement of those trees in consultation with the relevant Council, prior to the commencement of works impacting the relevant trees.

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LEP	LEP / ID No.	Name	Significance	Impact	Minimum mitigation measures item as per Table 6.1
Hornsby LEP	I111	Street Trees (Hull Rd)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1). • Where reasonable and feasible, design and construct the Project to avoid direct impacts to trees that are heritage items. Where impacts to the street trees cannot be avoided, further investigate options for replacement of those trees in consultation with the relevant Council, prior to the commencement of works impacting the relevant trees.
Hornsby LEP	I590	Street Trees (Campbell Ave)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1). • Where reasonable and feasible, design and construct the Project to avoid direct impacts to trees that are heritage items. Where impacts to the street trees cannot be avoided, further investigate options for replacement of those trees in consultation with the relevant Council, prior to the commencement of works impacting the relevant trees.
Hornsby LEP	I603	House (4 Mount Pleasant Avenue, Normanhurst)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Hornsby LEP	I607 / A60	Loretto Convent group – grounds, gates and cemetery	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Hornsby LEP	I618	St. Agatha's Primary School grounds (excluding buildings)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Hornsby LEP	I619	"Cheddington" and stables (27 Boundary Road, Pennant Hills)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Hornsby LEP	I626	House (7 Fulbourne Avenue Pennant Hills)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Hornsby LEP	I630	House (17 Greycliffe Avenue, Pennant Hills)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).

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LEP	LEP / ID No.	Name	Significance	Impact	Minimum mitigation measures item as per Table 6.1
Hornsby LEP	I652	"Camira" (418 Pennant Hills Road, Pennant Hills)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Hornsby LEP	I653	Mount St. Benedict's Convent and grounds	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Hornsby LEP	I654/ A62	Observatory Park – Observatory site and park	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Hornsby LEP	I660	Fence (34 Ramsay Road, Pennant Hills)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Hornsby LEP	I661	Fence (35 Ramsay Road, Pennant Hills)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Hornsby LEP	I662	House and Fence (37 Ramsay Road, Pennant Hills)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments.
Hornsby LEP	I666	"Bushloe" House (25-27 Stevens Street, Pennant Hills)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Hornsby LEP	I680	House (20 Warne Street, Pennant Hills)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Hornsby LEP	I681	House (24 Warne Street, Pennant Hills)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Hornsby LEP	I682	House	Local	Potentially direct –	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey

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LEP	LEP / ID No.	Name	Significance	Impact	Minimum mitigation measures item as per Table 6.1
		(9 Weemala Road, Pennant Hills)		vibration and settlement	<ul style="list-style-type: none"> Reasonable and feasible mitigation measures based on the above assessments.
Hornsby LEP	I683	"Hillcourt" House (9 Werona Street, Pennant Hills)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> Ground settlement assessment Pre and post construction condition survey Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Hornsby LEP	I684	"Karooa" House (14 Werona Street, Pennant Hills)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> Ground settlement assessment Pre and post construction condition survey Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Hornsby LEP	I689	House (4 Yarrara Road, Pennant Hills)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> Ground settlement assessment Pre and post construction condition survey Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Hornsby LEP	I690	House (6 Yarrara Road, Pennant Hills)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> Ground settlement assessment Pre and post construction condition survey Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Hornsby LEP	I691	"The Maze" House (18-20 Yarrara Road, Pennant Hills)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> Ground settlement assessment Pre and post construction condition survey Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Hornsby LEP	I714	"Loch Maree House" and Garden (237 Pennant Hills Road, Thornleigh)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> Ground settlement assessment Pre and post construction condition survey Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Hornsby LEP	I716	House (3 Pritchard Street, Thornleigh)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> Ground settlement assessment Pre and post construction condition survey Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Hornsby LEP	I723	House (80 The Esplanade, Thornleigh)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> Ground settlement assessment Pre and post construction condition survey Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Hornsby LEP	I724	Gardens	Local	Potentially direct –	<ul style="list-style-type: none"> Ground settlement assessment

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LEP	LEP / ID No.	Name	Significance	Impact	Minimum mitigation measures item as per Table 6.1
		(17, 19, 21, 23 and 23A Trelawney Street Thornleigh)		vibration and settlement	<ul style="list-style-type: none"> Pre and post construction condition survey Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Hornsby LEP	I725	House (17 Wells Street, Thornleigh)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> Ground settlement assessment Pre and post construction condition survey Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Hornsby LEP	I731	Garden (45 Bundarra Avenue, Wahroonga)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> Ground settlement assessment Pre and post construction condition survey Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Hornsby LEP	I755	House (6 John Hughes Place, Wahroonga)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> Ground settlement assessment Pre and post construction condition survey Reasonable and feasible mitigation measures based on the above assessments.
Hornsby LEP / Ku-ring-gai LEP	C7 / C1	Wahroonga Heritage Conservation Area	Local	Indirect - visual	<ul style="list-style-type: none"> No management required
Hornsby LEP	C8	Wahroonga North Heritage Conservation Area	Local	Direct – change in heritage conservation area values	<ul style="list-style-type: none"> Ancillary infrastructure sites would be revegetated with consideration of the heritage values of the area. Where reasonable and feasible, avoid direct impacts to trees that are associated with the heritage significance of the conservation area. Where impacts to the street trees cannot be avoided, options for replacement of those trees in consultation with the relevant Council to be investigated.
Hornsby LEP	I475	Street trees (Edgeworth David Avenue, Hornsby)	Local	No impact	<ul style="list-style-type: none"> No management required
Hornsby LEP	I596	Garden (1-7 Frith Avenue, Wahroonga)	Local	No impact	<ul style="list-style-type: none"> No management required
Hornsby LEP	I743	Street trees (Edwards Road, Wahroonga)	Local	No impact	<ul style="list-style-type: none"> No management required
Hornsby LEP	I750	Street trees (Ingram Road, Wahroonga)	Local	Potentially direct – vibration and settlement Indirect - visual	<ul style="list-style-type: none"> Ground settlement assessment Pre and post construction condition survey Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1). Heritage values (including views and vistas) to be considered during the detailed design of built elements of the Project and

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LEP	LEP / ID No.	Name	Significance	Impact	Minimum mitigation measures item as per Table 6.1
					<ul style="list-style-type: none"> development of the landscape plan. Where reasonable and feasible, design and construct the Project to avoid direct impacts to trees that are heritage items. Where impacts to the street trees cannot be avoided, further investigate options for replacement of those trees in consultation with the relevant Council, prior to the commencement of works impacting the relevant trees.
Hornsby LEP	1762	Garden - Canary Island Palms (1 Pacific Highway, Wahroonga)	Local	Direct – Acquisition Direct – heritage vegetation removal	<ul style="list-style-type: none"> Feasible and reasonable options for the relocation of the two mature Canary Island Palms (1762) would be investigated. Alternative measures may be applied if investigation identifies translocation is not possible, including: <ul style="list-style-type: none"> Archival recording / sampling. Seed collection / propagation.
Hornsby LEP	1767	St Pauls Church – Pearce Corner	Local	Potentially direct – vibration and acoustic treatment Indirect - visual	<ul style="list-style-type: none"> Ground settlement assessment Pre and post construction condition survey Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1). Where at property acoustic treatment is required, potential impacts to heritage items will be considered. Heritage values (including views and vistas) to be considered during the detailed design of built elements of the Project and development of the landscape plan.
Hornsby LEP	1768	Street trees (Russell Avenue, Wahroonga)	Local	No Impact	<ul style="list-style-type: none"> No management required
Hornsby LEP	1769	Street trees (Woonona Avenue, Wahroonga)	Local	Direct – heritage vegetation removal	<ul style="list-style-type: none"> Minimise impacts as far as practicable during detailed design. Or; Revegetate in consultation Hornsby Shire Council. Representative plantings of Blue Gum High Forest to be considered.
Hornsby LEP	1770	“Cherrygarth” and garden (42 Woonona Avenue, Wahroonga)	Local	Potentially direct – vibration, settlement and acoustic treatment Indirect – visual	<ul style="list-style-type: none"> Ground settlement assessment Pre and post construction condition survey Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1). Where at property acoustic treatment is required, potential impacts to heritage items will be considered. Heritage values (including views and vistas) to be considered during the detailed design of built elements of the Project and development of the landscape plan.
Hornsby LEP	1771	“Neringala” and garden (46 Woonona Avenue, Wahroonga)	Local	Potentially direct – vibration Indirect – visual	<ul style="list-style-type: none"> Ground settlement assessment Pre and post construction condition survey Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1). Heritage values (including views and vistas) to be considered during the detailed design of built elements of the Project and development of the landscape plan.
Hornsby LEP	1772	Street trees and bushland (Alexandria Parade, Waitara)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> Ground settlement assessment Pre and post construction condition survey Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1). Where reasonable and feasible, design and construct the Project to avoid direct impacts to trees that are heritage items. Where impacts to the street trees cannot be avoided, further investigate options for replacement of those trees in consultation with the relevant Council, prior to the commencement of works impacting the relevant trees.
Ku-ring-gai	1897,	5 x Coonanbarra Road	Local	Potentially direct –	<ul style="list-style-type: none"> Ground settlement assessment

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LEP	LEP / ID No.	Name	Significance	Impact	Minimum mitigation measures item as per Table 6.1
LEP	1898, 1900, 1901, 1902 ²	Timber Cottages Group		vibration Indirect – visual	<ul style="list-style-type: none"> • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1). • Heritage values (including views and vistas) to be considered during the detailed design of built elements of the Project and development of the landscape plan.
Ku-ring-gai LEP	1953	“Bolton Grange” Dwelling House (21 Lucinda Avenue, Wahroonga)	Local	Potentially direct – vibration and settlement Indirect – visual	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1). • Heritage values (including views and vistas) to be considered during the detailed design of built elements of the Project and development of the landscape plan.
Ku-ring-gai LEP	1955	“Matakana” Dwelling House (28 Lucinda Avenue, Wahroonga)	Local	Potentially direct – vibration and settlement Indirect – visual	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1). • No management required for visual impacts
Ku-ring-gai LEP	1956	“Cullingral Dwelling House”	Local	Potentially direct – vibration and settlement Indirect – visual	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1). • Heritage values (including views and vistas) to be considered during the detailed design of built elements of the Project and development of the landscape plan.
Ku-ring-gai LEP	I1012	“Poole House” Dwelling House (24 Woonona Avenue, Wahroonga)	Local	Potentially direct – vibration and settlement	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1).
Draft Ku-ring-gai LEP	1855 ¹	Dwelling House (4 Burns Road, Wahroonga)	Local	Potentially direct – vibration Indirect – visual	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1). • No management required for visual impacts
Draft Ku-ring-gai LEP	1954 ¹	Dwelling House (24 Lucinda Avenue, Wahroonga)	Local	Potentially direct – vibration and settlement Indirect – visual	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1). • No management required for visual impacts
Draft Ku-ring-gai LEP	1957 ¹	“Mansfield” Dwelling House (41 Lucinda Avenue, Wahroonga)	Local	Potentially direct – vibration and settlement Indirect – visual	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1). • Heritage values (including views and vistas) to be considered during the detailed design of built elements of the Project and development of the landscape plan.

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LEP	LEP / ID No.	Name	Significance	Impact	Minimum mitigation measures item as per Table 6.1
Draft Ku-ring-gai LEP	I959 ¹	"Hindfell" Dwelling House (11A Lucinda Avenue, Wahroonga)	Local	Potentially direct – vibration, settlement and acoustic treatment Indirect – visual	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1). • Where at property acoustic treatment is required, potential impacts to heritage items will be considered. • No management required for visual impacts
Draft Ku-ring-gai LEP	I960 ¹	Dwelling House (37A Lucinda Avenue, Wahroonga)	Local	Potentially direct – vibration and settlement Indirect – visual	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1). • Heritage values (including views and vistas) to be considered during the detailed design of built elements of the Project and development of the landscape plan.
Hornsby LEP	I791	House (587 Pennant Hills Road, West Pennant Hills)	Local	Potentially direct – vibration and settlement Indirect – visual	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1). • No management required for visual impacts
Hornsby LEP	I138	Pennant Hills Golf Course - grounds	Local	Potentially direct – vibration and settlement Indirect – visual	<ul style="list-style-type: none"> • Ground settlement assessment • Pre and post construction condition survey • Reasonable and feasible mitigation measures based on the above assessments (such as those listed in H12 of Table 6-1). • No management required for visual impacts.

¹ Item identified in the *Draft Ku-ring-gai Local Environment Plan 2013*, and assessed in the EIS, although item is not listed in the current *Ku-ring-gai Local Environment Plan 2015*.

² Item identified in the *Ku-ring-gai Planning Scheme Ordinance*, and assessed in the EIS, although item is not listed in the current *Ku-ring-gai Local Environment Plan 2015*.

6 Environmental Management Measures

A range of environmental requirements and control measures are identified in the various environmental documents, including the SPIR, Conditions of Approval, LLBJV EMS and other Roads and Maritime and NorthConnex Project Co documents. Specific management measures to address these requirements and impacts on Aboriginal and non-Aboriginal heritage relevant to the works are outlined in Table 6-1.

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Table 6-1 Heritage management measures

ID	Measure / Requirement	When to implement	Responsibility	Reference
GENERAL				
H1	Training will be provided to relevant Project personnel, including relevant sub-contractors on the location of known Aboriginal and non-Aboriginal heritage items, areas of archaeological sensitivity and artefacts (including photographs where available) along with key requirements from this plan through the project induction. Toolboxes and targeted training would also be employed where appropriate, to sites where there is a high risk of direct impacts to heritage.	Prior to construction Construction	Environment Manager	Good Practice CoA B20
H2	A suitably qualified and experienced heritage specialist will be engaged to provide guidance on the management of construction heritage impacts. Guidance would include compliance on MCoA, REMM and documents under A2 generally such as ongoing management of Thornleigh Malt works.	Prior to construction	Environment Manager	G36 SPIR / EIS Section 7.10.4 CoA D57 c)i)(E) CoA D57 c)ii)(F)
H3	Measures identified in Table 5-3 would be employed as a minimum for the identified heritage items.	Prior to construction Construction	Environmental Manager Construction Manager	EIS Section 7.11.4
H4	If any unexpected heritage items (including human remains) are encountered, works potentially affecting the find would cease immediately and the Roads and Maritime Standard Management Procedure – Unexpected Heritage Items (August 2013) (refer Appendix A) would be followed.	Prior to construction Construction	All personnel and subcontractors	SPIR / EIS Section 7.11.4 G36 CoA D34 CoA D57 c)i)(B) CoA D57 c)ii)(F)
H5	If additional land outside the assessed construction footprint is required for the construction of the Project, an investigation will be carried out by the project archaeologist, in accordance with the Procedure for Aboriginal Cultural Heritage Consultation and Investigation (Roads and Maritime, 2011) (PACHCI). This process will determine if further consultation and/or approval is required prior to works being conducted.	Prior to construction Construction	Environment Manager	SPIR / EIS Section 7.11.4
H6	All known heritage items within immediate vicinity of the construction work zones will be identified on Sensitive Area Plans included in the CEMP.	Prior to construction Construction	Environment Manager	Good Practice
H7	Exclusion fencing or No Go Zones will be established to protect heritage items within the immediate vicinity of the construction work zones as required, unless the site is required to be directly impacted as part of the approved construction works. Distances would consider safe work distances and likely indirect/direct impacts to the item.	Prior to construction Construction	Environment Officer / Foremen	Good Practice
H8	Identified impacts to heritage items listed in Table 5-1 and 5-2 will be minimised where feasible and reasonable through both detailed design and construction.	Prior to construction Construction	Environment Manager Design Manager	CoA B20

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ID	Measure / Requirement	When to implement	Responsibility	Reference
H9	The Proponent shall not harm, modify or otherwise impact any heritage items outside the SSI footprint. Project boundaries would be clearly delineated where relevant.	Construction	Construction Manager / Environment Manager	CoA B18
H10	The Proponent shall not harm, modify or otherwise impact the heritage items listed as receiving 'No Impact' from the SSI under the column heading 'Degree of Impact' in Table 7 of Volume 6, Technical Working Paper: Non-Aboriginal Heritage Assessment, of the document listed in condition A2.	Construction	Construction Manager / Environment Manager	CoA D31
H11	Vibration monitoring shall be conducted in accordance with section 7.3 of this plan, consistent with the measures detailed in the CNVMP.	Construction	Environment Officer / Foremen	CoA D57
H12	Where vibration goals are likely to be exceeded, works shall be amended to assist in complying with the vibration goals. Such measures may include reducing plant size, changing operational settings (such as turning off the vibratory function of the machine), and using alternative plant, utilizing alternate construction methodology and mitigation measures listed within the CNVMP or a combination of these.	Construction	Environment Officer / Foremen	CoA D57 c)ii)(B)II CoA D57 c)ii)(B)III
SPECIFIC NON-ABORIGINAL HERITAGE MANAGEMENT / MITIGATION MEASURES				
H13	Where non-Aboriginal heritage items have been identified as having the potential to be impacted by construction vibration or ground settlement (refer to Table 5-2), the following would be implemented: <ul style="list-style-type: none"> A ground settlement assessment (in accordance with CoA D5 and D6) would be undertaken during detailed design to confirm predicted impacts on heritage structures. Completion of existing condition surveys prior to the commencement of construction for heritage items within the Project corridor or that have been identified during detailed design to be within recommended safe working distances to surface works. A post-construction condition survey would also be undertaken of these items to identify if impacts have occurred. 	Prior to construction Construction Post-construction	Construction Manager	SPIR / EIS Section 7.10.4 CoA D5 and D6
H14	Additional feasible and reasonable mitigation and management measures would be implemented based on the above assessments (H11). This would include: <ul style="list-style-type: none"> Vibration monitoring (as per section 7.3 of this plan). The placement of vibration monitors would consider the heritage fabric of the item. In the event of appreciable vibration levels arising, measures would be put in place to reduce vibration to within acceptable levels. Such measures may include reducing plant size, changing operational settings (such as turning off the vibratory function of the machine), and using alternative plant, utilizing alternate construction methodology and mitigation measures listed within the CNVMP or a combination of these. Appropriate support and stabilisation of structures in consultation with the relevant land and owners prior to the commencement of construction to ensure heritage items do not experience settlement exceeding the settlement criteria of 20mm or a maximum angular distortion of 1 in 500 (as per CoA D7). 	Prior to construction Construction	Environmental Officer Project Manager	SPIR / EIS Section 7.10.4 CoA D7 CoA D57 c)ii)(B)II CoA D57 c)ii)(B)III

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ID	Measure / Requirement	When to implement	Responsibility	Reference
H15	<p>The following measures would be implemented at the Thornleigh Maltworks prior to the commencement of construction:</p> <ul style="list-style-type: none"> • Works that will impact the heritage site will be undertaken under the guidance of a suitably qualified and experienced heritage specialist. • A structural assessment of the germination structure would be conducted to ascertain the possible impact of the demolition of adjacent structures and to identify suitable mitigation methods to ensure the germination structure remains intact. Additional measures would be identified and implemented, if required, to treat the newly exposed surfaces of the germination structure to protect it from the elements as a result of the demolition of adjacent structures. • The germination building would be retained and conserved. • Demolition of non-significant structures; • Subject to safety clearance, retention of additional structures such as the silos; • An archival recording of the industrial site would be undertaken to record the connection of the original structures to the modern upgraded structures. • An archaeological test excavation program would be undertaken to assess the archaeological potential of identifying evidence of the early malting industry in this area, and the relationship of the industrial to the urban site and evidence of the occupation of the Manager's house by the Chilvers family. • Appropriate safe working distances from retained structures, exclusion fencing and sensitive area signage; and • Additional reasonable and feasible measures as recommended following completion of the archaeological investigations (examples of this may include efforts to retain the vines as part of the germination building). 	<p>Prior to / construction Construction</p>	<p>Environment Manager Archaeologist</p>	<p>SPiR / EIS Section 7.10.4 CoA D30 and B20</p>
H16	<p>The Thornleigh Maltworks archaeological test excavation program will be undertaken in consultation with the relevant Council and OEH (Heritage Division), and will:</p> <ul style="list-style-type: none"> • be conducted in accordance with the Archaeological Assessments Guideline (Heritage Council, 1996) using a methodology prepared in consultation with the OEH (Heritage Division). The archaeological investigation will be undertaken by an archaeological heritage consultant, a suitably qualified and experienced heritage expert with demonstrated ability to comply with the Criteria for the Assessment of Excavation Directors (Heritage Council July 2011); • provide for the detailed analysis of any heritage items discovered during the investigations; • include management options for these heritage items (including options for relocation and display); and • if the findings of the investigations are significant, provide for the preparation and implementation of a heritage interpretation plan. <p>Within 12 months of completing the above work, or as otherwise agreed with the DP&E Secretary, a report containing the findings of the excavations will be prepared, including artefact analysis, and the identification of a final repository for finds, prepared in consultation with the OEH (Heritage Division) and to the satisfaction of the DP&E Secretary. The final approved report will be submitted to the DP&E Secretary, the Heritage Council of NSW, and the local library and the local Historical Society in the relevant local government area(s).</p>	<p>Construction</p>	<p>Environmental Manager Archaeologist</p>	<p>CoA D30</p>

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ID	Measure / Requirement	When to implement	Responsibility	Reference
H17	Prior to conducting acoustic treatment at any heritage items, the Project shall obtain the advice of a suitably qualified and experienced built heritage expert. The recommended management measures would then be implemented by the Project to ensure any such work is carried out in a manner sympathetic to the heritage values of the item.	Construction	Environment Manager Archaeologist	CoA B22
H18	Landscaping of ancillary infrastructure sites within the Wahrenonga North heritage conservation area and Beecroft-Cheltenham heritage conservation area would be undertaken with consideration of the heritage values of these conservation areas. Consideration will be given to the selection of landscaping vegetation species, similar to those affected by the Project, and are consistent with the heritage conservation area.	Construction	Design Manager	SPIR / EIS Section 7.10.4
H19	Where feasible and reasonable, the Project will be designed and constructed to avoid direct impacts to identified heritage listed vegetation along Woonona Ave, Wahrenonga (1769). If impacts cannot be avoided: <ul style="list-style-type: none"> The street frontage would be revegetated in consultation with the landowner (Hornsby Shire Council), prior to the commencement of works impacting the relevant trees. Plantings that are representative species of the Blue Gum High Forest ecological community would be considered. 	Prior to construction Construction	Environment Manager Design Manager	SPIR / EIS Section 7.10.4 CoA B21
H20	The heritage values of items 1771, 1953, 1956, 1957, 1770, 1750, 1767, 1960, 1897, 1898, 1900, 1901, 1902 (including views and vistas from the items) would be considered during the detailed design of built elements of the Project and detailed in the Urban Design and Landscape Plan under CoA B33.	Prior to construction Construction	Design Manager	SPIR / EIS Section 7.10.4 Technical Working Paper: Non-Aboriginal Heritage Assessment - Table 7
H21	Where feasible and reasonable, the Project will be designed and constructed to avoid direct impacts to trees that are heritage items or are associated with the heritage significance of heritage items or heritage conservation areas. Where impacts to the street trees cannot be avoided, further investigations will be conducted prior to the commencement of works impacting the relevant trees into options for replacement of those trees, in consultation with the relevant Council.	Prior to construction Construction	Environment Manager Design Manager	CoA B21

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ID	Measure / Requirement	When to implement	Responsibility	Reference
H22	<p>Where feasible and reasonable, the Project will be designed and constructed to avoid the Canary Island Palms associated with the Garden at 1 Pacific Highway, Wahroonga (I762).</p> <p>Where impacts to the Canary Island Palms cannot be avoided, the project would further investigate options for relocation of those trees in consultation with the Archaeologist, supported by an appropriately qualified arborist. Outcomes will be consulted with the relevant Council, prior to the commencement of works impacting the relevant trees.</p> <p>Should feasible and reasonable options be unavailable, and the trees cannot be relocated, the project would develop suitable offset measures which may include:</p> <ul style="list-style-type: none"> • Archival samples would be collected in accordance with NSW Royal Botanic Gardens collection procedures. • Options would be investigated to collect seed samples for later propagation. • Oral histories (if relevant) would be obtained. • Investigate options for replacement of those trees in consultation with the relevant Council, prior to the commencement of works impacting the relevant trees. 	<p>Prior to construction</p> <p>Construction</p>	<p>Environment Manager</p> <p>Archaeologist</p>	<p>SPIR / EIS Section 7.10.4</p> <p>CoA B21</p>
SITE SPECIFIC ABORIGINAL HERITAGE MANAGEMENT / MITIGATION MEASURES				
H23	The detailed design of the Project will be developed to avoid direct impacts on ASA1 or ASA2 management zones.	<p>Prior to construction</p> <p>Construction</p>	<p>Environment Manager</p> <p>Design Manager</p> <p>Archaeologist</p>	SPIR / EIS Section 7.11.4
H24	<p>ASA1, ASA2 or any listed AHIMS areas shall be clearly delineated prior to construction works if there is a risk of direct impacts as a result of construction activities.</p> <p>NOTE: Under the terms of the SSI approval, the Project can only impact, (including fencing) within the approved Project footprint, and under the terms of CoA B18, the Project is not permitted to harm, modify, or otherwise impact any heritage items outside of the SSI footprint. To protect offsite rock shelters and overhangs from potential impacts during construction, the Project boundary would be clearly delineated and identified as an environmentally sensitive area where these items are located within 200 metres of the SSI footprint, as per Management Measure H9 in Table 6-1</p>	<p>Prior to construction</p> <p>Construction</p>	Environment officer	SPIR / EIS Section 7.11.4
H25	During construction, vibration monitoring would be conducted for vibration intensive works within 50 metres of rockshelter sites and associated overhangs within management zone ASA1 and ASA2. The need for vibration monitoring would be informed by a preliminary screening of activities at this location to identify activities which have the potential for vibration at these areas of sensitivity.	<p>Prior to construction</p> <p>Construction</p>	Environment officer	EIS Section 7.11.4

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ID	Measure / Requirement	When to implement	Responsibility	Reference
H26	All reasonable steps so as not to harm, modify or otherwise impact any Aboriginal heritage item associated with ASA1 or ASA2 shall be implemented.	Prior to construction Construction	Environment Manager Design Manager Archaeologist	CoA D32

7 Compliance Management

7.1 Roles and Responsibilities

The Project Team's organisational structure and overall roles and responsibilities are outlined in Section 4 of the CEMP. Specific responsibilities for the implementation of environmental controls are detailed in Section 6 of this Plan.

7.2 Training

All relevant employees, contractors and utility staff working on site will undergo site induction training relating to Aboriginal and non-Aboriginal heritage management issues. Records of site inductions will be kept at the Project office. The induction training will address elements related to heritage management including:

- Existence and requirements of this sub-plan.
- Relevant legislation.
- Roles and responsibilities for heritage management.
- Location of identified heritage sites and areas.
- Proposed heritage management and protection measures.
- Heritage site identification.
- Procedure to follow in the event of an unexpected heritage item find during construction works (Roads and Maritime Standard Management Procedure – Unexpected Heritage Items (August 2013) (refer Appendix A)).
- Procedure to follow in the event of discovery of human remains during construction works (Roads and Maritime Standard Management Procedure – Unexpected Heritage Items (August 2013) (refer Appendix A)).

On-site toolbox training would continue throughout the project where required, where there is a high risk of heritage impacts by the project. Heritage awareness training would also be conducted as part of the CEMP onboarding process to key LLBJV personnel. Further details regarding staff induction and training are outlined in Section 5 of the CEMP.

7.3 Inspections and Monitoring

Inspections of sensitive areas and activities with the potential to impact Aboriginal and non-Aboriginal heritage will occur for the duration of the Project. Inspections will be undertaken during weekly environmental officer inspections and may also be undertaken during formal Client or Environmental Representative (ER) inspections. Requirements and responsibilities in relation to inspections are documented in Section 8 of the CEMP.

7.3.1 Vibration monitoring

The following vibration monitoring shall be undertaken:

- Vibration monitoring would be initially carried out at nearby structures when the 'safe working distances' for structural damage (including the more conservative criteria for heritage items) cannot be complied with, in accordance with Table 5-8 of the Construction Noise and Vibration Management Plan.
- In locations where the vibration levels, as a result of tunnelling activities are predicted to be greater than the maximum values for human comfort. For detail on predictions, refer to the EIS Technical working paper: Noise and Vibration, Appendix I. Such monitoring will also determine if the tunnelling will exceed the criteria's for structural damage (including heritage buildings and structures).
- When vibration intensive works are within 50 meters of rockshelter sites and associated overhangs within management zone ASA2. The need for vibration monitoring would be informed by a preliminary screening of activities at this location to identify activities which have the potential for vibration at these areas of sensitivity.

7.4 Non-conformances

Non-conformances such as accidental damage or vibration exceedances will be dealt with and documented in accordance with Section 8.6 of the CEMP.

Where vibration goals are exceeded, works are to be amended if possible to assist in complying with vibration goals and the following actions undertaken:

- Confirm that monitored levels are not being influenced by other vibration sources.
- Confirm that all reasonable and feasible measures have been implemented. Such measures may include reducing plant size, changing operational settings (such as turning off the vibratory function of the machine), and using alternative plant, utilizing alternate construction methodology and mitigation measures listed within the CNVMP or a combination of these.
- Confirm if the exceedance is due to an abnormally high vibratory piece of equipment.
- Identify if equipment can be swapped out for another piece of equipment or alternative equipment or plant.
- Ensure that learning's from the above are fed back into the vibration modelling assessment process.

7.5 Auditing

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this sub plan, CoA and other relevant approvals, licences and guidelines.

Audit requirements are detailed in Section 8 of the CEMP.

7.6 Reporting

General reporting requirements and responsibilities are documented in Section 8 of the CEMP, however the specific reporting required by this CHMP is:

- If an unexpected heritage item is discovered then reporting in accordance with Roads and Maritime's Standard Management Procedure, Unexpected Heritage Items (RMS 2013), will be required.
- Reporting in accordance with Roads and Maritime's PACHCI, is required if land outside of the assessed construction footprint is to be utilised for the construction of the Project.
- Existing condition surveys / reports will be undertaken where required in accordance with Table 6-1.
- Ground settlement reports would be undertaken where required in accordance with Table 6-1.
- Within 12 months of completing Thornleigh Maltworks archaeological test excavation program, or as otherwise agreed by the Secretary, a report containing the findings shall be prepared in consultation with the OEH (Heritage Division) and to the satisfaction of the Secretary. The final approved report shall be submitted to the Secretary, the Heritage Council of NSW, and the local library and the local Historical Society in the relevant local government area(s).
- A post-construction condition survey / report would also be undertaken of the heritage items to identify if impacts have occurred.

8 Review and Improvement

8.1 Continuous Improvement

Continuous improvement of this plan will be achieved by the ongoing evaluation of environmental management performance against environmental policies, objectives and targets for the purpose of identifying opportunities for improvement.

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance.
- Determine the cause or causes of non-conformances and deficiencies.
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies.
- Verify the effectiveness of the corrective and preventative actions.
- Document any changes in procedures resulting from process improvement.
- Make comparisons with objectives and targets.

8.2 CHMP Update and Amendment

Revisions to this plan will be in accordance with the process outlined in Section 1.6 and Section 9 of the CEMP. Amendments in response to processes described in Section 8 may also occur.

Changes to this plan will be approved by the client and stakeholders (if required) and documented in the document control section for each revision. A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure – refer to Section 10.2 of the CEMP.

Appendix A
Roads and Maritime Standard Management Procedure – Unexpected
Heritage Items