



Design Investigation Risk Assessment

Project: Sydney Metro City & Southwest – TSE Works

Document No: SMCSWTSE-JCG-TPW-EM-RPT-097003

DOCUMENT APPROVAL

REV	DATE	PREPARED BY	REVIEWED BY	APPROVED BY	ER ENDORSEMENT	COMMENT
01	06/06/17	Foster Walker	Jeremy Glasgow Christian D'Hondt	Caitlin Richards	Mike Woolley	Draft for discussion
02	19/07/17	Foster Walker	Caitlin Richards	Caitlin Richards	Mike Woolley	For ER endorsement
03	22/08/17	Foster Walker	Caitlin Richards	Caitlin Richards	Mike Woolley	Updated to include movement of TSC equipment to Marrickville for storage for sustainable reuse in site establishment (construction works to be addressed in separate risk assessment)
04	28/08/17	Roisin Batch	Foster Walker	Caitlin Richards	Mike Woolley	Update to include compliance controls for E79, E80, E81, E82, E83, E85 and E88
05	07/09/17	Roisin Batch	Caitlin Richards	Caitlin Richards	Mike Woolley	Update to include discharge of mains water from water-filled barriers.
06	02/11/17	Roisin Batch	Cliff Wallman	Caitlin Richards	Mike Woolley	Update to include harbour CPT testing, design investigation works and geotechnical investigation locations
07	06/11/17	Ann Azzopardi	Cliff Wallman	Caitlin Richards	Mike Woolley	Update to address ER comments
Signature:						6/11/17
Date Signed:						



Table of Contents

Glossary	3
1.0 Introduction	5
1.1 Purpose	5
1.2 Scope	5
1.3 Planning approval pathway	5
1.4 Completion of this Risk Assessment	8
1.5 Community notifications	8
1.6 Management of Design Investigations	8
1.7 ER endorsement	9
1.8 Amendments to this risk assessment	9
2.0 Risk assessment	10
Appendix A – Risk matrix	76
Appendix B – Land Geotechnical Borehole Locations	77
Appendix C – Over Water Geotechnical Borehole Locations	78

Glossary

Term/ acronym	Definition
ANZECC	Australian and New Zealand Environment Conservation Council
CEEC	Critically Endangered Ecological Community
CEMF	Construction Environmental Management Framework (Appendix B of the Submissions and Preferred Infrastructure Report)
CEMP	Construction Environmental Management Plan
CoA	Condition of Approval
DP&E	NSW Department of Planning and Environment
DP&I	NSW Department of Primary Industries including DPI Agriculture, DPI Biosecurity and Food Safety, DPI Land and Natural Resources, DPI Water and DPI Fisheries
EIS	Environmental Impact Statement for Sydney Metro Chatswood to Sydenham
EMS	Environmental Management System
EPA	Environment Protection Authority
EPL	Environment Protection Licence
EP&A Act	Environmental Planning and Assessment Act 1979
EP&A Regulation	Environmental Planning and Assessment Regulation 2000
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999 (Cth)
ESCP	Erosion and Sedimentation Control Plan
JHCPBG	John Holland CPB Ghella
NPW Act	National Parks and Wildlife Act 1974
NPWS	National Parks and Wildlife Service
OEH	Office of Environment and Heritage
POEO Act	Protection of the Environment Operations Act 1997
Project	Sydney Metro City & Southwest
Project Planning Approval	Critical State Significant Infrastructure Sydney Metro & Southwest Chatswood to Sydenham Infrastructure Approval dated 9 January 2017 (Application no. SSI 15_7400)
Relevant Councils	Any or all as relevant, Willoughby, North Sydney, City of Sydney or Inner West
Relevant Road Authority	Any or all as relevant, RMS, Relevant Councils, Barangaroo Development Authority
REMM	Revised Environmental Mitigation Measures (Chapter 11 of the Submissions and Preferred Infrastructure Report).
SEPP	State Environmental Planning Policy
SPIR	Sydney Metro & Southwest Chatswood to Sydenham Submissions and Preferred Infrastructure Report, October 2016
SSI	State Significant Infrastructure
SWMS	Safe Work Method Statement
SWTC	Scope of Work and Technical Criteria
SCO	Sydney Coordination Office
TBM	Tunnel Boring Machine

Design Investigation Risk Assessment



Term/ acronym	Definition
TfNSW	Transport for New South Wales
TSC Act	Threatened Species and Conservation Act 1995, and amendments
TSE Works	Tunnels and Station Civil Works for the Sydney Metro City & Southwest Project

1.0 Introduction

1.1 Purpose

This risk assessment has been prepared to address design investigation works which will be undertaken by John Holland CPB Contractors Ghella (JHCPBG) from 24 July 2017 until the Construction Environmental Management Plan (CEMP) (SMCTSE-JCG-TPW-EN-PLN-002010) is approved (scheduled to be no later than 4 December 2017). The design investigation work is required to inform the detailed design of the Sydney Metro City & Southwest Tunnel and Stations Excavation Works at the Sydney Metro City & Southwest Project (TSE Works).

The purpose of this risk assessment is to confirm that these works are of low environmental impact and fall outside the definition of Construction under the Critical State Significant Infrastructure Sydney Metro & Southwest Chatswood to Sydenham Infrastructure Approval dated 9 January 2017 (Application no. SSI 15_7400) (Project Planning Approval).

1.2 Scope

This risk assessment covers the following design investigation works:

- Survey
- Flora and fauna investigations including pre-clearing survey
- Water quality monitoring of surrounding waterways and boreholes
- Aboriginal archaeological test pitting and investigation under Condition E24 and historic archaeological test pitting, investigation and excavation under Condition E17
- Geotechnical survey
- Contamination investigation (including but not limited to test pits at construction worksites, and utilising boreholes from geotechnical surveys, where possible)

1.3 Planning approval pathway

1.3.1 Overview

Construction is defined within the Project Planning Approval as all physical work required to construct the Project including demolition, other than the following low impact work:

- a) survey works including carrying out general alignment survey, installing survey controls (including installation of global positioning system (GPS)), installing repeater stations, carrying out survey of existing and future utilities and building and road dilapidation surveys;*
- b) investigations including investigative drilling and excavation;*
- c) heritage excavation and salvage works, subject to addressing related requirements of this approval, including Conditions E10-E27;*
- d) treatment of contaminated sites subject to the recommendations of a Site Contamination Report prepared in accordance with Condition E66.*
- e) establishment of ancillary facilities, except where demolition is required, in approved locations or in locations meeting the criteria identified in Condition A16 and Condition A18 of this approval, including constructing ancillary facility access roads and providing utilities to the facility;*

- f) *operation of ancillary facilities if the ER has determined the operational activities will have minimal impact on the environment and community;*
- g) *minor clearing and relocation of native vegetation, as identified in the EIS as amended by the description in the PIR;*
- h) *installation of mitigation measures including erosion and sediment controls, temporary exclusion fencing for sensitive areas and acoustic treatments;*
- i) *property acquisition adjustment works including installation of property fencing, and relocation and adjustments of utilities to property including water supply and electricity;*
- j) *relocation and connection of utilities where the relocation or connection has a minor impact to the environment as determined by the ER;*
- k) *archaeological testing under the Code of practice for archaeological investigation of Aboriginal objects in NSW (DECCW, 2010) or archaeological monitoring undertaken in association with (a)-(j) above to ensure that there is no impact on heritage items;*
- l) *other activities determined by the ER to have minimal environmental impact which may include construction of minor access roads, temporary relocation of pedestrian and cycle paths and the provision of property access; and*
- m) *maintenance of existing buildings and structures required to facilitate the carrying out of the CSSI.*

However, where heritage items, or threatened species, populations or ecological communities (within the meaning of the EP&A Act) are affected or potentially affected by any low impact work, that work is construction, unless otherwise determined by the Secretary in consultation with OEH or DPI Fisheries (in the case of impact upon fish, aquatic invertebrates or marine vegetation).

The low impact work described in this definition becomes construction with the approval of a Construction Environmental Management Plan

The design investigation works clearly fall within the definition of preconstruction works under the Project Planning Approval and are not scheduled activities (as defined under Schedule 1 of the Protection of the Environment Operations Act (POEO Act)) or scheduled development work (as defined under Section 47 of the POEO Act) and as such do not require an Environment Protection Licence (EPL).

1.3.2 Out of hours design investigations

If works are required outside of the standard working hours specified in Project Planning Approval Condition E36, they will need to be assessed in consultation with the Acoustic Advisor (AA) and approved by the ER or the Department of Environment and Planning (DP&E) in accordance with TfNSW's Condition E47 Out of Hours Works Protocol (rev 1.3 dated 4 July 2017 and approved by DP&E on 14 July 2017).

1.3.3 Heritage investigations

The definition of Construction provided in the Project Planning Approval technically defines two approval pathways for pre-construction works including design investigations:

- *Activities which are endorsed by the ER as having a minimal environmental impact*
- *Activities which affect heritage, threatened species, populations or endangered ecological communities that the Secretary of DP&E approves, following consultation with the Office of Environment and Heritage (OEH) and/or the Department of Primary Industries.*

Heritage items are defined under the Project Planning Approval as:

A place, building, work, relic, archaeological site, tree, movable object or precinct of heritage significance that is listed under one or more of the following registers: the State Heritage Register under the Heritage Act 1977 (NSW), a heritage item registered under a Local Environmental Plan under the EP&A Act, the World, National or Commonwealth Heritage lists under the Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth), and an Aboriginal object or Aboriginal place as defined in section 5 of the National Parks and Wildlife Act 1974 (NSW)

Based on this definition, the discovery of a relic or object during planned archaeological excavations or an unexpected find during design investigation or pre-construction site establishment work triggers a requirement for the Secretary of DP&E's approval. Considering heritage potential, there is a requirement for targeted historic and Aboriginal archaeological investigations in advance of pre-Construction site establishment works commencing. There is also potential for unexpected finds at any of the proposed pre-Construction site establishment worksites.

As such, JHCPBG propose that the documents set out in Table 1 are prepared and submitted to the Secretary of DP&E so the Sectary can consult with OEH regarding the heritage impacts and approve the pre-construction heritage investigation, excavation and salvage works.

Table 1: Preconstruction heritage impact approval process

Document	Consultation	DP&E
Construction Heritage Management Plan (SMCSWTSE-JCG-TPW-EM-PLN-002015)	OEH	Approval for pre-construction works following ER endorsement
Nomination of the Excavation Director under Condition E18 (appendix to the CHMP)	Heritage Council	Information
Historic and Aboriginal Heritage Management Procedure (SMCSWTSE-JCG-TPW-EM-MPR-003005)	N/A	Information
Archaeological Method Statements under Condition E17	Heritage Council or delegate	N/A (ER endorsement prior to implementation)

The Construction Heritage Management Plan (SMCSWTSE-JCG-TPW-EM-PLN-002015) addresses the preparation of Archaeological Method Statements and note that the above table includes only those method statements required during the pre-construction phase. It is anticipated that Construction approval will be granted by DP&E in early December 2017 and therefore investigation of the remaining sites will be completed following approval of the Construction Environmental Management Plan (SMCSWTSE-JCG-TPW-EM-PLN-002010) and the Construction Heritage (SMCSWTSE-JCG-TPW-EM-PLN-002015).

Design Investigation Risk Assessment

Heritage investigation or implementation of the unexpected finds protocol is to be implemented in areas where excavation is required. While there will likely be relics uncovered as part of these works, it is noted that disturbance of these areas is required to make way for the TSE Works and already approved under the Project Planning Approval. As such, these investigations, excavation and, if required salvage works will enhance heritage value as they will address areas not previously researched and if significant relics are uncovered an open day may be held in advance of bulk excavation and information may be displayed on site hoardings.

DP&E approved the commencement of early heritage investigation works on 2 November 2017.

1.4 Completion of this Risk Assessment

This risk assessment has been prepared based on the risk methodology adopted in the CEMP, and is based on the risk matrix and structure documented in TfNSW's Sydney Metro Integrated Management System: Risk Management Standard (SM RM-ST-201/3.0).

The risk matrix detailed in Sydney Metro Integrated Management System: Risk Management Standard (SM RM-ST-201/3.0) has been replicated in Appendix A.

During a review of the identified risks, uncontrolled risk was rated qualitatively and was used to determine required controls. A risk rating was then assigned for the risk, assuming the full application of controls and treatments.

This risk assessment has been prepared with input from the following specialist consultants:

- AMBS Ecology and Heritage
- Pells Sullivan Meynink (PSM)
- Douglas Partners

Workplace health and safety risks (including encountering Asbestos) will be identified through the Work Pack risk assessment and are not covered in this risk assessment.

1.5 Community notifications

In accordance with the Deed, the community will be notified of the commencement of design investigation works. This will include a letterbox drop to the defined adjacent area, to be undertaken seven (7) days prior to the commencement of works at each site. The notifications will be approved by TfNSW prior to distribution and will include a description of the relevant design investigation works and also the relevant community contact numbers and website details.

1.6 Management of Design Investigations

1.6.1 Site access requirements

Where required site access for design investigation works will be coordinated with TfNSW, - with all access requests being channelled through the nominated TfNSW contact (Linda Miller Construction Director). Site access arrangements will be confirmed prior to entering site. All personnel entering site must be inducted. Any additional approvals associated with gaining access to site will be followed.

1.6.2 Induction

Prior to JHCPBG personnel or contractors entering the site to undertake design investigation works, all personnel must undergo a Design Investigation Works Induction (SMCSWTSE-JCG-TPW-HS-FRM-004600), and site access protocols must also be followed.

1.6.3 Environment procedures and hold points

This risk assessment has referenced a number of JHCPBG environment procedures relevant to specific activities for implementation. Hold Points detailed in the referenced procedures are not detailed in this risk assessment, but are located in the relevant JHCPBG procedures.

Hold Points will be signed out by the Project Environment Manager or delegate Environment Co-ordinator using the specified forms. Out of hours works will require separate assessment by the AA and ER/DP&E approval (see Section 1.3.2).

1.7 ER endorsement

Prior to design investigation works commencing the ER must endorse this risk assessment on the front cover page.

Site Environment Plans (SEPs) for the design investigation works will be provided to the ER prior to commencement of the works. It is noted that this is not required by the Project Planning Approval but will ensure the ER is fully informed of environmental controls to be implemented.

SEPs that have been provided to the ER are detailed in Appendix B. Any updates to SEPs and subsequent endorsements will be included on a SEP register and provided to the ER. It is noted that this process will not require the ER to re-endorse the whole Design Risk Assessment, this is simply an administration process to manage SEP revisions.

1.8 Amendments to this risk assessment

If there is a proposed change to the scope of works, this risk assessment must be amended and resubmitted to the ER for endorsement prior to the amended scope of works commencing. The scope of works endorsed by the ER can continue while the risk assessment is reviewed by the ER. Amendments to text in this risk assessment will be made in track change and provided to ER for information and ease of review along with the clean final revision for endorsement. This is to allow an efficient review of the risk assessment so that amended scope of works can commence within a timely manner.

Design Investigation Risk Assessment

2.0 Risk assessment

Table 2 provides a description of the proposed works, justification, timing, uncontrolled risk rating, key environmental controls and residual risk rating.

Table 2: Risk assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
Flora and Fauna Investigations						
Team mobilisation <ul style="list-style-type: none"> Gaining access to site Coordinating with personnel working on the site 	<ul style="list-style-type: none"> Chatswood (day/night time) (24/07/17) Victoria Cross north (day time) (24/08/17) Barangaroo (day time) (24/07/17) Waterloo (day time) (21/08/17) 	To enable personnel to undertake flora and fauna surveys prior to vegetation removal.	Potential changes in staff Personnel entering unapproved areas Un-inducted personnel entering worksite Environmental control materials unavailable/not present on site after commencement of investigation works	C-Medium	<ul style="list-style-type: none"> All personnel entering site must be inducted Site access arrangements must be made prior to entering site All required environmental control materials are to be purchased and available prior to accessing site and commencing investigations 	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
<p>Fauna survey (day time)</p> <ul style="list-style-type: none"> Surveys for fauna during the day will be performed with techniques including: <ul style="list-style-type: none"> Searches for nests All investigations will involve personnel traversing the site on foot If a threatened species not previously considered in EIS is encountered, the distribution and habitat utilisation of the species will be investigated 	<ul style="list-style-type: none"> Marrickville (day/night time) (24/07/17) 	<p>To confirm the presence (or otherwise) of fauna species (including nocturnal species) identified in the EIS prior to vegetation removal or site establishment works.</p>	Potential disturbance to vegetation when undertaking the survey works	C-Medium	<ul style="list-style-type: none"> Investigations will be performed by qualified and experienced ecologists Where possible, existing tracks will be used when moving around site 	D-Low
<p>Fauna survey (night time)</p> <ul style="list-style-type: none"> Surveys for threatened fauna during the night will be performed with techniques including: 			Potential noise impact on surrounding receivers	C-Medium	<ul style="list-style-type: none"> Noise will be limited to arriving at and leaving site, conversing between personnel and movement of 	

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
<ul style="list-style-type: none"> - Spotlighting for nocturnal fauna (and call-playback for threatened frogs, if suitable habitat is present). Two 30 minute active spotlight searches for nocturnal species will be performed. - Stag-watching - Use of ultra-sonic call recording for microchiropteran bats - All investigations will involve personnel traversing the site on foot - This will involve working from dusk until around midnight 					<p>personnel about the site on foot</p> <p>Hold Points:</p> <ul style="list-style-type: none"> • Approved community notification must be provided at least one week prior to undertaking these works. Community notification must be submitted for approval five business day prior to its provision to the community. • The DP&E approved Condition E47 OOHW Protocol (rev 1.3 dated 4 July 2017 and approved by DP&E on 14 July 2017) to be implemented. OOHW Approval Form to be 	

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
					<p>completed and signed out by the AA and ER</p> <ul style="list-style-type: none"> All personnel to be present on site for night time surveys will receive an induction and a daily toolbox talk, advising to keep noise to a minimum, particular when entering and leaving site 	
			Potential light spill, resulting from lighting required for safety reasons and to undertake spotlighting, impacting on receivers	C-Medium	<ul style="list-style-type: none"> No lighting is to be directed into adjacent properties Lighting used for safety reasons is to be directed at the ground Lighting used for spotlighting investigations is to be directed at vegetation only, and limited to two 	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
					periods of 30 minutes in any one night	
			Potential disturbance of fauna	C-Medium	<ul style="list-style-type: none"> Disturbance of fauna during night time fauna investigations would be minimal, with investigations being performed by qualified and experienced ecologists 	D-Low
Habitat feature identification <ul style="list-style-type: none"> A suitably qualified ecologist from AMBS will identify features that could provide potential resources for fauna, involving assessments of groundcover and identification of hollow-bearing 		To confirm the presence (or otherwise) of habitat trees and other habitat features	Potential disturbance to vegetation when traversing the site on foot	C-Medium	Investigations will be performed by qualified and experienced ecologists	D-Low
			Potential disturbance to fauna when traversing the site on foot	C-Medium	Investigations will be performed by qualified and experienced ecologists	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
<p>trees. Locations of identified trees will be recorded using a handheld GPS.</p> <ul style="list-style-type: none"> Assessments of ground cover will identify features that should be searched and/or cleared carefully during vegetation clearance Assessments of vegetation will identify and mark hollow-bearing trees and trees or shrubs containing nests Determine the number and type of nest boxes (if required) that need to be installed based on findings of flora surveys and habitat feature identification 			Potential disturbance to ground cover and soils when accessing and moving around site	D-Low	Where possible, existing tracks will be used when moving around site, so as to minimise disturbance to existing groundcover	D-Low
<p>Assessment of weed issues</p> <ul style="list-style-type: none"> Each site will be surveyed to record the type and location of weed species and infestations 		To inform initial weed management and ongoing weed control (if required)	Potential spread of weeds	D-Low	<ul style="list-style-type: none"> Weeds not to be removed at time of survey. Investigations will be performed by qualified and experienced ecologists 	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
<ul style="list-style-type: none"> Investigations will involve personnel traversing the site on foot, making notes, taking photos, and recording locations using handheld GPSs 						
			Potential disturbance to fauna when traversing the site on foot	C-Medium	<ul style="list-style-type: none"> Investigations will be performed by qualified and experienced ecologists Where possible, existing tracks will be used when moving around site, limiting disturbance to habitat 	D-Low
			Potential disturbance to ground cover and soils when accessing and moving around site	C-Medium	<ul style="list-style-type: none"> Where possible, existing tracks will be used when moving around site, so as to minimise disturbance to existing groundcover 	D-Low
Water Quality Monitoring						
Team mobilisation <ul style="list-style-type: none"> Gaining access to site Coordinating with personnel working on the site 	<ul style="list-style-type: none"> Scotts Creek (Chatswood) Flat Rock Creek (Chatswood, 	To enable personnel to waterways top commence pre-construction background water monitoring as	Potential changes in staff	C-Medium	<ul style="list-style-type: none"> All personnel must be inducted 	D-Low
			Personnel entering unapproved areas	C-Medium		D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
	<ul style="list-style-type: none"> Artarmon, Crows Nest Milsons park (Victoria Cross) Sydney Harbour (Blues Point) 	required under the Planning Approval.	Un-inducted personnel undertaking sampling	C-Medium	<ul style="list-style-type: none"> Monitoring must be undertaken by at least two people Site access arrangements must be made prior to entering site (if required) 	D-Low
Visual inspection of surrounding waterways/ harbour Approaching waterway on foot to conduct visual inspection of waterway, noting presence (or otherwise) of oil or grease, level of turbidity, presence of debris, etc.	<ul style="list-style-type: none"> Darling Harbour (Barangaroo) Martin Place, Pitt Street (Farm Cove) Waterloo (Alexandria Canal) 	To collect background water quality data to set a benchmark against which to compare water quality both during and following construction, with the aim of maintaining water quality and preventing pollution during construction.	Damage to vegetation when accessing waterways	C-Medium	Where possible, existing tracks will be used to access waterway	D-Low
	<ul style="list-style-type: none"> Marrickville (Eastern Channel) 		Disturbance of creek bank and riparian vegetation when making observations	C-Medium	Bank stability will be assessed visually prior to approaching waterway Existing tracks or areas clear of vegetation will be utilised to approach creek where possible	D-Low
Sampling of waterways/ harbour Collection of grab samples from waterways to analyse surface water quality. This will involve personnel approach the bank of the creek, submerging a water sampling bottle into the surface of the creek water			Damage to vegetation to access waterways	C-Medium	Where possible, existing tracks will be used to access waterway	D-Low
			Disturbance of creek bank and riparian	C-Medium	Bank stability will be assessed visually prior to approaching waterway	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
<p>(approximately 30 cm), and allowing it to fill.</p> <p>Use of water monitoring probe to obtain various water quality readings. This will involve personnel approach the bank of the creek, submerging a water monitoring probe into the surface of the creek water (approximately 30 cm), and waiting for readings to steady. These readings are then recorded.</p> <p>Samples and readings will be taken at three locations: adjacent to the worksite, upstream of the site, and downstream of the site. Locations of sampling will be recorded using handheld GPS.</p>	<p>Water monitoring will commence on 24/07/17</p>		vegetation when collecting samples		Existing tracks or areas clear of vegetation will be utilised to approach creek where possible	
			Potential for foreign object to fall into waterway	C-Medium	<p>The person doing the sampling and monitoring is not to have any loose items on them that may fall into the waterway</p> <p>During collection of grab samples, a second person is to be positioned downstream to retrieve sample bottle if it is dropped into the waterway</p> <p>Equipment used during sampling is to be placed well away from the bank of the waterway</p>	D-Low
			Disturbance of flora and fauna	C-Medium	Where possible, existing tracks will be used when moving around site, limiting disturbance to flora and habitat	D-Low
			Disturbance of sediments on creek bed within the waterway	C-Medium	Grab samples will only be taken from the surface of the waterway, and therefore the creek bed will not be disturbed	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
					Water monitoring probe will not touch the creek bed during monitoring	
			Disturbance of fauna within waterway	C-Medium	<p>Collection of water samples will be done by hand, and sample bottle will be submerged for only a short period of time (around 1 minute). As such, minimal disturbance to aquatic fauna is anticipated.</p> <p>Prior to submerging sample bottle, visual inspection of the waterway should be undertaken to identify presence of any aquatic fauna. If fauna is spotted, wait until fauna has moved on before submerging sample bottle, or select an alternative sampling site.</p>	D-Low
Geotechnical Investigations						
Team mobilisation <ul style="list-style-type: none"> Gaining access to site Coordinating with personnel working on the site 	At all required locations as detailed on the drawings provided in Appendix B.	To enable personnel to access site to undertake Geotechnical	Potential changes in staff	C-Medium	<ul style="list-style-type: none"> All personnel must be inducted 	D-Low
			Personnel entering unapproved areas	C-Medium		D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
		Investigation Works	Un-inducted personnel entering worksite	C-Medium	<ul style="list-style-type: none"> Site access arrangements must be made prior to entering site 	D-Low
			Environmental control materials unavailable/not present on site after commencement of investigation works	C-Medium	All required environmental control materials are to be purchased and available prior to accessing site and commencing investigations	D-Low
			Undertaking works outside the approved TSE Works boundary	B-High	Where access is required to areas outside of the TSE Works boundary, permission for access must be granted by the landowner/s and/or occupier/s prior to entering these areas	D-Low
Land Boreholes¹ Drilling of boreholes consists of: <ul style="list-style-type: none"> Utilities search by NDT prior to drilling 	Along TSE alignment including: <ul style="list-style-type: none"> Chatswood (2 boreholes, 7 	To inform design of the TSE Works and determine site-specific	Disruption to traffic	B-High	<ul style="list-style-type: none"> Road Occupancy Licence required for works on public roads and/or footpaths prior to commencement of works. 	D-Low

¹ Indicative location of boreholes.

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
<ul style="list-style-type: none"> Vary in depth from 20-60 m Drilled using truck mounted or tracked rigs Require driving on and around the site Involves service locating using radar Some boreholes may require concrete cutting Boreholes will be grouted once testing is complete, except where stand pipes are installed Investigations/activities to be undertaken within boreholes include: <ul style="list-style-type: none"> Packer testing In-situ stress testing Downhole imaging 	<ul style="list-style-type: none"> CPT) (commence 27/07/17) Crows Nest (2 boreholes) (commence 28/07/17) Victoria Cross north (3 boreholes) (commence 07/08/17) Barangaroo (4 boreholes) (commence 15/08/17) Cross Passage 24 (1 borehole) 	geotechnical constraints	<p>Potential for erosion and sedimentation impacts resulting from:</p> <ul style="list-style-type: none"> disturbance of groundcover when accessing site and bringing in plant <p>drilling of boreholes and stockpiling of spoil extracted</p>	B-High	<ul style="list-style-type: none"> Excavation Permit required with Environment Team sign off, prior to commencement of works. Erosion and sediment control plans will be developed and implemented prior to investigations. Refer to Erosion Sediment Control Management Procedure (SMCSTSE-JCG-TPW-EN-MPR-003016) Work areas must be backfilled prior to demobilisation, and groundcover reinstated. Reinstatement works must be inspected and signed off by the Environment Team. 	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
<ul style="list-style-type: none"> - Groundwater standpipe installation - Sampling for laboratory testing 	<ul style="list-style-type: none"> (commence 28/08/17) • Cross Passage 27 (1 borehole) (commence 04/09/17) • Martin Place (13 bore holes 10 of which on Bligh St site) (commence 04/09/17) • Martin Place basement of 28 Castlereagh St (20 boreholes) (commence 10/11/17) • Pitt Street (6 boreholes) 				<ul style="list-style-type: none"> • Work areas to be left overnight must be inspected to assess the need for and, if required, incorporate additional environmental controls if wet weather is predicted 	
			Poor management of waste water (including groundwater and drilling mud) encountered in boreholes	B-High	<ul style="list-style-type: none"> • Waste water (including groundwater and drilling mud) encountered in boreholes is to be captured and trucked to a licenced facility. No waste water is to be discharged on or off the site. • Records of transportation of waste water to licenced facility (i.e. dockets) are to be retained and recorded 	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
	(commencing 21/08/17) <ul style="list-style-type: none"> Waterloo (2 boreholes) (commence 09/08/17) Waterloo Station to Sydney Park (1 borehole) (commence TBA) Sydney Park (8 boreholes commence 01/11/2017) Marrickville (1 borehole) (commence 24/07/17) 		Potential disturbance to known heritage investigation and excavation areas (Indigenous and historic)	B-High	<ul style="list-style-type: none"> See the Aboriginal and Historic Heritage Management Procedure (SMCSTSE-JCG-TPW-EN-MPR-003005). Location of heritage investigation excavation areas is to be captured in the Excavation Permit. AMBS is to be present during drilling of boreholes in uncleared pad sites -see Soil Sampling and Drilling Heritage Procedure (SMCSWTSE-JCG-TPW-EN-MPR-003189). 	D-Low
			Potential for disturbance of or damage to vegetation	C-Medium	<ul style="list-style-type: none"> Boreholes have been located to avoid the need to remove or disturb vegetation, where possible 	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
					<ul style="list-style-type: none"> Existing tracks or areas clear of vegetation will be utilised where possible If minor vegetation clearing is required refer to the Tree Clearing and Grubbing Management Procedure (SMCSTSE-JCG-TSE-EN-MPR-003006). A Tree Clearing and Grubbing Checklist (NWR-TJHDJV-PRO-ENV-00005) must be completed and signed out by the Project Environment Manager 	
			Potential noise impacts on receivers	C-Medium	<ul style="list-style-type: none"> Design Investigation Works are to be undertaken during standard construction hours, as defined in the Project Planning Approval if possible 	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
			Potential dust impacts from drilling and stockpiling of materials	C-Medium	<ul style="list-style-type: none"> Erosion and sediment control plans, including dust minimisation and management strategies, will be developed and implemented prior to investigations 	D-Low
			Potential for spills from plant and machinery	C-Medium	<ul style="list-style-type: none"> If a spill takes place, it should be contained if it is safe to do so, and the Project Environment Manager is to be notified immediately Spill kits are to be present in all plant/vehicles on site Plant and machinery are to be sited away from waterways or drains, where practicable 	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
			Potential excavation of contaminated material	C-Medium	If observations indicate presence of potential contamination then STOP ALL WORK in the immediate area and prevent further activity in the area. The Project Environment Manager is to be notified immediately	D-Low
			Potential excavation of historic and/or Aboriginal heritage items	C-Medium	For any unexpected heritage find, including uncovering human remains, works will stop immediately in that area The Project Environment Manager is to be notified immediately	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
			Potential for traffic congestion means Road Occupancy Licence not permitted during standard ours	C-Medium	Hold Points: <ul style="list-style-type: none"> • Approved community notification must be provided at least one week prior to undertaking night works. Community notification must be submitted for approval five business day prior to its provision to the community. • The DP&E approved Condition E47 OOHW Protocol (rev 1.3 dated 4 July 2017 and approved by DP&E on 14 July 2017) to be implemented. OOHW Approval Form to be completed and signed out by the AA and ER. • All personnel to be present on site for night time 	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
					surveys will receive an induction and a daily toolbox talk, advising to keep noise to a minimum, particular when entering and leaving site	
Over Water Boreholes² Drilling of 6 boreholes: <ul style="list-style-type: none"> To a depth from 45m Drilled using barge mounted rigs Require navigation to location to undertake drilling 	At all required locations as detailed on the drawings provided in Appendix B. Sydney Harbour Chainage:	To inform design of the TSE Works and determine site-specific geotechnical constraints.	No approval to undertake works	B-High	<ul style="list-style-type: none"> Harbour Master Approval required prior to works commencing. The approval requires that an Environmental Assessment be prepared for the works.	D-Low

² Exact location of boreholes is to be determined.

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
	<ul style="list-style-type: none"> TBA 		Potential for sedimentation impacts resulting from: drilling of boreholes and management of excavated material	B-High	<ul style="list-style-type: none"> Excavation Permit required with Environment Team sign off, prior to commencement of works. Barges must have following management and containment devices on board: <ul style="list-style-type: none"> Bunding of materials storage Spill control i.e. floating booms for quick deployment The material removed from the boreholes must be appropriately maintained on the barge and not allowed to escape into the water Barges to be left in place overnight must be inspected 	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
					and if required additional environmental controls installed	
			Poor management of waste water (including groundwater and drilling mud) encountered in boreholes	B-High	<ul style="list-style-type: none"> Waste water (including groundwater and drilling mud) encountered during drilling works is to be captured and trucked to a licenced facility. No waste water is to be discharged on or off the site. Records of transportation of waste water to licenced facility (i.e. dockets) are to be retained and recorded 	D-Low
			Potential noise impacts on receivers	C-Medium	Design Investigation Works are to be undertaken during standard construction hours, as defined in the Project Planning Approval	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
			Potential dust impacts from drilling	C-Medium	Erosion and sediment control plans, including dust minimisation and management strategies, will be developed and implemented prior to investigations	D-Low
			Potential for spills from plant and machinery	C-Medium	<ul style="list-style-type: none"> If a spill takes place, it should be contained if it is safe to do so, and the Project Environment Manager is to be notified immediately Marine spill kits (including marine booms) are to be present on the barge. The barge working surface must be bunded to ensure that spills (fuel, liquids or spoil) cannot run off the working surface into the water). Plant and machinery are to be sited away from 	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
					waterways or drains, where practicable	
			Potential excavation of contaminated material	C-Medium	If observations indicate presence of potential contamination then STOP ALL WORK in the immediate area and prevent further activity in the area. The Project Environment Manager is to be notified immediately	D-Low
			Potential excavation of historic and/or Aboriginal heritage items	C-Medium	For any unexpected heritage find, including uncovering human remains, works will stop immediately in that area The Project Environment Manager is to be notified immediately	D-Low
Discharge of mains water from water-filled barriers Demobilisation of geotechnical investigation site which occurs within the road alignment.	At all required locations which require hard barriers for traffic deflection.	To enable demobilisation of site.	Potential impact to water quality in receiving waterway	C-Medium	<ul style="list-style-type: none"> Discharge of mains water only. Testing and dewater permit must be issued by a member of the environment team prior to discharge 	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
					<ul style="list-style-type: none"> Discharge will occur in a sealed location or such that it does not create scouring of the discharge point Waterfilled barriers will be maintained in a such a way that they are free of litter and other debris. 	
Stage 2 Contamination Investigation						
Team mobilisation <ul style="list-style-type: none"> Gaining access to site Coordinating with personnel working on the site 	At all required locations as detailed on the drawings provided in Appendix C. <ul style="list-style-type: none"> Chatswood (07/08/17) Crows Nest (21/08/17) 	To enable personnel to access site to undertake Contamination Investigation Works	Potential changes in staff	C-Medium	<ul style="list-style-type: none"> All personnel entering site must be inducted Site access arrangements must be made prior to entering site 	D-Low
			Personnel entering unapproved areas	C-Medium		D-Low
			Un-inducted personnel entering worksite	C-Medium		D-Low
			Environmental control materials unavailable/not	C-Medium	All required environmental control materials are to be purchased and available prior to	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
	<ul style="list-style-type: none"> Victoria Cross north (05/12/17) Victoria Cross south (03/10/17) 		present on site after commencement of investigation works		accessing site and commencing investigations	
<p>Test pits and boreholes³</p> <p>Chatswood (13 locations):</p> <ul style="list-style-type: none"> Six boreholes (5m) including three wells (10m) Seven test pits (1m into natural) <p>Crows Nest (eighteen locations):</p> <ul style="list-style-type: none"> Ground penetrating radar at 521 Pacific Highway Nine boreholes (5m) including four wells (10m) Nine test pits (1m into natural) 	<ul style="list-style-type: none"> Barangaroo (04/09/17) Martin Place Bligh Street (21/08/17) Martin Place north (04/09/17) Pitt Street north (21/08/17) Pitt Street south (21/08/17) 	<p>To determine the likelihood of potential soil contamination and likelihood of site remediation required</p> <p>To provide a baseline assessment of soil so as to assess land quality prior to an post-construction</p> <p>To provide an indication of the thickness of filling</p>	<p>Potential for erosion and sedimentation impacts resulting from:</p> <ul style="list-style-type: none"> disturbance of groundcover when accessing site and bringing in plant excavation of test pits and 	B-High	<ul style="list-style-type: none"> Excavation Permit required with Environment Team sign off, prior to commencement of works. Erosion and sediment control plans will be developed and implemented prior to investigations Work areas must be backfilled prior to demobilisation, and groundcover reinstated. Reinstatement works must 	D-Low

³ Exact location of boreholes and test pits is to be determined.

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
<p>Victoria Cross (nineteen locations):</p> <ul style="list-style-type: none"> Eight boreholes (5m) including three wells (10m) Eleven test pits (1m to natural) 	<ul style="list-style-type: none"> Waterloo (21/08/17) Marrickville (07/08/17) 	To inform waste classification of soils	stockpiling of spoil extracted		<ul style="list-style-type: none"> be inspected and signed off by the Environment Team. Work areas left overnight must incorporate additional environmental controls if wet weather is predicted 	
<p>Barangaroo (thirty-nine locations):</p> <ul style="list-style-type: none"> Nineteen boreholes (5m to 15m) including eight wells (four 10m to 15m and four 25m to 35m) Twenty test pits (1m into natural or to 4m) 			Poor management of waste water (including groundwater and drilling mud) encountered in boreholes and test pits	B-High	<ul style="list-style-type: none"> Waste water (including groundwater and drilling mud) encountered in boreholes and test pits is to be captured and trucked to a licenced facility. No waste water is to be discharged on or off the site. Records of transportation of waste water to licenced facility (i.e. dockets) are to be retained and recorded 	D-Low
<p>Martin Place (eighteen locations):</p> <ul style="list-style-type: none"> Three boreholes including three wells (10m) Fifteen test pits (1m into natural) <p>Pitt Street (sixteen locations):</p>			Potential disturbance to known heritage	B-High	<ul style="list-style-type: none"> See Aboriginal and Historic Heritage Management 	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
<ul style="list-style-type: none"> Three boreholes including three wells (10m) Thirteen test pits (1m into natural) <p>Waterloo Station (thirteen locations):</p> <ul style="list-style-type: none"> Six boreholes (5m) including four wells (10m) Seven test pits (1m into natural) <p>Marrickville (nineteen locations)</p> <ul style="list-style-type: none"> Nine boreholes (5m) including three wells (10m) Ten test pits (1m into natural) <p>Note: Some boreholes may require concrete cutting</p>			items (Indigenous and historic)		<p>Procedure (SMCSTSE-JCG-TPW-EM-MPR-003005).</p> <ul style="list-style-type: none"> Location of heritage investigation excavation areas is to be captured in the Excavation Permit. AMBS is to be present during bore holing excavation of test pits in uncleared PAD sites. Soil Sampling and Drilling Heritage Procedure (SMCSWTSE-JCG-TPW-EN-MPR-003189). 	
			Potential for disturbance of or damage to vegetation	B-High	Test pits have been located to avoid the need to remove or disturb vegetation, where possible	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
					Existing tracks or areas clear of vegetation will be utilised where possible Hold Point: If minor vegetation clearing is required, a Tree Clearing and Grubbing Checklist must be completed and signed out by the Project Environment Manager	
			Potential noise impacts on receivers	C-Medium	Design Investigation Works are to be undertaken during standard construction hours, as defined in the Project Planning Approval	D-Low
			Potential dust impacts from drilling boreholes, excavation of test pits, and stockpiling of materials	C-Medium	Erosion and sediment control plans, including dust minimisation and management strategies, will be developed and implemented prior to investigations	D-Low
			Potential for spills from plant and machinery	C-Medium	<ul style="list-style-type: none"> If a spill takes place, it should be contained if it is safe to do so, and the Project Environment 	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
					<p>Manager is to be notified immediately</p> <ul style="list-style-type: none"> Spill kits are to be present in all plant/vehicles on site Plant and machinery are to be sited away from waterways or drains, where practicable 	
			Potential excavation of contaminated material	C-Medium	If observations indicate presence of potential contamination then STOP ALL WORK in the immediate area and prevent further activity in the area. The Project Environment Manager is to be notified immediately	D-Low
			Potential excavation of historic and/or Aboriginal heritage items	C-Medium	For any unexpected heritage find, including uncovering human remains, works will stop immediately in that area. Hold Point: The Project Environment Manager is to be notified	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
					immediately. Implement the Aboriginal and Historic Heritage Management Procedure (SMCSTSE-JCG-TPW-EM-MPR-003005)	
Groundwater testing from monitoring wells Groundwater samples will be collected from groundwater standpipes installed as part of the borehole activity associated with Geotechnical Investigations (as described above)		To determine the likelihood of groundwater contamination To collect background groundwater quality data to supplement groundwater quality monitoring undertaken by TfNSW to further define background groundwater quality	Groundwater samples not representative due to prolonged exposure of borehole	C-Medium	Borehole must be covered if it is to remain open over night or for extended periods of time	D-Low
Survey Works						
Team mobilisation		To enable personnel to	Potential changes in staff	C-Medium		D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
<ul style="list-style-type: none"> Gaining access to site Coordinating with personnel working on the site 	<ul style="list-style-type: none"> Chatswood (07/08/17) 	<p>access areas to undertake survey works</p> <p>To collect data required for detailed drainage design</p>	Personnel entering unapproved areas	C-Medium	<ul style="list-style-type: none"> All personnel conducting survey work must be inducted Access arrangements must be made prior to entering site 	D-Low
	<ul style="list-style-type: none"> Crows Nest (21/08/17) 		Un-inducted personnel entering worksite	C-Medium		D-Low
	<ul style="list-style-type: none"> Victoria Cross north (05/12/17) Victoria Cross south (03/10/17) 		Environmental control materials unavailable/not present on site after commencement of investigation works	C-Medium	<p>Hold Point:</p> <p>All required environmental control materials are to be purchased and available prior to accessing site and commencing investigations</p>	D-Low
	<ul style="list-style-type: none"> Barangaroo (04/09/17) 		Potential noise impacts on receivers	C-Medium	<p>Design Investigation Works are to be undertaken during standard construction hours, as defined in the Project Planning Approval.</p> <p>Hold Points:</p> <ul style="list-style-type: none"> Approved community notification must be provided at least one week 	D-Low
<p>Drainage survey</p> <ul style="list-style-type: none"> Measure invert levels of stormwater and sewer lines from existing pits (lift pits and measure with staff) Survey will commence at nearest state marker (triangulation may be required) 	<ul style="list-style-type: none"> Martin Place Bligh Street (21/08/17) Martin Place north (04/09/17) Pitt Street north (21/08/17) 					

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
<p>in throughout general location – generally from a footpath).</p> <ul style="list-style-type: none"> Traffic control will be required to access pit lids in some locations (this may include a full lane and/or at intersections). If pit is obstructed, direct access to the chamber may be required to measure depth 	<ul style="list-style-type: none"> Pitt Street south (21/08/17) Waterloo (21/08/17) Marrickville (07/08/17) 				<p>prior to undertaking these works. Community notification must be submitted for approval five business day prior to its provision to the community.</p> <ul style="list-style-type: none"> The DP&E approved Condition E47 OOHW Protocol (rev 1.3 dated 4 July 2017 and approved by DP&E on 14 July 2017) to be implemented. OOHW Approval Form to be completed and signed out by the AA and ER 	
			Personnel entering unapproved areas	C-Medium	<p>Hold Point: Access arrangements must be made prior to entering any site or property All personnel conducting survey work must be inducted</p>	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
			Potential discovery of contaminated material	C-Medium	<p>Hold Point: If observations indicate presence of potential contamination then STOP ALL WORK in the immediate area and prevent further activity in the area</p> <p>The Project Environment Manager is to be notified immediately</p>	D-Low
			Disruptions to local traffic	C-Medium	Where required, an approved Traffic Control Plan must be implemented for works on roadways. All conditions (including access times) to be specified on permit. Works are minor in nature and it is expected that the TCPs will be approved for implementation between 10am and 3pm.	D-Low
<p>Positive location of services/utilities</p> <ul style="list-style-type: none"> Protection design regarding site egress locations. 		To positively identify service locations to enable detailed design and planning	Potential noise impacts on receivers	C-Medium	<ul style="list-style-type: none"> Design Investigation Works are to be undertaken during standard construction hours, as defined in the Project Planning Approval. 	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
<ul style="list-style-type: none"> Potholing involves the non-destructive removal of material utilising high pressure water and a vac to collect material. Surface preparation will be necessary and is likely to involve rolling back turf and lifting some pavers. Some saw cutting may also be required in the footpath at identified locations. At completion, sand will be used to backfill the hole, with the surface appropriately reinstated (with turf, pavers or cold mix). It is expected that potholing will predominately be in the grassed road verge area (where possible) and holes will be backfilled and reinstated with turf. Any potholes required within a 					<p>If out of hours survey works are required due to traffic management conditions, Hold Points:</p> <ul style="list-style-type: none"> Approved community notification must be provided at least one week prior to undertaking night works. Community notification must be submitted for approval five business day prior to its provision to the community. The DP&E approved Condition E47 OOHW Protocol (rev 1.3 dated 4 July 2017 and approved by DP&E on 14 July 2017) to be implemented. OOHW Approval Form to be 	

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
footpath, cold mix will be used to repair the surface. • Holes will not be left open overnight, with all holes backfilled prior to end of shift.					completed and signed out by the AA and ER. • All personnel to be present on site for night time surveys will receive an induction and a daily toolbox talk, advising to keep noise to a minimum, particular when entering and leaving site	
			Personnel entering unapproved areas	C-Medium	Access arrangements must be made prior to entering any site or property	D-Low
			Potential for spills from plant and machinery	C-Medium	• If a spill takes place, it should be contained if it is safe to do so, and the Project Environment	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
					<p>Manager is to be notified immediately.</p> <ul style="list-style-type: none"> Spill kits are to be present in all plant/vehicles on site Plant and machinery are to be sited away from waterways or drains, where practicable 	
			Potential excavation of contaminated material	C-Medium	If observations indicate presence of potential contamination then STOP ALL WORK in the immediate area and prevent further activity in the area. The Project Environment Manager is to be notified immediately	D-Low
			Potential excavation of historic and/or Aboriginal heritage items	C-Medium	For any unexpected heritage find, including uncovering human remains, works will stop immediately in that area. The Project Environment Manager is to be notified immediately. Implement the Aboriginal and Historic Heritage Management	D-Low

Design Investigation Risk Assessment



Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
					Procedure (SMCSTSE-JCG-TPW-EM-MPR-003005)	
			Poor management of waste water from potholing (using high pressure water jet)	B – High	<ul style="list-style-type: none"> Waste water (including water used to excavate and any slurry) must be captured (i.e. vac) and trucked to a licenced facility. No waste water is to be discharged on or off the site. Records of transportation of waste water to licenced facility (i.e. dockets) are to be retained and recorded 	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
			Potential for erosion and sedimentation impacts resulting from excavation management of excavated material	B – High	<ul style="list-style-type: none"> Excavation Permit required with Environment Team sign off, prior to commencement of works. Erosion and sediment control plans will be developed and implemented prior to investigations Work areas must be reinstated (subject to ROL) prior to demobilisation. Work areas are not to be left open overnight where possible. All works to be performed in accordance with any ROL. 	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
			Disruptions to local traffic	C-Medium	Where required, an approved Traffic Control Plan must be implemented for works on roadways. All conditions (including access times) to be specified on permit. It is anticipated that the TCPs will be approved for implementation between 10am and 3pm.	D-Low
Heritage Site Investigation						
Team mobilisation <ul style="list-style-type: none"> Gaining access to site Coordinating with personnel working on the site 	At all required locations detailed below: <ul style="list-style-type: none"> Chatswood (04/09/17) Crows Nest (06/11/17) Victoria Cross South (potential post-demolition) 	To provide input to the development of Archaeological Method Statements (see the Aboriginal and Historic Heritage Management Procedure (SMCSTSE-JCG-TPW-EM-MPR-003005)) To provide clearance to facilitate pre-	Potential changes in staff Potential for erosion and sedimentation impacts resulting from: <ul style="list-style-type: none"> disturbance of 	C-Medium	<ul style="list-style-type: none"> All personnel entering site must be inducted Site access arrangements must be made prior to entering site 	D-Low
Historic Heritage Monitor and test excavations as follows: Chatswood: <ul style="list-style-type: none"> NC5 1850s Bryson's Cottage – moderate potential archaeological 				B-High	<ul style="list-style-type: none"> Excavation Permit required with Environment Team sign off, prior to commencement of works. Erosion and sediment control plans will be 	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
<p>evidence of early occupation and early activities associated with store and livery stables.</p> <ul style="list-style-type: none"> NC6 1870's School of Arts – low archaeological potential <p>Crows Nest:</p> <ul style="list-style-type: none"> CN11 & CN12 a possibly pre-1870s building indicated in 1895 Sydney Water Plan CN8, possible pre-1870s building indicated in 1895 Sydney Water Plan Non-sensitive areas to be managed in accordance with Unexpected Finds Protocol <p>Victoria Cross South</p> <ul style="list-style-type: none"> Potential post-demolition 	<ul style="list-style-type: none"> Barangaroo (03/10/17) Pitt Street (31/07/17) Waterloo (03/12/17) Marrickville (04/09/17) 	<p>construction works</p>	<ul style="list-style-type: none"> groundcover when accessing site and bringing in plant excavation of test pits and stockpiling of spoil extracted 		<p>developed and implemented prior to investigations</p> <ul style="list-style-type: none"> Work areas must be backfilled prior to demobilisation, and groundcover reinstated. Reinstatement works must be inspected and signed off by the Environment Team. Work areas left overnight must incorporate additional environmental controls if wet weather is predicted 	
			<p>Poor management of waste water (including groundwater and drilling mud) encountered in</p>	B-High	<ul style="list-style-type: none"> Waste water (including groundwater and drilling mud) encountered in boreholes and test pits is to be captured and trucked to a licenced facility. No waste 	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
<p>Barangaroo:</p> <ul style="list-style-type: none"> Archival photographic recording: bridge over Hickson Rd and Hickson Road Cutting Potential state significant archaeological remains of Cuthbert's shipyard, Dibbs' wharf. Hickson Road and non-sensitive areas to be managed in accordance with the Unexpected Finds Protocol <p>Pitt Street:</p> <ul style="list-style-type: none"> Early plans demonstrate at least 2 occupation phases in areas where there are no basements: PS1, PS4-PS8 Non sensitive areas to be managed in accordance with Unexpected Finds Protocol 			boreholes and test pits		<ul style="list-style-type: none"> water is to be discharged on or off the site. Records of transportation of waste water to licenced facility (i.e. dockets) are to be retained and recorded 	
			Potential disturbance to known heritage items (Indigenous and historic)	B-High	<ul style="list-style-type: none"> Heritage consultant is to be present during bore holing excavation of test pits in uncleared PAD sites. <p>Location of heritage items is to be captured in the Excavation Permit.</p>	D-Low
			Potential for disturbance of or damage to vegetation	C-Medium	<p>Test pits have been located to avoid the need to remove or disturb vegetation, where possible</p> <p>Existing tracks or areas clear of vegetation will be utilised where possible</p> <p>Hold Point: If minor vegetation clearing is required, a Tree Clearing and</p>	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
<p>Waterloo:</p> <ul style="list-style-type: none"> Artefact Heritage identified the Cope Street (Botany Street) frontage as populated by mid-twentieth century structures to be tested and salvaged Pre-1880s Sydney Water plan indicates presence of pre-1870s buildings, which should be monitored and tested to determine integrity and significance, possible open-area excavation, where there are no basements. <p>Marrickville:</p> <ul style="list-style-type: none"> Too little known for certainty; however, need to determine whether the remains of 3 houses on the north side of Murray Street housing present in 1943 are pre-1870s (1943 aerial) 					Grubbing Checklist must be completed and signed out by the Project Environment Manager	
			Potential noise impacts on receivers	C-Medium	Design Investigation Works are to be undertaken during standard construction hours, as defined in the Project Planning Approval	D-Low
			Potential dust impacts from excavation of test pits, and stockpiling of materials	C-Medium	Erosion and sediment control plans, including dust minimisation and management strategies, will be developed and implemented prior to investigations	D-Low
			Potential for spills from plant and machinery	C-Medium	<ul style="list-style-type: none"> If a spill takes place, it should be contained if it is safe to do so, and the Project Environment Manager is to be notified immediately Spill kits are to be present in all plant/vehicles on site 	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
Aboriginal Heritage Chatswood, Crows Nest: <ul style="list-style-type: none"> Non-sensitive areas to be managed in accordance with the Unexpected Finds Protocol Barangaroo: <ul style="list-style-type: none"> Stage 1 test excavation required if intact remnant soil profiles are located during historic excavations. Stage 2 salvage excavations required if Aboriginal heritage items identified during test excavations Non-sensitive areas to be managed in accordance with Unexpected Finds Protocol Pitt Street:					<ul style="list-style-type: none"> Plant and machinery are to be sited away from waterways or drains, where practicable 	
			Potential excavation of contaminated material	C-Medium	If observations indicate presence of potential contamination then STOP ALL WORK in the immediate area and prevent further activity in the area. The Project Environment Manager is to be notified immediately	D-Low
			Potential excavation of historic and/or Aboriginal heritage items	C-Medium	For any unexpected heritage find, including uncovering human remains, works will stop immediately in that area. The Project Environment Manager is to be notified immediately. Implement the Aboriginal and Historic Heritage Management Procedure (SMCSTSE-JCG-TPW-EM-MPR-003005)	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
<ul style="list-style-type: none"> Stage 1 test excavation required if intact remnant soil profiles are located during historic excavations. Stage 2 salvage excavations required if Aboriginal heritage items identified during test excavations Non-sensitive areas to be managed in accordance with Unexpected Finds Protocol <p>Waterloo:</p> <ul style="list-style-type: none"> Aboriginal Archaeology Director to inspected cleared area. Stage 1 test excavation required if intact remnant soil profiles are identified during inspection, or located during historic excavations/ assessment. Stage 2 salvage excavations required if Aboriginal heritage items identified during test excavations. 						

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
<p>Marrickville:</p> <ul style="list-style-type: none"> Aboriginal archaeology director to inspect cleared area. Stage 1 test excavation required if intact remnant soil profiles are identified during inspection, or located during historic excavations/ assessment Stage 2 salvage excavations required if Aboriginal heritage items identified during test excavations. 						
Tunnel Equipment Relocation						
<p>Transport of the following listed items from NRT's Bella Vista Worksite to JHCPBG's Marrickville Worksite via the existing road network:</p> <ul style="list-style-type: none"> Segment moulds Segment stands and palletised dunnage 	<p>Transport from NRT's Bella Vista Worksite to JHCPBG Marrickville Worksite for storage – note site establishment work is addressed under separate risk assessment SMCSWTSE-JCG-TPW-EM-RPT-097010 Initial Site</p>	<p>To maximise the sustainable reuse of equipment salvaged from the TSC project</p> <p>Remove equipment that is currently stored at NRT's Bella Vista</p>	<p>Traffic impacts on local roads including controls detailed in MCOAs E79, E80, E81, E82, E83, E85 and E88.</p>	<p>C-Medium</p>	<p>All people undertaken the works will be project inducted by both NRT, JHCPBG and Delta.</p> <p>The most direct route along arterial roads will be used to transport the items. This is to reduce traffic impacts but also ensure that items can be transported quickly and safely to the JHCPBG Marrickville</p>	<p>D-Low</p>

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
<ul style="list-style-type: none"> Pallet racking Segment grabs Carousel rail frames Approx. 8 x 40ft shipping containers Approx. 2 x 20ft shipping containers Miscellaneous items including equipment and consumables <p>It is anticipated that there will be approx. 6-10 deliveries per day over a approx. 10-week period.</p> <p>A combination of sized trucks i.e. flatbed trucks, semi-trailers etc will be utilised for transporting items from NRT's Bella Vista Worksite to the JHCPBG Marrickville Worksite.</p> <p>Mobile cranes/ telehandler/ EWP's will be used to facilitate in the transport of items.</p>	Establishment Risk Assessment	Worksite to allow NRT to complete construction works.			Worksite. Consideration of alternatives to local roads where feasible (as required under E85) will be applied. The truck haulage route will also be designed to minimise transit through commercial centres during peak times (as required under E80). This will be documented in the relevant work pack (SMCSWTSE-JCG-TPW-CN-WPK-061008). Where relevant truck movements are within the vicinity of the Marrickville site, these will be consistent with the measures and haulage routes committed in the Delta Group Traffic Control Management Plan – Marrickville Dive Site (May 2017). Similarly these works will be consistent to the mitigation measures and haulage routes, within the vicinity of the Marrickville site, detailed in the Sydney Metro Chatswood to Sydenham EIS.	

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
					<p>A Vehicle Management Plan will be prepared and implemented for the works.</p> <p>All drivers will be required to sign the Heavy Vehicle Driver Code of Conduct (SMCSWTSE-JCG-TPW-CN-FRM-004218) prior to undertaking the works.</p> <p>Chain of Responsibility Management Plan (SMCSWTSE-JCG-TPW-PLN-002164) to be implemented for the works.</p> <p>E79 does not apply as there is no oversized or overweight haulage involved.</p> <p>E81, and subsequently E82 and E83, refers to commencement of construction and therefore does not apply to the proposed works.</p>	

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
			Noise impacts on surrounding receivers	C-Medium	<p>Only the required plant to facilitate the transport of items will be utilised.</p> <p>When plant is not in use it will be turned off.</p> <p>Works to be undertaken during standard daytime construction hours. However, where oversized items are to be transported at night, an OOHW application is to be prepared and submitted to the AA and ER for approval using the TfNSW OOHW Application Form.</p>	D-Low
Harbour CPT Testing						
<p>The running tunnels cross under the Sydney Harbour from Millers Point to Blues Point an approximate distance of 550 meters.</p> <p>It is proposed to undertake a series of Sedbed Cone Penetration Tests</p>	<p>Operations are scheduled to start on 27 November 2017 and continue up to 19 December inclusive, subject to the number of tests able to be</p>	<p>Geotechnical site investigation is required within the Sydney Harbour in order to obtain geotechnical parameters for the</p>	Noise impacts on surrounding receivers	C-Medium	<p>Testing will be undertaken during standard daytime hours (7 am to 6 pm Monday to Friday and 8 am to 1 pm on Saturdays)</p>	D-Low
			Disruption to shipping channel	C- Medium	<p>Provide the Harbour Master with sufficient written notification of the intended drilling works for them to issue a Notice to</p>	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
<p>(CPTs) that are executed from the sea bed using a specialist sea bed pushing or reaction frame, as an alternative to traditional geotechnical site investigation from a jack up barge.</p> <p>The test locations are within Sydney Harbour – Port Jackson between Blues Point and Dawes Point Wharves. The top of the work site is located approximately 55m south of Blues Point. Given that this work is undertaken from a ship a separate SEP will not be required</p> <p>The Geotechnical site investigation method that will be used is Sedbed CPTs that are executed from the sea bed using a specialist sea bed pushing or reaction frame. A cone penetration test rig pushes a steel cone (about 32mm diameter) into</p>	<p>completed on any particular working day due to shipping movements and/or weather. Works will be undertaken across 11-hour shifts, based on a 6-day working week being, Monday to Friday, 7am to 6pm and Saturday 8am to 1pm. It is envisaged that Monday to Friday 7-hour work windows will generally be available between cruise ship movements into and out of White Bay.</p>	<p>detailed design of the slurry shield driven Tunnel Boring Machine (TBM) tunnel. In this area there is currently insufficient geotechnical data, as previous geotechnical site investigation programs using traditional jack up barge methods were unsuccessful.</p>			<p>Mariners covering the period of works.</p> <p>All drilling operation must then comply with the Notice to Mariners.</p> <p>The Master will access the Daily Shipping schedule and current movement updates from the Port Authority of New South Wales website (www.portauthoritynsw.com.au).</p> <p>The master will report to VTS Channel 13 each day when departing for the works to inform them of the days operations and then again upon leaving at the end of each day.</p> <p>No test location shall be accessed without prior discussion and scheduling at the</p>	

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
<p>the seabed, generally up to 20m below the surface or until the cone reaches refusal at a hard layer, or the inferred rock level. The steel cone contains an electronic measuring system that records tip resistance and sleeve friction. As the cone is pushed into the ground, the soil responds with differing degrees of resistance. This resistance is recorded using force sensors in the tip. At the same time as the sensors are recording resistance at the cone tip, sensors in the friction sleeve are recording sleeve friction along a 100mm length. The chain drive action of the Seabed CPT allows for a continuous push of 20mm / sec, recording data until target depth or refusal.</p>					<p>Daily Scheduling Meeting. The Shipmaster shall discuss relocation procedures in accordance with Polaris and Probedrill Safe Work Procedures and complete a Relocation Checklist and Briefing Record.</p> <p>In the event that any CPT has to be stopped, and the test vessel moved out of the shipping channel, the following sequence would occur;</p> <ul style="list-style-type: none"> i) Sydney Ports VTS advises Shipmaster that the test vessel needs to vacate the shipping channel ii) CPT ceased and cone retracted from seabed at 20mm/sec – 15 minutes 	

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
<p>Basic sequencing of works will be as follows;</p> <ul style="list-style-type: none"> i) Desk top utility investigation of proposed CPT work zone ii) Site Clearance – diver visual assessment of full work zone prior to commencement iii) Establish test position & exclusion zone iv) Lower CPT Marine 'A' frame into water, and reaction frame to sea bed v) Under take CPT vi) Raise reaction frame & CPT Marine 'A' frame out of the water vii) Move Vessel to next test location <p>Repeat Steps iv-vii, inclusive, for each test</p>					<ul style="list-style-type: none"> iii) CPT reaction from winched to surface – 15 minutes iv) Demobilise from exclusion zone – 30 minutes v) Contingency – 60 minutes <p>Clearance of the shipping channel can therefore occur within 1-2 hours (or 2 hours max.)</p> <p>Should the CPT pushing rod be damaged, and 'snapped off', in the haste to demobilise, in the worst-case scenario 10m of rod would be left protruding from the sea bed (in a depth of water of approximately 22m), until such time that it was safe for a diver to remove. If this occurs Master to notify Sydney Ports VTS so a</p>	

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
					navigation warning can be issued	
			Collision resulting in environmental incident	B -High	<ul style="list-style-type: none"> Masters to comply with International Collision Regulations See controls for 'Disruption to shipping channel' above Notifications completed in advance of testing 	D- Low
			Garbage pollution	C-Medium	<ul style="list-style-type: none"> All rubbish to be put in bins with fitted lids No rubbish to be left behind whatsoever Crew to ensure that any loose items or garbage are to be removed and managed in accordance with the NSW EPA Waste Classification 	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
			Sewage pollution	C-Medium	Toilets on board vessel will be used and pumped out as required at a designated shore disposal facility	D-Low
			Fuel and oil pollution	C-Medium	<ul style="list-style-type: none"> Vessel will be serviced and leak free All vessel refuelling, lubrication, hydraulic and greasing activities will be undertaken at the Rozelle Yard Visual inspection to be undertaken at least daily for oil or fuel spills and spill kits to be available on board the vessel at all times 	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
			Impact on marine flora and fauna	C-Medium	<ul style="list-style-type: none"> • Use only potable water for any required ballast where possible • No salt water ballast to be release within Sydney Harbour • Crew is to be experienced at spotting marine mammals and instructed to notify the Master of the bearing of any mammals immediately so that avoiding action can be implemented 	D-Low

Design Investigation Risk Assessment

Scope of Activity	Location of Activity (Indicative Commencement Date)	Justification	Potential Environmental Risks	Uncontrolled Risk Rating	Key Environmental Controls	Residual Risk Rating
			No approval to undertake works	B-High	<ul style="list-style-type: none"> Harbour Master Approval required prior to works commencing. The approval requires that an Environmental Assessment be prepared for the works. 	D-Low

Design Investigation Risk Assessment

Design Investigation Works						
Design Investigation works including: <ul style="list-style-type: none"> • Survey • Service and other underground items/ ground condition identification and verification • Visual inspection of underground infrastructure 	At all required locations as detailed on the drawings provided in Appendix B.	To inform design of the TSE Works and determine site-specific service supply constraints	Environmental control materials unavailable/not present on site after commencement of investigation works	C-Medium	<ul style="list-style-type: none"> • All required environmental control materials are to be purchased and available prior to accessing site and commencing investigations 	D-Low
			Undertaking works outside the approved TSE Works boundary	B-High	<ul style="list-style-type: none"> • Where access is required to areas outside of the TSE Works boundary, permission for access must be granted by the landowner/s and/or occupier/s prior to entering these areas 	D-Low

Design Investigation Risk Assessment



Design Investigation Works						
			Disruption to traffic	B-High	<ul style="list-style-type: none"> Road Occupancy Licence required for works on public roads and/or footpaths prior to commencement of works provided by relevant authority 	D-Low
			Potential for erosion and sedimentation impacts resulting from: <ul style="list-style-type: none"> disturbance of groundcover non-destructive digging 	B-High	<ul style="list-style-type: none"> Erosion and sediment control plans will be developed and implemented prior to investigations. Refer to Erosion Sediment Control Management Procedure (SMCSTSE-JCG-TPW-EN-MPR-003016) 	D-Low

Design Investigation Risk Assessment

Design Investigation Works						
					<ul style="list-style-type: none"> • Work areas must be backfilled and groundcover reinstated prior to completion of shift and demobilisation • Work areas to assessed whether appropriate controls are in place during works and incorporate additional environmental controls, if required (eg.if wet weather is predicted/ unexpected change occurs) 	

Design Investigation Risk Assessment

Design Investigation Works						
			<p>Poor management of waste water (including groundwater and non-destructive digging process waster) encountered in boreholes</p>	<p>B-High</p>	<ul style="list-style-type: none"> Waste water (including groundwater and non-destructive digging process water) encountered is to be captured and trucked to a licenced facility. No waste water is to be discharged on or off the site. Records of transportation of waste water to licenced facility (i.e. docketts) are to be retained and recorded 	<p>D-Low</p>

Design Investigation Risk Assessment

Design Investigation Works						
			Potential disturbance of unknown historic and/or Aboriginal heritage items	B-High	<ul style="list-style-type: none"> See the Aboriginal and Historic Heritage Management Procedure (SMCSTSE-JCG-TPW-EN-MPR-003005). For any unexpected heritage find, including uncovering human remains, works will stop immediately in that area The Project Environment Manager is to be notified immediately 	D-Low

Design Investigation Risk Assessment

Design Investigation Works						
			Potential for disturbance of or damage to vegetation	C-Medium	<ul style="list-style-type: none"> • Ground disturbance to be located to avoid the need to remove or disturb vegetation, where possible • Existing tracks or areas clear of vegetation will be utilised where possible • If minor vegetation clearing is required refer to the Tree Clearing and Grubbing Management Procedure (SMCSTSE-JCG-TSE-EN-MPR-003006). A Tree Clearing and 	D-Low

Design Investigation Risk Assessment

Design Investigation Works						
					Grubbing Checklist (NWR-TJHDJV-PRO-ENV-00005) must be completed and signed out by the Project Environment Manager	
			Potential noise impacts on receivers	B-High	<ul style="list-style-type: none"> Design Investigation Works are to be undertaken during standard construction hours, as defined in the Project Planning Approval, where possible Design Investigation 	D-Low

Design Investigation Risk Assessment

Design Investigation Works						
					<p>works required to be undertaken outside of standard hours are to be undertaken as per the <i>Sydney Metro City Southwest Construction Noise and Vibration Strategy</i> which requires Acoustic Advisor and Environmental Representative endorsement prior to works commencing</p> <ul style="list-style-type: none"> • Appropriate community notification and consultation will be undertaken 	

Design Investigation Risk Assessment



Design Investigation Works						
					<p>prior to commencement of works as per the <i>Sydney Metro City Southwest Construction Noise and Vibration Strategy</i></p>	
			Potential dust impacts from ground disturbance	C-Medium	<ul style="list-style-type: none"> Erosion and sediment control plans, including dust minimisation and management strategies, will be developed and implemented prior to and during works 	D-Low

Design Investigation Risk Assessment

Design Investigation Works						
			Potential for spills from plant and machinery	C-Medium	<ul style="list-style-type: none"> If a spill takes place, it should be contained if it is safe to do so, and the Project Environment Manager is to be notified immediately Spill kits are to be present in all plant/vehicles on site Plant and machinery are to be sited away from waterways or drains, where practicable 	D-Low

Design Investigation Risk Assessment

Design Investigation Works						
			Potential excavation of contaminated material	C-Medium	<ul style="list-style-type: none"> If observations indicate presence of potential contamination then STOP ALL WORK in the immediate area and prevent further activity in the area. The Project Environment Manager is to be notified immediately 	D-Low

Appendix A – Risk matrix

Risk Rating A – Very High B – High C – Medium D - Low			Consequence					
			Insignificant	Minor	Moderate	Major	Severe	Catastrophic
			C6	C5	C4	C3	C2	C1
Likelihood	Almost certain	L1	C	B	B	A	A	A
	Likely	L2	C	C	B	B	A	A
	Possible	L3	D	C	C	B	B	A
	Unlikely	L4	D	D	C	C	B	B
	Rare	L5	D	D	D	C	C	B
	Almost unprecedented	L6	D	D	D	D	C	C

Appendix B – Land Geotechnical Borehole Locations

Note: As geotechnical investigations are confirmed, Site Environment Plans (SEP's) will be prepared/ amended to illustrate the applicable locations of works. All SEPs must be endorsed by the ER prior to works commencing. A register of current, applicable SEPs will be updated and provided via Teambinder to the ER and other representatives post-endorsement of that SEP.

Refer to the SEP register SMCSWTSE-JCG-TPW-EM-REG-026099-Endorsed Site Environment Plan Register for the latest endorsed SEPs.

Appendix C – Over Water Geotechnical Borehole Locations

Note: As borehole locations are confirmed on Site Environment Plans (SEPs) which will be prepared/ amended to illustrate the locations.