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Reference: JL:JL RPT:S&C 15188

15th June 2015

The Manager
Crone Partners
Level 2, 364 Kent Street
SYDNEY NSW 2001

Attention: Ms Sally Hsu

Dear Madam

**RE: 1 ALFRED STREET – PROPOSED REDEVELOPMENT
STRUCTURAL AND CIVIL ENGINEERING ADVICE FOR DISTRICT APPROVAL STAGE 1 (DA1)**

Robert Bird Group (RBG) has been engaged by Crone Partners on behalf of the client WANDA group to provide civil and structural consulting engineering services for the DA1 submission of the proposed "Australia Sydney One project" development at 1 Alfred Street, Sydney.

RBG has been involved in coordination sessions and have reviewed concept design drawings provided by Crone partners proposals. RBG have provided engineering advice that is to be incorporated into the DA submission. This includes the following:

- Basement Coordination including coordination of shoring structures adjacent to the proposed CBDRL alignment, the Tank stream culvert and other adjacent services.
- Structural framing of the hotel, podium and ballroom structures
- Coordination of the existing DA1 approved building Tower A.

Items that need to be addressed to ensure the structural solution can be realised include the following:

- Require building information on the adjacent properties (south of the site) to confirm basement depths and any temporary and permanent restraint requirements. This may affect shoring systems retaining those sites.
- Require confirmation that structural grid can be accommodated and/or required additional column transfer structure.

Once the building envelope and function has been coordinated around these comments, RBG believe the design is reasonably in accordance with, and can be further developed and delivered in accordance with, all relevant Australian Standards, the Building Code of Australia, and all other statutory conditions relevant to the structure of the project.

The structural design will be developed in accordance with all relevant Building Code of Australia requirements and relevant Australian Standards including but not limited to:-

AUSTRALIAN STANDARDS

- AS3600 Concrete Structures Code
- AS4100 Steel structures Code
- AS3700 Masonry Structures
- AS1170.0 Structural Design Action Effects
- AS1170.1 Loading Code
- AS1170.2 Wind Loads
- AS1170.4 Earthquake Loads
- AS2159 Piling Code

Yours faithfully
ROBERT BIRD GROUP PTY LTD



MATT HARDING
Principal – Structures NSW



Robert **Bird** Group

Structural review of Shoring Systems
Adjacent to Proposed CBDRL and
tank Stream

AUSTRALIA SYDNEY 1 PROJECT
1 Alfred street, Sydney

Issue: A

**Prepared For: Crone Partners and Wanda Commercial Planning and Research
Institute co. Ltd**

Project No.: 15188

09 July 2015



[illegible]

REVIEWER:

JASON LANGER
Signing for and on behalf of
Robert Bird Group Pty Ltd
Date: 9 July 2015

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Appendix B: Current CBDRL Drawings received from TfNSW 3 June and 18 June 2015

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Appendix D: DBYD Information

Appendix E: Fairfax House Existing Basement drawings

Appendix F: Goldfields House Basement drawings

Appendix G: Tank Stream Information

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1.0 INTRODUCTION

The proposed One Alfred street site consists of the combination of the following existing sites:

- Goldfields House
- Fairfax House
- Existing Rugby club

The proposed development is to encompass the whole site and will involve a 6 basement deep excavation to approximate RL -15m.

The proposed CBDRL alignment currently runs along the North-east corner of the site.

The existing tank stream culvert borders the east of the site.

Both items of infrastructure will affect the extent of the basement envelope itself as well as restrict the type of structure and loadings of proposed building structure.

2.0 SITE LOCATION AND BUILDING INFORMATION GATHERING

The proposed One Alfred street site is on the corners of Pitt street, Alfred street and George street adjacent to Circular quay.

Building information has been obtained for the existing Fairfax house and Goldfields house sites, but has not yet been obtained for the existing Rugby club or the Neighbouring properties. This has been requested from the City of Sydney Archives 9 June 2015 and has not yet been received. This information will allow confirmation of shoring systems to the South of the proposed site. Refer to

A dial-before-you-dig (DBYD) retrieval was completed to determine all known major services in the area of the site.

- Refer Appendix D for DBYD Information
- Refer Appendix E for Fairfax house drawings
- Refer Appendix F for Goldfields house drawings
- Refer Appendix H for site plan.

3.0 CBDRL INFORMATION GATHERING

The CBDRL is a proposed underground tunnel that will link the city and surrounding area. The tunnel alignment is protected under the State Environmental Planning Policy (Infrastructure) 2007 and all new building work must be in accordance with TfNSW requirements.

The current anticipated CBDRL alignment has been provided by TfNSW, however it is not expected that the exact location, or construction type of the tunnel will be confirmed until the end of 2015 when it is publically announced.

During the preparation for the DA stage 1, a meeting with TfNSW representative: Michael Gheorghiu was completed where basic guidelines and restrictions around the alignment, as well as expected reporting were informally identified, noting that exact requirements would be determined during the district approval assessment.

Michaels contact details for any future coordination beyond DA stage 1 application are as follows:

Michael Gheorghiu
Coordinator, Future Rail Corridors Protection
Transport for NSW
M: 0419 265 659
E: michael.gheorghiu@transport.nsw.gov.au
Level 3, 18 Lee Street, Chippendale NSW 2018
PO Box K659, Haymarket NSW 1238

The current TfNSW alignment and basic restrictions are noted in Appendix B of this report.

The alignment and restrictions available during the previous DA1 application (circa 2011) are noted in Appendix C for information.

4.0 TANK STREAM INFORMATION GATHERING

The Tank stream is a brick arch tunnel stormwater culvert built in the 1800's that has been Heritage listed.

The culvert runs along the eastern side of the site and based on existing drawings may encroach the site boundary. No exact survey setout information has been provided to date.

The culvert is movement sensitive, so all excavation for the proposed site needs to allow for minimal to no movement of the culvert, and continuous full support to protect the important infrastructure.

Historic drawings and the Sydney Water Conservation management plan are included in Appendix G. The Heritage Impact statement and report is not appended in this report.

5.0 PROPOSED SHORING AND FOUNDATION SYSTEM

5.1 Shoring systems

The proposed shoring system will vary around the perimeter of the site depending on the existing structure, the excavation sequence and temporary retention and the requirements beyond the site boundary.

In all cases the shoring design needs to reflect the requirements of item 12 in the SEAR's report to ensure structural integrity or safety of, or ability to operate rail projects adjacent to the site as well as not unreasonably constrain the construction of the proposed CBDRL.

Refer to Appendix A showing the various zones of anticipated shoring systems:

Zone 1 – Existing Goldfields House retaining wall bordering Alfred street

Zone 2 – Shoring retention along existing Fairfax House basement, adjacent to the Tank Stream Box culvert

Zone 3 – Shoring retention along existing Goldfields House - adjacent to CBDRL

Zone 4 – New retention system along the southern boundary of the site adjacent to Neighbouring properties.

Zone 1 – Goldfields House – Northern Boundary

The Intention for this zone is to retain the existing reinforced concrete retaining wall that runs along the Northern boundary approximately 2 basements deep. Temporary steel tensioned anchors will be placed above the existing slabs to support the wall as the internal slab structure is demolished and new structure re-built. Additional wall strengthening will be completed as required.

The existing wall is understood to be sitting on rock. Below the existing wall will be a vertical rock face excavation. Shoring is expected to be limited to localised rock bolting as required. Any strengthening and/or support of the rock shelf below will be provided by the Geotechnical Engineer.

Zone 2 – Fairfax House – Eastern Boundary

It is understood the Fairfax house has a 1 level deep basement. This basement wall is understood to be directly adjacent to the existing tank stream culvert drain, This culvert is very sensitive to both horizontal and vertical movement.

The intention is to leave the existing wall in place and construct a separate shoring system directly in front of the wall. This system will consist of a bored pier soldier, or secant pile wall that will socket into rock. Temporary steel wire anchors will be positioned below the Tank stream culvert and socketed into rock at an angle to not affect the proposed CBDRL tunnel.

To ensure that the Fairfax house wall does not relax, a jacking type system (hydraulically filled flat-jacks or similar) can be implemented to ensure that active pressure is applied to the wall at all times.

Zone 3 – Goldfields House – Eastern Boundary

This corner of the site is most affected by the proposed CBDRL alignment. The tunnel itself is expected to cut through the corner of the site, so along with the easement requirements a large area of basement will be affected.

Similar to the DA stage 1 proposal circa 2011, the intention is to excavate the full basement down to a level where podium columns can found without significantly affecting either the future tunnel construction, or the affecting the 1 Alfred development.

Adjacent to the tunnel the basement will step and be excavated down to basement level 6 (approximate BEL of -15m) to ensure a minimum 3m clearance as per current requirements issued by TfNSW.

Refer to Appendix A for intended excavation and shoring system

Refer to Appendix B for current TfNSW CBDRL requirements.

It is likely that some temporary rock anchoring will be required to support both the existing Goldfields retaining wall the rock face. These anchors will need to be carefully coordinated and documented so that they do not unreasonably constrain the construction of the CBDRL, or detrimentally affect the tank stream culvert.

In discussions with TfNSW, there are options being discussed to use a Tunnel boring machine (TBM) to complete the CBDRL. If stray anchors do reach into the tunnel alignment, then there may be options to allow this if all other design options are exhausted. However it is not preferred as it will cause delays as TBM cutting heads will need to be adjusted for cutting through steel.

Zone 4 – Southern Boundary support

No information has been received on the existing Jacksons building, or the Neighbouring sites. The expected shoring is to be a mix of retention similar to zones 1,2 and 3.

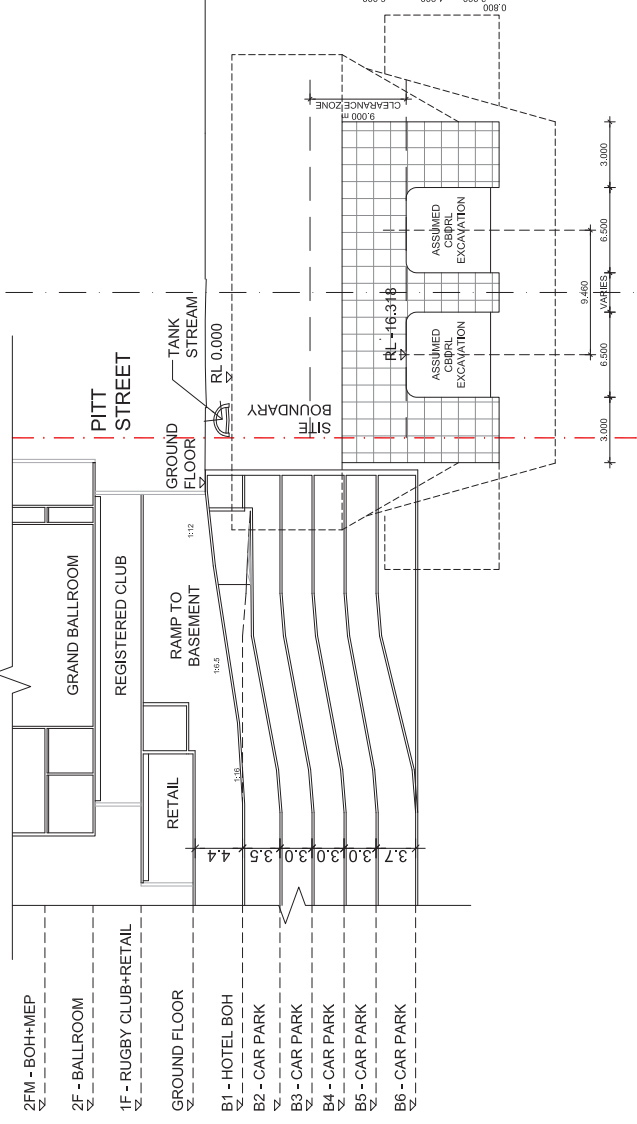
5.2 Foundation Systems

The majority of footings will be pad footings founded below the BEL of -15m

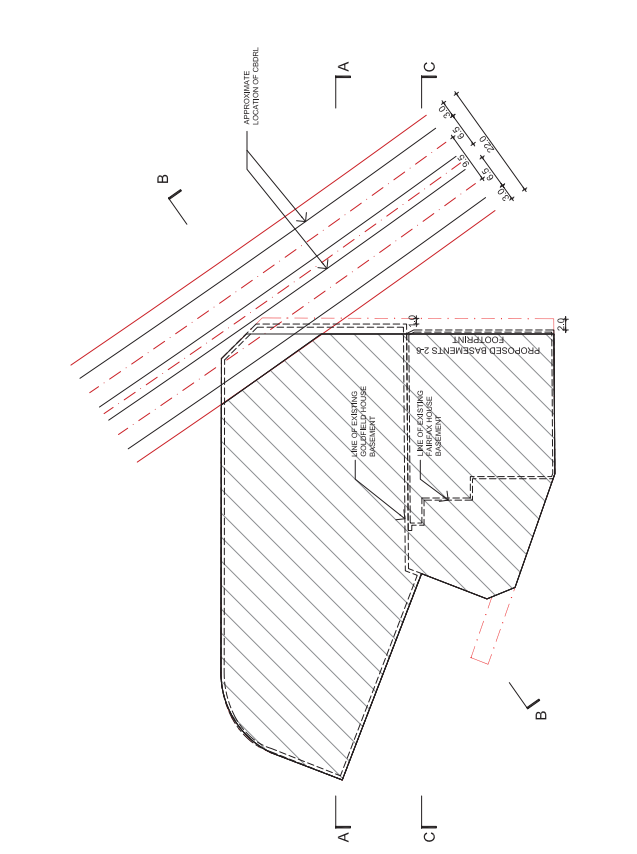
Adjacent to the CBDRL, there may be requirements to provide wither deep pad footings, or a piled solution to ensure the loading does not affect the CBDRL zones of influence.

Over the CBDRL, the intention is to only have podium column loading onto high level foundations. These footings will have loads in the order of 4000 – 6000 KN only. Current geotechnical advice has set these to sit a minimum of 9m above the tunnel void to minimise effect on future CBDRL and potential relaxing settlement the 1 Alfred building.

Appendix A: Site Plan and sections



2 SECTION A

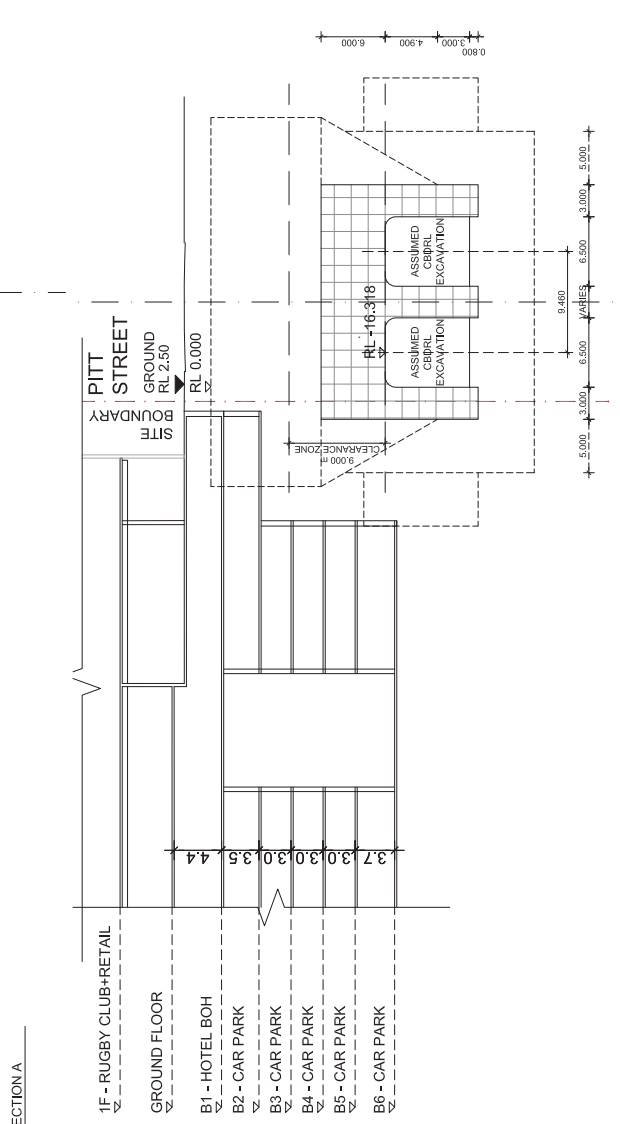


3 SECTION B

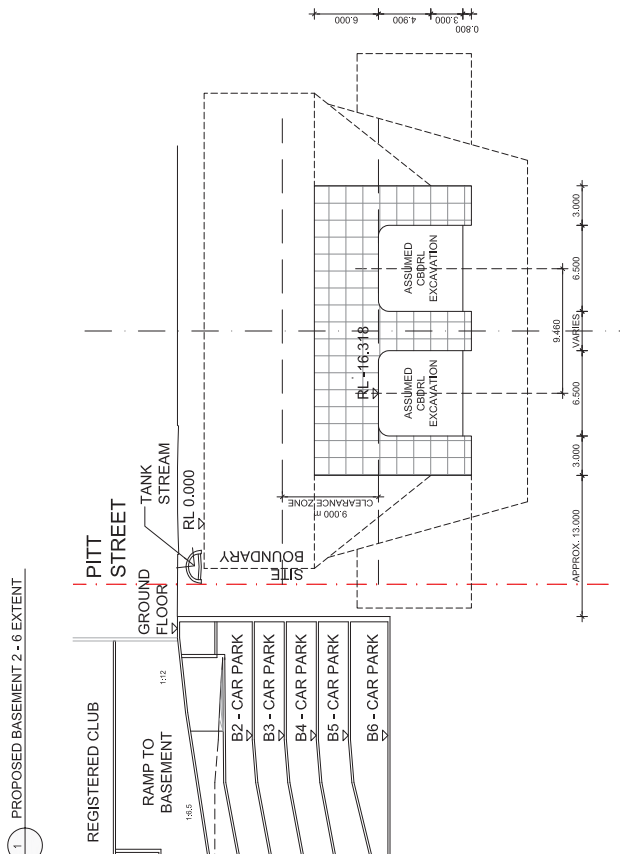


4 SECTION C

1 PROPOSED BASEMENT 2 - 6 EXTENT



2 SECTION A



3 SECTION B



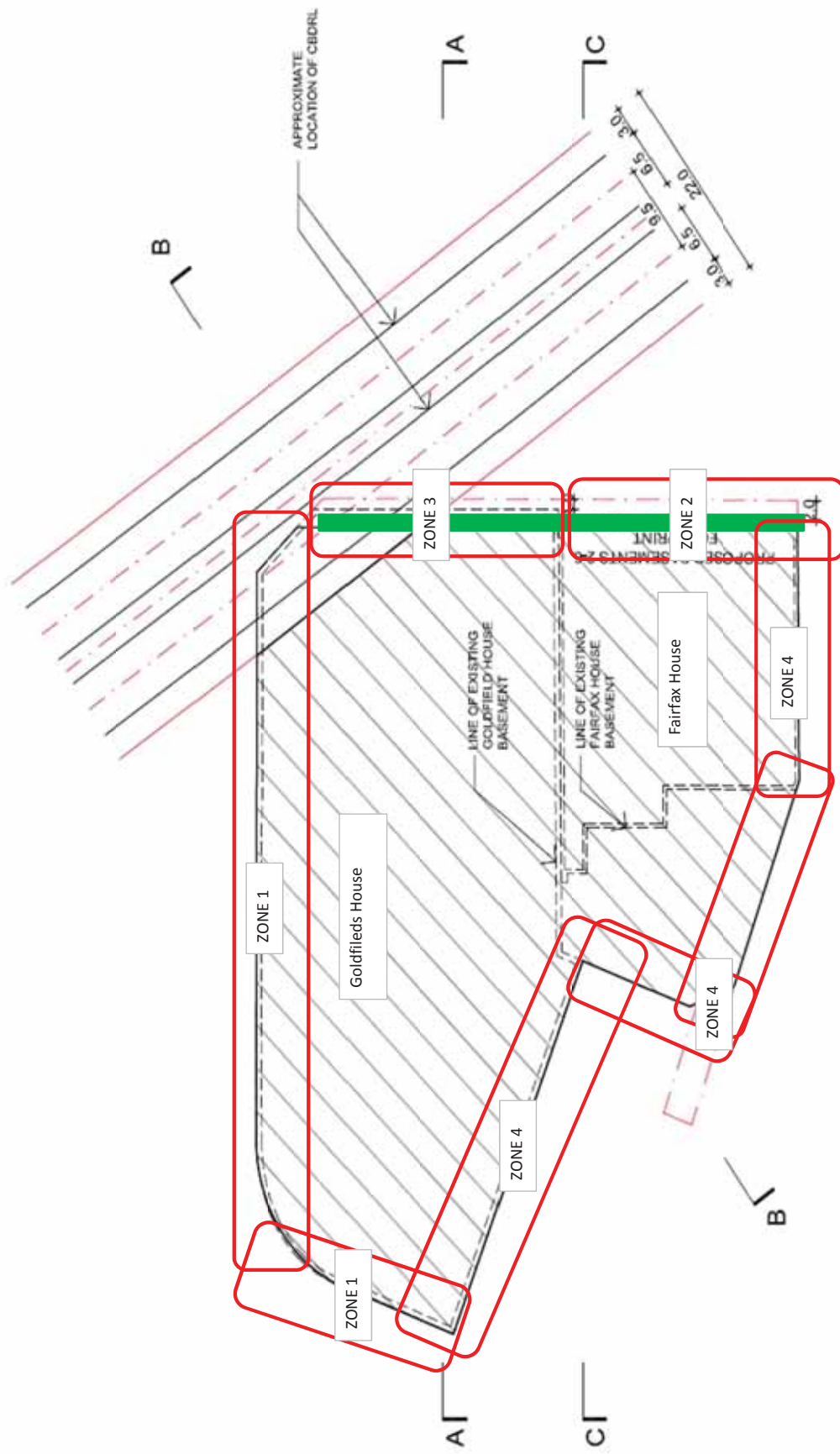
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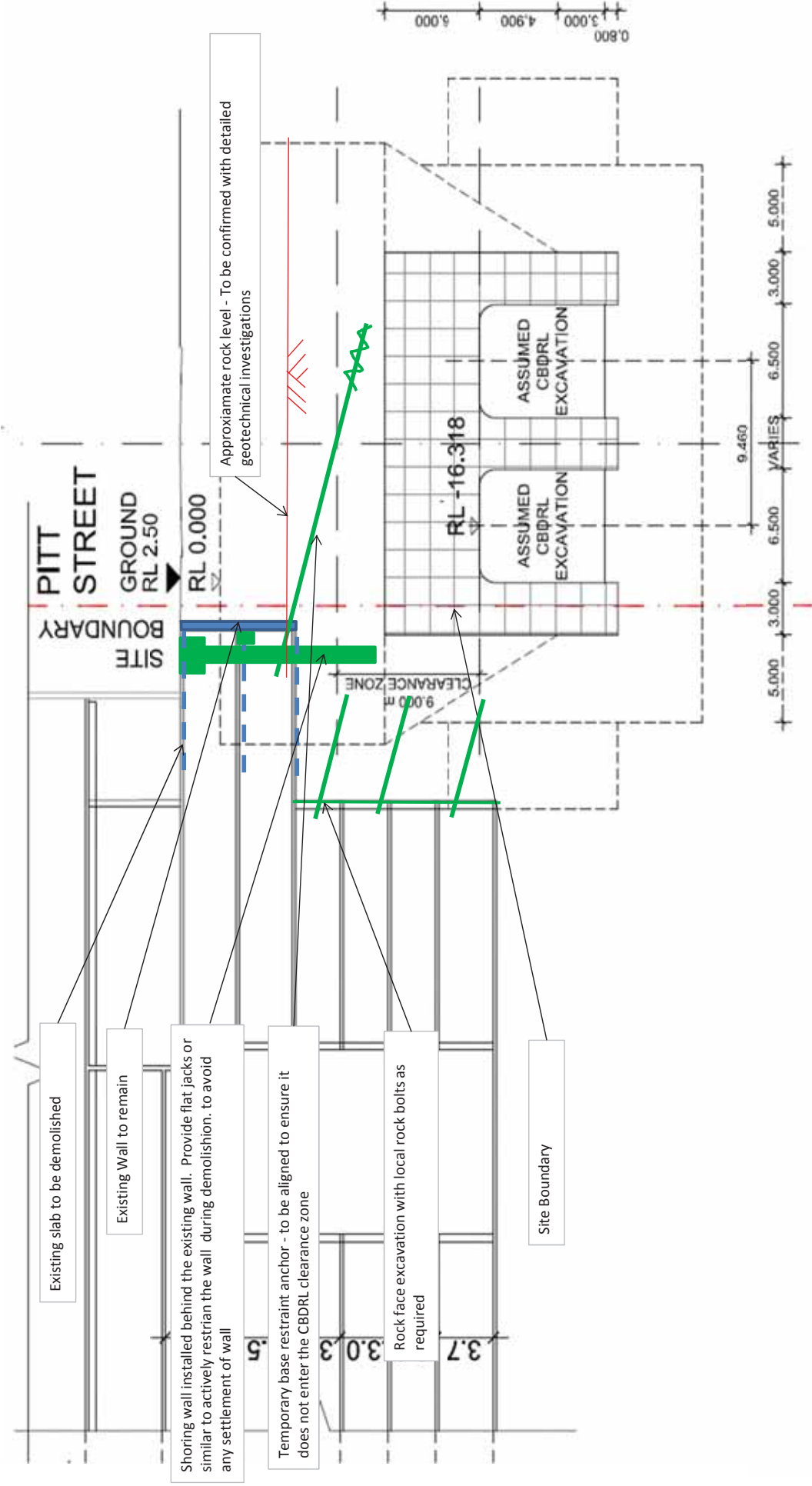
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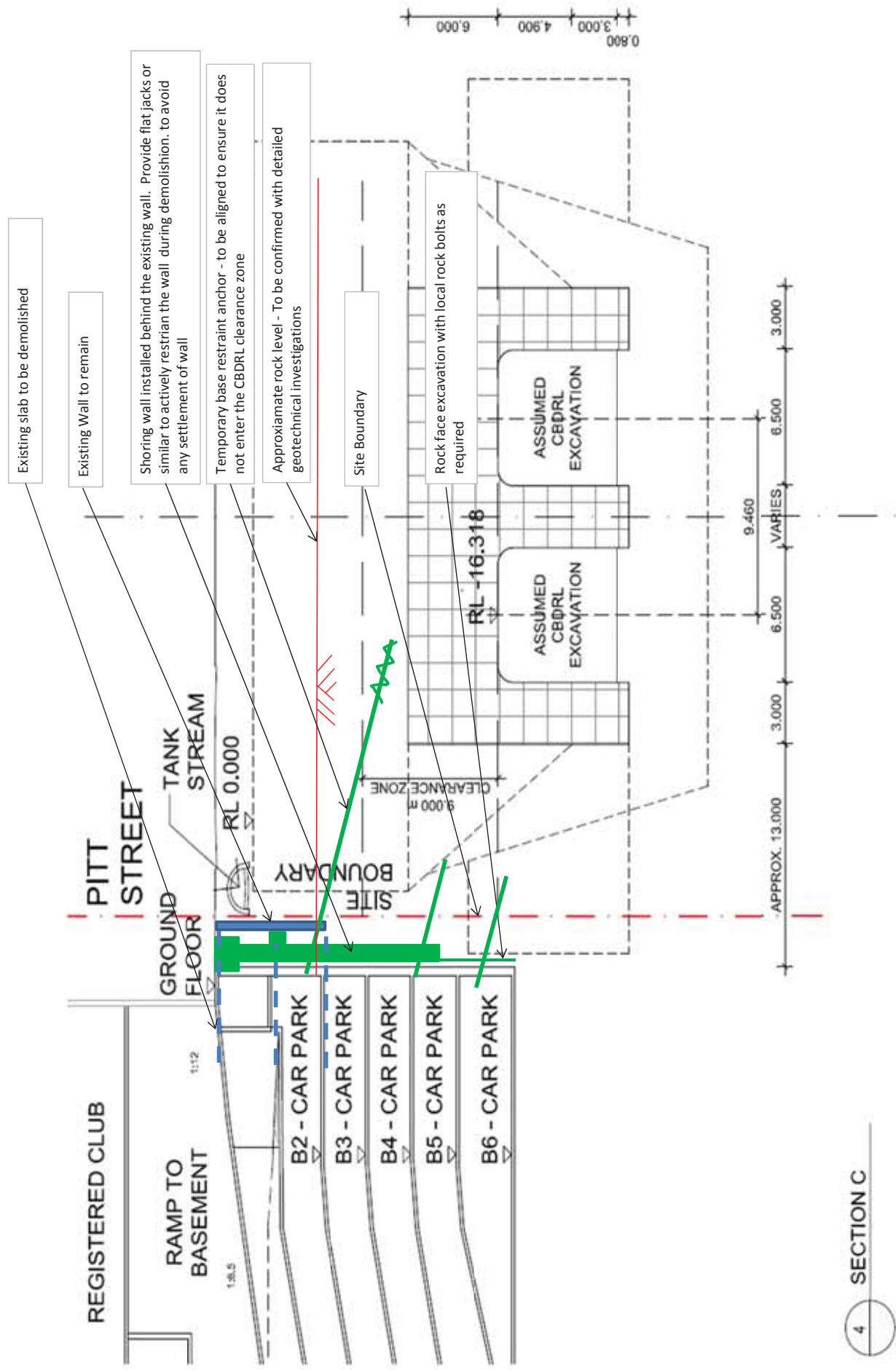
PRELIMINARY

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PRELIMINARY



Appendix B: Current CBDRL Drawings received from TfNSW 3 June and 18 June 2015



Interim Rail Corridor
CBD Rail Link & CBD Metro
Map 6 of 9

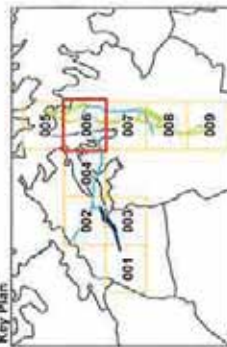
- CBD Rail Link (Zone B - Tunnel)
- CBD Metro (Zone A - Above Ground including Cut & Cover Tunnel)
- CBD Metro (Zone B - Tunnel)
- CBD Station Extent
- LGA Boundary
- Land Title Boundary 2007/08 @ Dept of Lands

The CBD Metro is stage 1 of the Sydney Metro Network

Minister for Planning

Date:

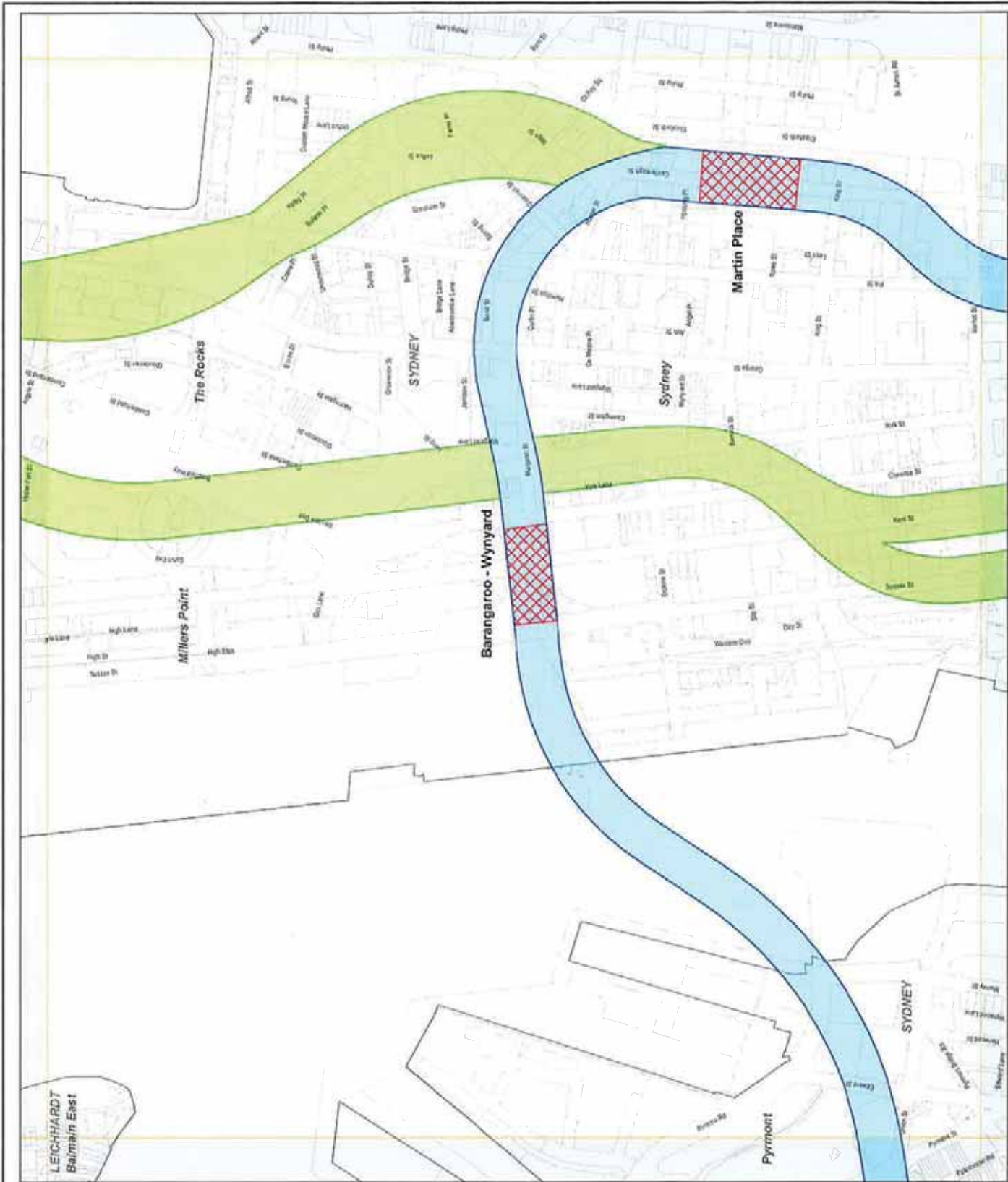
Key Plan

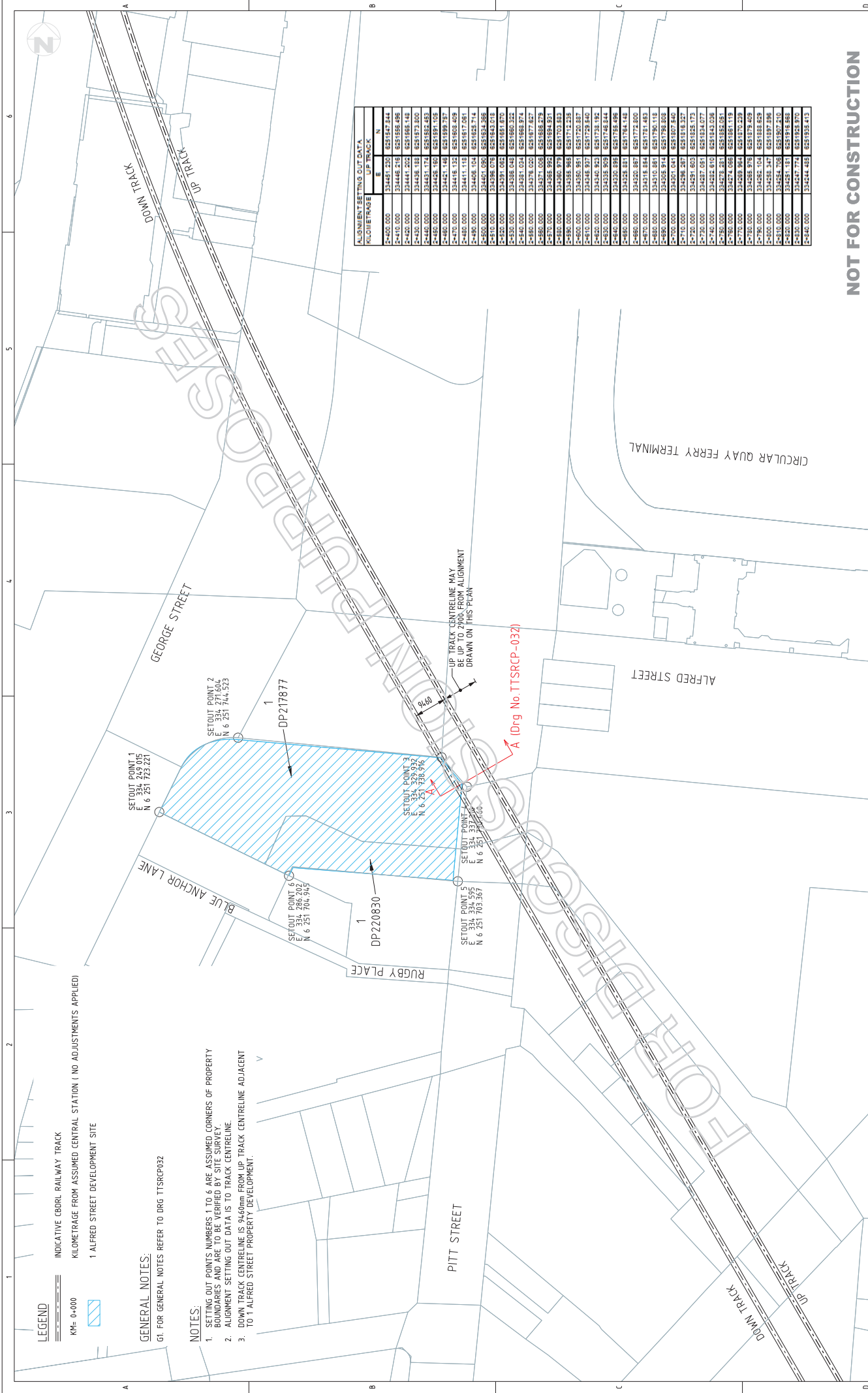


CERTIFIED BY:


Sydney Metro

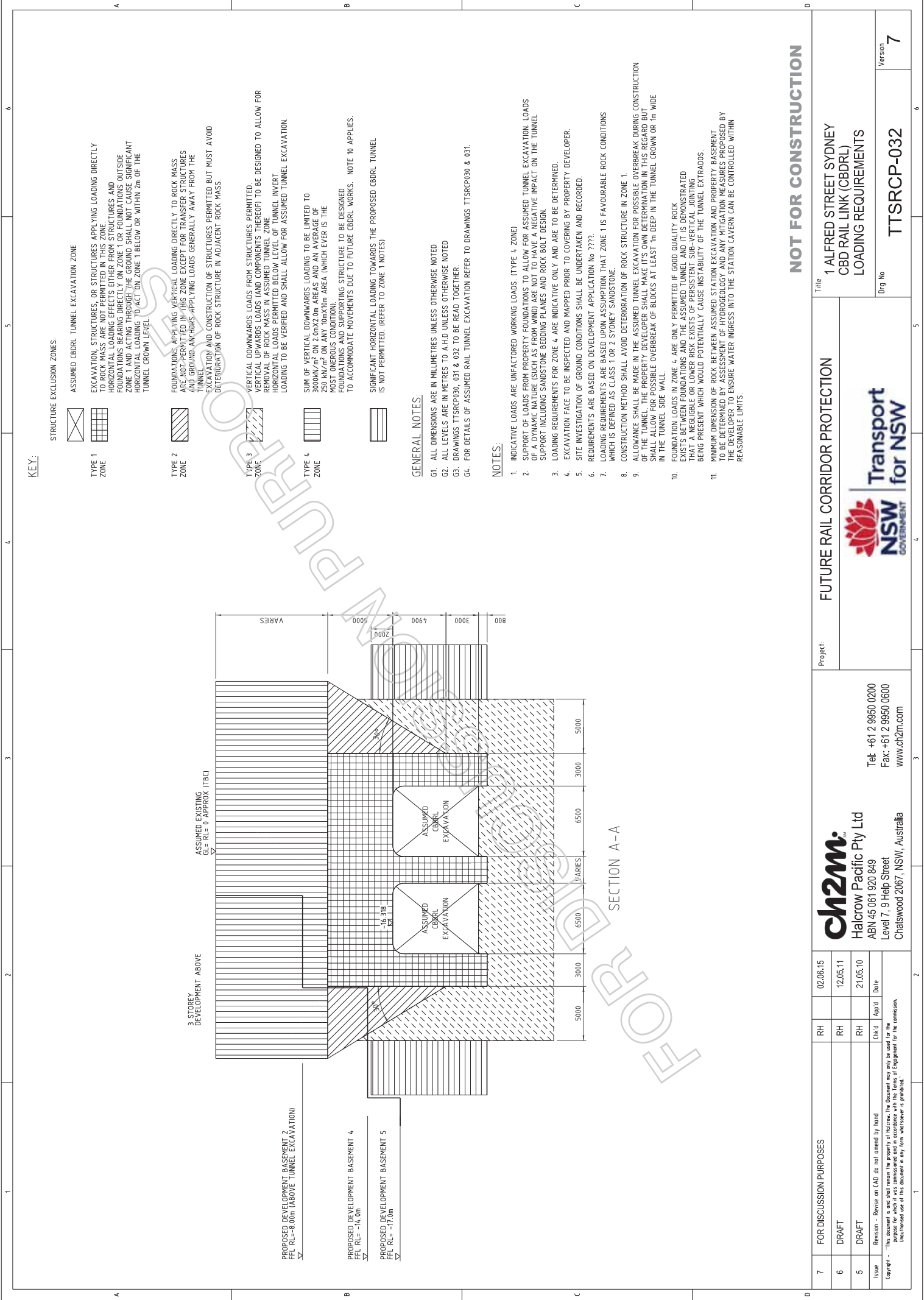
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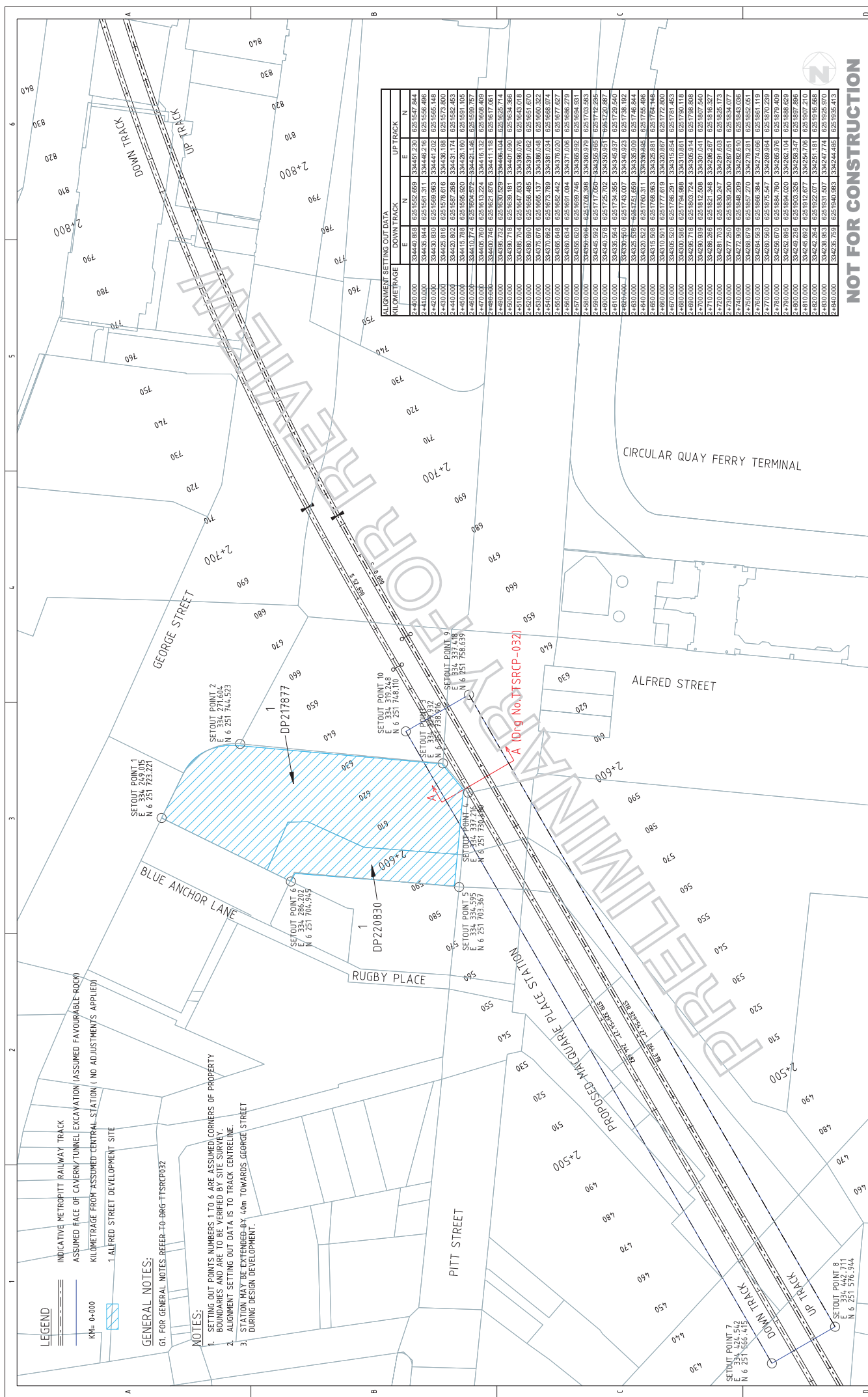
6		FOR DISCUSSION PURPOSES	RH	03.06.15	 ch2m [®] Halcrow Pacific Pty Ltd ABN 45 061 920 849 Level 7, 9 Help Street Chatswood 2067, NSW, Australia	Tel: +61 2 9950 0200 Fax: +61 2 9950 0600 www.ch2m.com	Project: FUTURE RAIL CORRIDOR PROTECTION	Title: 1 ALFRED STREET SYDNEY CBD RAIL LINK (CBRL) ASSUMED TRACK ALIGNMENT	Drg No TTSRCP-030	Version 6
5		DRAFT	RH	12.05.11						
4		DRAFT	RH	05.05.10						
Issue		Revision - Reuse on CAD do not amend by hand	Chk'd	Date						
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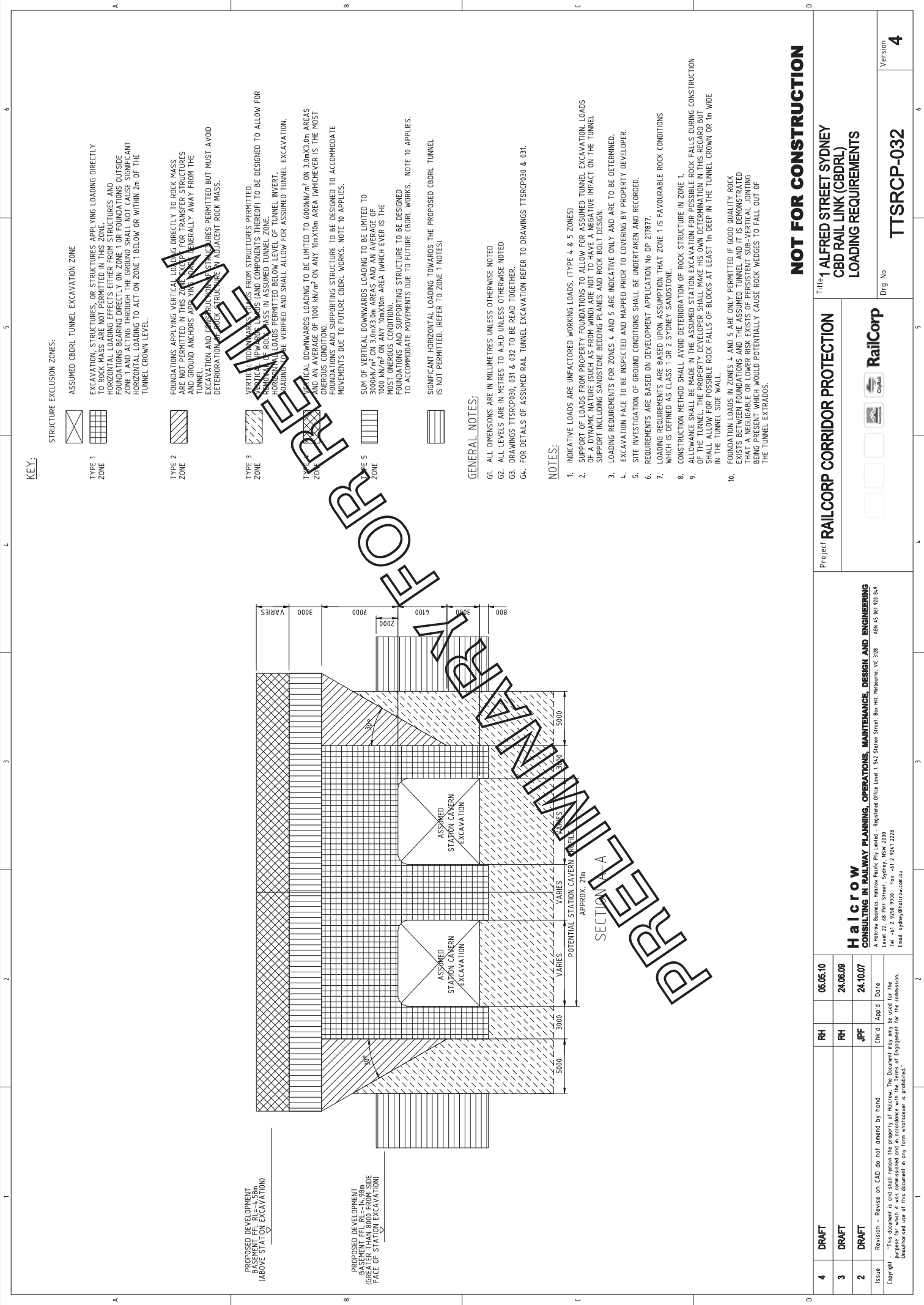
7		FOR DISCUSSION PURPOSES	RH	02.06.15	Project: FUTURE RAIL CORRIDOR PROTECTION		Title: 1 ALFRED STREET SYDNEY CBD RAIL LINK (CBDRL) LOADING REQUIREMENTS		Version 7			
6		DRAFT	RH	12.05.11	 Halcrow Pacific Pty Ltd ABN 45 061 920 849 Level 7, 9 Help Street Chatswood 2067, NSW, Australia		Tel: +61 2 9950 0200 Fax: +61 2 9950 0600 www.ch2m.com				TTSRCP-032	
5		DRAFT	RH	21.05.10								
Issue		Revision - Reuse on CAD do not amend by hand		Chk'd	App'd	Date		Drg No		Version		
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Appendix C: Previous CBDRL Drawings dated 5 May 2010 (used form previous DA stage 1 submission)



4 DRAFT				06.05.10			
3 DRAFT				24.06.09			
2 DRAFT				24.10.07			
Issue				Revision	Revise on CAD	Do not amend by hand	Chk'd App'd Date
Copyright				This document is and shall remain the property of Halcrow. The Document may only be used for the purpose for which it was commissioned and in accordance with the Terms of Engagement for the commission. Unauthorised use of this document in any form whatsoever is prohibited.			
Project				RAILCORP CORRIDOR PROTECTION			
Title				1 ALFRED STREET SYDNEY CBD RAIL LINK (CBRL) ASSUMED TRACK & STATION ALIGNMENT			
Drg No				TTSRCP-030			
Version				4			

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KEY:

STRUCTURE EXCLUSION ZONES:



ASSUMED CBDRL TUNNEL EXCAVATION ZONE



TYPE 1 ZONE
EXCAVATION, STRUCTURES, OR STRUCTURES APPLYING LOADING DIRECTLY TO ROCK MASS ARE NOT PERMITTED IN THIS ZONE.
HORIZONTAL LOADING EFFECTS FROM STRUCTURES AND FOUNDATIONS BEARING DIRECTLY ON ZONE 1 OR FOUNDATIONS OUTSIDE ZONE 1 AND ACTING THROUGH THE GROUND SHALL NOT CAUSE SIGNIFICANT HORIZONTAL LOADING TO ACT ON ZONE 1 BELOW OR WITHIN 2m OF THE TUNNEL CROWN LEVEL.



TYPE 2 ZONE
FOUNDATIONS APPLYING VERTICAL LOADING DIRECTLY TO ROCK MASS ARE NOT PERMITTED IN THIS ZONE EXCEPT FOR TRANSFER STRUCTURES AND GROUND ANCHORS AND TIES THAT ARE GENERALLY AWAY FROM THE TUNNEL AND DO NOT CAUSE VERTICAL LOADS TO BE APPLIED TO THE EXCAVATION AND DO NOT CAUSE VERTICAL LOADS TO BE APPLIED TO THE EXCAVATION AND DO NOT CAUSE VERTICAL LOADS TO BE APPLIED TO THE EXCAVATION.



TYPE 3 ZONE
VERTICAL DOWNWARDS LOADING FROM STRUCTURES PERMITTED. HORIZONTAL LOADING TO TUNNELS AND COMPONENTS THEREOF TO BE DESIGNED TO ALLOW FOR HORIZONTAL LOADS PERMITTED BELOW LEVEL OF TUNNEL INVERT. LOADING TO BE VERIFIED AND SHALL ALLOW FOR ASSUMED TUNNEL EXCAVATION.



TYPE 4 ZONE
VERTICAL DOWNWARDS LOADING TO BE LIMITED TO 600kN/m² ON 3.0mX3.0m AREAS AND AN AVERAGE OF 1000 kN/m² ON ANY 10mX10m AREA WHICH EVER IS THE MOST ONEROUS CONDITION. FOUNDATIONS AND SUPPORTING STRUCTURE TO BE DESIGNED TO ACCOMMODATE MOVEMENTS DUE TO FUTURE CBDRL WORKS. NOTE 10 APPLIES.



TYPE 5 ZONE
SUM OF VERTICAL DOWNWARDS LOADING TO BE LIMITED TO 3000kN/m² ON 3.0mX3.0m AREAS AND AN AVERAGE OF 1000 kN/m² ON ANY 10mX10m AREA WHICH EVER IS THE MOST ONEROUS CONDITION. FOUNDATIONS AND SUPPORTING STRUCTURE TO BE DESIGNED TO ACCOMMODATE MOVEMENTS DUE TO FUTURE CBDRL WORKS. NOTE 10 APPLIES.



TYPE 6 ZONE
SIGNIFICANT HORIZONTAL LOADING TOWARDS THE PROPOSED CBDRL TUNNEL IS NOT PERMITTED. (REFER TO ZONE 1 NOTES)




GENERAL NOTES:

- G1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS OTHERWISE NOTED
- G2. ALL LEVELS ARE IN METRES TO A.H.D UNLESS OTHERWISE NOTED
- G3. DRAWINGS TTSRCP030, 031 & 032 TO BE READ TOGETHER.
- G4. FOR DETAILS OF ASSUMED RAIL TUNNEL EXCAVATION REFER TO DRAWINGS TTSRCP030 & 031.

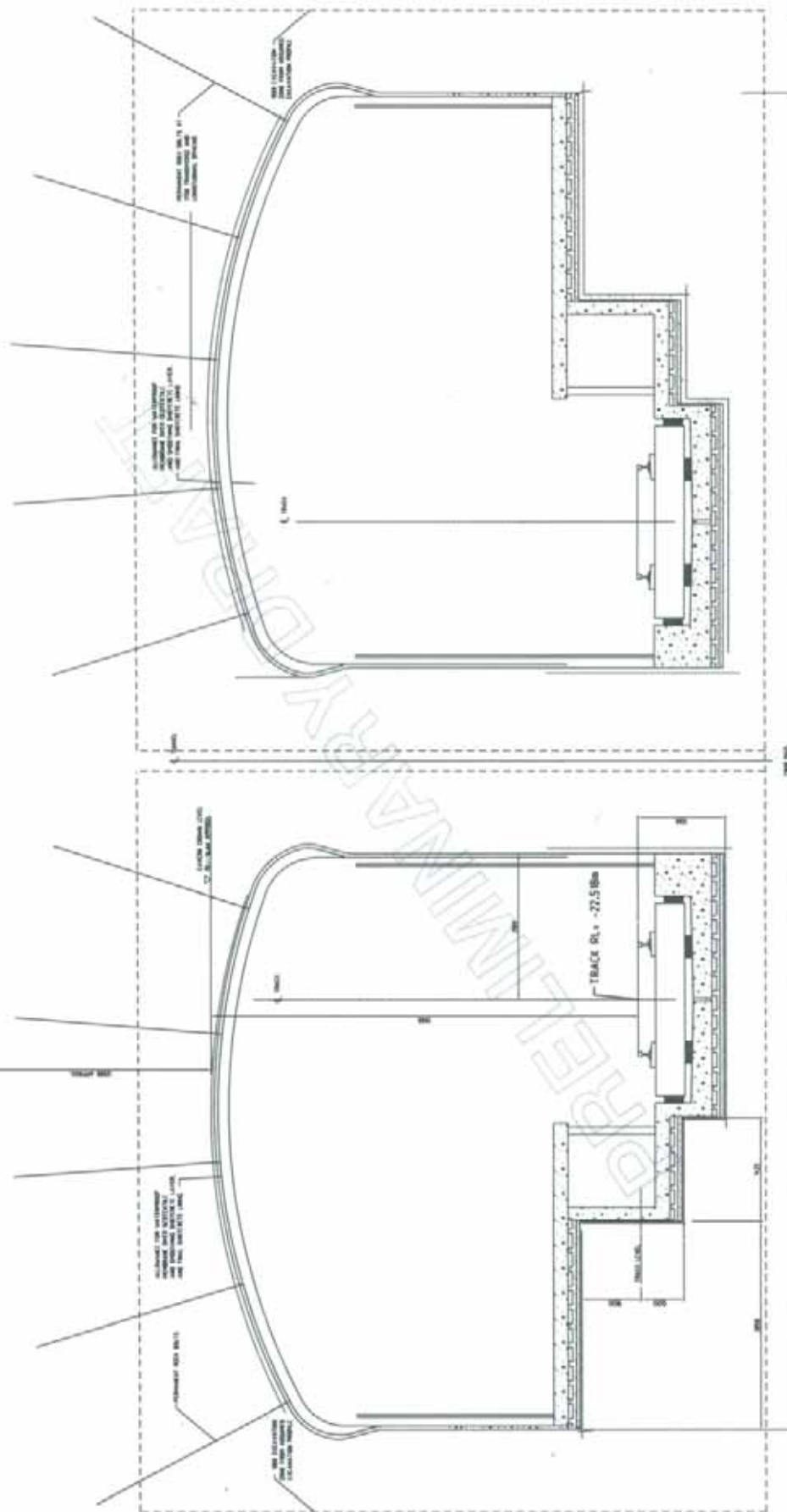
NOTES:

- 1. INDICATIVE LOADS ARE UNFACTORED WORKING LOADS. (TYPE 4 & 5 ZONES)
- 2. SUPPORT OF LOADS FROM PROPERTY FOUNDATIONS TO ALLOW FOR ASSUMED TUNNEL EXCAVATION. LOADS OF A DYNAMIC NATURE (SUCH AS FROM WIND) ARE NOT TO HAVE A NEGATIVE IMPACT ON THE TUNNEL SUPPORT INCLUDING SANDSTONE BEDDING PLANES AND ROCK BOLT DESIGN.
- 3. LOADING REQUIREMENTS FOR ZONES 4, AND 5 ARE INDICATIVE ONLY AND ARE TO BE DETERMINED.
- 4. EXCAVATION FACE TO BE INSPECTED AND MAPPED PRIOR TO COVERING BY PROPERTY DEVELOPER.
- 5. SITE INVESTIGATION OF GROUND CONDITIONS SHALL BE UNDERTAKEN AND RECORDED.
- 6. REQUIREMENTS ARE BASED ON DEVELOPMENT APPLICATION No DP 217877.
- 7. LOADING REQUIREMENTS ARE BASED UPON ASSUMPTION THAT ZONE 1 IS FAVOURABLE ROCK CONDITIONS WHICH IS DEFINED AS CLASS 1 OR 2 SYDNEY SANDSTONE.
- 8. CONSTRUCTION METHOD SHALL AVOID DETEIORATION OF ROCK STRUCTURE IN ZONE 1.
- 9. ALLOWANCE SHALL BE MADE IN THE ASSUMED STATION EXCAVATION FOR POSSIBLE ROCK FALLS DURING CONSTRUCTION OF THE TUNNEL. THE PROPERTY DEVELOPER SHALL MAKE HIS OWN DETERMINATION IN THIS REGARD BUT SHALL ALLOW FOR POSSIBLE ROCK FALLS OF BLOCKS AT LEAST 1m DEEP IN THE TUNNEL CROWN OR 1m WIDE IN THE TUNNEL SIDE WALL.
- 10. FOUNDATION LOADS IN ZONES 4, AND 5 ARE ONLY PERMITTED IF GOOD QUALITY ROCK EXISTS BETWEEN FOUNDATIONS AND THE ASSUMED TUNNEL AND IT IS DEMONSTRATED THAT A NEGLIGIBLE OR LOWER RISK EXISTS OF PERSISTENT SUB-VERTICAL JOINTING BEING PRESENT WHICH WOULD POTENTIALLY CAUSE ROCK WEDGES TO FALL OUT OF THE TUNNEL EXTRADOS.

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4		DRAFT	RH	05.05.10	Halcrow CONSULTING IN RAILWAY PLANNING, OPERATIONS, MAINTENANCE, DESIGN AND ENGINEERING A Halcrow Business, Halcrow Pacific Pty Limited - Registered Office Level 1, 542 Station Street, Box Hill, Melbourne, VIC 3108 ABN 45 961 920 849 Level 22, 68 Pitt Street, Sydney, NSW 2000 Tel: +61 2 9250 9900 Fax: +61 2 9241 2228 Email: sydney@halcrow.com.au	Project: RAILCORP CORRIDOR PROTECTION			Title: 1 ALFRED STREET SYDNEY CBD RAIL LINK (CBDRL) LOADING REQUIREMENTS	
3		DRAFT	RH	24.06.09		<div><div></div><div></div><div></div><div></div><div></div></div> <div>  </div>			Drg No	
2		DRAFT	JPF	24.10.07					Version	
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NOTES:
1) FINAL TUNNEL PROFILE AND DETAILS TO BE DEVELOPED DURING
SUBSEQUENT DESIGN STAGES



2014/10/23
GPA Meeting

up

DOWN

SECTION A-A AT KM 2+608.000 (DOWN TRACK)

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1 ALFRED STREET SYDNEY
CBD RAIL LINK (CBDR)
ASSUMED TUNNEL/STATION EXCAVATION

Org. No.	TTSRCP-031	Ver. num.	2
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Project RAILCORP CORRIDOR PROTECTION



Halcrow
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Rev	Revised	Revised by	Revised on	Revised for	Revised by	Revised on	Revised for
2							
1							

Appendix D: DBYD Information