



Robert **Bird** Group

Civil Design Report

North Ryde Station Urban Activation Precinct

State Significant Development Application in
respect of Lot 4 in DP 1131774 and Lot 160 in
DP 1136651

Prepared For: Urban Growth NSW

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1.0 Introduction

1.1 Document Scope

This document has been prepared by Robert Bird Group (RBG) who were engaged by Urban Growth NSW (UG NSW) to provide civil engineering design in respect of Lot 4 in DP 1131774 (Station Site North) and Lot 160 in DP 1136651 (Station Site South), being part of the North Ryde Station Urban Activation Precinct (UAP). In this report the land contained in both lots is referred to as the "Site".

This civil design report has been prepared by Robert Bird Group (RBG) to support a State Significant Development Application (SSDA) for the Site. This report provides a summary of the proposed civil works associated with the development including earthworks and grading, and drainage.

The SSDA seeks consent for subdivision, road opening, and road and infrastructure works. Refer the draft plan of subdivision in Appendix A for the location of the proposed road.

1.2 The North Ryde Station Urban Activation Precinct

The NSW Government's Urban Activation Precinct (UAP) Programme identifies areas considered to have wider social, economic or environmental significance for the community or to have development significance important to the future planning objectives of the State Government. The Site forms part of the North Ryde Station UAP.

The North Ryde Station UAP (NRSUAP) is located within the Macquarie Park Corridor, a predominately commercial area that lies between the M2 Motorway and Epping Road, North Ryde. The NRSUAP is divided into three sites: Lot 101 in DP 1131776 (the M2 Site), Station Site North, and Station Site South. This report relates only to Station Site North and Station Site South and not to other areas of the NRSUAP.

1.3 References and Inputs

Referenced documents include:

- Site Servicing Report, Station Site North, RBG, February 2014.
- Stormwater Management Plan, RBG, February 2014 (SWMP 2014).
- ADP-1207-CON-4003 Phase 1 Contamination Assessment Report, October 2012.
- ADP-1207-CON-4022 Limited Phase 2 Contamination Assessment Report, November 2012.
- ADP-1207-GEO-4008 Report on Preliminary Geotechnical Investigation for North Ryde Station Precinct' November 2012.
- ADP-1207-CIV-4009 Water, Wastewater, Gas Servicing Report, November 2012.
- ADP-1207-DRN-4010 Hydrology, Flooding & WSUD Strategy Report, October 2012.
- ADP-1207-ELE-4011 Electrical, Lighting and Communications – Concept Report, November 2012
- Whelans Survey ADP-1207-SUR-7000, October 2011;
- TIDC Development Sites Report of Impacts on Epping to Chatswood Rail Line, Doc# PR_6437, August 2008;
- TIDC ECRL Underground Infrastructure Guidelines, May 2008;
- City of Ryde Development Control Plan 2010 (DCP 2010)
- North Ryde Station Precinct Development Control Plan, 4 December 2013 (DCP 2013)
- Macquarie Park Floodplain Risk Management Study & Plan, April 2010 (Bewsher 2010).
- Macquarie Park Floodplain Risk Management Study & Plan, February 2011 (Bewsher 2011).

1.4 Existing Site Description and Conditions

The Site is located within the City of Ryde local government area at the southern end of the Macquarie Park Corridor. Comprising of a total area of approximately 3.061 hectares, the Site is bound by the M2 Motorway to the west and south, Delhi Road to the north, and the Riverside Corporate Park to the east. Refer Figure 1.1 below for a Site Context Map.

The Station Site North is adjacent to the North Ryde Railway Station and its service buildings. Access to the Site is via Road 38 (sign posted as "Leighton Way") which connects to the existing traffic signals on Delhi Road.

The lot varies in elevation between reduced levels (RL) 60m Australian Height Datum (AHD) in the north to RL 48m AHD on the southern boundary.

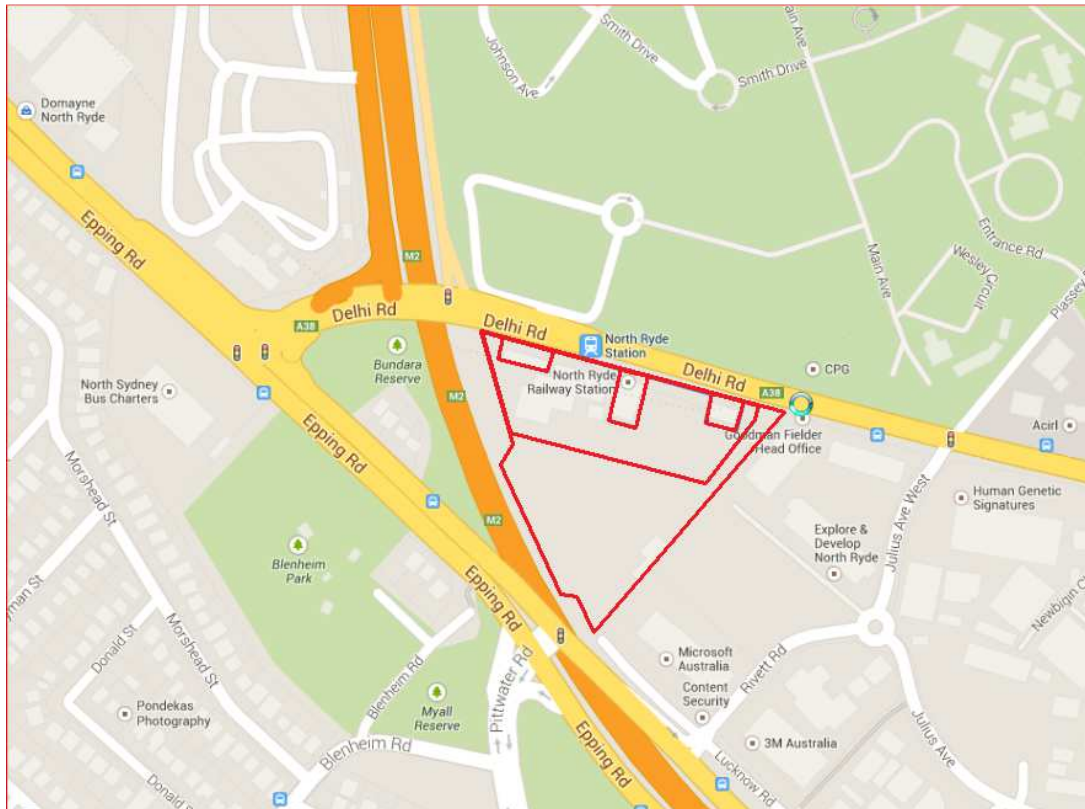


Figure 1.1 – Site Context Map
(sourced from Google maps)

Existing Structures

The North Ryde Train Station building and two related buildings are located adjacent the northern boundary of the Station Site North. All three buildings are accessed from Delhi Road.

The Station Site North is vertically separated from Delhi Road by a crib retaining wall that runs between each Epping to Chatswood Rail Line (ECRL) service building. The crib wall is planted in dense ferns, and the batter above the crib wall is planted in dense shrubs.

Utilities

Survey and Dial-Before-You-Dig (DBYD) information indicate most of the utilities servicing the North Ryde Station Buildings are located in Delhi Road. Within the Station Site North itself, a 225mm diameter sewer pipe flows south through to the adjacent Station Site South. Lot stormwater pipes follow a similar route, and drain to the lower southern boundary of Station Site South.

The site survey (Whelans 2011) identified minor electrical and communications ducting within Station Site North. These communications and electrical assets are not indicated on any utility agency DBYD plans received from DBYD enquiries. It is assumed that these assets were to

support temporary site offices, car park lighting, etc. These assets require identifying in future stages. Refer the Site Servicing Report for further details and plans on existing services.

Epping to Chatswood Rail Line

An ECRL tunnel, the North Ryde Station box, and some ancillary buildings, are located partly below the Station Site North and provide development constraints that are to be considered.

ECRL Underground Infrastructure Protection (ECRL UIP) Guidelines, Report # 20007300/ PO-4532, dated 06 May 2009, Revision 4, provides the protection requirements and constraints on construction activities and building development in the vicinity of the ECRL. Specifically, Section 3.1 details the 'Reserve' zones and the drawings (PRL GD 02467-02604) detail the extents of the reserve zones. Development guidelines are detailed in Section 3.4. The guidelines limit excavations, footings and foundations within the zones and provide advice as to when detailed geotechnical evaluations need to be undertaken for certain construction activities.

Typically the reserve corridor is 70m wide, consisting of a 30m wide (typical) '1st Reserve' located over the ECRL tunnels, with a further 40m comprising the remaining '2nd Reserve Zone' (20m either side of the 1st Reserve). The reserve zone is extended at the Station Site North to accommodate the North Ryde Station and the two service buildings. The reserve zones are shown on Drawing C2-02 in Appendix A.

The 1st Reserve is also defined vertically to extend 10m above the crown of the tunnels. The ECRL UIP Guidelines Drawings PRL GD 02475-02477 provide longitudinal sections of the alignment across the development, and details of the depth from existing ground level to 1st reserve zone can be identified.

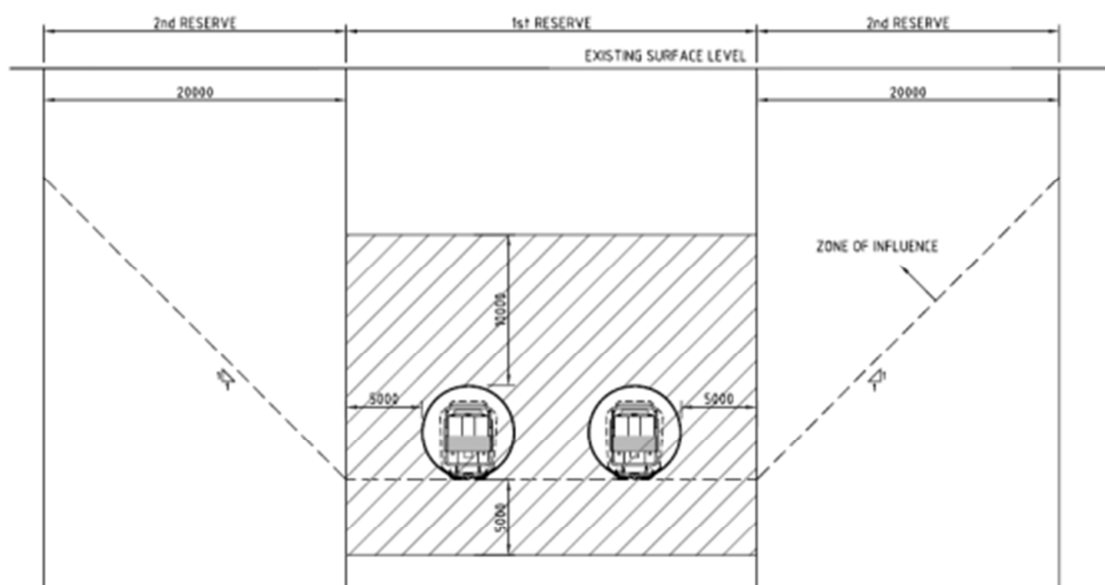


Figure 1.2 – Typical Section through ECRL running tunnels
Sourced from the ECRL Protection Guidelines PRL-GD-02600-1.

The ECRL UIP Guidelines highlight that construction directly over the bore shaft (but outside first reserve zone) should be limited to shallow excavations and light loadings (maximum 3m deep excavations and maximum 150kPa bearing pressure footings), anything greater than this would require a detailed analysis of impacts of the proposed construction. Development inside the second reserve zone will also be constrained, but to a lesser degree. It is noted that deep foundations can be located in the second reserve zone subject to founding below the zone of influence and de-bonding of the pile. The net effect of any construction in the reserve zone must not adversely affect the ECRL.

Refer to site plan drawing in Appendix A indicating the ECRL reserve zones.

For information on ECRL infrastructure and constraint to development refer to the following reports”

- TIDC Development Sites Report of Impacts on Epping to Chatswood Rail Line, Doc# PR_6437, August 2008;
- TIDC ECRL Underground Infrastructure Guidelines, Doc#20007300/PO-4532, May 2008.

Geotechnical

A preliminary geotechnical investigation and report has been undertaken by Douglas Partners. Refer Document No. ADP – 1207 – GEO - 4008, November 2012. The purpose of the geotechnical investigation is to advise on ground conditions for structural and civil works. Specifically, the following has been addressed:

General:	Reactivity of the soil; Standard of compaction of fill encountered; Advice on site trafficability during construction; Depth to rock; Salinity of the soil;
Structural:	Soil bearing parameters for pad and strip footings and bored piers; Soil stiffness parameters for slab on ground under wheel and racking loads;
Civil:	Design parameters for embankment stabilisation and/or retaining walls; Design parameters for pavement design; Safe batter slopes (temporary and permanent).

The geotechnical report provides a Geotechnical Model, which is presented as Table 1.3 below. The model indicates shallow filling overlying clayey shale, with sandstone below. Bedrock was encountered at relatively shallow depth. In Borehole No.10 drilled by Douglas Partners sandstone was encountered at a depth of approximately 5m. Borehole No.10 is located within Station Site South, however it is in close proximity to the proposed Station Street shared zone turning head, hence it provides a good indication of ground conditions expected to be encountered during Station Street civil works. The shallow depth of bedrock should be considered when developing site grading plans and utility networks with an aim to avoid excessive rock excavation.

Table 1.3 Station Site North Geotechnical Model (Douglas Partners 2012)

Unit	Material	Description
1	Filling	Shallow filling to depths of 0.15 m to 0.2 m.
2	Shaly Clay / Clayey Shale	Hard shaly clay or clayey shale was encountered to depths of 2.0 m to 6.5 m.
3	Shale, Siltstone and Sandstone (Mittagong Formation)	Extremely low to high strength shale, siltstone and sandstone to depths of 10.8 m to 13.6 m.
4	Sandstone (Hawkesbury Sandstone)	Medium to high strength, fine and medium grained sandstone below approximately RL 50 m was proven to depths of 40.05 m to 45 m with some carbonaceous silty laminate and siltstone bands at various depths.

2.0 Civil Works Design

The proposed roadworks for provision of Station Street and part of Road 38 should generally consist of the following key elements:

- Site preparation and clearance
- Erosion and sediment control
- Earthworks
- Roadworks and pavements
- WSUD and stormwater drainage

2.1 Site Preparation and Clearance

Site preparation should all generally consist of the following:

- Detailed site services investigation confirming location of all utility assets, establishment of construction management plans, including addressing any requirements set forth by Transport NSW for protection of ECRL assets (refer ECRL UIP Guidelines);
- Implementation of site specific environmental and construction management plans i.e. establish site compound, install sediment and erosion control devices, etc;
- Site clearance and demolition of redundant structures and utilities;
- Stripping of any vegetation and unsuitable material for disposal at an appropriate disposal facility. Stockpiling of materials deemed suitable for reuse i.e. milled pavements for reuse as fill material; and

The existing asphalt car park will require partial demolition to facilitate the proposed construction of Station Street and Road 38. It is proposed that the car park outside of the works extent will remain undisturbed.

Trees, redundant utilities, and other redundant minor structures (light poles, signage and fencing) within the works extent will be demolished. Refer the demolition plan in Appendix A for demolition details.

Demolition and site preparation works shall be undertaken in accordance with the ECRL UIP Guidelines.



• Image 1 – Existing site features (looking west)



• Image 2 – Existing site features (looking north west)

2.2 Erosion and Sediment Control

A preliminary erosion and sediment control plan has been prepared for the Site based on existing survey data and geotechnical information. Reference is made to the Landcom guideline, Managing Urban Stormwater Runoff: Soils and Construction ('the Blue Book').

The Preliminary Geotechnical Report indicates that "*natural site soils are of high plasticity clays with a relatively high potential for movement with changes in moisture content*". As such, Type F soil category has been adopted for design (as defined in the Blue Book).

The erosion and sediment control measures proposed for the Site include:

- A settling basin with sediment storage, discharge connections and overflow to the existing in-ground stormwater network.
- Sediment fences and catch drains/bunds to collect site runoff prior to entering work zone and channel flows to the settling basin
- A primary collection point (PCP) in the works zone to collect works zone runoff. Discharge line to the settling basin.
- Sediment protection devices on existing and proposed inlet pits i.e. filter socks.

Access shall be provided to the sediment basin to enable regular maintenance and sediment removal.

Soil management measures shall be in accordance with City of Ryde Council DCP 2010 Part 4.5 Section 6.3.4.

Refer the Stormwater Management Plan Report for further details.

2.3 Earthworks

2.3.1 Codes, Guidelines and Specifications

The earthworks design of the project will be carried out in accordance with the relevant local, state and national design guidelines and Australian Standard Codes of Practice including but not limited to the following:

- AS 1289 Methods of Testing Soils For Engineering Purposes;
- AS 3798 Guidelines on Earthworks for Commercial and Residential Developments; and
- Managing Urban Stormwater: Soils and Construction, Landcom ('The Blue Book').
- ECRL Underground Infrastructure Protection Guidelines,

Table 3.1 below provides preliminary geotechnical design criteria adopted for developing site grading and earthworks. Refer the Douglas Partners '*Report on Preliminary Geotechnical Investigation for North Ryde Station Precinct*' November 2012, for detailed requirements for site preparation and earthworks.

Table 3.1 Preliminary Geotechnical Parameters – Earthworks	
Parameter	Design Criteria
Earthworks	
Excavation batters (H:V) (for batter heights up to 2m)	Uncontrolled Fill or Silty Clay - 1.5:1 (temporary); 2.5:1; (permanent) Stiff / Hard Silty Clay – 1:1 (temporary); 2:1 (permanent) Low Strength Rock – 0.75:1 (temporary); 1:1 (permanent) Med – High Strength Rock – vertical (temporary); 0.75:1 (permanent)
Fill	300mm thick layers compacted at 98% SMDD up to 500mm below proposed subgrade level. 500mm below proposed subgrade levels to be compacted to 100% SMDD. Moisture content to be controlled within optimum < 2%

2.3.2 Materials

A preliminary cut and fill analysis has been undertaken for the proposed earthworks. Refer to the Bulk Earthworks Plan Drawing C2-01 in Appendix A for details of the earthworks, and cut and fill analysis.

An excess of 1,772 m³ cut material has been modelled for earthworks to the design subgrade level. Where deemed suitable, the onsite materials that are excavated (i.e. milled pavements, fill, crushed sandstone) may be reused as fill material. During excavation works excavated material can be stockpiled for screening, grading and testing to determine adequacy for reuse. Any material deemed unsuitable shall be disposed of offsite at an appropriate and accredited disposal facility.

2.4 Roadworks and Pavements

2.4.1 Codes and Specifications

The roadworks design of the project will be carried out in accordance with the relevant local, state and national design guidelines (where not over-ridden by Ryde City Council requirements) and Australian Standard Codes of Practice including but not limited to the following:

- AS1428 Design for Access and Mobility
- AS 1742 Manual of Uniform Traffic Control Devices Parts 1 to 15
- AS 2890 Parking Facilities, Parts 1 and 2
- AUSTROADS Guide to Road Design Parts 1 to 8
- AUSTROADS Vehicle Turning Templates
- AUSTROADS Pavement Design – A Guide to the Structural Design of Road Pavements
- AUSTROADS APRG Report No.21 - A guide to the design of new pavements for light traffic
- RMS Delineation Guidelines
- RMS Shared Zone Policy and Guidelines
- Cement & Concrete Association of Australia: Industrial Floors and Pavements: Guidelines for Design Construction and Specification.

- NSW Department of Planning – North Ryde Precinct Development Control Plan 4 December 2013.
- City of Ryde Council
 - Council Development Control Plan 2010 – Parts 8.3. 9.2
 - Environmental Standards Development Criteria, Section 4, Public Civil Works (draft)

2.4.2 Design Criteria

The following design criteria have been adopted for road design:

Table 5.2 Roads and Pavement Design Criteria	
Parameter	Design Criteria
Road Classifications	Local Access
Design Vehicle	Iveco ACCO 2350 (Garbage Truck) – single turning movement 12.5m heavy rigid vehicle (HRV) – multi-point turn
Design Speeds	Streets - 50KPH Design; 40KPH Posted Shared Zone – 10KPH Posted
Design Traffic Loading (Equivalent Standard Axle)*	Station Streets – 1.5×10^6 ESAs
Pavement Design Life	40 Years
Design Subgrade California Bearing Ratio (CBR)	CBR 5**

* As provided by the Traffic Engineer. Assumptions as follows:

- Austroads Guide to Pavement Technology Part 2: Pavement Structural Design (2012)

- 3-5% heavy vehicles, 1% annual growth, 2.1 axle groups per heavy vehicle, 0.3-0.6 ESA/HVAG, flexible pavement

**as nominated in the Preliminary Geotechnical Report

2.4.3 Design Gradients

The design gradients for roads and footpaths shall be in accordance with the Ryde City Council Environmental Standards Development Criteria, Section 4, Public Civil Works (draft).

Refer grading plans in Appendix A for design grading.

2.4.4 Materials

Pavement materials shall be in accordance with the Ryde City Council Environmental Standards Development Criteria, Section 4, Public Civil Works (draft).

For trafficable paver material in the shared zone, the paver materials shall be in accordance with Concrete Masonry Association of Australia (CMAA) Guidelines.

2.4.5 Shared Zone

Shared zones are proposed for a section of Station Street in front of the North Ryde Station. The shared zone will in accordance with the RMS Shared Zone Policy and Guidelines. The area will be delineated from adjacent property by bollards. Pavement colouring shall be such so as to distinguish between normal street conditions, footpaths and the shared zones.

Refer the Roadworks Plans in Appendix A which details the extent of shared zone.

2.4.6 Junctions

Delhi Road and Road 38 Intersection

It is proposed to maintain the existing signalised intersection at Delhi Road and Road 38.

A degree of regrading of the pavement at the Road 38 approach is required in order to improve the approach vertical curve. Detailed design of these works is to be undertaken in consultation with RMS to determine extent of works required.

Station Street and Road 38 Junction

It is proposed to make provision for an exit only lane from Road 38 to the proposed road (Triniti Road) in the Riverside Corporate Park development, however this provision will not extend outside the Site.

2.4.7 Parking, Signage

On-street parking is proposed to be provided on Station Street only. No parking is provided on Road 38. Refer the roadworks and signage & line marking plans in Appendix A for proposed parking layouts.

Signage shall be coordinated with street lighting poles where possible to avoid signage clutter in the footway.

2.5 WSUD and Stormwater Drainage

Refer to the RBG Stormwater Management Plan for details of the Water Sensitive Urban Design (WSUD) and stormwater management strategy.

In summary, the principles for the site stormwater management are summarised as follows:

- Lot developers (future developers) will provide onsite detention (OSD), retention and reuse, and discharge requirements in accordance with Development Control Guidelines and Ryde Council minimum requirements. Overflows from lots shall discharge to the proposed in-ground drainage network to be provided in Station Street and Road 38;
- Public realm runoff shall be directed to WSUD elements, specifically bio-retention tree pits or rain gardens. WSUD elements shall provide treatment to meet best practice water quality targets. Subsoil and overflow connections shall be provided from WSUD elements to the in-ground drainage network;
- Discharge to existing drainage network which currently discharges from Station Site South.

2.6 Flood Risk

Due to the site being located along a local ridgeline and the boundary between two separate drainage catchments, flooding of the Site from external catchment overland flows is not expected.

The *Macquarie Park Floodplain Risk Management Study & Plan* by Bewsher Consulting, April 2010 (Bewsher 2010 Report) provide flood mapping for Porters Creek and Lane Cove catchments, including flood levels and extents. The Bewsher 2010 Report was sourced from the Ryde City Council website.

The Bewsher Report indicated localised flooding in an area within Station Site North (refer Figure 2.1 below). It is believed that the geospatial data used in the flood modelling may have indicated localised depressions in this area, possibly during construction on the site.

Notwithstanding the flood affectation shown in the Bewsher 2010 Report, from review of survey information and from site inspections:

- This is not an area that would be susceptible to flooding as it is at the top of the catchment and on a significant grade with overland flow routes to the south; and,
- The site of the proposed road is not flood affected and will not have any negative impact on flood storage

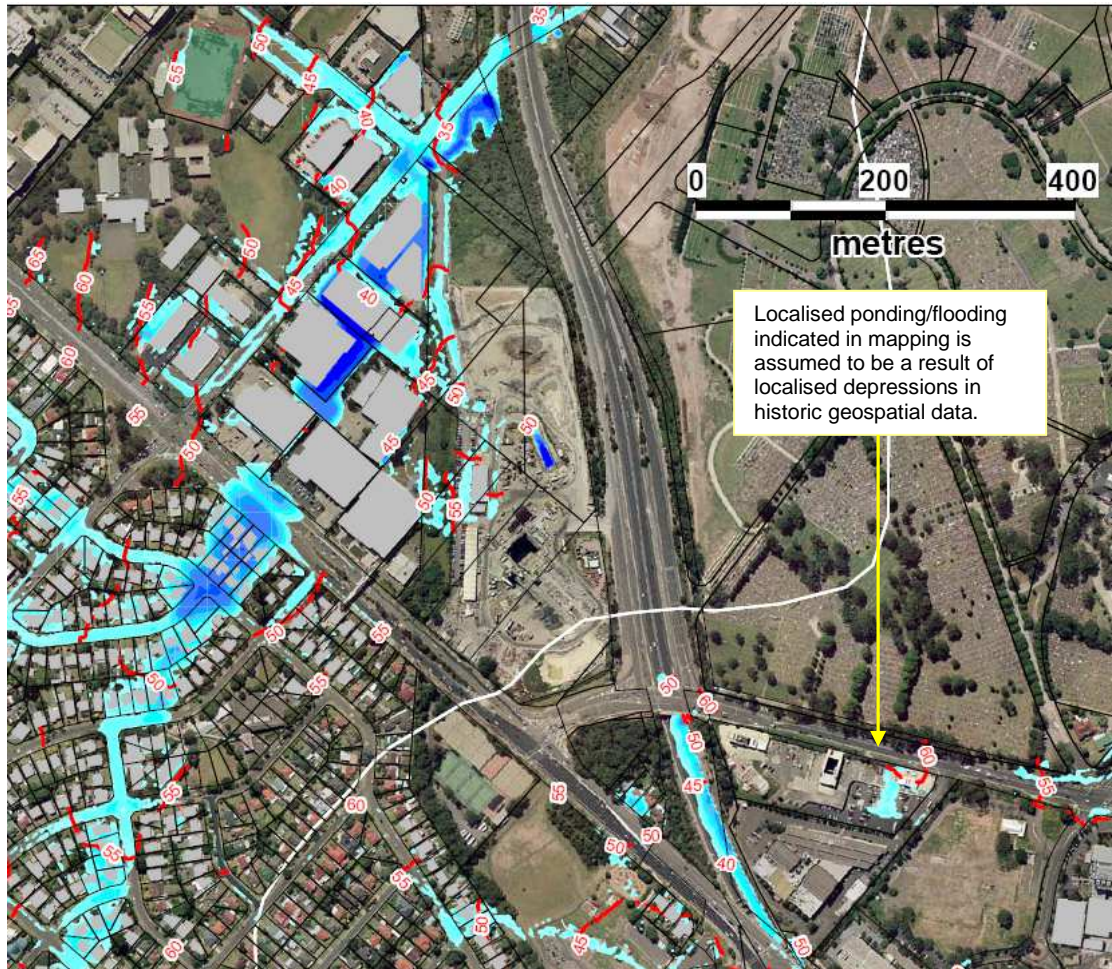


Figure 2.1 - Extract from Figure 8.5 Simulation of 100 Year ARI Flood (Bewsher 2010 Report)

2.7 Landscaping

Landscaping shall include street trees compatible with bio-retention and WSUD principles. Street tree selection shall generally be in accordance with the City of Ryde Street Tree Master Plan.

Refer to the Landscaping Plan and Typical Street Sections in Appendix A for proposed layout of street trees.

Appendix A

Civil Design Drawings



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