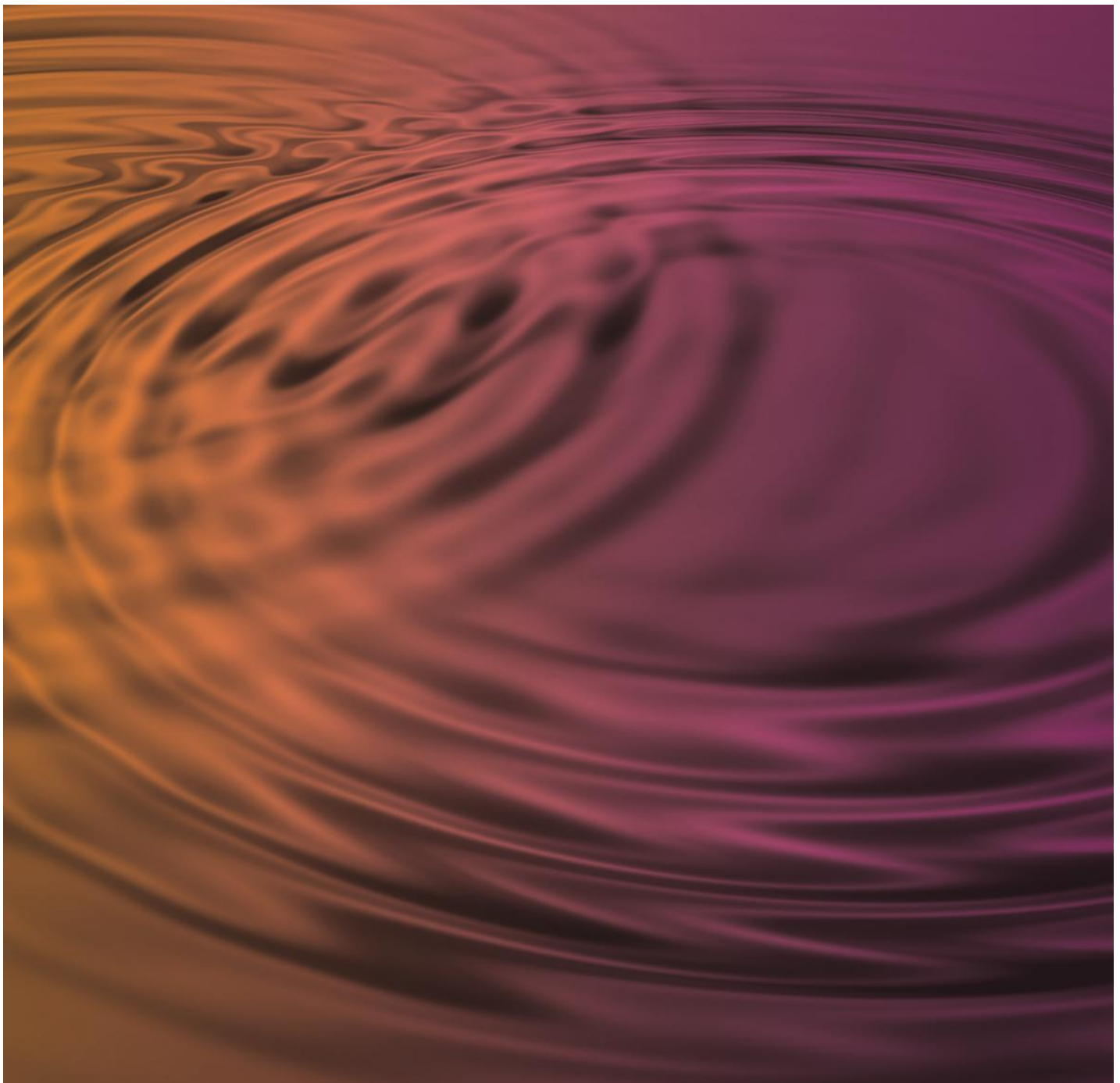


North Eveleigh Housing Project - Stormwater Management Plan



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North Eveleigh Housing Project - Stormwater Management Plan

Prepared for

SMDA

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Quality Information

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DRAFT**Table of Contents**

1.0	Introduction	1
2.0	Site Description	3
2.1	Existing Site Conditions	3
2.2	Proposed Development	4
3.0	Design Criteria	8
3.1	Planning Commitments from the North Eveleigh Concept Plan	8
3.2	City of Sydney Requirements	8
3.3	Design Standards	9
3.4	Adopted Design Criteria	9
3.5	Stormwater Quantity Control Requirements	10
3.6	Stormwater Quality Control Requirements	11
4.0	Previous Stormwater Investigations	12
4.1	North Eveleigh Concept Plan - Hydraulic Services Concept Design Report	12
4.2	Alexandra Canal Catchment Flood Study	13
5.0	Existing Stormwater Management	15
5.1	External Catchment Extent	15
5.2	Internal Sub-Catchments	16
5.3	Existing On-site Stormwater Management Approach	16
5.4	Existing Hydrology and Hydraulic Performance	17
6.0	Proposed Stormwater Management	19
6.1	Proposed Stormwater Management Approach and Quantity Control	19
6.1.1	Development Phase 1 – NEHP Infrastructure	19
6.1.2	Development Phase 2 – Affordable Housing Building Development	20
6.1.3	Development Phase 3 – Building and Park Development	22
6.1.4	Development Phase 4 - Future Development on RailCorp Land	23
6.2	Proposed Stormwater Quality Management	24
6.2.1	Development Phase 1 – NEHP Infrastructure	25
6.2.2	Development Phase 2 – Affordable Housing Building Development	25
6.2.3	Development Phase 3 – Building and Park Development	25
6.2.4	Development Phase 4 – Future Development on RailCorp Land	26
7.0	Conclusion	27
Appendix A	North Eveleigh Dedication Plan	A
Appendix B	External Catchment Details	B
Appendix C	Internal Catchment - Existing Condition Details	C
Appendix D	Existing Conditions Drains Model	D
Appendix E	NEHP Stormwater Drainage Design Drawings	E
Appendix F	Proposed Conditions Drains Model	F

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1.0 Introduction

The UrbanGrowth NSW Development Corporation (UGDC, formerly Sydney Metropolitan Development Authority) is undertaking the North Eveleigh Housing Project (NEHP) involving the delivery of infrastructure and public spaces to support the development of a 1.2 ha site that will ultimately comprise 4 residential buildings.

The NEHP site is located on the north-western corner of the broader 10.7 ha North Eveleigh Site, for which planning approval for a Concept Plan was granted in 2008. The Concept Plan for the North Eveleigh site was approved by the Department of Planning as a Major Project under Part 3A of the Environmental Planning and Assessment Act.

The location of the North Eveleigh Housing Project in relation to the overall North Eveleigh Concept Plan Site is presented schematically in Figure 1.

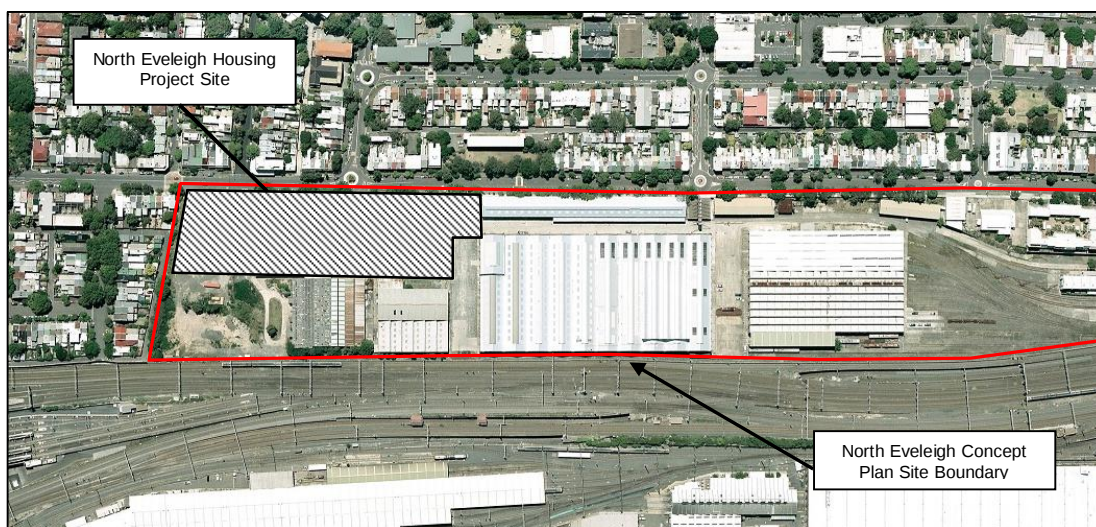


Figure 1 North Eveleigh Housing Project (NEHP) site boundary in relation to the overall North Eveleigh Concept Plan site

As part of the development of the Concept Plan for the overall North Eveleigh site, a Hydraulic Services Concept Design Report was prepared by Warren Smith and Partners (April 2008) which presents a concept design of the stormwater management for the site. Based on this document, the Director General's Requirements (DGR) and Statement of Commitments included in the planning approval present the key stormwater management obligations for development on the whole North Eveleigh site. This includes a commitment to not increase flows discharged from the site post development.

This Stormwater Management Plan (SWMP) describes how the NEHP development will address these planning obligations and develop the previous stormwater management concept design to be specific to the current scope of work. Furthermore, as the NEHP development is located within the broader catchment covering the entire western part of the North Eveleigh Concept Plan site, to provide a holistic strategy for this site this SWMP also considers the future additional development proposed immediately to the south of the NEHP site. This land currently remains in RailCorp ownership and there is no plan to develop this area in the short term, however as any future development will rely on the same stormwater discharge points as the NEHP it is essential that this also be considered in this SWMP.

As part of the NEHP, UGDC is responsible for delivery of infrastructure and public spaces to support building development to be delivered by others. This report provides an overall strategy for the western part of the North Eveleigh Concept Plan Site, with additional detail being provided for the areas being delivered by UGDC. Detailed stormwater management proposals for the areas being delivered by others will be developed as part of future design development, and will form part of future development applications based on the requirements specified in this overall strategy.

The various site boundaries and responsibilities for delivery across the western part of the site are summarised in Figure 2.

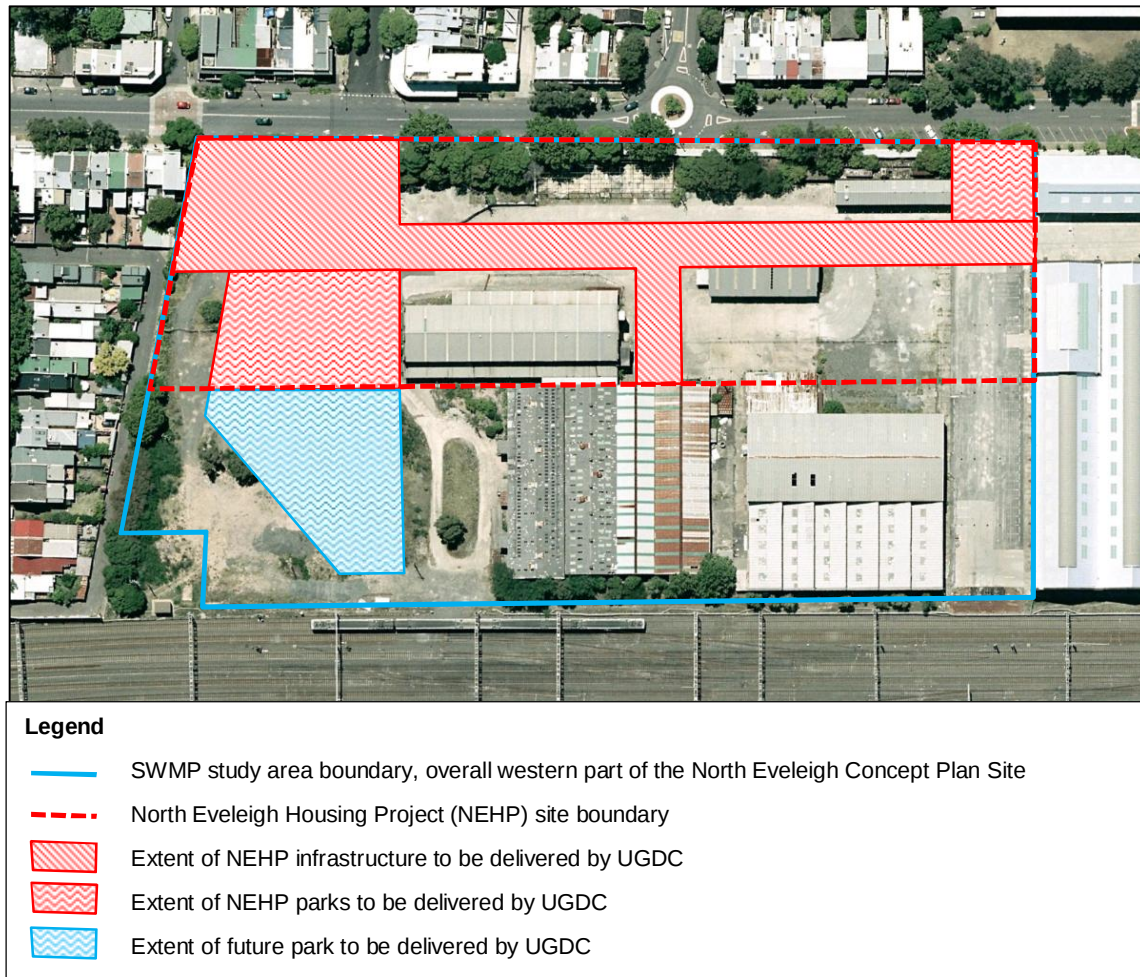
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Figure 2 Boundaries and delivery responsibilities for the western part of the North Eveleigh Concept Plan Site

Further detail of the staging of development and associated responsibilities are discussed in Section 2.

Stormwater management at the North Eveleigh site involves interface with a number of stakeholders including the following:

- City of Sydney – Responsible for the drainage network within the future dedicated road and public realm;
- Sydney Water – Responsible for the downstream drainage network; and
- RailCorp – Responsible for the culvert crossing the rail corridor.

Consultation has been undertaken with each of these stakeholders as part of the North Eveleigh Housing Project and the outcomes of this consultation are reflected in this SWMP.

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2.0 Site Description

2.1 Existing Site Conditions

The North Eveleigh Housing Project (NEHP) site is located in the suburb of Eveleigh immediately to the north of the Western Rail corridor. The site is approximately 1.2 ha and is bounded by Wilson Street to the north, Iverys Lane to the west, RailCorp land to the south and the Carriage Works building to the east. The site location is presented in Figure 3.

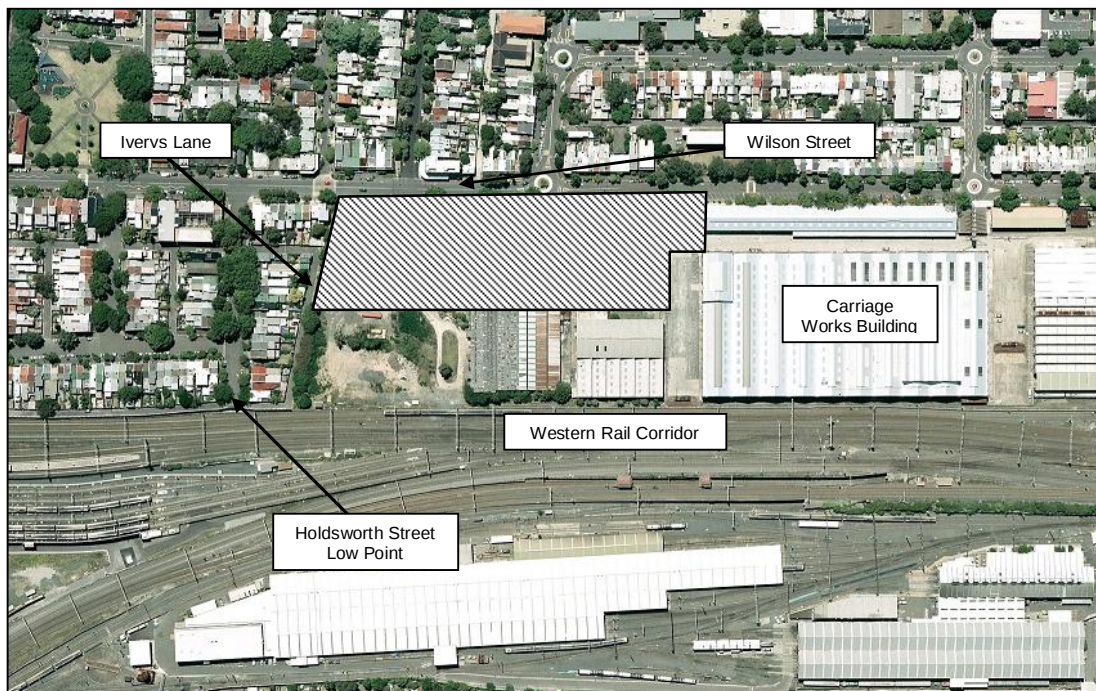


Figure 3 Site location plan

The NEHP site is located in the north western corner of the overall North Eveleigh site. The land for the NEHP development is to be transferred from RailCorp to facilitate the proposed development, while the remaining land to the south of this site will remain in RailCorp ownership.

The development site currently consists of substantial impervious areas including asphalt paved roads, concrete pad foundations, dilapidated buildings and warehouses. There are areas of pervious ground and mature trees on the steep slope from Wilson Street, along the northern boundary.

The existing site conditions are presented in Figure 4.

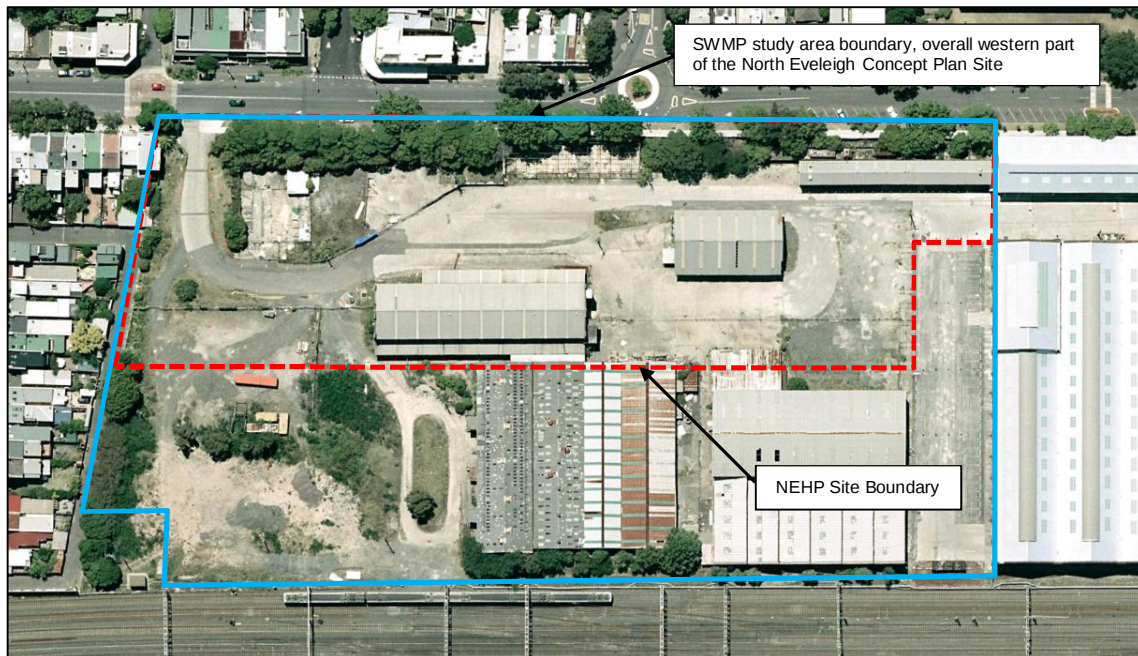
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Figure 4 Existing site conditions

2.2 Proposed Development

The North Eveleigh Housing Project (NEHP) involves the delivery of infrastructure and landscaping to support the development of four residential buildings. The residential buildings to be facilitated by the NEHP infrastructure are referred to as A2, A3, C4 and D4 in the overall North Eveleigh Concept Plan, as presented in Figure 5. Building D4 will accommodate affordable housing, to be developed and managed by City West Housing Pty Ltd.

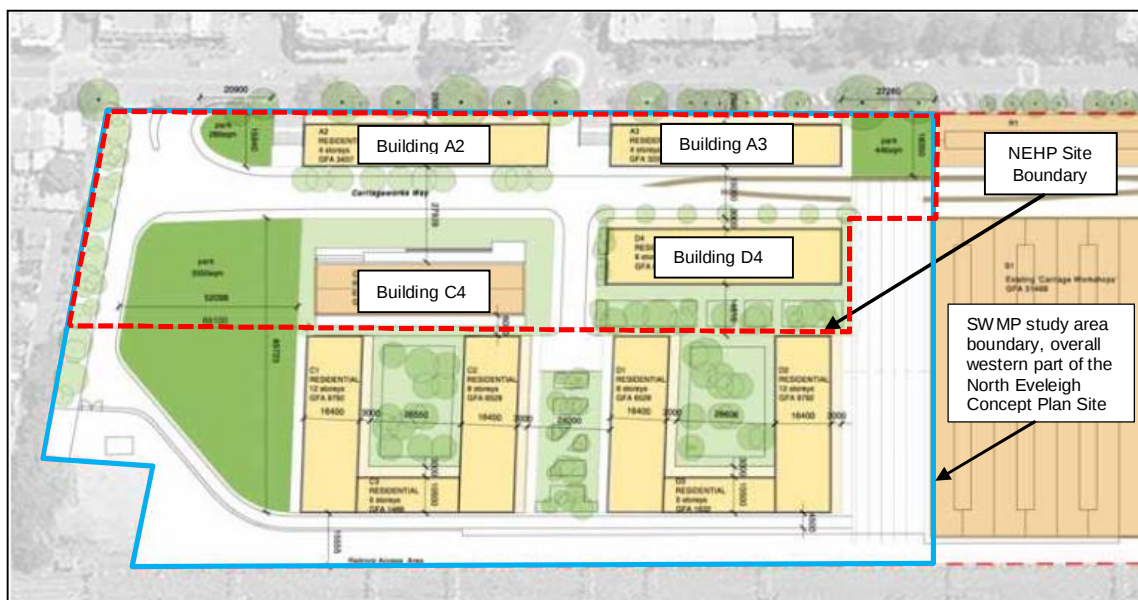


Figure 5 Building plot layout from the North Eveleigh Concept Plan

The delivery of infrastructure and parks, associated development of buildings and overall development of the western portion of the North Eveleigh Concept Plan Site will be constructed in a number of stages, with a resultant staged approach being required for stormwater management. This SWMP has identified four main development phases for assessment. These are summarised in Table 1 and presented graphically in Figures 6 to 9.

DRAFT**Table 1** Proposed development phasing

Development Phase	Description of Scope of Works
Development Phase 1	Delivery of the NEHP Infrastructure (by UGDC), comprising: - Concrete road; - Accessible pedestrian ramps and footpaths; - Landscaped embankment.
Development Phase 2	Construction of building D4 for affordable housing (by City West Housing Pty Ltd)
Development Phase 3	Construction of eastern pocket park (by UGDC) Construction of the northern portion of the main park (by UGDC) Construction/refurbishment of buildings C4, A2 and A3 (by others)
Development Phase 4	Delivery of infrastructure on the southern part of the site (by others) Construction of buildings C1, C2, C3 and D1, D2, D3 (by others)

It is noted that the works included in Development Phase 4 are outside the NEHP boundary and there is currently no commitment to progress these works. However, as this part of the overall North Eveleigh site will have common stormwater management requirements with the NEHP site, it is essential that this be considered as part of this document to ensure that the proposed solutions are suitable for the final development condition identified in the North Eveleigh Concept Plan.

**Figure 6** Extent of Development Phase 1 - NEHP infrastructure delivered by UGDC

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Figure 7 Extent of Development Phase 2 – Affordable housing delivered by City West Housing Pty Ltd

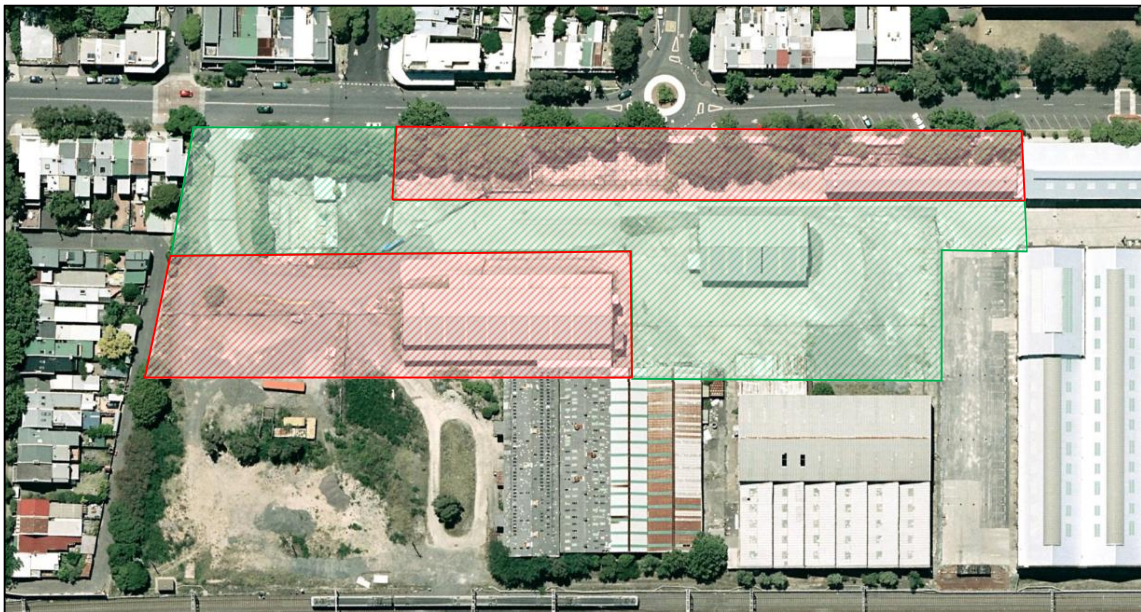


Figure 8 Extent of Development Phase 3 – Parks (delivered by UGDC) and additional residential development (by Others)

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Figure 9 Extent of Development Phase 4 – Future development on RailCorp land (by others)

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3.0 Design Criteria

3.1 Planning Commitments from the North Eveleigh Concept Plan

The Director General's Requirements for the approval of the North Eveleigh Concept Plan include the following clauses relating to drainage and flooding.

13. Drainage and Flooding

- Address drainage/flooding issues associated with the development/site, including stormwater, drainage infrastructure, and incorporation of Water Sensitive Urban Design measures;
- Address the issue of managing the downstream impacts of stormwater on Sydney Water's stormwater network, including a stormwater management system and the capture and reuse of rainwater;
- Explore non-potable water supply sources, including onsite recycling of grey water, rainwater and stormwater harvesting; and
- Address stormwater and drainage impacts on rail corridor.

In addition, the Statement of Commitments included with the North Eveleigh Concept Plan includes the following requirements which relate to stormwater management.

Water Quality and Quantity Management

The Concept Plan commits to:

- i. Water quality management
 - Improve stormwater runoff quality by reducing the average annual load of :
 - Total Phosphorous by 45%,
 - Total Nitrogen by 45%,
 - Total Suspended Solids (TSS) by 80%.
- ii. For up to 3 month ARI peak flow retain:
 - Visible oil or grease, Litter > 50mm and Sediment >0.125mm
- iii. Stormwater quantity
 - Provide on-site detention of stormwater to mitigate drainage capacity constraints.
 - Collect rainwater for reuse in irrigation.

To be addressed at project application stage.

Rail Impacts

The proponent commits to the following:

- Discharging stormwater drainage from the North Eveleigh site across the rail corridor and providing RailCorp with necessary information in relation to drainage.
- Ensuring that the detention system is designed to ensure that post development flow rates from the site are not more than the pre-development site discharge.

This SWMP outlines how the proposed development will comply with these commitments.

3.2 City of Sydney Requirements

During the design development stage of Development Phase 1, there has been ongoing consultation with City of Sydney regarding their requirements for the drainage infrastructure at the North Eveleigh site.

The City of Sydney provided detailed requirements to be addressed for stormwater management in correspondence dated 17 August 2012, as follows:

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k. Stormwater Management Plan

- a. *It is proposed to convey the site runoff and external catchment runoff with a pipe and overland system through Iverys Lane. Additional flow (particularly overland) generated by the development must also be assessed to ensure that the properties adjacent to the laneway are not adversely affected.*
- b. *Holdsworth Street/ Leamington Lane already experience severe flooding. Directing additional runoff to these areas will worsen flooding. This issue must be assessed and mitigation measures proposed accordingly as part of the Construction Certificate stage submission.*
- c. *It is noted that the Stormwater Management Plan for the site proposes that overland flow will be directed to a local pond. The overland flow from the site / pond must be conveyed safely through a defined path to a public drainage system. A flood assessment is required to prove that any proposal to direct overland flow does not adversely impact any other properties or development.*
- d. *Furthermore, if the pond is located outside the Phase 1 development site, the submission must document whether this arrangement will remain beyond Phase 1, or else document the future scenario. It is therefore **not acceptable** to direct overland flows into this pond without adequate legal arrangements (ie. Easements and positive covenants in favour of Council).*
- e. *The proposed bioretention solution to address the stormwater quality issues may not be adequate to removing gross pollutants. The pipe drainage should include gross pollutant traps (GPTs) to capture gross pollutants.*
- f. *On site detention (OSD) requirements are to be provided in accordance with Sydney Water's final detail design documentation approval.*

This SWMP outlines how the proposed development will comply with these requirements.

3.3 Design Standards

City of Sydney design standards have generally been adopted for the NEHP development, as the stormwater infrastructure to be delivered external to the buildings will ultimately be dedicated to Council.

A summary of each of the standards, codes and other additional design documents used in the design of stormwater infrastructure for the NEHP development is presented in Table 2.

Table 2 Stormwater drainage reference documents and standards

Reference Number	Title
COS D5	City of Sydney Design Specification D5 Stormwater Drainage Design.
RMS R11	RMS Specification R11.
CPA	Concrete Pipe Association's "Concrete Pipe Selection and Installation" Guide.
AR&R Vol 1	Australian Rainfall and Runoff "A Guide to Flood Estimation" Volume 1, 1987.
AR&R Vol 2	Australian Rainfall and Runoff "A Guide to Flood Estimation" Volume 2, 1987.
AR&R – Project 10	Australian Rainfall and Runoff – Revision Projects "Appropriate Safety Criteria for People"
AS 3500.3	Australian Standard AS3500.3: Plumbing and Drainage Code – Stormwater Drainage (2003).
AS 3725	Australian Standards AS3725: Design for Installing of Buried Concrete Pipes.
BBCW IP	Botany Bay & Catchment Water Quality Improvement Plan. Sydney Metropolitan CMA, 2011

3.4 Adopted Design Criteria

Based on the planning commitments and the requirements of the various design standards, the stormwater drainage design criteria adopted for the NEHP development are summarised in Table 3.

DRAFT**Table 3 Stormwater drainage design criteria**

Item	Standard	Adopted	Comment
Hydrology			
Hydrological model	COS D5 AR&R	DRAINS model	Using the Time Area method – ILSAX
Time of concentration	COS D5	Min. 5 minutes Max. 20 minutes	Specific site values to be calculated
% Impervious	COS D5	Min. 80%	Specific site values to be calculated
Minor Design Storm	COS D5	20 year ARI	Industrial area with overflow bypass to public road
Major Design Storm		100 year ARI	
Hydraulics			
Freeboard	COS D5	Min. 150 mm HGL in pits Min. 500 mm to habitable floor levels Min. 300 mm for car park entrances	Minimum pit freeboard measured in the minor design storm. Minimum levels for habitable floors /car parks measured from the 100 year ARI level.
Pipe size	COS D5	Min. 150mm diameter Min. 375mm diameter	150 mm pipe diameter is the absolute minimum for pipes located in private property.
Pit spacing	COS D5	Max. 100m	-
Pit provision	COS D5	For connection of pipes ≥ 225 mm	-
Pit losses		Missouri Charts, (Sangster et al, 1958)	-
Maximum allowable ponding	COS D5	Max. depth 0.2 m	-
Blockage	COS D5	Sag pit - 50% On-grade pit - 30%	For a combination of side entry and grated.
Flood Hazard			
Appropriate Safety Criteria for People	AR&R – Project 10	Max. Depth x Velocity $= 0.4 \text{ m}^2\text{s}^{-1}$	

3.5 Stormwater Quantity Control Requirements

The Statement of Commitments requires the proposed development to implement stormwater quantity controls to achieve the following:

'ensure that post development flow rates from the site are not more than the pre-development site discharge'.

This requirement is included under the Rail Impacts section and is understood to be required to ensure that there is no increase in flows discharging to the RailCorp culverts crossing the western rail corridor.

Further requirements to ensure that offsite discharge is not increased post development are also included in City of Sydney's requirements as follows:

'Additional flow (particularly overland) generated by the development must also be assessed to ensure that the properties adjacent to the laneway are not adversely affected.'

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Sydney Water (the authority responsible for the downstream drainage network) has advised additional requirements for stormwater discharge quantity control from the North Eveleigh Housing Project, as follows:

- Detention storage of 20 m³ per 1,000 m² site area
- Discharge limited to 30 l/s per 1,000 m² site area

Sydney Water has subsequently clarified this requirement with an email received on 16 February 2012 stating the following:

'Generally if any Road or Road Reserve or Parks are proposed as part of any development for public access, then you can exclude these areas for On Site Detention calculation. This means upon completion of the work, the maintenance of these facilities are either with Council or Road Authorities. However if these Road or Road Reserve or Parks are only for exclusive use for the people who live in those new dwellings, then this area should be included in the On Site Detention calculation. In this situation the maintenance of these facilities are with the Strata Management or Community Title Management or similar private body (not with the public authority).'

In accordance to the approved concept plan, the roads and public realm to be delivered in the Development Phase 1 and the parks to be delivered in Development Phase 3 will be dedicated to City of Sydney (a copy of the approved concept plan depicting areas to be dedicated is included in Appendix A). Based on the recent correspondence from Sydney Water, the areas to be dedicated are therefore exempt from the Sydney Water detention requirements (however, all building development will need to comply with Sydney Water requirements).

As such, the overall development will provide stormwater quantity controls to comply with the Statement of Commitments requirement for post development flow rates discharged from the site to not exceed pre-development site discharge. In addition, the building developments will provide stormwater quantity controls to comply with the Sydney Water storage and discharge requirements.

3.6 Stormwater Quality Control Requirements

The Statement of Commitments requires the development to improve stormwater runoff quality by reducing the average annual load of pollutants as follows:

- Total Suspended Solids (TSS) by 80%
- Total Phosphorous (TP) by 45%
- Total Nitrogen (TN) by 45%

In addition, the water quality controls are to remove visible oil or grease, litter > 50 mm and sediment > 0.125 mm.

These requirements are in line with the requirements of Sydney Water being the authority responsible for the downstream drainage network.

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4.0 Previous Stormwater Investigations

4.1 North Eveleigh Concept Plan - Hydraulic Services Concept Design Report

As part of the submission for the North Eveleigh Concept Plan, Warren Smith and Partners (WSP) produced the Hydraulic Services Concept Design Report (WSP, April 2008) which presented a concept layout of the proposed drainage infrastructure.

The Hydraulic Services Concept Design Report reviewed the available RailCorp drainage records to determine the existing drainage configuration. This review identified the western end of the North Eveleigh site as primarily draining to Traverser 2 and then across the Western Rail Corridor through the existing 600 mm and 1,200 mm culverts. The report does not include any plans identifying the existing internal sub-catchment layout, however also identifies the existing culvert at the southern end of Holdsworth Street.

A more detailed assessment of the existing internal hydrology for the NEHP is presented in Section 5.

The WSP report includes a high level assessment of the external catchment to the North Eveleigh site, making the following conclusion:

The existing North Eveleigh site for the purposes of runoff analysis is considered to be a wholly self-contained catchment zone. The Wilson Street catchment immediately to the north is self-draining into the SWC trunk drainage system and is completely separated from the North Eveleigh site. For the purposes of flood assessment, the discussion below emphasises that the North Eveleigh site is completely self-contained and drains in the direction of existing drainage infrastructure below the rail corridor.

This assumption has been reviewed as part of the current work and an assessment of the external catchment is presented in Section 5.

The study also assessed the catchment draining to the culvert at the southern end of Holdsworth Street, estimating a peak flow rate of 4.4 m³/s in the 100 year ARI storm (resulting in a maximum water level of 26.34 m).

The stormwater concept design states that it seeks to achieve the following:

- A network of drainage pipelines and pits to comply with the requirements of SCC and relevant Australian Standards and Policies;
- A roof water system for each building complying with the relevant Australian Standards, the BCA and other relevant guideline documents;
- A below ground basement pump out system complying with the relevant Australian Standards, the BCA and other relevant guideline documents;
- An OSD system comprising below ground storage tanks of a minimum depth of two metres and varying cross sectional area to comply with the relevant PSD for that precinct;
- A PSD exiting the North Eveleigh site not exceeding the capacity of the 600mm, 1200mm and 1.25m wide x 1.125m high Munni Creek culvert.

The *Stormwater Management Catchment Plan* drawing included in the WSP report, presented a proposed drainage system for the area of the North Eveleigh Housing Project which drained towards Traverser 2 and the existing 600 mm and 1,200 mm culverts crossing the rail corridor. This proposal is reviewed in Section 6, based on detailed review of the existing site topography and drainage configuration.

The report includes the DRAINS model layout used to estimate the on-site storage requirement, with the model layout for the western end of the site presented in Figure 10. The NEHP site appears to be located in catchments A, B and RD1, which have a combined estimated detention storage requirement of 1,143 m³.

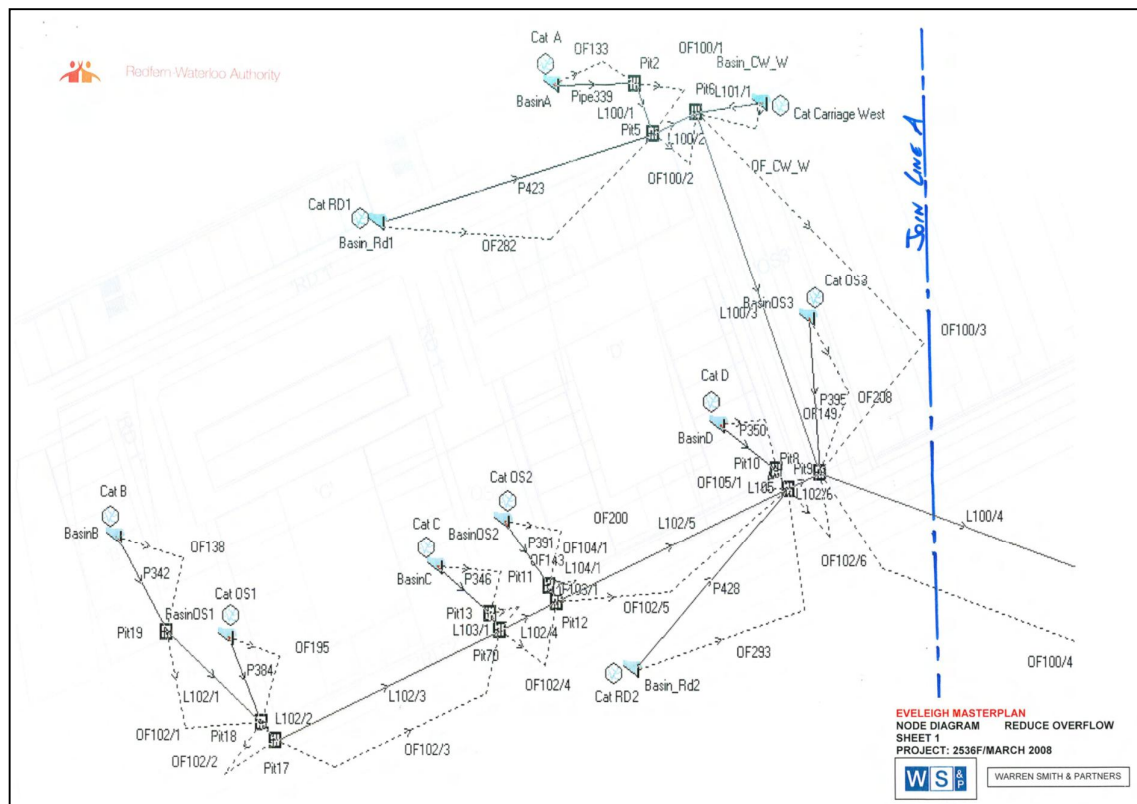
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Figure 10 WSP DRAINS Model Layout

The report presented the following requirements for water quality following consultation with City of Sydney and other agencies:

- *OSD above ground or below ground systems complete with trash screens and sedimentation traps to control coarse litter and coarse sediment within each of the individual allotments as presented in the Concept Plan;*
- *Road flows will enter into a series of drainage structures located along kerb lines; Enviropods which are an outsource control screening system can be fitted to each of the drainage structures to control coarse debris and coarse sediment emanating from these road flows;*
- *The remaining residual flow will be treated within a series of bio-retention swales and shallow water bodies which together will aim to trap and treat coarse and fine sediment, nutrient and provide nutrient phosphorus removal.*

Details of the detailed proposals for the North Eveleigh Housing Project are presented in Section 6.

4.2 Alexandra Canal Catchment Flood Study

This flood study, prepared by Cardno for the City of Sydney in December 2010, investigated mainstream and overland flood behaviour for the overall Alexandra Canal catchment. The NEHP site is located within the Munni Street-Erskineville sub-catchment which drains towards Sydney Park before discharging to the Alexandra Canal.

While the study covers the NEHP site, it did not model any of the existing stormwater infrastructure on the site itself. Similarly the flood study did not identify any areas of ponding on the NEAPH site, however it is anticipated that this is because of the coarse 2D grid applied rather than because ponding of water does not occur.

The flood study identifies ponding at the Holdsworth Street low point for all storm events investigated (from the 1 year ARI through to the PMF). The ponding depth is estimated as being greater than 1m for the 100 year ARI design storm. The extent of ponding in the 100 year ARI design storm is presented in Figure 11.

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Figure 11 100 year ARI ponding extent at the Holdsworth Street low point (Alexandra Canal Catchment Flood Study, 2010)

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5.0 Existing Stormwater Management

5.1 External Catchment Extent

The NEHP site is located within an urbanised external catchment that drains to the Holdsworth Street low point extending to the ridgeline formed by King Street, approximately 300 m to the north of the site. This overall external catchment comprises two main sub-catchments, one draining to Wilson Street immediately in front of the NEHP site the other draining directly to the Holdsworth Street low point.

These external sub-catchments are presented in Figure 12 and further detail is presented in Appendix B.

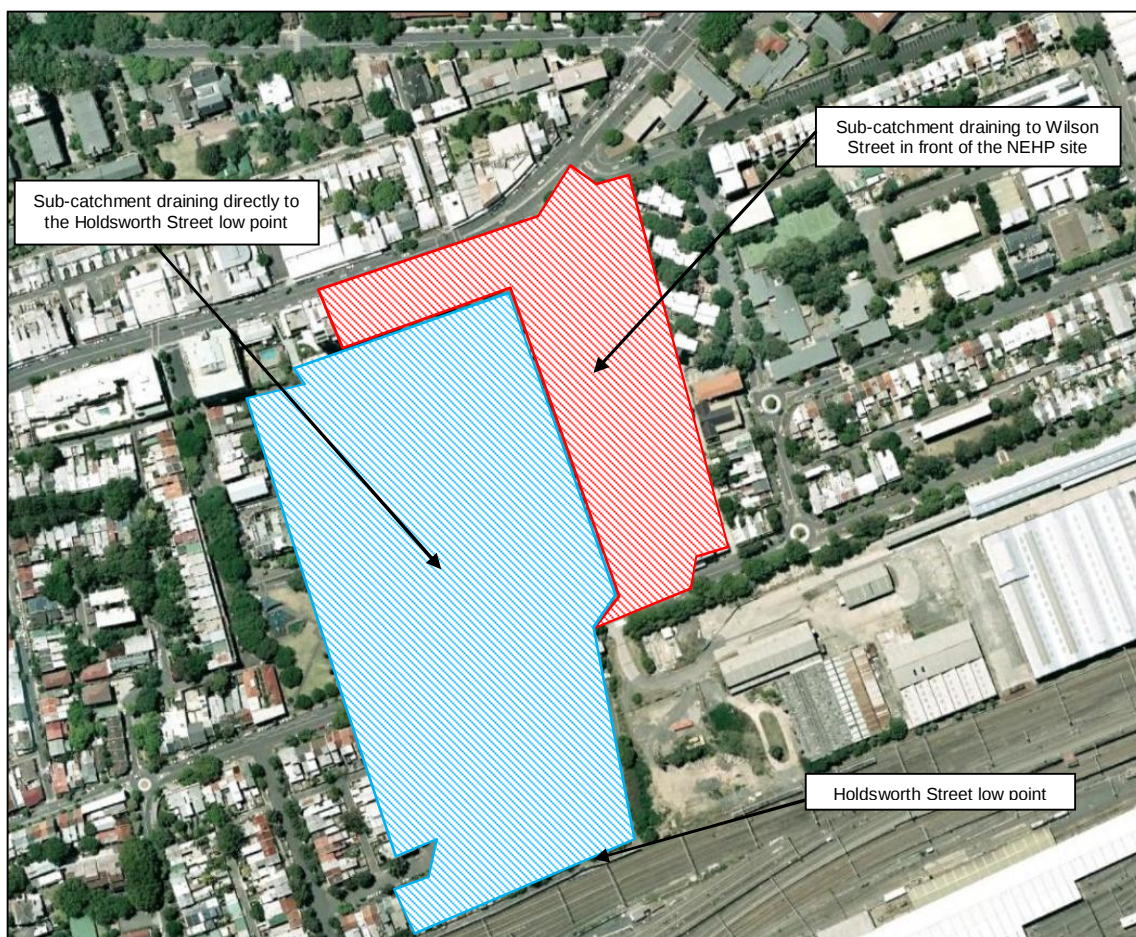


Figure 12 External catchments draining to the Holdsworth Street low point

Stormwater from this external catchment is conveyed in a City of Sydney pipe drainage network, which is separate to the drainage system on the NEHP site. The extent of this external drainage network was provided by the City of Sydney from their GIS system. The extents of the external sub-catchments were defined using this drainage network information and lidar topographic survey.

It is understood that a small amount of overland flow spills into the site down the existing driveway from Wilson Street. This has been confirmed through hydraulic modelling as discussed in Section 5.4.

At the Holdsworth Street low point, an existing culvert under the rail corridor (owned by RailCorp) discharges stormwater to the south, into the Sydney Water drainage system for the Munni Street catchment that ultimately discharges to the Alexandra Canal.

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5.2 Internal Sub-Catchments

The NEHP site itself consists of two main sub-catchments, differentiated by their existing points of discharge across the rail corridor as follows:

- Western sub-catchment draining to the Holdsworth Street low point (and the 1200mm diameter RailCorp culvert)
- Eastern sub-catchment draining to the Traverser 2 low point (drained by a 600mm diameter culvert)

As the existing site is very flat, these sub-catchments have been delineated through review of RailCorp drawings of the existing stormwater drainage pipe network and through analysis of the existing topographic survey using the 12D program. Copies of the drainage record drawings and the detailed topographical survey used for this assessment are attached in Appendix C.

Based on this assessment, the overall internal sub-catchment extents are presented in Figure 13, this indicates that the majority of the site discharges to the Holdsworth Street low point.

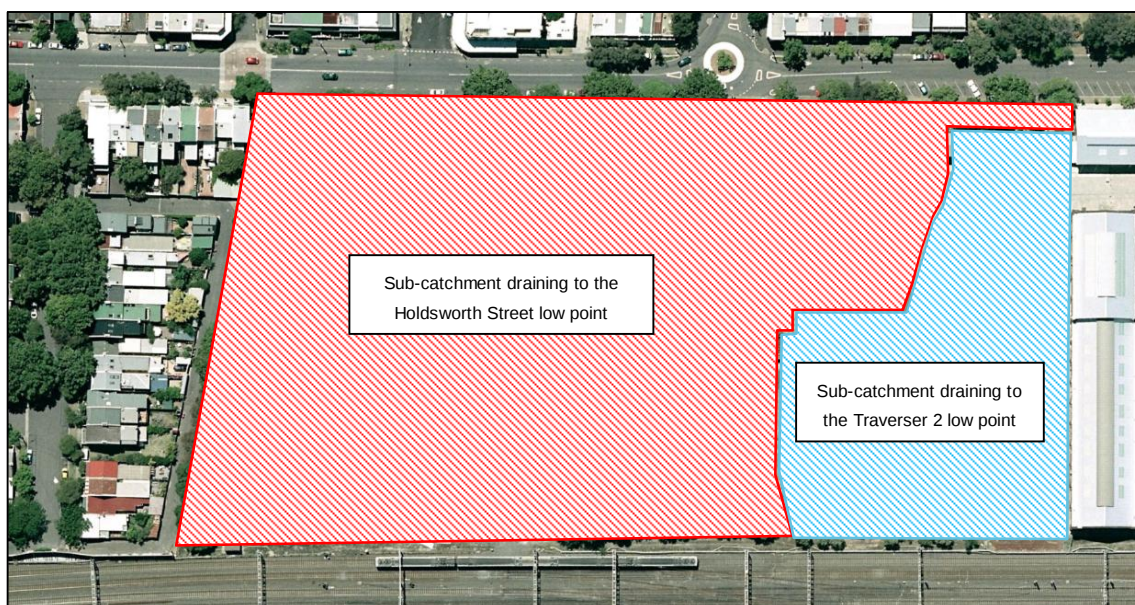


Figure 13 NEHP site existing internal sub-catchments

5.3 Existing On-site Stormwater Management Approach

The existing on-site stormwater management system consists of a limited pit and pipe drainage network and informal overland flow paths.

The Holdsworth Street sub-catchment is currently drained by two stormwater lines, a 450mm diameter pipe draining the NEHP site area and a dual 225mm diameter pipe along the boundary with the rail corridor. These pipes converge into a 600mm diameter pipe at the site boundary before connecting to the culvert under the rail corridor at Holdsworth Street. This layout is presented schematically in Figure 14.

The sub-catchment draining towards Traverser 2 discharges as overland flow, being collected by the extensive existing pit and pipe network located within the Traverser.

Overland flow exceeding the pipe network capacity drains across the site informally. Overland flow from the northern part of the site initially ponds in front of the existing Clothing Store building before making its way to an existing informal ponding area located on RailCorp land behind the Clothing Store building. From this ponding area overland flow spills into a depressed area along the site boundary with the rail corridor from where flow spills towards Leamington Lane. These general overland flow arrangements are presented in Figure 14.

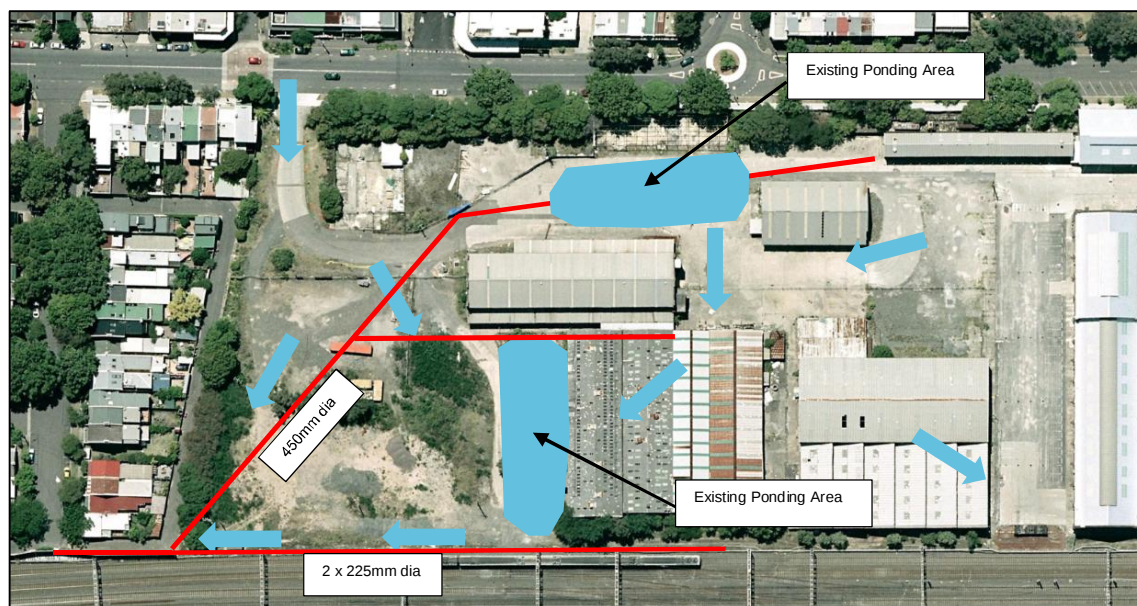
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Figure 14 Existing on-site stormwater management approach

5.4 Existing Hydrology and Hydraulic Performance

The existing hydrology of the catchments described previously and the hydraulic performance of the existing drainage networks have been assessed using a DRAINS model developed for the internal and external catchments. The layout of the DRAINS model developed and key assumptions applied to the model are presented in Appendix D.

This DRAINS model was used to assess the existing stormwater flows for the 1 year, 20 year and 100 year ARI design storm events, which will form the baseline conditions against which each of the development phases will be assessed.

Key outcomes of this modelling are summarised as follows:

- Flow will discharge from the external catchment onto the site via the existing driveway for both the 20 year and 100 year ARI design storms
- The existing ponding area attenuates overland flow discharges before spilling to the boundary with the rail corridor and ultimately Leamington Lane (for each of the 1 year, 20 year and 100 year ARI design storms)

Estimated flow rates at key points on the site are presented in Table 4 with the relevant locations presented in Figure 15. These locations have been selected to allow demonstration that the stormwater management approach will comply with the Statement of Commitments and City of Sydney requirements for post development conditions.

A summary of the DRAINS model results are also presented in Appendix D.

Table 4 Estimated existing conditions peak flow rates (m³/s)

Storm Event	Pipe Discharge (at boundary)	Overland Flow to Rail Corridor Boundary	Overland Flow to Leamington Lane	Total Combined Discharge from the Site
1 year ARI	0.33	0.02	0.13	0.46
20 year ARI	0.38	0.42	0.44	0.82
100 year ARI	0.38	0.84	0.87	1.25

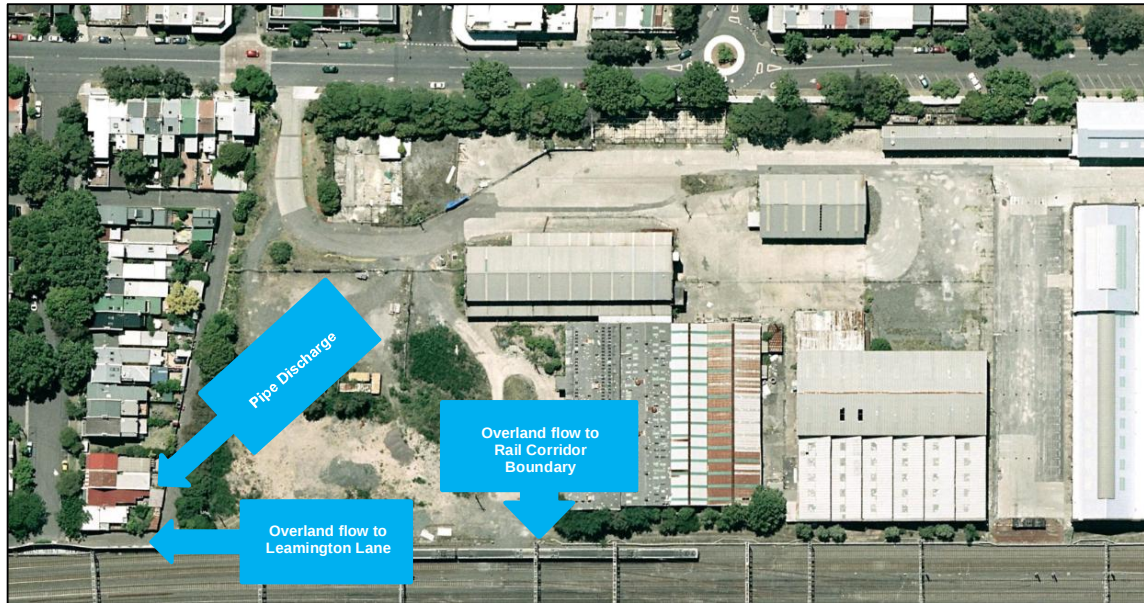
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Figure 15 Existing peak flow summary locations

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6.0 Proposed Stormwater Management

6.1 Proposed Stormwater Management Approach and Quantity Control

The proposed stormwater drainage system for the NEHP development will comply with the design requirements identified in Section 3 and the previous proposals discussed in Section 4, with the main design considerations being summarised below:

- Provision of a pipe drainage network with capacity to convey the 20 year ARI storm;
- Provision of overland flow routes to safely convey runoff from the 100 year ARI storm through the site;
- Provide drainage connections points for buildings;
- Management of water quality through the incorporation of Water Sensitive Urban Design (WSUD) techniques; and
- Management of water quantity to ensure no increase in stormwater discharge from the site.

The DRAINS model developed to assess the existing hydrological and hydraulic conditions, was updated to reflect each development phase to assess the stormwater discharge from the site under developed conditions. In accordance with the Statement of Commitments, in addition to providing the Sydney Water stormwater detention requirements for each building, the NEHP development needs to ensure that the stormwater discharge from the site does not exceed existing for any development phase.

6.1.1 Development Phase 1 – NEHP Infrastructure

The proposed drainage system to be constructed in Development Phase 1 will consist of a pit and pipe network to be located within the central road reserve through the centre of the site. Surface runoff from the roads and public realm will drain towards the bio-retention areas, located adjacent to the road carriageway, with overflow from the bio-retention areas entering the pipe drainage network via raised inlet pits. The pipe drainage network will allow two connection points to each of the future building plots.

The pipe drainage network will drain towards the existing RailCorp culvert at the southern end of Holdsworth Street. A new drainage line is proposed within Iverys Lane to connect to the existing drainage system located in Leamington Lane, this is to maintain the drainage network within public roads and not cross RailCorp land.

Overland flow from the western internal sub-catchment will be conveyed in the road towards a local low point between the building plots C4 and D4. Once the storage capacity of the road has been exceeded, flow will spill across the footpath to a defined overland flow path draining to the south between the building plots. From here the overland flow will discharge as for existing conditions, initially to the existing ponding area on RailCorp land and then to Leamington Lane along the rail corridor boundary.

These arrangements are presented schematically in Figure 16, with detailed design drawings for the stormwater infrastructure to be delivered in Development Phase 1 included in Appendix E.

As discussed in Section 3, Sydney Water stormwater detention requirements will not apply to the infrastructure corridor delivered in Development Phase 1. As Development Phase 1 involves delivery of additional piped stormwater discharge, but does not include formal detention storage, it will be necessary to restrain the discharge rates of the pipe drainage system until the first building is delivered in Development Phase 2.

Hydraulic modelling indicates that the discharge can be restrained to pre-development rates (as required by the Statement of Commitments) by providing temporary storage to replicate the future storage on the building plots. This would specifically require the following:

- Install 80mm diameter orifice plate on the outlet from Pit 4.1, resulting in approximately 200m³ of storage occurring on the footprint of future buildings A2 and A3 in the 100 year ARI storm
- Install 100 mm diameter orifice plate on the outlet from Pit 5.1, resulting in approximately 160m³ of storage occurring on the footprint of future building D4 in the 100 year ARI storm
- Install 150mm diameter orifice plate on the outlet from Pit 9.1, resulting in approximately 90m³ of storage occurring adjacent to existing building C4 in the 100 year ARI storm

These proposed areas of temporary areas of OSD are presented in Figure 16.

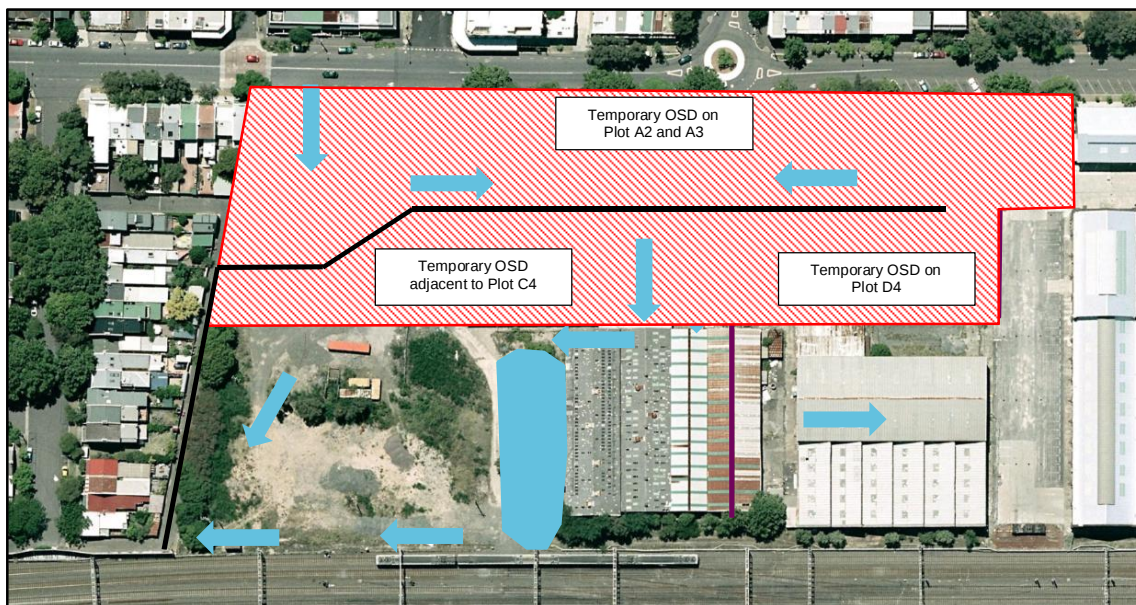
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Figure 16 Post development catchment layout and flow directions for NEHP development phases 1

Results from the hydraulic modelling for Development Phase 1 are presented in Table 5, confirming that with the incorporation of the orifice plates mentioned above the post development discharge does not exceed existing.

Table 5 Estimated post development peak flow rates for Development Phase 1 (m³/s)

Storm Event	Existing Conditions Total Discharge	Proposed Conditions			
		Pipe Discharge (at boundary)	Overland Flow to Rail Corridor Boundary	Overland Flow to Leamington Lane	Total Combined Discharge from the Site
1 year ARI	0.46	0.36	0.01	0.11	0.44
20 year ARI	0.82	0.52	0.23	0.26	0.79
100 year ARI	1.25	0.65	0.35	0.42	1.07

6.1.2 Development Phase 2 – Affordable Housing Building Development

The affordable housing building to be delivered in Development Phase 2 will discharge to the stormwater drainage to the infrastructure installed in Development Phase 1. In addition, the building will be required to provide OSD complying with Sydney Water requirements. Table 6 provides the permissible site discharge (PSD) and site storage requirement (SSR) for the building based on the Sydney Water requirements outlined in Section 3.5.

Table 6 Sydney Water stormwater detention requirements for Building D4

Building Reference	Plot Area (m ²)	Permissible Site Discharge (l/s)	Site Storage Requirements (m ³)
D4	2,562	77	51

It is noted that the Sydney Water requirements address only a maximum PSD and do not provide a separate PSD for each recurrence interval storm event. As the statement of commitments require the site discharge to not exceed existing conditions for each recurrence interval investigated, a permissible site discharge for each of the 1

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year, 20 year and 100 year have been calculated using the site wide DRAINS model and are presented in Table 7.

Table 7 Permissible site discharge for Building D4 to ensure no increase in offsite discharge

Storm Recurrence Interval	PSD (l/s)
1 year ARI	28
20 year ARI	56
100 year ARI	77

In accordance with City of Sydney requirements, to facilitate dedication of the stormwater infrastructure at the end of Development Phase 2, it would be necessary to formalise the overland flow arrangements downstream of the NEHP site, including bypassing the existing area of informal ponding. As has been demonstrated in Section 5, this existing area of informal ponding provides peak flow attenuation, meaning that in advance of development of buildings A2, A3 and C4, it will be necessary to provide compensatory flood attenuation within the swale to be provided for this overland flow path.

To ensure that offsite discharge does not increase when the existing ponding on RailCorp land is bypassed would require the temporary detention storage volume adjacent to Plot C4 to be increased to 160m³. The temporary detention storage provided on the footprint of future buildings A2 and A3 would also remain as for development phase 1.

The stormwater management arrangements at the completion of Development Phase 2 are presented in Figure 17.

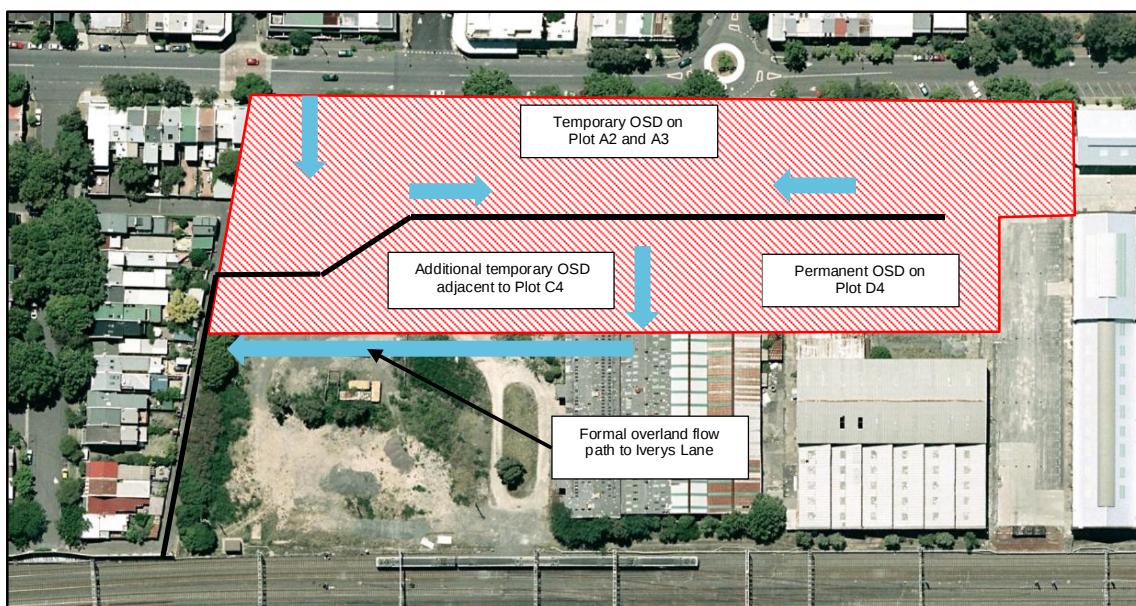


Figure 17 Post development catchment layout and flow directions for NEHP development phases 2

The peak flow discharge rates at the completion of Development Phase 2 (including the temporary detention storage discussed above) are presented in Table 8.

DRAFT**Table 8** Estimated post development peak flow rates for Development Phase 2 (m³/s)

Storm Event	Existing Conditions Total Discharge	Proposed Conditions			
		Pipe Discharge (at boundary)	Overland Flow to Rail Corridor Boundary	Overland Flow to Leamington Lane	Total Combined Discharge from the Site
1 year ARI	0.46	0.34	0.01	0.11	0.45
20 year ARI	0.82	0.55	0.23	0.26	0.81
100 year ARI	1.25	0.66	0.37	0.44	1.10

6.1.3 Development Phase 3 – Building and Park Development

The buildings and parks to be delivered in Development Phase 3 will discharge to the stormwater drainage to the infrastructure installed in Development Phase 1.

As a minimum, the buildings will be required to provide OSD complying with Sydney Water requirements. Table 9 provides the permissible site discharge (PSD) and site storage requirement (SSR) for the building based on the Sydney Water requirements outlined in Section 3.5.

Table 9 Sydney Water stormwater detention requirements for Building A2, A3 and C4

Building Reference	Plot Area (m ²)	Permissible Site Discharge (l/s)	Site Storage Requirements (m ³)
A2	1,283	39	26
A3	1,257	38	25
C4	2,504	76	50

It is noted that the Sydney Water requirements address only a maximum PSD and do not provide a separate PSD for each recurrence interval storm event. As the statement of commitments require the site discharge to not exceed existing conditions for each recurrence interval investigated, a permissible site discharge for each of the 1 year, 20 year and 100 year have been calculated using the site wide DRAINS model and are presented in Table 10.

Table 10 Permissible site discharge for Building A2, A3 and C4 to ensure no increase in offsite discharge

	Storm Recurrence Interval	PSD (l/s)
A2	1 year ARI	14
	20 year ARI	32
	100 year ARI	38
A3	1 year ARI	14
	20 year ARI	32
	100 year ARI	38
C4	1 year ARI	27
	20 year ARI	45
	100 year ARI	76

As the existing ponding on RailCorp land to the south of the existing Clothing Store Building would still be bypassed by the formalised overland flow path, it would be necessary to maintain a small amount of storage within this swale at the completion of development phase 3.

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The stormwater management arrangements at the completion of Development Phase 3 are presented in Figure 18.

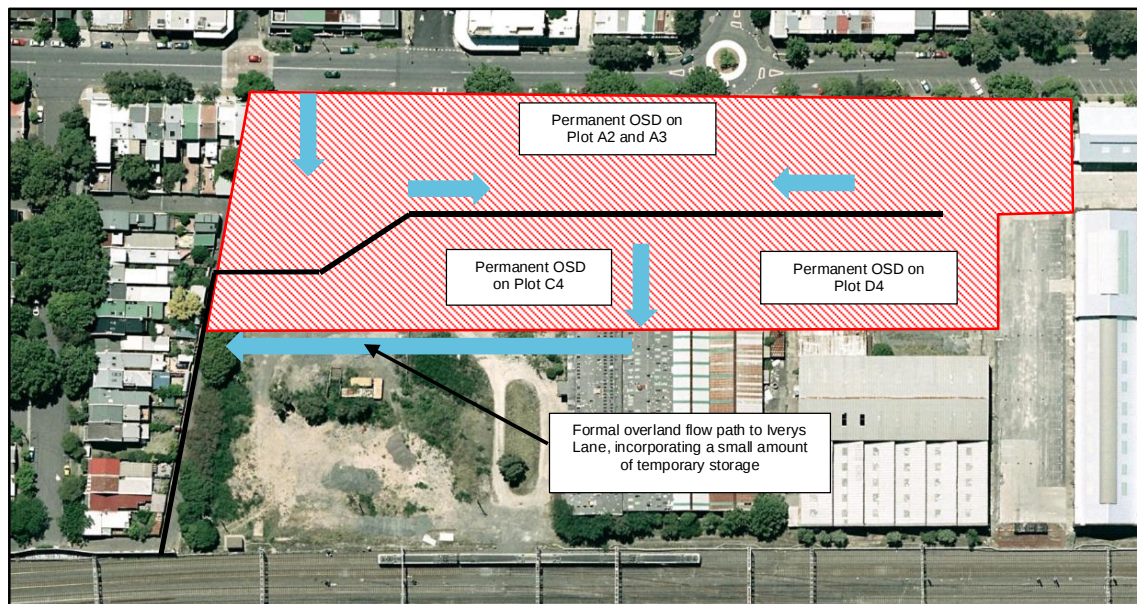


Figure 18 Post development catchment layout and flow directions for NEHP development phases 3

The peak flow discharge rates at the completion of Development Phase 3 are presented in Table 11.

Table 11 Estimated post development peak flow rates for Development Phase 3 (m³/s)

Storm Event	Existing Conditions Total Discharge	Proposed Conditions			
		Pipe Discharge (at boundary)	Overland Flow to Rail Corridor Boundary	Overland Flow to Leamington Lane	Total Combined Discharge from the Site
1 year ARI	0.46	0.41	0.01	0.01	0.42
20 year ARI	0.82	0.64	0.15	0.18	0.82
100 year ARI	1.25	0.73	0.21	0.31	1.04

6.1.4 Development Phase 4 - Future Development on RailCorp Land

The buildings and parks to be delivered in Development Phase 4 will discharge to stormwater drainage infrastructure to be installed as part of Development Phase 4.

To maintain the same sub-catchment distribution as for existing conditions, it is proposed to drain buildings D1, D2, D3 towards Traverser 2, while buildings C1, C2 and C3 along with the proposed park would drain towards the Holdsworth Street Low Point. The overland flow path from NEHP Development Phase 1-3 would be formalised along the southern boundary of lot C4 (the Clothing Store) ultimately discharging to Iverys Lane.

Details of this drainage infrastructure will be defined as part of design development for this future phase, however as a minimum this will consist of an additional pipe connection to Iverys Lane to drain Buildings C1, C2 and C3 and a new pipe connection to Traverser 2 to drain Buildings D1, D2 and D3.

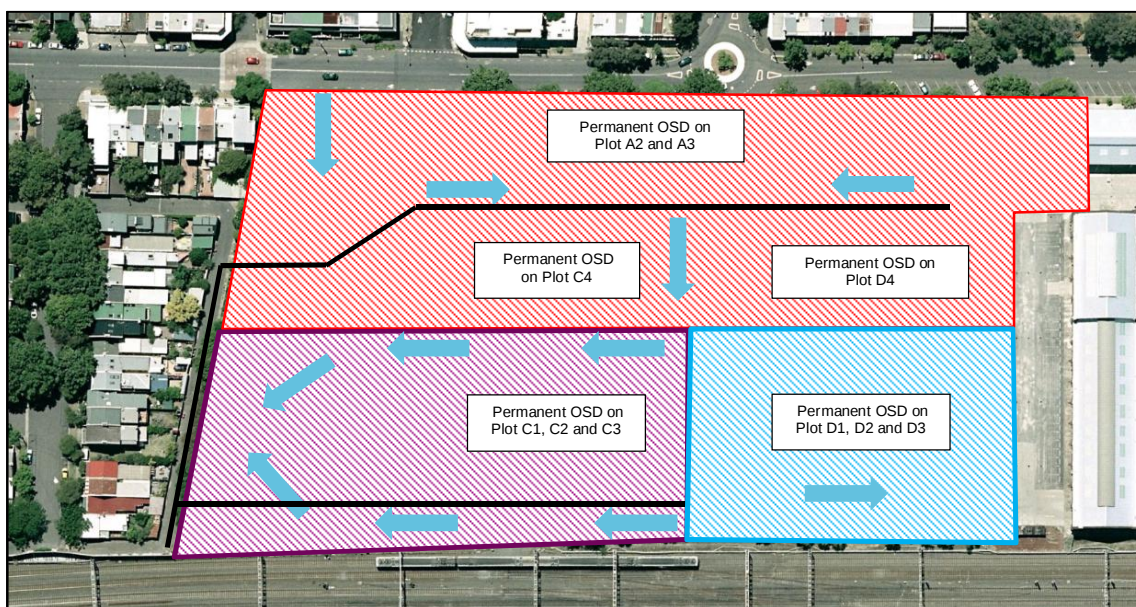
As noted previously, there is currently no commitment to progress Development Phase 4 as the land on which this would occur currently remains in RailCorp ownership.

As a minimum, the buildings will be required to provide OSD complying with Sydney Water requirements. Table 12 provides the permissible site discharge (PSD) and site storage requirement (SSR) for the building based on the Sydney Water requirements outlined in Section 3.5.

DRAFT**Table 12** Sydney Water stormwater detention requirements for Building C1, C2 and C3 and D1, D2 and D3

Building Reference	Plot Area (m ²)	Permissible Site Discharge (l/s)	Site Storage Requirements (m ³)
C1, C2 and C3	4,850	145	97
D1, D2 and D3	4,850	145	97

These proposed stormwater management arrangements are presented schematically in Figure 17.

**Figure 19** Post development catchment layout and flow directions for NEHP development phase 4

The peak flow discharge rates at the completion of Development Phase 4 are presented in Table 13.

Table 13 Estimated post development peak flow rates for Development Phase 4 (m³/s)

Storm Event	Existing Conditions Total Discharge	Proposed Conditions			
		Pipe Discharge (at boundary)	Overland Flow to Rail Corridor Boundary	Overland Flow to Leamington Lane	Total Combined Discharge from the Site
1 year ARI	0.46	0.41	0	0.02	0.43
20 year ARI	0.82	0.70	0	0.08	0.78
100 year ARI	1.25	0.83	0	0.15	0.98

6.2 Proposed Stormwater Quality Management

The stormwater quality management approach will involve incorporation of Water Sensitive Urban Design (WSUD) techniques in the proposed stormwater drainage system. This reflects the obligations included in the DGR's and the approach proposed in the Hydraulic Services Concept Design Report (WSP, 2008).

Detailed water quality controls will be defined as part of design development for each development phase, as such the following sections provide a detailed scope and modelling results for the works to be delivered by UGDC and more general approaches for development stages to be delivered by third parties.

DRAFT**6.2.1 Development Phase 1 – NEHP Infrastructure**

As noted in the Hydraulic Services Concept Design Report (WSP, 2008), the most applicable WSUD technique for constrained road areas (such as Development Phase 1) will be bio-retention swales.

Bio-retention systems combine various Water Sensitive Urban Design (WSUD) treatment types in one 'treatment train'. The bio-retention swale treatment process operates by filtering stormwater runoff through surface vegetation associated with the swale and then percolating the runoff through a prescribed filter media, forming the bio-retention component which provides treatment through fine filtration, extended detention treatment and some biological uptake.

The Development Phase 1 infrastructure works will incorporate a series of bio-retention areas incorporated between the proposed car parking spaces along the central road, as presented in the drawings in Appendix E. The area of bio-retention has been maximised allowing for the specified requirement for parking spaces and will comprise a total area of approximately 100 m².

A MUSIC model has been developed to assess the performance of the water quality treatment proposals, with the results summarised in Table 9. This demonstrates that the proposed water quality controls will achieve the pollutant removal targets included in the Statement of Commitments.

In accordance with City of Sydney requirements, a gross pollutant trap (GPT) be included in Development Phase 1, as presented on the drawings in Appendix E. This GPT has not been modelled in MUSIC, however would further improve the water quality performance presented in Table 9.

Table 14 Development Phase 1 – NEHP Infrastructure - Water Quality Modelling Results

Stormwater Pollutant	Load without Treatment (kg/year)	Load with Treatment (kg/year)	% Removal Rate	Statement of Commitment % Removal Requirement
Total Suspended Solids (TSS)	595	68	90	80
Total Phosphorous (TP)	1.2	0.3	75	45
Total Nitrogen (TN)	8.4	4.8	45	45

6.2.2 Development Phase 2 – Affordable Housing Building Development

As the affordable housing building to be constructed in development phase 2 is to be delivered by a third party developer, detailed water quality management proposals will be developed as part of a separate design development process and will be submitted as part of the development application for this building.

The stormwater quality controls proposed will need to demonstrate compliance with the requirements outlined in this SWMP, including:

- Compliance with stormwater pollutant removal efficiencies included in the Statement of Commitments
- Demonstration that opportunities for rainwater for reuse in irrigation have been fully investigated

As the North Eveleigh Concept Plan shows the building surrounded by landscape, it is anticipated that there would be opportunity to incorporate rainwater harvesting for both irrigation and toilet flushing. Furthermore, this landscaping may present an opportunity for vegetative water quality treatment in addition to typical building related water quality treatment measures such as sand filters and proprietary treatment systems.

6.2.3 Development Phase 3 – Building and Park Development

Development Phase 3 will comprise both park areas to be delivered by UGDC and buildings to be delivered by third party developers.

The water quality controls for the building developments will generally be in line with the requirements outlined in Section 6.2.2 for development phase 2. Details will be provided by the respective developers as part of each Development Application.

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The stormwater treatment approach for the two parks to be delivered by UGDC will be based around passive irrigation of soft landscaped areas. The landscape and drainage design for the site will be undertaken to ensure that all impervious surfaces would drain to nearby planted areas. Planted areas include planter beds, turf areas, tree pits and any other deep soil area planted with vegetation. This strategy is possible at these sites because planting will be distributed throughout the parks and there will not be any locations of large impervious surfaces where flow cannot be distributed to vegetated areas.

If run-off exceeds the infiltration or temporary storage capacity of the planted areas, these planted areas will overflow and water will be directed to the major overland flooding flow path

A MUSIC model has been developed to assess the performance of the water quality treatment proposals for the two parks to be delivered by UGDC (referred to as the Local Park and Pocket Park), with the results summarised in Table 10 and 11. This demonstrates that the proposed water quality controls will achieve the pollutant removal targets included in the Statement of Commitments.

Table 15 Development Phase 3 – Local Park Water Quality Modelling Results

Stormwater Pollutant	Load without Treatment (kg/year)	Load with Treatment (kg/year)	% Removal Rate	Statement of Commitment % Removal Requirement
Total Suspended Solids (TSS)	232	6.6	97	80
Total Phosphorous (TP)	0.5	0.1	87	45
Total Nitrogen (TN)	3.2	0.8	77	45

Table 16 Development Phase 3 – Pocket Park Water Quality Modelling Results

Stormwater Pollutant	Load without Treatment (kg/year)	Load with Treatment (kg/year)	% Removal Rate	Statement of Commitment % Removal Requirement
Total Suspended Solids (TSS)	25.9	0.9	97	80
Total Phosphorous (TP)	0.05	0.01	80	45
Total Nitrogen (TN)	0.36	0.10	72	45

6.2.4 Development Phase 4 – Future Development on RailCorp Land

The water quality controls for Development Phase 4 will be developed by the respective developers when a decision to develop this part of the site is made.

As the development within this area will generally comprise building development, it is anticipated that the water quality controls will generally be in line with the requirements outlined in Section 6.2.2 for development phase 2. Details will be provided by the respective developers as part of each Development Application.

The area of the local park to be delivered by UGDC within Development Phase 4 has been assessed in the MUSIC model as summarised in Table 10.

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7.0 Conclusion

This SWMP presents the proposed stormwater management approach for the western part of the North Eveleigh Concept Plan Site, including the North Eveleigh Housing Project (NEHP) area where infrastructure and public realm is to be delivered by UGDC.

The proposed stormwater management approach will ensure that the developed site complies with planning commitments from the approved North Eveleigh Concept Plan, addresses City of Sydney requirements and achieves the Sydney Water water quantity control standards. Table 11 and Table 12 provide a summary of how each of these requirements is addressed in this SWMP.

Table 17 Response to planning commitments from the North Eveleigh Concept Plan

Planning Commitment	Stormwater Management Response	Report Section Reference
Director General Requirements		
Address drainage/flooding issues associated with the development/site, including stormwater, drainage infrastructure, and incorporation of Water Sensitive Urban Design measures	The overall stormwater management approach, including quantity and quality control, for the whole western part of the North Eveleigh Concept Plan Site is documented in this SWMP.	-
Address the issue of managing the downstream impacts of stormwater on Sydney Water's stormwater network, including a stormwater management system and the capture and reuse of rainwater	The approach for stormwater quantity control, including consideration of Sydney Water requirements, is documented in this SWMP. This includes demonstrating that overall discharge from the site under developed conditions has been assessed for each Development Phase to ensure that quantity control measures ensure that post development discharge does not exceed existing.	3.5 and 5.1
Explore non-potable water supply sources, including onsite recycling of grey water, rainwater and stormwater harvesting	Rainwater collection for irrigation and toilet flushing will be investigated for each building. Details of how rainwater harvesting has been incorporated into each building proposal will be included with the Development Application for each building.	5.2
Address stormwater and drainage impacts on rail corridor	The hydraulic assessment of post development conditions presented in this SWMP demonstrates that overland flow discharged towards the rail corridor will not increase for each Development Phase.	5.1
Statement of Commitments		
Improve stormwater runoff quality by reducing the average annual load of : - Total Phosphorous by 45%, - Total Nitrogen by 45%, - Total Suspended Solids (TSS) by 80%. For up to 3 month ARI peak flow retain: - Visible oil or grease, Litter > 50mm and Sediment >0.125mm	Detailed assessment of the water quality management proposals for the works to be delivered by UGDC (Development Phase 1 Infrastructure and Development Phase 3 Parks) confirms that these requirements will be achieved. Further detail of the water quality performance for the building developments to be delivered by third parties will be documented within the Development Application for each building.	5.2
Provide on-site detention of stormwater to mitigate drainage capacity constraints.	The overall discharge from the site under developed conditions has been assessed for each Development Phase to ensure that quantity	5.1

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	control measures ensure that post development discharge does not exceed existing.	
Collect rainwater for reuse in irrigation.	Rainwater collection for irrigation and toilet flushing will be investigated for each building. Details of how rainwater harvesting has been incorporated into each building proposal will be included with the Development Application for each building.	5.2
Discharging stormwater drainage from the North Eveleigh site across the rail corridor and providing RailCorp with necessary information in relation to drainage.	UGDC has been liaising with RailCorp throughout the NEHP design period and in accordance with the Statement of Commitments, RailCorp sign off of stormwater management proposals will be sought as part of this process.	-
Ensuring that the detention system is designed to ensure that post development flow rates from the site are not more than the pre-development site discharge.	The overall discharge from the site under developed conditions has been assessed for each Development Phase to ensure that quantity control measures ensure that post development discharge does not exceed existing.	5.1

Table 18 Responses to City of Sydney stormwater management requirements

City of Sydney Requirement	Stormwater Management Response	Report Section Reference
a. It is proposed to convey the site runoff and external catchment runoff with a pipe and overland system through Iverys Lane. Additional flow (particularly overland) generated by the development must also be assessed to ensure that the properties adjacent to the laneway are not adversely affected.	The overall discharge from the site under developed conditions has been assessed for each Development Phase to ensure that quantity control measures ensure that post development discharge does not exceed existing.	5.1
b. Holdsworth Street/ Leamington Lane already experience severe flooding. Directing additional runoff to these areas will worsen flooding. This issue must be assessed and mitigation measures proposed accordingly as part of the Construction Certificate stage submission.	The overall discharge from the site under developed conditions has been assessed for each Development Phase to ensure that quantity control measures ensure that post development discharge does not exceed existing.	5.1
c. It is noted that the Stormwater Management Plan for the site proposes that overland flow will be directed to a local pond. The overland flow from the site / pond must be conveyed safely through a defined path to a public drainage system. A flood assessment is required to prove that any proposal to direct overland flow does not adversely impact any other properties or development.	A proposed stormwater management approach which redirects overland flow away from the existing area of ponding is outlined for Development Phases 2 and 3. This includes defining additional peak flow mitigation measures to ensure that the peak flow discharged from the site does not increase after any stage of development. In Development Phase 4 a proposed building will be constructed over the existing area of ponding, however hydraulic modelling confirms that the OSD to be provided within the buildings will ensure there is no increase in flow discharged from the site.	5.1
d. Furthermore, if the pond is located	The stormwater management proposals assume	5.1

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outside the Phase 1 development site, the submission must document whether this arrangement will remain beyond Phase 1, or else document the future scenario. It is therefore not acceptable to direct overland flows into this pond without adequate legal arrangements (ie. Easements and positive covenants in favour of Council).	that overland flow would discharge via the existing ponding area following Development Phase 1, however that a formalised overland flow path would be delivered at the completion of Development Phase 2. As levels dictate that this formal overland flow path is located on RailCorp land it will be necessary to obtain necessary easements.	
e. The proposed bioretention solution to address the stormwater quality issues may not be adequate to removing gross pollutants. The pipe drainage should include gross pollutant traps (GPTs) to capture gross pollutants.	This comment refers specifically to Development Phase 1, in which the Bioretention areas have been supplemented by a Gross Pollutant Trap. As discussed in the SWMP, detailed stormwater quality proposals for building developments will be proposed by the developer of each plot.	5.2
f. On site detention (OSD) requirement are to be provided in accordance with Sydney Water's final detail design documentation approval.	Public domain areas to be dedicated to City of Sydney will be exempt from Sydney Water OSD requirements in accordance with advice from Sydney Water. All building developments will be required to comply with Sydney Water OSD requirements. Sydney Water approval will be sought as part of each construction package.	3.5

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Appendix A

North Eveleigh Dedication Plan

Parks and Public Domain Plan
Scale 1:2500



Legend

	Approximate
 Public parks to be dedicated	9,401sqm
 Roads to be dedicated	12,284sqm
 Public domain to be dedicated	744sqm
 Other public domain	5,807sqm
Total Public Parks	9,401sqm
Total Public Domain	6,551sqm
Total Public Parks & Public Domain	15,952sqm (15% of site area)

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Appendix B

External Catchment Details



External Sub-Catchment Layout

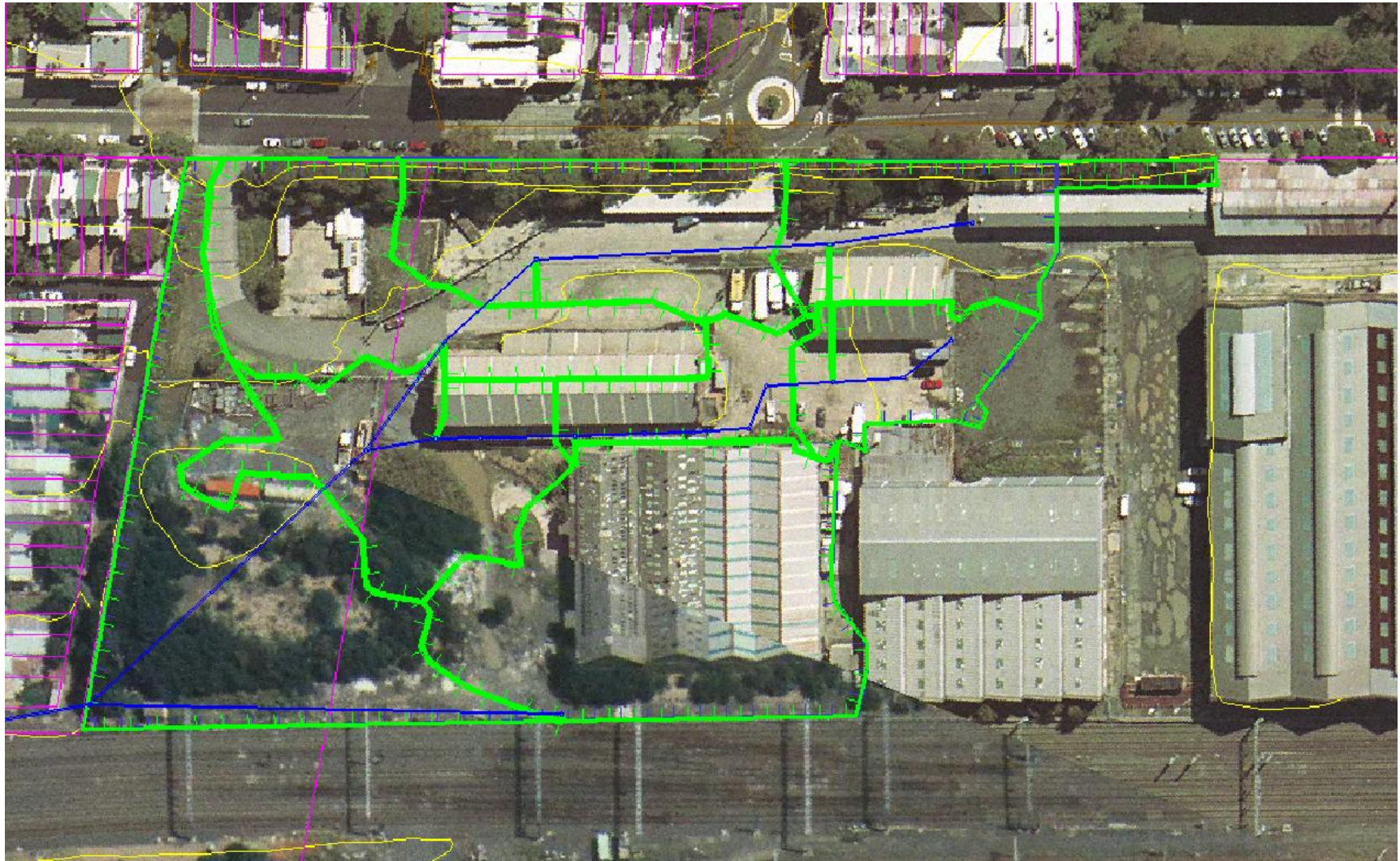


External Sub-Catchment Layout

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Appendix C

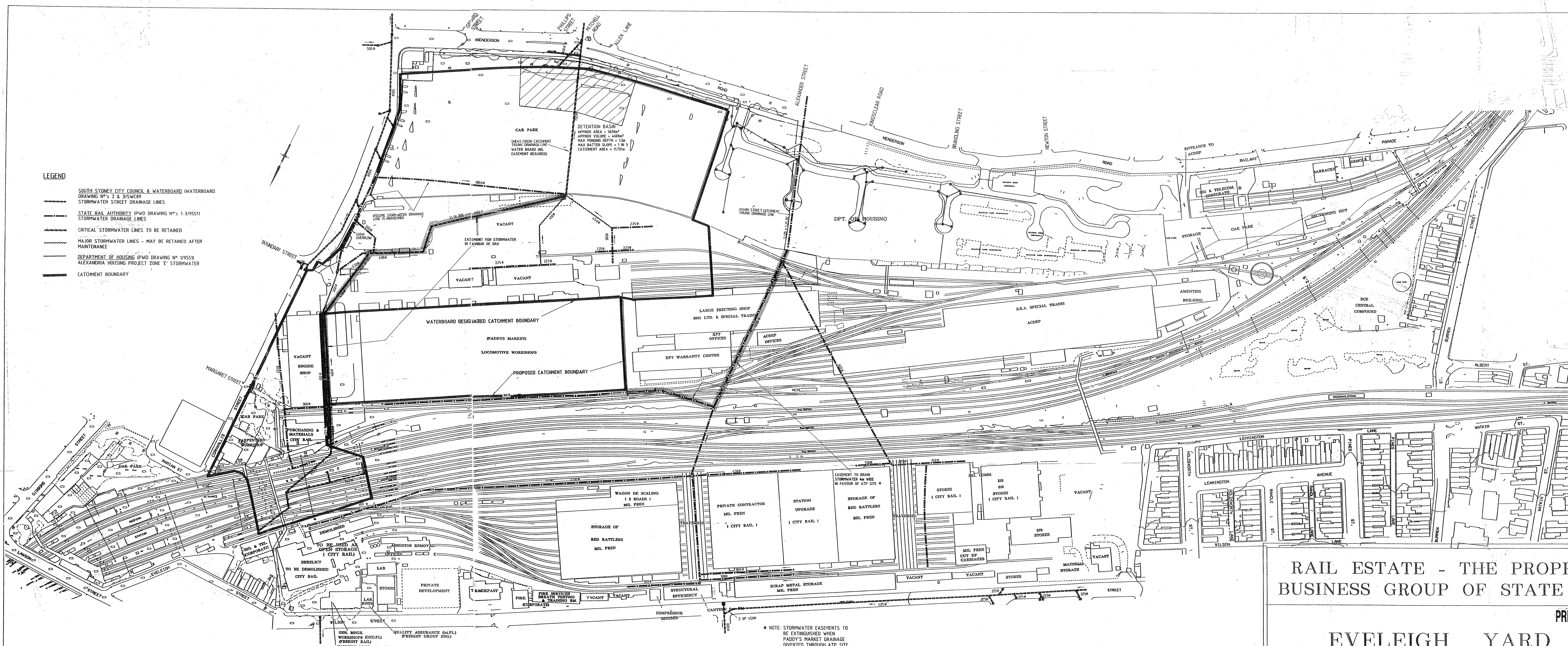
Internal Catchment - Existing Condition Details



Existing Conditions Internal Sub-Catchment Layout

LEGEND

- SOUTH SYDNEY CITY COUNCIL & WATERBOARD (WATERBOARD DRAWING N°s 2 & 3/SWC89) STORMWATER STREET DRAINAGE LINES
- STATE RAIL AUTHORITY (PWD DRAWING N°s 1-3/9551) STORMWATER DRAINAGE LINES
- CRITICAL STORMWATER LINES TO BE RETAINED
- MAJOR STORMWATER LINES - MAY BE RETAINED AFTER MAINTENANCE
- DEPARTMENT OF HOUSING (PWD DRAWING N° 1/9551) ALEXANDRIA HOUSING PROJECT ZONE 'E' STORMWATER
- CATCHMENT BOUNDARY



* NOTE: STORMWATER EASEMENTS TO BE EXTINGUISHED WHEN PADDY'S MARKET DRAINAGE DIVERTED THROUGH ATP SITE

RAIL ESTATE - THE PROPERTY BUSINESS GROUP OF STATE RAIL

PRELIMINARY

EVELEIGH YARD SERVICES INFRASTRUCTURE STORMWATER

scale: 1:1000

WARNING SCANNED IMAGE
EDMS CV0206417

EVELEIGH YARD

Scale 2Chs = 1Inch.

DRAINAGE PLAN

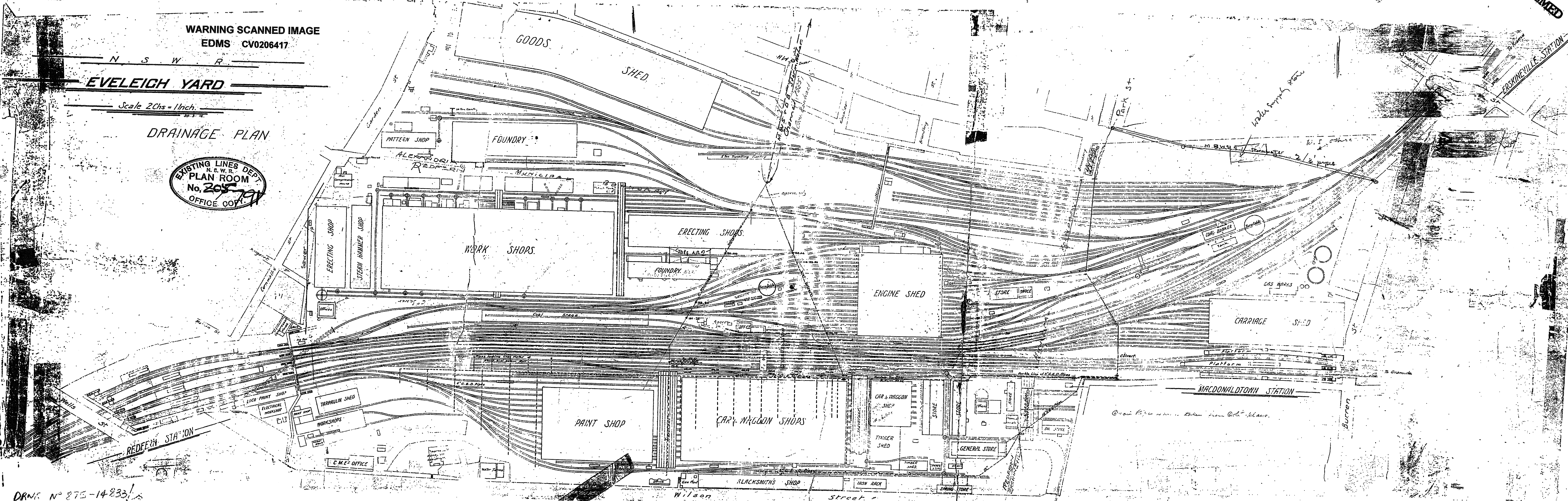
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OFFICE COPY

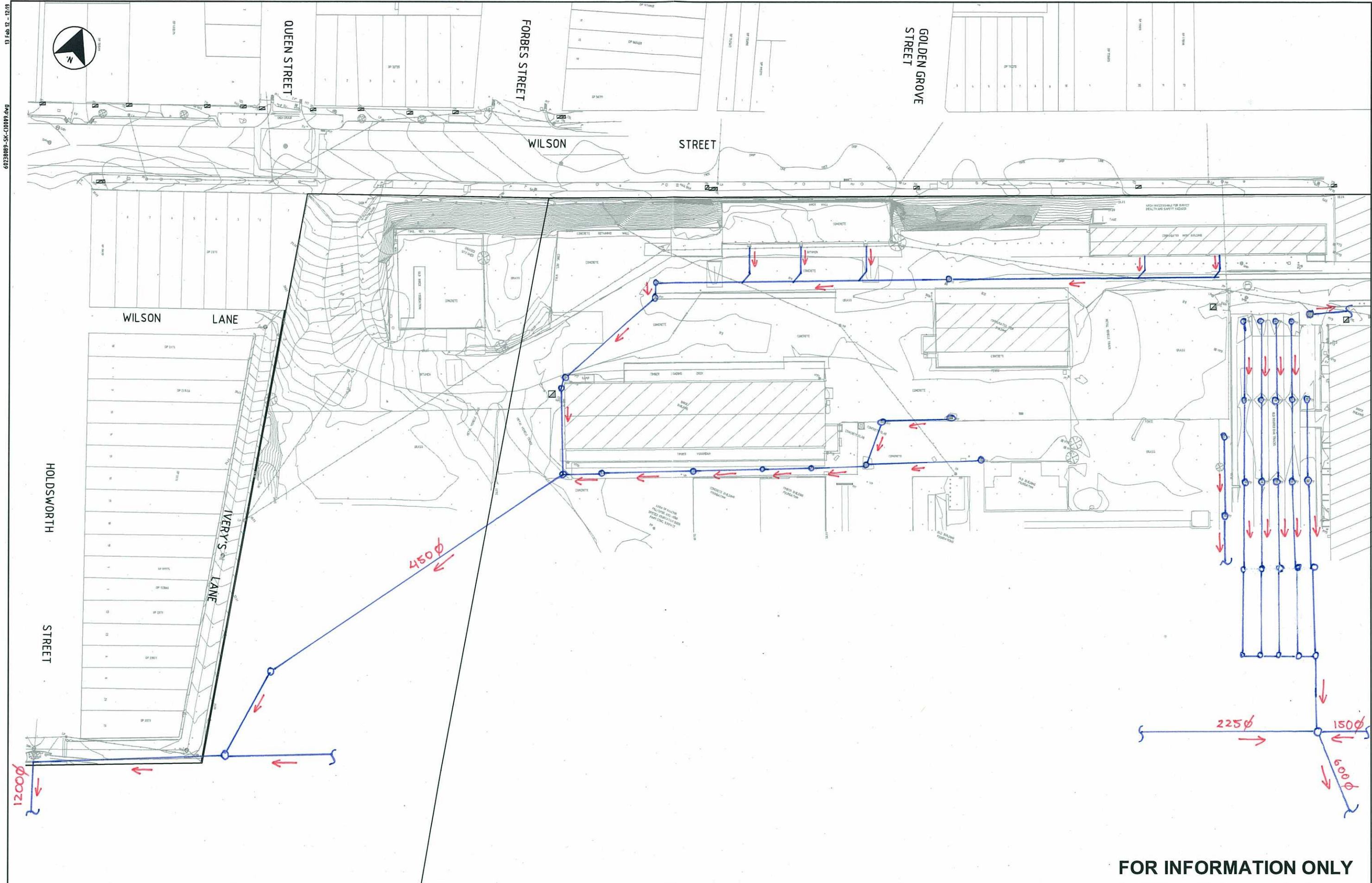
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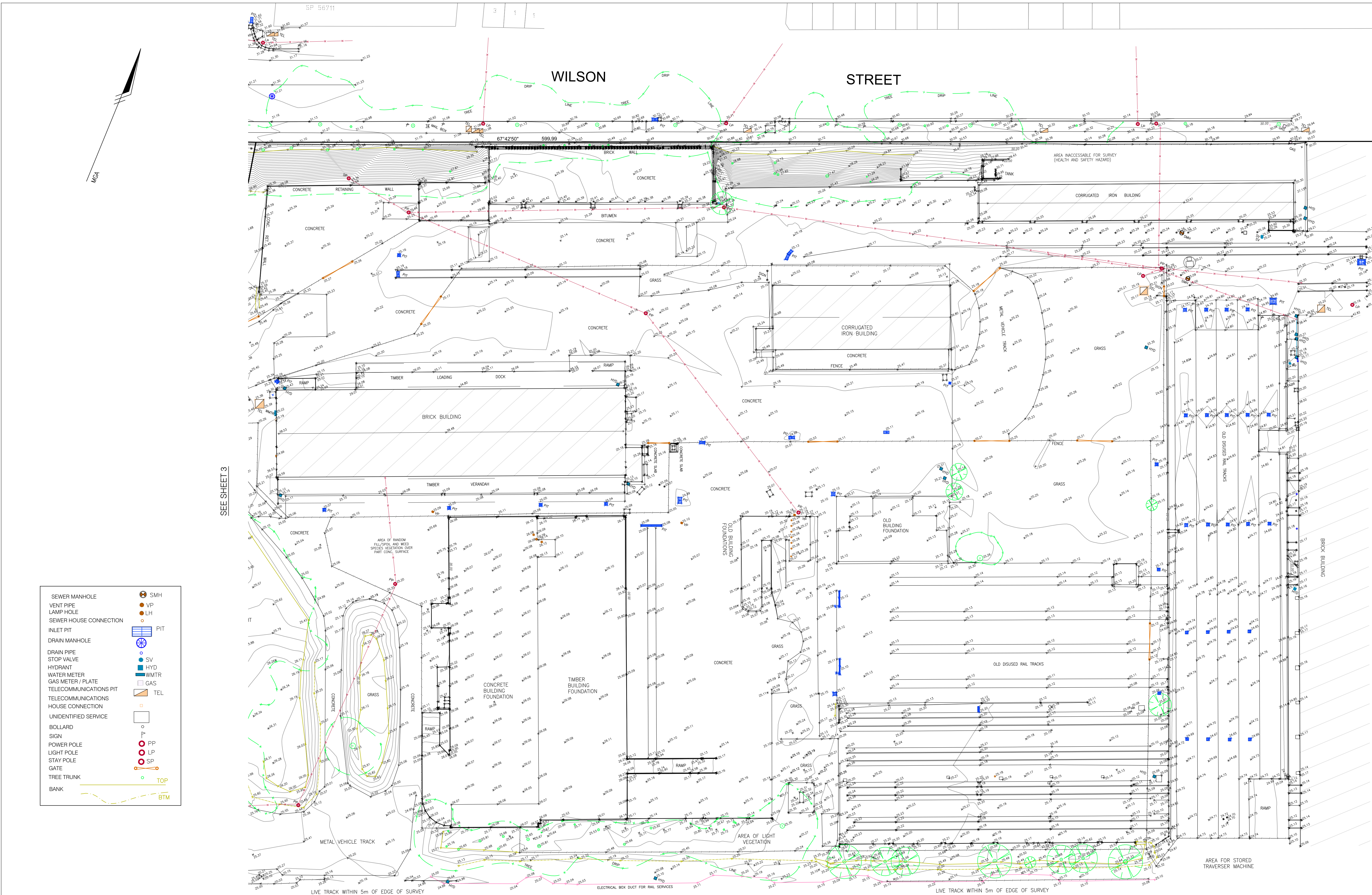


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					N.T.S.		DESIGNED	RV	CHECKED			AECOM		NORTH EVELEIGH AFFORDABLE HOUSING	
							DRAWN	CW	CHECKED			AECOM Australia Pty Ltd		ESTIMATED EXISTING DRAINAGE CONFIGURATION	
							APPROVED		DATE			A.B.N. 20 093 846 925		Status	
							THIS DRAWING IS CONFIDENTIAL AND SHALL ONLY BE USED FOR THE PURPOSES OF THIS PROJECT.							SKETCH	
														Dwg No. 60238089-SK-C10009	
														Rev. 01	



REVISIONS	D	29.01.13	ADDITIONAL AREA SURVEYED	C.K.B.	C.K.B.	C.K.B.	■ NOTES: 1. ORIGIN OF LEVELS: SS 98929 RL = 30.684 (AHD71 CLASS B2) 2. ORIGIN OF COORDINATES: SS 98929 NE 332579.135 mN 6248110.115 (MGA CLASS B2) 3. CONTOUR INTERVAL: 0.2m 4. SITE BOUNDARIES ADOPTED FROM DP 862514 5. ABUTTING BOUNDARIES ADOPTED FROM DCDB 6. DEPTHS OF ALL DRAINAGE PITS ARE APPROXIMATE ONLY AND SHOULD BE CONFIRMED BY FURTHER INVESTIGATION AFTER CLEANNING. 7. WHERE DEPTHS ARE NOT SHOWN, PITS ARE BLOCKED OR NOT MEASURABLE. 8. PREVIOUS AREAS OF SURVEY UNDERTAKEN IN JAN 2012 & AUG 2012 HAVE NOT BEEN UPDATED AND MAY NOT BE CURRENT AT THE DATE OF THIS PLAN
	C	30.08.12	ADDITIONAL AREA SURVEYED	C.K.B.	C.K.B.	C.K.B.	
	B	29.01.12	EASMTT BDYS, WATR MAIN, FIRE HYD	C.K.B.	C.K.B.	C.K.B.	
	A	20.01.12	MINOR AMENDMENTS	P.L.H.	C.K.B.	C.K.B.	
	No.	DATE	REVISION DETAILS	DRAWN	CHK	APP	
■ HORIZ. SCALE: 1:300 @ A1 ■ COORDINATES: MGA  SCALE IN METRES AT ORIGINAL REDUCTION RATIO ■ VERTICAL SCALE: N/A ■ DATUM: AHD  SCALE IN METRES AT ORIGINAL REDUCTION RATIO ■ PREPARED BY:  Whelans Insites Pty Ltd ACN: 088 148 743							
■ TITLE TOPOGRAPHICAL SURVEY OVER PT 4 DP 862514 & LOT 50 DP 1001467 ■ JOB No C641SC ■ ISSUE D							
■ SURVEY: C.K.B. DATE OF SURVEY: 06.01.2012 ■ DRAWN: P.L.H. DATE OF PLAN: 25.01.2013 ■ CHECKED: C.K.B. DATE LAST SAVED: 30.01.13 ■ APPROVED: C.K.B. DATE APPROVED: 25.01.2013							
■ DRAWING No C641-055d.dwg ■ SHEET 1 OF 3 SHEETS ■ SIZE A1							



REVISIONS

No	DATE	REVISION DETAILS	DRAWN	CHK	APP
D	29.01.13	ADDITIONAL AREA SURVEYED	C.K.B.	C.K.B.	C.K.B.
C	30.08.12	ADDITIONAL AREA SURVEYED	C.K.B.	C.K.B.	C.K.B.
B	29.01.12	EASMTN BDYS, WATR MAIN, FIRE HYD	C.K.B.	C.K.B.	C.K.B.
A	20.01.12	MINOR AMENDMENTS	P.L.H.	C.K.B.	C.K.B.

NOTES

- ORIGIN OF LEVELS: SS 98829 RL - 30.684 (AHD71 CLASS B2)
- ORIGIN OF COORDINATES: SS 98829 ME 332579.135 MN 6248110.115 (MGA CLASS B2)
- CONTOUR INTERVAL: 0.2m
- SITE BOUNDARIES ADOPTED FROM DP 862514
- ABUTTING BOUNDARIES ADOPTED FROM DCDB
- DEPTHS OF ALL DRAINAGE PITS ARE APPROXIMATE ONLY AND SHOULD BE CONFIRMED BY FURTHER INVESTIGATION AFTER CLEANING.
- WHERE DEPTHS ARE NOT SHOWN, PITS ARE BLOCKED OR NOT MEASURABLE.
- PREVIOUS AREAS OF SURVEY UNDERTAKEN IN JAN 2012 & AUG 2012 HAVE NOT BEEN UPDATED AND MAY NOT BE CURRENT AT THE DATE OF THIS PLAN.

HORIZ. SCALE:

1:300 @ A1

VERTICAL SCALE:

N/A

COORDINATES:

MGA

DATUM:

AHD

PREPARED BY

WHELAN'S insites

Level 12, 80 Clarence Street
Sydney, NSW 2000
DK 289 Sydney
t: 02 8234 8300
f: 02 9262 6511

Whehlans Insites Pty Ltd
ACN: 088 148 743

insites.com.au

AECOM

SURVEY: C.K.B.

DRAWN: P.L.H.

CHECKED: C.K.B.

APPROVED: C.K.B.

DATE OF SURVEY: 06.01.2012

DATE OF PLAN: 25.01.2013

DATE LAST SAVED: 30.01.13

DATE APPROVED: 25.01.2013

TITLE

TOPOGRAPHICAL SURVEY OVER
PT 4 DP 862514 & LOT 50 DP 1001467

DRAWING No

C641-055d.dwg

JOB No

C641SC

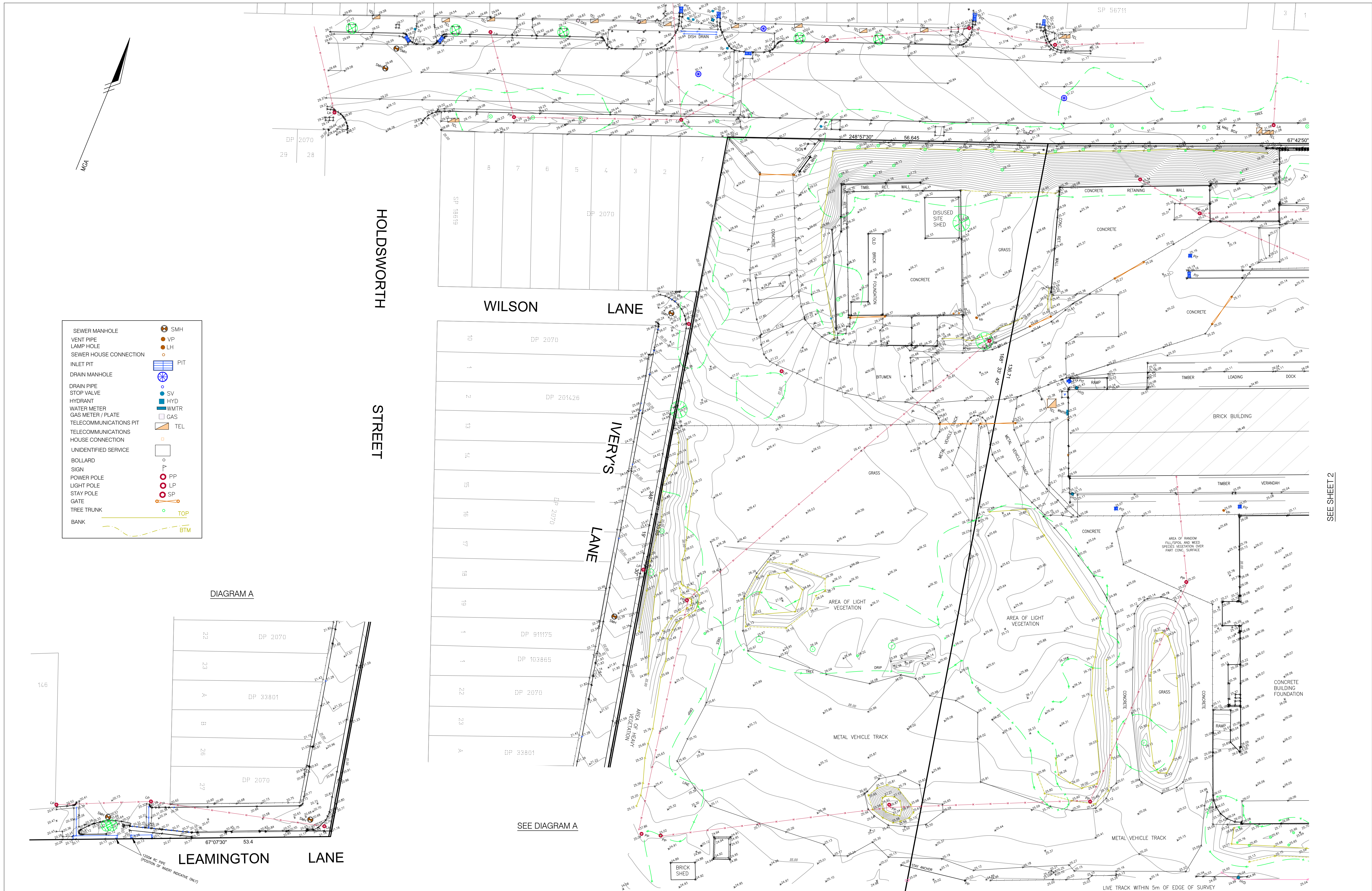
ISSUE

D

SHEET 2 OF 3 SHEETS

SIZE

A1



REVISIONS	D	29.01.13	ADDITIONAL AREA SURVEYED	C.K.B.	C.K.B.	C.K.B.	NOTES: 1. ORIGIN OF LEVELS: SS 98829 RL = 30.684 (AHD71 CLASS B2) 2. ORIGIN OF COORDINATES: SS 98829 ME 332579.135 MN 6248110.115 (MGA CLASS B2) 3. CONTOUR INTERVAL: 0.2m 4. SITE BOUNDARIES ADOPTED FROM DP 862514 5. ABUTTING BOUNDARIES ADOPTED FROM DCDB 6. DEPTHS OF ALL DRAINAGE PITS ARE APPROXIMATE ONLY AND SHOULD BE CONFIRMED BY FURTHER INVESTIGATION AFTER CLEANING. 7. WHERE DEPTHS ARE NOT SHOWN, PITS ARE BLOCKED OR NOT MEASURABLE. 8. PREVIOUS AREAS OF SURVEY UNDERTAKEN IN JAN 2012 & AUG 2012 HAVE NOT BEEN UPDATED AND MAY NOT BE CURRENT AT THE DATE OF THIS PLAN.	HORIZ. SCALE: 1:300 @ A1 COORDINATES: MGA VERTICAL SCALE: N/A DATUM: AHD SCALE IN METRES AT ORIGINAL REDUCTION RATIO 	 insites.com.au Level 12, 80 Clarence Street Sydney, NSW 2000 DR 299 Sydney T: 02 8234 8300 F: 02 9262 4511 Whehlans Insites Pty Ltd ACN: 088 148 743	PREPARED BY  AECOM	TITLE TOPOGRAPHICAL SURVEY OVER PT 4 DP 862514 & LOT 50 DP 1001467	JOB No C641SC	ISSUE D
	C	30.08.12	ADDITIONAL AREA SURVEYED	C.K.B.	C.K.B.	C.K.B.							
	B	29.01.12	EASMTN BDYS, WATR MAIN, FIRE HYD	C.K.B.	C.K.B.	C.K.B.							
	A	20.01.12	MINOR AMENDMENTS	P.L.H.	C.K.B.	C.K.B.							
	No	DATE	REVISION DETAILS	DRAWN	CHK	APP							

SURVEY:	C.K.B.	DATE OF SURVEY:	06.01.2012
DRAWN:	P.L.H.	DATE OF PLAN:	25.01.2013
CHECKED:	C.K.B.	DATE LAST SAVED:	30.01.13
APPROVED:	C.K.B.	DATE APPROVED:	25.01.2013

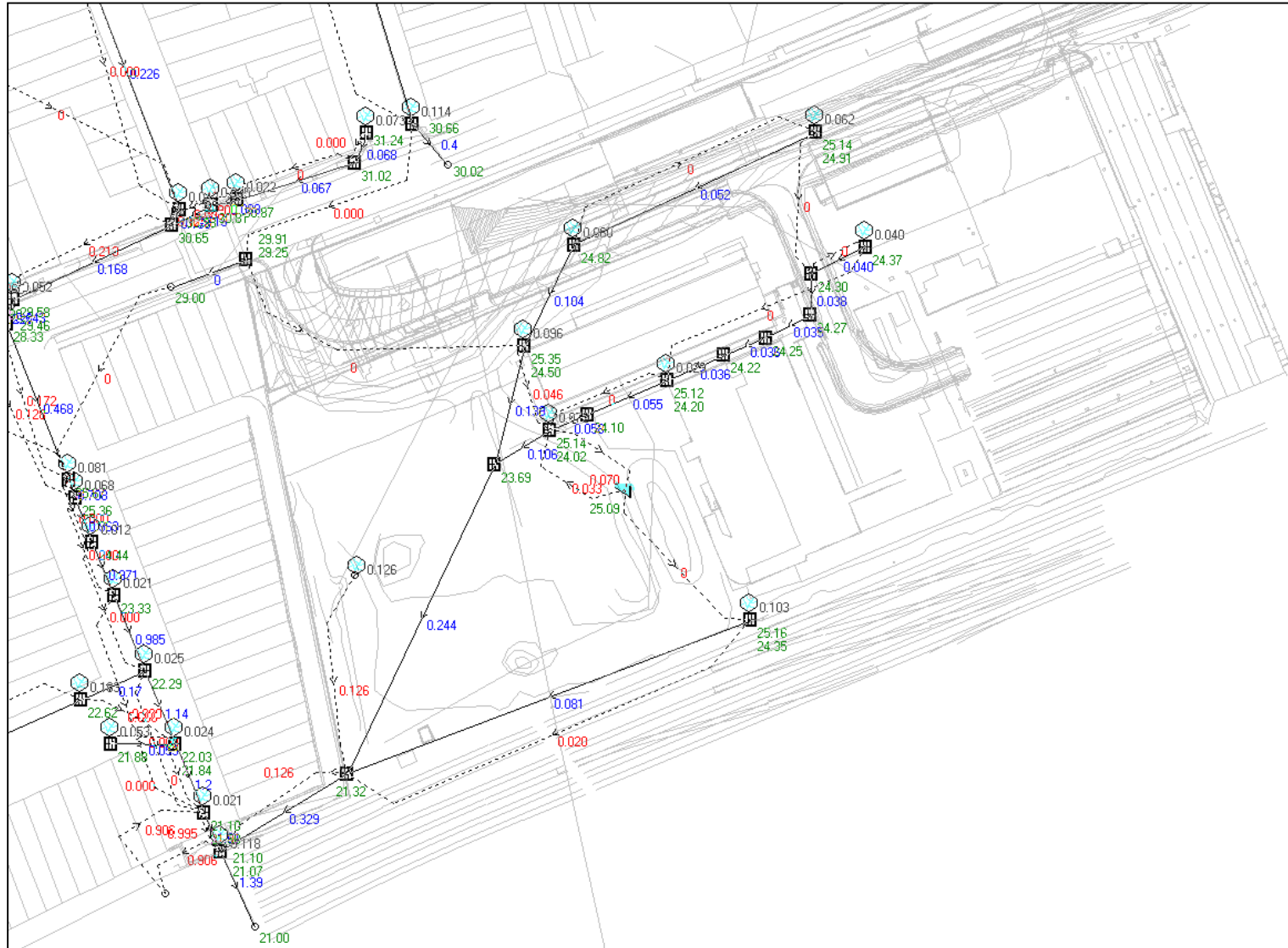
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SHEET 3 OF 3 SHEETS	SIZE A1

SEE SHEET 2

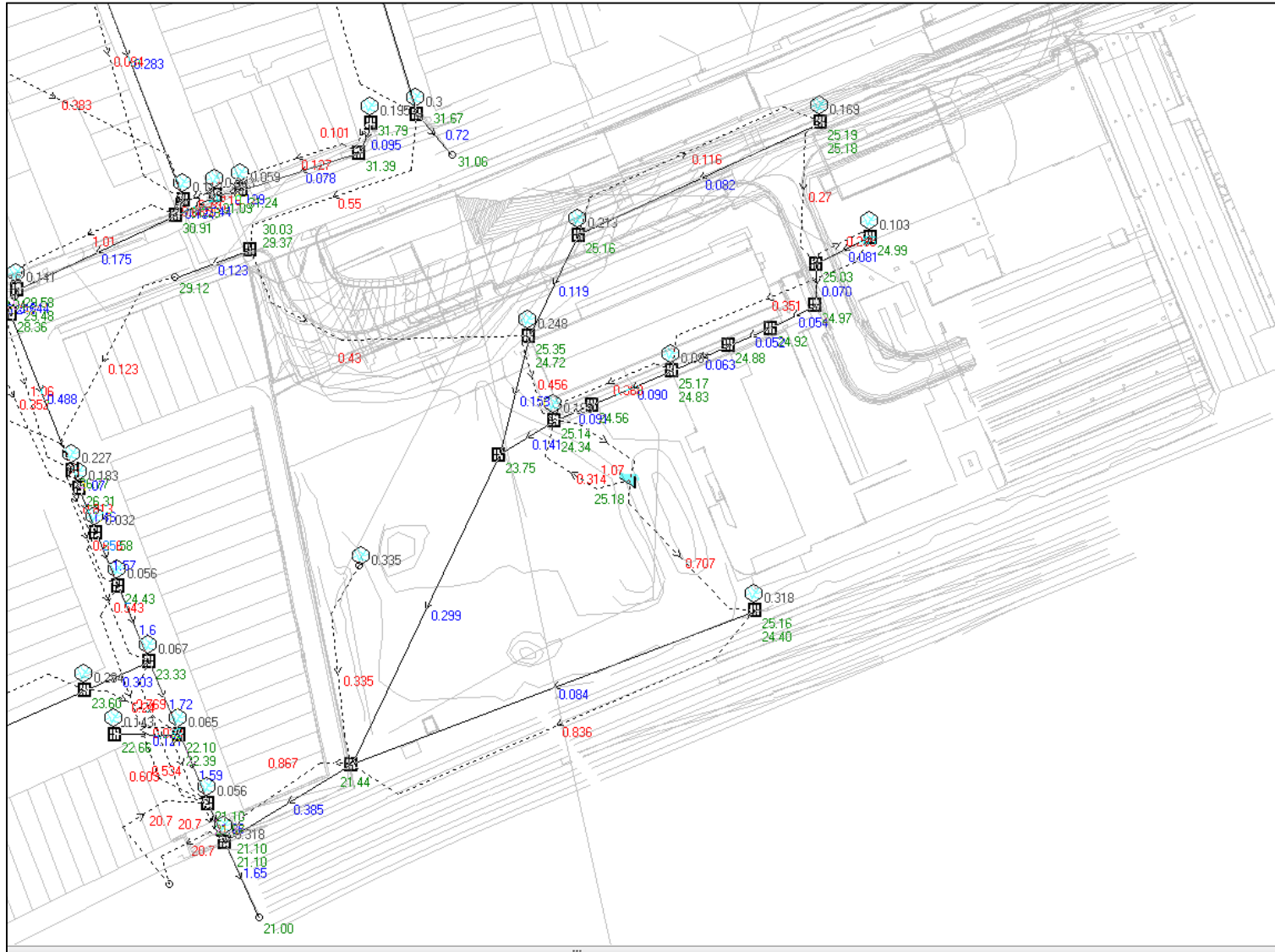
D R A F T

Appendix D

Existing Conditions Drains Model



Existing Conditions DRAINS model Results – 1 year ARI

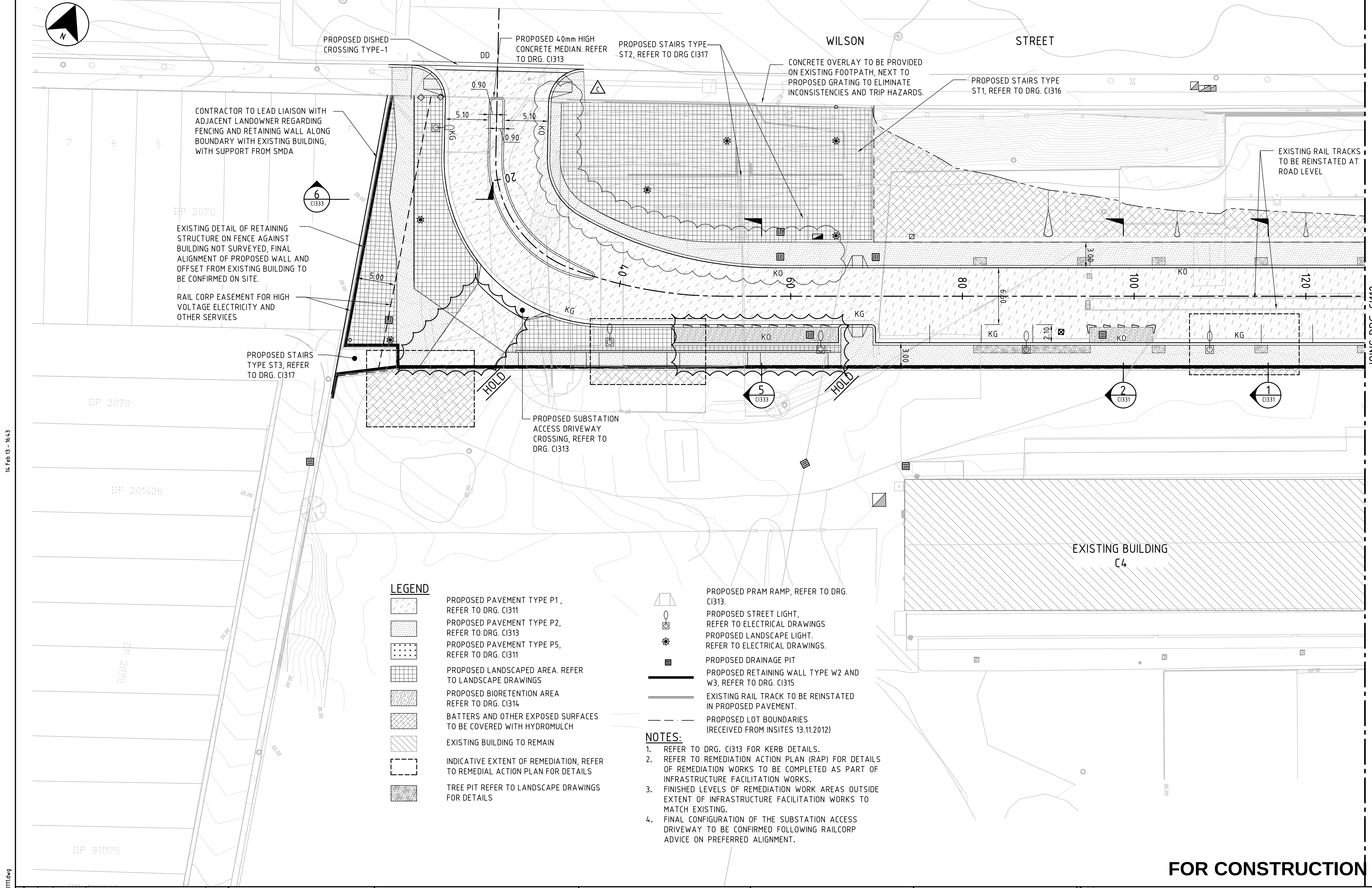


Existing Conditions DRAINs model Results – 100 year ARI

D R A F T

Appendix E

NEHP Stormwater Drainage Design Drawings



60238089-drg-CI111.dwg

14 Feb 13 - 16:43

REVISIONS	
No.	BY
C	PAS
B	MT
A	TR
No.	BY

14.02.13	RE-ISSUED FOR CONSTRUCTION	R.M.
27.11.12	RE-ISSUE FOR CONSTRUCTION	R.M.
22.11.12	FOR CONSTRUCTION	R.M.
DATE	DESCRIPTION	APPD.

Scales:

2 0 2 4 6 8m

1:200 FULL SIZE A1

THE SIGNING OF THIS TITLE BLOCK CONFIRMS THE DESIGN AND DRAFTING OF THIS PROJECT HAVE BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE AECOM QUALITY ASSURANCE SYSTEM TO ISO 9001:2000

DESIGNED	RV	CHECKED	CV
DRAWN	TT	CHECKED	JA
APPROVED	RM	DATE	10.08.12

THIS DRAWING IS CONFIDENTIAL AND SHALL ONLY BE USED FOR THE PURPOSES OF THIS PROJECT.

Contractor :

Client :

Designer :

NSW

Sydney Metropolitan Development Authority

AECOM

AECOM Australia Pty Ltd
A.B.N. 20 093 846 925

Project

North Eveleigh Affordable Housing Project

Title

GENERAL ARRANGEMENT PLAN

Status

CONSTRUCTION

Drg No.

60238089-DRG-CI111

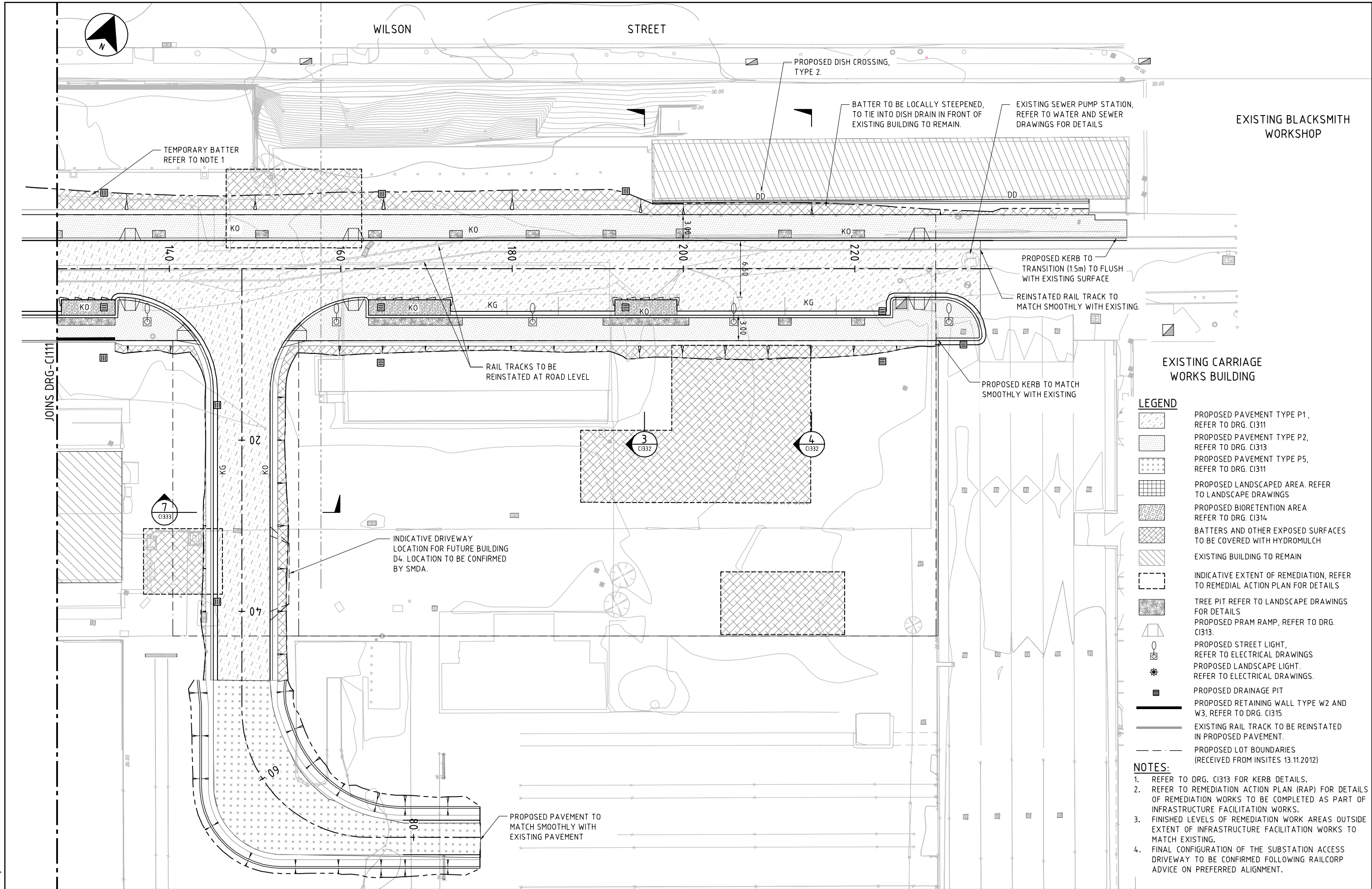
Rev.

C

SHEET 1

27 Nov 12 - 10:07

60238089-drg-CI112.dwg



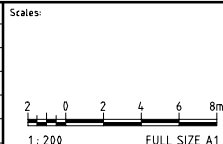
LEGEND

- PROPOSED PAVEMENT TYPE P1, REFER TO DRG. CI311
- PROPOSED PAVEMENT TYPE P2, REFER TO DRG. CI313
- PROPOSED PAVEMENT TYPE P5, REFER TO DRG. CI311
- PROPOSED LANDSCAPED AREA. REFER TO LANDSCAPE DRAWINGS
- PROPOSED BIORETENTION AREA REFER TO DRG. CI314
- BATTERS AND OTHER EXPOSED SURFACES TO BE COVERED WITH HYDROMULCH
- EXISTING BUILDING TO REMAIN
- INDICATIVE EXTENT OF REMEDIATION, REFER TO REMEDIAL ACTION PLAN FOR DETAILS
- TREE PIT REFER TO LANDSCAPE DRAWINGS FOR DETAILS
- PROPOSED PRAM RAMP, REFER TO DRG. CI313
- PROPOSED STREET LIGHT, REFER TO ELECTRICAL DRAWINGS
- PROPOSED LANDSCAPE LIGHT. REFER TO ELECTRICAL DRAWINGS.
- PROPOSED DRAINAGE PIT
- PROPOSED RETAINING WALL TYPE W2 AND W3, REFER TO DRG. CI315
- EXISTING RAIL TRACK TO BE REINSTATED IN PROPOSED PAVEMENT.
- PROPOSED LOT BOUNDARIES (RECEIVED FROM INSITES 13.11.2012)

NOTES:

- REFER TO DRG. CI313 FOR KERB DETAILS.
- REFER TO REMEDIATION ACTION PLAN (RAP) FOR DETAILS OF REMEDIATION WORKS TO BE COMPLETED AS PART OF INFRASTRUCTURE FACILITATION WORKS.
- FINISHED LEVELS OF REMEDIATION WORK AREAS OUTSIDE EXTENT OF INFRASTRUCTURE FACILITATION WORKS TO MATCH EXISTING.
- FINAL CONFIGURATION OF THE SUBSTATION ACCESS DRIVEWAY TO BE CONFIRMED FOLLOWING RAILCORP ADVICE ON PREFERRED ALIGNMENT.

REVISIONS					
No.	BY	DATE	DESCRIPTION	APPD	
B	MT	27.11.12	RE-ISSUE FOR CONSTRUCTION	R.M.	
A	TR	22.11.12	FOR CONSTRUCTION	R.M.	



THE SIGNING OF THIS TITLE BLOCK CONFIRMS THE DESIGN AND DRAFTING OF THIS PROJECT HAVE BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE AECOM QUALITY ASSURANCE SYSTEM TO ISO 9001:2000			
DESIGNED	RV	CHECKED	CV
DRAWN	TT	CHECKED	JA
APPROVED	RM	DATE	10.08.12
THIS DRAWING IS CONFIDENTIAL AND SHALL ONLY BE USED FOR THE PURPOSES OF THIS PROJECT.			

Contractor :	

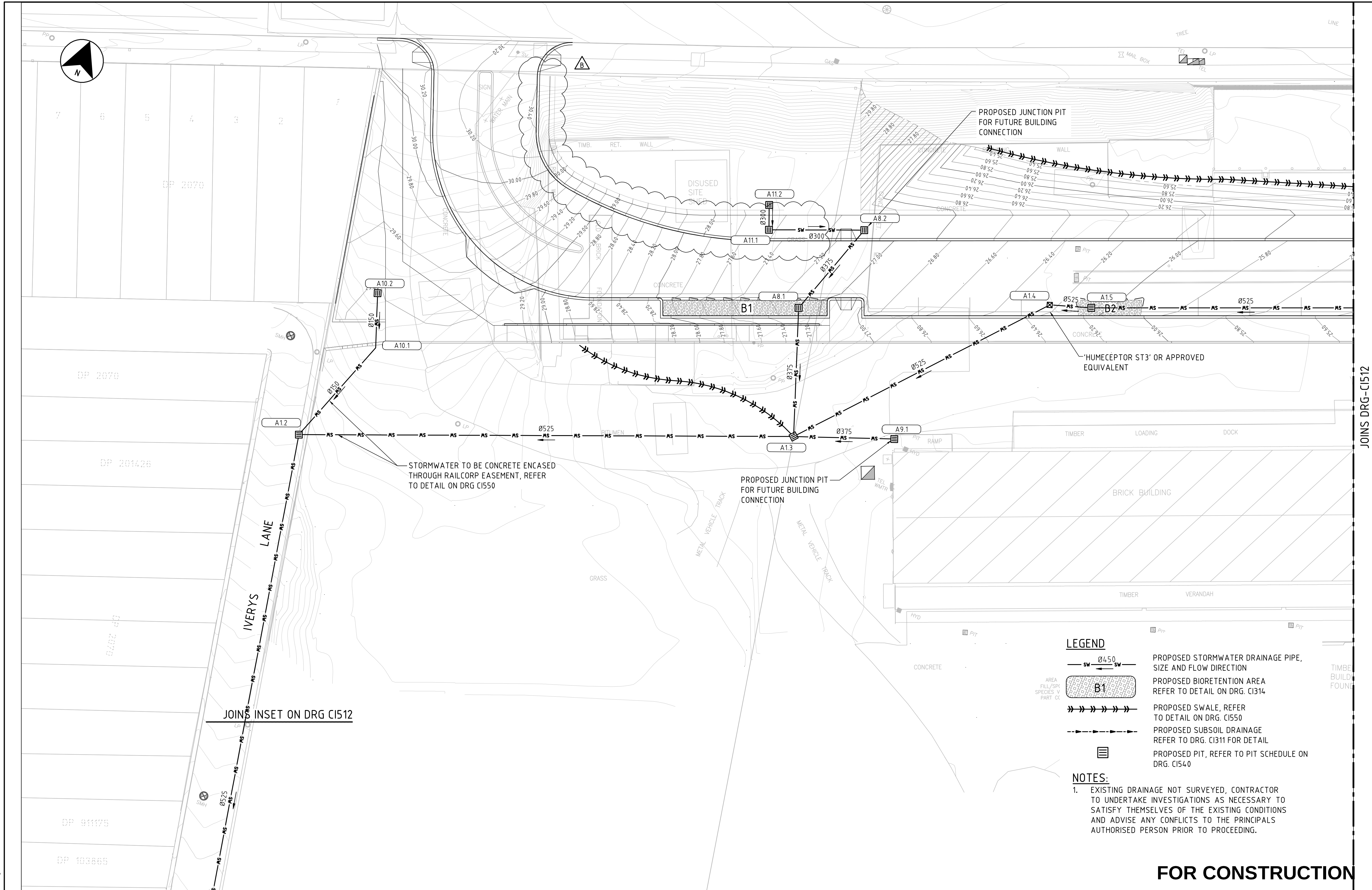
Client :	
 Sydney Metropolitan Development Authority	

Designer :	
	
AECOM Australia Pty Ltd A.B.N. 20 093 846 925	

Project		NORTH EVELEIGH AFFORDABLE HOUSING PROJECT	
Title		GENERAL ARRANGEMENT PLAN	
Status		CONSTRUCTION	
Drg No.		60238089-DRG-CI112	
Rev.		B	

14 Feb 13 - 16:40

60238089-drg-CI511.dwg



JOINS INSET ON DRG CI512

LEGEND

- SW Ø450 PROPOSED STORMWATER DRAINAGE PIPE, SIZE AND FLOW DIRECTION
- B1 PROPOSED BIORETENTION AREA REFER TO DETAIL ON DRG. CI314
- PROPOSED SWALE, REFER TO DETAIL ON DRG. CI550
- PROPOSED SUBSOIL DRAINAGE REFER TO DRG. CI311 FOR DETAIL
- PROPOSED PIT, REFER TO PIT SCHEDULE ON DRG. CI540

NOTES:

- EXISTING DRAINAGE NOT SURVEYED, CONTRACTOR TO UNDERTAKE INVESTIGATIONS AS NECESSARY TO SATISFY THEMSELVES OF THE EXISTING CONDITIONS AND ADVISE ANY CONFLICTS TO THE PRINCIPALS AUTHORISED PERSON PRIOR TO PROCEEDING.

FOR CONSTRUCTION

REVISIONS				
No.	BY	DATE	DESCRIPTION	APPD.
B	PAS	14.02.13	RE-ISSUED FOR CONSTRUCTION	R.M.
A	TR	22.11.12	FOR CONSTRUCTION	R.M.

Scales:	
1:200	FULL SIZE A1

THE SIGNING OF THIS TITLE BLOCK CONFIRMS THE DESIGN AND DRAFTING OF THIS PROJECT HAVE BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE AECOM QUALITY ASSURANCE SYSTEM TO ISO 9001:2008			
DESIGNED	RV	CHECKED	CV
DRAWN	TT	CHECKED	JA
APPROVED	RM	DATE	10.08.12
THIS DRAWING IS CONFIDENTIAL AND SHALL ONLY BE USED FOR THE PURPOSES OF THIS PROJECT.			

Contractor :	
Client :	

Designer :	
AECOM Australia Pty Ltd A.B.N. 20 093 846 925	

Project	
Title	
Status	CONSTRUCTION

Project	
Title	
Status	CONSTRUCTION
Drg No.	60238089-DRG-CI511
Rev.	B

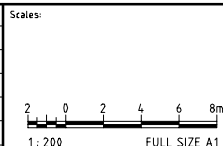
JOINS DRG-CI512

TIMBER BUILDING FOUNDATION

22 Nov 12 - 17:39

60238089-drg-CI512.dwg

REVISIONS				
No.	BY	DATE	DESCRIPTION	APPD
A	TR	22.11.12	FOR CONSTRUCTION	R.M.



THE SIGNING OF THIS TITLE BLOCK CONFIRMS THE DESIGN AND DRAFTING OF THIS PROJECT HAVE BEEN PREPARED AND CHECKED IN ACCORDANCE WITH THE AECOM QUALITY ASSURANCE SYSTEM TO ISO 9001:2000			
DESIGNED	RV	CHECKED	CV
DRAWN	TT	CHECKED	JA
APPROVED	RM	DATE	10.08.12
THIS DRAWING IS CONFIDENTIAL AND SHALL ONLY BE USED FOR THE PURPOSES OF THIS PROJECT.			

Contractor :

Client :



Designer :

AECOM

AECOM Australia Pty Ltd
A.B.N. 20 093 846 925

Project

NORTH EVELEIGH AFFORDABLE HOUSING PROJECT

Title

DRAINAGE PLAN

Status

CONSTRUCTION

Drg No.

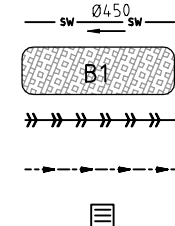
60238089-DRG-CI512

SHEET 2

Rev.

A

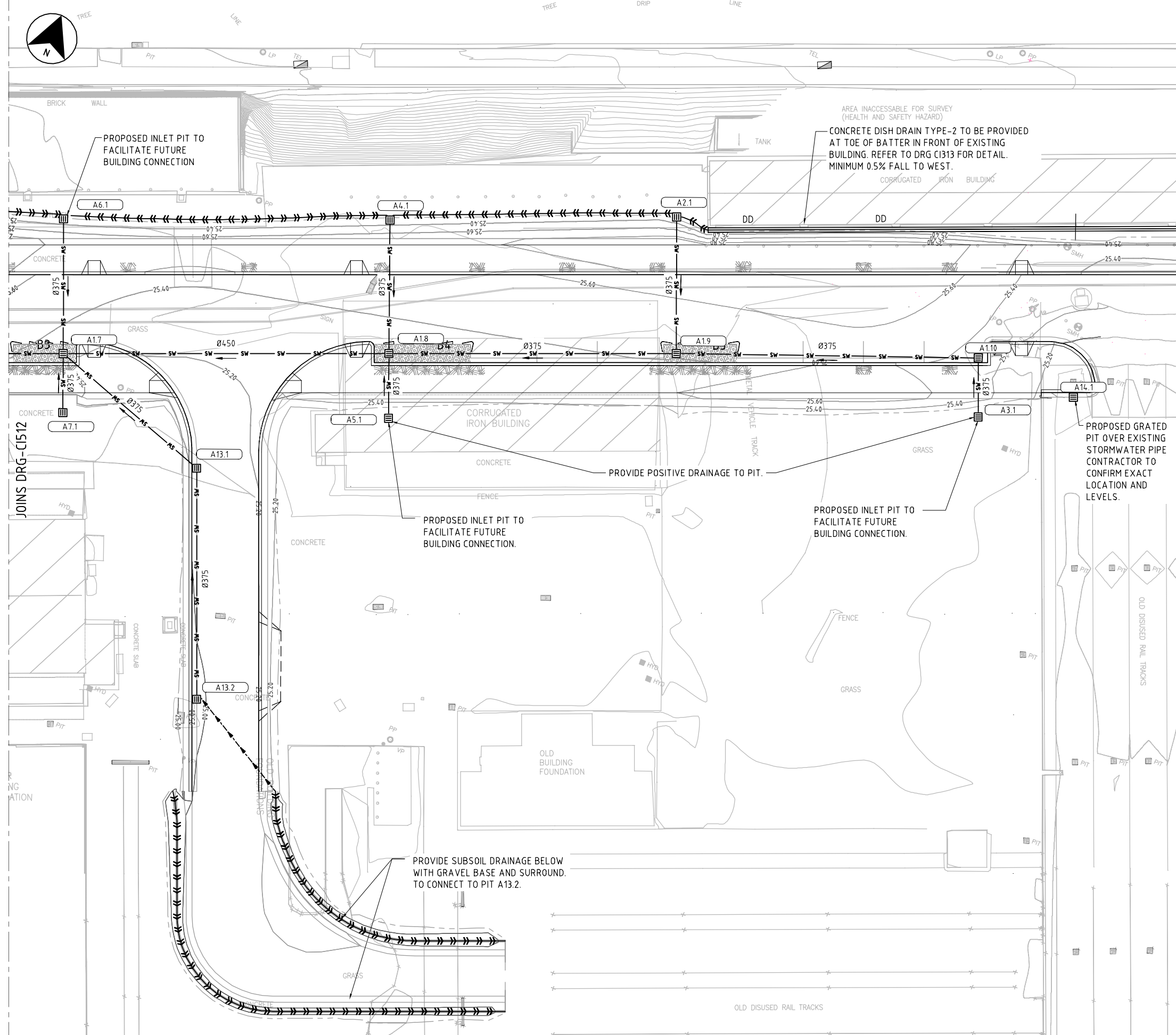
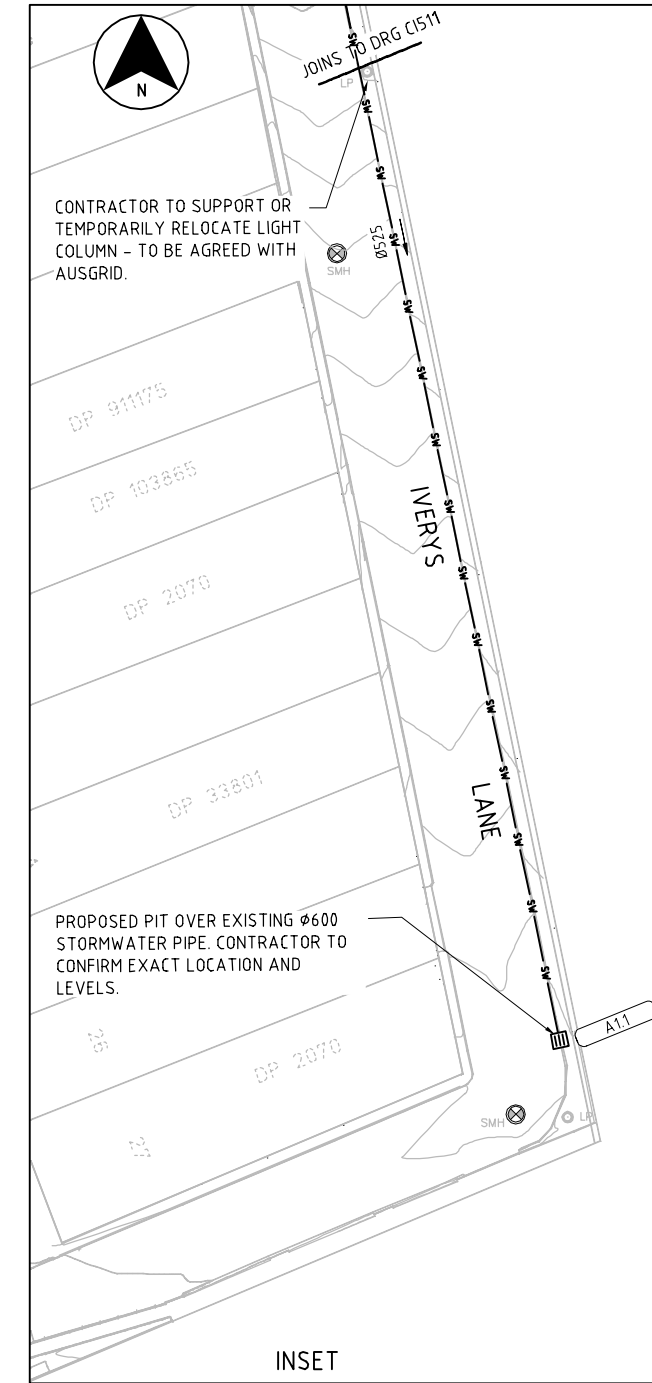
LEGEND



- PROPOSED STORMWATER DRAINAGE PIPE, SIZE AND FLOW DIRECTION
- PROPOSED BIORETENTION AREA
REFER TO DETAIL ON DRG. CI314
- PROPOSED SWALE, REFER TO DETAIL ON DRG. CI550
- PROPOSED SUBSOIL DRAINAGE
REFER TO DRG. CI311 FOR DETAIL
- PROPOSED PIT, REFER TO PIT SCHEDULE ON DRG. CI540

NOTES:

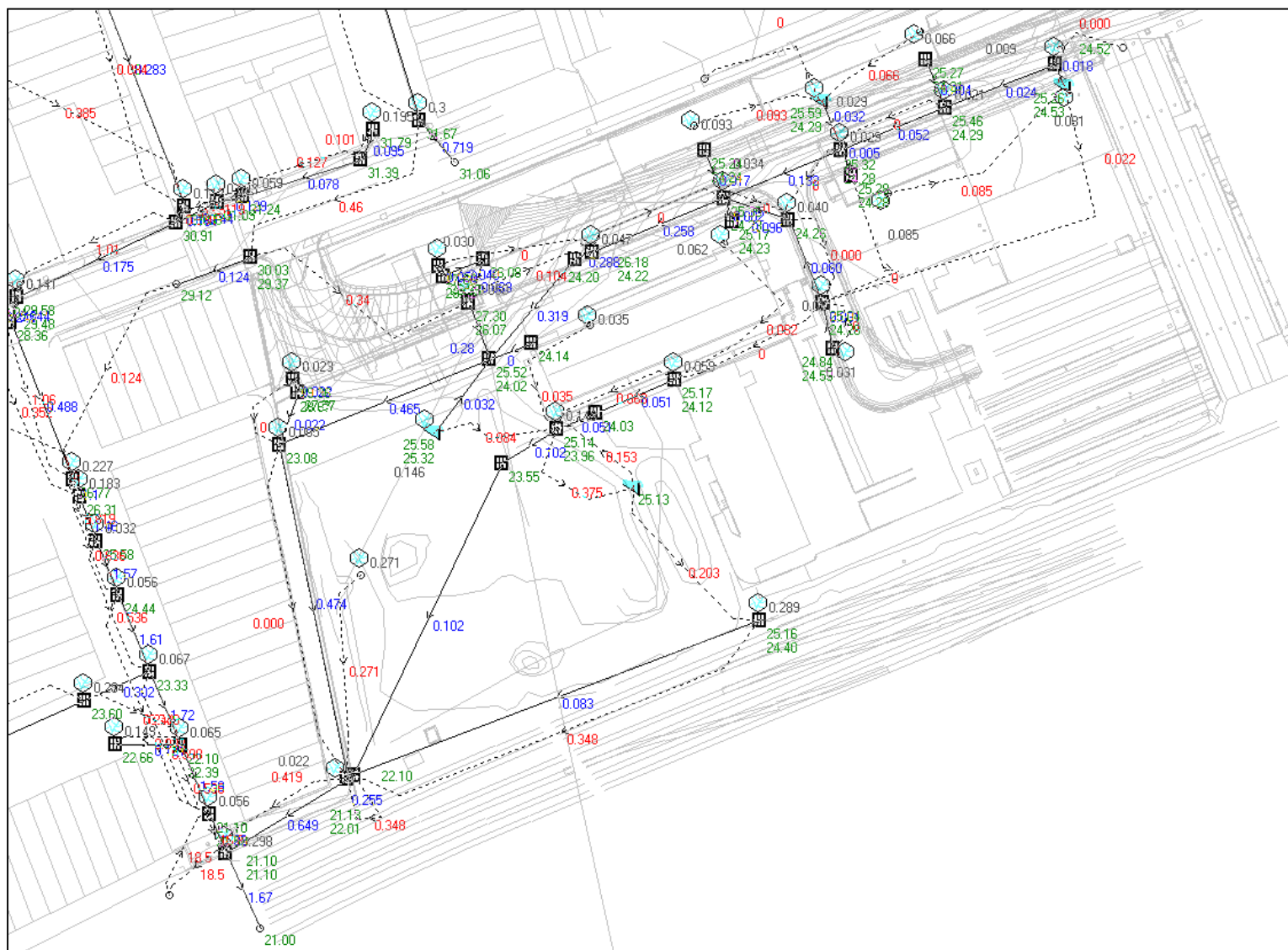
- EXISTING DRAINAGE NOT SURVEYED, CONTRACTOR TO UNDERTAKE INVESTIGATIONS AS NECESSARY TO SATISFY THEMSELVES OF THE EXISTING CONDITIONS AND ADVISE ANY CONFLICTS TO THE PRINCIPALS AUTHORISED PERSON PRIOR TO PROCEEDING.



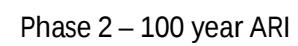
D R A F T

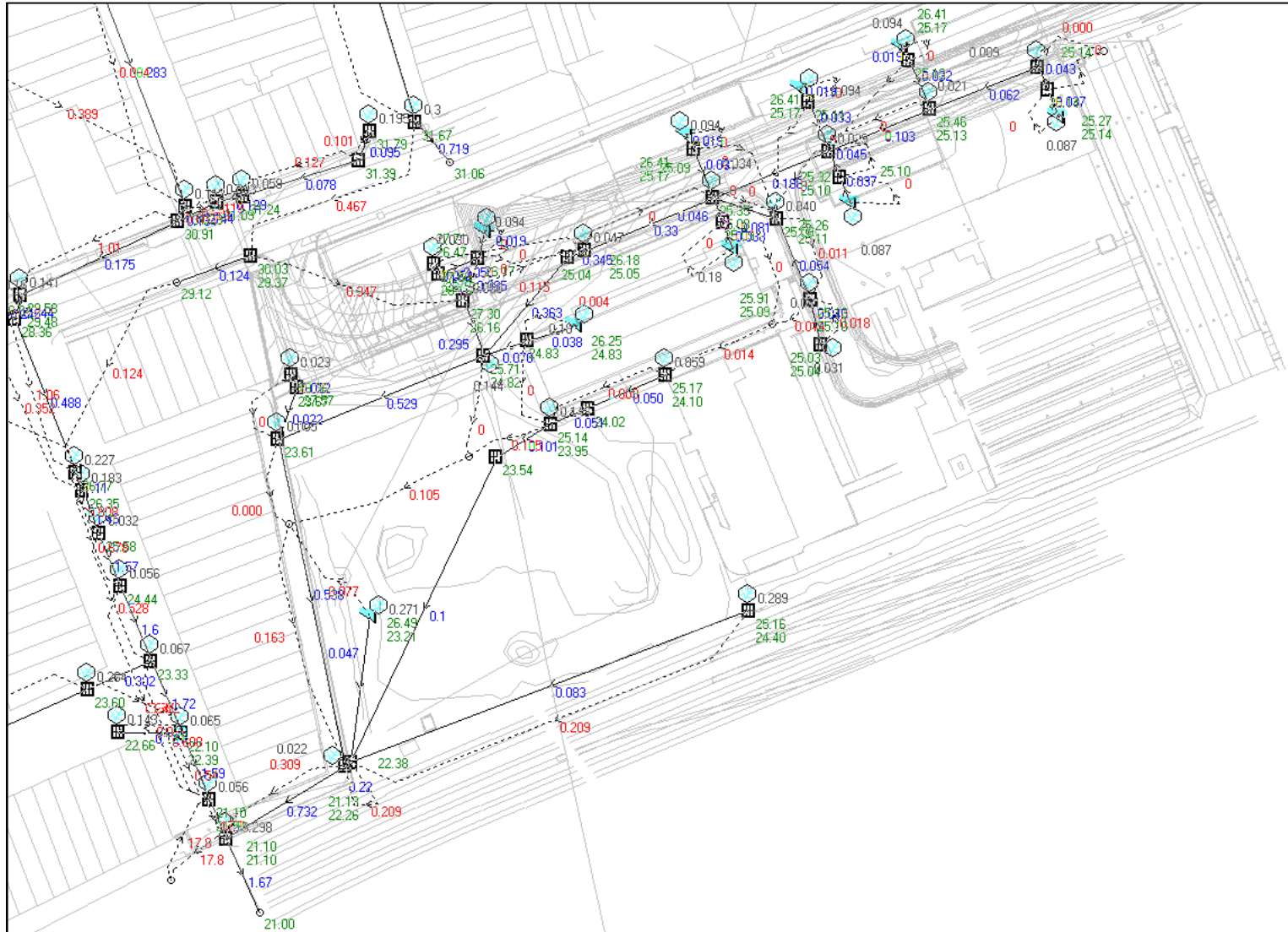
Appendix F

Proposed Conditions Drains Model



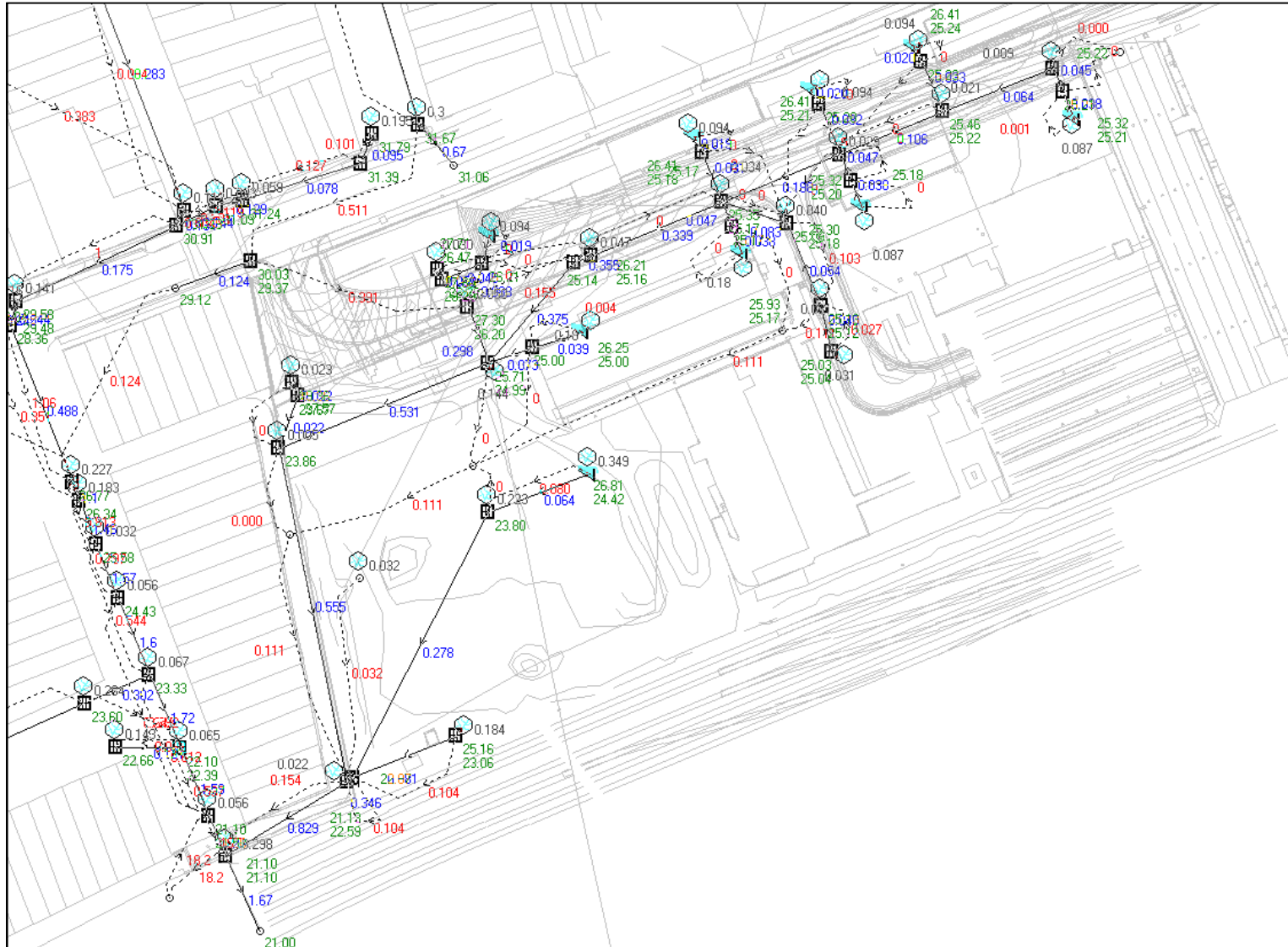
Phase 1 – 100 year ARI





Proposed Conditions DRAINS model Results

Phase 3 – 100 year ARI



Proposed Conditions DRAINS model Results

Phase 4 – 100 year ARI