SCHEDULE 3

FUTURE ENVIRONMENTAL ASSESSMENT REQUIREMENTS

Residential Amenity

1. Future Development Applications shall demonstrate compliance with the provisions of the *State Environmental Planning Policy 65 – Design Quality of Residential Flat Development* (SEPP 65) and the accompanying *Residential Flat Design Code 2002*, except where modified by this Concept Plan approval. In particular, future applications shall demonstrate that:

   (a) a minimum of 70% of apartments within each building receive a minimum of 3 hours solar access to living areas and balconies mid winter; and

   (b) a minimum of 60% of apartments within each building are capable of being naturally cross ventilated.

ESD

2. Future Development Applications shall demonstrate the incorporation of ESD principles in the design, construction and ongoing operation phases of the development, including the selection of fabric and materials, water conservation and management initiatives, and energy efficiency and renewable energy initiatives.

Car Parking

3. Future applications shall provide on-site car parking at the following maximum rates:

   (a) 1 space per 4 studio/1 bedroom apartment;

   (b) 1 space per 2/3 bedroom apartment (including townhouses);

   (c) 1 visitor space per 10 apartments; and

   (d) 1 space per 80m^2 of commercial/retail GFA.

4. Future applications are to demonstrate that a minimum of 50 on-street car parking spaces will be provided.

Bicycle Parking

5. Future applications shall provide bicycle parking at the following minimum rates:

   (a) 1 space per 2 residential units;

   (b) 1 visitor space per 10 residential units;

   (c) 1 space per 20 employees (for commercial/retail uses); and

   (d) 1 visitor space per 250m^2 of commercial/retail GFA.

Car Share Scheme

6. Future applications shall require the provision and implementation of a car share scheme with a minimum of 2 dedicated on-street car share spaces.

Retail Tenancies

7. Future applications shall ensure that no single retail tenancy exceeds 500m^2 GFA.

Local Streets and Servicing

8. Future applications shall provide for design of the two new local streets in the western portion (including road carriageway, footpath and tree planting) to the satisfaction of Council in accordance with Council's engineering guidelines/standard designs for local

roads. The design shall provide for traffic calming and pedestrian safety measures where appropriate to provide a slow speed safe environment for pedestrians. The roads shall be dedicated to Council at no cost to Council.

9. The new local street serving Building 1A of the development shall be designed and constructed in accordance with Sydney Water and Council requirements and maintained in private ownership with on-going maintenance the responsibility of the future body corporate.

10. Future applications shall provide for the upgrade of the footpath in Edward Street (adjacent to the relevant stage), including provision of street tree planting for the full frontage of the site to Edward Street.

11. Future applications shall provide details of all servicing, including waste collection, removalist vehicles and all loading/unloading operations and appropriate design of such locations.

Road Infrastructure upgrades

12. Future application/s for Stage 1 shall provide the concept designs of the proposed roundabout at the intersection of Edward Street and Smith Street. The roundabout shall be operational prior to occupation of the first Stage of the development.

13. Future application/s for Stage 1 shall provide details of the pedestrian/cycle improvement works in the area surrounding the site and to Summer Hill Village as outlined in Table 10 of ARUP's Traffic and Transport Report dated 12 March 2012. These works shall be completed prior to occupation of the first stage of the development.

14. Future application/s for Stage 3 shall provide the concept design for the proposed traffic signals at the intersection of Old Canterbury Road and Edward Street in accordance with the Roads and Maritime Services letter dated 30 August 2012.

    The design of the intersection shall be generally in accordance with the ARUP concept (Drawing SKT004) but subject to further refinement and resolution of issues raised by the RMS in Attachment A of their letter dated 30 August 2012.

    The signals and associated civil works be constructed and operational prior occupation of Stage 3 of the development.

Roads and Maritime Services Requirements

15. Future application/s for Stage 3 shall demonstrate that the RMS requirements have been met in relation to:
    (a) agreement to the payment of an upfront fee to cover the cost of the first 10 years maintenance of the signals;
    (b) agreement enter into a "Major Works Authorisation Deed" with the RMS for the signalisation and civil works;
    (c) consultation with bus operators in relation to the relocated of existing bus zones on Old Canterbury Road; and
    (d) consultation with the local Councils and affected residents/business regarding the implementation of "no stopping' restrictions.

Workplace Travel Plan/Travel Access Guide

16. Future application/s for Stage 3 shall include a workplace travel plan and/or travel access guide.

Open Space/Public Access

17. Future application/s shall provide for the embellishment and dedication of a minimum of 4,806m^2 of public open space to Council.

18. Future applications shall provide for the embellishment of a minimum of 5,287m^2 of publicly accessible open space to be maintained in private ownership by the future body corporate.

19. Future applications for each relevant stage shall clearly set out the mechanism for creating rights of public access to the:

    - private roads,
    - all publicly accessible areas of open space and through site links,

    with the relevant instrument/s to be executed prior to commencement of the occupation/use of the development.

Access to the Lewisham West light rail stop

20. Future applications for Stage 1 shall provide for pedestrian/cycle access through the site to the Lewisham West light rail stop in consultation with Council and Transport NSW/RailCorp.

Heritage

21. Future applications for demolition shall include details of salvaging of materials identified as having heritage significance for re-use, interpretation on or off the site and photographic records of structures to be demolished.

Flora and Fauna

22. Future applications shall incorporate the following measures to protect potential Long-nosed Bandicoot population within the local area:

    (a) induction of construction workers to include instruction on the potential habitat for Long-nosed Bandicoots and how to identify signs of Long-nosed Bandicoot activity and required actions to be undertaken if any signs are found;
    (b) prior to demolition/construction, the site should be checked by an appropriately qualified and experienced ecologist for signs of Long-nosed Bandicoot activity;
    (c) installation of Bandicoot proof fencing around the perimeter of the site (once the site has been checked by an ecologist who is satisfied that there are no signs of Long-nosed Bandicoots on the site);
    (d) if Long-nosed Bandicoots are found on site prior to or during construction, all works must cease and the proponent must contact the Department of Office and Heritage;
    (e) provision of native landscape beds that contribute to foraging areas for bandicoots; and
    (f) permanent fencing should where possible allow for movement and access to the site by bandicoots.

Section 94 Contributions

23. Future applications shall be required to pay developer contributions to the Council towards the provision or improvement of public amenities and services. The amount of the contribution shall be determined by Council in accordance with the requirements of the Contributions Plan current at the time of approval.

Noise and Vibration

24. Future applications, where applicable shall provide an acoustic assessment which demonstrates that the internal residential amenity of the proposed apartments is not unduly affected by the noise and vibration impacts from the Western Suburbs Railway Line, Old Canterbury Road and Longport Street to comply with the requirements of Clause 102 of State Environmental Planning Policy (Infrastructure) 2007 and the Department of Planning's 'Development Near Rail Corridors and Busy Roads – Interim Guidelines'.

Adaptable Housing

25. A minimum of 10% of apartments (excluding townhouses) shall be provided as adaptable housing in accordance with Australian Standard 4229-1995.

Flooding

26. Future applications shall clearly document flood levels, associated flood hazards and management measures within each stage and will be based upon detailed reviews, and where necessary, updates of flood study results that account for works approved or undertaken in the adjoining light rail corridor, the McGill Street Precinct and/or the subject site and the Hawthorne Canal.

27. Future applications shall ensure appropriate levels are provided, in particular:

    (a) at least 500 mm freeboard above the adopted 100 year ARI design flood level for residential floors and basement entry crests; and
    (b) a flood study shall clearly identify the flood levels control(s) and the sensitivity of flood level estimates to assumptions regarding climate change and blockage of the Longport Street culvert and land levels along the light rail alignment under Longport Street.

28. The future application for Stages 1 and/or 4 (as relevant) shall provide details relating to piping of the existing Smith Street flows through the development site to the Hawthorne Canal. Documentary evidence of consultation with Sydney Water shall be provided with this design including any specific amendments to accommodate Sydney Water requirements.

29. Future applications shall be provided with a draft Flood Emergency Response Plan. The draft Flood Emergency Response Plan should justify the adopted alarm level (10.8 m ADH) and demonstrate that all necessary facilities are available within each building to allow the proposed response.

30. The future application for Stage 4 shall ensure an allowance within the foundation space of Building 1A (as referred to in APP Drainage/Water Management Flooding/Utilities report dated March 2011 submitted with the EA) for a box culvert or equivalent to accommodate a possible stormwater drainage connection from the light rail corridor to the Hawthorne Canal. Evidence of consultation with Sydney Water (and consideration of Sydney Water's requirements) in this regard is to be provided with the application for Stage 4.

31. Future applications shall provide documentary evidence of consultation with Transport NSW in regards to flood mitigation works including any specific amendments to the project design to accommodate TNSW comments regarding light rail, including consideration of any flood impacts resulting from the design of the light rail station.

32. No wall shall be approved on the rail corridor boundary adjacent to Building 2A (as referred to in APP Drainage/Water Management Flooding/Utilities report dated March 2011 submitted with the EA) unless a flood study demonstrates that the wall does not have any unacceptable impact in terms of flood levels and flow velocities within the light rail corridor or neighbouring property.

33. Future applications shall provide documentary evidence of consultation with Sydney Water in regard to any measures that might affect the entry of floodwater into the Hawthorne Canal and measures, such as fencing, to protect the public against exposure to areas of high flood hazard.

Sydney Water requirements

34. Future applications shall address Sydney Water's requirements in relation to:

    (a) water supply and waste water connections as set out in Sydney Water's letter dated 23 August 2011; and

    (b) a Water Sensitive Urban Design Strategy and stormwater treatment plan which demonstrates:
        i. a 90% reduction in the post development mean annual load of total gross pollutant loads;
        ii. a 85% reduction in the post development mean annual load of Total Suspended Solids;
        iii. a 60% reduction in the post development mean annual load of Total Phosphorus; and
        iv. a 45% reduction in the post development mean annual load of Total Nitrogen.

    Details shall be submitted with future applications in accordance with Sydney Water and Council requirements.

35. Future applications shall provide for the treatment of stormwater prior to discharge to surface water and/or groundwater sources.

Groundwater

36. Future applications shall provide an assessment of ground water, including the need for licences in relation to taking or interfering with groundwater and dewatering.

Contamination

37. Future applications shall include details of the remedial/management strategy for the site and the proposed Remedial Action Plan to remediate parts of the site which have been identified as contaminated/potentially contaminated with the Aargus Environmental Site Assessment dated June 2008.

RailCorp requirements

38. Future applications shall address RailCorp's requirements in relation to:

    <u>Corridor Protection</u>

    - Future applications for any structure within 25 metres of the rail corridor and involving ground penetration of greater than 2 metres, shall include the following plans/details for RailCorp approval/certification/endorsement:
        - Geotechnical and Structural report/drawings that meet RailCorp's requirements. The Geotechnical Report must be based on actual borehole testing conducting on the site closest to the rail corridor;
        - Construction methodology with construction details pertaining to structural support during excavation;
        - Cross sectional drawings showing ground surface, rail tracks, sub soil profile, proposed basement excavation and structural design of sub ground support adjacent to the Rail Corridor. All measurements are to be verified by a Registered Surveyor;
        - Detailed Survey Plan showing the relationship of the proposed developed with respect to RailCorp's land and infrastructure; and
        - If required by RailCorp, an FE analysis which assesses the different stages of loading-unloading of the site and its effect on the rock mass surrounding the rail corridor.

    RailCorp's concurrence will be required, in accordance with Clause 86 of State Environmental Planning Policy (Infrastructure) 2007, for any applications for the above works.

Derailment protection

- Future applications for any future structure located within 20 metres of the rail corridor shall provide a derailment protection risk assessment in accordance with Australian Standard AS5100. Where the risk assessment has identified a need for derailment protection, or where required by the Australian Standard, measures shall be incorporated into the design and engineering details of the building and to submitted with the application.

Drainage

- Future applications shall include a stormwater concept plan which demonstrates how stormwater drainage from the site will to be appropriately managed. Any discharge into the rail corridor requires RailCorp approval.

Balconies

- Future applications involving balconies within 20 metres of the light rail tracks shall provide adequate measures that prevent the throwing of objects onto the rail corridor or are to be entirely enclosed. Measures to be utilised are to be endorsed by RailCorp in writing.

Reflective material

- Future applications for buildings adjacent to the rail corridor shall ensure that the materials/finishes are non-reflective.

Fencing and Landscaping

- The first application for subdivision or works shall include design guidelines regarding the fencing to be used/constructed along the entire common boundary with the rail corridor. The fencing design guidelines and specification are to be approved by RailCorp. This fencing is to be installed in accordance with the endorsed guidelines and specifications prior to the commencement of building construction on the site.

- Future applications are to provide appropriate vegetation species for all landscaping within 20 metres of the rail corridor in accordance with RailCorp requirements. RailCorp's Biodiversity Specialist can provide details of appropriate tree and plant species.

Contamination

- Future applications shall demonstrate that the area previously occupied by the encroachments has not been contaminated, and if proven to be contaminated, to be remediated at the Proponent's cost. The timing of any remediation to be determined by either RailCorp or Transport NSW.

Sydney Light Rail Inner West Extension (SLRIWE) interface

Future applications shall demonstrate compliance with the following requirements in relation to the light rail interface:

- the proponent shall liaise Transport NSW regarding the retention and protection of the rail sidings which are a heritage item that needs to be retained as part of the SLRIWE approval;
- the proponent shall liaise with Transport NSW regarding the location and design of the future permanent public pedestrian access through the site from Smith Street to the approved new light rail stop;
- maintain appropriate ongoing pedestrian access to the light rail stop during the future construction stages of the development; and
- co-ordination of construction/demolition works within the rail corridor with the SLRIWE construction contractor.

End of Schedule 3

SCHEDULE 4

STATEMENT OF COMMITMENTS (Source: SJB Letter dated 27 July 2012)

APPENDIX C

NPC Pty Ltd
PO Box 1060
CROWS NEST NSW 1585

112066

1 November 2012

Attention: **Mark Tooker**

Dear Mark,

Re: Allied Mills Site – Proposed Development

Introduction

Development is proposed for the Allied Mills site (also known as the Mungo Scott site) lying immediately upstream of Longport St and on the western side of Hawthorne Canal. The development site is shown in Figure 1 (western side of canal) and an outline in Figure 2 describes the proposed development site's extent.

The development comprises a variety of uses including medium density residential, retail and commercial. The proposed development and building extents are described in Figure 2.

Flood Behaviour

The site is impacted by piped drainage (Smith St), overland flow flooding (again from Smith St) as well as mainstream flooding (Hawthorne Canal). The Longport Street culvert has a capacity less than the peak 100 year ARI flood flow and in these conditions floodwaters pond behind the culvert and overflow through the Longport crossing of the rail corridor.

In the 100Y ARI event flood levels vary significantly between Old Canterbury Road and Longport St. In more severe floods, floodwaters tend to be retained behind the high Longport St embankment resulting in a very flat flood profile upstream to Old Canterbury Road. This is discussed further in the Results section.

Mainstream Mechanisms

Hawthorne Canal is a system of open channels, closed channels and culverts that drains the Hawthorne Canal catchment. The catchment is comprised of the suburbs of Summer Hill, Haberfield, Ashfield and Leichhardt, all of which are developed. The headwaters of the catchment are proximate to New Canterbury Road and the catchment drains to the north, eventually discharging into Iron Cove.

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At Old Canterbury Road the canal has an upstream catchment of 175 ha. The upstream catchment dramatically increases at Longport Street to 264 ha due to the inclusion of the Henry and Smith St overland flow paths.

A significant structure for the study area is the Longport St culvert as discussed above.

Overland Flow Mechanism

Besides being impacted by flooding due to Hawthorne Canal proper, the site is also impacted by the Smith Street overland flow path and piped drainage. The Smith St catchment is 70 ha. Flow moves down Smith Street, mainly being constrained to the road itself. At a sag in the road that is slightly to the north of the current Allied Mills site gate, floodwaters will pond and when high enough, they will flow over the kerb and into the site and down toward the channel. Another important flow entry point into the site is the current driveway off Smith Street. In the 100Y ARI event flow enters via this driveway, flowing down toward Hawthorne Canal through an unoccupied area of the proposed development site.

Study Goals

The goals of the study are as follows:

- Revise the existing case model based on available detailed site survey and a detailed site inspection;
- Establish existing case design flood behaviour for the site;
- Construct a model to represent the developed scenario at the site;
- Assess the impact of the development on 100Y ARI levels;
- Implement mitigation works to optimise flood liability on site and to reduce flood risk;
- Test the sensitivity of site flood levels to various model changes such as blockage, roughness changes and climate change predictions;
- Create 100Y ARI hazard maps for the site; and
- Establish PMF levels for the site.

Methodology

The following section describes the work undertaken in order to achieve the variety of modelled scenarios presented herein.

Existing Case Modelling

The existing scenario model describes conditions as they currently are. The work carried out to generate the existing case model is best described in the Hawthorne Canal Flood Study (draft) (WMAwater, 2012). Note all modelling work is best practice and carried out as per Australian Rainfall and Runoff (ARR, 1987). In summary modelling is based on the following work:

- Hydrological modelling is carried out in DRAINS. Specifically DRAINS is used to generate hydrographs from applied rainfall (minus losses where applicable);
- Hydraulic modelling has been carried out in a best practice 1D/2D model using a 3 m grid in the 2D;
- Modelling informed by high quality ALS survey data (70% of points within +/- 150 mm in the vertical);
- Topography of the site and adjacent areas refined using the detailed site land survey; and
- Hydraulic structure information comes from the Sydney Water Corporation capacity assessment document (SWC, 1998).

Developed Case Modelling

The developed case includes proposed buildings as described in Figure 2 as well as other accompanying works as follows:

- A section of railway land will be lowered in order to facilitate a pedestrian crossing from the Allied Mills site to the proposed light rail platform. Note this flood modelling has been carried out by the proponent on behalf of Transport NSW. The area to be lowered is shown in Figure 2;
- Protective walls will be installed in order to prevent the ingress of flood waters into the proposed development. The location of these is shown in Figure 2; and
- Two 900 mm diameter pipes have been installed (again see Figure 2). These are for the mitigation of minor flood impacts in Smith St.

Sensitivity Modelling

A variety of runs have been carried out in order to examine the sensitivity of design flood levels (in the 100Y ARI event) to various parameter changes. Runs carried out include the following:

- Blockage – blockage of 10 and 25% have been modelled;
- Roughness – roughness has been varied by plus and minus 20% in order to assess sensitivity to this parameter setting; and finally
- A climate change run has been undertaken using a 10% increase in rainfall. Sea level rise has no impact on the site given its location in the upper catchment and as such elevated tail water level runs have not been carried out. Note that the Longport Street culvert will be inlet controlled for all tail water conditions in Iron Cove.

Results

Figure 3 shows 100Y ARI modelled levels for the existing case. As can be seen flood levels immediately downstream of Old Canterbury Road are ~ 13.4 mAHD whilst in the canal, immediately upstream of Longport Street, peak flood level is ~ 9.0 mAHD. Floodwaters through the development are shown, with a “loop” of floodwaters connecting the area upstream of the development with Smith St overland flow. The significant extent of inundation caused by Smith St is also noteworthy as is the inundation in Smith St shown at the corner of Edward Street. Figure 4 describes 100Y ARI existing case hazard categories as per the NSW Floodplain Development Manual (NSW, 2005). Noteworthy is the high hazard flow within the area proposed for development.

Figure 5 shows the 100Y ARI modelled levels for the developed case with all works as described in the above section entitled “Developed Case Modelling”. Note that floodwaters from the canal no longer enter the site nor form a “loop” connecting these flows to the Smith St overland flow flooding. As with Figure 3 (existing case results), flood levels vary from 13.4 mAHD downstream of Old Canterbury Road to 9 mAHD immediately upstream of Longport Street. Figure 6 shows hazard for the 100Y ARI developed case run. Of note is that what was previously high hazard flow in the “loop” which moved through the site, is now no longer flooded or low hazard.

Figure 7 shows impacts for the 100Y ARI event. No adjoining property impacts occurs due to the development. Note that as per established convention no impacts less than 0.01 m are shown, as at this magnitude they are considered to be outside the models ability to resolve impact.

Figure 8 shows modelling results (presented as profiles) in the vicinity of the proposed light rail platform. In both cross-section 1 and 2, the ramp and light rail platform location and height information is presented in the context of 100Y ARI flood levels. As can be seen neither structure is impacted by the 100Y ARI event.

Sensitivity Testing

The significance of sensitivity results may be assessed by comparison with each other but more absolutely by comparison to standard freeboard which as per NSW guidelines is 0.5 m (NSW, 2005). Broadly sensitivity testing which shows flood levels changing by significantly less than freeboard indicates that flood levels are insensitive.

Note that the developed case is used as the "base case" in all sensitivity runs.

Locations 4 and 6 (see Table 1 and Figure 2) indicate a relatively high degree of sensitivity to blockage, with flood levels in the canal immediately upstream of Longport Street increasing ~ 0.5 m for 10% blockage (relative to none) and a further 0.5 m for an additional 15% blockage (i.e. total blockage 25%). Whilst location 4 was not sensitive to an increase in blockage from 0 to 10%, the change to 25% did induce a large change in flood level of ~ 0.5 m. Besides the upstream Smith Street location (point 3), which showed no variation for any blockage scenario, other locations exhibited some sensitivity though far less than points 4 and 6.

Sensitivity to roughness changes was relatively low with no changes of any significance relative to freeboard occurring.

Table 1: Sensitivity Run Results

#	Description	Existing	Developed	Blockage		Roughness		Climate Change	
				10%	25%	+20%	-20%	+10% Rain	10% Block
1	OCR - Railway	13.02	13.02	13.07	13.14	13.05	13.00	13.11	13.15
2	OCR - Channel	11.77	11.78	11.81	11.86	11.81	11.75	11.84	11.86
3	US - SmithSt	10.85	10.83	10.83	10.83	10.88	10.79	10.86	10.86
4	DS - SmithSt	9.36	9.35	9.51	10.04	9.36	9.35	9.75	10.13
5	Longport - Railway	10.06	10.06	10.07	10.12	10.09	10.03	10.12	10.14
6	Longport - Channel	8.86	8.95	9.45	10.00	8.86	9.01	9.69	10.09
7	Railway	10.10	10.09	10.11	10.16	10.12	10.07	10.16	10.18

Extreme Flooding

Modelling has also been carried out to examine Probable Maximum Flood levels for the site. Due to the restriction of the Longport Street culvert and the large flows associated with the PMF event, a flat backwater is established between Longport Street and Old Canterbury Road in the PMF event. The peak flood level is 13.2 mAHD which leads to only slight overtopping of Longport Street on the eastern side of the bridge.

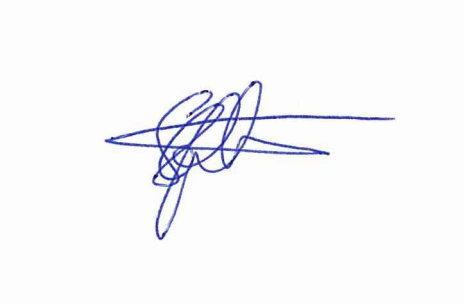
Conclusions and Recommendations

Development is proposed for a location that is flood liable in the 100Y ARI event. Flood liability is related to mainstream flow (Hawthorne Canal) as well as overland flow and piped flow (Smith Street tributary).

Development as proposed, including associated works as shown in Figure 2, has been modelled in a detailed 2D hydraulic model of the study area. Impact assessment shows no off-site impact on adjoining property. Detailed results presented in Figure 8 show no interaction of floodwaters with either the light rail platform or the access ramp.

Sensitivity modelling indicates that flood levels are sensitive to climate change and blockage, albeit only at locations immediately upstream of the Longport Street culvert. Throughout the area of proposed development flood level sensitivity is low relative to the standard freeboard of 0.5 m.

Yours Sincerely,
WMAwater



S Gray
Associate

References

1. Sydney Water Corporation, Hawthorne SWC 62 Capacity Assessment, Sydney Water Corporation, May 1998.

2. NSW Government, Floodplain Development Manual, April 2005.

3. Institution of Engineers, Australia, Australian Rainfall and Runoff, 3rd Edition, 1987.

FIGURE 1
STUDY AREA
ALLIED MILLS

Old Canterbury Rd - High Pass

Old Canterbury Rd - Channel

Railway Pipe

Smith St - Pipe

Longport St - Channel

Longport St - High Pass

N

Study Area

Site Boundary

Main Drainage Assets

0 0.05 0.1 (km)

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FIGURE 2
PROPOSED DEVELOPMENT AND KEY LOCATIONS

1
2
3
4
5
6
7

N

Proposed Development
Protective Walls
Site Boundary
Proposed Culvert
Section Lowered to 9.2m AHD
Report Locations

0 0.05 0.1 (km)

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FIGURE 3

100Y ARI DESIGN FLOOD EVENT

EXISTING CASE - PEAK DEPTHS AND CONTOURS

Water Level Contours

Depth (m)

- 0 - 0.1
- 0.1 - 0.2
- 0.2 - 0.4
- 0.4 - 1.0
- >1.0

0 0.05 0.1 (km)

N

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FIGURE 4

100Y ARI DESIGN FLOOD EVENT
EXISTING CASE - FLOOD HAZARD

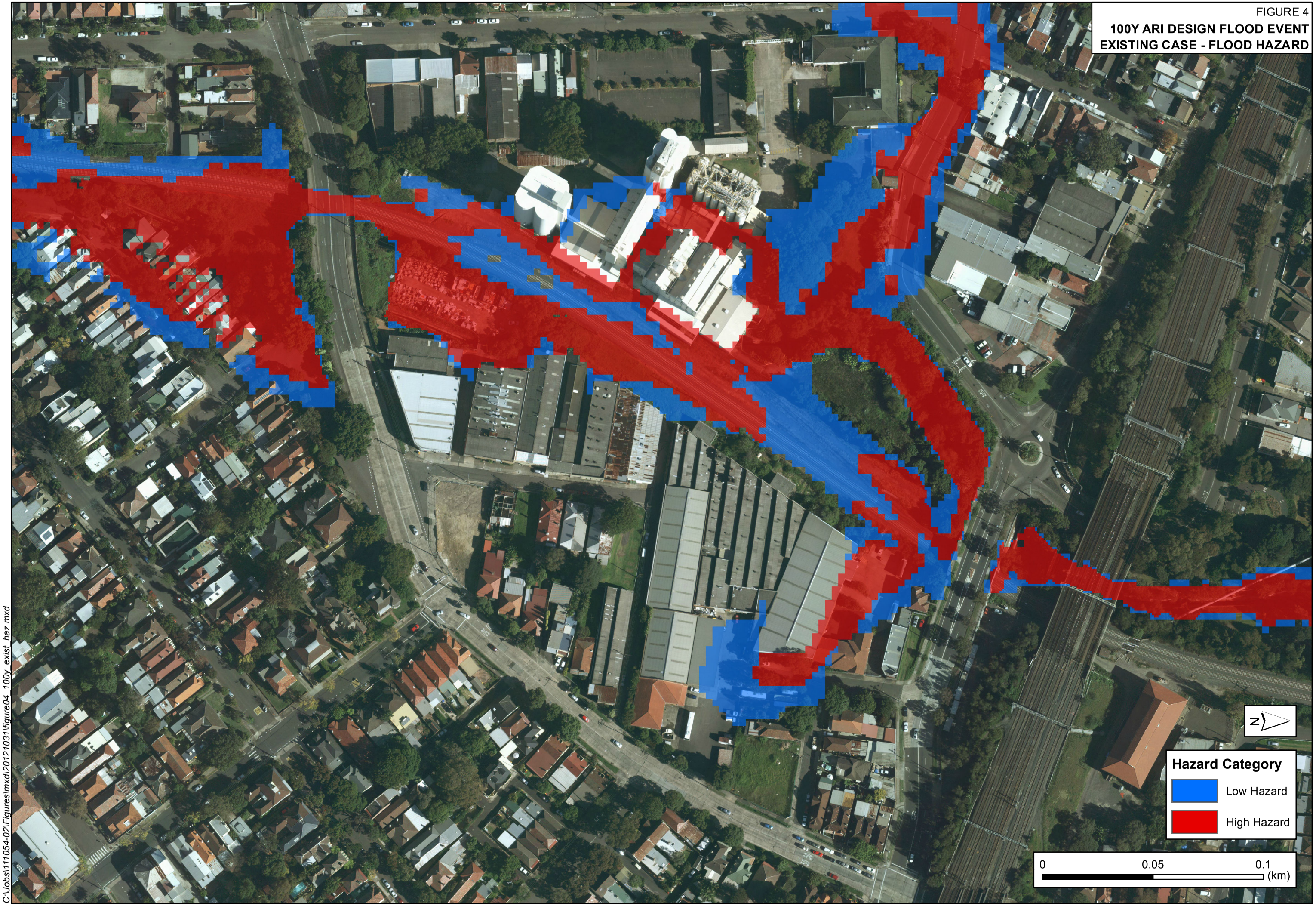

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FIGURE 5

100Y ARI DESIGN FLOOD EVENT

DEV MITIGATION CASE - PEAK DEPTHS AND CONTOURS

N

Proposed Development

Site Boundary

Protective Wall

Proposed Culvert

Section Lowered to 9.2m AHD

Water Level Contours

Depth (m)

0 - 0.1

0.1 - 0.2

0.2 - 0.4

0.4 - 1.0

>1.0

0 25 50 100 (m)

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FIGURE 6

100Y ARI DESIGN FLOOD EVENT
DEV MITIGATION CASE - FLOOD HAZARD

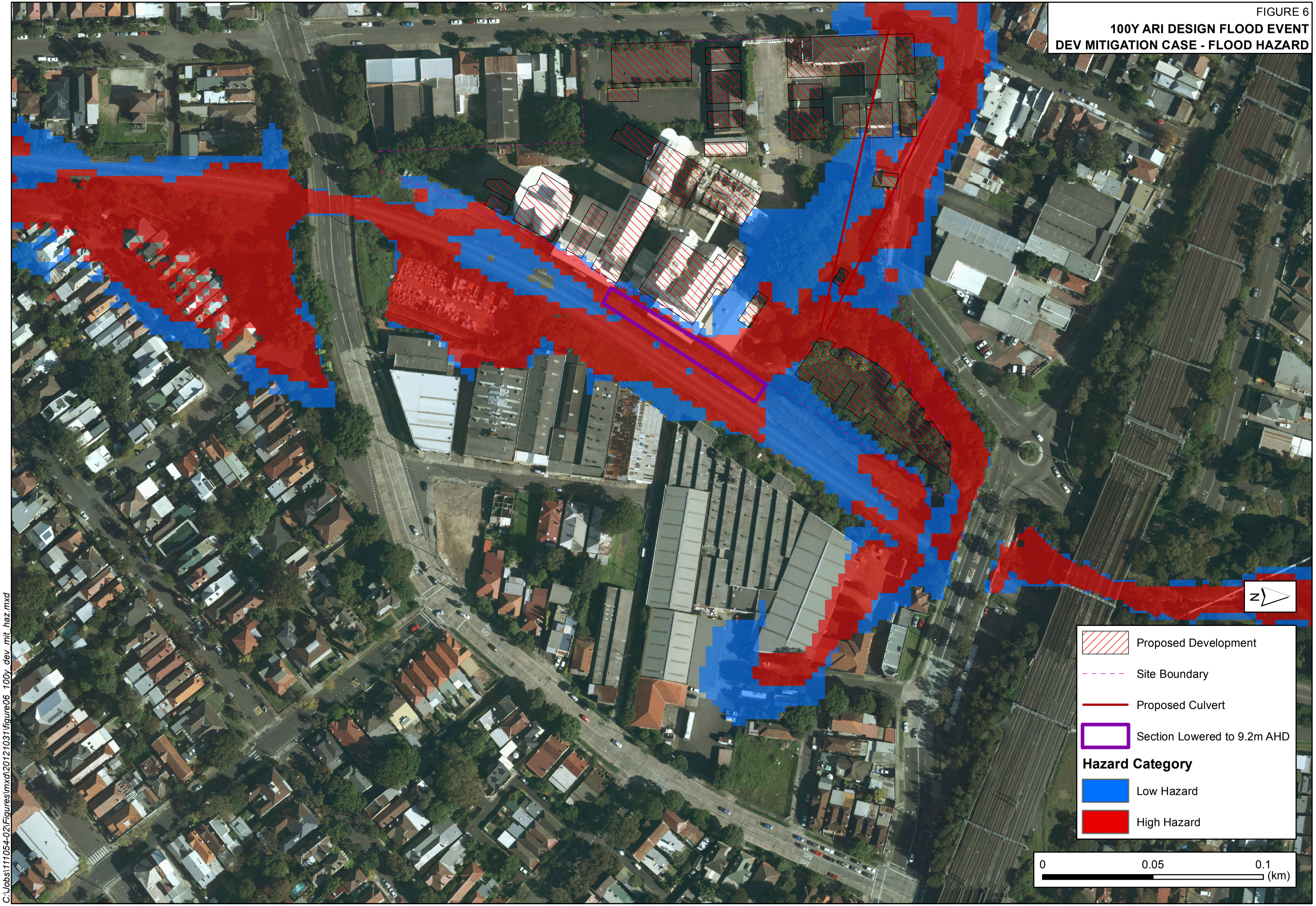

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FIGURE 7

100Y ARI DESIGN FLOOD EVENT
DEV MITIGATION CASE - IMPACTS

N

Proposed Development

Site Boundary

Proposed Culvert

Section Lowered to 9.2m AHD

Impact (m)

No Longer Flooded

No Impact

0.01 - 0.05

0.05 - 0.1

0.1 - 0.2

0.2 - 0.5

>0.5

Newly Flooded

0 25 50 100 (m)

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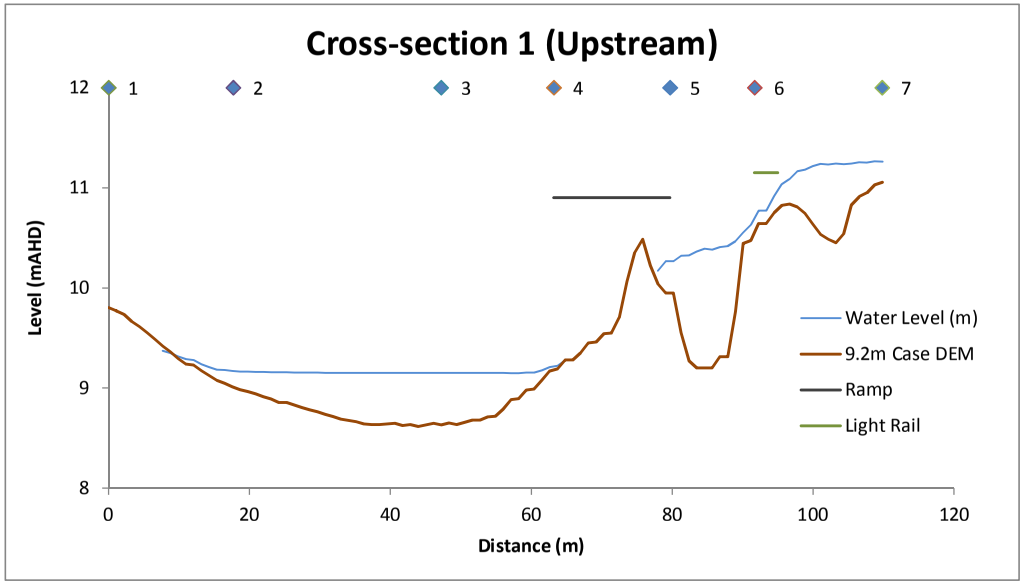
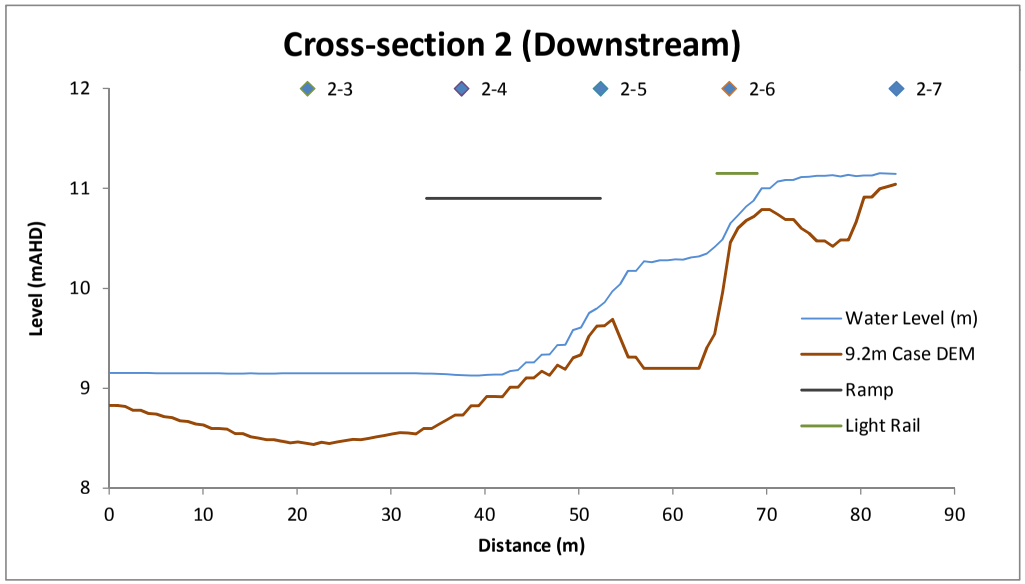
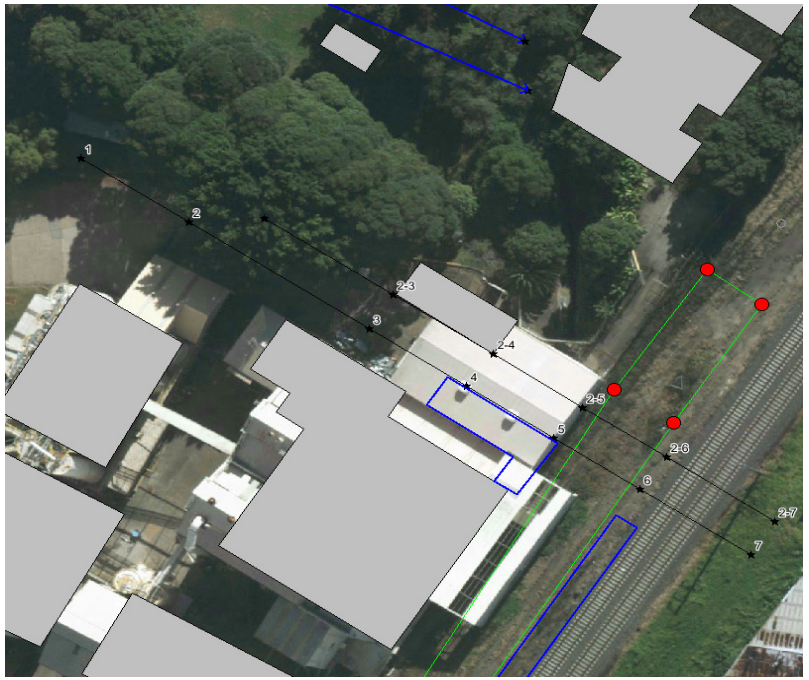
FIGURE 8
WATER LEVEL PROFILES





Location	Water Level (m)
3	9.15
4	9.21
5	10.16
6	10.69
7	11.26
2-3	9.15
2-4	9.13
2-5	9.8
2-6	10.65
2-7	11.15



APPENDIX D

EG FUNDS MANAGEMENT

SUMMER HILL FLOUR MILL SITE
2-32 SMITH STREET
STAGE 1

Integrated Water Management Plan
Stormwater Drainage Concept Plan &
Infrastructure Management Plan

Project Application Stage

Issue No. 2
NOVEMBER 2012

EG FUNDS MANAGEMENT

Summer Hill Flour Mill Site
2-32 Smith Street
Stage 1

Integrated Water Management Plan
Stormwater Drainage Concept Plan &
Infrastructure Management Plan

Project Application Stage

Issue No. 2
NOVEMBER 2012

Document Amendment and Approval Record

Issue	Description of Amendment	Prepared by [date]	Verified by [date]	Approved by [date]
1	Draft Report	Mike Shaw	Mike Shaw	Mike Shaw
2	Final Report	Mike Shaw	Mike Shaw	Mike Shaw

Note: This document is preliminary unless it is approved by a principal of Civil Certification.

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TABLE OF CONTENTS

Page No.

TABLE OF CONTENTS

Page No.

LIST OF TABLES

LIST OF DIAGRAMS

1 INTRODUCTION

Civil Certification has been engaged by NPC on behalf of EG Funds Management to prepare an integrated water management plan, stormwater drainage concept plan and infrastructure management plan in support of the project application for Stage 1 of the proposed development at the Summer Hill Flour Mill site. In particular, to address the Director General's Requirements (*MP10-0180 dated 22 August 2012*) related to drainage and integrated water management.

The proposed development site is located on the corner of Smith Street and Edward Street, Summer Hill.

A concept plan application (*MP10_0155*) has already been submitted to the NSW Department of Planning and Infrastructure for the entire site (*approx. 2.5ha*). The conceptual flooding and stormwater management aspects of this previous application are described in the Civil Certification report titled "*Summer Hill Flour Mill Site, 2-32 Smith Street – Flood Report and Stormwater Drainage Concept Plan. Concept Application Stage*" Issue 2, March 2011.

This current report deals with Stage 1 of the development (*approx. 0.6ha*), the extent of which is illustrated in **Figures 1 and 2**.

Stage 1 is described as "*The subdivision, partial demolition and construction of 2 to 6 storey residential and mixed use residential/retail/commercial buildings with basement car parking, together with infrastructure works including new public roads and public access to the Lewisham west light rail stop and removal of encroachments into the light rail corridor*".

Stage 1 is entirely located within the Local Government area of Ashfield Council.

This report addresses the following stormwater management elements of Stage 1:

- Integrated Water Management;
- Stormwater detention;
- Stormwater quality and Water Sensitive Urban Design (*WSUD*);
- Stormwater drainage concept design; and
- Infrastructure Management Plan.

As Stage 1 forms part of a larger development over the site incorporating many shared elements to achieve an integrated outcome, this report should be read in conjunction with our previous March 2011 report.

For details of mainstream flooding from the nearby Hawthorne Canal and overland flooding generated by the SWC Smith Street branch refer to the site specific flood study by WMA Water.

1.1 QUALIFICATIONS OF AUTHOR

This report has been prepared by Michael Shaw, a Principal of Civil Certification. Michael has over 18 year's experience in stormwater management and flood assessment. Details of Michael's qualifications and experienced are contained at **Appendix A**.

1.2 QUALIFIER

This report has been prepared for the benefit of EG Funds Management with relation to the particular project described and no responsibility is accepted for the use of any part of this report in any other context or for any other purpose. Copyright in this report is the property of Civil Certification. In preparing this report, Civil Certification have used a degree of care, skill and diligence normally exercised by consulting engineers in similar circumstances and locality. No other warranty expressed or implied is made or intended.

2 HYDROLOGY

2.1 PREVIOUS MAINSTREAM HYDROLOGY RESULTS

A detailed hydrological assessment (*including verification and sensitivity testing*) has already been completed for the site and contributing upstream catchments as outlined in our March 2011 report.

A summary of the mainstream hydrological results adopted in our March 2011 report is provided in **Table 1**. For consistency, the same mainstream flows will be utilised in our assessment of Stage 1.

Table 1 – Adopted Mainstream Hydrological Results (*Overland Flow Only- m^3/s*)

HEC RAS Chainage	Location Description	20yr ARI Peak Flow (m^3/s)	100yr ARI Peak Flow (m^3/s)	100yr ARI + 10% CC	100yr ARI + 15% CC	100yr ARI + 30% CC	PMF
25	Approx. 230m downstream of the Longport Street Culvert	69.8	103.0	114.3	120.3	137.5	438.0
230	Immediately downstream of the Longport Street Culvert	65.6	95.4	105.9	111.4	127.4	434.4
334.5	At the confluence of Hawthorne Canal and the Smith Street Branch	61.6	86.5	96.0	101.1	115.5	351.9
395	At the downstream end of the Goods Railway Line Culvert (*Hawthorne Canal*)	41.3	51.8	57.5	60.5	69.2	351.9
480	At the upstream end of the Goods Railway Line Culvert (*Hawthorne Canal*)*	18.0	27.9	31.0	32.6	37.2	326

Note * Overland flow only. Incorporates reduction in flow due to 23m3/s culvert capacity
CC = Climate Change
10%, 15% and 30% = 10%, 15% and 30% increase in rainfall intensity as a result of climate change

2.2 DETENTION

2.2.1 Nil Detention Argument

As previously stated in our March 2011 report, onsite detention is not required for the proposed development on the Summer Hills Flour Mill site, including Stage 1.

A summary of the reasons why stormwater detention is not necessary is provided below.

- *Minimal change in impervious fraction* – The site as a whole is currently covered by a high proportion of impervious surfaces (*estimated to be approximately 65%).* Following

development this is estimated to increase by no more than 10% to a total impervious fraction of 75%. Compared with predevelopment conditions this will lead to a minor increase in flows only. Furthermore, WSUD measures (*particularly reuse of roof water*) will go a long way to mitigating this minor increase. Note that for Stage 1 it is estimated that there will be no change to the existing impervious fraction;

- *Site location in lower part of catchment* – The proposed development site is located near the downstream end of a large elongated catchment. In these circumstances (*due to lag and timing effects*) it is often beneficial to provide early release of site generated flows prior to arrival of the peak upstream hydrograph; and
- *Site will directly connect to SWC trunk drainage infrastructure (i.e. Hawthorne Canal)* – Marrickville Councils OSD Policy (Feb 1999) states that "*OSD will be required for all developments except for……..sites that discharge directly into a major Sydney Water Corporation controlled trunk drainage system"*. Note that this is directly applicable for the areas within the Marrickville LGA to the east of the site but there is no reason why the same logic applies to Stage 1 within the Ashfield LGA, where the Stage 1 trunk drainage line will directly discharge into Hawthorne Canal.

2.2.2 Nil Detention Case Modelling (*Total Site*)

In order to confirm that detention would not be required for the site as a whole, DRAINs modelling was previously undertaken for our March 2011 report to incorporate the estimated increase of 10% impervious fraction over the entire site.

Note for conservatism any beneficial detention effect provided by the proposed WSUD measures was not included in this site wide modelling exercise.

Details of this DRAINS model exercise are included in our March 2011 report. The results are summarised in **Table 2**.

Table 2 – Nil Detention Case DRAINS Model Results (*Total Flow - m^3/s*)

	Smith St Branch Outlet	Model Outlet	Change Compared to Existing Case
100yr ARI	30.4	116.0	0% increase
20yr ARI	22.9	86.2	0.4% increase
5yr ARI	16.5	61.6	0% increase

The results confirm minimal increase in overall flows and hence provide justification for exemption of detention for the subject site, including the Stage 1 development.

2.2.3 Stage 1 Detention Modelling

It is estimated that the impervious fraction of Stage 1 will be maintained if not reduce compared to existing conditions.

Logically, this should translate to maintenance of existing peak flows generated by Stage 1 and hence negate the need for detention.

A Stage 1 RAFTs model was constructed to demonstrate this point using the development scenarios as summarised below:

- Existing Conditions (*i.e. current conditions – 85% impervious*); and
- Post Development Conditions (*i.e. proposed development incorporating WSUD storages – 85% impervious and 100KL rainwater tank storage*).

The details of the above modelling exercise are provided in **Appendix B** and summarised below.

Adopted RAFTS input parameters are summarised below:

- Stage 1 Site Area = 0.6ha;
- Stage 1 Vectored average slope = 2%;
- Pervious Manning's n = 0.04;
- Impervious Manning's n = 0.018;
- IFD as per Ashfield Std;
- Impervious IL + CL losses = 5mm + 0mm/h
- Pervious IL + CL losses = 20mm + 2.5mm/h;
- Total rainwater tank storage = 100KL; and
- Reuse rate = 5.0KL/d or 0.23m^3/h.

The peak flow results for the two development scenarios are provided in **Tables 3 and 4**.

Table 3 – Stage 1 Existing Condition RAFTS Modelling Results

Design Storm ARI	Storm Duration (min)	Peak Flow (m3/s)*
1yr	60 min	0.121
1yr	90 min	**0.128**
1yr	120 min	0.121
1yr	180 min	0.066
5yr	60 min	0.223
5yr	90 min	**0.238**
5yr	120 min	0.220
5yr	180 min	0.126
20yr	60 min	0.305
20yr	90 min	**0.324**
20yr	120 min	0.299
20yr	180 min	0.171
100yr	60 min	0.391
100yr	90 min	**0.407**
100yr	120 min	0.376
100yr	180 min	0.213

Note *: Results reported to 3 decimal places for comparison purposes only.

Table 4 – Stage 1 Post Dev. Condition RAFTS Modelling Results

Design Storm ARI	Storm Duration (min)	Peak Flow (m3/s)*
1yr	60 min	0.000
1yr	90 min	0.017
1yr	120 min	**0.026**
1yr	180 min	0.023
5yr	60 min	0.108
5yr	90 min	**0.238**
5yr	120 min	0.163
5yr	180 min	0.126
20yr	60 min	0.305
20yr	90 min	**0.324**
20yr	120 min	0.299
20yr	180 min	0.171
100yr	60 min	0.391
100yr	90 min	**0.406**
100yr	120 min	0.376
100yr	180 min	0.213

Note *: Results reported to 3 decimal places for comparison purposes only.

Rational Method estimates of peak flows generated under existing conditions compared well with those generated in RAFTS (*i.e. RM results of 0.19m^3/s-5yrARI, 0.27m^3/s-20yr ARI and 0.40m^3/s-100yr ARI*).

The proposed condition RAFTS modelling results are all equal to or less than existing conditions. As expected the detention effect of the proposed rainwater tanks has the most impact on the more frequent storm events (*i.e. 1yr ARI to 5yr ARI*) with peak flows reduced well below existing conditions in the 1yr ARI and marked reductions in hydrograph volumes in the 5yr ARI. The rainwater tanks have marginal impact on peak flows and storm volumes in the 20yr ARI and 100yr ARI.

Overall, the Stage 1 RAFTs modelling demonstrates that flows are not increased as a result of the development (*i.e. compared with existing conditions*) and that the proposed WSUD devices, including rainwater capture and reuse systems will substantially reduce flows below existing conditions in the more frequent storm events (*i.e. 1-2yr ARI*). **Diagrams 1 to 4** demonstrate the impact of the proposed WSUD measures in the 1 and 5yr ARI events.

Again, based on these modelling results it is not considered that stormwater detention is required for the proposed development on Stage 1.