Wee Hur (Australia) Pty Ltd

104-116 REGENT STREET REDFERN FLOODING ASSESSMENT

wma water

DECEMBER 2021

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104-116 REGENT STREET REDFERN
FLOODING ASSESSMENT

DECEMBER 2021

Project **104-116 Regent Street REDFERN** **Flooding Assessment**	**Project Number** **121032**
Client **Wee Hur (Australia) Pty Ltd**	**Client's Representative** Mark Surtees
Authors Fabien Joly Richard Dewar	**Prepared by:** Fabien Joly Richard Dewar
Date 5 December 2021	**Verified by** 

Revision	Description	Distribution	Date
1	Draft	Mark Surtees	November 2021
2	Final Draft	Mark Surtees	December 2021
3	Final	Mark Surtees	5 DECEMBER 2021

104-116 REGENT STREET REDFERN
FLOODING ASSESSMENT
TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF PHOTOGRAPHS

LIST OF DIAGRAMS

LIST OF FIGURES

LIST OF ACRONYMS

AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ARR	Australian Rainfall and Runoff 1987 / 2019 editions
BoM	Bureau of Meteorology
DCP	Development Control Plan
FPL	Flood Planning Level
LEP	Local Environmental Plan
LiDAR	Light Detection and Ranging or known as ALS (Airborne Laser Scanning)
m AHD	meters above Australian Height Datum
PMF	Probable Maximum Flood
SOBEK	one-dimensional (1D) and two-dimensional (2D) flood hydraulic computer model
TUFLOW	one-dimensional (1D) and two-dimensional (2D) flood hydraulic computer model

EXECUTIVE SUMMARY

STUDY OBJECTIVES

There are two objectives of this flood assessment for 104-116 Regent Street.

1. Determine the appropriate design flood levels for structures on the property and
2. determine if the proposed works on 104-116 Regent Street will increase flood levels outside the property.

PAST FLOOD STUDIES

Several past studies have looked at flooding in the Alexandra Canal catchment. The first was completed in 2008 with several subsequent updated studies. These latter studies were based on revised topographies and building layers, updated modelling approaches and revised design rainfall data.

The Alexandra Canal Catchment Flood Study Model Update – ARR2019 Hydrology (Reference 1 prepared for the City of Sydney by WMAwater in September 2020) is considered the most up to date Flood Study for the Alexandra Canal catchment and was therefore adopted for use in this report.

EXISTING FLOOD PROBLEM

The catchment area to the site is small and runoff is predominantly from pervious surfaces (roads and building roofs). Flooding will have occurred in the past near the site but there are no recorded flood marks or history of flooding within the study area.

FLOOD MODELLING

Initially the TUFLOW hydraulic model from Reference 1 was modified within the local area to reflect the approved upstream developments and the proposed development under construction on the adjacent 13-23 Gibbons Street site. This is important as works on 13-23 Gibbons Street will create a flowpath through the site by extending William Lane to Margaret Street.

Modelling of existing conditions (but assuming completion of the flowpath through 13-23 Gibbons Street) indicates that in the 1% AEP and PMF events floodwaters will not cross over 104-116 Regent Street and exit onto Margaret Street and William Lane. Rather they will be conveyed within the to be creates flow path through 13-23 Gibbons Street and exit into Margaret Street.

Modelling was then undertaken of the proposed works on 104-116 Regent Street (the design case). The design results indicates that in the 1% AEP and PMF events floodwaters will also not cross over into 104-116 Regent Street. Thus, the proposed works will result in no change in design flood levels on surrounding properties.

CLIMATE CHANGE

Climate change will potentially impact on flooding by raising the sea levels and / or increasing the design rainfall intensities (i.e., what was previously a 1% AEP event may occur more frequently and become say a 2% AEP event).

Sea level rise will have no impact on flood levels at this site as the land is sufficiently high (at 24m AHD) above sea level. Increasing the design rainfall intensities will raise existing flood levels. At present there is no guidance as to the magnitude of any rainfall increase and the timeframe over which this might occur. An indicative climate change increase in rainfall may be 10%. If the rainfall increase does not raise the 1% AEP rainfalls to above the PMF the site will still not be affected by floodwaters from upstream.

FLOOD RELATED DEVELOPMENT CONTROLS

It is recommended that the proposed development complies with the guidelines provided in the City of Sydney's DCP Section 3.7 (Appendix B) and Council's Interim Floodplain Management Policy 12 May 2014 (Appendix C).

1. BACKGROUND

1.1. Development Proposal

Wee Hur Pty Ltd has recently demolished the former service station building on 104-116 Regent Street and propose to construct an 18-storey mixed-use building accommodating ground floor retail premises and 411 bed student housing accommodation with indoor and outdoor communal spaces, on-site bicycle parking and ancillary facilities.

Various flood studies undertaken for the City of Sydney Council have indicated that in a 1% AEP flood event 104-116 Regent Street is surrounded by floodwaters in William Lane, Regent Street and Margaret Street. Some studies also show flood waters crossing the site in the 1% AEP event. However, there have been significant changes to flood modelling, available survey data and the local topography in the last 15 years which has meant that many of the former studies are out of date.

WMAwater was engaged to undertake a flood assessment of the site. WMAwater has undertaken several flood studies for the City of Sydney Council for the Alexandra Canal catchment and are therefore well placed to undertake this flooding assessment using the most up to date and best practice modelling approach.

1.2. Planning Secretary's Environmental Assessment Requirements (SEARs)

The SEARs relating to flooding for SSD-12618001 for 104-116 Regent Street are listed in the table below.

The EIS must include a flood impact assessment, which:	**Section in Report where issue is addressed**
1. identifies and describes any on-site flood behaviour and flood risk impacts associated with the proposed development, having regard to relevant provisions of the NSW Floodplain Development Manual and other local or State studies and guidance.	Section 2.1 and Section 2.2
2. identifies potential effects of climate change, sea level rise and an increase in rainfall intensity.	Section 2.3
3. identifies required management measures and design solutions to minimise the impacts of flooding on the proposed development.	Section 2.4

Key aspects of this assessment include:

- Not to increase the flood risk to people and property in the surrounding community.
- Ensure future development is controlled in a manner consistent with the flood risk (considering the potential impacts of climate change).
- Reduce private and public losses due to flooding.
- Protect and where possible enhance the floodplain environment.
- Be consistent with the objectives of, the NSW Government's Flood Prone Land Policy and gazetted 2005 NSW Government Floodplain Development Manual (Reference 2).
- Ensure that the floodplain strategy is fully in accordance with Council's existing corporate, business and strategic plans (LEP and DCP), existing and proposed planning proposals, meets Council's obligations under the Local Government Act 1993, and has the support of the local community.
- Ensure actions undertaken are sustainable in social, environmental, ecological, and economic terms.

1.3. Catchment Description

104-116 Regent Street (red cross in Photo 1 and Photo 2) is in the very upper parts of the Alexandra Canal catchment with the catchment divide approximately 200m to the north along Lawson Street (this is the bridge crossing over the railway lines at Redfern railway station). As runoff flows in a generally southern direction and ultimately into Alexandra Canal and then Botany Bay, the site will potentially be affected by runoff from Regent Street to the east, William Lane to the west and Margaret Street to the south.

Photo 1: Nearmap aerial taken in October 2021 showing demolition on 13-23 Gibbons Street and removal of the service station on 104-116 Regent Street

Photo 2: Google aerial prior to works on 13-23 Gibbons Street and the removal of the service station on 104-116 Regent Street (circa 2018)

1.4. Overview of Previous Flood Studies

Flooding will have occurred in the past at the site but there are no recorded flood marks or history of flooding near the study area. A glossary of technical terms used in flooding is provided in Appendix A.

There has been a range of previous flood studies of the Alexandra Canal catchment, undertaken for various purposes. The following is a brief list of the key studies:

a. *Green Square West Kensington Flood Study*, WMAwater, April 2008 (Reference 3).
b. *Alexandra Canal Catchment Flood Study*, Cardno, 2014 (Reference 4).
c. *Green Square Trunk Drain – Hydraulic and Flood Modelling*, UNSW Water Research Laboratory and WMAwater, August 2014 (Reference 5).
d. *Alexandra Canal Model Conversion*, BMT WBM, March 2016 (Reference 6).
e. *Alexandra Canal Catchment Flood Study Model Update,* WMAWater, 2018 (Reference 7).
f. *Alexandra Canal Catchment Flood Study Model Update, ARR2019 Hydrology,* WMAWater, Final Draft September 2020 (Reference 1).

Prior to the finalisation of Reference 7, the 2014 Cardno report (Reference 4) had been the Council adopted catchment flood study for the purposes of setting design flood levels for flood-related development controls. However, this study does not include several features of the catchment that are currently in planning or under construction, which may affect flood behaviour in the vicinity of the site. In 2018 WMAwater prepared an update (Reference 7), which then become the adopted Council catchment-wide flood study. The model update involved the conversion of the SOBEK model to TUFLOW and the inclusion of several new commercial and residential precincts that were planned and either constructed subsequently or will soon be constructed. Two different scenarios were modelled – the base case, replicating 2013 catchment conditions (for comparison with the previous SOBEK model) and an ultimate development scenario, representing recent developments and a number of proposed (or approved) future developments as at 2017. The report was adopted by City of Sydney in June 2018.

In 2020 WMAwater (Reference 1) prepared a further update to the 2018 study to include.

1. Updated design rainfall data and design flood methods from Australian Rainfall and Runoff 2019 (ARR2019, Reference 8). Previous modelling used the now superseded information from Australian Rainfall and Runoff 1987 (ARR1987, Reference 9). A significant change adopted in ARR2019 was the inclusion of updated design rainfall intensity data (provided by the Bureau of Meteorology) which indicated lower design rainfall intensities than adopted in ARR1987. This has therefore resulted in a catchment wide reduction in peak flood levels as shown in Photo 3.

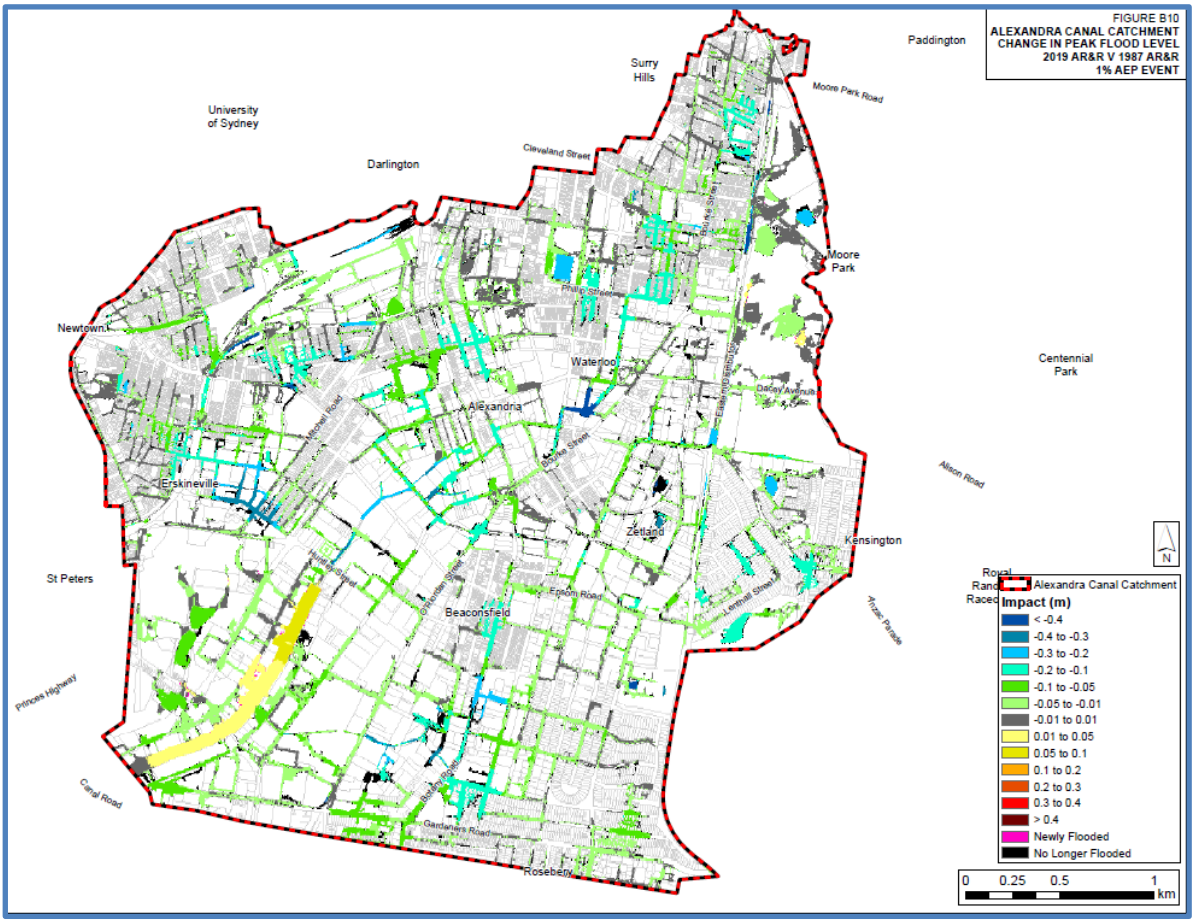


Photo 3: Copy of Figure B10 from 2020 WMAwater Report (Reference 1)

2. Inclusion of upgraded drainage infrastructure built in the catchment in recent years.
3. Inclusion of recent developments in the catchment, including private development, precinct developments (including new road layouts and drainage), and major public infrastructure like WestConnex.
4. Refinements to the model schematisation to reflect features identified during catchment inspections by WMAwater.

Reference 1 is considered the most up to date Flood Study for the Alexandra Canal catchment and this modelling approach was therefore adopted for use in this report.

1.5. Recently Completed and Proposed Developments along William Lane

In the last 3 to 4 years there has been significant re-development of surrounding upstream properties with some completed and some still under construction (notably 13-23 Gibbons Street – refer Nearmap aerial - Photo 1). WMAwater is aware of the following Flood Assessment reports completed for:

- 11 Gibbons Street (Reference 10).
- 80-102 Regent Street (Reference 11).
- 13-23 Gibbons Street (Reference 12).

The 13-23 Gibbons Street report (Reference 12) indicates that William Lane will be extended to Margaret Street with removal of the three steps (Photo 4) and lowering of the ground to form a flow path through the eastern side of that property. The report indicates that as a result peak 1% AEP flood levels will be lowered at the upstream limit of the property and flood waters will flow along the flowpath (Photo 5).

Photo 4: Prior to works in 13-23 Gibbons Street, William Lane ended with three steps into the property (Photo courtesy of Reference 12)

Photo 5 was taken from Reference 12, the Report is confusing to interpret but Photo 5 is presumed to indicate the extent of inundation in the 1% AEP event under design conditions on 13-23 Gibbons Street and indicates no flow across 104-116 Regent Street.

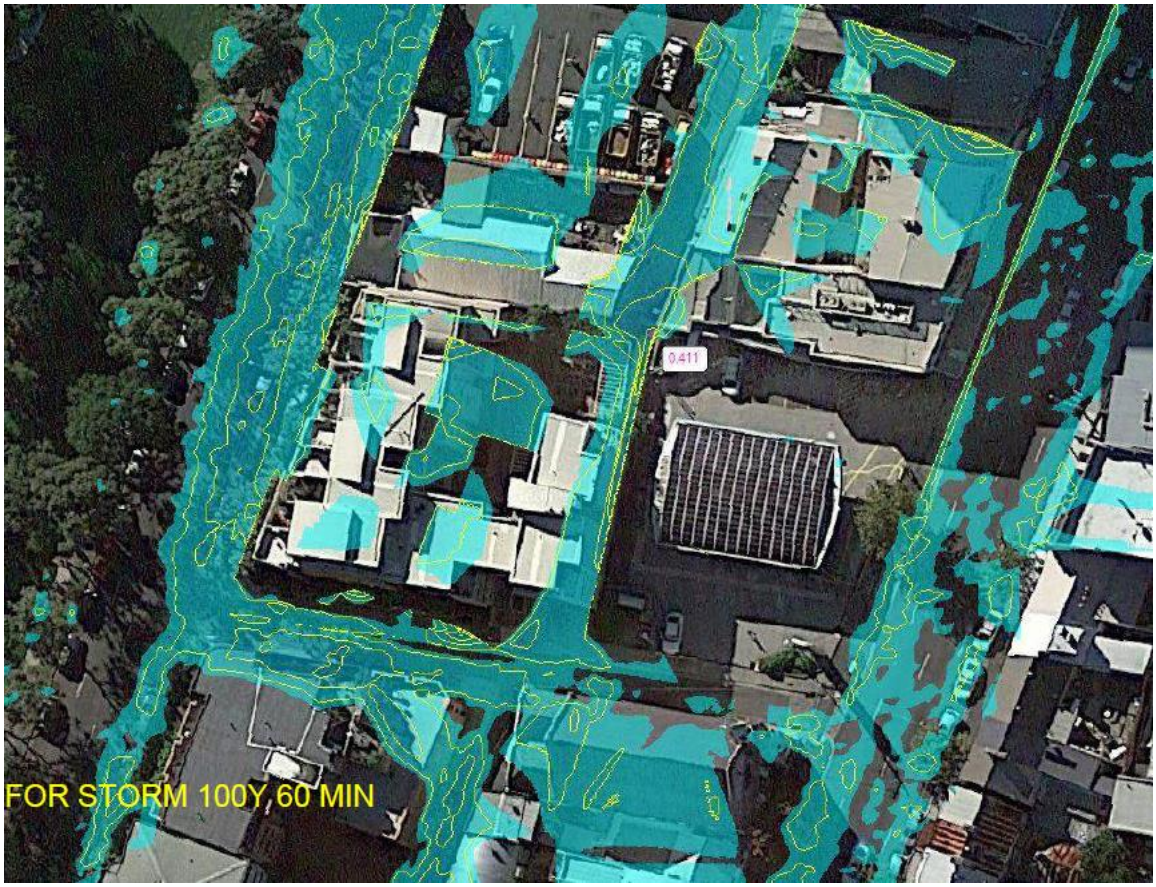


Photo 5: 1% AEP event assuming Design Conditions on 13-23 Gibbons Street and appears to indicate no flow across 104-116 Regent Street (taken from Reference 12)

1.6. Objectives of this Flood Assessment

There are two objectives of this flood assessment for 104-116 Regent Street.

1. Determine the appropriate design flood levels for structures on the property and
2. determine if the proposed works on 104-116 Regent Street will increase flood levels outside the property.

The approach is to establish an “existing” and “design” case topographies for 104-116 Regent Street which are then modelled using the TUFLOW hydraulic model established in the 2020 WMAwater report (Reference 1). From this the design flood levels to be adopted for the relevant flood planning levels are obtained. A comparison between the peak levels for the 1% AEP and PMF events for existing and design cases will indicate whether the proposed works will increase flood levels on adjoining properties.

1.7. Available Survey

The surrounding topography was taken from Reference 1 with site survey for 104-116 Regent

Street taken from Figure 1. The proposed development (ground floor only) on 104-116 Regent Street is shown on Figure 2.

There is no works as executed site survey for 13-23 Gibbons Street as the works are under construction. WMAwater has therefore relied upon the plans supplied by the client (Figure 3 and Figure 4) to provide detail of the proposed design flow path on the eastern side of 13-23 Gibbons Street. It is presumed by WMAwater that these plans are the same as evaluated in Reference 12, with the exception of the proposed upgrade to the sub surface stormwater system, as indicated on Figure 3. This is to be undertaken as part of the redevelopment of 90-102 Regent Street.

2. EXISTING FLOOD BEHAVIOUR

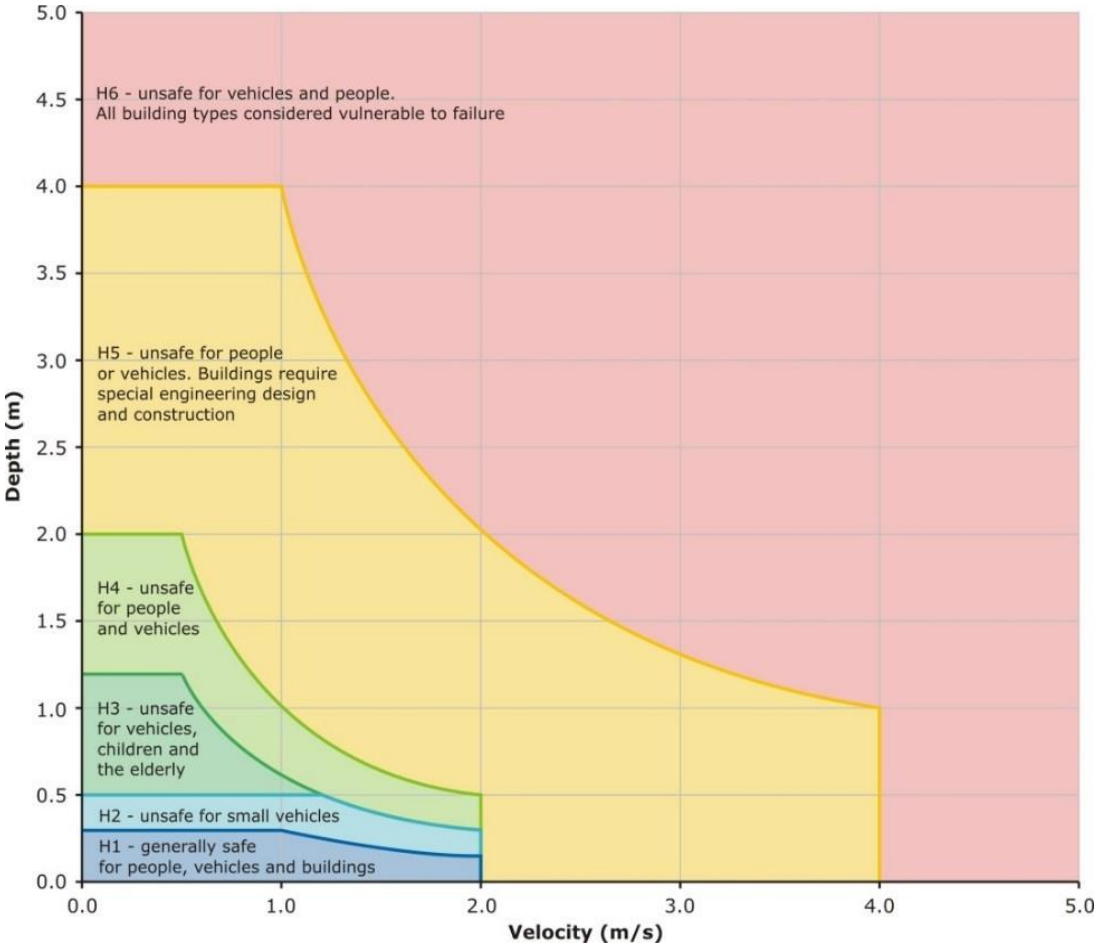
2.1. Existing Conditions (pre removal of Service Station) on 104-116 Regent Street

The existing case peak flood depths, contours and extents within the study area for the 1% AEP and PMF events are shown on Figure 5 and Figure 6. The modelling of existing conditions (but assuming completion of the flowpath through 13-23 Gibbons Street) indicates that in the 1% AEP and PMF events flood waters will not cross over 104-116 Regent Street and exit onto Margaret Street and William Lane.

In recent years there has been several developments in the classification of hazard. *Managing the floodplain: a guide to best practice in flood risk management in Australia* (Reference 13) provides revised hazard classifications. These add clarity to the description of hazard categories and what they mean in practice. The hazard classifications are divided into six categories (Diagram 1) which indicate the restrictions on people, buildings, and vehicles:

- H1 - Generally safe for vehicles, people, and buildings,
- H2 - Unsafe for small vehicles,
- H3 - Unsafe for vehicles, children, and the elderly,
- H4 - Unsafe for people and vehicles,
- H5 - Unsafe for people or vehicles. Buildings require special engineering design and construction, and
- H6 - Unsafe for vehicles and people. All building types considered vulnerable to failure.

Diagram 1: Hazard Classifications (Reference 13)



The existing flood hazard within the study area for the 1% AEP and PMF events are shown on Figure 7 and Figure 8.

2.2. Design Conditions on 104-116 Regent Street

The design peak flood depths, contours and extents within the study area for the 1% AEP and PMF events are shown on Figure 9 and Figure 10. Modelling of the proposed works on 104-116 Regent Street (the design case) indicates that in the 1% AEP and PMF events flood waters will also not cross over 104-116 Regent Street. Thus the proposed works will result in no change in design flood levels on surrounding properties.

The design flood hazard within the study area for the 1% AEP and PMF events are shown on Figure 11 and Figure 12.

2.3. Climate Change

Climate change will potentially impact on flooding by raising the sea levels and / or increasing the design rainfall intensities (i.e., what was previously a 1% AEP event may occur more frequently and become a 2% AEP event).

Sea level rise will have no impact on flood levels at this site as the land is sufficiently high (at 24m AHD) above sea level. Increasing the design rainfall intensities will raise existing flood levels. At present there is no guidance as to the magnitude of any rainfall increase and the timeframe over which this might occur. An indicative climate change increase in rainfall may be 10%. If the rainfall increase does not raise the 1% AEP rainfalls to above the PMF the site will still not be affected by floodwaters from upstream.

2.4. Outcomes of Flood Assessment

Modelling of the existing and design case scenarios indicate that floodwaters from upstream will not cross over 104-116 Regent Street and thus the proposed development as described on Figure 2 will have no impact on flood levels on surrounding properties. Note this assumes that the flowpath to be constructed within 13-23 Gibbons Street is constructed in accordance with that shown on Figure 3 and Figure 4.

Climate change increase in sea level and / or rainfall will have no impact on flood levels across 104-116 Regent Street.

The management measures and design solutions to minimise the impacts of flooding on the proposed development are:

- Construct the building floors and all entry points to the building in accordance with the guidelines provided in the City of Sydney's DCP Section 3.7 (Appendix B) and Interim Floodplain Management Policy 12 May 2014 (Appendix C).
- Develop a Flood Risk Management Plan for 104-116 Regent Street.
- Undertake certification of the above at the Construction Certificate and Occupation Certificate stages by a recognised expert in floodplain management.

3. REFERENCES

WMAwater
1. **Alexandra Canal Catchment Flood Study Model Update – ARR2019 Hydrology**
City of Sydney, Final Draft September 2020

NSW Government
2. **Floodplain Development Manual**
2005

Webb McKeown & Associates Pty Ltd
3. **Green Square - West Kensington (Sheas Creek Victoria Branch) Flood Study**
City of Sydney & Randwick City Council, April 2008

Cardno
4. **Alexandra Canal Catchment Flood Study (Final)**
City of Sydney, May 2014

Water Research Laboratory & WMAwater
5. **Green Square Trunk Drain – Hydraulic and Flood Modelling**
WRL Technical Report 2014/18
City of Sydney & Sydney Water, August 2014

BMT WBM
6. **Alexandra Canal Model Conversion**
City of Sydney, 25 June 2013

WMAwater
7. **Alexandra Canal Catchment Flood Study Model Update**
City of Sydney, June 2018

Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I
8. **Australian Rainfall and Runoff: A Guide to Flood Estimation**
Geoscience Australia, Australia, 2016

Pilgrim DH (Editor in Chief)
9. **Australian Rainfall and Runoff – A Guide to Flood Estimation**
Institution of Engineers, Australia, 1987

St George Community Housing
10. **Site Flood Assessment -11 Gibbons Street**
WMAwater, September 2018

Wee Hur Pty Ltd

11. **Flood Assessment and Stormwater Management -90-102 Regent Street**
JHA Consulting Revision 3, 9 February 2021

Wee Hur Pty Ltd

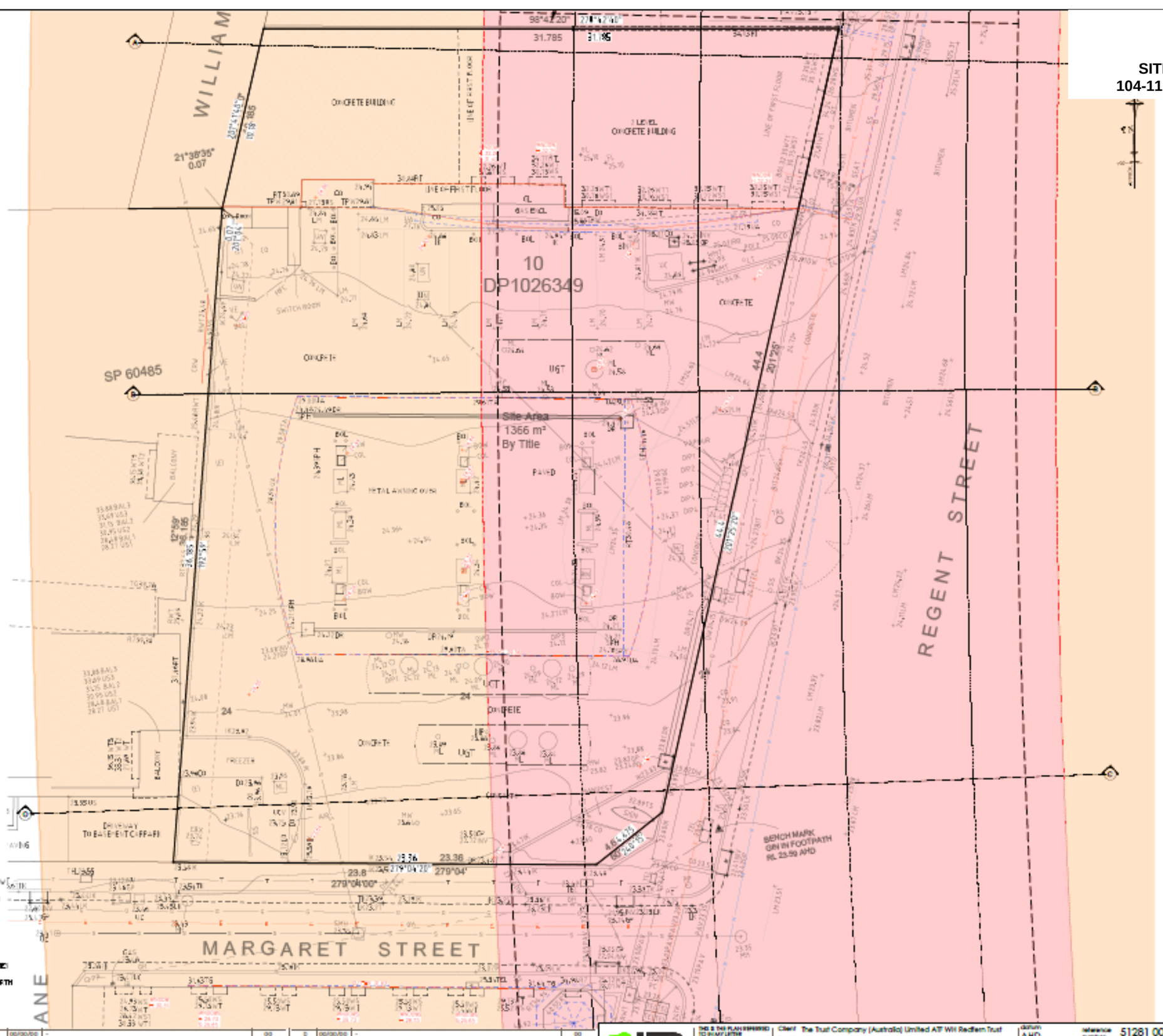
12. **Flood Assessment and Stormwater Management -13-23 Gibbons Street**
JHA Consulting Revision 3, 10 October 2019

Commonwealth of Australia

13. **Australian Disaster Resilience Handbook Collection, Guideline 7-3**
Australian Institute for Disaster Resilience, on behalf of the Australian Government Attorney-General's Department, 2017 2nd Edition

Figures

FIGURE 1
SITE SURVEY
104-116 REGENT



LEGEND

BENCH MARK	▲
WINDOW	W
BASE OF WALL	BW
PIT WITH METAL LID	PIT/LID

NOTES
1. THE BOUNDARIES HAVE NOT BEEN MARKED ON GROUND
2. ALL AREAS AND DIMENSIONS SHOWN HEREON ARE COMPILED FROM PLANS MADE AVAILABLE BY NSW LAND REGISTRY SERVICES AND ARE SUBJECT TO FULL SURVEY
3. BOUNDARIES WITHIN THIS FILE HAVE BEEN ADDED FROM DCDB DATA OBTAINED FROM NSW LAND REGISTRY SERVICES AND ARE APPROXIMATE ONLY
4. ORIGIN OF LEVELS ON AHD IS TAKEN FROM BENCHMARK HEREON FROM UNDER SURVEY PLAN REFERENCE 11488 R.L. 24.35 (AHD) IN GREENS STREET
5. CONTOUR INTERVAL 10 m
6. ONLY SPOT LEVELS SHOWN SHOULD BE USED FOR CALCULATIONS OF QUANTITIES WITH CAUTION
7. FLOOR LEVELS SHOWN ARE THRESHOLD LEVELS AT ENTRANCES OR INTERNAL FLOOR LEVELS HAS BEEN UNDERTAKEN
8. NO INVESTIGATION OF UNDERGROUND SERVICES HAS BEEN MADE. ALL RELEVANT AUTHORITIES SHOULD BE NOTIFIED PRIOR TO ANY EXCAVATION ON OR NEAR THE SITE
9. BEARINGS SHOWN ARE ON GRID BASED ON AUSTRALIAN AMG ADOPTED FROM TRUE NORTH
10. UNDERLAY SURVEY PROVIDED BY REGISTERED PDF ISSUED DATED 21-04-2020

DIAL BEFORE YOU DIG www.1100.com.au
GDA2020

Revision	Date	Description	Reference
H	00/00/00	-	00
G	00/00/00	-	00
F	00/00/00	-	00
E	00/00/00	-	00
D	00/00/00	-	00
C	00/00/00	-	00
B	00/00/00	-	00
A	00/00/00	-	00

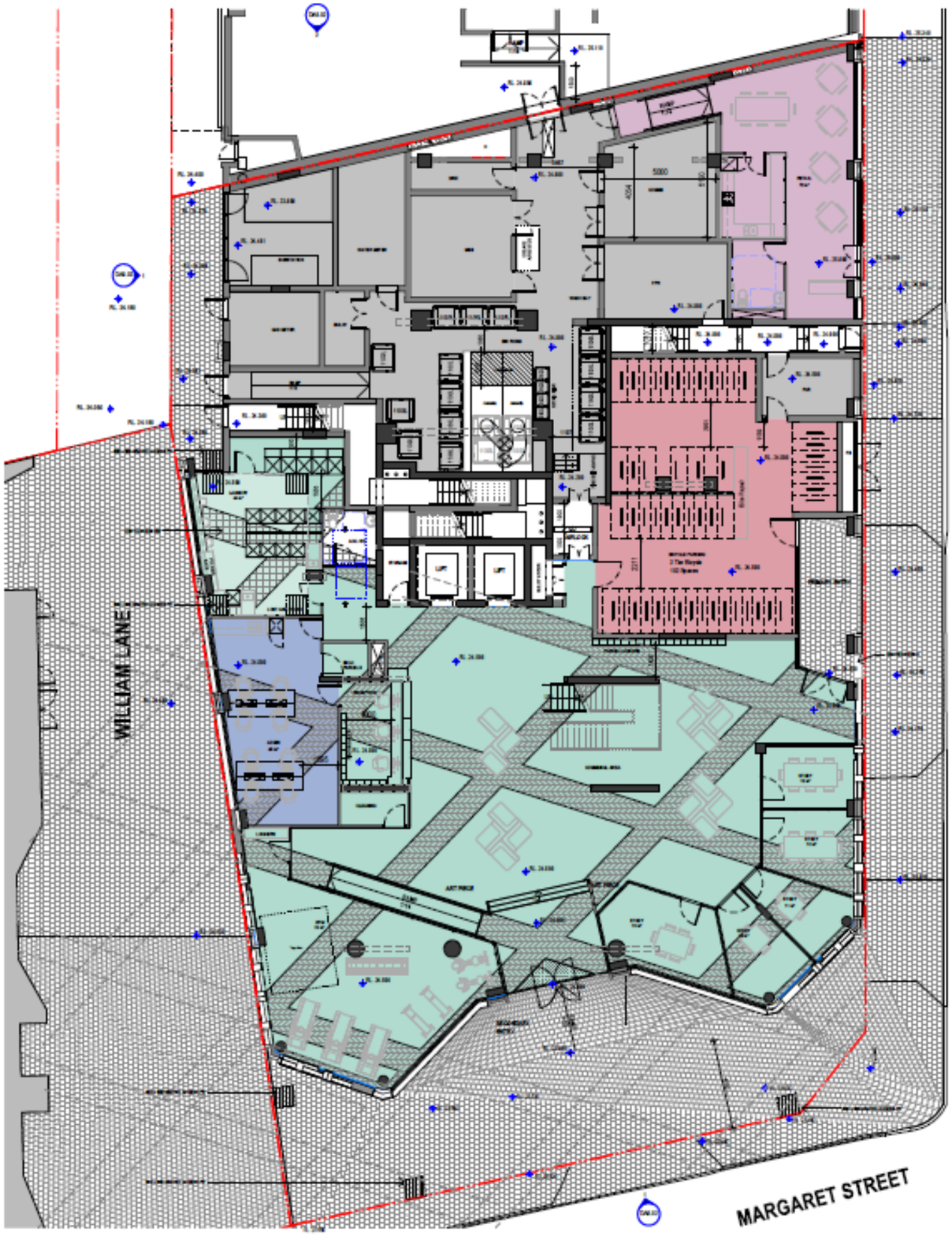
LTS
THIS IS THE PLAN REFERRED TO IN MY LETTER DATED:
Registered Surveyor NSW

Client: The Trust Company (Australia) Limited ATF Wit Redfern Trust
Drawing title: PLAN OF PARTIAL DETAIL AND LEVELS OVER PART OF LOT 10 IN DP 1026349 KNOWN AS No 104-116 REGENT STREET, REDFERN

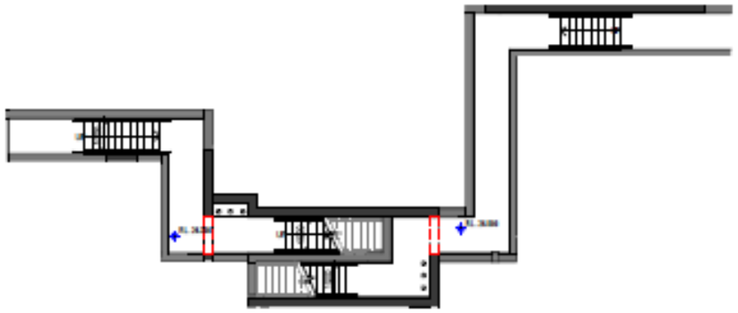
datum: AHD
site Area: N/A
LGA: SYDNEY
reference number: 51281 001DT
scale: 1:100 @A1
date of survey: 11/03/2021
SHEET 1 OF 1

FIGURE 2

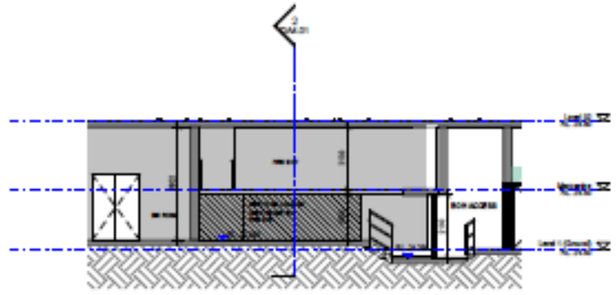
PROPOSED GROUND FLOOR DESIGN
104-116 REGENT STREET



1 Level 1 (Ground)
Floor Plan 1 : 100



1 Fire Exit Plan
Floor Plan 1 : 100



1 Section - Fire exit
Section 1 : 100

NOT FOR CONSTRUCTION

General Notes

1. All drawings to be read in conjunction with all consultants and sub-contractors documentation and reports.
2. All works to conform with the National Construction Code of Australia and Australian Standards.
3. Check all dimension on site and notify Antoniades Architects of any discrepancies.
4. Refer A20 Series for specifications, materials and products schedule for full scale description.

Legend

Property Boundary
Setbacks
Centreline
Hidden
RL 0.00 Level Marker (Plan)
RL 0.00 Level Marker (Elevation)
RL 0.00 Level Marker (Spot)
Room Tag
Room Number
Room Name
Room Area
Material Tag
See Material Board for scale reference
Section
Existing Elements (Projection)
Existing Elements (Cut)
Demolished Elements (Projection)
Demolished Elements (Cut)
Zone for Service Penetration
Earth
Concrete
Water feature
Tile
Carpet
Timber Floors
Glass
Glass/Floors
Brickwork
Metal/Sheet

Abbreviations

RL Relative Level (AHD)
FFL Finished Floor Level
AFFL Above FFL
TOW Top Of Wall Level
TOP Top of Parapet Level
F Storage Cupboard
R Wardrobe
T Full Height Pantry Cupboard

REV	DESCRIPTION	BY	DATE
A	Issued for Information		28.10.2021
B	Issued for coordination		29.11.2021

PROJECT PHASE
DEVELOPMENT APPLICATION

STATUS
PRELIMINARY

PROJECT NO.
2000SDA

PROJECT
REGENT STREET

ADDRESS
104-116 REGENT STREET

CLIENT
WEE HUR

SCALE As indicated@A1 NORTH

DRAWING TITLE
Entry Level

DRAWING NO. DA3.02 REVISION B DRN ZD CHK AA

ANTONIADES ARCHITECTS

www.antoniades.com.au
ACN 139 731 550

Nominated Architect: Andreas Antoniades
NSW Registration 7454

FIGURE 3
PROPOSED DESIGN
13-23 GIBBONS STREET

EXISTING COUNCIL STORMWATER PIPE

NOTE
IT IS PROPOSED TO UPGRADE THE DOWNSTREAM COUNCIL STORMWATER SYSTEM, TO ALLOW FOR THE CONNECTION OF THE PROPOSED REDEVELOPMENT OF 90-102 REGENT STREET TO WILLIAM LANE.

PROPOSED 1.8M EASEMENT TO BE OFFSET FROM BOUNDARY LINE

13 - 23 GIBBONS STREET

104 - 116 REGENT STREET

PROPOSED SYDNEY WATER SEWER SHOWN INDICATIVELY. REFER TO DOCUMENTATION BY THE WATER SERVICES COORDINATOR FOR DIVERSION WORKS.

NOTE
EXISTING COUNCIL Ø450 STORMWATER LINE SHOWN INDICATIVELY. CONTRACTOR TO UNDERTAKE CCTV SURVEY/TRACING TO CONFIRM EXACT LOCATION, DEPTH AND STATE OF REPAIR.

SWP3
COUNCIL KIP WITH 3.0m LINTEL
GRATE RL 23.98
IL 22.68

1.2m WIDE, 50mm DEEP VEGETATED SWALE, TO ACT AS DRAINAGE/OVERLAND FLOW PATH AND BE COORDINATED WITH LANDSCAPING CONSULTANT

SWP4
V-GRATE
900 x 900
RL 24.09
IL 22.47

SWP5
V-GRATE
900 x 900
RL 23.91
IL 22.32

HATCHED AREA DENOTES POSSIBLE EXTENTS OF SOFT LANDSCAPING TO BE REVIEWED BY LANDSCAPING CONSULTANT

EXISTING Ø300 STORMWATER LINE TO BE ABANDONED AND REMOVED

SWP6
V-GRATE
900 x 900
RL 23.50
IL 22.14

SWP7
RL 23.394
CONTRACTOR TO INVESTIGATE, LOCATE AND CONSTRUCT NEW 900 x 900 STANDARD JUNCTION PIT OVER EXISTING Ø450 COUNCIL STORMWATER SYSTEM IN ACCORDANCE WITH Cs6 COUNCIL REQUIREMENTS

PIPE TO CE CAPPED DOWNSTREAM OF EXISTING PIT IN ACCORDANCE WITH Cs6 COUNCIL REQUIREMENTS. ALL UPSTREAM PIT AND PIPE SYSTEM TO BE ABANDONED AND REMOVED.

EXISTING 300Ø COUNCIL STORMWATER PIPE TO BE RETAINED DOWNSTREAM OF COUNCIL JUNCTION PIT.

EXISTING Ø450 COUNCIL STORMWATER PIPE

EXISTING Ø600 COUNCIL STORMWATER PIPE

EXISTING EASEMENT

PROPOSED Ø225 SYDNEY WATER SEWER

MARGARET STREET

NOTES

1. ALL WORKS SHALL BE UNDERTAKEN IN ACCORDANCE WITH AS3500.3 PLUMBING & DRAINAGE PART 3: STORMWATER DRAINAGE, CITY OF SYDNEY STORMWATER DRAINAGE MANUAL AND THE LATEST BASIX REQUIREMENTS.
2. SWP4-6 TO BE FITTED WITH OCEANGUARD FILTRATION BASKETS OR APPROVED EQUIVALENT AS PART OF WSUD STRATEGY TO 13-23 GIBBONS ST.

1 : 100-A1 1 : 200-A3

REVISIONS / AMENDMENTS				REVISIONS / AMENDMENTS			
No	Date	Description	Verified	No	Date	Description	Verified
P1	15.10.21	ISSUE FOR REVIEW	M.S.				

All dimensions to be verified on site prior to commencement of any site work and/or off site construction. Figured dimensions to be taken in preference to scaled dimensions. This drawing is copyright and remains the property of JHA Consulting Engineers. Reproduction in whole or part of these drawings without written consent constitutes an infringement of copyright.

CLIENT: WEE HUR
ARCHITECT: ALLEN JACK COTTIER
CONSULTANT: JHA
PROJECT: WEE HUR REGENT
90-102 REGENT STREET, REDFERN, NSW 2016
TITLE: STORMWATER SERVICES
COUNCIL STORMWATER EXTENSION LAYOUT

PRELIMINARY ISSUE
NOT TO BE USED FOR CONSTRUCTION

DRAWN	J.M.	SCALE @ A1
CHECKED	J.S.	N.T.S.
APPROVED	J.S.	
CREATED	OCT 2021	
JOB No.	DRAWING No.	REV
190276	C401	P1

FIGURE 4
PROPOSED DESIGN
13-23 GIBBONS STREET

NEW CONCRETE PAVEMENT: REFER CIVIL WORKS DETAILS.

NEW PLANTING: REFER LANDSCAPE ARCHITECT'S DETAILS.

RW	NEW RETAINING WALL
K&G	NEW KERB AND GUTTER
MK	NEW MOUNTABLE KERB
Bo	NEW REMOVABLE METAL BOLLARDS
S1	NEW BENCH SEAT
d	DUMMY JOINT
k	DOWELLED KEY JOINT
3.80	DESIGN SPOT LEVEL
e3.80	EXISTING SPOT LEVEL
(2E)	2 EXTRA N12-100 BARS (TOP) x 1200 LONG
(2V)	2 EXTRA N12-100 V-BARS (TOP) x 1200 LONG
	DESIGN CONTOURS (0.1m)

NOTE:
REFER HYDRAULIC ENGINEER'S DRAWINGS FOR STORMWATER DRAINAGE DETAILS; INCLUDING SUB-SURFACE DRAINAGE ASSOCIATED WITH PERMEABLE PAVING.

FIGURE 5
ALEXANDRA CANAL CATCHMENT
PEAK FLOOD DEPTH
1% AEP EVENT
EXISTING CASE

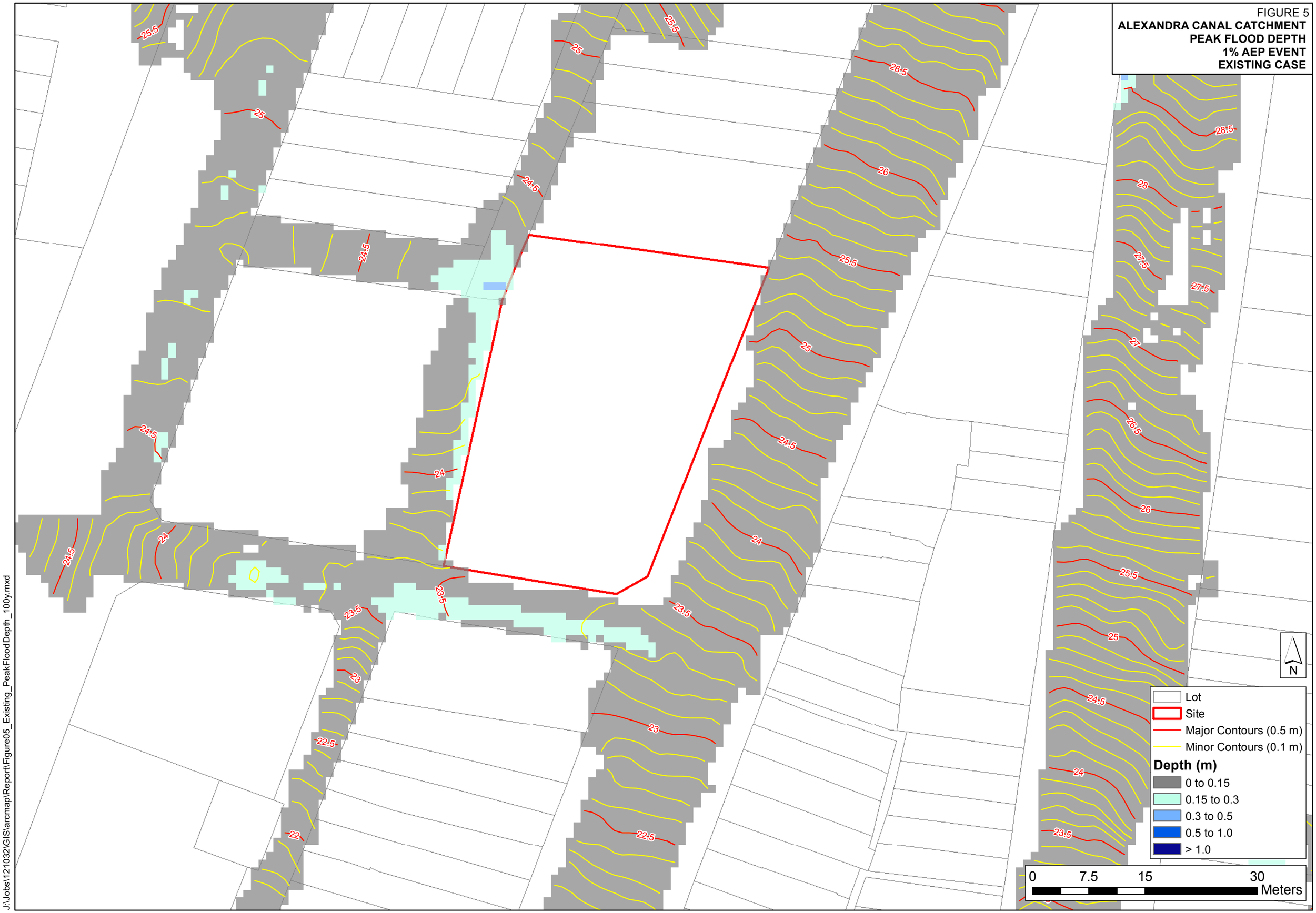


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FIGURE 6
ALEXANDRA CANAL CATCHMENT
PEAK FLOOD DEPTH
PMF EVENT
EXISTING CASE

N

Lot
Site
Major Contours (0.5 m)
Minor Contours (0.1 m)

Depth (m)
0 to 0.15
0.15 to 0.3
0.3 to 0.5
0.5 to 1.0
> 1.0

0 7.5 15 30
Meters

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FIGURE 7
ALEXANDRA CANAL CATCHMENT
PEAK FLOOD HAZARD
1% AEP EVENT
EXISTING CASE

N

Lot
Site

Hydraulic Hazard

H1 - Generrally safe for people, vehicules and buildings
H2 - Unsafe for small vehicles
H3 - Unsafe for vehicles, children and the elderly
H4 - Unsafe for people and vehicles
H5 - Unsafe for people or vehicles. All Buildings Vulnerable to structural damage. Some less robust building types vulnerable to failure
H6 - Unsafe for vehicles and people. All Building Types considered vulnerable to failure

0 7.5 15 30 Meters

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FIGURE 8
ALEXANDRA CANAL CATCHMENT
PEAK FLOOD HAZARD
PMF EVENT
EXISTING CASE

N

Lot
Site

Hydraulic Hazard

H1 - Generrally safe for people, vehicules and buildings
H2 - Unsafe for small vehicles
H3 - Unsafe for vehicles, children and the elderly
H4 - Unsafe for people and vehicles
H5 - Unsafe for people or vehicles. All Buildings Vulnerable to structural damage. Some less robust building types vulnerable to failure
H6 - Unsafe for vehicles and people. All Building Types considered vulnerable to failure

0 7.5 15 30
Meters

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FIGURE 9
ALEXANDRA CANAL CATCHMENT
PEAK FLOOD DEPTH
1% AEP EVENT
DESIGN CASE

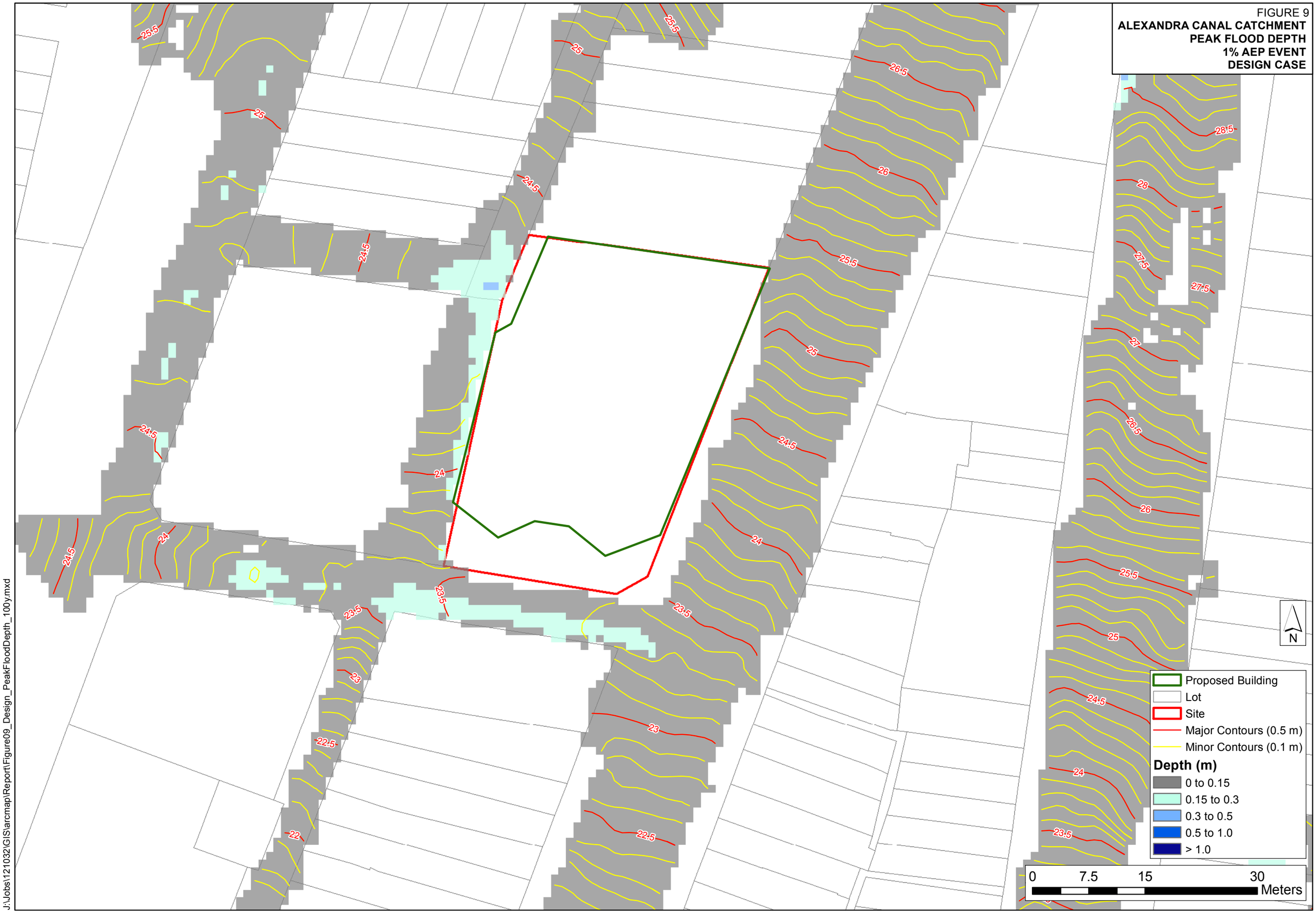

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FIGURE 10
ALEXANDRA CANAL CATCHMENT
PEAK FLOOD DEPTH
PMF EVENT
DESIGN CASE

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FIGURE 11
ALEXANDRA CANAL CATCHMENT
PEAK FLOOD HAZARD
1% AEP EVENT
DESIGN CASE

N

Proposed Building
Lot
Site

Hydraulic Hazard

H1 - Generrally safe for people, vehicules and buildings

H2 - Unsafe for small vehicles

H3 - Unsafe for vehicles, children and the elderly

H4 - Unsafe for people and vehicles

H5 - Unsafe for people or vehicles. All Buildings Vulnerable to structural damage. Some less robust building types vulnerable to failure

H6 - Unsafe for vehicles and people. All Building Types considered vulnerable to failure

0 7.5 15 30
Meters

J:\Jobs\121032\GIS\arcmap\Report\Figure11_Design_PeakFloodHazard_100y.mxd

FIGURE 12
ALEXANDRA CANAL CATCHMENT
PEAK FLOOD HAZARD
PMF EVENT
DESIGN CASE

N

Proposed Building
Lot
Site

Hydraulic Hazard

H1 - Generrally safe for people, vehicules and buildings
H2 - Unsafe for small vehicles
H3 - Unsafe for vehicles, children and the elderly
H4 - Unsafe for people and vehicles
H5 - Unsafe for people or vehicles. All Buildings Vulnerable to structural damage. Some less robust building types vulnerable to failure
H6 - Unsafe for vehicles and people. All Building Types considered vulnerable to failure

0 7.5 15 30
Meters

J:\Jobs\121032\GIS\arcmap\Report\Figure12_Design_PeakFloodHazard_PMF.mxd

Appendix A: Glossary of Terms

Appendix A

APPENDIX A: GLOSSARY OF TERMS

Taken from the Floodplain Development Manual (April 2005 edition)

acid sulfate soils	Are sediments which contain sulfidic mineral pyrite which may become extremely acid following disturbance or drainage as sulfur compounds react when exposed to oxygen to form sulfuric acid. More detailed explanation and definition can be found in the NSW Government Acid Sulfate Soil Manual published by Acid Sulfate Soil Management Advisory Committee.
Annual Exceedance Probability (AEP)	The chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage. For example, if a peak flood discharge of 500 m^3/s has an AEP of 5%, it means that there is a 5% chance (that is one-in-20 chance) of a 500 m^3/s or larger event occurring in any one year (see ARI).
Australian Height Datum (AHD)	A common national surface level datum approximately corresponding to mean sea level.
Average Annual Damage (AAD)	Depending on its size (or severity), each flood will cause a different amount of flood damage to a flood prone area. AAD is the average damage per year that would occur in a nominated development situation from flooding over a very long period of time.
Average Recurrence Interval (ARI)	The long term average number of years between the occurrence of a flood as big as, or larger than, the selected event. For example, floods with a discharge as great as, or greater than, the 20 year ARI flood event will occur on average once every 20 years. ARI is another way of expressing the likelihood of occurrence of a flood event.
caravan and moveable home parks	Caravans and moveable dwellings are being increasingly used for long-term and permanent accommodation purposes. Standards relating to their siting, design, construction and management can be found in the Regulations under the LG Act.
catchment	The land area draining through the main stream, as well as tributary streams, to a particular site. It always relates to an area above a specific location.
consent authority	The Council, Government agency or person having the function to determine a development application for land use under the EP&A Act. The consent authority is most often the Council, however legislation or an EPI may specify a Minister or public authority (other than a Council), or the Director General of DIPNR, as having the function to determine an application.
development	Is defined in Part 4 of the Environmental Planning and Assessment Act (EP&A Act). **infill development:** refers to the development of vacant blocks of land that are generally surrounded by developed properties and is permissible under the current zoning of the land. Conditions such as minimum floor levels may be imposed on infill development. **new development:** refers to development of a completely different nature to that associated with the former land use. For example, the urban subdivision of an area previously used for rural purposes. New developments involve rezoning and typically require major extensions of existing urban services, such as roads, water supply, sewerage and electric power. **redevelopment:** refers to rebuilding in an area. For example, as urban areas age, it may become necessary to demolish and reconstruct buildings on a relatively large scale. Redevelopment generally does not require either rezoning or major extensions to urban services.
disaster plan (DISPLAN)	A step by step sequence of previously agreed roles, responsibilities, functions, actions and management arrangements for the conduct of a single or series of connected emergency operations, with the object of ensuring the coordinated response by all agencies having responsibilities and functions in emergencies.

discharge	The rate of flow of water measured in terms of volume per unit time, for example, cubic metres per second (m^3/s). Discharge is different from the speed or velocity of flow, which is a measure of how fast the water is moving for example, metres per second (m/s).
ecologically sustainable development (ESD)	Using, conserving and enhancing natural resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be maintained or increased. A more detailed definition is included in the Local Government Act 1993. The use of sustainability and sustainable in this manual relate to ESD.
effective warning time	The time available after receiving advice of an impending flood and before the floodwaters prevent appropriate flood response actions being undertaken. The effective warning time is typically used to move farm equipment, move stock, raise furniture, evacuate people and transport their possessions.
emergency management	A range of measures to manage risks to communities and the environment. In the flood context it may include measures to prevent, prepare for, respond to and recover from flooding.
flash flooding	Flooding which is sudden and unexpected. It is often caused by sudden local or nearby heavy rainfall. Often defined as flooding which peaks within six hours of the causative rain.
flood	Relatively high stream flow which overtops the natural or artificial banks in any part of a stream, river, estuary, lake or dam, and/or local overland flooding associated with major drainage before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves overtopping coastline defences excluding tsunami.
flood awareness	Flood awareness is an appreciation of the likely effects of flooding and a knowledge of the relevant flood warning, response and evacuation procedures.
flood education	Flood education seeks to provide information to raise awareness of the flood problem so as to enable individuals to understand how to manage themselves and their property in response to flood warnings and in a flood event. It invokes a state of flood readiness.
flood fringe areas	The remaining area of flood prone land after floodway and flood storage areas have been defined.
flood liable land	Is synonymous with flood prone land (i.e. land susceptible to flooding by the probable maximum flood (PMF) event). Note that the term flood liable land covers the whole of the floodplain, not just that part below the flood planning level (see flood planning area).
flood mitigation standard	The average recurrence interval of the flood, selected as part of the floodplain risk management process that forms the basis for physical works to modify the impacts of flooding.
floodplain	Area of land which is subject to inundation by floods up to and including the probable maximum flood event, that is, flood prone land.
floodplain risk management options	The measures that might be feasible for the management of a particular area of the floodplain. Preparation of a floodplain risk management plan requires a detailed evaluation of floodplain risk management options.
floodplain risk management plan	A management plan developed in accordance with the principles and guidelines in this manual. Usually includes both written and diagrammatic information describing how particular areas of flood prone land are to be used and managed to achieve defined objectives.

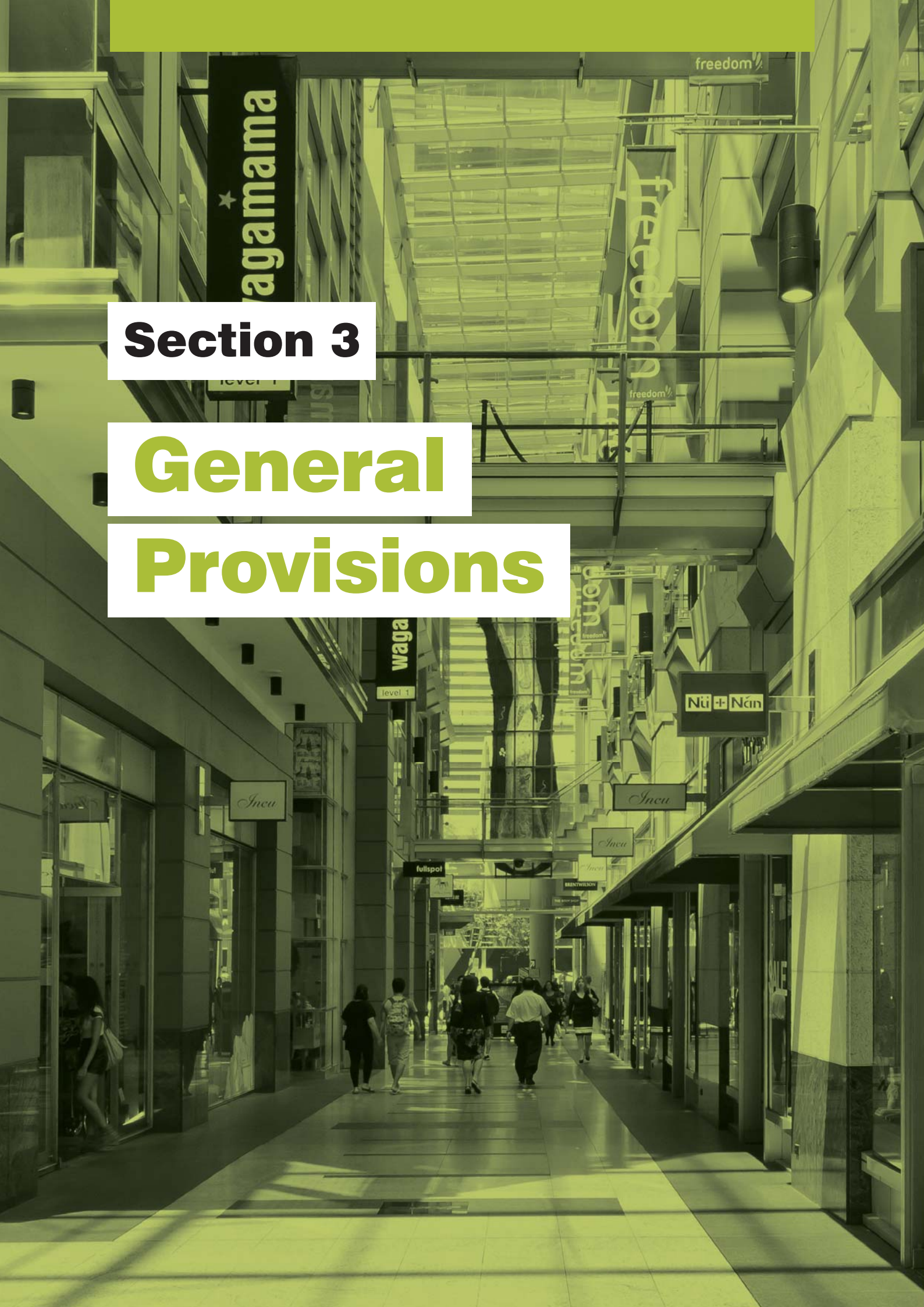
flood plan (local)	A sub-plan of a disaster plan that deals specifically with flooding. They can exist at State, Division and local levels. Local flood plans are prepared under the leadership of the State Emergency Service.
flood planning area	The area of land below the flood planning level and thus subject to flood related development controls. The concept of flood planning area generally supersedes the flood liable land concept in the 1986 Manual.
Flood Planning Levels (FPLs)	FPLs are the combinations of flood levels (derived from significant historical flood events or floods of specific AEPs) and freeboards selected for floodplain risk management purposes, as determined in management studies and incorporated in management plans. FPLs supersede the standard flood event in the 1986 manual.
flood proofing	A combination of measures incorporated in the design, construction and alteration of individual buildings or structures subject to flooding, to reduce or eliminate flood damages.
flood prone land	Is land susceptible to flooding by the Probable Maximum Flood (PMF) event. Flood prone land is synonymous with flood liable land.
flood readiness	Flood readiness is an ability to react within the effective warning time.
flood risk	Potential danger to personal safety and potential damage to property resulting from flooding. The degree of risk varies with circumstances across the full range of floods. Flood risk in this manual is divided into 3 types, existing, future and continuing risks. They are described below. **existing flood risk:** the risk a community is exposed to as a result of its location on the floodplain. **future flood risk:** the risk a community may be exposed to as a result of new development on the floodplain. **continuing flood risk:** the risk a community is exposed to after floodplain risk management measures have been implemented. For a town protected by levees, the continuing flood risk is the consequences of the levees being overtopped. For an area without any floodplain risk management measures, the continuing flood risk is simply the existence of its flood exposure.
flood storage areas	Those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood. The extent and behaviour of flood storage areas may change with flood severity, and loss of flood storage can increase the severity of flood impacts by reducing natural flood attenuation. Hence, it is necessary to investigate a range of flood sizes before defining flood storage areas.
floodway areas	Those areas of the floodplain where a significant discharge of water occurs during floods. They are often aligned with naturally defined channels. Floodways are areas that, even if only partially blocked, would cause a significant redistribution of flood flows, or a significant increase in flood levels.
freeboard	Freeboard provides reasonable certainty that the risk exposure selected in deciding on a particular flood chosen as the basis for the FPL is actually provided. It is a factor of safety typically used in relation to the setting of floor levels, levee crest levels, etc. Freeboard is included in the flood planning level.
habitable room	**in a residential situation:** a living or working area, such as a lounge room, dining room, rumpus room, kitchen, bedroom or workroom. **in an industrial or commercial situation:** an area used for offices or to store valuable possessions susceptible to flood damage in the event of a flood.
hazard	A source of potential harm or a situation with a potential to cause loss. In relation to this manual the hazard is flooding which has the potential to cause damage to

	the community. Definitions of high and low hazard categories are provided in the Manual.
hydraulics	Term given to the study of water flow in waterways; in particular, the evaluation of flow parameters such as water level and velocity.
hydrograph	A graph which shows how the discharge or stage/flood level at any particular location varies with time during a flood.
hydrology	Term given to the study of the rainfall and runoff process; in particular, the evaluation of peak flows, flow volumes and the derivation of hydrographs for a range of floods.
local overland flooding	Inundation by local runoff rather than overbank discharge from a stream, river, estuary, lake or dam.
local drainage	Are smaller scale problems in urban areas. They are outside the definition of major drainage in this glossary.
mainstream flooding	Inundation of normally dry land occurring when water overflows the natural or artificial banks of a stream, river, estuary, lake or dam.
major drainage	Councils have discretion in determining whether urban drainage problems are associated with major or local drainage. For the purpose of this manual major drainage involves: • the floodplains of original watercourses (which may now be piped, channelised or diverted), or sloping areas where overland flows develop along alternative paths once system capacity is exceeded; and/or • water depths generally in excess of 0.3 m (in the major system design storm as defined in the current version of Australian Rainfall and Runoff). These conditions may result in danger to personal safety and property damage to both premises and vehicles; and/or • major overland flow paths through developed areas outside of defined drainage reserves; and/or • the potential to affect a number of buildings along the major flow path.
mathematical/computer models	The mathematical representation of the physical processes involved in runoff generation and stream flow. These models are often run on computers due to the complexity of the mathematical relationships between runoff, stream flow and the distribution of flows across the floodplain.
merit approach	The merit approach weighs social, economic, ecological and cultural impacts of land use options for different flood prone areas together with flood damage, hazard and behaviour implications, and environmental protection and well being of the State's rivers and floodplains. The merit approach operates at two levels. At the strategic level it allows for the consideration of social, economic, ecological, cultural and flooding issues to determine strategies for the management of future flood risk which are formulated into Council plans, policy and EPIs. At a site specific level, it involves consideration of the best way of conditioning development allowable under the floodplain risk management plan, local floodplain risk management policy and EPIs.
minor, moderate and major flooding	Both the State Emergency Service and the Bureau of Meteorology use the following definitions in flood warnings to give a general indication of the types of problems expected with a flood: **minor flooding:** causes inconvenience such as closing of minor roads and the submergence of low level bridges. The lower limit of this class of flooding on the reference gauge is the initial flood level at which landholders and townspeople begin to be flooded.

	moderate flooding: low-lying areas are inundated requiring removal of stock and/or evacuation of some houses. Main traffic routes may be covered. **major flooding:** appreciable urban areas are flooded and/or extensive rural areas are flooded. Properties, villages and towns can be isolated.
modification measures	Measures that modify either the flood, the property or the response to flooding. Examples are indicated in Table 2.1 with further discussion in the Manual.
peak discharge	The maximum discharge occurring during a flood event.
Probable Maximum Flood (PMF)	The PMF is the largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation, and where applicable, snow melt, coupled with the worst flood producing catchment conditions. Generally, it is not physically or economically possible to provide complete protection against this event. The PMF defines the extent of flood prone land, that is, the floodplain. The extent, nature and potential consequences of flooding associated with a range of events rarer than the flood used for designing mitigation works and controlling development, up to and including the PMF event should be addressed in a floodplain risk management study.
Probable Maximum Precipitation (PMP)	The PMP is the greatest depth of precipitation for a given duration meteorologically possible over a given size storm area at a particular location at a particular time of the year, with no allowance made for long-term climatic trends (World Meteorological Organisation, 1986). It is the primary input to PMF estimation.
probability	A statistical measure of the expected chance of flooding (see AEP).
risk	Chance of something happening that will have an impact. It is measured in terms of consequences and likelihood. In the context of the manual it is the likelihood of consequences arising from the interaction of floods, communities and the environment.
runoff	The amount of rainfall which actually ends up as streamflow, also known as rainfall excess.
stage	Equivalent to water level. Both are measured with reference to a specified datum.
stage hydrograph	A graph that shows how the water level at a particular location changes with time during a flood. It must be referenced to a particular datum.
survey plan	A plan prepared by a registered surveyor.
water surface profile	A graph showing the flood stage at any given location along a watercourse at a particular time.
wind fetch	The horizontal distance in the direction of wind over which wind waves are generated.

City of Sydney's DCP Section 3.7 only

Appendix B



Section 3

General Provisions

3 General Provisions

Contents

3.7
Water and Flood Management

Terms used in this section are consistent with the NSW Floodplain Development Manual 2005.

Objectives

(a) Ensure an integrated approach to water management across the City through the use of water sensitive urban design principles.

(b) Encourage sustainable water use practices.

(c) Assist in the management of stormwater to minimise flooding and reduce the effects of stormwater pollution on receiving waterways.

(d) Ensure that development manages and mitigates flood risk, and does not exacerbate the potential for flood damage or hazard to existing development and to the public domain.

(e) Ensure that development above the flood planning level as defined in the Sydney LEP 2012 will minimise the impact of stormwater and flooding on other developments and the public domain both during the event and after the event.

(f) Ensure that flood risk management addresses public safety and protection from flooding.

Note: A number of flood studies are currently underway. New development will be required to conform to the flood studies once endorsed by Council.

Provisions

3.7.1 Site specific flood study

(1) When required by Clause 7.15 of Sydney LEP 2012, a site-specific flood study is to be prepared by a suitably qualified and experienced hydrologist in accordance with the NSW Floodplain Development Manual 2005, the NSW Coastal Planning Guideline: Adapting to Sea Level Rise, NSW Coastal Risk Management Guide: Incorporating Sea Level Rise Benchmarks In Coastal Risk Assessments and the NSW Flood Risk Management Guide: Incorporating Sea Level Rise Benchmarks In Flood Risk Assessments.

(2) The site-specific flood study is to include, but not be limited to:

  (a) a detailed topographical survey that defines flow paths, storage areas and hydraulic controls; and

  (b) flood modelling that uses appropriate hydrological and hydraulic techniques and incorporates boundary conditions.

(3) The site-specific flood study is to show pre-development and post-development scenarios, and at a minimum is to include the following information:

  (a) water surface contours;

  (b) velocity vectors;

  (c) velocity and depth product contours;

  (d) delineation of flood risk precincts; and

  (e) flood profiles for the full range of events for total development including all structures and works (such as revegetation and physical enhancements).

(4) The site-specific flood study is to assume the 'worst case scenario' conditions for blockages to pipes, culverts and other infrastructure, such that:

(a) kerb inlets are assumed to be 50% blocked;

(b) sag pits are assumed to be 100% blocked; and

(c) culverts and bridges with an open area less than six metres, measured on the diagonal, are assumed to be 50% blocked.

3.7.2 Drainage and stormwater management

These provisions are supported by the *Stormwater management map*. The map identifies the catchments with specific stormwater management requirements and also those areas where stormwater is required to be integrated with open space.

(1) A local drainage management plan is required for development on sites of:

(a) 1,000sqm or more in the Fowler's Creek catchment area and drains to Johnston's Creek as shown on the *Stormwater management map*; or

(b) 1,800sqm or more in other catchments.

(2) The Local Drainage Management Plan is to address:

(a) the hydrology of the locality and its relationship to the drainage system;

(b) the distribution of soil types and the scope for on-site infiltration;

(c) any expected rise in ground water level due to development;

(d) the role of the principal landscape components on the site for water conservation and on-site detention;

(e) the scope for on-site stormwater detention and retention, including collection of water for re-use;

(f) how any detrimental impacts on the existing natural hydrology and water quality are proposed to be minimised;

(g) how pedestrian safety is to be ensured; and

(h) integration of drainage management responses and open space areas.

(3) A suitably qualified engineer with experience in drainage design is to assess the site drainage requirements for the proposed development, and prepare the required local drainage management plan in accordance with the provisions of this DCP.

(4) Development on sites identified in the *Stormwater management map*, are to provide on-site stormwater detention within open space areas.

(5) Drainage systems are to be designed so that:

(a) on a site with an area less than or equal to 1,000sqm:

(i) stormwater flows up to the 20% annual exceedance probability event are conveyed by a minor drainage system; and

(ii) stormwater flows above the 20% annual exceedance probability event are conveyed by a major drainage system;

(b) on a site with an area greater than 1,000sqm:

(i) stormwater flows up to the 5% annual exceedance probability event are conveyed by a minor drainage system; and

(ii) stormwater flows above the 5% annual exceedance probability event are conveyed by a major drainage system.

(6) The development proposal must demonstrate how the major drainage system addresses any site-specific conditions and connects to the downstream drainage system.

(7) Major drainage systems are to be designed so that ensures that public safety is not compromised.

(8) Minor flows from a development site are not to be discharged to the kerb if direct connection to an existing stormwater pipe is available, unless it can be demonstrated there is sufficient capacity within the existing gutter and the flow velocity and depth within the gutter will remain below 400mm.

(9) Where the proposed development is located on a floodplain, high level overflows are permitted for roof drainage systems where the overflow is set above the 1% annual exceedance probability level.

(10) Connection to existing stormwater infrastructure are not to reduce the capacity of that infrastructure by more than 10%. The development proposal is to show the level of impact on the existing stormwater infrastructure as a result of the proposed new connection.

(11) The post development run-off from impermeable surfaces (such as roofs, driveways and paved areas) is to be managed by stormwater source measures that:

(a) contain frequent low-magnitude flows;

(b) maintain the natural balance between run-off and infiltration;

(c) remove some pollutants prior to discharge into receiving waters;

(d) prevent nuisance flows from affecting adjacent properties; and

(e) enable appropriate use of rainwater and stormwater.

(12) Post-development stormwater volumes during an average rainfall year are to be:

(a) 70% of the volume if no measures were applied to reduce stormwater volume; or

(b) the equivalent volume generated if the site were 50% pervious, whichever results in the greater volume of detention required.

(13) Stormwater detention devices are to be designed to ensure that the overflow and flowpath have sufficient capacity during all design rainfall events, discharge to the public stormwater system without affecting adjoining properties, and are free of obstructions, such as fences.

(14) Where filtration and bio-retention devices are proposed, they are to be designed to capture and provide temporary storage for stormwater.

(15) Car parking areas and access aisles are to be designed, surfaced and graded to reduce run-off, allow stormwater to be controlled within the site, and provide for natural infiltration of stormwater runoff through landscaping.

3.7.3 Stormwater quality

(1) Development of a site greater than 1,000sqm must undertake a stormwater quality assessment to demonstrate that the development will achieve the post-development pollutant load standards indicated below:

(a) reduce the baseline annual pollutant load for litter and vegetation larger than 5mm by 90%;

(b) reduce the baseline annual pollutant load for total suspended solids by 85%;

(c) reduce the baseline annual pollutant load for total phosphorous by 65%; and

(d) reduce the baseline annual pollutant load for total nitrogen by 45%.

(2) The stormwater quality assessment is to be prepared by a suitably qualified engineer with experience in water sensitive urban design (WSUD) and include:

(a) modelling of pollutant load standards with an industry standard water quality model;

(b) the design of WSUD measures used to achieve the post-development pollutant load standards; and

(c) maintenance schedules of any proposed WSUD measure that requires maintenance or full replacement including the likely recycling or disposal location of any wastes that may be generated.

(3) Development on a site with an area less than 1,000sqm is to be designed so that the flow of pollutants from the site due to stormwater is reduced.

3.7.4 Additional provisions for commercial and industrial properties

(1) Development proposals for service stations, motor showrooms, vehicle repair stations and vehicle body repair workshops are to capture all stormwater up to the 3 month average recurrence interval event within the site to reduce the risk of stormwater pollution caused by spilled contaminants. The critical duration storm for the property and the 24 hour duration storm should be analysed.

(2) Drainage and waste disposal is to be conducted to the levels specified by the NSW Environmental Protection Authority.

3.7.5 Water re-use, recycling and harvesting

(1) Development proposals that seek to re-use water runoff from paved surfaces for irrigation and wash down purposes are to incorporate measures into the design of the development that will treat the water to ensure that it is fit for this purpose. These measures are to clean the water to exclude contaminants such as litter, sediment and oil.

City of Sydney's Interim Floodplain Management Policy 12 May 2014

Appendix C

Interim Floodplain Management Policy

Purpose

The Floodplain Management Policy provides direction with respect to how floodplains are managed within the Local Government Area (LGA) of the City of Sydney Council (the City).

The City has a responsibility to manage floodplains to ensure that any:

- new development will not experience undue flood risk; and
- existing development will not be adversely flood affected through increased damage or hazard as a result of any new development.

The Policy provides controls to facilitate a consistent, technically sound and best practice approach for the management of flood risk within the City's LGA. In forthcoming years the City will complete Floodplain Risk Management Plans and then integrate outcomes from these plans into planning controls. Once this process is completed this interim policy will be withdrawn.

Scope

This Policy applies to all new developments within the City of Sydney.

Definitions

Term	Meaning
Annual Exceedance Probability (AEP)	The chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage. 1% AEP flood is approximately equal to 1 in 100 year Average Recurrent Interval (ARI) flood event (or simply 100 year flood). It has 1% chance to occur in a given year.
Australian Height Datum (AHD)	A common national plan of level corresponding approximately to mean sea level.
Average Recurrence Interval (ARI)	The long-term average number of years between the occurrence of a flood as big as or larger than, the selected event. For example, floods with a discharge as great as, or greater than, the 20 year ARI flood event may occur on average once every 20 years.

Term	Meaning
Basement Car Parking or Below-Ground Car Parking	The car parking area generally below ground level where inundation of the surrounding areas may raise water levels above the entry level to the basement, resulting in inundation. Basement car parks are areas where the means of drainage of accumulated water in the car park has an outflow discharge capacity significantly less than the potential inflow capacity.
Below-Ground Garage/Car park	Applies where the floor of the parking and/or access surface is more than 1 m below the surrounding natural ground.)
Carport	A structure used to house motor vehicles, which has a minimum of two sides "open" and not less than one third of its perimeter "open".
Critical Facilities	Includes hospitals and ancillary services, communication centres, police, fire SES, major transport facilities, sewerage and electricity plants; any installations containing critical infrastructure control equipment and any operational centres for use in a flood.
Effective Warning Time	The time available after receiving advice of an impending flood and before the floodwaters prevent appropriate flood response actions being undertaken. The effective warning time is typically used to raise furniture, evacuate people and transport their possessions.
Evacuation	The transfer of people and or stock from areas where flooding is likely, either close to, or during a flood event. It is affected not only by warning time available, but also the suitability of the road network, available infrastructure, and the number of people that have to evacuate during floods.
Extreme Flood	An estimate of the probable maximum flood (PMF), which is the largest flood that could conceivably occur at a particular location, generally estimated from the probable maximum precipitation (PMP). Generally it is not physically or economically possible to provide complete protection against this event.
Flood	A relatively high stream flow that overtops the natural or artificial banks in any part of a stream, channel, river, estuary, lake or dam, and/or local overland flooding associated with major drainage as defined by the NSW Floodplain Development Manual (FDM) before entering a watercourse, and/or coastal inundation resulting from super-elevated sea levels and/or waves overtopping coastline defences excluding tsunami.
Flood Compatible Materials	Those materials used in building which are resistant to damage when inundated. A list of flood compatible materials is attached.
Flood Evacuation Strategy	The proposed strategy for the evacuation of areas with effective warning time during periods of flood as specified within any policy of Council, the floodplain risk management plan (FRMP), the relevant state government disaster plan, by advices received from the State Emergency Services (SES) or as determined in the assessment of individual proposals.
Floodplain	The area of land which is subject to inundation by floods up to and including the probable maximum flood (PMF) event.

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CITY OF SYDNEY
2030

Term	Meaning
Floodplain Development Manual (FDM)	The document dated April 2005, published by the New South Wales Government and entitled 'Floodplain Development Manual: the management of flood liable land'.
Flood Planning Area	The area of land below the FPL and thus subject to flood related development controls.
Flood Planning Level (FPL)	The combinations of flood levels and freeboards selected for floodplain risk management purposes, as determined in flood studies and floodplain risk management studies and plans.
Floodplain Risk Management Plan (FRMP)	A plan prepared for one or more floodplains in accordance with the requirements of the FDM or its predecessor.
Floodplain Risk Management Study (FRMS)	A study prepared for one or more floodplains in accordance with the requirements of the FDM or its predecessor.
Flood Storage	Those parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood.
Floodway	Those areas, often aligned with obvious naturally defined channels, where a significant discharge of water occurs during floods. They are also areas where, if only partially blocked, will cause a significant redistribution of flood flow or significant increase in flood levels, which many impact on other properties.
Freeboard	A factor of safety expressed as the height above the design flood level. Freeboard provides a factor of safety to compensate for uncertainties in the estimation of flood levels across the floodplain, such as wave action; localised hydraulic behaviour and impacts that are specific event related, such as levee and embankment settlement; cumulative impacts of fill in floodplains and other effects such as changes in rainfall patterns as a result of climate change.
Garage	A private building or part of a building used to park or keep a motor vehicle and that is not defined as a carport.
Habitable Floor Area	• in a residential situation: a living or working area, such as a lounge room, dining room, rumpus room, kitchen, bedroom or workroom; • in an industrial or commercial situation: an area used for offices or to store valuable possessions susceptible to flood damage in the event of a flood.
Hazardous Materials	Solids, liquids, or gases that can harm people, other living organisms, property, or the environment. These may include materials that are radioactive, flammable, explosive, corrosive, oxidizing, asphyxiating, bio-hazardous, toxic, pathogenic, or allergenic. Also included are physical conditions such as compressed gases and liquids or hot materials, including all goods containing such materials or chemicals, or may have other characteristics that render them hazardous in specific circumstances.
Large Scale Development	For the purposes of this document refers to a proposal that involves site disturbance 1000m2 of land or greater.

Term	Meaning
Local Overland ~~Flooding~~ Flow Path	Inundation by local runoff rather than overbank discharge from a stream, river, estuary, lake or dam.
Probable Maximum Flood (PMF)	The largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation.
Probable Maximum Precipitation (PMP)	The greatest depth of precipitation for a given duration meteorologically possible over a given size storm area at a particular location at a particular time of the year, with no allowance made for long-term climatic trends (World Meteorological Organisation, 1986). It is the primary input to the estimation of the probable maximum flood.
Reliable Access During A Flood	The ability for people to safely evacuate an area subject to imminent flooding within effective warning time, having regard to the depth and velocity of flood waters, the suitability of the evacuation route, and without a need to travel through areas where flood hazard increases
Section 149 Planning Certificate	Information, including the statutory planning controls that apply to a parcel of land on the date the certificate is issued.
Shed	Includes machinery sheds, garden and storage sheds but does not include a garage or car park.
Suitably Qualified Engineer	An engineer who is included in the National Professional Engineers Register, administered by the Institution of Engineers Australia.
Survey plan	A plan prepared by a Registered Surveyor which shows the information required for the assessment of an application in accordance with the provisions of this Policy.

Policy statement

1 Introduction

The Policy has been prepared in accordance with the guidelines provided in the NSW Government Floodplain Development Manual (2005) (FDM). This manual guides Council in the development and implementation of local Floodplain Risk Management Plans to produce robust and effective floodplain risk management outcomes.

In accordance with the FDM, the Flood Risk Management Process entails four sequential stages:

- Stage 1:Flood Study
- Stage 2:Floodplain Risk Management Study
- Stage 3:Floodplain Risk Management Plan
- Stage 4:Implementation of the Plan

The City is progressively producing Floodplain Risk Management Plans for each of the individual drainage catchments within the City's LGA. Floodplain Risk Management Plans consider the existing flood environment and recommend specific measures to manage the impact of flooding. In assessing the flood environment, elements such as known flood behaviour, evacuation issues, site access and the potential impact of sea level rise are taken into consideration. This information is used to create floodplain risk mapping for each catchment.

Floodplain Risk Management Plans provide a range of measures that can be used to mitigate the impact of flooding. Invariably one of the most successful measures is the implementation of effective land use planning. This document provides the means for implementing the Floodplain Risk Management Plans and associated mapping for the control of development on the floodplain within the City.

1.1 Aims and Objectives of the Policy

- To inform the community of the City's Policy with regard to the use of flood prone land;
- To establish guidelines for the development of flood prone land that are consistent with the NSW Flood Policy and NSW Floodplain Development Manual (2005) as updated by the Floodplain Management Guides;
- To control development and activity within each of the individual floodplains within the City having regard to the characteristics and level of information available for each of the floodplains;
- To minimise the risk to human life and damage to property by controlling development on flood prone land;
- To apply a merit based approach to all development decisions taking into account ecological, social and environmental considerations;
- To ensure that the development or use of floodplains does not adversely impact upon the aesthetic, recreational and ecological values of the waterway corridors;
- To ensure that all land uses and essential services are appropriately sited and designed in recognition of all potential floods;
- To ensure that all development on the floodplain complies with Ecologically Sustainable Development (ESD) principles and guidelines; and
- To promote building design that considers requirements for the development of flood prone land and to ensure that the development of flood prone land does not have significant impacts upon the amenity of an area.

1.2 Background

This Policy has been prepared having regard to the provisions of the NSW Flood Policy and NSW Floodplain Development Manual (2005).

Sydney Local Environmental Plan 2012 (Sydney LEP 2012) requires the consent authority to be satisfied that all new development adequately protects the safety of property and life, and avoid significant adverse impacts on flood behaviour and the environment. Specified flood planning controls apply to all land which is at or below the flood planning level. The requirements set out in Sydney LEP 2012 must be met before development consent is granted.

This Policy is to be read in conjunction with the provisions of Sydney LEP 2012 and Sydney DCP 2012.

1.3 Relationship to other Policies

This Policy is to be read in conjunction with Sydney LEP 2012 and Sydney DCP 2012. It includes but is not limited to the development types listed below:

- Single dwellings, terraces, and dual occupancy buildings;
- Residential flat, commercial and mixed use developments;
- Industrial developments; and
- Other development types and uses, as detailed in the Sydney DCP 2012.

In conjunction with the development type requirements, the Sydney LEP 2012 and Sydney DCP 2012 also require:

- Sustainable water use practices;
- The reduction of stormwater pollution on receiving waterways; and
- That development does not exacerbate the potential for flood damage or hazard for existing development or public domain.

1.4 Application of Policy

The policy is written in an objectives/requirements format. Where an applicant seeks variation from the requirements, appropriate written justification indicating how the proposal meets the relevant objectives, must be provided for the consideration of Council.

2 Application Requirements

2.1 Required Information

Applications must include information that addresses all relevant controls listed within this document and the following matters as applicable:

a Development applications affected by this Policy shall be accompanied by a survey plan showing:

- i the position of the existing building/s or proposed building/s;
- ii the existing ground levels and features to Australian Height Datum around the perimeter of the site and contours of the site; and
- iii the existing or proposed floor levels to Australian Height Datum.

b Applications for earthworks, filling of land, infrastructure and subdivision shall be accompanied by a survey plan (with a minimum contour interval of 0.25m) showing relative levels to Australian Height Datum.

c For large scale developments, or developments that in the opinion of the City are in critical situations, where an existing catchment based flood study is not available, a flood assessment report prepared by a suitably qualified engineer using a hydrologic and hydraulic dynamic one or two dimensional computer model.

d Where the controls for a particular development proposal require an assessment of structural soundness during potential floods, the following impacts must be addressed:

- iv hydrostatic pressure;
- v hydrodynamic pressure;
- vi impact of debris; and
- vii buoyancy forces.

Foundations need to be included in the structural analysis. Scour protection may be required at foundations.

3 Development Provisions

The Department of Planning and Infrastructure has produced a group of Model Local Provisions for inclusion in Local Environmental Plans. The Model Local Provisions have been produced to address common topics raised by Councils in Local Environmental Plan preparation and provide them with guidance in what is to be considered in the assessment of development proposals. The Model Clause for Flood Planning has been adopted as clause 7.15 in Sydney LEP 2012. The Performance Criteria listed under Section 3.2 below reflects the considerations specified in Sydney LEP 2012.

Sydney DCP 2012 provides prescriptive planning controls in Section 3.7. The objectives of these planning controls are to:

- Ensure an integrated approach to water management across the City through the use of water sensitive urban design principles.
- Encourage sustainable water use practices.
- Assist in the management of stormwater to minimise flooding and reduce the effects of stormwater pollution on receiving waterways.
- Ensure that development manages and mitigates flood risk, and does not exacerbate the potential for flood damage or hazard to existing development and to the public domain.
- Ensure that development above the flood planning level as defined in the Sydney LEP 2012 will minimise the impact of stormwater and flooding on other developments and the public domain both during the event and after the event.

Note: A number of flood studies and associated flood risk management plans are currently under development. New development will be required to conform to the requirements of these flood studies and associated flood risk management plans once endorsed by Council.

3.1 Performance Criteria

If a proposal does not meet the requirements of the relevant Prescriptive Provisions, consent must not be granted to development unless the consent authority is satisfied with the following the provision and assessment of information relating to the development. The development:

a is compatible with the established flood hazard of the land. In areas where flood hazard has not been established through previous studies or reports, the flood hazard must be established in accordance with the Floodplain Development Manual considering the following:

- i Impact of flooding and flood liability is to be managed ensuring the development does not divert floodwaters or interfere with flood storage or the natural function of the waterway;
- ii Flood behaviour (for example, flood depths reached, flood flow velocities, flood hazard, rate of rise of floodwater);
- iii Duration of flooding for a full range of events;
- iv Appropriate flood mitigation works;
- v Freeboard;
- vi Council's duty of care – Proposals to address or limit; and
- vii Depth and velocity of flood waters for relevant flood events.

b will not significantly adversely affect flood behaviour resulting in detrimental increases in the potential flood affectation of other development or properties;

c incorporates appropriate measures to manage risk to life from flood considering the followings:

- i The proposed development should not result in any increased risk to human life
- ii Controls for risk to life for floods up to the Flood Planning Level
- iii Controls for risk to life for floods greater than the Flood Planning Level

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CITY OF SYDNEY
2030

iv Existing floor levels of development in relation to the Flood Planning Level and floods greater than the Flood Planning level

v Council's duty of care – Proposals to address and limit

vi What level of flooding should apply to the development e.g. 1 in 100 year, etc

vii Effective flood access and evacuation issues

viii Flood readiness – Methods to ensure relative flood information is available to current and future occupants and visitors;

d will not significantly adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of creek or channel banks or watercourses;

e is not likely to result in unsustainable social and economic costs to the community as a consequence of flooding;

f is consistent with the principles of Ecologically Sustainable Development; and

g adequately considers the impact of climate change.

It is to be noted that with regard to climate change, appropriate benchmarks based on the best available current information have been used in producing the flood risk management plans that inform this document.

Some prescriptive requirements such as flood planning level requirements may be relaxed if Council can be satisfied that the projected life of the proposed development is for a relatively short-term and therefore does not warrant the imposition of controls that consider impacts beyond the cessation of the proposed development. This will only be considered for uses where the residual risk to the occupation of the development is considered to be low. This may include certain temporary or demountable structures but would not include residential developments.

3.2 Concessional Development – Minor Additions

a. The City acknowledges that in some instances, relatively minor building additions will have minimal impact on the floodplain and will not present an unmanageable risk to life. Council will give consideration for the following forms of development on suitable sites:

i attached dwelling additions of up to 40m^2 of habitable floor area at or above the same level as the existing adjoining approved floor level for habitable floor area. The allowance for additions shall be made no more than once for any given development;

ii additions to Commercial and Industrial Uses of up to an additional 100 m^2 or 20% (whichever the less) of the Gross Floor Area of the existing building at no less than the same level as the existing adjoining approved floor level. The allowance for additions shall be made no more than once for any given development.

b. As part of any consent issued pursuant to this section Council will require:

i a restriction on the property title requiring compliance with the flood studies and associated flood risk management plans.

ii the existing development is to be suitably upgraded to address the potential impacts of flooding.

3.3 Heritage Considerations

The City acknowledges that certain buildings or structures require preservation due to their heritage significance. Developments with heritage significance can be assessed on a merit based approach provided the following requirements are satisfied:

i. Expert assessment has identified the structure or development as having heritage conservation value;

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CITY OF SYDNEY
2030

ii. Planning instruments have specifically identified the existing developmentas having heritage conservation value and provide the appropriate level of statutory protection;
iii. The highest practical level of flood protection is provided while maintaining an appropriate balance with heritage conservation;
iv. The proposed development will not be subject to frequent flooding risk that may jeopardise the long term viability or heritage conservation of the development. Comprehensive assessment would be required where the development is subject to flooding in storms more frequent than the 5% AEP flood;
v. A restriction shall be placed on the property title, identifying the flooding risk and requiring conservation of heritage values.

4 General Requirements

The following ancillary development issues are to be considered in the assessment of proposed development of flood prone land.

Development Type/ Aspect	Objective	Requirement
Fencing	• To ensure that fencing does not result in any significant obstruction to the free flow of floodwaters; and • To ensure that fencing will remain safe during floods and not become moving debris that potentially threatens the security of structures or the safety of people.	Fencing is to be designed and constructed in such a manner that it will not modify the flow of floodwaters and cause damage to surrounding land.
Residential Properties	• To minimise the damage to residential properties from flooding; and • To minimise risk to human life from the inundation of residential properties and to minimise economic cost to the community resulting from flooding.	• The proposed residential building or dwelling must be free from flooding up to and including the 1% AEP flood and must meet the Flood Planning Level Requirements detailed in Section 5; and • The proposed residential building or dwelling should not increase the likelihood of flooding on other developments, properties or infrastructure.
Industrial and Commercial Properties	• To minimise the damage to industrial and commercial properties from flooding; and • To minimise risk to human life from the inundation of industrial and commercial properties and to minimise economic cost to the community resulting from flooding.	• The City may consider merits-based approaches presented by the applicant. The proposed industrial or commercial buildings must meet the Flood Planning Level Requirements detailed in Section 5; and • The proposed industrial or commercial development should not increase the likelihood of flooding on other developments, properties or infrastructure.

Development Type/ Aspect	Objective	Requirement
Car Parking	• To minimise the damage to motor vehicles from flooding; • To ensure that motor vehicles do not become moving debris during floods, which threaten the integrity or blockage of structures or the safety of people, or damage other property; and • To minimise risk to human life from the inundation of basement and other car park or driveway areas.	• The proposed car park should not increase the risk of vehicle damage by flooding inundation; • The proposed garage or car park should not increase the likelihood of flooding on other developments, properties or infrastructure; • The proposed garage or car park must meet the Flood Planning Level Requirements detailed in *Section 5*; and • Open car parking - The minimum surface level of open space car parking subject to inundation should be designed giving regard to vehicle stability in terms of depths and velocity during inundation by flood waters. Where this is not possible, it shall be demonstrated how the objectives will be met.
Filling of Flood Prone Land	To ensure that any filling of land that is permitted as part of a development consent does not have a negative impact on the floodplain.	Unless a floodplain risk management plan for the catchment has been adopted, which allows filling to occur, filling for any purpose, including the raising of a building platform in flood-prone areas is not permitted without Council approval. Application for any filling must be supported by a flood assessment report from a suitably qualified engineer which certifies that the filling will not increase flood affectation elsewhere.
On-Site Sewer Management (Sewer mining)	• To prevent the spread of pollution from on-site sewer management systems during periods of flood; and • To assist in the ongoing operation of on-site sewer management systems during periods of flood.	The treatment facility must be located above the 1% AEP flood level and must comply with Flood Planning Level requirements, or are otherwise protected and may function if below this level.
Storage of Hazardous Substances	To prevent the potential spread of pollution from hazardous substances.	The storage of products which, in the opinion of the City, may be hazardous or pollute floodwaters, must be placed above the 1% AEP flood level or placed within an area protected by bunds or levels such that no flood waters can enter the bunded area and must comply with the Flood Planning Level requirement for such a facility.

Sydney2030/Green/Global/Connected
CITY OF SYDNEY
2030

Development Type/ Aspect	Objective	Requirement
Consideration of the Impact of Climate Change	To prevent the potential impact of climate change.	• For those developments which have a lifespan of more than fifty years the impact due to sea level rise and impacts due to increased rainfall intensities shall be considered. • Meet the allowances for sea level rise as recommended in the NSW Government Coastal Planning Guideline: Adopting Sea Level Rise 2010 (recently withdrawn from publication). Specifically, this shall include and allowance of 40cm by 2050 and a 90cm by 2100 from the 2009 Mean Sea Level. • Where in the opinion of the City the proposed development is of reasonable impact to regional or catchment trunk drainage, the drainage system design shall allow for a minimum of 10% increased rainfall.

5 Flood Planning Levels

A Flood Planning Level refers to the permissible minimum building floor levels. For below-ground parking or other forms of below-ground development, the Flood Planning Level refers to the minimum level at each access point. Where more than one flood planning level is applicable the higher of the applicable Flood Planning Levels shall prevail.

Development		Type of flooding	Flood Planning Level
Residential	Habitable rooms	Mainstream flooding	1% AEP flood level + 0.5 m
		Local drainage flooding (Refer to Note 2)	1% AEP flood level + 0.5 m or Two times the depth of flow with a minimum of 0.3 m above the surrounding surface if the depth of flow in the 1% AEP flood is less than 0.25 m
		Outside floodplain	0.3 m above surrounding ground
	Non-habitable rooms such as a laundry or garage (excluding below-ground car parks)	Mainstream or local drainage flooding	1% AEP flood level
Industrial or Commercial	Business	Mainstream or local drainage flooding	Merits approach presented by the applicant with a minimum of the 1% AEP flood level
	Schools and child care facilities	Mainstream or local drainage flooding	Merits approach presented by the applicant with a minimum of the 1% AEP flood level + 0.5m
	Residential floors within tourist establishments	Mainstream or local drainage flooding	1% AEP flood level + 0.5 m
	Housing for older people or people with disabilities	Mainstream or local drainage flooding	1% AEP flood level + 0.5 m or a the PMF, whichever is the higher
	On-site sewer management (sewer mining)	Mainstream or local drainage flooding	1% AEP flood level
	Retail Floor Levels	Mainstream or local drainage flooding	Merits approach presented by the applicant with a minimum of the 1% AEP flood. The proposal must demonstrate a reasonable balance between flood protection and urban design outcomes for street level activation.
Below-ground garage/ car park	Single property owner with not more than 2 car spaces.	Mainstream or local drainage flooding	1% AEP flood level + 0.5 m

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CITY OF SYDNEY
2030

Development		Type of flooding	Flood Planning Level
	All other below-ground car parks	Mainstream or local drainage flooding	1% AEP flood level + 0.5 m or the PMF (whichever is the higher) See Note 1
	Below-ground car park outside floodplain	Outside floodplain	0.3 m above the surrounding surface
Above ground car park	Enclosed car parks	Mainstream or local drainage flooding	1% AEP flood level
	Open car parks	Mainstream or local drainage	5% AEP flood level
Critical Facilities	Floor level	Mainstream or local drainage flooding	1% AEP flood level + 0.5m or the PMF (whichever is higher)
	Access to and from critical facility within development site	Mainstream or local drainage flooding	1% AEP flood level

Note***s***

1) The below ground garage/car park level applies to all possible ingress points to the car park such as vehicle entrances and exits, ventilation ducts, windows, light wells, lift shaft openings, risers and stairwells.

2) Local drainage flooding occurs where:

- The maximum cross sectional depth of flooding in the local overland flow path through and upstream of the site is less than 0.25m for the 1% AEP flood; and
- The development is at least 0.5m above the 1% AEP flood level at the nearest downstream trapped low point; and
- The development does not adjoin the nearest upstream trapped low point; and
- Blockage of an upstream trapped low point is unlikely to increase the depth of flow past the property to greater than 0.25m in the 1% AEP flood.

3) Mainstream flooding occurs where the local drainage flooding criteria cannot be satisfied.

4) A property is considered to be outside the floodplain where it is above the mainstream and local drainage flood planning levels including freeboard.

6 Flood Compatible Materials

Where required for development, the following materials are to be applied. Materials not listed may be accepted by Council subject to certification of the suitability of the material of the manufacturer.

Component	Flood Compatible Material
Flooring and Sub-floor	▪ Concrete slab-on-ground monolith construction ▪ Suspended reinforced concrete slab
Wall Structure	▪ Solid brickwork, blockwork, reinforced concrete or mass concrete
Wall and Ceiling Linings	▪ Fibro-cement board ▪ Brick, face or glazed ▪ Clay tile glazed in waterproof mortar ▪ Concrete ▪ Concrete block ▪ Steel with waterproof applications ▪ Stone, natural solid or veneer, waterproof grout ▪ Glass blocks ▪ Glass ▪ Plastic sheeting or wall with waterproof adhesive
Roof Structure	▪ Reinforced concrete construction ▪ Galvanised metal construction
Doors	▪ Solid panel with water proof adhesives ▪ Flush door with marine ply filled with closed cell foam ▪ Painted metal construction ▪ Aluminium or galvanised steel frame
Insulation	▪ Closed cell solid insulation ▪ Plastic/polystyrene boards
Windows	▪ Aluminium frame with stainless steel rollers or similar corrosion and water resistant material.
Nails, Bolts, Hinges and Fittings	▪ Brass, nylon or stainless steel ▪ Removable pin hinges ▪ Hot dipped galvanised steel wire nails or similar
Main Power Supply	▪ Subject to the approval of the relevant authority the incoming main commercial power service equipment, including all metering equipment, shall be located above the designated flood planning level. Means shall be available to easily disconnect the dwelling from the main power supply.
Wiring	▪ All wiring, power outlets, switches, etc., should be located above the designated flood planning level. All electrical wiring installed below this level should be suitable for continuous underwater immersion and should contain no fibrous components. This will not be applicable for below-ground car parks where the car park complies with flood planning level requirements. ▪ Earth leakage circuit-breakers (core balance relays) or Residual Current Devices (RCD) must be installed. ▪ Only submersible type splices should be used below maximum flood level. ▪ All conduits located below the relevant designated flood level should be so installed that they will be self-draining if subjected to flooding.
Electrical Equipment	▪ All equipment installed below or partially below the designated flood planning level should be capable of disconnection by a single plug and socket assembly.

Sydney2030/Green/Global/Connected
CITY OF SYDNEY
2030

Component	Flood Compatible Material
Heating and Air Conditioning Systems	▪ Heating and air conditioning systems should be installed in areas and spaces of the house above the designated flood planning level.
Fuel storage for heating purposes	▪ Heating systems using gas or oil as a fuel should have a manually operated valve located in the fuel supply line to enable fuel cut-off. ▪ The heating equipment and related fuel storage tanks should be mounted on and securely anchored to a foundation pad of sufficient mass to overcome buoyancy and prevent movement that could damage the fuel supply line. The tanks should be vented above the flood planning level.
Ducting for heating/cooling purposes	▪ All ductwork located below the relevant flood level should be provided with openings for drainage and cleaning. Self-draining may be achieved by constructing the ductwork on a suitable grade. Where ductwork must pass through a water-tight wall or floor below the relevant flood level, a closure assembly operated from above relevant flood level should protect the ductwork.

Responsibilities

The Technical Services Manager is responsible for the development and revision of the policy. The City's Planning team together with the Public Domain team are responsible for communicating the policy and ensuring systems are in place to validate its compliance.

Consultation

The initial draft edition of the Interim Floodplain Management Policy was first reviewed by internal stakeholders of the City including City Operations and City Planning divisions. The Policy was then revised to take account of this input.

The City's Floodplain Risk Management Committee was initially informed regarding the need for the interim policy in December 2012. During the March 2013 Floodplain Risk Management Committee meeting a presentation was made by City staff regarding the draft policy. Copies of the policy were then provided to all Committee members for comment. Some minor changes were then made to the draft policy following feedback from committee members.

References

Laws and standards	• Local Government Act 1993, Section 733 • Environment Planning and Assessment Act 1979
Policies and procedures	• *Floodplain Development Manual: the management of flood liable land*, New South Wales Government, Published April 2005 • Sydney LEP 2012 • Sydney DCP 2012 • South Sydney DCP 1997, Green Square precinct amended 2006

Approval

Council approved this policy on 12 May 2014.

Review

Review period	Next review date	TRIM reference
City Operations will review this policy every 2 years	May 2016	2014/216277

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CITY OF SYDNEY
2030