NORTHROP

CIVIL

Flood Assessment Report

for

Sydney Helicopters Cottage Upgrade

for Sydney Helicopters

Level 1, 215 Pacific Highway
Charlestown NSW 2290
02 4943 1777
newcastle@northrop.com.au
ABN 81 094 433 100

Contents

Figures

Photos

Tables

Acronyms

AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ALS	Airborne Laser Survey (LiDAR)
ARI	Average Recurrence Interval
ARR	Australian Rainfall and Runoff
BoM	Bureau of Meteorology
DCP	Development Control Plan
FPL	Flood Planning Level
LGA	Local Government Area
LiDAR	Light Detection and Ranging (also see ALS)
m	Measure of length / height / distance (metres)
m AHD	Meters above Australian High Datum
m/s	Measure of velocity (metres per second)
m^3/s	Measure of flow rate (cubic metres per second)
OSD	On-Site Detention
PCC	Penrith City Council (“Council”)
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
PSD	Permissible Site Discharge
SES	NSW State Emergency Service
TUFLOW	A 1D and 2D hydraulic modelling software

Introduction

Northrop Consulting Engineers Pty Ltd (Northrop) have been engaged to prepare a Flood Impact Assessment report submission for the existing building at 89-151 Old Castlereagh Road, Castlereagh.

Included herein is a:

- List of related drawings.
- Description of the subject site and proposed development.
- Existing flood behaviour.
- Developed flood behaviour.
- Outline of Penrith Lakes requirements and development response.
- Flood risk assessment.

Methodology

The following methodology has been adopted to undertake our assessment:

- Summarise the existing site conditions and proposed development.
- Review the existing flood behaviour according to 'Nepean River Flood Study VOLUME 2 Advisian 2018'.
- Assess the proposal with respect to Penrith Lakes requirements.

Consideration has been given to the following as part of this assessment.

- Flood Risk Management Manual (Department of Planning and Environment, June 2023).
- Flood Impact and Risk Assessment – Flood Risk Management Guide LU01 (Department of Planning and Environment, February 2022)
- 89-151 Old Castlereagh Road, Castlereagh – Flood Evacuation Management Plan (JWP, September 2023), included as an attachment to this correspondence.

Subject Site and Proposed Development

Subject Site

The subject site is located at 89-151 Old Castlereagh Road, Castlereagh and is otherwise known as Lot 2 DP 1013504. It is bounded by Old Castlereagh Road to the south, a waterway to the north and adjacent predominantly greenfield sites to the east and west. Site elevations range from approximately 15 to 26 metres AHD (Australian Height Datum) with terrain sloping away from Old Castlereagh Road. There are several structures on the lot with correlating driveways and roads as well as a hardstand carpark area. Pockets of dense vegetation are scattered throughout the lot with a large amount if the site being open grass. A large dam is located in the north-western portion of the lot.

Characteristics of the area are presented below in Photo 1, Photo 2, Photo 3 and Photo 4.

Aerial images showing the Site Locality, Existing Ground Elevations and Proposed Development is presented overleaf in Figure 1, Figure 2 and Figure 3 respectively.

The existing cottage being upgraded is located at approximately 26m AHD, outlined in blue in Figure 2 and Figure 3.

Photo 1 - Looking north from Castlereagh Road (©Google Maps, 2023)

Photo 2 – Looking northeast from Castlereagh Road (©Google Maps, 2023)

Photo 3 – Looking northwest from Castlereagh Road (©Google Maps, 2023)

Photo 4- Aerial Photo of Site

Legend

Subject Site

0 600 1,200 Metres

1:35,000

Figure 1

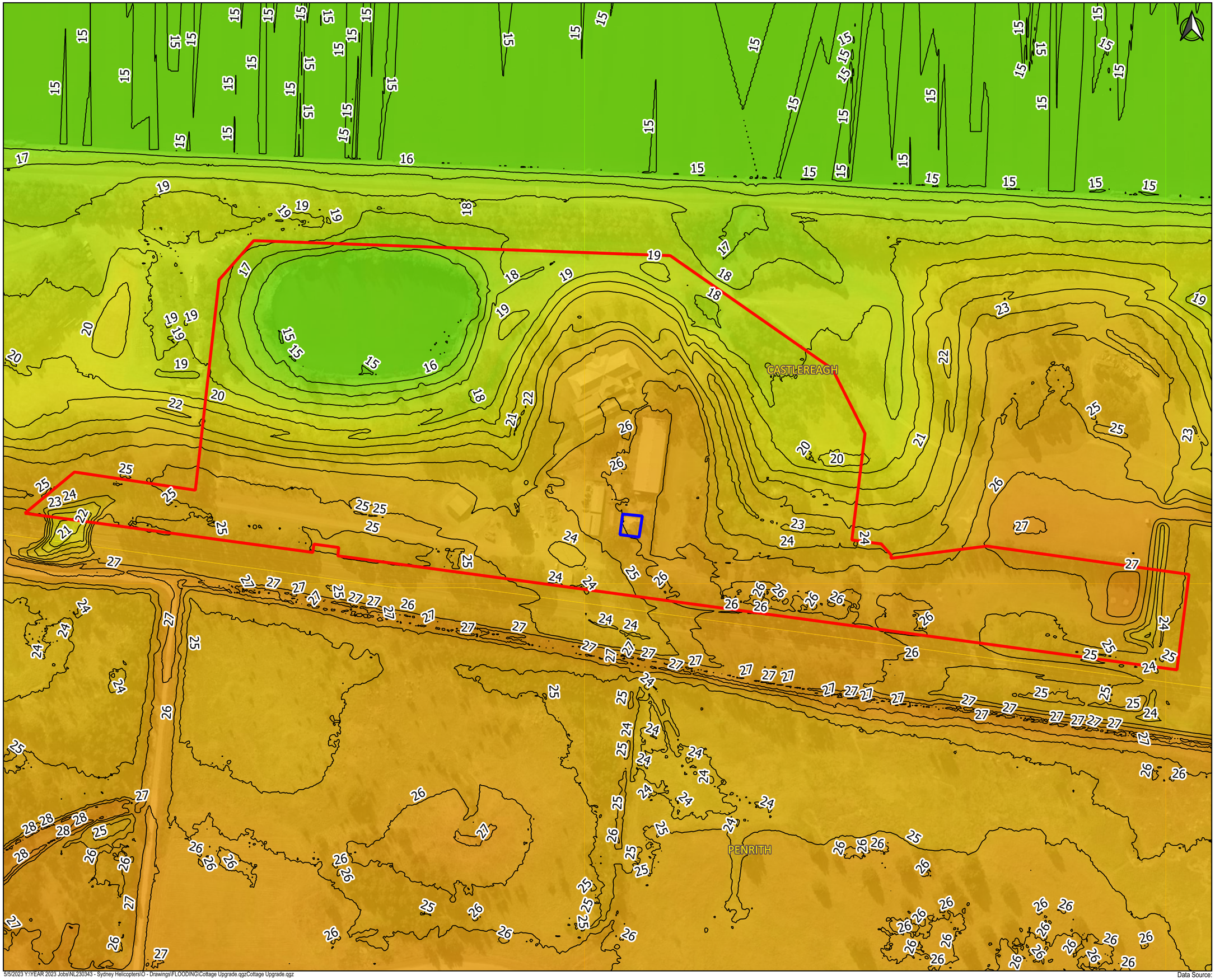
Locality

Sydney Helicopters
Cottage Upgrade
100 Old Castlereagh Road
NL230343-00

NORTHROP

5/5/2023 Y:\YEAR 2023 Jobs\NL230343 - Sydney Helicopters\O - Drawings\FLOODING\Cottage Upgrade.qgzCottage Upgrade.qgz

Data Source:



Legend

- Subject Site
- Cottage
- 1m contours

Ground Elevation (m AHD)

50
0

0 40 80 Metres

1:2,500

Figure 2

Ground Elevations

Sydney Helicopters
Cottage Upgrade
100 Old Castlereagh Road
NL230343-00

NORTHROP

Data Source:

Legend

- Subject Site
- cottage

0 10 20 Metres

1:1,000

Figure 3

Site layout

Sydney Helicopters
Cottage Upgrade
100 Old Castlereagh Road
NL230343-00

NORTHROP

5/5/2023 Y:\YEAR 2023 Jobs\NL230343 - Sydney Helicopters\O - Drawings\FLOODING\Cottage Upgrade.qgzCottage Upgrade.qgz

Data Source:

Proposed Development

The proposed development consists of the conversion of the existing cottage, outlined in blue in Figure 3 into a café and bar. Note that the cottage is located at a ground elevation of approximately 26m AHD.

Existing Flood Behaviour

The existing flood behaviour has been interpreted from the Nepean River Flood Study (Advisian, 2018). Flood extents for selected events are presented overleaf in Figure 4 to Figure 7 and flood levels are shown below in Table 1.

Table 1 – Peak flood levels

Event	m AHD	Site Inundation	Development Affected
1% AEP	22.0	Partial	No
1 in 500 AEP	24.0	Partial	No
1 in 1000 AEP	26.0	Majority	Yes
PMF	29.0	Complete	Yes

Noting that the proposed development is located at approximately 26m AHD, this shows the development is unaffected up to the 1 in 500 AEP flood event. The site becomes almost completely submerged in the 1 in 1000 AEP event and is subject to extreme high hazard flooding in the PMF.

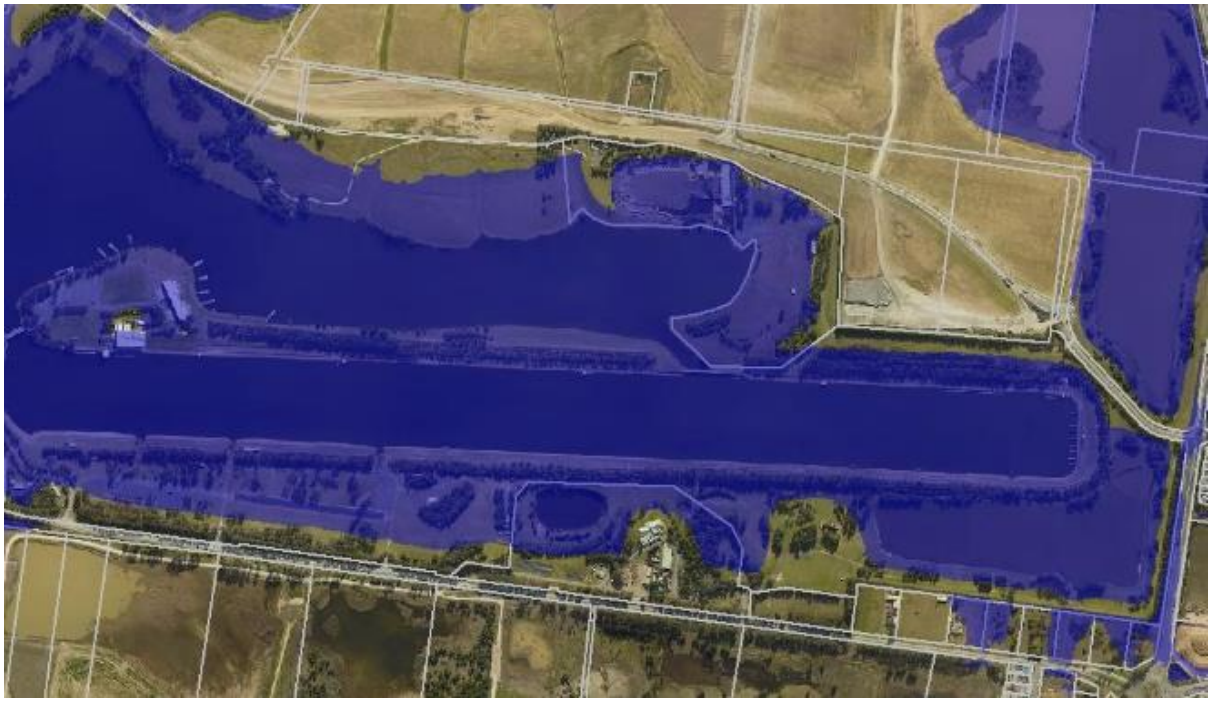


Figure 4 - 1% AEP Flood Extents

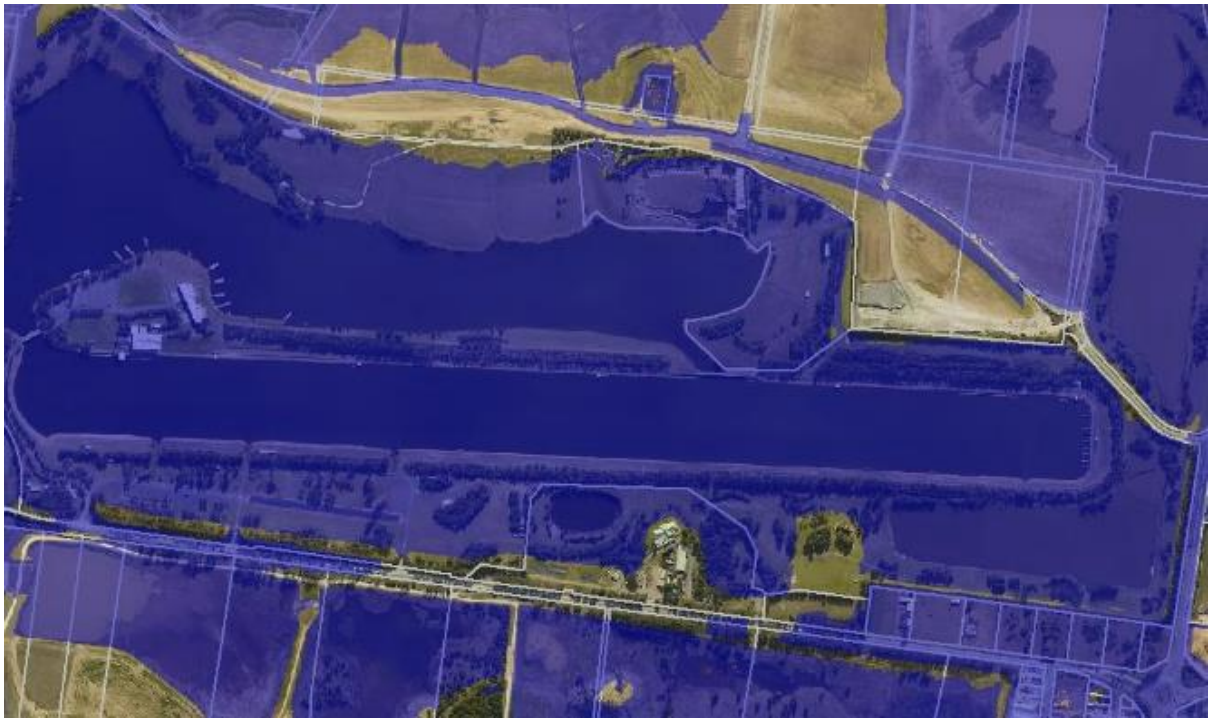


Figure 5 - 1 in 500 AEP Flood Extents

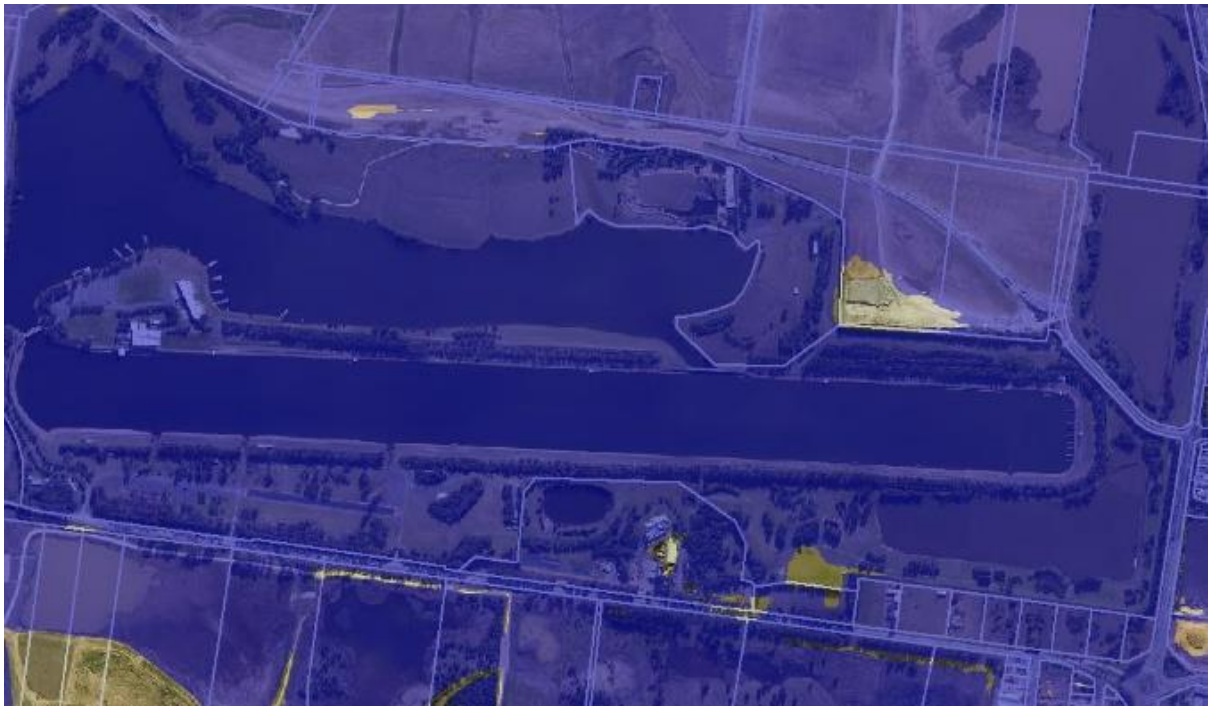


Figure 6 - 1 in 1000 AEP Flood Extents

Figure 7 - PMF Extents

Developed Flood Behaviour

No changes to flood behaviour are expected from the proposed development.

Council Requirements and Response

SEPp and DCP Design Principles

The requirements have been obtained from State Environmental Planning Policy (Precincts – Western Parkland City) 2021 Clause 5.38 and Penrith Lakes Stage 1 DCP Clause 3.1 and are summarised below in **Table 2** and **Table 3**.

Responses are also summarised in these tables.

Table 2 – SEPP requirements

Requirement	Response	Compliant
(1) The objectives of this clause are as follows		
(a) to minimise the flood risk to life and property associated with the use of land,	The flood risk to the property can be minimised by using flood compatible material in areas with the risk of inundation. The development only includes change of use of existing building with minimal changes from a flooding perspective, as such we do not believe the development increases flood risk based on the existing conditions.	**Yes**
(b) to allow development on land that is compatible with the flood function and behaviour on the land, taking into account projected changes as a result of climate change,	We believe the site is only inundated in the very rare and extreme events, and this use is commensurate with the flood function of the land.	**Yes**
(c) to avoid adverse or cumulative impacts on flood behaviour and the environment,	Since the development proposes minor changes to the extent of the external building, it is not expected to apply adverse impacts on flood behaviour elsewhere and the environment.	**Yes**
(d) to enable the safe occupation and efficient evacuation of people in the event of a flood.	We do not believe the proposed development impedes the flood evacuation procedures outlined in the Hawkesbury-Nepean Flood Emergency Sub plan (SES, 2020).	**Yes**
(e) to protect the operational capacity of emergency response facilities and critical infrastructure during flood events.	The proposed development is not a critical infrastructure facility.	**Not applicable**

Requirement	Response	Compliant
(2) Development consent must not be granted to development on land the consent authority considers to be below the level of a probable maximum flood unless the consent authority is satisfied the development		
(a) is compatible with the flood function and behaviour on the land, and	We believe the site is only inundated in the very rare and extreme events, and this use is commensurate with the flood function of the land.	**Yes**
(b) will not adversely affect flood behaviour in a way that results in detrimental increases in the potential flood affectation of other development or properties, and	Considering the development only includes minor external changes, it is not expected to adversely impact the flood behaviour or to increase in the potential flood affection of the other development or properties.	**Yes**
(c) will not adversely affect the safe occupation and efficient evacuation of people or exceed the capacity of existing evacuation routes for the surrounding area in the event of a flood, and	We do not believe the proposed development impedes the flood evacuation procedures outlined in the Hawkesbury-Nepean Flood Emergency Sub plan (SES, 2020). A Flood Evacuation Management Plan (JWP, September 2023) also supports this development.	**Yes**
(d) incorporates appropriate measures to manage risk to life in the event of a flood, and	Risk to life is minimised as floor levels are above the 1 in 500 AEP flood level. The proposed development does not impede the flood evacuation procedures outlined in the Hawkesbury-Nepean Flood Emergency Sub plan (SES, 2020). A Flood Evacuation Management Plan (JWP, September 2023) also supports this development.	**Yes**
(e) will not adversely affect the environment or cause avoidable erosion, siltation, destruction of riparian vegetation or a reduction in the stability of riverbanks or watercourses.	Considering the development only includes minor changes to the external building, we believe the development is unlikely to affect erosion and siltation from a flooding perspective.	**Yes**
(f) is not likely to result in unsustainable social and economic costs to the community as a consequence of flooding.	The proposal is unlikely to result in unsustainable social and economic costs to the community due to flooding. The proposal provides a social benefit due to the change of use, and any economic loss is likely to be borne by the applicant.	**Yes**
(3) In deciding whether to grant development consent on land to which this clause applies, the consent authority must consider the following matters		

Requirement	Response	Compliant
(a) the impact of the development on projected changes to flood behaviour as a result of climate change,	The development includes change of use of existing building with minimal external changes. Hence, the flood function and the behaviour as a result of the climate change is not expected to change comparing to the existing case.	**Yes**
(b) the intended design and scale of buildings resulting from the development,	The scale of the building will remain the same as the existing case.	**Yes**
(c) whether the development incorporates measures to minimise the risk to life and ensure the safe evacuation of people in the event of a flood,	Risk to life is minimised as floor levels are above the 1 in 500 AEP flood level. The proposed development does not impede the flood evacuation procedures outlined in the Hawkesbury-Nepean Flood Emergency Sub plan (SES, 2020). A Flood Evacuation Management Plan (JWP, September 2023) also supports this development.	**Yes**
(d) the potential to modify, relocate or remove the building if the Hawkesbury-Nepean Valley floodplain is impacted by flooding.	Whilst unlikely, the building could be demolished in the future if required.	**Yes**

Table 3 - DCP Design Principles

Requirement	Response	Compliant
3.1 Flood planning and evacuation		
Objectives		
(a) Ensure development on the floodplain is consistent with the NSW Government's Flood Prone Land Policy and the principles in the NSW Government's Floodplain Development Manual.	Consideration has been given to the Flood Risk Management Manual (Department of Planning and Environment, June 2023) and Flood Impact and Risk Assessment – Flood Risk Management Guide LU01 (Department of Planning and Environment, February 2022).	**Yes**

Requirement	Response	Compliant
b) Minimise flood risk to life of the users of the development in the full range of flooding, including the 5% annual exceedance probability (AEP), 1% AEP, 0.5% AEP, 0.2% AEP and the probable maximum flood (PMF).	A Flood Evacuation Management Plan (JWP, September 2023) has been prepared to address this item, and this considers the full range of flood events.	**Yes**
c) Maintain the flood function of the floodplain to minimise impacts of development on flood behaviour and adverse impacts to community.	The building is existing, and we do not believe there will be any impacts on flood behaviour.	**Yes**
d) Enable safe evacuation from the land and ensure development does not adversely impact the evacuation capacity of the existing Hawkesbury–Nepean community.	A Flood Evacuation Management Plan (JWP, September 2023) has been prepared to address this item, and this considers the full range of flood events.	**Yes**
e) Allow development that is compatible with the flood hazard and flood function of the land.	The building is existing and only impacted by flood greater than the 1 in 500 AEP, nominally starting at the 1 in 1000 AEP.	**Yes**
f) Avoid significant adverse impacts on flood behaviour and the environment.	The building is existing, and we do not believe there will be any impacts on flood behaviour.	**Yes**
g) Manage changing flood risk due to climate change.	Consideration of rarer events has been undertaken as a proxy for climate change.	**Yes**
Controls		
(1) Development on land below the level of the PMF that will increase the number of people on the land must be consistent with the flood evacuation requirements outlined in Section 3.1.1 of the DCP.	See below.	**Yes**
(2) All development that will increase the number of people on the land must submit a flood emergency management plan prepared in accordance with and to demonstrate compliance with flood evacuation requirements in Section 3.1.1 of the DCP.	A Flood Evacuation Management Plan (JWP, September 2023) has been prepared to address this item, and this considers the full range of flood events.	**Yes**

Requirement	Response	Compliant
The following controls apply to land below the flood planning level: 3) A flood and drainage investigation that overlays the 20%, 5%, 1%, 0.2% AEP and PMF level and any overland flows must be submitted with a development application. The levels on the survey are required to be verified during construction by a survey certificate.	This document considers the full range of flood events.	**Yes**
4) The drainage investigation must acknowledge and mitigate the effects of flood on proposed infrastructure.	The building is existing, and we do not expect any impacts on flood behaviour.	**Yes**
5) Development must not adversely impact flood behaviour for the full range of floods (up to and including the PMF) and is to consider cumulative impacts of development on surrounding land, including: a) loss of flood storage; b) loss of or changes to flood flow paths; c) acceleration or obstruction of flood flows; d) increase in the depth, duration or velocity of floodwaters; and e) any reduction in flood warning times elsewhere on the floodplain.	The building is existing, and we do not expect any impacts on flood behaviour.	**Yes**
The applicant must demonstrate that: a) the development will not increase the flood hazard or risk to other properties; b) all structures are designed and constructed to ensure structural integrity up to the 0.2% AEP, taking into account the forces of floodwater, wave action, flowing water with debris, buoyancy and immersion. Structural certification must be provided confirming the above; c) the proposed building materials are flood-compatible;	The building is existing, and we do not expect any impacts on flood behaviour. The building is located above the 0.2% AEP event.	**Yes**

Requirement	Response	Compliant
d) the buildings are sited in the optimum position to avoid floodwaters and allow safe flood evacuation; and e) the development will not expose any occupants of the land to unacceptable levels of risk.		
7) Development, excluding temporary structures, in high flood hazard areas, floodways' and land below the 1% AEP should be avoided	The site is not impacted by the 1% AEP.	**Yes**
8) Development must demonstrate that any overland flow is maintained for the 1% AEP overland flow.	The site is not impacted by the 1% AEP.	**Yes**
9) Consent will not be granted to filling of floodways or high flood hazard areas.	No filling is proposed.	**Yes**
Development shall be consistent with the following guidelines: a) Managing Flood Risk Through Planning Opportunities—Guidance On Land Use Planning In Flood Prone Areas (Hawkesbury–Nepean Floodplain Management Steering Committee); b) Reducing Vulnerability of Buildings to Flood Damage—Guidance On Building In Flood Prone Areas (Hawkesbury–Nepean Floodplain Management Steering Committee); and c) Designing Safer Subdivisions—Guidance On Subdivision Design In Flood Prone Areas (Hawkesbury–Nepean Floodplain Management Steering Committee).	Consideration has been given to these guidelines. They are generally not appropriate due to the type of development, nature and level of the existing structure.	**Yes**
11) Development must avoid significant adverse effects on the floodplain environment that would cause erosion, siltation, destruction of riparian vegetation or a reduction in the stability of the riverbank or watercourse.	Considering the development only includes minor changes to the external building, we believe the development is unlikely to affect erosion and siltation from a flooding perspective.	**Yes**

Requirement	Response	Compliant
12) All electrical equipment, power points, wiring, fuel lines, sewerage systems or any other service pipes and connections must be waterproofed, located above the flood planning level, or both.	These will be above the FPL.	**Yes**
13) Hazardous or potentially polluting materials must not be stored below the 0.2% AEP level unless adequately protected from floodwaters in accordance with industry standards.	The site is generally at the 0.1% AEP (1 in 1000 AEP) level.	**Yes**
14) Adequate flood signage and exits must be installed to facilitate safe and orderly evacuation from flooding without reliance upon the State Emergency Service or other authorised emergency services personnel.	Please refer Flood Evacuation Management Plan (JWP, September 2023)	
15) Fencing must not impede the flow of floodwaters or increase flood affectation on surrounding land.	Not proposed.	**Yes**
3.1.1 Flood evacuation considerations		
1) Development that will increase the number of people on the land below the probable maximum flood (PMF) level at Penrith Lakes covered by this DCP must be consistent with the Early Flood Evacuation Guideline (if available), or the objective to achieve early site evacuation and/or non-attendance in the event of a flood or probable flood.	A Flood Evacuation Management Plan (JWP, September 2023) has been prepared to address this item, and this considers the full range of flood events. Please refer to this document for this clause.	
2) Development consent must not be granted to development on land below the PMF level that will increase the number of people on the land, unless the consent authority is satisfied that: a) appropriate systems and processes will be in place to ensure the efficient evacuation of the site and surrounding area and will not adversely impact on the evacuation routes in the Hawkesbury-Nepean Valley floodplain in the event of a flood; and		

Requirement	Response	Compliant
b) a flood emergency management plan has been prepared.		
The flood emergency management plan must address the following matters: a) an overview of the flood risk and resilience of the site and the surrounding area; b) details the requirements for governance and documentation of flood preparedness and response at Penrith Lakes; c) measures to be undertaken by occupants of the site to manage the risk to life in the event of a flood; d) measures to be undertaken by occupants of the site to ensure the efficient evacuation of people in the event of an early flood warning; e) immediate flood relief and recovery actions to be undertaken by occupants of the site following a flood event or false alarm of a flood event; and f) long-term review of systems and processes to ensure the efficient evacuation of the site and recovery measures to be undertaken by occupants of the site following a flood event or false alarm of a flood event.		
4) Only strata or community title subdivision is permitted, unless measures compliant with provisions 2 and 3 can otherwise be demonstrated.	Not applicable	
5) Despite any other provision in the DCP, the consent authority must not grant consent to a development application for development on land below the PMF in the Penrith Lakes precinct unless provisions 1, 2 and 3 are satisfied.	See above for Clause (1), (2), and (3).	

Flood Risk Assessment

Flood Hazard

The flood hazard has been quantified in Council's flood model, reproduced above.

Existing Risk

The following potential risks from the flood hazard were identified in the existing condition - presented below in Table 4.

Table 4 - Existing flood risk analysis

Item	Likelihood	Consequence	Risk Rating
Structural damage causing economic loss	**Rare to very rare** – The cottage is not expected to be inundated until the 0.1% AEP or 1 in 1000 AEP.	**Moderate –** Requires ceasing occupation whilst rectification occurs.	**Medium**
Loss of life	**Extremely rare –** This has to do with exposure. Currently the site is a cottage which implies a residential use. This is not a highly controlled situation and requires the receipt and compliance of regional warnings.	**Major –** Loss of life	**Low**

Developed and Residual Risk

The residual developed risk analysis is presented below in Table 5, providing commentary on proposed mitigation measures. A risk matrix showing the existing and residual risk comparison is presented in Table 6.

Table 5 – Developed residual risk analysis.

Item	Likelihood	Consequence	Risk Rating
Structural damage causing economic loss	**Rare to very rare** – The cottage and development is not expected to be inundated until the 0.1% AEP or 1 in 1000 AEP. No change.	**Moderate –** Requires ceasing operations whilst rectification occurs.	**Medium**
Loss of life	**Extremely rare –** Whilst the exposure is increased whilst the café and bar is in operation, the proposed FEMP applies a higher level of management to the emergency response.	**Major –** Loss of life	**Low**

Table 6 - Risk matrix

Likelihood	AEP Range	Consequence				
	(%)	Insignificant	Minor	Moderate	Major	Catastrophic
Likely	>10					
Unlikely	1 to 10					
Rare to very rare	0.01 to 1			Structural damage (E+D)		
Extremely rare	<0.01				**Loss of life (E + D)**	

Risk: Very low | Low | Medium | High | Extreme

From the above analysis, we believe the existing flood risk is maintained through the proposed development.

Conclusions

Northrop Consulting Engineers were engaged by Sydney Helicopters to complete Flood Impact Assessment, for the proposed development at 89-151 Old Castlereagh Road, Castlereagh.

It was concluded that the proposed development, which incorporates the change of use of an existing building.

- Generally, meets all flood related requirements of Penrith Lakes development controls.
- Incorporates measures to manage the flood risk – including being at a level above the Flood Planning Level and proposing a formal flood evacuation management plan.

We submit these findings for consideration.

Angus Brien

Principal | Flood Engineer

Limitation Statement

Northrop Consulting Engineers Pty Ltd (Northrop) has been retained to prepare this report based on specific instructions, scope of work and purpose pursuant to a contract with its client. It has been prepared in accordance with the usual care and thoroughness of the consulting profession for the use by Sydney Helicopters. The report is based on generally accepted practices and standards applicable to the scope of work at the time it was prepared. No other warranty, express or implied, is made as to the professional advice included in this report.

Except where expressly permitted in writing or required by law, no third party may use or rely on this report unless otherwise agreed in writing by Northrop.

Where this report indicates that information has been provided to Northrop by third parties, Northrop has made no independent verification of this information except as expressly stated in the report. Northrop is not liable for any inaccuracies in or omissions to that information.

The report was prepared on the dates shown and is based on the conditions and information received at the time of preparation.

This report should be read in full, with reference made to all sources. No responsibility is accepted for use of any part of this report in any other context or for any other purpose. Northrop does not purport to give legal advice or financial advice. Appropriate specialist advice should be obtained where required.

To the extent permitted by law, Northrop expressly excludes any liability for any loss, damage, cost or expenses suffered by any third party relating to or resulting from the use of, or reliance on, any information contained in this report.

Document Register

Rev	Status	Prepared	Approved	Date
A	For Client Review	SH	GB	11/05/23
B	For Approval	DN	GB	11/10/23

Attachments

Flood Emergency Evacuation Plan (JWP, September 2023)

CELEBRATING 40 YEARS 1982 - 2022

J. WYNDHAM PRINCE
CONSULTING CIVIL INFRASTRUCTURE ENGINEERS
& PROJECT MANAGERS

PO Box 4366
Penrith Westfield 2750
02 4720 3300
jwp@jwprince.com.au
www.jwprince.com.au

SUSTAINABLE CERTIFICATION
ISO 9001
AS/NZS 4801
ISO 14001

Our Ref: 110934-02-Flood Evacuation Management Plan
SL:sl

8 Sep 2023

Sydney Helicopters

89-151 Old Castlereagh Road

Castlereagh NSW 2749

Attn: Mark Harrold

Subject: 89-151 Old Castlereagh Road, Castlereagh - Flood Evacuation Management Plan

Dear Mark,

J Wyndham Prince have prepared this flood evacuation management plan to support the Development Application (DA) approval for the proposed Sydney Helicopters site at 89-151 Old Castlereagh Road, Castlereagh. We note that a separate development application (DA) has been submitted for a café to be located on the same site. The proposed café is also covered by this Flood Evacuation Management Plan. This letter demonstrates the evacuation procedures and requirements of the site during a regional flood event. It is noted that the flood evacuation plan has to reviewed no less frequently than every five (5) years or after a significant flood event.

1. SITE BACKGROUND

The site is located at 89-151 Old Castlereagh Road, Castlereagh NSW 2749 and is within the Penrith City Council Local Government Area (LGA). The site elevation ranges from 24m AHD on the existing hardstand area and naturally grades to the basin that is located in the north-west portion of the site. Refer to the proposed site plan in Plate 1-1.

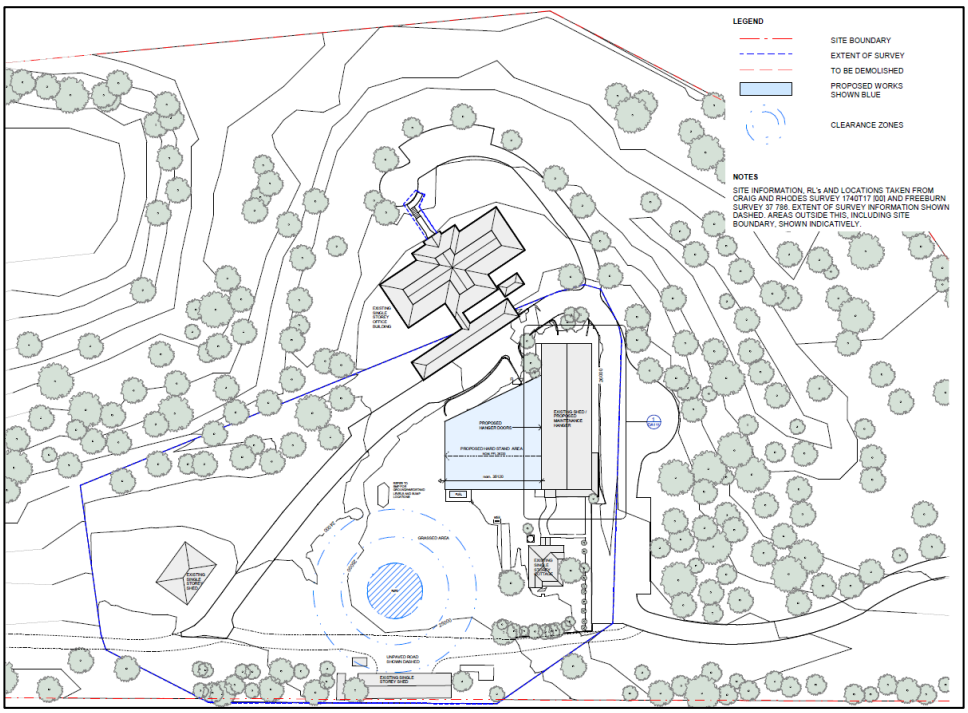


Plate 1-1 – Proposed Site Plan (Source: WMK Architecture)

The site is approximately 2.7 km east of the Nepean River and approximately 150 m south of the Sydney International Regatta Centre and zoned as Tourism South Precinct in Penrith Lakes Development Control Plan (DCP) 2022. The proposed development involves the repurposing of the existing Penrith Lakes Development Corporations offices into a Helipad Facility. This will involve the repurposing of the existing offices and sheds on the site and the introduction of additional hardstand areas at the maintenance hanger and the final approach and take off area (FATO).

The site is situated in the Hawkesbury Nepean catchment and was considered in the Nepean River Flood Study prepared by Advisian in 2017. The site is also considered in the Hawkesbury Nepean Valley Regional Flood Study prepared by WMA Water in 2019, however, flood mapping in the vicinity of Penrith Lakes is noted as being indicative only as the flood modelling does not incorporate the latest infrastructure of the Penrith Lakes Scheme.

Being part of the Hawkesbury Nepean Valley, formal evacuation of the residents within the valley is considered in the SES's evacuation strategy. The site is located within sub-sector 8.5 (Castlereagh) of the Penrith North Sector in the Hawkesbury Nepean Flood Plan (SES, 2020), which is a sub-plan of the State Emergency Management Plan (EMPLAN). Furthermore, as required by Penith Lakes DCP 2022, flood evacuatution strategy has been considered.

2. FLOOD EVACUATION ROUTES

The Hawkesbury Nepean Flood Plan (SES, 2020) identifies local and regional flood evacuation routes for the Penrith North Sector. The Penrith North Sector will need to be completely evacuated if the predicted flood level will exceed 8.2m (22.3m AHD) at the Penrith gauge which is near Victoria Bridge. The regional flood evacuation route is detailed as follows:

- Southbound along the Northern Road Evacuation Route
- Eastbound on the Great Western Highway or Eastbound on the M4 Motorway (dependant on what other sectors are also being evacuated at the same time).

The primary local flood evacuation route for the site is:

- Eastbound along Old Castlereagh Road
- Continue East along Andrews Road; and
- Southbound along the Northern Road Evacuation Route

The primary local flood evacuation route for the Sydney Helicopters site is east along Old Castlereagh Road. At the intersection of Old Castlereagh Road and Castlereagh Road, vehicles are expected to continue straight onto Andrews Road until reaching the Northern Road regional evacuation route. However, there is potential for vehicles to turn right onto Castlereagh Road and head south until reaching the Great Western Highway regional evacuation route.

The Evacuation Route for the Penrith North Sector can be seen illustrated in Map 1 and Map 9 in Annex D, of the Hawkesbury-Nepean Valley: NSW SES Evacuation Arrangements 2020. Refer to Appendix A for extracts of these maps. Figure 2-1 in Appendix B illustrates the primary and alternate flood evacuation routes for the Sydney Helicopters site.

3. FLOOD EVACUATION ASSESSMENT

Based on advice received from the SES (received on a similar development in the Hawkesbury Nepean Valley), we understand that:

- Eight (8) hours of reliable warning of flood events is available;
- It takes approximately one (1) hour for the SES to mobilise its operations for this area on receipt of a flood warning; and
- It takes the community one (1) hour to accept that evacuation is necessary and to prepare for evacuation. Note that this typically applies to residential areas. Given that Sydney Helicopters will be a managed site, it is expected that less than one (1) hour would be needed to mobilise the staff and patrons on site.

Therefore, it is conservatively assumed that six (6) hours are available for the site to evacuate.

3.1. Evacuation Time Assessment

Time Available

The target warning flood level of **RL 23.0 m AHD** is applicable for Penrith for riverine floods greater than 5% AEP and up to the 1% AEP. This level matches with the 5% AEP flood level identified in the Nepean River Flood Study (Advisian 2017) report and Hawkesbury-Nepean Valley Regional Flood Study (WMA 2019). For floods of this nature a **6 hr warning time** is relevant. (see further detail in Section 4.1 of this report)

The rate of rise for Major floods at Penrith was determined to be **0.58 m/hr** (refer Table F1 in Hawkesbury-Nepean Valley Regional Flood Study (WMA 2019))

The level at which the primary evacuation route for Site Andrews Road at Boundary Creek is overtopped is 24.7 m AHD in 1% AEP as identified Nepean River Flood Study (Advisian 2017) report and 26 m AHD in 0.1% AEP as identified in Hawkesbury-Nepean Valley Regional Flood Study (WMA 2019). To calculate the time available, Boundary Creek flooding is considered, as such, the additional time to rise to this level would be 24.7 – 23.0 = 1.7m / 0.58 m/hr = 2.9 hr.

The **time available** to Evacuate is therefore 6 hr Target Warning lead time + 2.9 hours additional time for the water to rise to the point it cuts off the adopted evacuation route = **8.9 hours**

Time Required

The time required to evacuate the site has been assessed in accordance with Hawkesbury-Nepean Valley: NSW SES Divisions, Sectors, Subsectors And Evacuation Strategy Selection Considerations, Annex C 2020 and is summarised in Table 3-1.

Table 3-1 – Time Required Assessment

Parameter	Total Andrews Road Adopted Time (hrs)
Warning Time acceptance Factor (WAF) [1]	0.5
Warning Time Lag Factor (WLF) [2]	1.0
Travel Time (TT) [3]	0.06 (4 min)
Traffic Safety Factor (TSF) [4]	1.0
Local Flood cutoff time (1% AEP local flood event on Boundary Creek)[5]	2.8
Time Required (TR) = WAF+WLF+TT+TSF	**5.36**

[1] SES recommends 1 hr which we agree is relevant for normal residential properties. As Sydney Helicopters site is a managed site a shorter time is applicable for their evacuees.
[2] Patrons at Sydney Helicopters site, including staff, can mobilise within SES recommendation of 1 hr.
[3] Allows for 40 cars from site. Assumes 1 lane evacuates at 600 vehicles /hr.
[4] Adopted from SES standard table
[5] In accordance with section 9.1.4 of Nepean River Flood Study (Advisian, 2017)

Surplus Time

The surplus time available for Sydney Helicopters site to complete an evacuation is calculated as follows:

Surplus Time = Time Available - Time Required

8.9 hrs – 5.36 hrs = 3.5 hrs

3.2. Sydney Helicopters Site Assesssment

Based on information provided in your email dated 21 February 2023, we understand that the total anticipated number of patrons and staff occupying the Sydney Helicopters site at any given time would be 60. This includes Sydney Helicopters staff, café staff and all visitors to the site. We also understand that there are 40 available parking spaces on the site.

Assumptions

The following assumptions have been made in the flood evacuation assessment:

- The maximum number of private vehicles on the site would be 40 based on the number of car parking spaces provided;
- On average, each car would convey 3 passengers;
- The anticipated travel mode split is 90% by car and 10% by public transport/shuttle buses together with helicopter;
- As Old Castlereagh Road and Andrews Road are single-lane roads, a maximum lane capacity of 600 vehicles/ lane/ hour is available for evacuation;
- The capacity of a 12.5 m passenger bus is 65 persons; and
- An average walking pace for a pedestrian is 5.0 km/hr and a conservatively slow walking pace is 4.5 km/hr for older individuals.

Evacuation Travel Modes

We have considered three (3) alternate travel mode scenarios in our evacuation assessment:

Scenario 1 – Private Vehicle Evacuation (100% of the patrons & staff)

Adopting an average of 3 persons per car and the 40 car parking spaces provided, there is the capacity to evacuate 120 persons by private car. Therefore, all of the anticipated 60 patrons and staff could be evacuated in this manner. At an evacuation rate of 600 vehicles/lane/hour on Old Castlereagh Road and Andrews Road, all patrons and staff of the Sydney Helicopters site could be evacuated within 5.36 hrs from the time that an evacuation notice is given as detailed in Section 3.1.2. However, the estimated time available to evacuate is 8.9 hours (refer to section 3.1.1).

Scenario 2 - Pedestrian Evacuation (if required)

In the unlikely event that vehicle access is restricted to/from the site, there is potential for all staff and patrons to walk east along Old Castlereagh Road and further east along Andrews Road to a location above the regional PMF flood level. Figure 37 of the Hawkesbury-Nepean Valley Regional Flood Study (WMA, 2019) and Map 015_B of the Nepean River Flood Study (Advisian, 2017) illustrates that Andrews Road would be flood free in a regional PMF flood event approximately 2 kms east of the site. It is a further 1 km along Andrews Road before reaching the regional Northern Road evacuation route.

Refer to Plate 2 for an extract of Map 015_B which illustrates the site in proximity to the PMF extent on Andrews Road.

Plate 2 – Proposed Flood Evacuation Route

Consequently the total capacity and Time required for Pedestrian Evacuation along Andrews Road (if required) is assessed as follows:

Distance = 2 km

Assumed Average speed 3.8 km/hr average (during evacuation event)

maximum Pedestrian Evacuees = 60

Footpath Capacity (2 persons abreast at 1.5 m spacing @ 3800 m/hr = 5,067 persons/hr

Evac Timeline Acceptance/Lag/Safety Factors (WAF + WLF + TSF) = 0.5 + 1.0 + 1.5 = 3.0 hr
(refer section 3.1 for details of each parameter)

Potential additional local flood delay = 2.5 hrs

Total Required time = 60/5,067 + 3.0 (safety) + 2.5 (flood delay) = **5.5 hr**

Total Available time = **8.9 hours** (Refer Section 3.1.1)

It is noted that during the time of flood emergency, there is also an pportunity for some patrons to evacuate via helicopter exists given the site is owned by Sydney Helicopters, however, this has been conservatively left out of evacuation calculations.

The early evacuation of commercial properties is considered beneficial in the context of the evacuation of the broader regional Hawkesbury Nepean Valley and is likely to improve the regional evacuation timeframe.

4. FLOOD EVACUATION STRATEGY

We recommend that Sydney Helicopters management undertake formal training for their staff in the evacuation strategy and the likely timeframe available for evacuation so that they can assist patrons evacuating the site without unnecessary panic.

We also recommend that Sydney Helicopters have current flood evacuation route maps prepared and printed for distribution to patrons when an evacuation is announced, particularly as traffic leaves the site. Flood evacuation plans should also be clear and visible at all entry/exit points of the site. For the successful implementation of evacuation plan, the site manager must:

- Know what to do in a flood;
- Provide the example of FloodSafe Plan to staff and construction workers;
- Maintain a register of special needs people;
- Possess emergency management skills;
- Arrange and carry out annual evacuation drills;
- Maintain the Flood Warning System;
- Engage an external auditor for annual audits; and
- Arrange for the updating and revision of the plan every 10 years.

If vehicular evacuation is restricted, preference should be given to evacuating the elderly, disabled and children from the site. Able-bodied persons have more than sufficient time within the available 8.9 hour evacuation time to walk 2 km east along Old Castlereagh Road and Andrews Road to a location above the regional PMF flood extent.

Any instruction provided at the time of an evacuation by the SES or other emergency services personnel takes precedence over this strategy. This strategy should be updated when the Hawkesbury Nepean Flood Plan (SES, 2020) is updated.

4.1. Regional Nepean River Flooding

Site Flooding

The flood depth maps provided in the Regional Flood Study (WMA, 2019) indicate that the site is flood affected in a 20% AEP (1 in 5 AEP), 1% AEP (1 in 100 AEP) and a 0.2% AEP (1 in 500 AEP) regional flood event. In the 20% AEP and 1% AEP the flooding is localised to the existing farm dam and local overland flow path in the northern portion of the site. In the 0.2% AEP, the flooding begins to breach the banks of the flow path and inundates portion of the disturbed site.

For a 0.1% AEP (1 in 1000 AEP) and up to PMF flood event the flood maps indicate that the site is completely submerged by floodwaters. This flood affectation will need to be considered during a regional flood evacuation, as evacuees will need to drive up Andrews Road and out of the PMF flood zone. Refer to the figures from the Regional Flood Study (WMA, 2019) which are included in Appendix C for range of storm event.

Andrews Road Flooding

In events up to and including the 0.2% AEP, the local evacuation route (Old Castlereagh Road and Andrews Road) remain flood free. In the 0.1% AEP and greater events, Andrews Road becomes inundated between Castlereagh Road and Laycock Street. This flood affectation will need to be considered during a regional flood evacuation, as evacuees will need to drive up Andrews Road and out of the PMF flood zone.

This flood affectation will need to be considered during a regional flood evacuation, as evacuees will need to drive up Andrews Road and out of the PMF flood zone. Refer to Plate 4-1 below which depicts Andrews Road flooding.

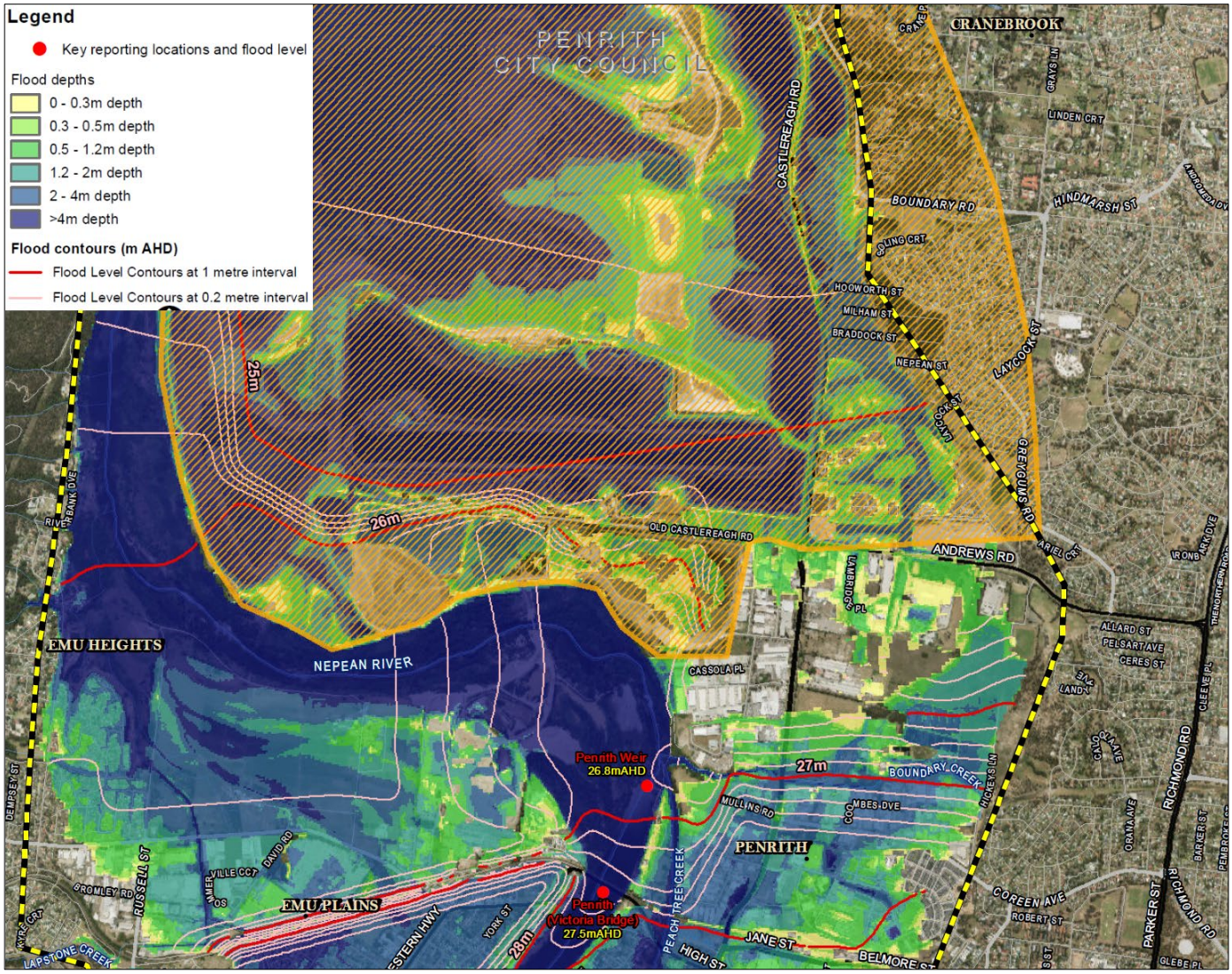


Plate 4-1 - Andrews Road Corridor showing peak 0.1% AEP Depth (Source: Hawkesbury-Nepean Valley Regional Flood Study 2019*)*

The document titled *HAWKESBURY-NEPEAN VALLEY: NSW SES FLOOD WARNING GAUGES – Annex B, Supporting document (NSW SES Response Arrangements for Hawkesbury-Nepean Valley) to the Hawkesbury-Nepean Flood Plan 2020* advises on the locations of flood warnings and local flood advices that are issued. An extract from table 1 of this document is provided in Table 4-1.

The Penrith Gauge at the Victoria Bridge has a base level of RL 14.1 m AHD. This means the target warning flood level of **RL 23 m AHD** is applicable for Penrith. This matches with the 20yr flood level identified in the Nepean River Flood Study (Advisian 2017) report and Hawkesbury-Nepean Valley Regional Flood Study (WMA, 2019). For floods of this nature a **6 hr warning time** is relevant.

As mentioned in Section 2 of this letter, the Penrith North sector (which includes the Sydney Helicopters site) will need to be completely evacuated if the predicted flood level at the Penrith gauge will exceed RL 22.3 m. This means that the site will be evacuated well before a Andrews Road flooding would occur.

It is noted that the regional flood mapping presented in the study at Penrith Lakes is indicative only.

Refer to the figures range of storm events, 20% AEP, 10% AEP, 5% AEP, 2% AEP, 1% AEP, 0.5% AEP, 0.2% AEP, 0.1% AEP, 0.05% AEP, 0.02% AEP and PMF the from Regional Flood Study (WMA, 2019) which are included in Appendix C.

Table 4-1 – Gauge Monitred within the Hawkesbury-Nepean Valley

Table 1: Gauges monitored within the Hawkesbury-Nepean Valley

Bureau No.	AWRC No.	Forecast location	Station owner	Gauge type	Flood Classification (m)			Flood Warnings provided by the Bureau	Flood Intelligence Card Held	Gauge Zero (m)	Target warning lead time		70% of peak forecasts within	Comments
					Min	Mod	Maj				Time (hrs)	Trigger height (m)		
568171	212238	Menangle Weir +	Water NSW	Automatic	2.8	6.5	9.3	No (flood classifications available for information only)						Used as a proxy to predict to 212238.
068216	212904	Menangle	Bureau	Automatic	5.2	9.2	12.2	Quantitative	Yes	58.47	6hrs	>5.2m	+/- 0.3m	
568154	212216	Camden Weir +	Water NSW	Automatic	6.8	8.3	13.8	Quantitative		55.284	12hrs	>6.8m	+/- 0.3m	Used as a proxy to predict to 212900
68214	212900	Camden Bridge	Bureau	Manual	6.8	8.3	13.8	No (flood classifications available for information only)	Yes	55.672				212216 is used to predict to this gauge. They read roughly the same.
067093	212202	Wallacia Weir	Water NSW	Automatic	5.0	8.7	11.0	Quantitative	Yes	29.646	12hrs	>5.0m	+ / - 0.3m	
567047	212201	Penrith	Water NSW	Automatic	3.9	7.9	10.4	Quantitative	Yes	14.136	6hrs	>8.9m	+/- 0.3m	
											8hrs	>11.3m		

4.2. Local Nepean River Flooding

Site Flooding

The flood depth maps provided in the Nepean River Flood Study (Advisian, 2017) indicate that the site is not flood-affected in a 20 year ARI (5% AEP). In the 50 year ARI (2% AEP), 100 year ARI (1% AEP) and 200 year ARI (0.5% AEP) the site is flood affected, however, the flooding is localised to the existing farm dam and local overland flow path in the northern portion of the site. In the 500 year ARI (0.2% AEP), the flooding begins to breach the banks of the flow path and inundates portion of the disturbed site.

For a 1000 year ARI (0.1% AEP), 2000 year ARI (0.05% AEP) and a PMF flood event the flood maps indicate that the site is completely submerged by floodwaters.

Refer to the figures from the Nepean River Flood Study (Advisian, 2017) which are included in Appendix D.

Andrews Road Flooding

In events up to and including the 50 year ARI (2% AEP), the local evacuation route (Old Castlereagh Road and Andrews Road) remain flood free. In the 100 year ARI (1% AEP) and greater events, Andrews Road becomes inundated between Castlereagh Road and Laycock Street. This flood affectation will need to be considered during a regional flood evacuation, as evacuees will need to drive up Andrews Road and out of the PMF flood zone.

This flood affectation will need to be considered during a regional flood evacuation, as evacuees will need to drive up Andrews Road and out of the PMF flood zone.

Section 9.1.4 of the Nepean River Flood Study (Advisian, 2017) provides further details into the flood behaviours in the “Andrews Road Corridor” which is flooded by backwaters that emanate from Boundary Creek in the south and drain north across Andrews Road and through the Lakeside development. Refer to Plate 4-2 below which depicts this flow path.

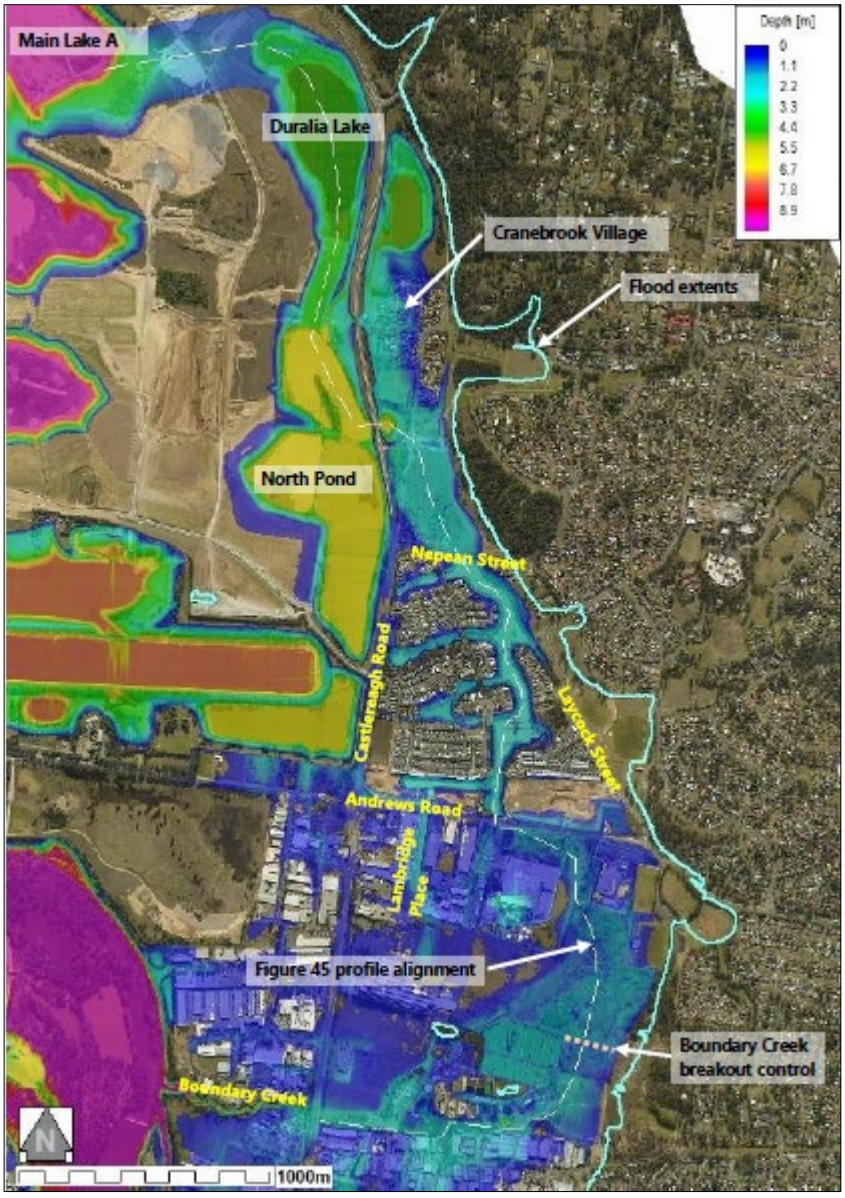


Plate 4-2 - Andrews Road flow corridor showing peak 200yr ARI depth and PMF extents (Source: Nepean River Flood Study, Figure 47)

During the PMF event, which is noted in the flood study as having the fastest rate of rise, the Boundary Creek breakout control (refer to Plate 3) is breached at a level of RL 24.7m. From this moment, it takes 2.8 hours for flood waters to increase to a level of RL 25.01m at the breakout control, at which point flows have expanded across the flow path and overtopped Andrews Road. Refer to section 9.1.4 of the Nepean River Flood Study (Advisian, 2017) for more information.

The Boundary Creek breakout occurs at a Penrith gauge level of RL 25.5m (near Victoria Bridge). As mentioned in Section 2 of this letter, the Penrith North sector (which includes the Sydney Helicopters site) will need to be completely evacuated if the predicted flood level at the Penrith gauge will exceed RL 22.3m. This means that the site will be evacuated well before a Boundary Creek breakout (and subsequent Andrews Road flooding) would occur.

4.3. Early Evacuation and Impact on Regional Flood Evacuation

As commercial properties within the Hawkesbury Nepean Valley are managed sites, these sites have the potential to be evacuated early on the direction of the site manager. That is, the SES's assumed one (1) hour time for residential residents to accept that they need to evacuate is not likely to be required for the commercial sites.

Therefore, the evacuation of commercial sites would occur ahead of the residential population. Given the proximity (approximately 3 km) of the site evacuees to the regional Northern Road evacuation route, the commercial evacuees would be on the Northern Road, well before the residential properties in the Penrith North Sector start to mobilise.

The likelihood of all commercial properties in the area (including Sydney Helicopters) being at full capacity also needs to be considered. A severe weather event sufficient to trigger a regional evacuation would likely be apparent to a significant portion of the population in the preceding days via the issue of a 'Flood Watch' for the Hawkesbury Nepean River from the Bureau of Meteorology (BoM). It is therefore likely that many patrons of commercial premises, and particularly the Sydney Helicopters site, would choose to make alternate arrangements and would not be within the floodplain.

The early evacuation of commercial properties is considered beneficial in the context of the evacuation of the broader regional Hawkesbury Nepean Valley and is likely to improve the regional evacuation timeframe.

4.4. Flood Awareness

Staffs, construction workers and visitors to the site need to be made aware of the flood hazard and evacuation procedures through a combination of measures and must be aware of FloodSafe Plan. All staff should be prepared and know what each staff member has to do if flooding should occur and know what route you are going to use to evacuate, as such a regular flood evacuation drill is recommended to reduce human behaviour risk during the flood events.

Signage should be installed at key locations within the site with clearly labelled directions of travel in the event of a flooding emergency. The signage draws awareness to flooding on site and flood evacuation procedures. The signs to guide people along the regional flood evacuation routes towards safer areas have to be installed. The template from SES is provided in Appendix E.

Individual staff including construction workers must be aware of FloodSafe Plan. The FloodSafe tips and "Get Prepared for Flood" fact sheet need to be provided on the notice board of office buildings and café. A Hawkesbury-Nepean factsheet "Get Prepared for Flood" and FloodSafe tips from the SES can be found in Appendix F.

4.5. Flood Warning

The Australian Warning System (AWS) is a nationally consistent, three-tiered approach designed to make warnings clearer and lead people to take action ahead of severe weather events. The warning system comprises warning levels, action statements, hazard icons, colours and shapes and can be found in Our Warnings | NSW State Emergency Service.

There are three levels within the AWS - Advice, Watch & Act and Emergency Warning as shown in Plate 4-3. For each level, there are a series of clear action statements to guide positive action by the community.

Plate 4-3 - Australian Warning System

These include 'stay informed', 'prepare to evacuate' and 'move to higher ground' as shown below:

- Advice - an incident has started. Stay up to date in case the situation changes.
  - Stay informed
  - Monitor conditions
  - Reduced threat: return with caution
- Watch and Act - conditions are changing and you need to start taking action now to protect you and your family.
  - Do not enter floodwater
  - Prepare to evacuate
  - Prepare to isolate
  - Avoid the area
- Emergency Warning - the highest level of warning. You may be in danger and need to take action immediately.
  - Evacuate now / Evacuate before [time]
  - Shelter now
  - Move to higher ground

Observation of local rainfall or floodwater

An important indication of likely imminent flood activity would be intense local rainfall. Furthermore, monitor WaterNSW site (Warragamba Dam - WaterNSW) for updates on spills from Warragamba Dam, affecting Nepean River water levels.

The Bureau of Meteorology

The Bureau of Meteorology does not prepare flood predictions for the Parramatta River but does issue Severe Thunderstorm Warnings and Severe Weather Warnings for Sydney.

Severe Thunderstorm Warnings are issued together with maps indicating the current location and predicted path of thunderstorms. Severe Weather Warnings are for severe weather not related to thunderstorms, cyclones or fire, but for other causes of intense rainfall or storm surge, such as "east coast lows". These warnings are available at http://www.bom.gov.au/nsw/warnings/.

BoM also provides real-time rain radar coverage for Sydney at http://www.bom.gov.au/products/IDR713.loop.shtml.

The NSW SES (Emergency Phone Number 132 500)

The local SES unit is Penrith located at 27 Fowler Street, Claremont Meadows NSW. The applicable region is the Metro Zone, which operates a Facebook page for informing members of the public (https://m.facebook.com/PenrithSES).

The SES issues Local Flood Advices. These are issued on the basis of localised valley watch information for locations for which the BoM does not issue Flood Warnings. They normally predict which class of flooding (minor, moderate or major) will occur, and must not contradict any Flood Warnings provided by the BoM for other gauges on the same river. Local Flood Advices are to be identified as being issued by the SES (Home | NSW State Emergency Service).

Local television and radio stations

Local television and radio stations would disseminate warnings from the Bureau of Meteorology, SES and other relevant sources. The local radio station for emergency information is 702 ABC.

5. POST-FLOOD RECOVERY PLAN

During a regional Nepean River flood event such as the PMF storm event, it is anticipated that the regional utility services such as electricity, sewer, water and communications would be out of commission for a period of time. Without the availability of these key utilities, it is unlikely that the Sydney Helicopters development would be able to conduct normal operations immediately following an extreme flood.

Once the SES has given the 'all clear' for residents and business owners to return to their premises after a flood, we anticipate that the post-flood recovery operations would include the following actions by the site manager:

- Arrange for a suitably qualified professional to undertake an inspection of the site for any structural damage to determine whether the building is safe to occupy;
- Liaise with utility providers to confirm the anticipated timeframes in which they can be restored;
- Clean up any debris and repair any damage to the building to ensure it is safe to occupy

Once all essential services are re-established and the site is cleaned/repaired after a flood event, normal operations could resume.

6. CONSULTATION

Urbis Pty Ltd has prepared the Response to Submissions (RTS) report for Sydney Helicopters in February 2022 in response to the community and agency submissions received during the public exhibition of the Environmental Impact Statement (EIS) for a proposed Helipad facility. The following government agencies had made submissions relevant response to each submission has been provided on the 2022 RTS report.

- Blue Mountains City Council;
- Civil Aviation Safety Authority;
- Department of Infrastructure, Transport, Regional Development & Communications;
- Julia Finn MP – Member for Granville;
- NSW DPE - Environment, Energy and Science Group;
- NSW Rural Fire Service;
- Penrith City Council; and
- Transport for NSW.

Refer to the 2022 RTS report for detailed information.

It is noted that the Department of Planning and Environment (DPE) required evidence of consultation with the Hawkesbury-Nepean Valley Flood Risk Management Directorate within Infrastructure NSW, NSW State Emergency Service (SES) and Transport for NSW as a part of this plan and is discussed below:

- NSW State Emergency Service (SES)

  J. Wyndham Prince has reviewed the comments received on 30 June 2023 from SES and have updated the strategy accordingly. The SES comments is provided in Appendix G.

- Transport for NSW (TfNSW)

  Transport for NSW (TfNSW), stated in 2022 RTS report that *The proposed flood evacuation procedures appear to incorrectly identify primary evacuation routes via the Great Western Highway which, in particular, includes egress from the site via a low-lying railway underpass at Penrith. The proposal should revisit flood evacuation procedures and include consultation with NSW State Emergency Services on the preferred regional evacuation path*.

  The updated FEMP addressing all the comments from SES dated 30 June 2023 was provided to TfNSW for their review and comments on 11 August 2023. TfNSW responded on 1 September 2023 noting that this report has addressed the TfNSW requirements and that Penrith Council and the SES have been consulted on the updated

Flood Evacuation Management Plan as such TfNSW have no further comments. The response from TfNSW is provided in Appendix H.

- Hawkesbury-Nepean Valley Flood Risk Management Directorate (New South Wales Reconstruction Authority from 1 July 2023) within Infrastructure NSW

  J. Wyndham Prince consulted with Hawkesbury-Nepean Valley Flood Risk Management Directorate, now, New South Wales Reconstruction Authority (NSWRA) as required by DA condition on 11 August 2023. J. Wyndham Prince received the response from NSWRA on 22 August 2023. In terms of evacuation risk, NSWRA stated that the evacuation risk to life is relatively low from this development is low given that the development site would need evacuation for events greater than 1 in 20 chance per year (5% AEP event).

  The NSWRA notes that:

  - The SES is the combat agency for flood events, and is responsible for managing flood events including flood emergency evacuations.
  - The NSWRA supports the issues they raised in SES letter on the FEMP to the Department of Planning and Environment dated 30 June 2023.
  - Also during flood emergencies the directions from the SES and other emergency response agencies must prevail over the measures outlined in the FEMP.

The response from NSWRA is provided in Appendix I.

We trust that this report complies with the DA condition requirement to have confidence that the patrons and staff of the Sydney Helicopters will have a manageable and safe flood evacuation strategy.

Should you have any queries regarding this matter please do not hesitate to contact me.

Yours faithfully

SABINA LOHANI

Manager – Stormwater & Flooding

7. REFERENCES

- State Emergency Service (SES), Hawkesbury Nepean Flood Plan, NSW Government, September 2020.
- WMA Water (WMA), Hawkesbury Nepean Valley Regional Flood Study Final Report, Infrastructure NSW, July 2019.
- Advisian, Nepean River Flood Study, Penrith City Council, August 2017.
- NSW Department of Planning and Environment (DPE), Penrith Lakes Development Control Plan, June 2022

8. APPENDICES

Appendix A – Maps extracted from the Hawkesbury Nepean Flood Plan (SES, 2020)

Appendix B – Sydney Helicopters Flood Evacuation Plan

Appendix C – Maps extracted from the Hawkesbury Nepean Valley Regional Flood Study (WMA, 2019)

Appendix D – Maps extracted from the Nepean River Flood Study (Advisian, 2017)

Appendix E – Signs to Guide Flood Evacuation Routes

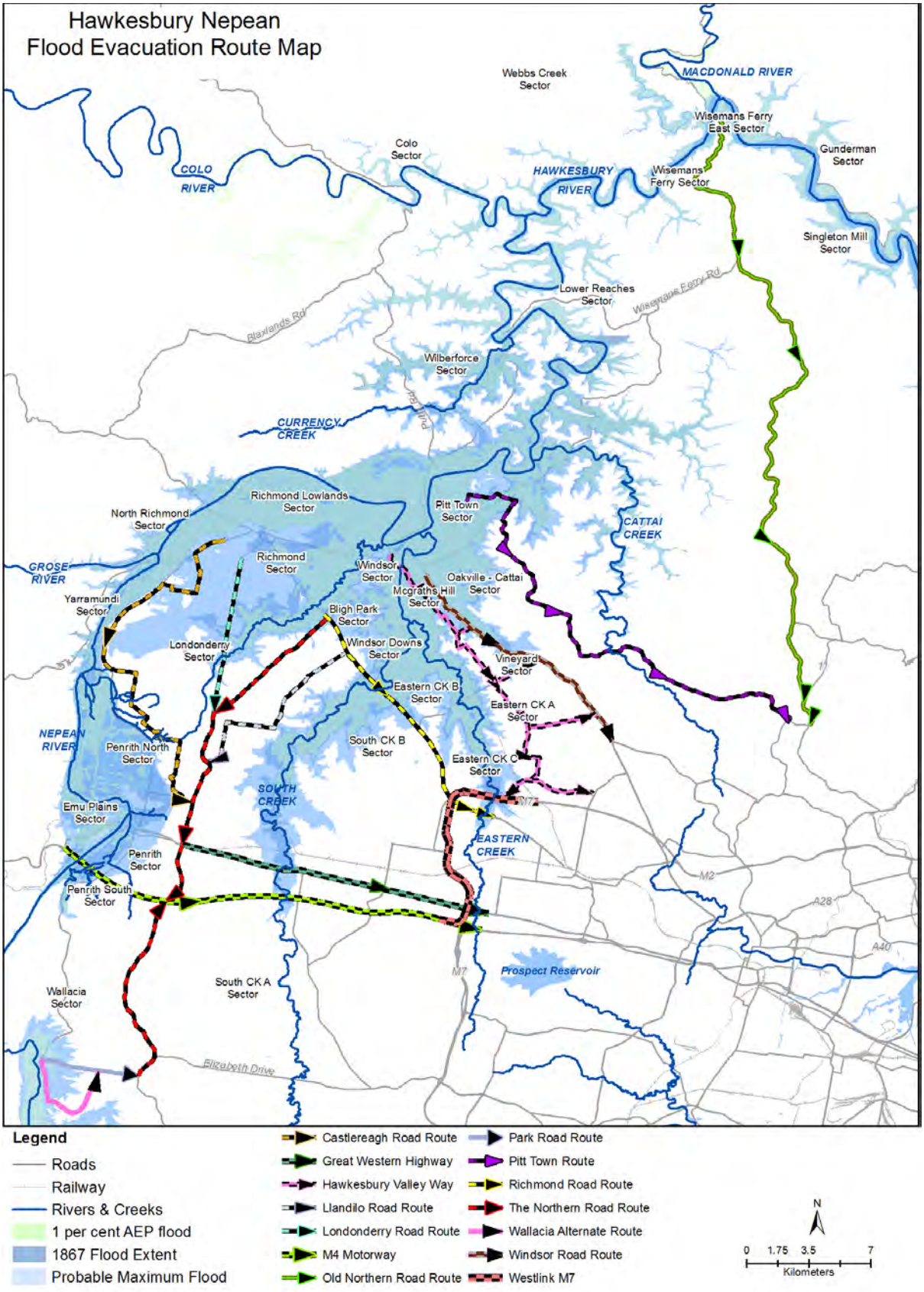
Appendix F – Hawkes-Nepean Fact Sheet “Get Prepared for Flood”

Appendix G – SES Consultation

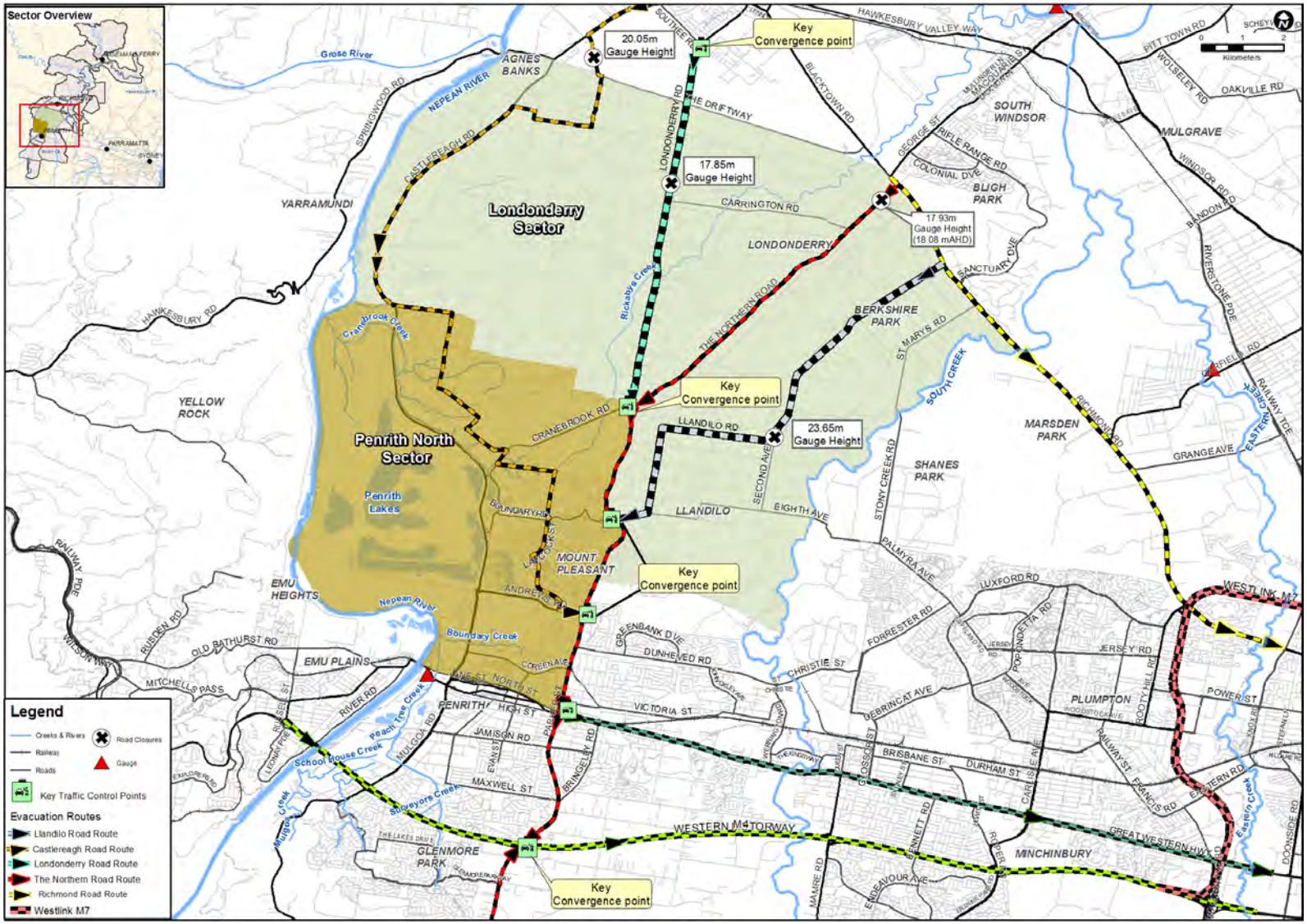
Appendix H – TfNSW Consultation

Appendix I – NSWRA Consultation

APPENDIX A – MAPS EXTRACTED FROM THE HAWKESBURY NEPEAN FLOOD PLAN (SES, 2020)



Map 1: Regional Evacuation Routes within the Hawkesbury-Nepean Valley



Map 9: Londonderry and Penrith North - Evacuation Routes

APPENDIX B – SYDNEY HELICOPTERS FLOOD EVACUATION PLAN

J. WYNDHAM PRINCE
CONSULTING CIVIL INFRASTRUCTURE ENGINEERS & PROJECT MANAGERS
CELEBRATING 40 YEARS 1982 - 2022

LEGEND

- Primary Flood Evacuation Route
- Alternate Flood Evacuation Route
- Existing Contours
- Site Area

N

0 200 400 m

Scale 1: 14299 @ A3

Projection: GDA2020 / MGA zone 56

Figure 2-1

89-151 Old Castlereagh Road, Castlereagh

Flood Evacuation Routes

Date: 15/02/2023 Revision:A

File Name: J:\110934 - 89-151 Old Castlereagh Road\02 - Package\SWE\QGIS\Project\Flood Evacuation Route.qgz

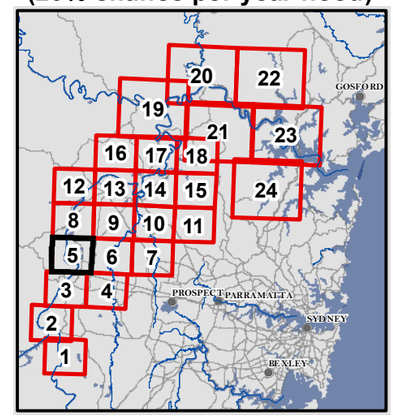
APPENDIX C – MAPS EXTRACTED FROM THE HAWKESBURY NEPEAN VALLEY REGIONAL FLOOD STUDY (WMA, 2019)

Hawkesbury-Nepean Valley Regional Flood Study

Final Report (July 2019)
Volume 3: Map Book - Part A

FLOOD EXTENTS, DEPTHS AND CONTOURS

1 in 5 AEP flood
(20% chance per year flood)



Legend

- Key reporting locations and flood level

Flood depths

- 0 - 0.3m depth
- 0.3 - 0.5m depth
- 0.5 - 1.2m depth
- 1.2 - 2m depth
- 2 - 4m depth
- >4m depth

Flood contours (m AHD)

- Flood Level Contours at 1 metre interval
- Flood Level Contours at 0.2 metre interval

0 750 1,500

Metres (1:28,000 at A3)

Notes:

This map was prepared by Infrastructure NSW based on the Hawkesbury-Nepean Valley Regional Flood Study (WMAwater, Final Report July 2019) using LiDAR dated May 2017 (dated 2011 downstream of Wisemans Ferry).

The mapped flood information represents Hawkesbury-Nepean mainstream regional flooding including backwater effects, but does not include local catchment flooding or local overland flooding.

Flood behaviour information is subject to change as a result of new data, methods and technology.

The mapped flood information excludes the impacts of climate change and implementation of potential flood mitigation measures.

Any flooding information within the banks of rivers or streams should not be used for any assessment (other than flood extents) without detailed investigation.

Flood depths are indicative only. To determine the depth of flooding at a particular location, the flood level should be compared to a surveyed ground level.

Aerial photography: 2016 NSW Spatial Services

Penrith Lakes Area (approximate only)
Flood mapping over Penrith Lakes is indicative only as the flood modelling does not incorporate the latest infrastructure of the Penrith Lakes Scheme.

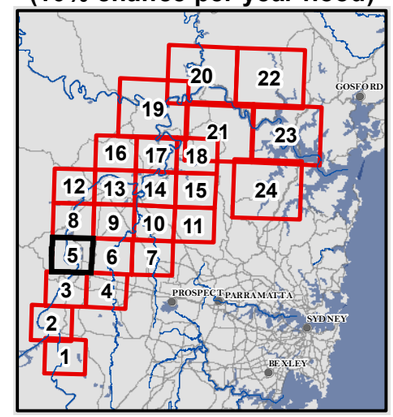
SES NSW STATE EMERGENCY SERVICE

NSW GOVERNMENT

Hawkesbury-Nepean Valley Regional Flood Study

Final Report (July 2019)
Volume 3: Map Book - Part A

FLOOD EXTENTS, DEPTHS AND CONTOURS
1 in 10 AEP flood
(10% chance per year flood)



Legend

- Key reporting locations and flood level

Flood depths
- 0 - 0.3m depth
- 0.3 - 0.5m depth
- 0.5 - 1.2m depth
- 1.2 - 2m depth
- 2 - 4m depth
- >4m depth

Flood contours (m AHD)
- Flood Level Contours at 1 metre interval
- Flood Level Contours at 0.2 metre interval

0 750 1,500
Metres (1:28,000 at A3)

Penrith Lakes Area (approximate only)
Flood mapping over Penrith Lakes is indicative only as the flood modelling does not incorporate the latest infrastructure of the Penrith Lakes Scheme.

Notes:
This map was prepared by Infrastructure NSW based on the Hawkesbury-Nepean Valley Regional Flood Study (WMAwater, Final Report July 2019) using LiDAR dated May 2017 (dated 2011 downstream of Wisemans Ferry).
The mapped flood information represents Hawkesbury-Nepean mainstream regional flooding including backwater effects, but does not include local catchment flooding or local overland flooding.
Flood behaviour information is subject to change as a result of new data, methods and technology.
The mapped flood information excludes the impacts of climate change and implementation of potential flood mitigation measures.
Any flooding information within the banks of rivers or streams should not be used for any assessment (other than flood extents) without detailed investigation.
Flood depths are indicative only. To determine the depth of flooding at a particular location, the flood level should be compared to a surveyed ground level.
Aerial photography: 2016 NSW Spatial Services

SES NSW STATE EMERGENCY SERVICE
NSW GOVERNMENT

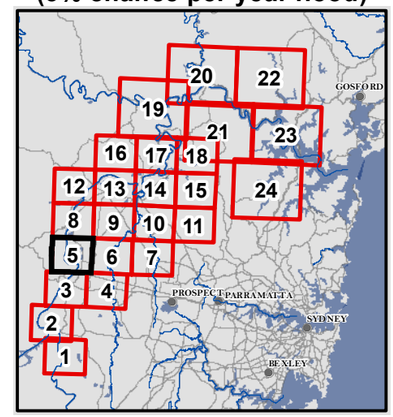
Hawkesbury-Nepean Valley Regional Flood Study

Final Report (July 2019)

Volume 3: Map Book - Part A

FLOOD EXTENTS, DEPTHS AND CONTOURS

1 in 20 AEP flood (5% chance per year flood)



Legend

- Key reporting locations and flood level

Flood depths

- 0 - 0.3m depth
- 0.3 - 0.5m depth
- 0.5 - 1.2m depth
- 1.2 - 2m depth
- 2 - 4m depth
- >4m depth

Flood contours (m AHD)

- Flood Level Contours at 1 metre interval
- Flood Level Contours at 0.2 metre interval

0 750 1,500

Metres (1:28,000 at A3)

Penrith Lakes Area (approximate only)

Flood mapping over Penrith Lakes is indicative only as the flood modelling does not incorporate the latest infrastructure of the Penrith Lakes Scheme.

Area of Penrith City Council Nepean River Flood Study

The Nepean River Flood Study provides more detailed analysis of flood behaviour in this area for this flood event.

Notes:

This map was prepared by Infrastructure NSW based on the Hawkesbury-Nepean Valley Regional Flood Study (WMAwater, Final Report July 2019) using LiDAR dated May 2017 (dated 2011 downstream of Wisemans Ferry).

The mapped flood information represents Hawkesbury-Nepean mainstream regional flooding including backwater effects, but does not include local catchment flooding or local overland flooding.

Flood behaviour information is subject to change as a result of new data, methods and technology.

The mapped flood information excludes the impacts of climate change and implementation of potential flood mitigation measures.

Any flooding information within the banks of rivers or streams should not be used for any assessment (other than flood extents) without detailed investigation.

Flood depths are indicative only. To determine the depth of flooding at a particular location, the flood level should be compared to a surveyed ground level.

Aerial photography: 2016 NSW Spatial Services

SES NSW STATE EMERGENCY SERVICE

NSW GOVERNMENT

Hawkesbury-Nepean Valley Regional Flood Study

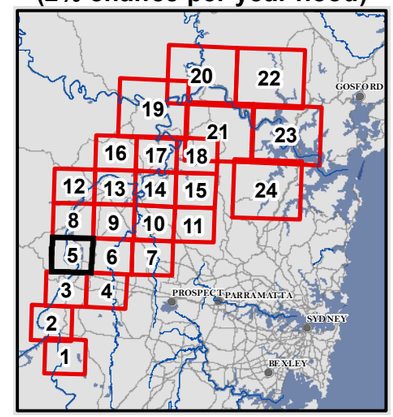
Final Report (July 2019)

Volume 3: Map Book - Part A

FLOOD EXTENTS, DEPTHS AND CONTOURS

1 in 50 AEP flood

(2% chance per year flood)



Legend

- Key reporting locations and flood level

Flood depths

- 0 - 0.3m depth
- 0.3 - 0.5m depth
- 0.5 - 1.2m depth
- 1.2 - 2m depth
- 2 - 4m depth
- >4m depth

Flood contours (m AHD)

- Flood Level Contours at 1 metre interval
- Flood Level Contours at 0.2 metre interval

0 750 1,500

Metres (1:28,000 at A3)

Notes:

This map was prepared by Infrastructure NSW based on the Hawkesbury-Nepean Valley Regional Flood Study (WMAwater, Final Report July 2019) using LiDAR dated May 2017 (dated 2011 downstream of Wisemans Ferry).

The mapped flood information represents Hawkesbury-Nepean mainstream regional flooding including backwater effects, but does not include local catchment flooding or local overland flooding.

Flood behaviour information is subject to change as a result of new data, methods and technology.

The mapped flood information excludes the impacts of climate change and implementation of potential flood mitigation measures.

Any flooding information within the banks of rivers or streams should not be used for any assessment (other than flood extents) without detailed investigation.

Flood depths are indicative only. To determine the depth of flooding at a particular location, the flood level should be compared to a surveyed ground level.

Aerial photography: 2016 NSW Spatial Services

Penrith Lakes Area (approximate only)
Flood mapping over Penrith Lakes is indicative only as the flood modelling does not incorporate the latest infrastructure of the Penrith Lakes Scheme.

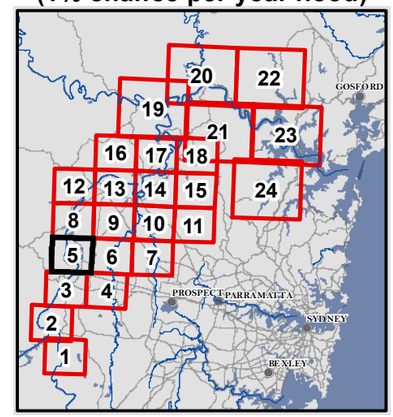
Area of Penrith City Council Nepean River Flood Study
The Nepean River Flood Study provides more detailed analysis of flood behaviour in this area for this flood event.

Hawkesbury-Nepean Valley Regional Flood Study

Final Report (July 2019)
Volume 3: Map Book - Part A

FLOOD EXTENTS, DEPTHS AND CONTOURS

1 in 100 AEP flood
(1% chance per year flood)



Legend

- Key reporting locations and flood level

Flood depths
- 0 - 0.3m depth
- 0.3 - 0.5m depth
- 0.5 - 1.2m depth
- 1.2 - 2m depth
- 2 - 4m depth
- >4m depth

Flood contours (m AHD)
- Flood Level Contours at 1 metre interval
- Flood Level Contours at 0.2 metre interval

0 750 1,500
Metres (1:28,000 at A3)

Penrith Lakes Area (approximate only)
Flood mapping over Penrith Lakes is indicative only as the flood modelling does not incorporate the latest infrastructure of the Penrith Lakes Scheme.

Area of Penrith City Council Nepean River Flood Study
The Nepean River Flood Study provides more detailed analysis of flood behaviour in this area for this flood event.

Notes:
This map was prepared by Infrastructure NSW based on the Hawkesbury-Nepean Valley Regional Flood Study (WMAwater, Final Report July 2019) using LiDAR dated May 2017 (dated 2011 downstream of Wisemans Ferry).
The mapped flood information represents Hawkesbury-Nepean mainstream regional flooding including backwater effects, but does not include local catchment flooding or local overland flooding.
Flood behaviour information is subject to change as a result of new data, methods and technology.
The mapped flood information excludes the impacts of climate change and implementation of potential flood mitigation measures.
Any flooding information within the banks of rivers or streams should not be used for any assessment (other than flood extents) without detailed investigation.
Flood depths are indicative only. To determine the depth of flooding at a particular location, the flood level should be compared to a surveyed ground level.
Aerial photography: 2016 NSW Spatial Services

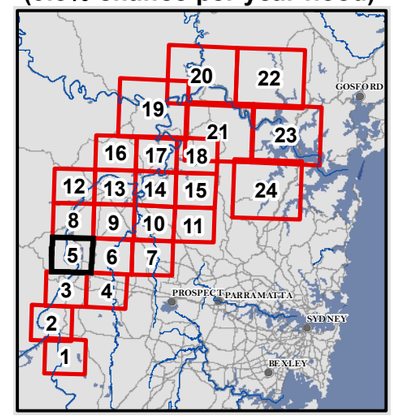
SES NSW STATE EMERGENCY SERVICE
NSW GOVERNMENT

Hawkesbury-Nepean Valley Regional Flood Study

Final Report (July 2019)
Volume 3: Map Book - Part A

FLOOD EXTENTS, DEPTHS AND CONTOURS

1 in 200 AEP flood
(0.5% chance per year flood)



Legend

- Key reporting locations and flood level

Flood depths
- 0 - 0.3m depth
- 0.3 - 0.5m depth
- 0.5 - 1.2m depth
- 1.2 - 2m depth
- 2 - 4m depth
- >4m depth

Flood contours (m AHD)
- Flood Level Contours at 1 metre interval
- Flood Level Contours at 0.2 metre interval

0 750 1,500
Metres (1:28,000 at A3)

Notes:
This map was prepared by Infrastructure NSW based on the Hawkesbury-Nepean Valley Regional Flood Study (WMAwater, Final Report July 2019) using LiDAR dated May 2017 (dated 2011 downstream of Wisemans Ferry).
The mapped flood information represents Hawkesbury-Nepean mainstream regional flooding including backwater effects, but does not include local catchment flooding or local overland flooding.
Flood behaviour information is subject to change as a result of new data, methods and technology.
The mapped flood information excludes the impacts of climate change and implementation of potential flood mitigation measures.
Any flooding information within the banks of rivers or streams should not be used for any assessment (other than flood extents) without detailed investigation.
Flood depths are indicative only. To determine the depth of flooding at a particular location, the flood level should be compared to a surveyed ground level.
Aerial photography: 2016 NSW Spatial Services

Penrith Lakes Area (approximate only)
Flood mapping over Penrith Lakes is indicative only as the flood modelling does not incorporate the latest infrastructure of the Penrith Lakes Scheme.

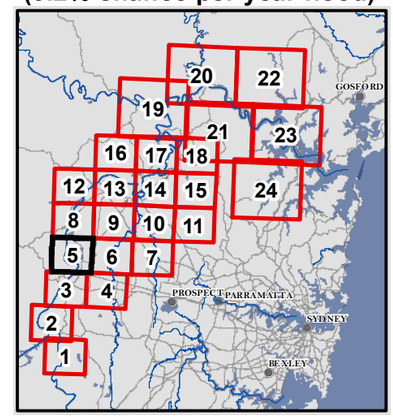
Area of Penrith City Council Nepean River Flood Study
The Nepean River Flood Study provides more detailed analysis of flood behaviour in this area for this flood event.

Hawkesbury-Nepean Valley Regional Flood Study

Final Report (July 2019)
Volume 3: Map Book - Part B

FLOOD EXTENTS, DEPTHS AND CONTOURS

1 in 500 AEP flood
(0.2% chance per year flood)



Legend

- Key reporting locations and flood level

Flood depths

- 0 - 0.3m depth
- 0.3 - 0.5m depth
- 0.5 - 1.2m depth
- 1.2 - 2m depth
- 2 - 4m depth
- >4m depth

Flood contours (m AHD)

- Flood Level Contours at 1 metre interval
- Flood Level Contours at 0.2 metre interval

0 750 1,500

Metres (1:28,000 at A3)

Penrith Lakes Area (approximate only)
Flood mapping over Penrith Lakes is indicative only as the flood modelling does not incorporate the latest infrastructure of the Penrith Lakes Scheme.

Area of Penrith City Council Nepean River Flood Study
The Nepean River Flood Study provides more detailed analysis of flood behaviour in this area for this flood event.

Notes:
This map was prepared by Infrastructure NSW based on the Hawkesbury-Nepean Valley Regional Flood Study (WMAwater, Final Report July 2019) using LiDAR dated May 2017 (dated 2011 downstream of Wisemans Ferry).
The mapped flood information represents Hawkesbury-Nepean mainstream regional flooding including backwater effects, but does not include local catchment flooding or local overland flooding.
Flood behaviour information is subject to change as a result of new data, methods and technology.
The mapped flood information excludes the impacts of climate change and implementation of potential flood mitigation measures.
Any flooding information within the banks of rivers or streams should not be used for any assessment (other than flood extents) without detailed investigation.
Flood depths are indicative only. To determine the depth of flooding at a particular location, the flood level should be compared to a surveyed ground level.
Aerial photography: 2016 NSW Spatial Services

SES NSW STATE EMERGENCY SERVICE

NSW GOVERNMENT

Hawkesbury-Nepean Valley Regional Flood Study

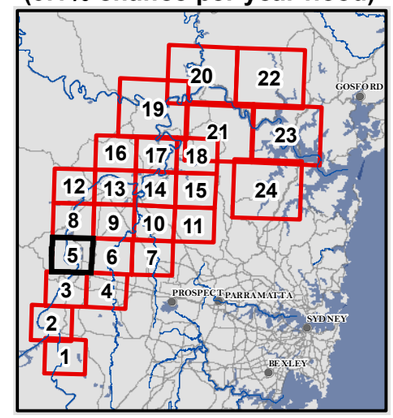
Final Report (July 2019)

Volume 3: Map Book - Part B

FLOOD EXTENTS, DEPTHS AND CONTOURS

1 in 1,000 AEP flood

(0.1% chance per year flood)



Legend

- Key reporting locations and flood level

Flood depths

- 0 - 0.3m depth
- 0.3 - 0.5m depth
- 0.5 - 1.2m depth
- 1.2 - 2m depth
- 2 - 4m depth
- >4m depth

Flood contours (m AHD)

- Flood Level Contours at 1 metre interval
- Flood Level Contours at 0.2 metre interval

0 750 1,500

Metres (1:28,000 at A3)

Penrith Lakes Area (approximate only)
Flood mapping over Penrith Lakes is indicative only as the flood modelling does not incorporate the latest infrastructure of the Penrith Lakes Scheme.

Area of Penrith City Council Nepean River Flood Study
The Nepean River Flood Study provides more detailed analysis of flood behaviour in this area for this flood event.

Notes:

This map was prepared by Infrastructure NSW based on the Hawkesbury-Nepean Valley Regional Flood Study (WMAwater, Final Report July 2019) using LiDAR dated May 2017 (dated 2011 downstream of Wisemans Ferry).

The mapped flood information represents Hawkesbury-Nepean mainstream regional flooding including backwater effects, but does not include local catchment flooding or local overland flooding.

Flood behaviour information is subject to change as a result of new data, methods and technology.

The mapped flood information excludes the impacts of climate change and implementation of potential flood mitigation measures.

Any flooding information within the banks of rivers or streams should not be used for any assessment (other than flood extents) without detailed investigation.

Flood depths are indicative only. To determine the depth of flooding at a particular location, the flood level should be compared to a surveyed ground level.

Aerial photography: 2016 NSW Spatial Services

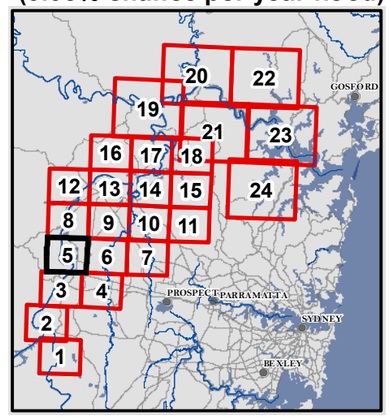
Hawkesbury-Nepean Valley Regional Flood Study

Final Report (July 2019)

Volume 3: Map Book - Part B

FLOOD EXTENTS, DEPTHS AND CONTOURS

1 in 2,000 AEP flood (0.05% chance per year flood)



Legend

- Key reporting locations and flood level

Flood depths

- 0 - 0.3m depth
- 0.3 - 0.5m depth
- 0.5 - 1.2m depth
- 1.2 - 2m depth
- 2 - 4m depth
- >4m depth

Flood contours (m AHD)

- Flood Level Contours at 1 metre interval
- Flood Level Contours at 0.2 metre interval

0 750 1,500

Metres (1:28,000 at A3)

Penrith Lakes Area (approximate only)
Flood mapping over Penrith Lakes is indicative only as the flood modelling does not incorporate the latest infrastructure of the Penrith Lakes Scheme.

Area of Penrith City Council Nepean River Flood Study
The Nepean River Flood Study provides more detailed analysis of flood behaviour in this area for this flood event.

Notes:

This map was prepared by Infrastructure NSW based on the Hawkesbury-Nepean Valley Regional Flood Study (WMAwater, Final Report July 2019) using LiDAR dated May 2017 (dated 2011 downstream of Wisemans Ferry).

The mapped flood information represents Hawkesbury-Nepean mainstream regional flooding including backwater effects, but does not include local catchment flooding or local overland flooding.

Flood behaviour information is subject to change as a result of new data, methods and technology.

The mapped flood information excludes the impacts of climate change and implementation of potential flood mitigation measures.

Any flooding information within the banks of rivers or streams should not be used for any assessment (other than flood extents) without detailed investigation.

Flood depths are indicative only. To determine the depth of flooding at a particular location, the flood level should be compared to a surveyed ground level.

Aerial photography: 2016 NSW Spatial Services

SES NSW STATE EMERGENCY SERVICE

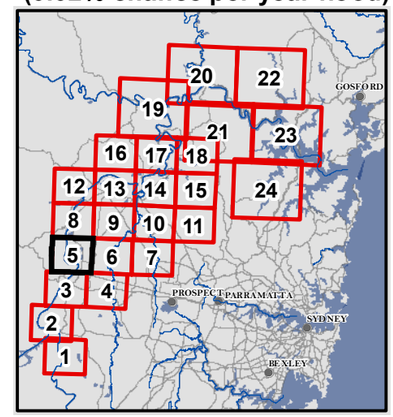
NSW GOVERNMENT

Hawkesbury-Nepean Valley Regional Flood Study

Final Report (July 2019)
Volume 3: Map Book - Part B

FLOOD EXTENTS, DEPTHS AND CONTOURS

1 in 5,000 AEP flood
(0.02% chance per year flood)



Legend

- Key reporting locations and flood level

Flood depths
- 0 - 0.3m depth
- 0.3 - 0.5m depth
- 0.5 - 1.2m depth
- 1.2 - 2m depth
- 2 - 4m depth
- >4m depth

Flood contours (m AHD)
- Flood Level Contours at 1 metre interval
- Flood Level Contours at 0.2 metre interval

0 750 1,500
Metres (1:28,000 at A3)

Notes:
This map was prepared by Infrastructure NSW based on the Hawkesbury-Nepean Valley Regional Flood Study (WMAwater, Final Report July 2019) using LiDAR dated May 2017 (dated 2011 downstream of Wisemans Ferry).
The mapped flood information represents Hawkesbury-Nepean mainstream regional flooding including backwater effects, but does not include local catchment flooding or local overland flooding.
Flood behaviour information is subject to change as a result of new data, methods and technology.
The mapped flood information excludes the impacts of climate change and implementation of potential flood mitigation measures.
Any flooding information within the banks of rivers or streams should not be used for any assessment (other than flood extents) without detailed investigation.
Flood depths are indicative only. To determine the depth of flooding at a particular location, the flood level should be compared to a surveyed ground level.
Aerial photography: 2016 NSW Spatial Services

Penrith Lakes Area (approximate only)
Flood mapping over Penrith Lakes is indicative only as the flood modelling does not incorporate the latest infrastructure of the Penrith Lakes Scheme.

SES NSW STATE EMERGENCY SERVICE

NSW GOVERNMENT

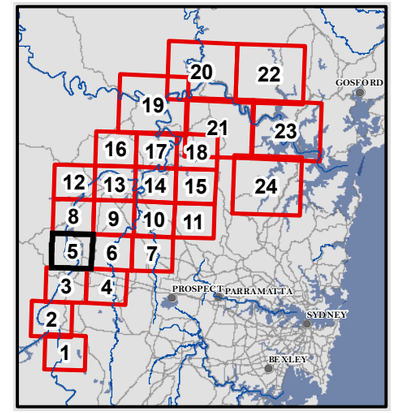
Hawkesbury-Nepean Valley Regional Flood Study

Final Report (July 2019)

Volume 3: Map Book - Part B

FLOOD EXTENTS, DEPTHS AND CONTOURS

Probable Maximum Flood (PMF)



Legend

- Key reporting locations and flood level

Flood depths

- 0 - 0.3m depth
- 0.3 - 0.5m depth
- 0.5 - 1.2m depth
- 1.2 - 2m depth
- 2 - 4m depth
- >4m depth

Flood contours (m AHD)

- Flood Level Contours at 1 metre interval
- Flood Level Contours at 0.2 metre interval

0 750 1,500

Metres (1:28,000 at A3)

Notes:

This map was prepared by Infrastructure NSW based on the Hawkesbury-Nepean Valley Regional Flood Study (WMAwater, Final Report July 2019) using LiDAR dated May 2017 (dated 2011 downstream of Wisemans Ferry).

The mapped flood information represents Hawkesbury-Nepean mainstream regional flooding including backwater effects, but does not include local catchment flooding or local overland flooding.

Flood behaviour information is subject to change as a result of new data, methods and technology.

The mapped flood information excludes the impacts of climate change and implementation of potential flood mitigation measures.

Any flooding information within the banks of rivers or streams should not be used for any assessment (other than flood extents) without detailed investigation.

Flood depths are indicative only. To determine the depth of flooding at a particular location, the flood level should be compared to a surveyed ground level.

Aerial photography: 2016 NSW Spatial Services

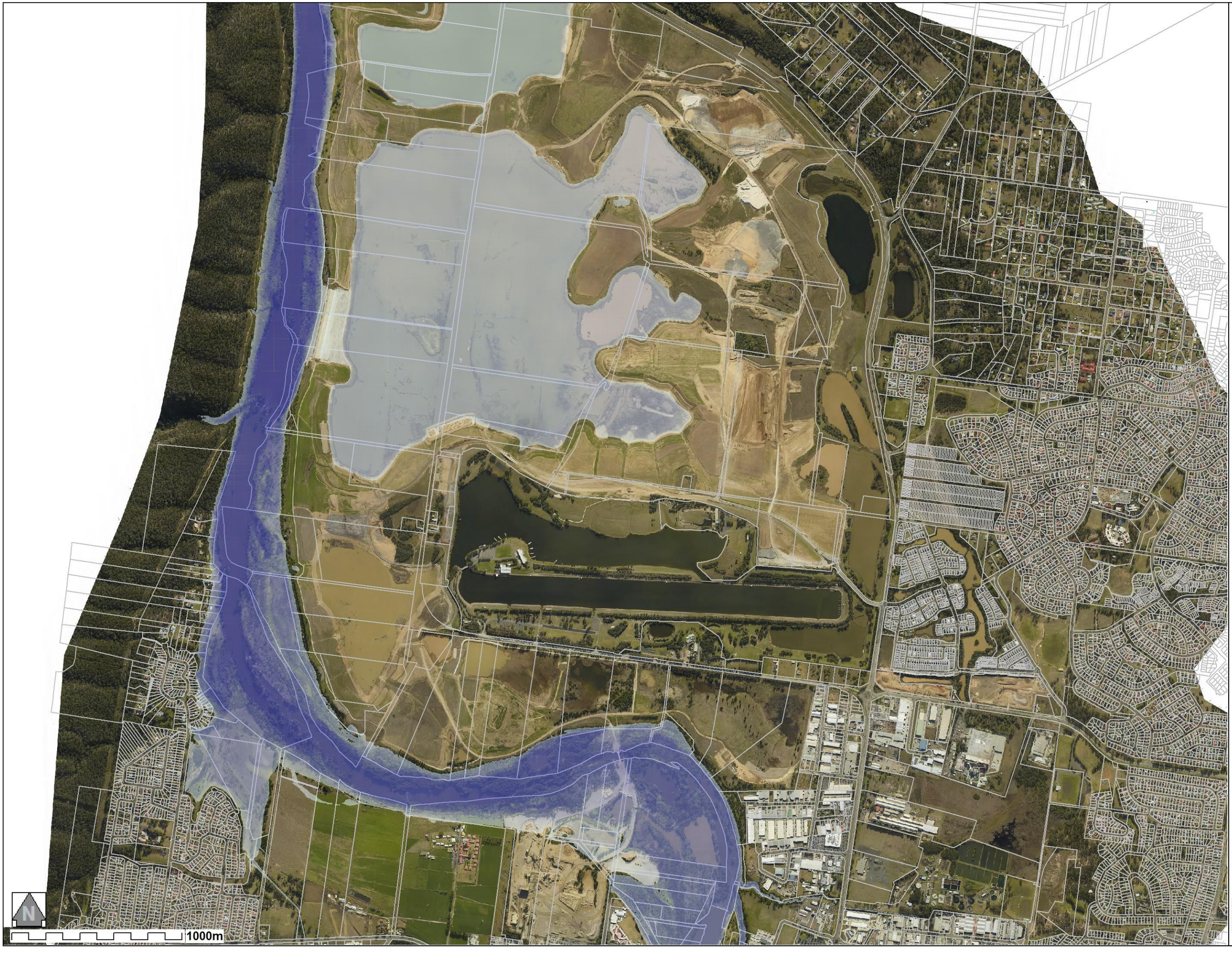
Penrith Lakes Area (approximate only)

Flood mapping over Penrith Lakes is indicative only as the flood modelling does not incorporate the latest infrastructure of the Penrith Lakes Scheme.

SES NSW STATE EMERGENCY SERVICE

NSW GOVERNMENT

APPENDIX D – MAPS EXTRACTED FROM THE NEPEAN RIVER FLOOD STUDY (ADVISIAN, 2017)



LEGEND

0 m
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

NEPEAN RIVER FLOOD STUDY

Flood Depth Surface 20 year ARI

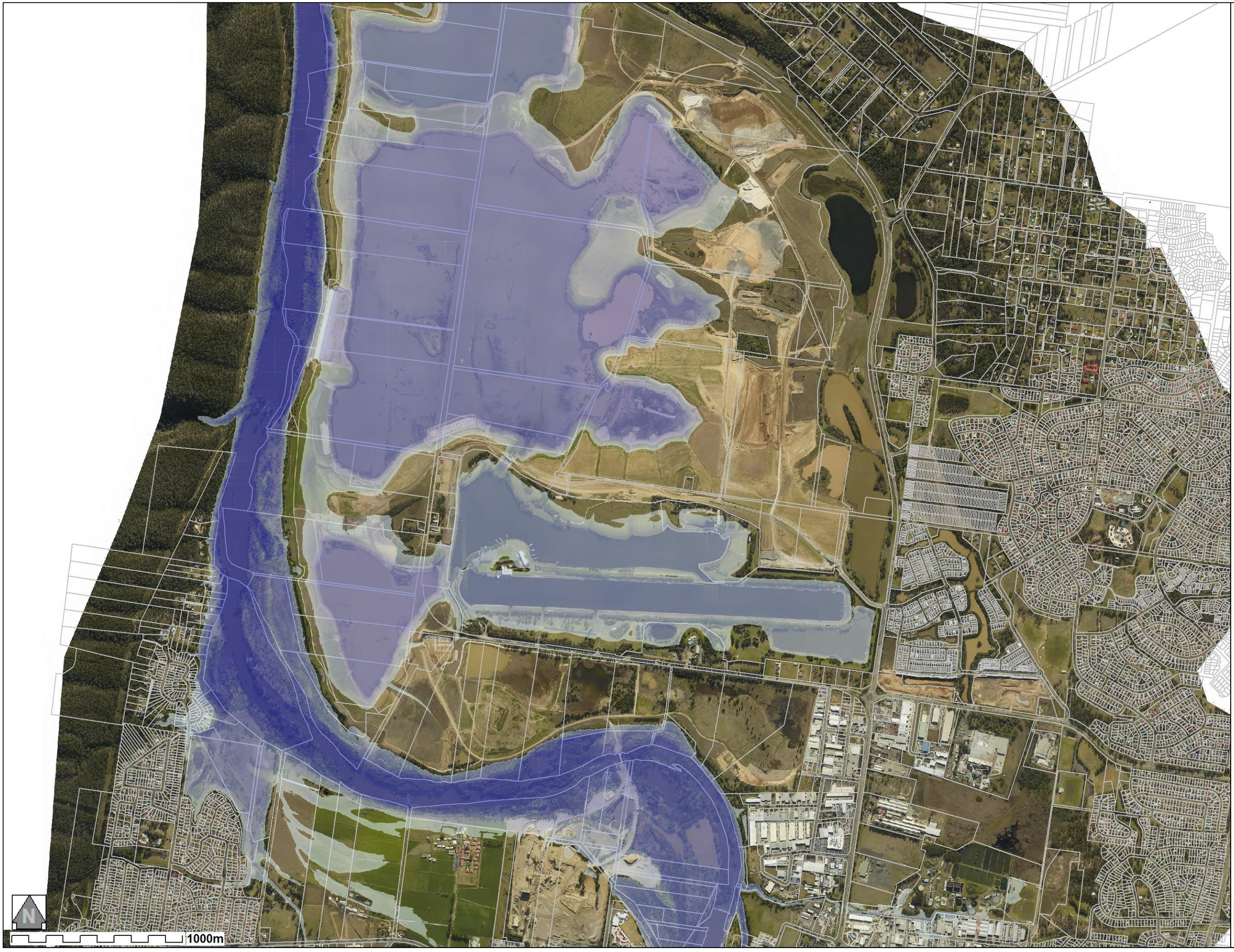
MAP 024_B

Scale 1:20,000 [A3]

5/11/2018
rp301077-14401-dmc-FS-Maps-r1.docx

PENRITH CITY COUNCIL

Advisian
WorleyParsons Group



LEGEND

0 m
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

NEPEAN RIVER FLOOD STUDY

Flood Depth Surface 50 year ARI

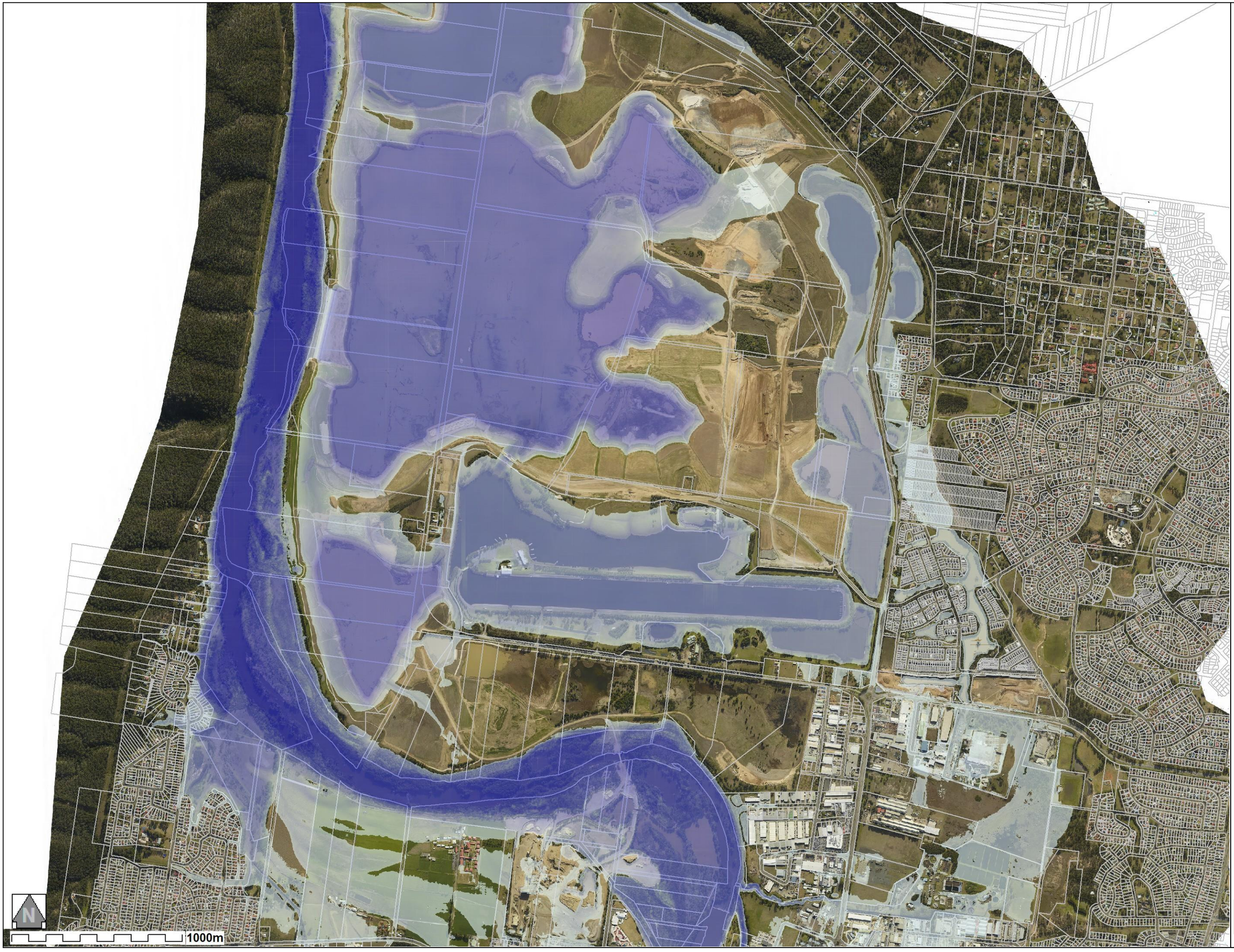
MAP 025_B

Scale 1:20,000 [A3]

5/11/2018
rp301077-14401-dmc-FS-Maps-r1.docx

PENRITH CITY COUNCIL

Advisian
WorleyParsons Group



LEGEND

0 m
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

NEPEAN RIVER FLOOD STUDY

Flood Depth Surface 100 year ARI

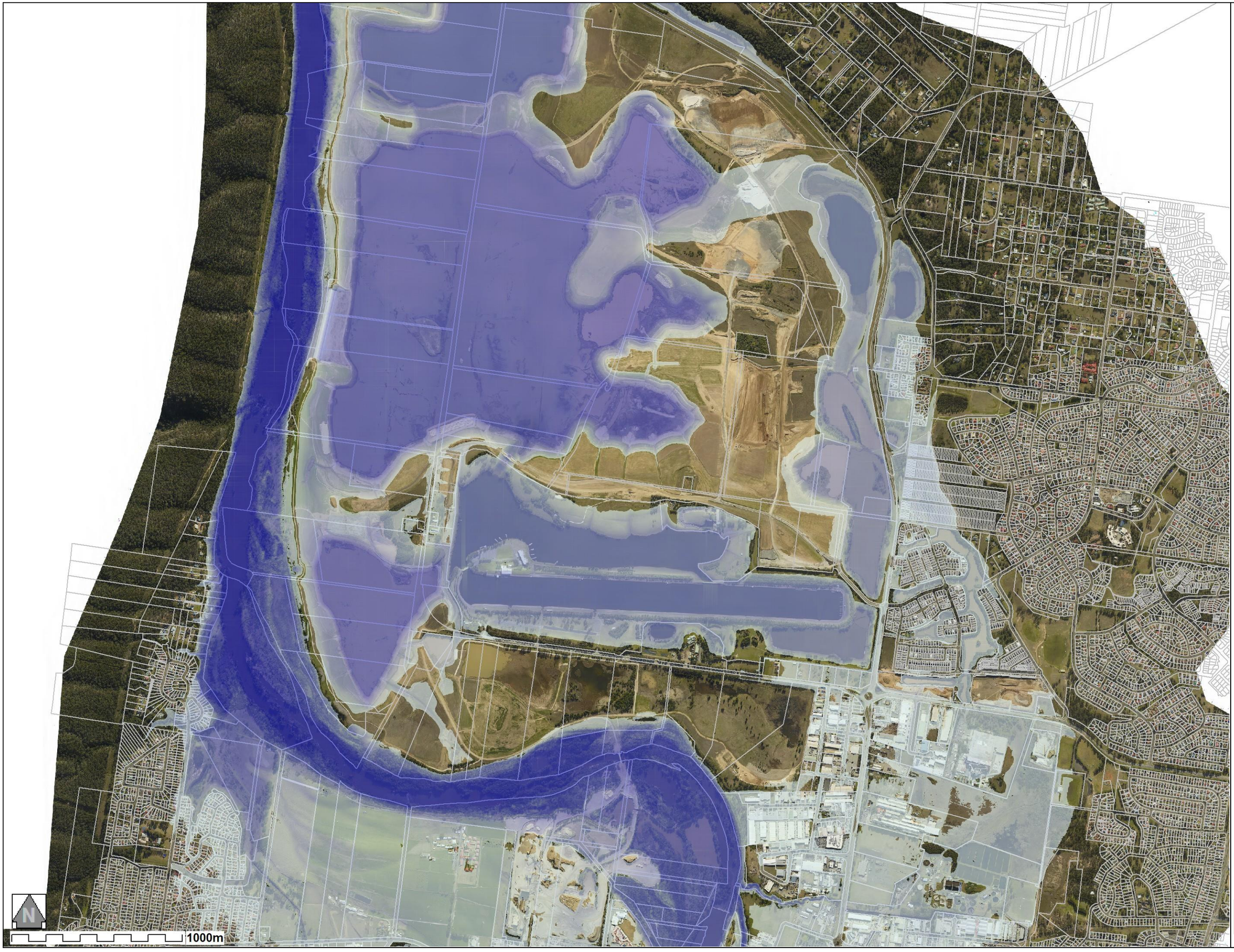
MAP 026_B

Scale 1:20,000 [A3]

5/11/2018
rp301077-14401-dmc-FS-Maps-r1.docx

PENRITH CITY COUNCIL

Advisian
WorleyParsons Group



LEGEND

0 m
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

NEPEAN RIVER FLOOD STUDY

Flood Depth Surface 200 year ARI

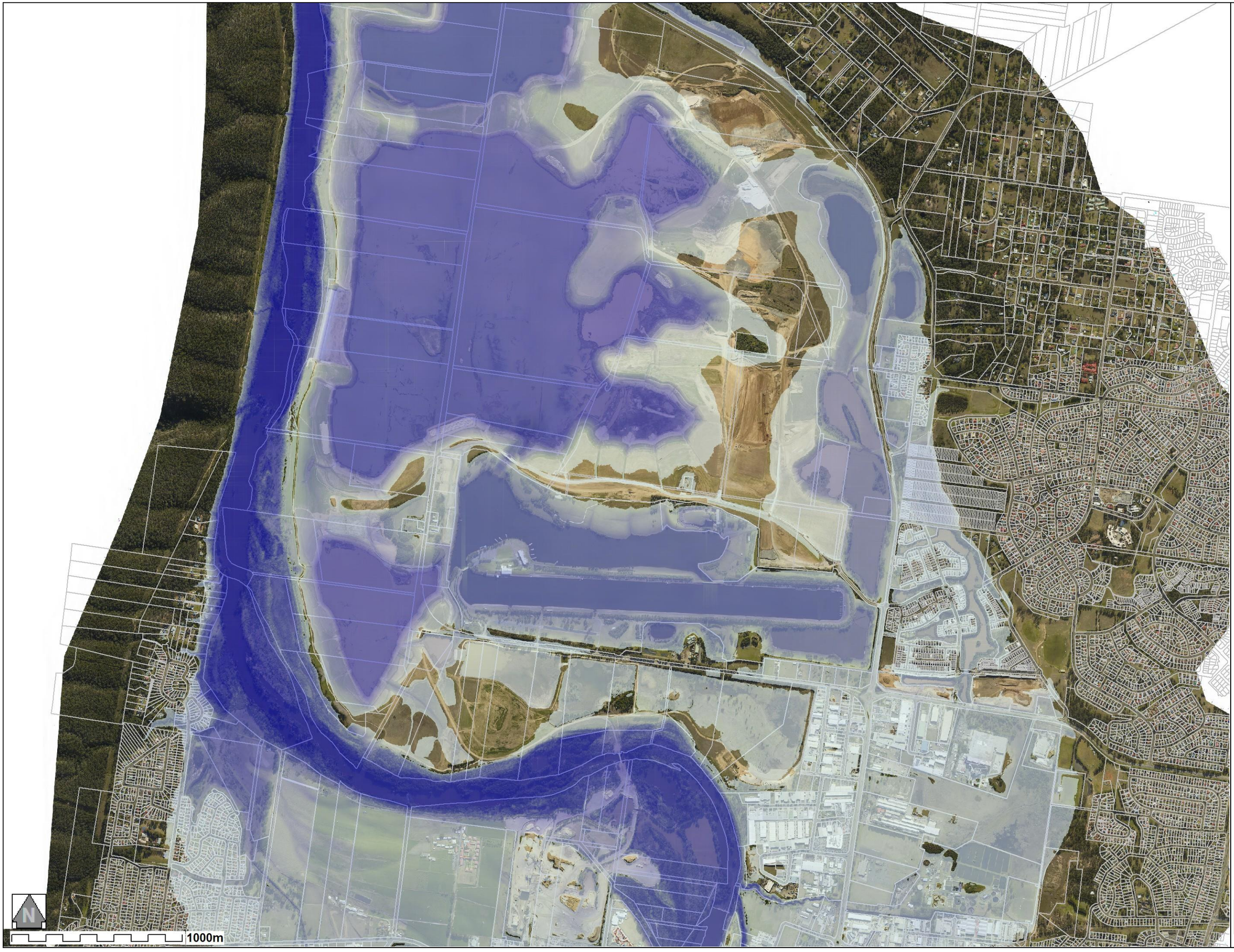
MAP 027_B

Scale 1:20,000 [A3]

5/11/2018
rp301077-14401-dmc-FS-Maps-r1.docx

PENRITH CITY COUNCIL

Advisian
WorleyParsons Group



NEPEAN RIVER FLOOD STUDY

Flood Depth Surface 500 year ARI

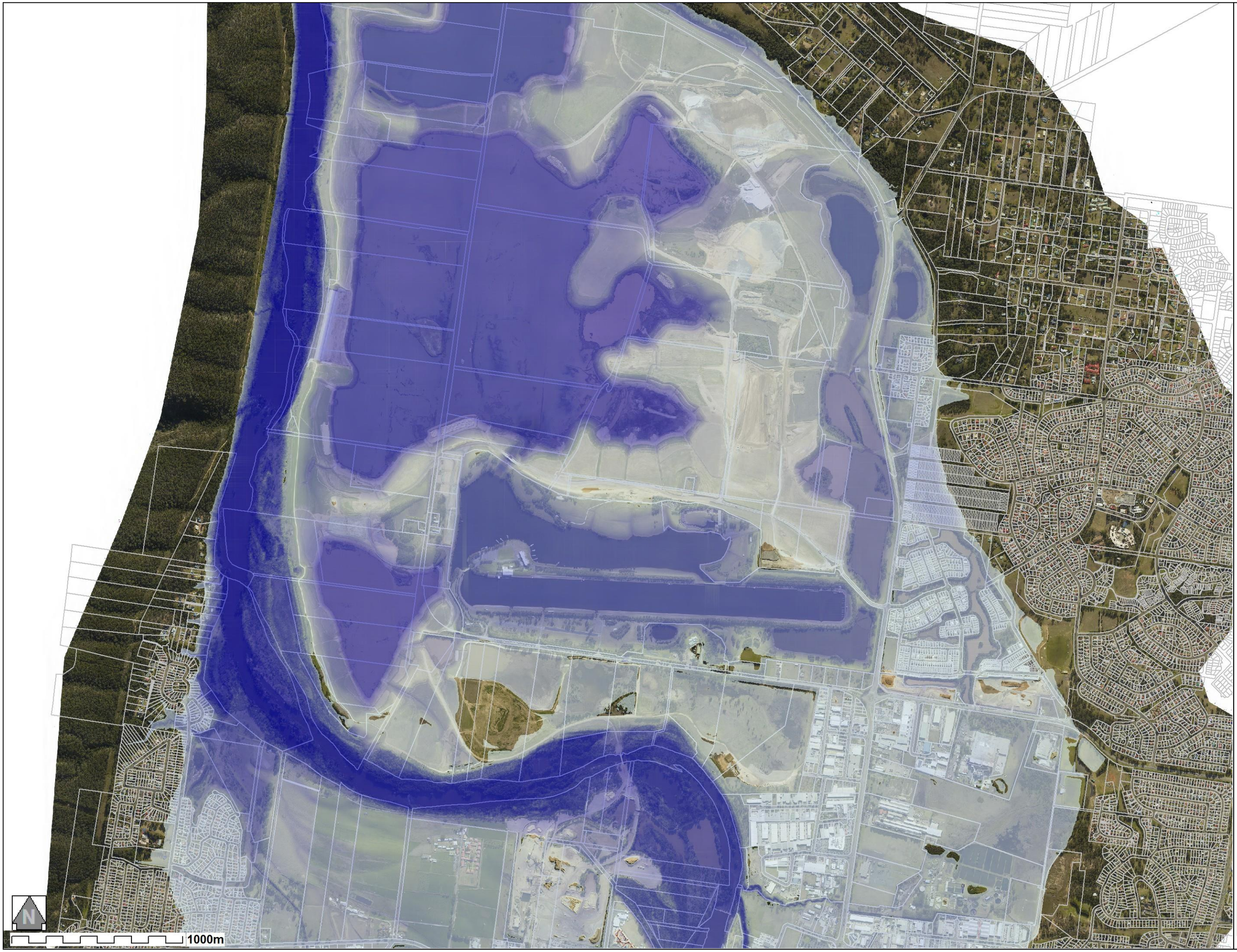
MAP 028_B

Scale 1:20,000 [A3]

5/11/2018
rp301077-14401-dmc-FS-Maps-r1.docx

PENRITH CITY COUNCIL

Advisian
WorleyParsons Group



LEGEND

0 m
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

NEPEAN RIVER FLOOD STUDY

Flood Depth Surface 1000 year ARI

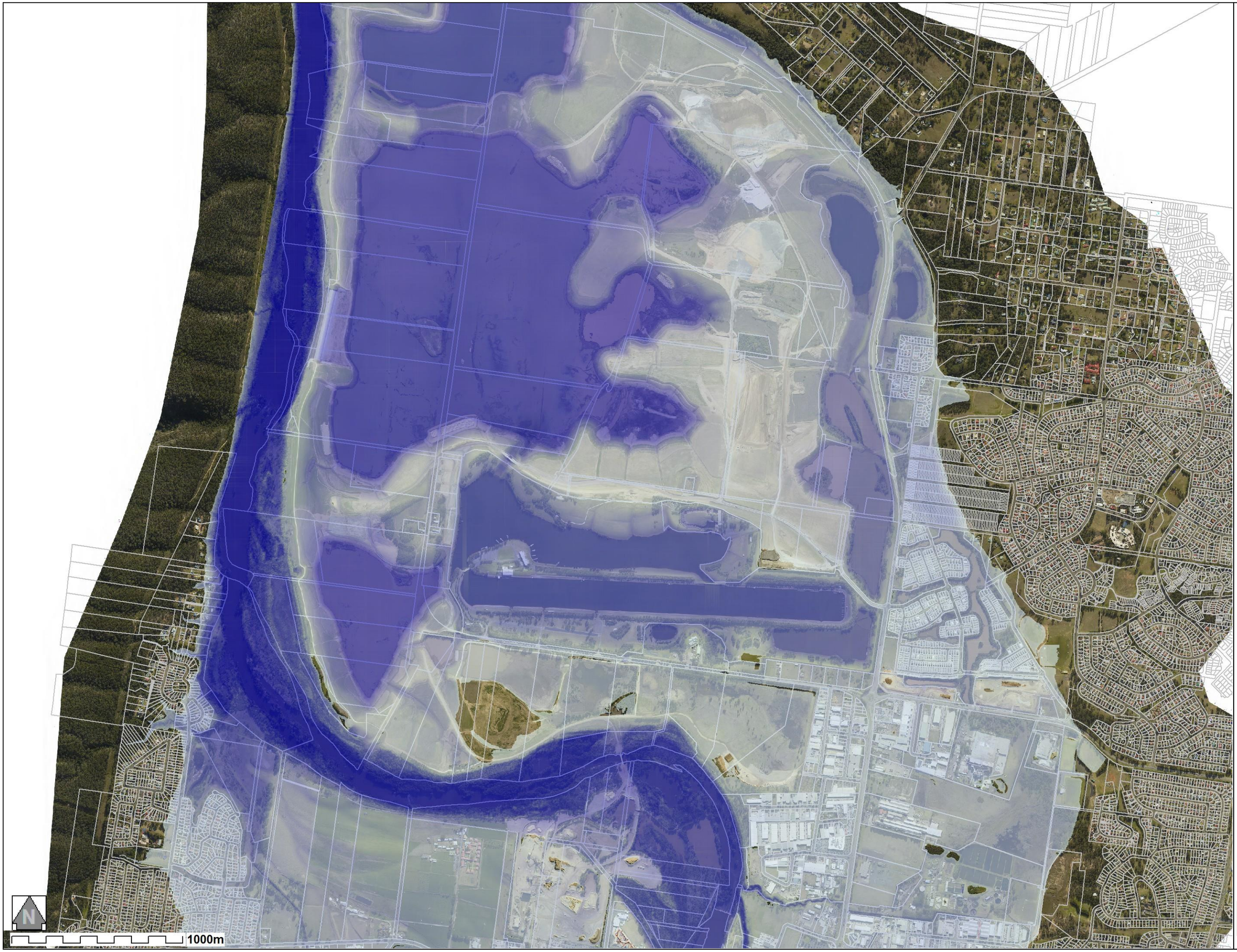
MAP 029_B

Scale 1:20,000 [A3]

5/11/2018
rp301077-14401-dmc-FS-Maps-r1.docx

PENRITH CITY COUNCIL

Advisian
WorleyParsons Group



NEPEAN RIVER FLOOD STUDY

Flood Depth Surface 2000 year ARI

MAP 030_B

Scale 1:20,000 [A3]

5/11/2018
rp301077-14401-dmc-FS-Maps-r1.docx

PENRITH CITY COUNCIL

Advisian
WorleyParsons Group

LEGEND

0 m
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20

NEPEAN RIVER FLOOD STUDY

Flood Depth Surface PMF

MAP 031_B

Scale 1:20,000 [A3]

5/11/2018
rp301077-14401-dmc-FS-Maps-r1.docx

PENRITH CITY COUNCIL

Advisian
WorleyParsons Group

APPENDIX E – SIGNS TO GUIDE FLOOD EVACUATION ROUTES

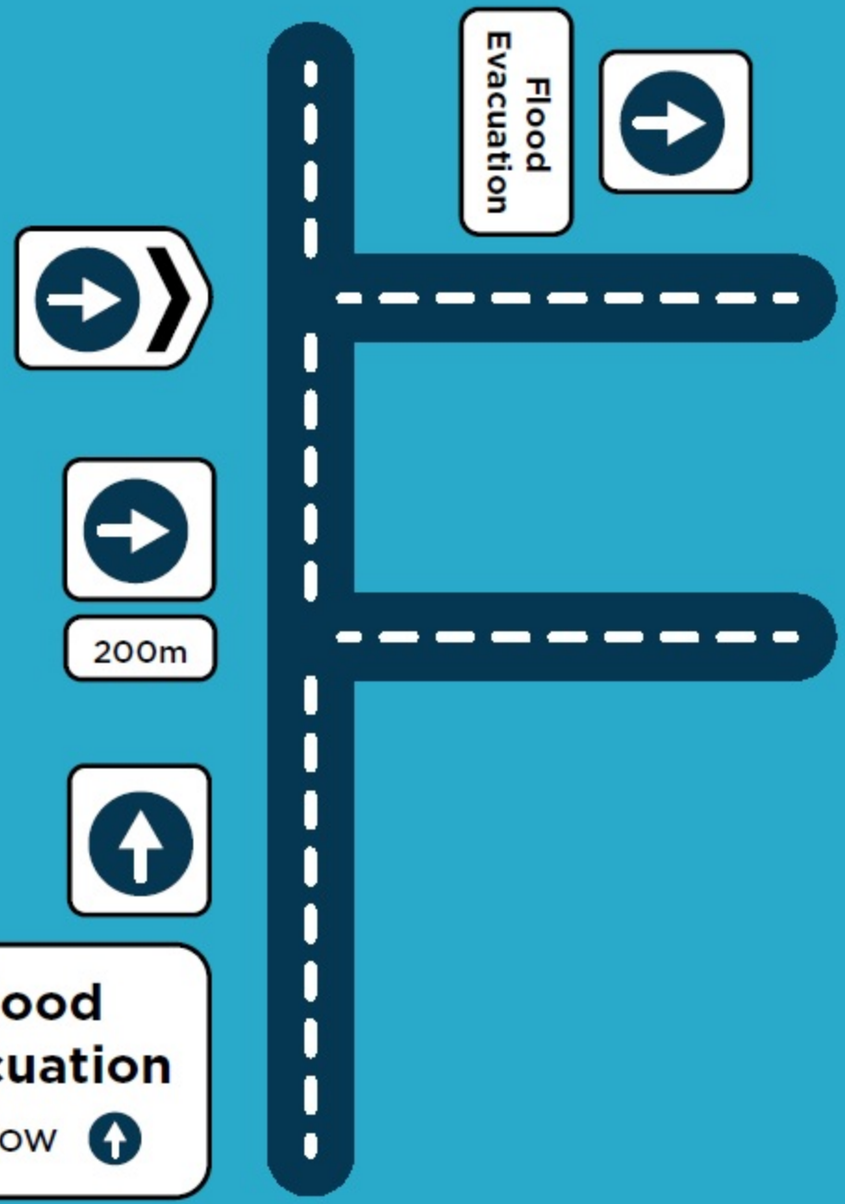
Signs to guide people along the regional flood evacuation routes towards safer areas.

4 Direction at the intersection

3 Advance notice of turns

2 Shows you're still on the route

1 At the start of the route



APPENDIX F – HAWKES-NEPEAN FACT SHEET "GET PREPARED FOR FLOOD"

HAWKESBURY-NEPEAN FACT SHEET

Get Prepared for Flood

SOME SIMPLE ACTIONS CAN SAVE LIVES

Your local flood risk

The Hawkesbury-Nepean Valley has a long history of flooding.

When there is heavy rainfall, water flows down five major rivers into the floodplain. It is slowed from reaching the ocean by around 80 kilometres of narrow gorges from Ebenezer to Spencer. This means that floodwater can back up and rise quickly, causing wide, deep and dangerous floods.

There are hidden dangers in floodwater like debris, electrical wires, pollutants and sewage. In a flood, bridges can be cut, roads closed, public transport routes interrupted, power lost and mobile phone and internet connections disrupted.

It is important for everyone who lives in the floodplain to be prepared. For more information see **www.myfloodrisk.nsw.gov.au**

How to prepare before a flood

✓ **Know where to get updates and warnings**

- Bureau of Meteorology for local weather updates
- NSW State Emergency Service (NSW SES) for information on floods and storms
- ABC Radio as the official emergency broadcaster

✓ **Prepare a 'Get Ready to Go' Kit**

What to pack:

1. Health care items like medications and prescriptions
2. Copies of your important documents (hard copies or stored digitally)
3. Important valuables and momentos
4. Important phone numbers
5. Radio, torch, phone chargers and batteries
6. Clothing and personal items

✓ **Make a plan for evacuation**

Know where you will go, how you will get there, what evacuation routes you can use, what you will do with your animals, and how you will manage your health

✓ **Share your plan**

Talk with your relatives, friends, and neighbours about what you will do if you need to evacuate

What to do during a flood

Follow NSW SES Flood Advice and Emergency Warnings

- Listen to your local ABC radio station for up to date flood information and advice
- Follow advice from NSW SES. If you are asked to evacuate, don't wait until it is too late

Take your 'Get Ready to Go' Kit

- This should include your medications, prescriptions and any assistance equipment

Take your animals

- Put them on leashes or in carriers
- Take food, medication and registration/vaccination documents

Know where to go

- Follow advice on evacuations and check live traffic information
- Make your way to relatives or friends outside the floodplain if you can
- Official evacuation centres will be announced at the time of the emergency

Look out for each other

Share information with family, friends, and neighbours. Help each other especially people who may need assistance

Where to find information

Useful websites to visit and phone apps to download

- Local weather updates: **www.bom.gov.au** and Bureau of Meteorology app
- Local ABC Radio frequency: **https://reception.abc.net.au** and ABC Listen app
- Flood and storm updates: **www.ses.nsw.gov.au** **www.facebook.com.au/NSW.SES**
- Plan for your animals: **www.getreadyanimals.nsw.gov.au**
- Live traffic information: **www.livetraffic.com** and Live Traffic app

Need help?

For emergency help in floods call NSW SES on 132 500

For all life threatening emergencies call 000

- Hearing/speech impaired SMS NRS: 0423 677 767
- Internet Relay: **https://internet-relay.nrscall.gov.au**
- If you are homeless call **Link2Home** on **1800 152 152**
- If an interpreter is required, emergency services can access translation services

My important contacts

Who will you need to contact in an emergency?

(e.g. emergency contact, relatives, friends, doctor, pharmacist, carer, support worker, Link2Home)

Name: ..... **Phone:** .....

Name: ..... **Phone:** .....

Name: ..... **Phone:** .....

Name: ..... **Phone:** .....

Name: ..... **Phone:** .....

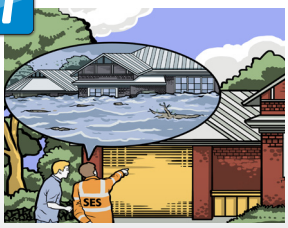
My checklist

I am prepared because:

	✓
I know where to find information like weather updates, warnings and advice	☐
I know where I will go in an evacuation and how I will get there	☐
I know what I will take with me	☐
I have talked with my household about what we will do if we need to evacuate	☐
I have a plan for keeping my animals safe	☐
I know how I will manage my health	☐
I have talked through my plan with relatives, friends and neighbours	☐
I have a list of my important numbers ready	☐

8 TIPS YOU CAN DO NOW TO PREPARE FOR FLOODS

1 KNOW YOUR RISK



2 KNOW WHERE TO GO

3 KNOW WHO TO CALL

4 KNOW YOUR PLAN

5 GET YOUR KIT TOGETHER

6 PREPARE NOW TO ACT EARLY

7 CHECK YOUR INSURANCE

8 LISTEN TO LOCAL RADIO

SES
NSW STATE EMERGENCY SERVICE

FloodSafe

APPENDIX G – SES CONSULTATION

Our Ref: ID2007
Your Ref:

30 June 2023

Andrew Beattie
Department of Planning and Environment
Locked Bag 5022
Parramatta NSW 2124

email: andrew.beattie@planning.nsw.gov.au
cc: rra@ses.nsw.gov.au

Dear Andrew,

Flood Emergency Response Plan for 89-151 Old Castlereagh Road, Castlereagh

Thank you for the opportunity to provide comment on the Flood Emergency Response Plan (FERP) for the proposed Helipad development at 89-151 Old Castlereagh Road, Castlereagh.

The NSW State Emergency Service (NSW SES) is the agency responsible for dealing with floods, storms and tsunami in NSW. This role includes, planning for, responding to and coordinating the initial recovery from floods. As such, the NSW SES has an interest in the public safety aspects of the development of flood prone land, particularly the potential for changes to land use to either exacerbate existing flood risk or create new flood risk for communities in NSW.

It is the preference of NSW SES that all developments follow the application of sound land use planning, flood risk management, site design and stormwater management measures that minimise any risk to the community. Furthermore, developments that are at known risk of flooding or isolation are closed prior to flooding commencing and when there is an indication that flooding is likely, for example, when there is a Watch and Act product issued by NSW SES indicating evacuation may be required.

The NSW SES has reviewed the proposed FERP and the flood risk information (e.g. Local Flood Plan, Flood Studies etc.) available to the NSW SES, noting the proposed development is at risk of flooding in a and the adjacent roads may be cut by floodwaters. In accordance with sections 3.6, A-5, L-5, L-6.9.6 and N-7 of the NSW Floodplain Development Manual, 2005 (the Manual), the NSW SES is opposed to the imposition of development consent conditions requiring private flood evacuation plans rather than the application of sound land use planning and flood risk management.

The NSW SES does not have statutory authority to endorse or approve flood emergency response plans, which is referred to in the Manual (particularly section N7), however provides the following advice based on the principles outlined in the Manual:

- **Risk assessment should consider the full range of flooding, including events up to the Probable Maximum Flood (PMF) and not focus only on the 1% AEP flood.**

  The site itself is prone to flooding in a 20% AEP flood, with the hydraulic hazard in a PMF of H6, which is unsafe for people and vehicles, and all buildings are considered to be vulnerable to failure (Nepean River Flood Study 2017 and Hawkesbury-Nepean Valley Regional Flood Study 2019).

  We are aware of a 2D Hawkesbury Nepean Valley Flood Study that is expected to be completed late 2023. The results from this flood study must be considered within managing the risk for the proposed development and be used to update the content within Section 4.1 and 4.2 of the FERP.

  Continuing research by the Bureau of Meteorology and the CSIRO predicts more intense, short duration heavy rainfall events. The projected increase in heavy rainfall will increase flood risk in cities, built-up urban areas, and small catchments, where extreme rainfall over hours to a day not only can result in Hawkesbury-Nepean flooding but can also quickly become flash floods and cut roads prior to the onset of riverine flooding. This would impact on the evacuation of Penrith Lakes.

  The operators of the new helipad would need to cognisant of the flood hazard at the site and factor that into their asset protection and business continuity planning.

- **Risk assessment should have regard to flood warning and evacuation demand on existing and future access/egress routes**.

  In the context of future development, self-evacuation of the community should be achievable in a manner which is consistent with the NSW SES's principles for evacuation. Evacuation must not require people to drive or walk through flood water.

  We understand that the total anticipated number of patrons and staff occupying the Sydney Helicopters site at any given time would be 60, with 40 parking spaces available onsite.

  Currently the confident warning timeframe for the Penrith flood gauge is around 8 hours as specified in the Bureau SLS with a flood peak forecast criteria (70% +/- 0.3m).

  The timeframe calculated for evacuation to be completed does not consider the potential for convergence on evacuation routes, potential traffic issues and delays associated with severe weather and road safety. This is likely to see the evacuation time to be longer than the "4 minutes" identified in the FERP (page 3), due to converging traffic from the surrounding areas including North Penrith Industrial Estate, Penrith Lakes developments, Lakeview Estate and the Industrial Estate north of Boundary Creek.

The time for evacuation is the time for the occupants of the site to reach The Northern Road, which would be much longer than 4 minutes due to significant congestion.

NSW SES does not support pedestrian evacuation as a primary evacuation strategy for the proposed development. It is unacceptable, as the primary evacuation strategy, to expect people to escape from a flood on foot (also referred to as overland escape/overland access), especially with the high likelihood of ongoing poor weather conditions and should not be used to justify the development. Pedestrian evacuation is a backup strategy.

The private motor vehicle is likely to be the most effective means of evacuation transport for most community members. The motor vehicle also provides an important although limited capacity for people to save some of their possessions or key business documents, most of which will almost certainly be lost in large floods.

Pedestrian evacuation is a rare phenomenon since car ownership became widespread and factors associated with a large-scale pedestrian evacuation are not well-understood. However, research following the 9/11 attack on the World Trade Centre indicates that the pedestrian evacuation that occurred was multi-modal, where many people walked to get a ferry, bus or train. Many complex issues were identified in this event, including the safety challenges of pedestrians and vehicles sharing routes, the large number of officials required to coordinate the evacuation on-ground, pedestrians being exposed to the weather, limited capacity to carry important documents and possessions particularly those requiring medicines or children's items and with pets.

In the context of the proposed development pedestrian evacuation would be constrained by:

- Distances that evacuees may need to travel. Evacuation by foot could exceed a distance greater than 1 km.
- Weather at the time of an evacuation becoming necessary. An evacuation by foot may coincide with heavy rainfall and strong winds which may dissuade people from selecting this strategy.
- Time of day. People may be reluctant to evacuate at night.
- Evacuation of people with special needs who may lack the mobility to evacuate by foot.
- Disruption to onsite and offsite infrastructure resulting in evacuees navigating streets, paths and bridges in darkness.
- Hazards such as downed powerlines due to strong winds and storm damage.

Similarly, evacuation by helicopter, also referred to as rescue, is not supported as a primary evacuation strategy. We note that this option has been conservatively left out of the evacuation calculations within the FERP. However, we would like to emphasise that the use of helicopters may not always be feasible during floods due to weather or other risks.

- **Development strategies relying on deliberate isolation or sheltering in buildings surrounded by flood water are not equivalent, in risk management terms, to evacuation**. **Development strategies relying on an assumption that mass rescue may be possible where evacuation either fails or is not implemented are not acceptable to the NSW SES**.

  Due to the potential flood hazard at the site, sheltering in a building at this location is not safe. Sheltering in buildings where entrances and exits may become flooded in the larger floods may result in isolating people potentially without food or water for several hours or more depending on the weather system/s. Isolation also increases the risk of fire or medical emergencies.

- **The FERP should be regularly reviewed, evaluated, updated and exercised regularly**

  The FERP refers to the NSW SES Hawkesbury-Nepean Flood Plan from 2015. Please note the most recent version of this plan is 2020, and should be referred to. Under the 2020 Hawkesbury-Nepean Flood Plan, the site is contained within the Penrith North Sector, subsector 8.5 (Castlereagh). Penrith North Sector will need to be completely evacuated if the predicted flood level will exceed 8.2m at the Penrith gauge (Annex D Evacuation Management Arrangements, p66). The draft FERP is consistent with the triggers and evacuation routes (on page 2, not in the attached maps) listed in the 2020 Hawkesbury-Nepean Flood Plan.

  These subsectors are being further refined with information from flood events and flood studies, such as 2021 and 2022 flooding as well as the revised 2D Flood Study being completed by INSW due for completion late 2023. This is a key example of why FERP's must be regularly reviewed and exercised.

  We strongly encourage that the FERP aligns with the NSW SES triggers for evacuation, and ensure that the Advice, Watch and Act and Emergency Warning Products are received and adhered to by all occupants of the proposed development. However, given the relatively small increase in population as a part of the proposal, the evacuation capacity is not likely to be significantly impacted by this development alone.

  We support alternative arrangements being made for commercial properties during a major flood to avoid being on the floodplain during flooding, such as closing the

business during a flood. However, the feasibility and economic losses associated with this must be considered.

Section 4.3 of the FERP discusses the "awareness" component of the FERP. However, this should also involve reducing human behaviour risks by undertaking regular exercising of the FERP similar to a building fire evacuation drill. This may also include emergency warning notification (or PA) system.

Section 4.4 contains outdated references to the "Sydney Western Region", which should be updated to "Metro Zone". Consistent with the Australian Warning System, NSW SES issues "Advice", "Watch and Act" and "Emergency Warning" products that should be referred to within the FERP. These products align with the flood predictions issued by the Bureau of Meteorology.

Further useful information can be found:

- NSW SES website https://www.ses.nsw.gov.au/disaster-tabs-header/flood/
- Emergency Business Continuity Plan (http:/www.sesemergencyplan.com.au/business/)
- The Department of Planning and Environment website https://www.environment.nsw.gov.au/research-and-publications/publications-search/floodplain-development-manual

Please feel free to contact me via email at rra@ses.nsw.gov.au should you wish to discuss any of the matters raised in this correspondence. The NSW SES would also be interested in receiving future correspondence regarding the outcome of this referral via this email address.

Yours sincerely

Elspeth O'Shannessy
A/Manager Risk Assessment, Emergency Risk Management
NSW State Emergency Service

APPENDIX H – TFNSW CONSULTATION

From: Nav Prasad (TRAFFIC SAFETY)
To: Sabina Lohani
Cc: markh@sydneyhelicopters.com.au
Subject: RE: [110934.02] Helipad Site FEMP Consultation
Date: Friday, 1 September 2023 12:54:29 PM
Attachments: image001.png
image003.png
image004.png
image005.png
image006.png
image007.png

Hi Sabina,

It is noted that this report has addressed the TfNSW requirement the updated report and that Penrith Council and the SES have been consulted on the updated Flood Evacuation Management Plan.

In this regard TfNSW have no further comments.

Regards

Nav Prasad
Development Assessment Officer
Planning and Programs
Greater Sydney
Transport for NSW

Ph. (02) 9983 3193
Level 4, 4 Parramatta Square, 12 Darcy Street, Parramatta NSW 2150

Please not that I am contracted to TfNSW in a part time capacity and generally available Mondays, Tuesdays and Wednesdays only.

OFFICIAL

From: Sabina Lohani <slohani@jwprince.com.au>
Sent: Friday, 11 August 2023 10:52 AM
To: Development Sydney <Development.Sydney@transport.nsw.gov.au>
Cc: markh@sydneyhelicopters.com.au
Subject: [110934.02] Helipad Site FEMP Consultation

Hi Zhaleh,

We note that Urbis Pty Ltd has prepared the Response to Submissions (RTS) report for Sydney Helicopters in February 2022 in response to the community and agency submissions received during the public exhibition of the Environmental Impact Statement (EIS) for a proposed Helipad facility. As per the 2022 report, it is understood that TfNSW has stated primary evacuation routes have been incorrectly identified and the proposal should revisit flood evacuation procedures and include consultation with NSW State Emergency Services on the preferred regional evacuation path.

As a Part of the DA approval requirement, J. Wyndham Prince has prepared the FEMP for the Helipad site at Penrith and SES has been consulted. Please find the FEMP for the site provided in the link below for your consideration.
Helipad Site FEMP

If you have any questions, please do not hesitate to contact me.

Kind Regards,

Sabina Lohani – Manager-Stormwater & Flooding

J. WYNDHAM PRINCE
CONSULTING CIVIL INFRASTRUCTURE ENGINEERS
& PROJECT MANAGERS

CELEBRATING 40 YEARS 1982 - 2022

P 02 4720 3342 **M** 0416 018 959
W www.jwprince.com.au

Level 2, 50 Belmore Street, Penrith NSW
PO Box 4366 PENRITH WESTFIELD 2750

APPENDIX I – NSWRA CONSULTATION

NSW Reconstruction Authority

Attn: Sabina Lohani
Manager-Stormwater & Flooding
J. Wyndham Prince
Level 2, 50 Belmore St
PENRITH NSW 2750

Sydney Helicopters– Proposed Helicopter Facility at 89-151 Old Castlereagh Road, Castlereagh – Flood Evacuation Management Plan (FEMP) – request for comments

Dear Sabina,

I refer to your email dated 11 August 2023 seeking to comply with a Development Approval (DA) condition requiring the Hawkesbury-Nepean Valley Flood Risk Management Directorate within Infrastructure NSW be consulted on flood evacuation management plan (FEMP) for the proposed Sydney Helicopters facility at 89-151 Old Castlereagh Road, Castlereagh.

From 1 July 2023 the functions and staff of the Hawkesbury-Nepean Valley Flood Risk Management Directorate in Infrastructure NSW were transferred to the New South Wales Reconstruction Authority (NSWRA). This response is therefore coming from the NSWRA.

The NSWRA notes that the assessment of the regional flood risk has utilised the Penrith City Council Nepean River flood study. The NSWRA is completing an updated Hawkesbury-Nepean Flood Study, and the NSWRA will be consulting with the community on the results of this study in the third quarter of 2023. This study, which includes assessment of recent flood events, indicates that flood levels have risen in the Penrith floodplain, and are projected to increase even further with climate change. Penrith City Council is aware of and has access to the results of this flood study, and the results have been provided to the Department of Planning and Environment and Penrith City Council.

In terms of regional flood evacuation risk, the development adds to the considerable evacuation traffic generated from the Castlereagh area, which is to increase with the construction of the Nepean Business Park and other developments. The development would need evacuation for events greater than 1 in 20 chance per year, and vehicles would have a number of road low points before rising above PMF. This means the evacuation risk to life is relatively low, but people in vehicles should be aware that they may have problems getting onto The Northern Road due to both day-to-day traffic and evacuation and diverted traffic from other parts of the floodplain during flood events.

The NSW State Emergency Service (SES) is the combat agency for flood events, and is responsible for managing flood events including flood emergency evacuations. The NSWRA support the issues they raised in their letter on the FEMP to the Department of Planning and Environment dated 30 June 2023 (attached). Also during flood emergencies the directions from the SES and other emergency response agencies must prevail over the measures outlined in the FEMP.

If you have any questions, please do not hesitate to contact the Directorate at emma.whale@reconstruction.nsw.gov.au or phone – 0424766061.

Yours sincerely

Emma Whale

A/Head of Hawkesbury-Nepean Valley Flood Risk Management

Reconstruction NSW

Att: Letter dated 30 June 2023 from NSW SES to the Department of Planning and Environment on the Flood Evacuation Management Plan (FEMP) for the Proposed Helicopter Facility at 89-151 Old Castlereagh Road, Castlereagh