NORTHROP

CIVIL

Flood Impact and Risk Assessment

for

Allity Brentwood Residential Aged Care Facility, Parramatta

for Allity Aged Care Pty Limited

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Contents

Acronyms

AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ALS	Airborne Laser Survey (LiDAR)
ARI	Average Recurrence Interval
ARR	Australian Rainfall and Runoff 2019
BoM	Bureau of Meteorology
DCP	Development Control Plan
DTM	Digital Elevation Model
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)
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
TUFLOW	A 1D and 2D hydraulic modelling software

Introduction

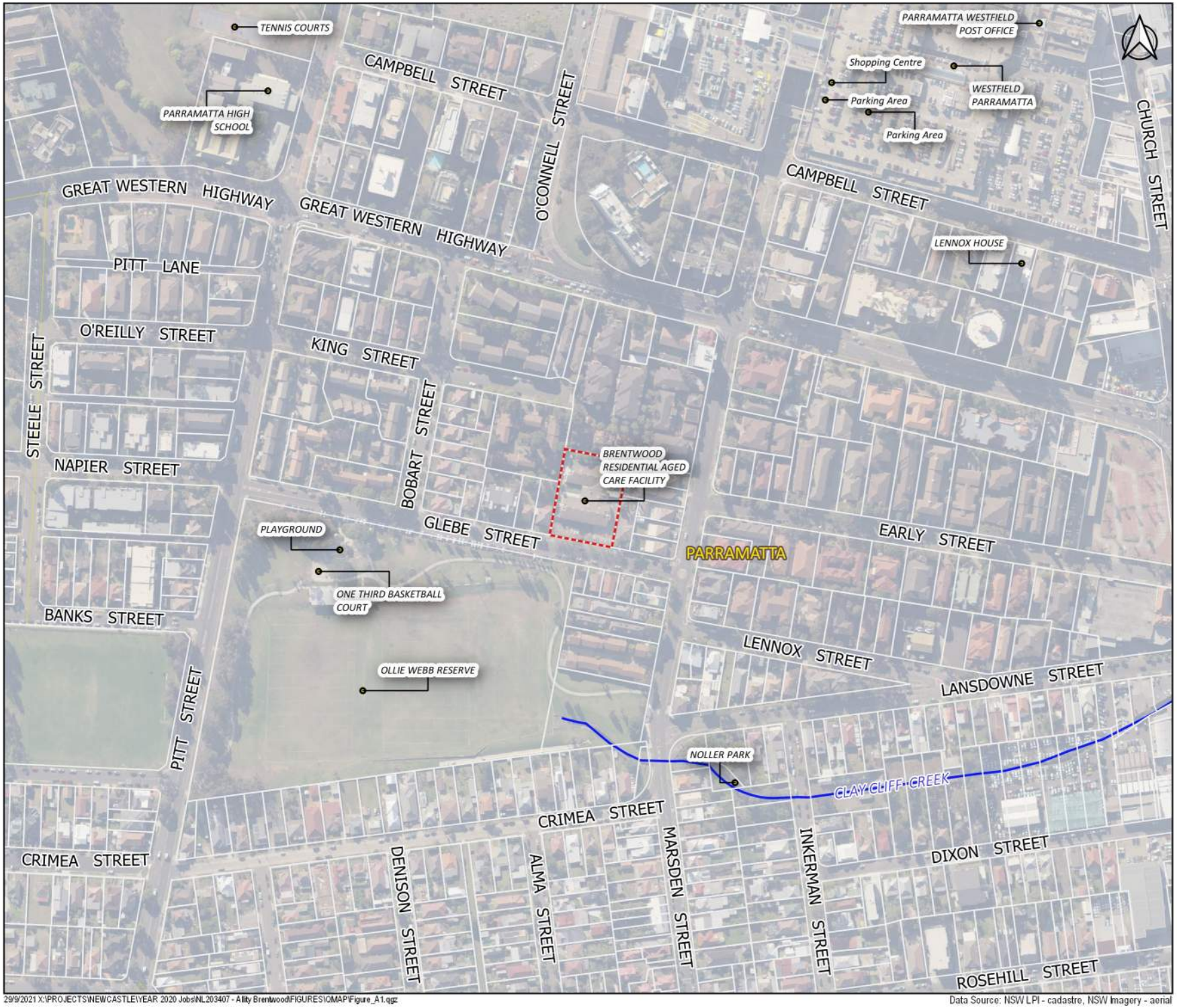
Northrop Consulting Engineers have been engaged by Allity Aged Care Pty Limited to prepare a Flood Impact Assessment for the proposed development at 28 Glebe Street, Parramatta, herein referred to as the subject site or the site. The subject site locality is presented in **Figure A1** overleaf.

This flood impact assessment aims to review the impact the proposed development has on existing flood behaviour within the subject site and adjacent properties.

This assessment has been prepared with the consideration of the following guidelines and documents:

- Parramatta Development Control Plan 2011.
- Australian Rainfall and Runoff 2016 (AR&R 2016).
- NSW Floodplain Development Manual (NSW Government 2005).
- Architectural Drawings prepared by Group GSA Pty Limited.
- Civil Drawings and Design surfaces prepared by Northrop Consulting Engineers.

This report has been prepared for Development Application submission to City of Parramatta Council.



Legend

- Subject Site
- Cadastre

0 60 120 Metres

1:4,000

Figure A1

Locality

28 Glebe Street
Parramatta

NORTHROP

Data Source: NSW LPI - cadastre, NSW Imagery - aerial

Methodology

This flood impact assessment has been undertaken using the following procedure:

- Desktop review of all available information including design plans and latest survey data.
- Site visit to ground truth catchment roughness and hydraulic obstructions.
- Creation of DRAINS hydrological model to determine the 5% AEP, 1% AEP and PMF flows derived from the upstream local catchment.
- Setup a two-dimensional TUFLOW hydraulic model to quantify flood behaviour in existing and developed scenarios.
- Comparison of the existing and developed case results for the 5% and 1% AEP to review the impact the proposed development has on the existing flood behaviour on-site and in adjacent properties.

Subject Site and Proposed Development

Subject Site

The subject site is located at 28 Glebe Street, Parramatta and contained within Lot 16 DP 554691. The site area is 3486 m^2 with elevations ranging from approximately 24.35 to 19.40 m AHD. The site is not identified as a flood prone land but can potentially be a subject of overland flooding from local upstream catchment areas during rare or extremely rare flood events.

The existing site currently hosts Brentwood Residential Aged Care Facility. All neighbouring properties have a similar residential style land use. The site has a frontage of approximately 50 metres to Glebe Street to the south.

The existing site frontage is presented in **Photo 1** below:

Photo 1 – Glebe Street Frontage (Google Maps 2021), Looking to North

Proposed Development

The proposed development includes demolition the existing facility and construction of new four-storey, 102-beds residential aged care building with associated landscaped communal areas, access routes, car parking and signage.

Minimal changes in finished surface and obstructions are proposed to avoid potential adverse flooding impact on the site and adjacent properties. A landscaped overland flow path is proposed within the existing drainage easement along the western boundary of the site to capture and convey surface runoff to the Glebe Street drainage.

The architectural plan describing the development is provided in **Figure 2.** Civil design surface including proposed building footprint, retaining walls and landscaped overland flow path is presented in **Figure A4** below.

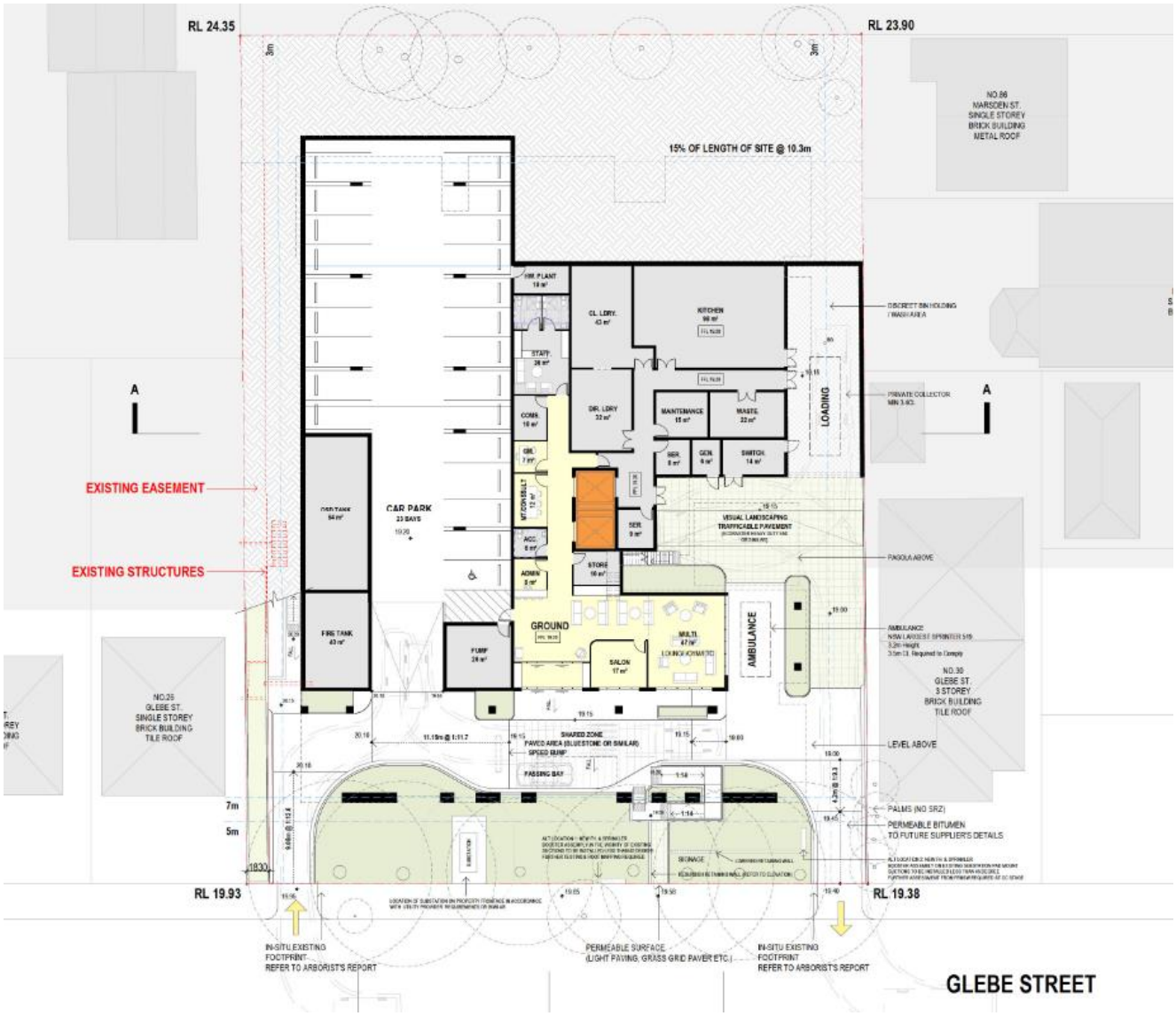


Figure 2 - Proposed development ground floor

Legend

- Proposed Building, Structural RW
- Proposed RW
- Fences
- Cadastre

Proposed Landform (mAHD)

- <= 19.2
- 19.2 - 19.9
- 19.9 - 20.5
- 20.5 - 21.1
- 21.1 - 21.8
- 21.8 - 22.4
- 22.4 - 23.0
- 23.0 - 23.7
- > 23.7

0 8 16 Metres

1:500

Figure A4

Development Details

28 Glebe Street
Parramatta

NORTHROP

Data Source: NSW LPI - cadastre, NSW Imagery - aerial

Flood Model Setup

Hydrology

The hydrological model used in preparation of this study is the DRAINS one-dimensional software coupled with the Initial and Continuing Loss model.

Sub-Catchment Details

The latest Australian Rainfall and Runoff 2019 guidelines have been used for this study with a total of 25 sub-catchments delineated using a combination of LiDAR terrain data, cadastre, and aerial imagery. The modelled sub-catchments are shown in **Figure A2** with the catchment properties presented in the below **Table 1**.

Table 1 - Modelled Sub-Catchment Properties

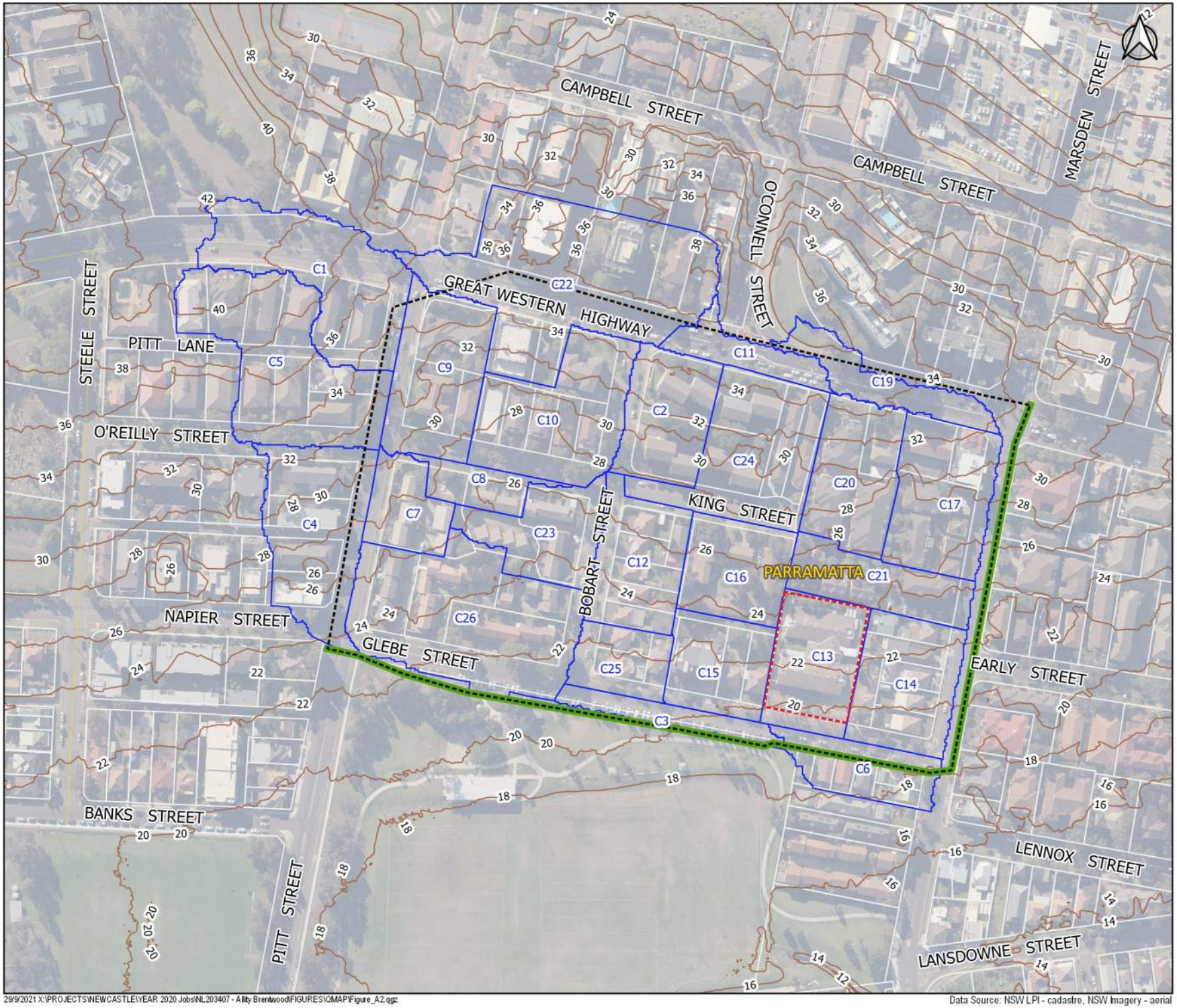
Catchment Reference	Area (ha)	Impervious (%)	Slope (%)	Catchment Reference	Area (ha)	Impervious (%)	Slope (%)
C01	0.66	78	7.9	**C14**	0.46	72	6.7
C02	0.39	70	10.6	**C15**	0.34	68	8.0
C03	0.16	89	4.5	**C16**	0.36	71	7.9
C04	0.61	73	10.8	**C17**	0.51	75	11.9
C05	0.80	70	9.3	**C19**	0.24	92	6.2
C06	0.28	72	4.7	**C20**	0.43	70	12.6
C07	0.23	72	8.5	**C21**	0.33	69	10.2
C08	0.16	82	7.3	**C22**	1.21	75	7.9
C09	0.51	70	11.0	**C23**	0.36	69	6.3
C10	0.61	72	10.4	**C24**	0.62	72	10.5
C11	0.18	96	5.1	**C25**	0.22	74	5.3
C12	0.41	69	7.0	**C26**	0.97	70	6.4
C13	0.41	73	7.5				

Burst Rainfall

The latest AR&R 2019 rainfall has been obtained from the Bureau of Meteorology while the accompanying rainfall temporal patterns have been obtained by the AR&R Data Hub for a location over the study area. AR&R 2019 recommends the use of the storm ensemble method using 10 temporal patterns for each storm duration. For this investigation, storm durations ranging from the 5, 10, 15, 20, 25, 30, 45, 60, 90, 120 minutes events were assessed in the hydrological model.

The Probable Maximum Precipitation (PMP) design storm event rainfall depths and temporal patterns were estimated using the Generalised Short-Duration Method (GSDM). The durations 15, 30, 45 minutes and 1, 1.5, 2 hours were modelled to define PMF.

Burst rainfall input data are listed in **Table 2** below.



Legend

- Subject Site
- 2D Model Extent
- DRAINS Subcatchments
- 1m Contours (mAHD)
- 2D Model DS Boundary
- Cadastre

0 50 100 Metres

1:3,000

Figure A2

Hydrologic and Hydraulic Model Extents

28 Glebe Street
Parramatta

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29/9/2021 X:\PROJECTS\NEWCASTLE\YEAR 2020 Jobs\NL203407 - Ality Brentwood\FIGURES\QMAP\Figure_A2.qgz

Data Source: NSW LPI - cadastre, NSW Imagery - aerial

Table 1 - IFD Rainfall Depths (mm)

Duration (min)	5%AEP	1%AEP	PMP
5	13.6	17.5	
10	22.4	28.6	-
15	28.0	35.7	170
20	31.9	40.6	-
25	34.8	44.3	-
30	37.1	47.2	250
45	42.2	53.9	310
60	46.0	58.9	360
90	52.1	67.1	410
120	57.4	74.3	460

Pre-Burst Rainfall

The latest NSW Specific Transformational Pre-Burst depths has also been used as part of the investigation. These were obtained from the AR&R Data Hub for a location over the study area. As recommended by the latest AR&R 2019 guidelines, the 60min pre-burst depths have been used for storm durations less than 60 minutes. Modelled pre-burst rainfall depths are outlined in **Table 3** below.

Table 3 – Transformational Pre-Burst Depths (mm)

Duration (min)	5%AEP	1%AEP	PMP
5	18.2	19.5	
10	18.2	19.5	-
15	18.2	19.5	-
20	18.2	19.5	-
25	18.2	19.5	-
30	18.2	19.5	-
45	18.2	19.5	-
60	18.2	19.5	-
90	18.3	21.6	-
120	18.8	21.4	-

Infiltration Losses and Roughness

As mentioned previously, the Initial and Continuing Loss model has been used for this study with the latest AR&R 2019 storm losses were obtained from the AR&R Data Hub for a location over the study area. The Initial and Continuing Loss method simulates catchment storage as an initial loss in rainfall followed by a constant loss rate (continuing loss).

The below **Table 4** presents the Initial and Continuing losses obtained from the ARR data hub and the corresponding modelled loss rates. The latest OEH guidelines recommend reducing the continuing loss values provided by the ARR Data Hub, by a factor 0.4 for un-calibrated models within NSW. As such, modelled continuing losses have been reduced accordingly.

Table 4 – Infiltration Loss Rates

Land Use	Initial Loss (mm)	Continuous Loss (mm/hr)
ARR Data Hub Losses	28.0	1.90
Modelled Pervious Losses	28.0	0.45
Modelled Impervious Losses	1.5	0.00
Modelled Pervious Losses PMF	0.0	0.00
Modelled Impervious Losses PMF	0.0	0.00

The following catchment (hydrological) roughness values have been adopted in the modelling:

- Pervious – 0.045 (grassed areas over urban catchment).
- Impervious – 0.015 (concrete surfaces).

Hydraulics

Two-dimensional hydraulic modelling was undertaken using the TUFLOW hydrodynamic modelling software. The TUFLOW model extent, runoff inflows, downstream boundaries and topography are shown on **Figure A2**.

The TUFLOW modelling parameters are as follows:

- TUFLOW version 2020-01-AA with HPC GPU module was used.
- DTM with a 0.5m grid resolution was developed as a combination of 2019 LiDAR ground classified point cloud and detailed topographic survey in the vicinity of the site.
- LiDAR elevations along roads were manually rectified where the point cloud classification is inaccurate due to high density vegetation and street furniture.
- Manning's roughness was delineated based on recent aerial photography. Land use and roughness values are presented in **Figure A3** overleaf.
- 100% blockage factor for below ground drainage was adopted.
- Buildings were incorporated into the model based on building footprints and were delineated using aerial imagery and site observations. All buildings within the model were "blocked out" (i.e., impermeable).
- Downstream tailwater conditions were entered as a free outfall for all modelled events.
- Fences were represented as a layered flow constriction with adopted blockage factor ranging from 50 to 75 percent.

Legend

- Subject Site
- 2D Model DS Boundary
- Fences
- Inflows
- Cadastre
- Walls, Garden Beds

Manning's Roughness

- Buildings (Blocked Out)
- Residential (0.045)
- Road Reserve (0.025)
- Roads (0.015)

0 30 60 Metres

1:2,000

Figure A3

2D Model Setup

28 Glebe Street
Parramatta

NORTHROP

Data Source: NSW LPI - cadastre, NSW Imagery - aerial

Existing Flood Behaviour

Critical Duration

To determine the critical storm duration for the subject site and vicinity the guidance provided in the latest AR&R 2019 guidelines was considered as summarised below:

- Classification of the median value of the ten temporal patterns for each storm duration.
- Selection of the duration that produces the maximum median value for each return interval.

A water elevation parameter was used in this investigation to define the median value.

All ten rainfall patterns for the 5, 10, 15, 20, 25, 30, 45 minute and 1, 1.5, and 2-hour durations were used to determine the critical storm duration for each of the 1% and 5% AEP local catchment flood events existing conditions. Similarly, the 15, 30, 45 minute and 1, 1.5 and 2-hour durations were used to define the critical duration for the PMF local catchment flood event.

The two-dimensional TUFLOW modelling indicates that typically the 5,10 and 20-minute durations were critical for 1% AEP while the 15,20, and 25-minute durations were critical for the 5% AEP across the subject site and general vicinity. Similarly, the 15-minute duration was determined to be critical for the PMF.

1% AEP critical durations are presented in **Figure A5** below.

Maximum modelled water depth/ elevation, velocity and hazard maps are presented in **Figure B1-B9** below for the existing conditions for the 5%, 1% AEP and PMF events.

Flood hazard is based on the latest AR&R 2019 and Australian Institute of Disaster Resilience (AIDR) hazard categories presented in **Figure 3** below.

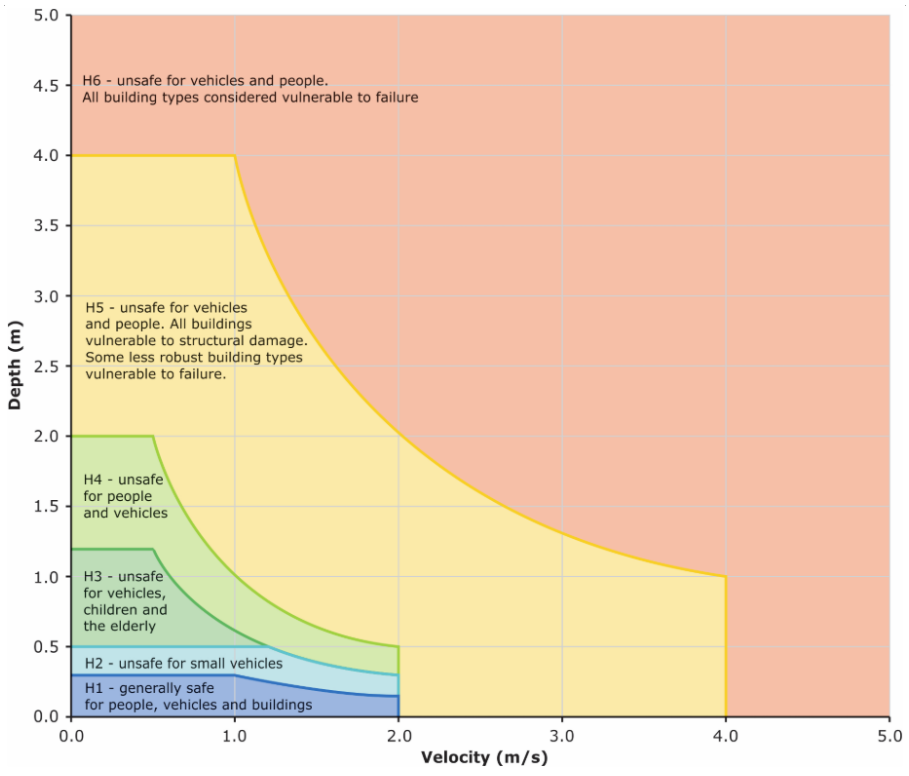


Figure 3 - Australian Rainfall and Runoff (2019) Hazard Categories

Peak Flows

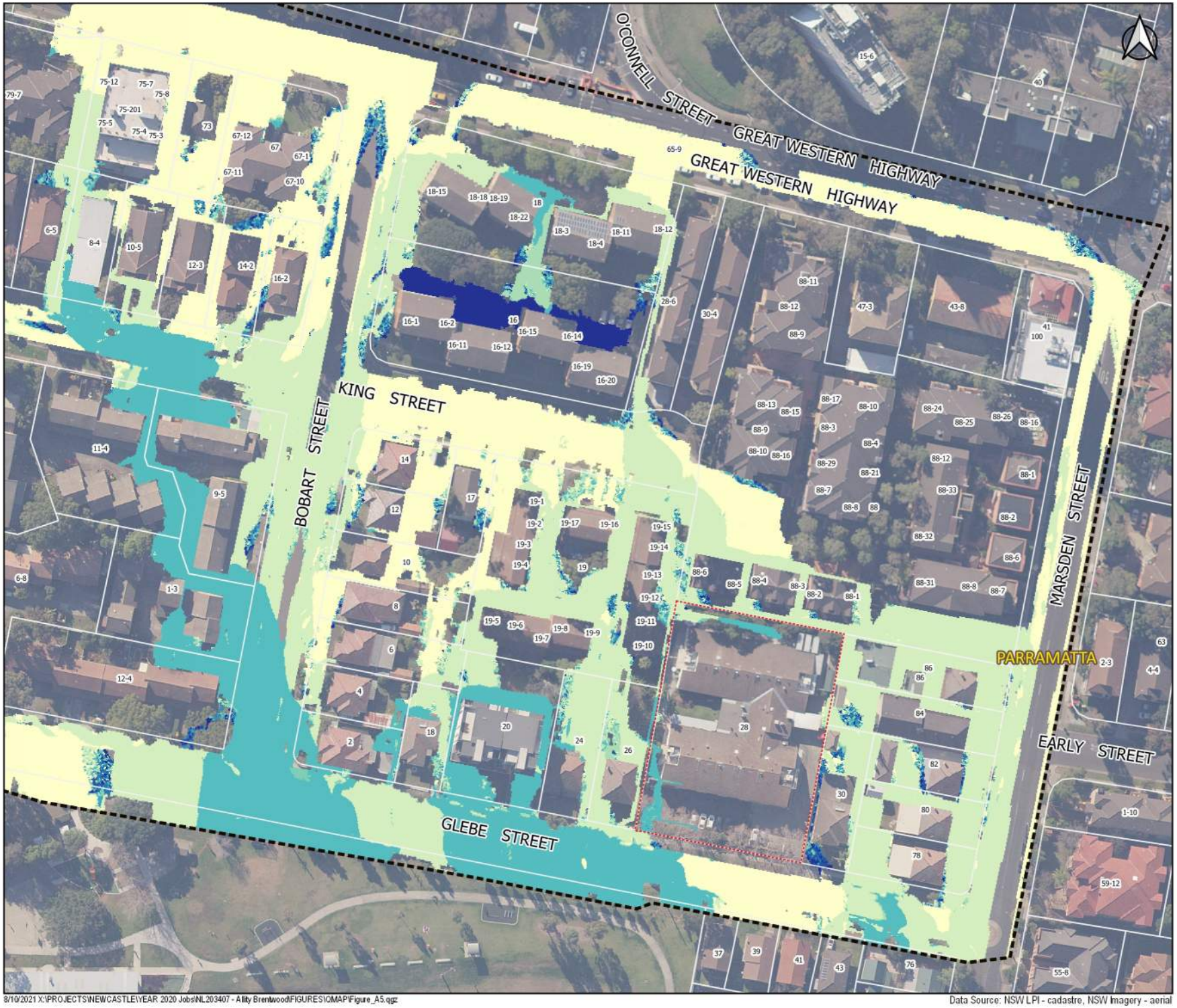
Overland peak flows across the subject site boundaries are presented below in **Table 2**.

Table 2 - Peak Flows (m^3/s)

Location	5% AEP	1% AEP	PMF
Across Western Boundary	0.0090	0.0090	0.8220
Across Northern Boundary	0.0002	0.0004	0.0040
Across Eastern Boundary	0.0003	0.0070	0.0040
Across Southern Boundary	0.0000	0.0004 (outflow)	0.0280 (outflow)

Water Depths

Modelling indicates that communal and access areas of the subject site will be partially inundated with maximum modelled water depths of 30mm, 37mm and 120mm for 5% AEP, 1% AEP and PMF events, respectively.



Legend

- Subject Site
- Model Extent

Duration (minutes)

- 5 min
- 10 min
- 15 min
- 20 min
- 25 min
- 30 min
- 45 min
- 60 min
- 90 min
- 120min

0 20 40 Metres

1:1,500

Figure A5

1% AEP Flood Event
Max Water Elevation
Critical Durations
Existing Conditions

28 Glebe Street
Parramatta

NORTHROP

Data Source: NSW LPI - cadastre, NSW Imagery - aerial

Legend

- Subject Site
- Model Extent
- Contours 0.5m

Water Depth(m)

- 0.001 - 0.02
- 0.02 - 0.05
- 0.05 - 0.10
- 0.10 - 0.15
- 0.15 - 0.20
- 0.20 - 0.50
- 0.50 >

0 20 40 Metres

1:1,500

Figure B1

1% AEP Flood Event
Water Depth and Elevation
Maximum Envelope
Existing Conditions

28 Glebe Street
Parramatta

NORTHROP

Data Source: NSW LPI - cadastre, NSW Imagery - aerial

Legend

- Subject Site
- Model Extent

Velocity(m/s)

- < 0.5
- 0.5 - 1
- 1 - 2
- 2 - 4
- 4 - 6
- > 6

0 20 40 Metres

1:1,500

Figure B2

1% AEP Flood Event
Flow Velocity
Maximum Envelope
Existing Conditions

28 Glebe Street
Parramatta

NORTHROP

Data Source: NSW LPI - cadastre, NSW Imagery - aerial

Legend

- Subject Site
- Model Extent

Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6

0 20 40 Metres

1:1,500

Figure B3

1% AEP Event
Flood Hazard
Maximum Envelope
Existing Conditions

28 Glebe Street
Parramatta

NORTHROP

Data Source: NSW LPI - cadastre, NSW Imagery - aerial

Legend

- Subject Site
- Model Extent
- Contours 0.5m

Water Depth(m)

- 0.001 - 0.02
- 0.02 - 0.05
- 0.05 - 0.10
- 0.10 - 0.15
- 0.15 - 0.20
- 0.20 - 0.50
- 0.50 >

0 20 40 Metres

1:1,500

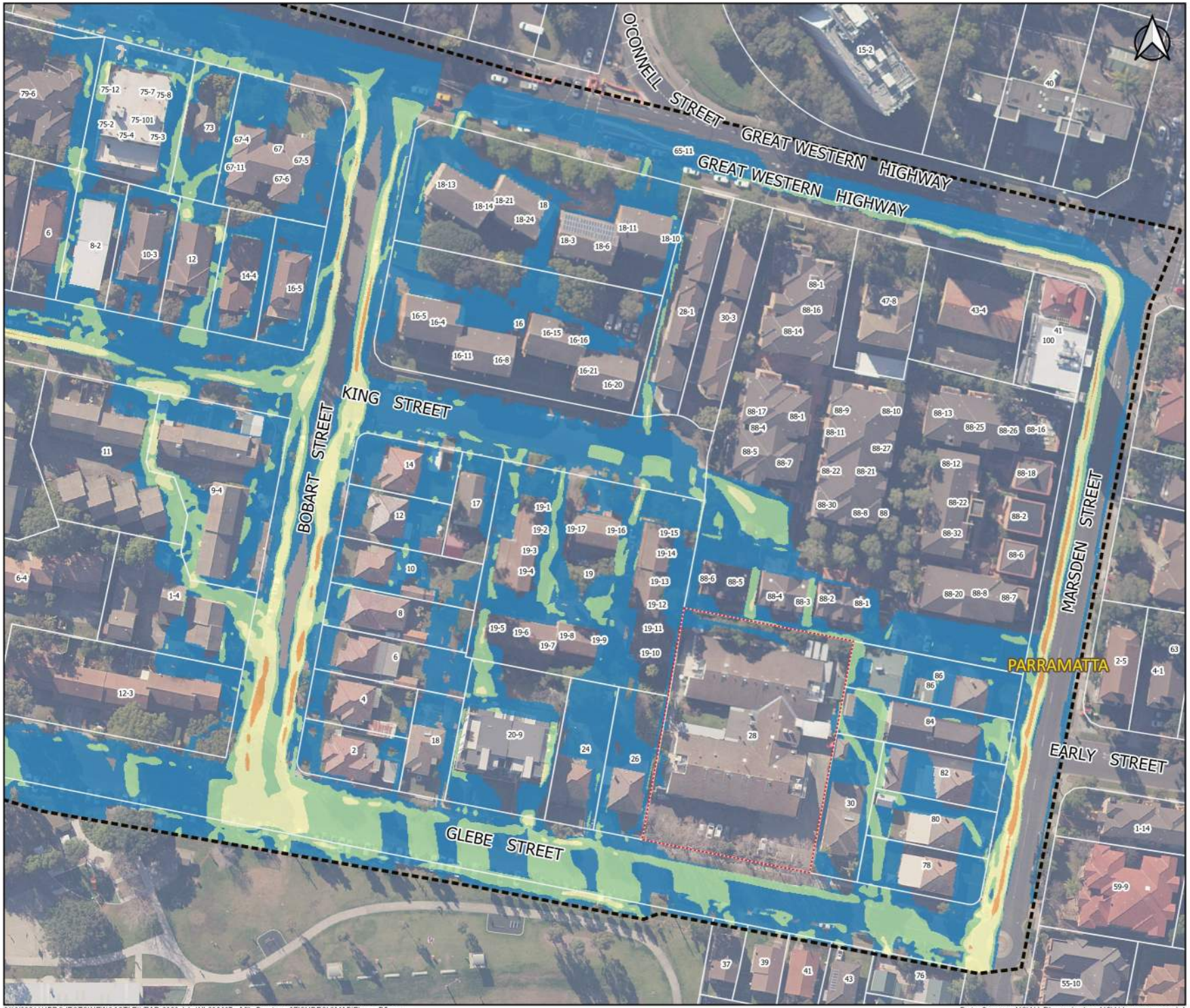
Figure B4

5% AEP Flood Event
Water Depth and Elevation
Maximum Envelope
Existing Conditions

28 Glebe Street
Parramatta

NORTHROP

Data Source: NSW LPI - cadastre, NSW Imagery - aerial



Legend

- Subject Site
- Model Extent

Velocity(m/s)

- < 0.5
- 0.5 - 1
- 1 - 2
- 2 - 4
- 4 - 6
- > 6

0 20 40 Metres

1:1,500

Figure B5

5% AEP Flood Event
Flow Velocity
Maximum Envelope
Existing Conditions

28 Glebe Street
Parramatta

NORTHROP

Data Source: NSW LPI - cadastre, NSW Imagery - aerial

Legend

- Subject Site
- Model Extent

Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6

0 20 40 Metres

1:1,500

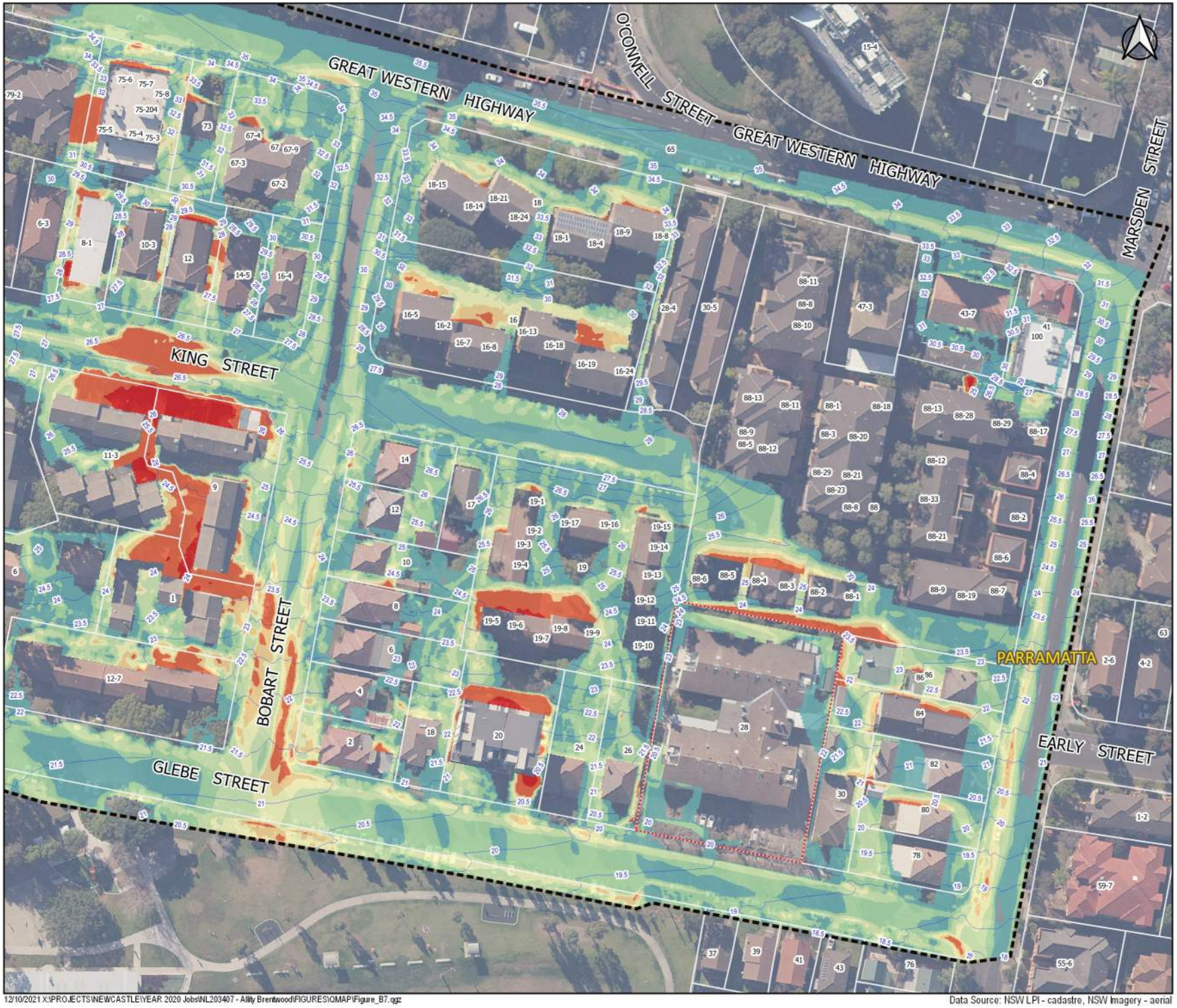
Figure B6

5% AEP Event
Flood Hazard
Maximum Envelope
Existing Conditions

28 Glebe Street
Parramatta

NORTHROP

Data Source: NSW LPI - cadastre, NSW Imagery - aerial



Legend

- Subject Site
- Model Extent
- Contours 0.5m

Water Depth(m)

- 0.001 - 0.02
- 0.02 - 0.05
- 0.05 - 0.10
- 0.10 - 0.15
- 0.15 - 0.20
- 0.20 - 0.50
- 0.50 >

0 20 40 Metres

1:1,500

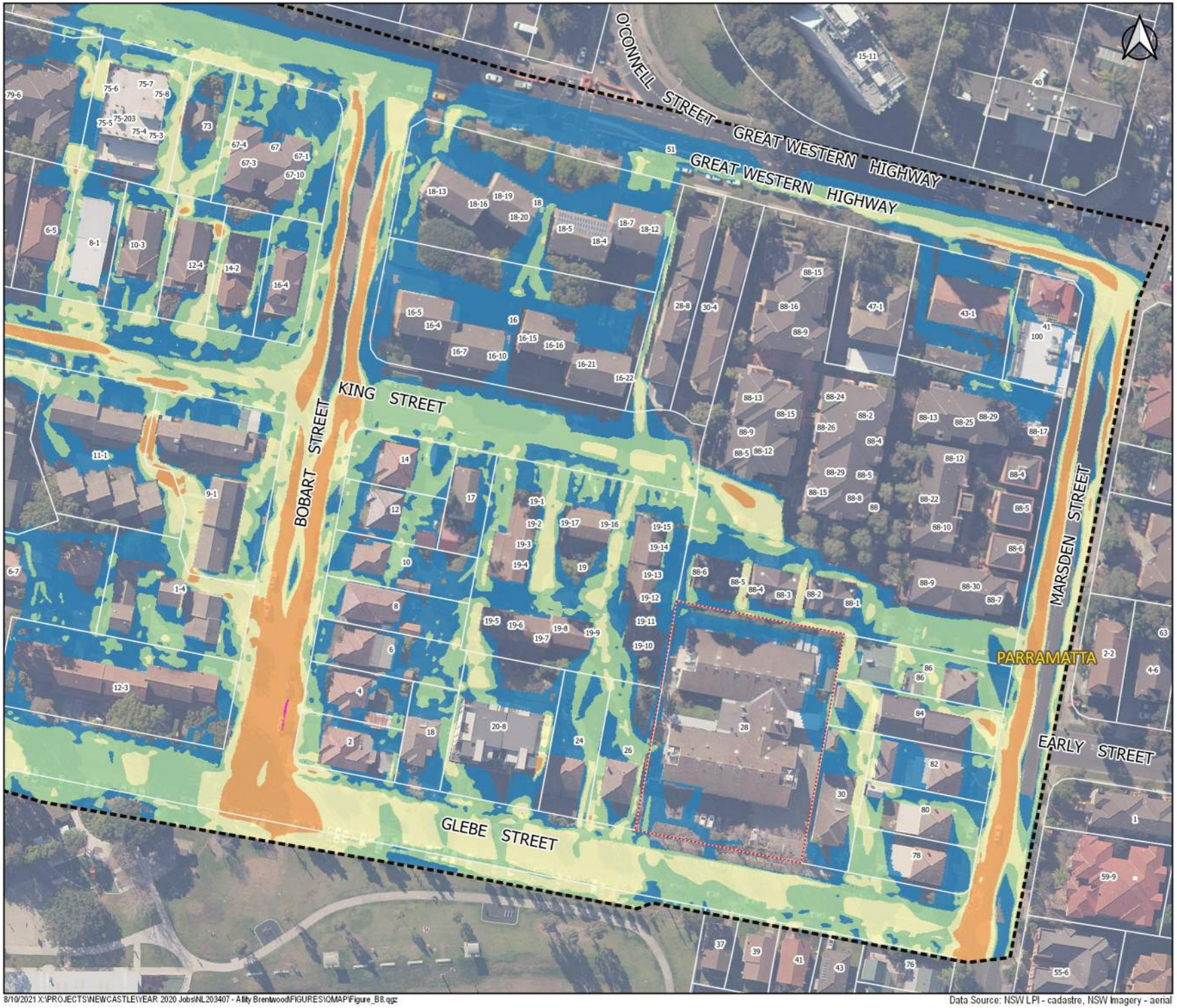
Figure B7

PMF Event
Max Water Depth and Elevation
Existing Conditions

28 Glebe Street
Parramatta

NORTHROP

Data Source: NSW LPI - cadastre, NSW Imagery - aerial



Legend

- Subject Site
- Model Extent

Velocity(m/s)

- < 0.5
- 0.5 - 1
- 1 - 2
- 2 - 4
- 4 - 6
- > 6

0 20 40 Metres

1:1,500

Figure B8

PMF Event
Max Flow Velocity
Existing Conditions

28 Glebe Street
Parramatta

NORTHROP

Data Source: NSW LPI - cadastre, NSW Imagery - aerial

Legend

- Subject Site
- Model Extent

Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6

0 20 40 Metres

1:1,500

Figure B9

PMF Event
Max Flood Hazard
Existing Conditions

28 Glebe Street
Parramatta

NORTHROP

Data Source: NSW LPI - cadastre, NSW Imagery - aerial

Developed Flood Behaviour and Impacts

Developed Flood Behaviour

Figures representing the developed flood behaviour for 5% AEP, 1% AEP and PMF flood events are presented in **Figure C1-C9**.

Peak Flows

Overland peak flows across the subject site boundaries are presented below in **Table 2**.

Table 4 - Peak flows (m^3/s)

Location	5% AEP	1% AEP	PMF
Across Western Boundary	0.0106	0.0161	0.2330
Across Northern Boundary	0.0003	0.0005	0.0045
Across Eastern Boundary	0.0000	0.0000	0.0032
Across Southern Boundary	0.0103 (outflow)	0.0155 (outflow)	0.2380 (outflow)
Across Southern Boundary (Drainage Easement)	0.0103 (outflow)	0.0155 (outflow)	0.2380 (outflow)

Water Depths

Modelling indicates the carparking, communal and access areas of the subject site will be free from overland flooding during 5% and 1% AEP events developed conditions. A localised inundation is observed in the north-east section of the subject site during PMF event with maximum modelled water depths will not exceed 55mm.

Flood Effects

Figures describing impact to flood levels for 5% and 1% AEP events are presented in **Figures D1-D2**.

A localised increase of up to approximately 16mm is observed in Glebe Street which is expected to be due to modification of the drainage easement at the western boundary of the subject site. The increase is contained within the road reserve, minor in magnitude and extent and does not result in a change in hazard conditions in Glebe Street.

Legend

- Model Extent
- Proposed Building, SRW
- Contours 0.5m

Water Depth(m)

- 0.001 - 0.02
- 0.02 - 0.05
- 0.05 - 0.10
- 0.10 - 0.15
- 0.15 - 0.20
- 0.20 - 0.50
- 0.50 >

Proposed Landform (mAHD)

- <= 19.0
- 19.0 - 20.0
- 20.0 - 22.0
- 22.0 - 23.0
- > 23.0

0 10 20 Metres

1:1,000

Figure C1

1% AEP Flood Event
Water Depth and Elevation
Maximum Envelope
Developed Conditions

28 Glebe Street
Parramatta

NORTHROP

Data Source: NSW LPI - cadastre, NSW Imagery - aerial

Figure C2

1% AEP Flood Event
Flow Velocity
Maximum Envelope
Developed Conditions

28 Glebe Street
Parramatta

NORTHROP

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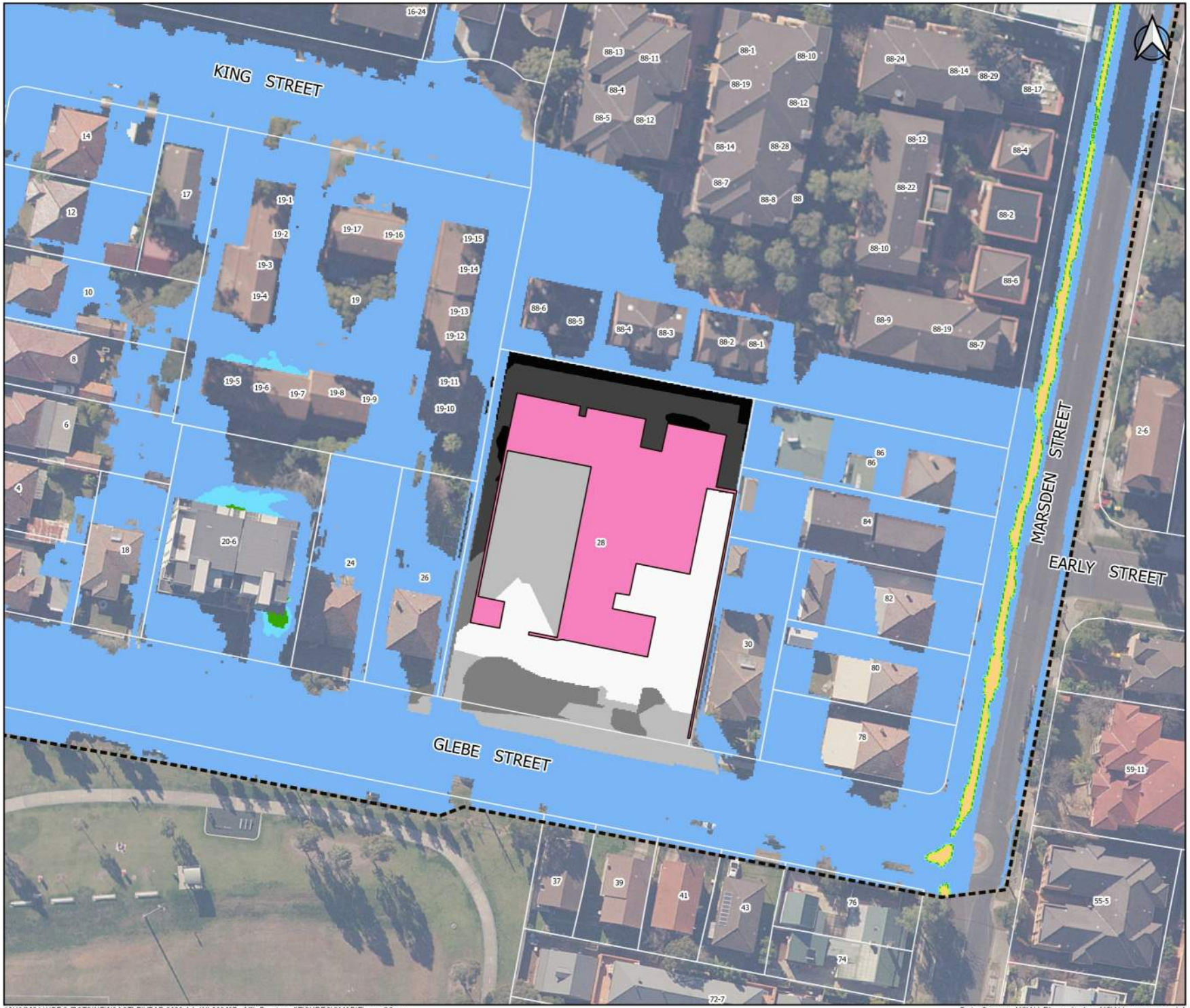
Data Source: NSW LPI - cadastre, NSW Imagery - aerial



Legend

- Model Extent
- Proposed Building, SRW

Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6

Proposed Landform (mAHD)

- <= 19.0
- 19.0 - 20.0
- 20.0 - 22.0
- 22.0 - 23.0
- > 23.0

0 10 20 Metres

1:1,000

Figure C3

1% AEP Flood Event
Flood Hazard
Maximum Envelope
Developed Conditions

28 Glebe Street
Parramatta

NORTHROP

Data Source: NSW LPI - cadastre, NSW Imagery - aerial

Legend

- Model Extent
- Proposed Building, SRW
- Contours 0.5m

Water Depth(m)

- 0.001 - 0.02
- 0.02 - 0.05
- 0.05 - 0.10
- 0.10 - 0.15
- 0.15 - 0.20
- 0.20 - 0.50
- 0.50 >

Proposed Landform (mAHD)

- <= 19.0
- 19.0 - 20.0
- 20.0 - 22.0
- 22.0 - 23.0
- > 23.0

0 10 20 Metres

1:1,000

Figure C4

5% AEP Flood Event
Water Depth and Elevation
Maximum Envelope
Developed Conditions

28 Glebe Street
Parramatta

NORTHROP

Data Source: NSW LPI - cadastre, NSW Imagery - aerial

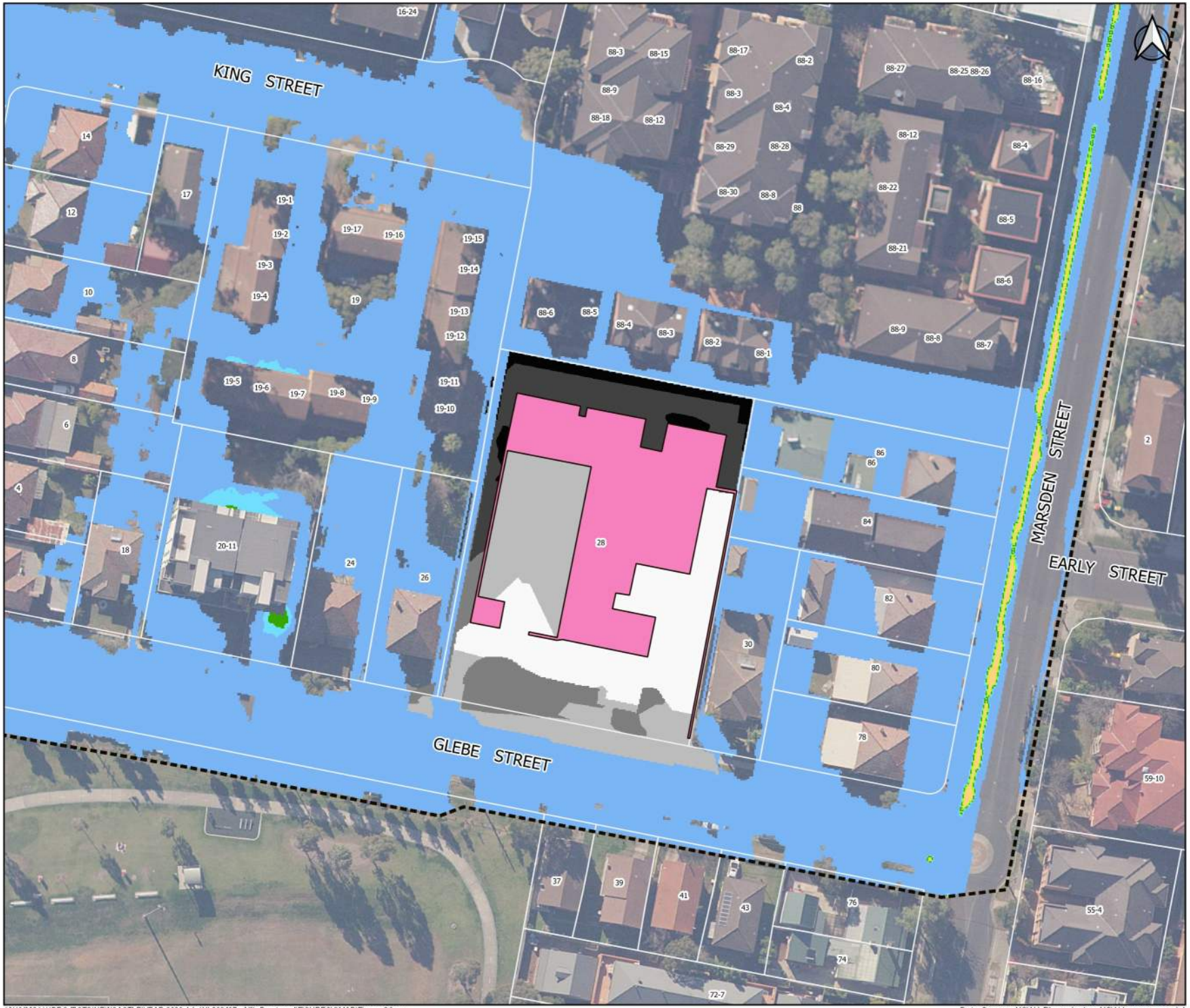
Figure C5

5% AEP Flood Event
Flow Velocity
Maximum Envelope
Developed Conditions

28 Glebe Street
Parramatta

NORTHROP

Data Source: NSW LPI - cadastre, NSW Imagery - aerial



Legend

- Model Extent
- Proposed Building, SRW

Hazard Category

- H1
- H2
- H3
- H4
- H5
- H6

Proposed Landform (mAHD)

- <= 19.0
- 19.0 - 20.0
- 20.0 - 22.0
- 22.0 - 23.0
- > 23.0

0 10 20 Metres

1:1,000

Figure C6

5% AEP Flood Event
Flood Hazard
Maximum Envelope
Developed Conditions

28 Glebe Street
Parramatta

NORTHROP

Data Source: NSW LPI - cadastre, NSW Imagery - aerial

Legend

- Model Extent
- Proposed Building, SRW
- Contours 0.5m

Water Depth(m)

- 0.001 - 0.02
- 0.02 - 0.05
- 0.05 - 0.10
- 0.10 - 0.15
- 0.15 - 0.20
- 0.20 - 0.50
- 0.50 >

Proposed Landform (mAHD)

- <= 19.0
- 19.0 - 20.0
- 20.0 - 22.0
- 22.0 - 23.0
- > 23.0

0 10 20 Metres

1:1,000

Figure C7

PMF Event
Max Water Depth and Elevation
Developed Conditions

28 Glebe Street
Parramatta

NORTHROP

Data Source: NSW LPI - cadastre, NSW Imagery - aerial

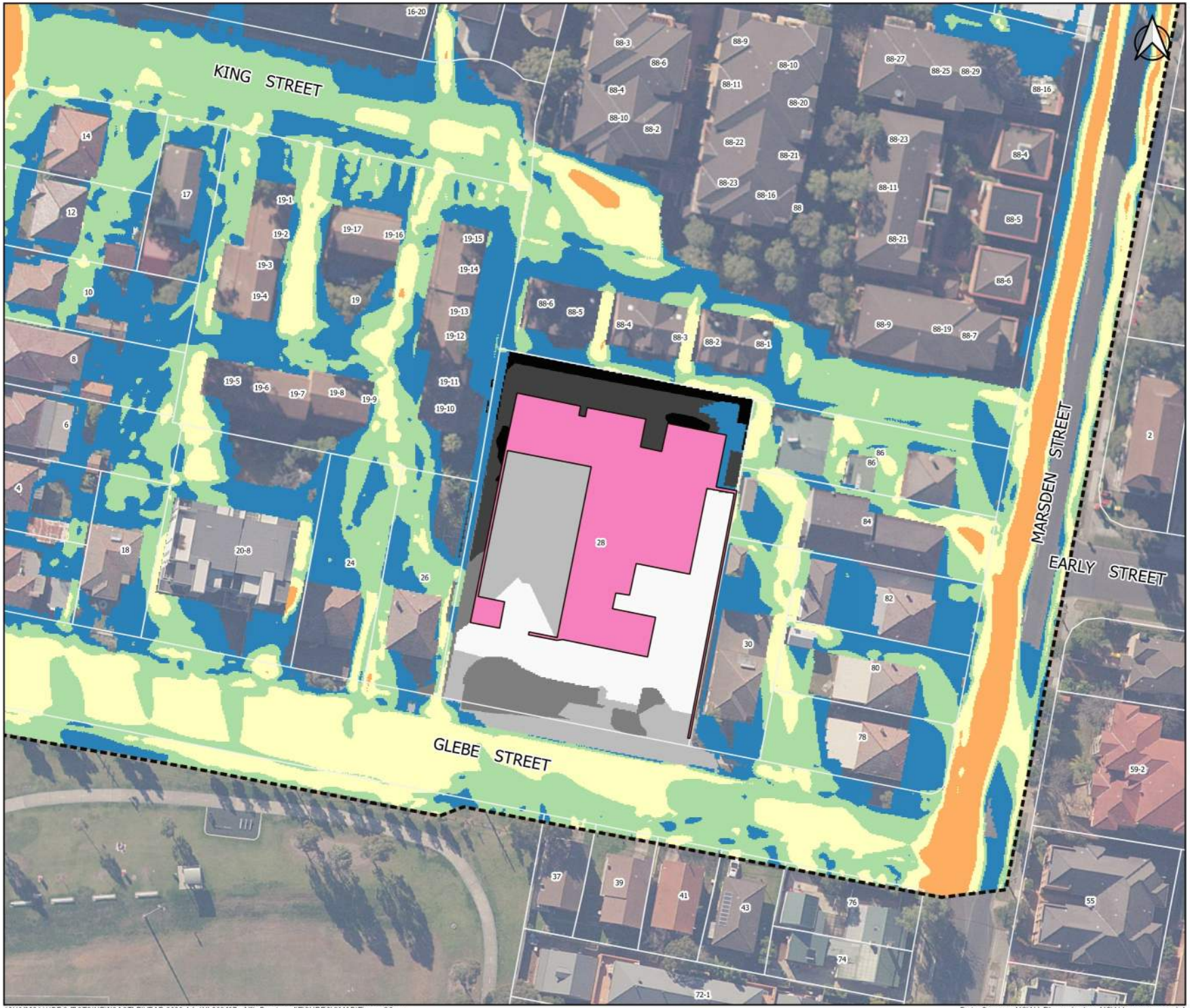


Figure C8

PMF Event
PMF Flow Velocity
Developed Conditions

28 Glebe Street
Parramatta

NORTHROP

Data Source: NSW LPI - cadastre, NSW Imagery - aerial

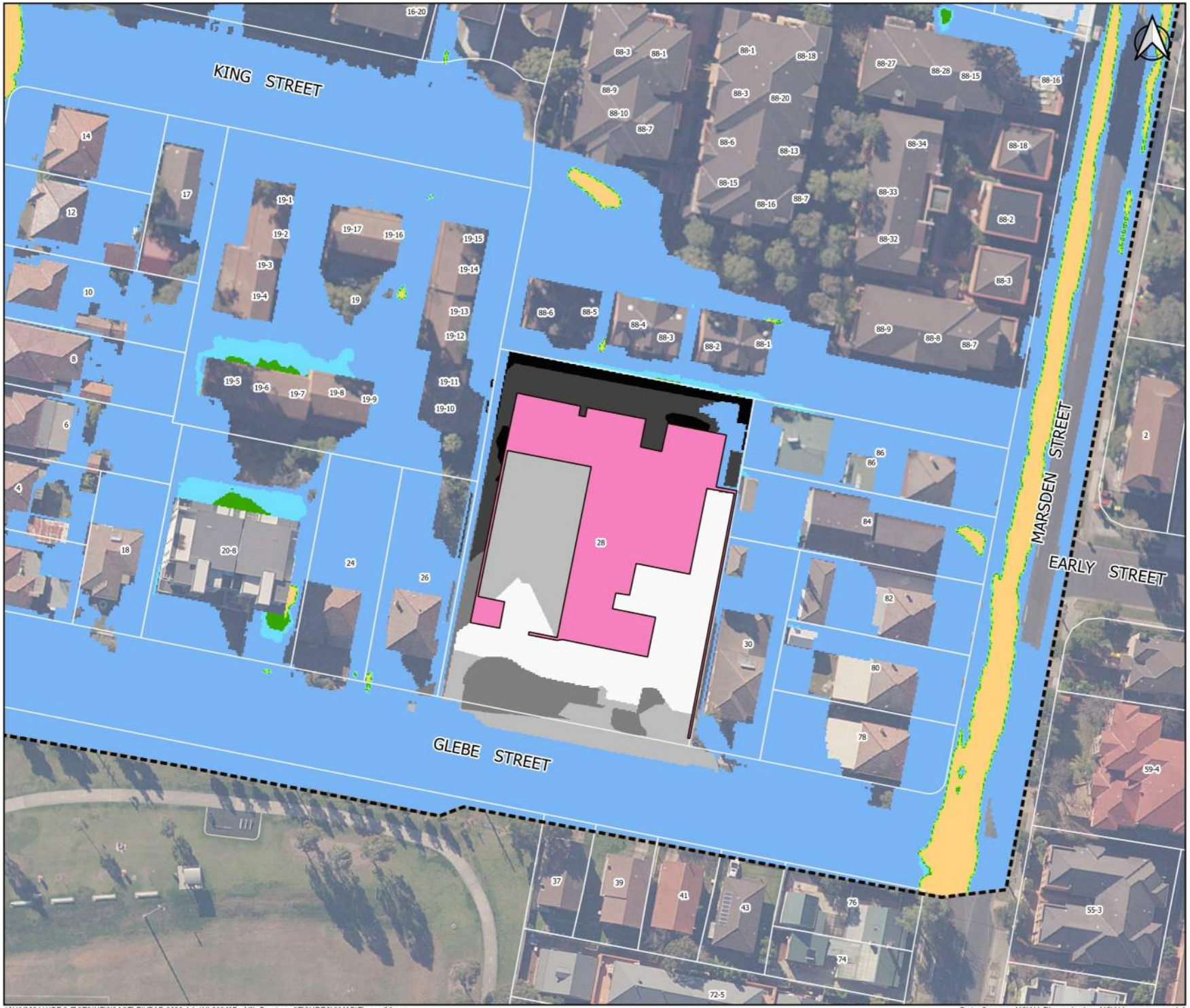


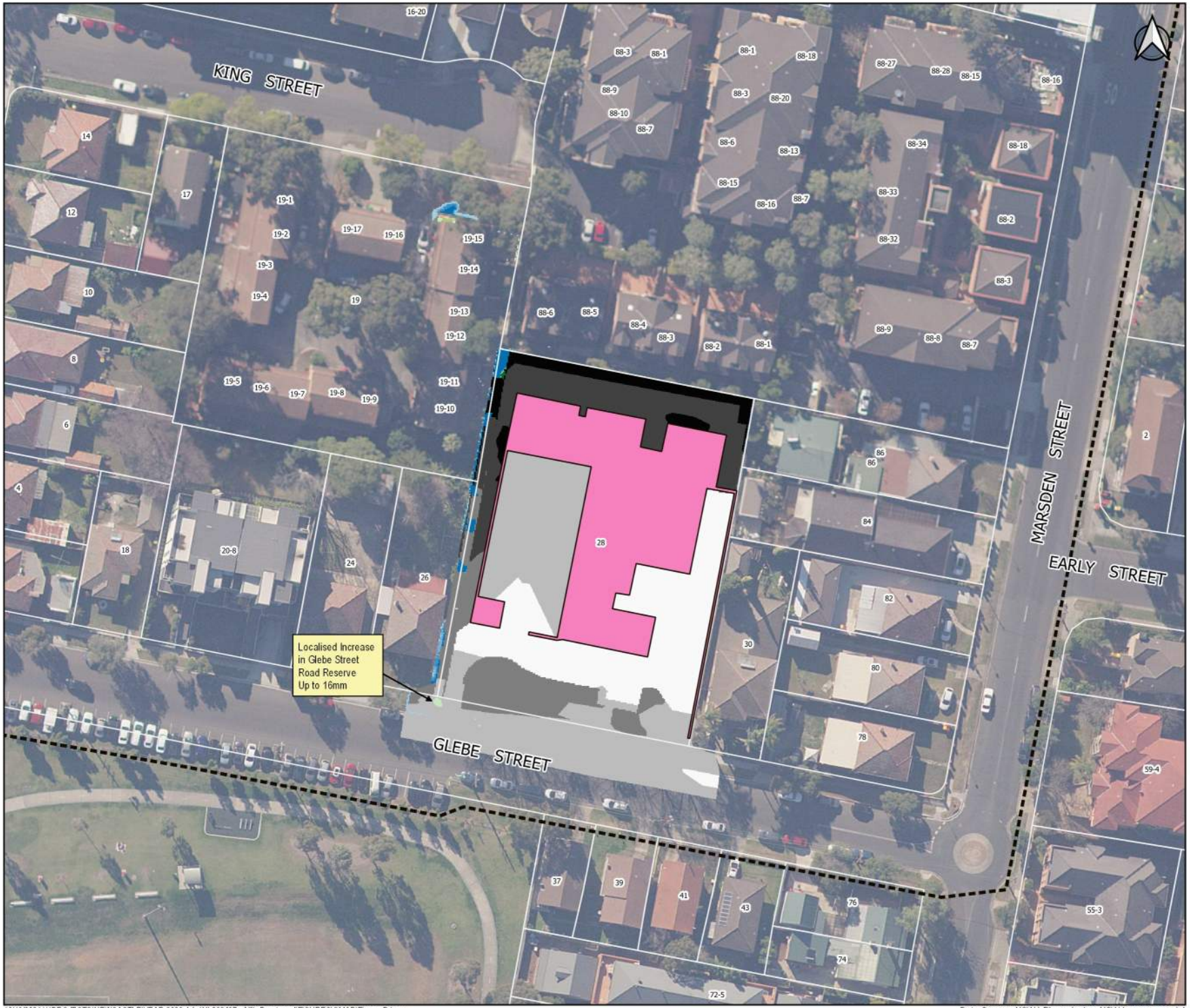
Figure C9

PMF Event
Max Flood Hazard
Developed Conditions

28 Glebe Street
Parramatta

NORTHROP

Data Source: NSW LPI - cadastre, NSW Imagery - aerial



Legend

- Model Extent
- Proposed Building, SRW

Difference (m)

- <-0.10
- -0.10 - -0.05
- -0.05 - -0.03
- -0.03 - -0.01
- Less than +/-10mm
- 0.01 - 0.03
- 0.03 - 0.05
- 0.05 - 0.10
- >0.10

Proposed Landform (mAHD)

- <= 19.0
- 19.0 - 20.0
- 20.0 - 22.0
- 22.0 - 23.0
- > 23.0

0 10 20 Metres

1:1,000

Figure D1

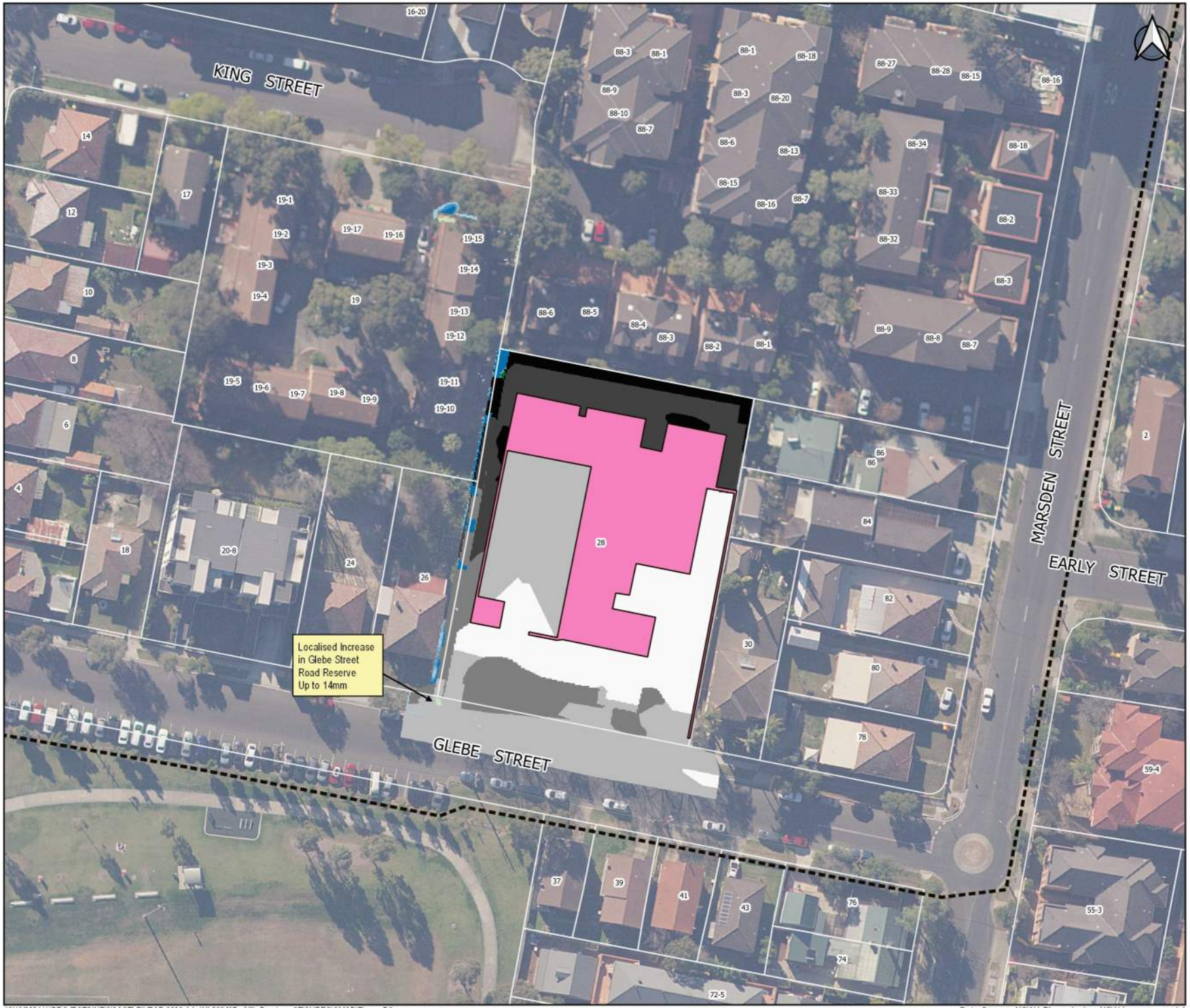
1% AEP Flood Event
Water Elevation Difference
Developed minus Existing

28 Glebe Street
Parramatta

NORTHROP

12/10/2021 X:\PROJECTS\NEWCASTLE\YEAR 2020 Jobs\NL203407 - Ability Brentwood\FIGURES\GMAP\Figure_D1.qgz

Data Source: NSW LPI - cadastre, NSW Imagery - aerial



Legend

- Model Extent
- Proposed Building, SRW

Difference (m)

- <-0.10
- -0.10 - -0.05
- -0.05 - -0.03
- -0.03 - -0.01
- Less than +/-10mm
- 0.01 - 0.03
- 0.03 - 0.05
- 0.05 - 0.10
- >0.10

Proposed Landform (mAHD)

- <= 19.0
- 19.0 - 20.0
- 20.0 - 22.0
- 22.0 - 23.0
- > 23.0

0 10 20 Metres

1:1,000

Figure D2

5% AEP Flood Event
Water Elevation Difference
Developed minus Existing

28 Glebe Street
Parramatta

NORTHROP

Data Source: NSW LPI - cadastre, NSW Imagery - aerial

Discussion

Finished Floor Levels

The proposed ground level finished floor ranges from an elevation of 19.20m AHD to 23.10m AHD. The proposed carparking, communal and access areas around footprint of the proposed building are remaining flood free during the 5% and 1% AEP flood events. Inundation during the PMF event developed conditions is negligible in terms of magnitude, extent and duration, and limited to the north-eastern courtyard area.

Driveway Access

Proposed driveway levels versus 1% AEP Glebe Street flood elevations are presented in **Table 3**.

Table 3 – Driveway Ground Level Assessment

Item	1% AEP Level	Driveway Top Level (m AHD)	Freeboard (mm)	Compliant
Eastern Driveway (Entry)	19.72	20.10	380	**Yes**
Western Driveway (Exit)	19.20	19.45	250	**Yes**

The driveway protects the carparking area from inundation in the 1% AEP which is considered compliant.

Flood Risk Assessment

Flood Hazard

The flood hazard has been quantified in the modelling exercise and reported in the figures above.

The flood hazard is low H1 category in the subject site and the vicinity for 5% and 1% AEP events for both the existing and developed conditions.

For the PMF event, the flood hazard is low H1 category in the subject site and generally low H1 category across majority of adjoining properties. Low H2 flood hazard category is observed in properties adjacent to the northern boundary of the subject site for both the existing and developed conditions.

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
Illness due to contact with contaminated floodwater	Unlikely	Minor	Low
Structural damage causing economic loss	Rare to very rare	Major	Low
Loss of life	Extremely rare	Major	Low

Developed and Residual Risk

Like the existing risk, the residual developed risk analysis is presented below in **Table** 7**7**.

Table 7 – Developed residual risk analysis

Item	Likelihood	Consequence	Risk Rating
Illness due to contact with contaminated floodwater	Unlikely	Minor	Low
Structural damage causing economic loss	Extremely rare	Moderate	Low
Loss of life	Extremely rare	Major	Low

Conclusions

A Flood Impact and Risk Assessment Report has been prepared for the proposed development at 28 Glebe Street, Parramatta NSW.

It was concluded that the proposed development will not create any significant adverse impacts to flood behaviour on the subject site and on the properties surrounding the subject site during 1% AEP flood event.

We commend our findings to Council for their review.

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 Allity Aged Care Pty Limited. 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.

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Document Register

Rev	Status	Prepared	Approved	Date
A	For Approval	RB	GB	15 October 2021

Appendix 1 – PMP GSDM Calculation Sheet

GSDM Caluclation Sheet

Location:	Brentwood	
Catchment:	Local	
Area:	0.12	km2
Smooth(S)=	0.9	
Rough(R)=	0.1	
Mean Elevation=	26	mAHD
EAF=	1	
MAF=	0.7	

Duration(hrs)	I D S	I D R	PMP=DS*S+DR*R*MAF*EAF	PMP Rounded (mm)
0.25	245	245	172	170
0.50	350	350	245	250
0.75	440	440	308	310
1.00	510	510	357	360
1.50	570	655	405	410
2.00	650	770	463	460
2.50	680	850	488	490
3.00	725	940	523	520
4.00	780	1065	566	570
5.00	855	1175	621	620
6.00	900	1245	654	650