

Rezoning of 1 Crescent Street Holroyd: Flooding Assessment

Final Report
R.S20147.001.00.docx
May 2015



Rezoning of 1 Crescent Street Holroyd: Flooding Assessment

Prepared for: Tiberius (Parramatta) Pty Ltd

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Synopsis: Documentation of flood impact assessment for the proposed rezoning of the site outlining background information, assessment methodology and findings		

REVISION/CHECKING HISTORY

Revision Number	Date	Checked by		Issued by	
0	19/05/15	DJL		DJL	
1	28/05/15	DJL		DJL	
2					

DISTRIBUTION

Destination	Revision					
	0	1	2	3	4	5
Tiberius (Parramatta) Pty Ltd BMT WBM File BMT WBM Library	1e					

Executive Summary

This report has been commissioned by Tiberius (Parramatta) Pty Ltd for the purpose of identifying potential flooding constraints for the proposed rezoning of the lot at 1 Crescent Street, Holroyd. The report considers the impact of local catchment flooding of A'Becketts Creek on the potential development of the site.

The flood assessment details the nature of the proposed development site, the analysis undertaken to quantify existing flood conditions, consideration of the constraints of existing flooding conditions on development potential and requirement for flood mitigation options to manage potential flood impact. The flood impact assessment herein provides a basis for assessing the potential for rezoning in respect to suitability of the land for future development under Holroyd Council's Flood Policy.

The site is located within the catchment of A'Becketts Creek. A'Becketts Creek has an approximate catchment area of 680 hectares, draining to Duck Creek (a tributary of Duck River) and then into the Parramatta River. The catchment of A'Becketts Creek is densely developed and drainage through the area is highly modified from its natural state. Artificial stormwater channels have replaced natural creeks in some reaches with channel road crossings and associated bridge/culvert structures providing significant flow control points.

Previous studies of A'Becketts Creek have been undertaken to examine flooding behaviour within the catchment. These studies include:

- Catchment Management Study - A'Becketts Creek SWC No.46, Bewsher Consulting (1990);
- Report for A'Becketts Creek – Drainage Master Plan, GHD, (2009); and
- Westconnex Stage 1A: M4 Widening - Hydrology & Flooding Technical Study (NSW Transport)

Holroyd Council's existing flood mapping based on the results of the above previous studies indicate that the entire 1 Crescent Street parcel is above the 1% AEP design flood level and not subject to inundation from A'Becketts Creek flooding. Floodwater at the 1% AEP flood level is confined to within the A'Becketts Creek channel adjacent to the site. The main channel alignment is categorised as a floodway.

In order to confirm the general flood behaviour established in the previous studies, BMT WBM developed a separate TUFLOW 2-dimensional hydraulic model of the A'Becketts Creek catchment. Whilst not anticipated to override existing Council data, the model has been developed with the intention to confirm the flood behaviour and/or identify any potential flooding risks for the proposed development not identified in the previous assessments. The simulated flood conditions from the additional modelling provide confirmation of the 1% AEP design flood inundation extents being confined to the main channel of A'Becketts Creek adjacent to the proposed development site.

The establishment of existing design flood conditions confirm that the proposed development site is not subject to mainstream flood inundation from the adjacent A'Becketts Creek. There are no major constraints to the proposed development in relation to the mainstream 1% AEP A'Becketts Creek flooding condition. No component of the proposed development layout encroaches within the 1% AEP flood inundation extent, and existing ground surface levels on the lot lie well above the nominal flood planning levels based on 1% AEP flood level + 0.5m freeboard. Therefore the proposed development will not be affected by mainstream flooding, nor have any impact on existing flooding conditions.

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Introduction

1 Introduction

This report has been commissioned by Tiberius (Parramatta) Pty Ltd for the purpose of identifying potential flooding constraints for the proposed rezoning of the lot at 1 Crescent Street, Holroyd (the Site). The report considers the impact of local catchment flooding of A'Becketts Creek on the potential development of the site.

The flood assessment details the nature of the proposed development site, the analysis undertaken to quantify existing flood conditions, consideration of the constraints of existing flooding conditions on development potential and requirement for flood mitigation options to manage potential flood impact. The flood impact assessment herein provides a basis for assessing the potential for rezoning in respect to suitability of the land for future development under Holroyd Council's Flood Policy.

1.1 Site Location

The site is located at 1 Crescent Street, Holroyd and is bounded by Crescent Street to the south, Woodville/Parramatta Road to the east and Holroyd Sportsground to the north; and adjacent M4 Motorway as shown in Figure 1-1.

The site is located within the catchment of A'Becketts Creek. A'Becketts Creek has an approximate catchment area of 680 hectares, draining to Duck Creek (a tributary of Duck River) and then into the Parramatta River. The catchment of A'Becketts Creek is densely developed and drainage through the area is highly modified from its natural state. Artificial stormwater channels have replaced natural creeks in some reaches with channel road crossings and associated bridge/culvert structures providing significant flow control points.

The topography of the A'Becketts Creek catchment is shown in Figure 1-2. The topography is based on LiDAR data acquired by the NSW Land and Property Information (NSW LPI) in 2013. Shown for reference are the indicative natural drainage lines based on the topography.

The site is located immediately adjacent the right bank of A'Becketts Creek. However, the site is elevated some 6m above the invert level of the channel.



Title:
Site Locality

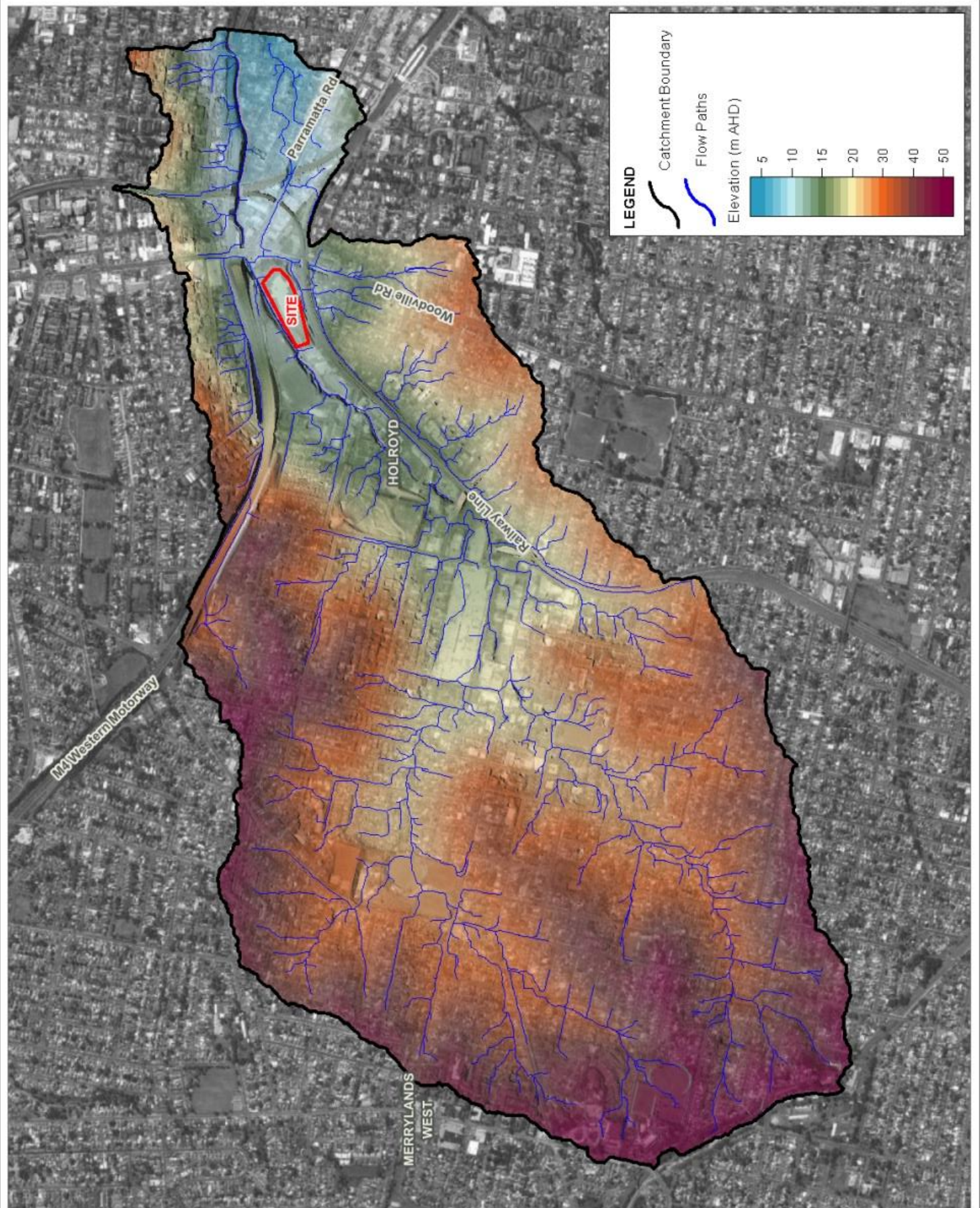
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A'Becketts Creek Catchment Area and Topography

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2 Existing Flood Conditions

A principle objective of the Flood Assessment is to define the existing flood behaviour of the local reach of A'Becketts Creek to examine the relative impact on existing flood behaviour of potential development associated with the proposed rezoning.

2.1 Existing Flood Data / Studies

Previous studies of A'Becketts Creek have been undertaken to examine flooding behaviour within the catchment. These studies include:

- Catchment Management Study - A'Becketts Creek SWC No.46, Bewsher Consulting (1990);
- Report for A'Becketts Creek – Drainage Master Plan, GHD, (2009); and
- Westconnex Stage 1A: M4 Widening - Hydrology & Flooding Technical Study (NSW Transport)

Each of these studies utilised 1-dimensional hydraulic modelling to establish flood levels along A'Becketts Creek. The most recent of these studies being the Westconnex study, incorporated hydrological modelling using XP-RAFTS software and hydraulic modelling of the A'Becketts Creek reach using HEC-RAS software.

In the reach adjacent to the proposed development at 1 Crescent Street, peak 1% AEP design flood levels were established as varying from approximately 10.0m AHD to 9.0m AHD. At these peak flood levels, floodwater is fully contained within the stormwater channel adjacent to the development site. The development site is elevated well above the floodplain with typical ground levels of the order of 12m AHD. Accordingly, there is no mainstream flooding impact on the proposed development site from A'Becketts Creek up to the 1% AEP event.

The flood levels adopted by Holroyd City Council for flood planning purposes have not been confirmed. Council have however confirmed that the above mentioned studies form the basis of the mainstream flooding assessment of A'Becketts Creek and at this stage, Council is not proposing to conduct a further mainstream flood study for this creek, only overland flooding to the creek.

Hydraulic categorisation is one of the tools used to identify flood behaviour and risk. Outcomes of the categorisation are primarily used to inform future land use planning. The categorisation is not used to assess individual developments, but rather to give a catchment-scale overview of which areas may be appropriate for various types of land use.

The hydraulic categories as defined in the Floodplain Development Manual are:

- **Floodway** - Areas that convey a significant portion of the flow. These are areas that, even if partially blocked, would cause a significant increase in flood levels or a significant redistribution of flood flows, which may adversely affect other areas.
- **Flood Storage** - Areas that are important in the temporary storage of the floodwater during the passage of the flood. If the area is substantially removed by levees or fill it will result in elevated water levels and/or elevated discharges. Flood Storage areas, if completely blocked would

cause peak flood levels to increase by 0.1m and/or would cause the peak discharge to increase by more than 10%.

- **Flood Fringe** - Remaining area of flood prone land, after Floodway and Flood Storage areas have been defined. Blockage or filling of this area will not have any significant effect on the flood pattern or flood levels.

Holroyd Council has developed hydraulic category mapping across the LGA including the A'Becketts Creek catchment as shown in Figure 2-1. The location of the proposed development site is shown for reference.

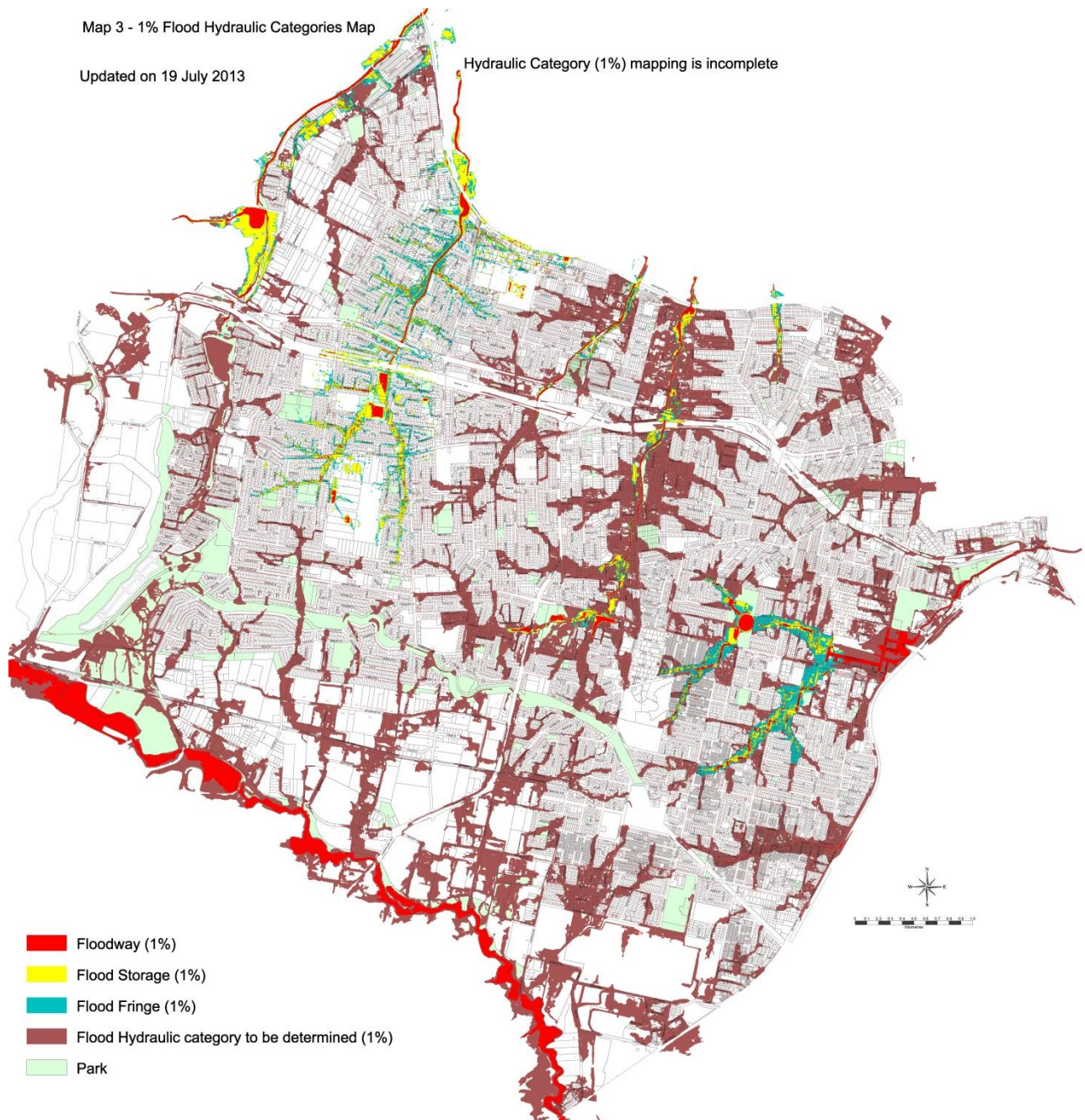


Figure 2-1 1% AEP Hydraulic Category Mapping

Figure 2-2 shows the hydraulic category mapping in greater detail for the reach of A'Becketts Creek adjacent to the development site. The development parcel is shown to be free from mainstream flooding of A'Becketts Creek for the 1% AEP design event. The main channel itself is classified as floodway adjacent to the development site. Note also that the mapping confirms that the inundation extent is confined to the stormwater channel.



Figure 2-2 1% AEP Hydraulic Category Mapping - Site Detail

2.2 Additional Modelling

In order to confirm the general flood behaviour established in the previous studies, BMT WBM developed a separate TUFLOW 2-dimensional hydraulic model of the A'Becketts Creek catchment. Whilst not anticipated to override existing Council data, the model has been developed with the intention to confirm the flood behaviour and/or identify any potential flooding risks for the proposed development not identified in the previous assessments.

BMT WBM has applied the fully 2D software modelling package TUFLOW. The channel and floodplain topography is defined using a high resolution digital elevation model (DEM) for greater accuracy in predicting flows and water levels and the interaction of in-channel and floodplain areas. Available LiDAR topographical data was used to define the floodplain and channel topography. As the study area is relatively small, a high resolution model cell size (2m) was adopted for the TUFLOW model.

There are a number of cross drainage structures located in the study catchment that are not represented in the LiDAR topographical data. In order to enable the transport of water at these locations, the underlying TUFLOW model topography was altered to effectively connect the

Existing Flood Conditions

channel reaches on the upstream and downstream sides of the cross drainage structures with the exception of the Woodville Rd culvert where a 1D culvert structure (with approximated details) was nested into the 2D model. Whilst it is acknowledged that this would not provide for an accurate representation of the flood behaviour at the structure locations, it is considered to be a reasonable approach to enable a flood assessment of the study site without the need for structure survey details to be obtained.

For the purpose of this study, the rainfall data was input into the hydraulic model using a direct rainfall approach. The direct rainfall approach applies a rainfall depth to every active cell within the assigned rainfall region, and essentially replaces the need to use a hydrological model (e.g. RAFTS-XP, WBNM). Given the relatively small size of the study catchment (~6.5km²) only one rainfall region was assigned encompassing the study catchment in its entirety (i.e. a single hydrograph was applied to the entire model area).

Design rainfall depth is based on the generation of intensity-frequency-duration (IFD) design rainfall curves utilising the procedures outlined in AR&R (2001). The temporal patterns adopted in for this study are based on the standard patterns presented in AR&R (2001).

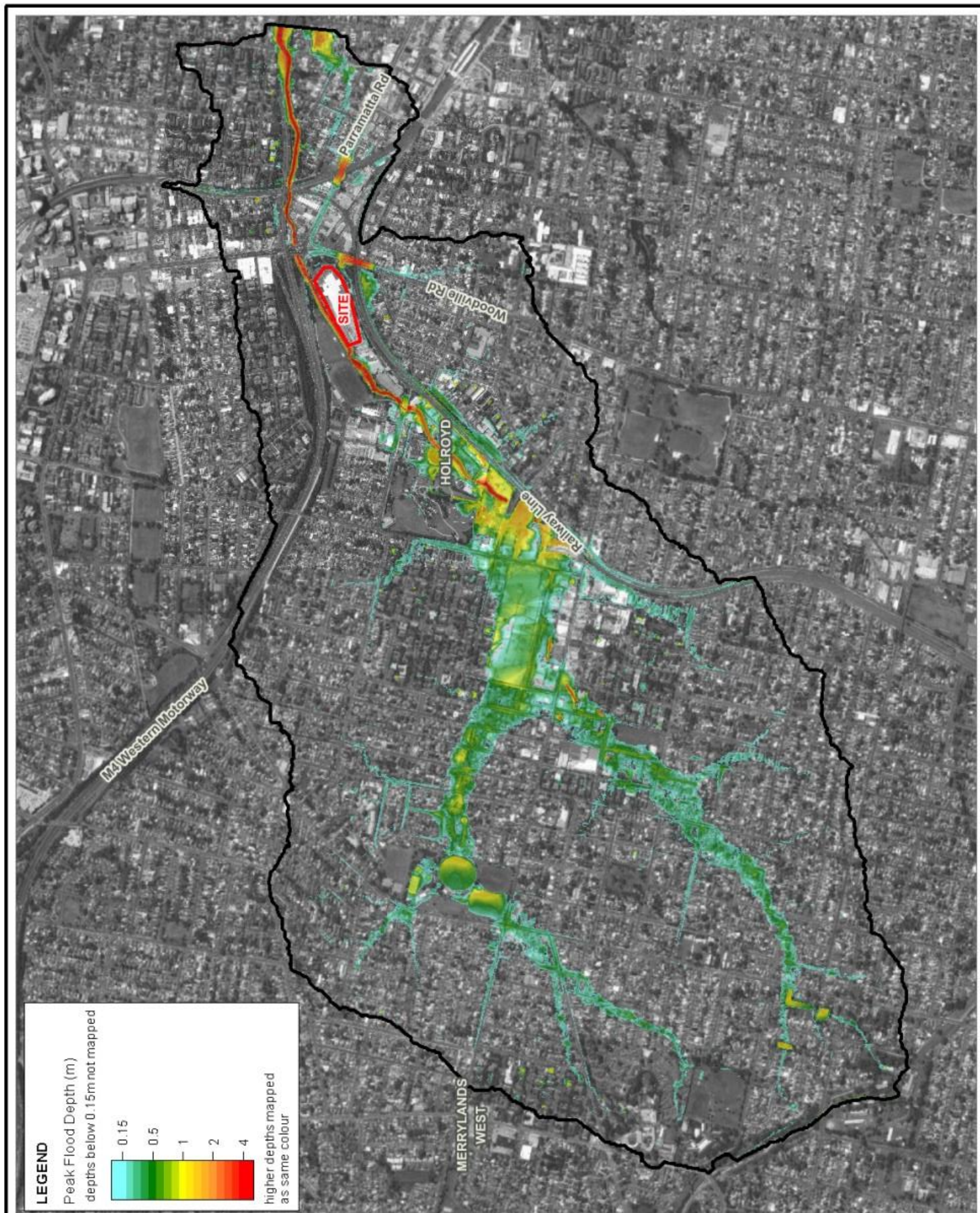
The 1% AEP 2-hour duration was identified as the critical storm duration for the catchment. The simulated peak flood depths and extent is shown in Figure 2-3 for the full catchment and Figure 2-4 for the proposed development site locality. Figure 2-3 shows the alignment of the major overland flow paths through the catchment, contributing to the flood discharge in A'Becketts Creek adjacent to the proposed development site. Two major overland flow paths converge well upstream of the proposed development site prior to discharging into the main A'Becketts Creek channel.

The simulated flood conditions in the vicinity of the proposed development are shown in Figure 2-4. The results provide confirmation of the 1% AEP design flood inundation extents being confined to the main channel of A'Becketts Creek adjacent to the proposed development site. There is also no mainstream flood inundation for the adjacent sports fields.

Peak flood level across the site varies from around 10m - 11m AHD. These levels are typically 0.5-1m higher than the estimates from the previous reporting discussed in Section 2.1. Nevertheless, relatively conservative assumptions have been adopted in the TUFLOW to provide expected upper bounds in flood behaviour such that any risks to the proposed development can be appreciated. Similar 1% AEP peak flood discharges of the order of 100m³/s provide some consistency between previous studies,

Some inundation is shown on Woodville Road and Crescent Street. However, it should be noted that no stormwater drainage provision is provided in the TUFLOW model. Accordingly, the model provides for some pondage in the low points on these access roads. Whilst these roads may be subject to some overland flooding, the inundation would not be as significant as shown given the drainage relief provided by the existing stormwater drainage system.

It is noted that there may be existing flooding issues at the Woodville Rd Crescent street junction, primarily under the railway. The development site extents are higher ground and flood free during the 100 year event. If however in the event that there is flooding inundation of the Crescent St/Woodville Rd intersection, traffic can alternatively exit the development site via the same main entry point at Crescent St and head west toward either Holroyd or Parramatta if required.



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Simulated 1% AEP Peak Flood Depths

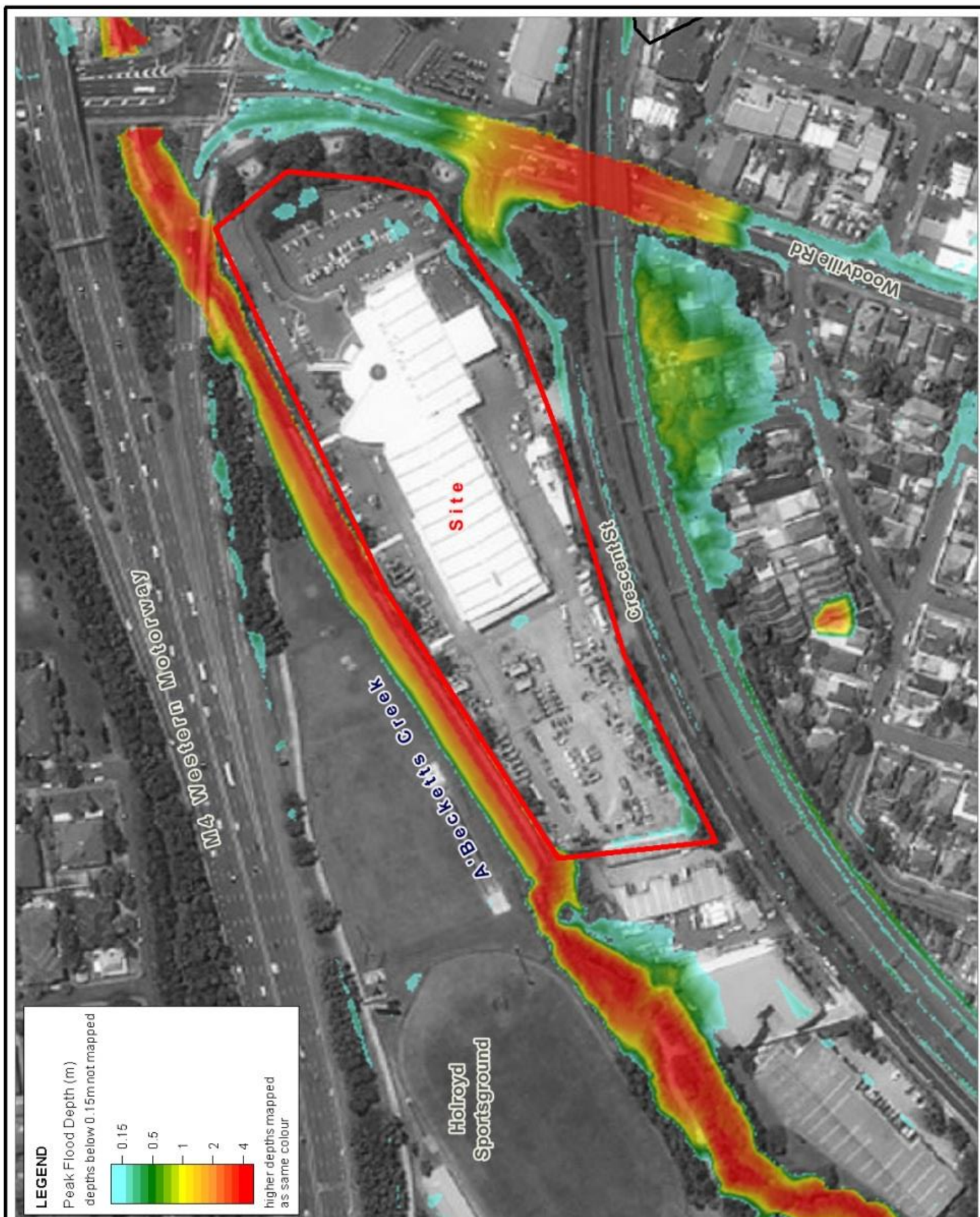
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Title:
Simulated 1% AEP Peak Flood Inundation (Site Locality)

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3 Flooding Constraints Proposed Development

The establishment of existing design flood conditions in the previous sections have confirmed that the proposed development site is not subject to mainstream flood inundation from the adjacent A'Becketts Creek. Accordingly, the proposed development would have no significant constraints in relation to this mainstream flooding and also have no impact on existing mainstream flooding conditions.

The proposed development is shown in Figure 3-1. The development is confined to the existing lot with all development located on above the design 1% AEP flood levels in A'Becketts Creek, including a 0.5m freeboard provision.



Figure 3-1 Proposed Development Masterplan (by architectus)

Figure 3-2 shows a typical cross section of A'Becketts Creek (based on the LiDAR data) and the representative peak flood level condition. As noted, the 1% AEP flood inundation extent is fully contained within the A'Becketts Creek channel section. Both the proposed development on the right bank, and the sports fields on the left bank, are located well above the simulated peak flood level condition.

Accordingly, there are no major constraints to the proposed development in relation to the mainstream 1% AEP A'Becketts Creek flooding condition. No component of the proposed development layout encroaches within the 1% AEP flood inundation extent, and existing ground surface levels on the lot lie well above the nominal flood planning levels based on 1% AEP flood level + 0.5m freeboard. Therefore the proposed development will not be affected by mainstream flooding, nor have any impact on existing flooding conditions.

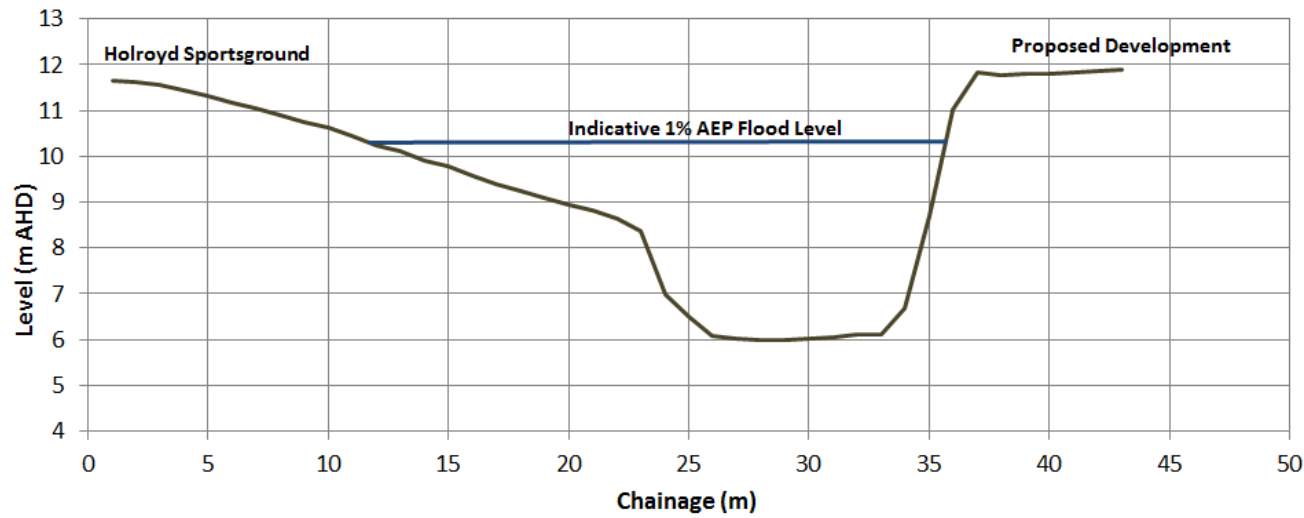


Figure 3-2 Typical Cross Section of A'Becketts Creek)



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