



*50/11-21 Underwood Road
Homebush Business Village
Homebush, NSW, 2140*

WWW.SDSENGINEERING.COM.AU

*SYMEC Group Pty. Ltd. T/As SDS Engineering
ABN 62 609 585 006*

FLOOD RISK MANAGEMENT REPORT

32 HALLORAN STREET TURVEY PARK, NSW, 2650

SATURDAY, 12 AUGUST 2023

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1.0 – INTRODUCTION

Archidrome commissioned SDS Engineering in the preparation of a Flood Risk Management Report pertaining to the proposed childcare centre development at 32 Halloran Street Turvey Park. The scope of works included, but was not limited to:

- Appraisal and review of flood modelling data prepared for the Probable Maximum Flood (PMF) and 1% AEP flood events by Wagga Wagga Council (received: 22/06/2023) [attached Appendix 'A']
- Appraisal and review of the architectural documentation prepared for the development by Archidrome (Dated: 11/07/2023)
- Assessment of the development with respect to flood-related development controls as prescribed by Wagga Wagga City Council
- Recommendations pertaining to built-form, flood planning levels and construction methods.

This report has been prepared as supporting documentation for a s8.2 review of the development application seeking approval for the works from Wagga Wagga City Council.



2.0 – SITE DESCRIPTION

The subject site, formally identified as 32 Halloran Street Turvey Park (Lot 29 in Section 'B' of DP 37333) is a rectangular shaped block, approximately 1017m² in area, situated on the western aspect of Turvey Street. The site shares its northern, western and southern boundaries with other residential allotments. Reference to detailed level survey plans prepared for the property by Wagga Surveyors (Ref.: 22193, Dated: 02/05/2022) indicates the site to dip to the northwest at an average grade of 1.0°. At the time of writing, the site contained a single storey brick and weatherboard dwelling with a tiled roof, an outbuilding, as well as a number of detached awnings.

A locality plan has been provided in figure '1' below:



Figure 1: Site Location - (Source: SIXMaps)

3.0 - PROPOSED DEVELOPMENT

Reference to architectural plans prepared by Archidrome highlight the proposed development to consist of the demolition of all structures on the site, as well as the construction of a two-storey childcare centre. Ancillary works on the site include construction of on-grade visitors and staff carparking in the front setback of the property, as well as erection of shade structures and landscaping associated with outdoor children's play areas. Acoustic fencing is to be provided to southern, western and northern perimeter of the development. The architectural plans current at the time of writing had undergone an iterative design process with feedback provided by this office pertaining to flood-related development controls.



4.0 – FLOOD LEVELS

The subject site is affected by local overland flows from catchments to the south-east of the property. The upstream catchment has been conservatively delineated and estimated at 61.87 hectares per figure '2' below. The rear of the property coincides with a naturally occurring gully in the context of the local catchment.



Figure 2: Delineate upstream catchment

Wagga Wagga City Council has provided detailed flood modelling results for the pre-development (existing) and post-development conditions for the Probable Maximum Flood (PMF) event. It is understood that Council has updated an existing TUFLOW model with the proposed development footprint. Council has assumed that the ground-floor level of the development is to be raised to the PMF flood level of 206.20m AHD. Notably, Council has also assumed that the outdoor play areas surrounding the building footprint are to be raised to a Reduced Level of 206.20m AHD, however, the design intent is to maintain natural ground levels to the surrounds of the site, and provide ramps for access from the raised internal floor level.

The 1% AEP flood depths and Water Surface Elevation for the *existing* condition as provided by Council has been provided in figure '3' below.





Figure 3: 1% AEP Flood Depth and WSE

Notably, flood depths for the 1% AEP flood event are generally limited and less than 150mm, and can therefore be classified as *sheet-flow*. The PMF flood levels and depths as provided by Council for the *existing* condition have been presented in Figure '4' below.

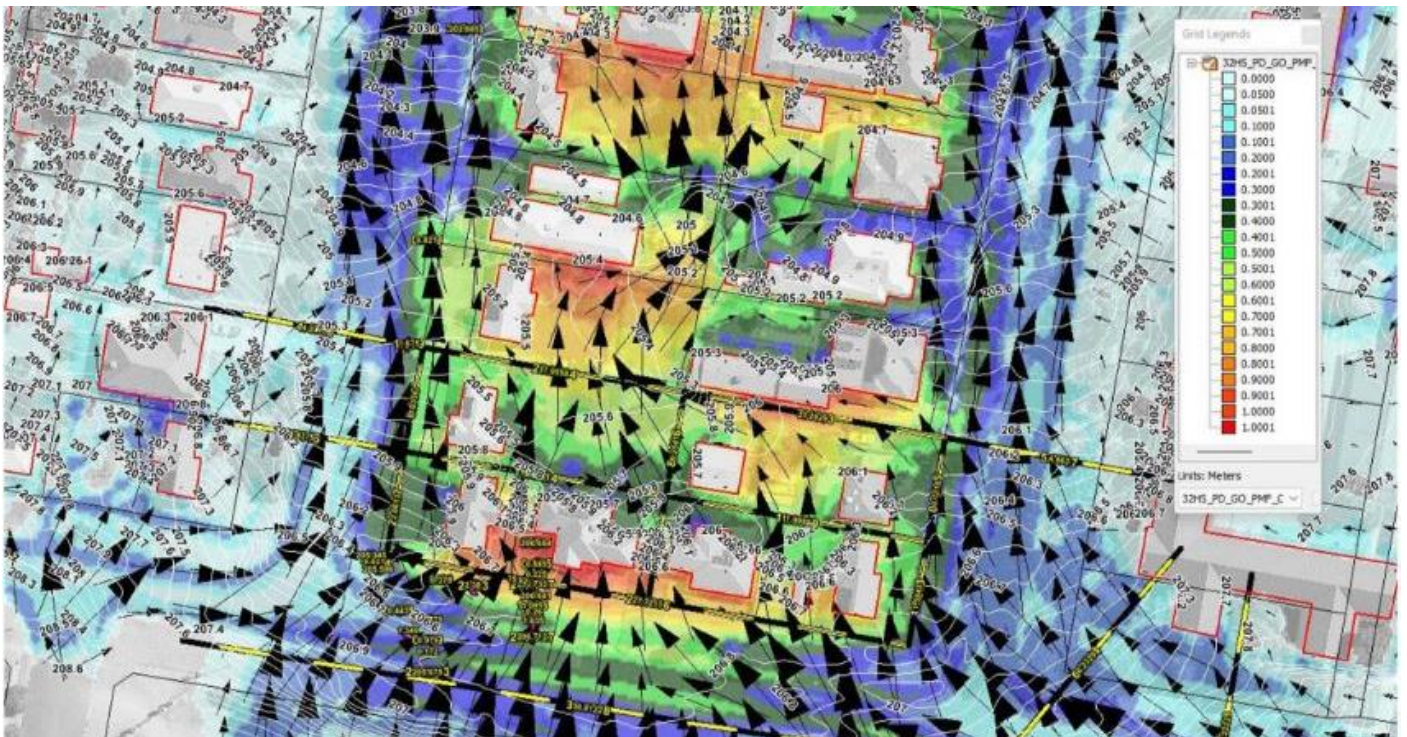


Figure 4: PMF Flood Depth and WSE



5.0 – FLOOD HAZARD

The Flood hazard category, as dictated by the New South Wales Floodplain Development Manual (2005) is a function of both flood depth and flow velocity. A plot showing the relationship between these two variables and various hazard categories is presented in Figure '5' below. This figure has been derived from the Australian Rainfall & Runoff – *A Guide to Flood Estimation (2019)*. For the 1% AEP flood event, flood depths are generally limited and less than 150mm, and whilst flood velocities have not been provided by Council, they presumably remain below 2m/s. As such, a **H1** hazard category applies to the site for storms up to and including the 1% AEP flood, which is generally considered safe for people, vehicles and buildings.

During the PMF event, flood depths are estimated at approximately 800mm throughout the property, and whilst velocities have only been provided as vector arrows by Council, they are estimated at 1.5-2.0m/s. As such, the flood hazard category during a PMF event is **H4**, which is generally considered unsafe for people and vehicles, however safe for purpose-built structures.

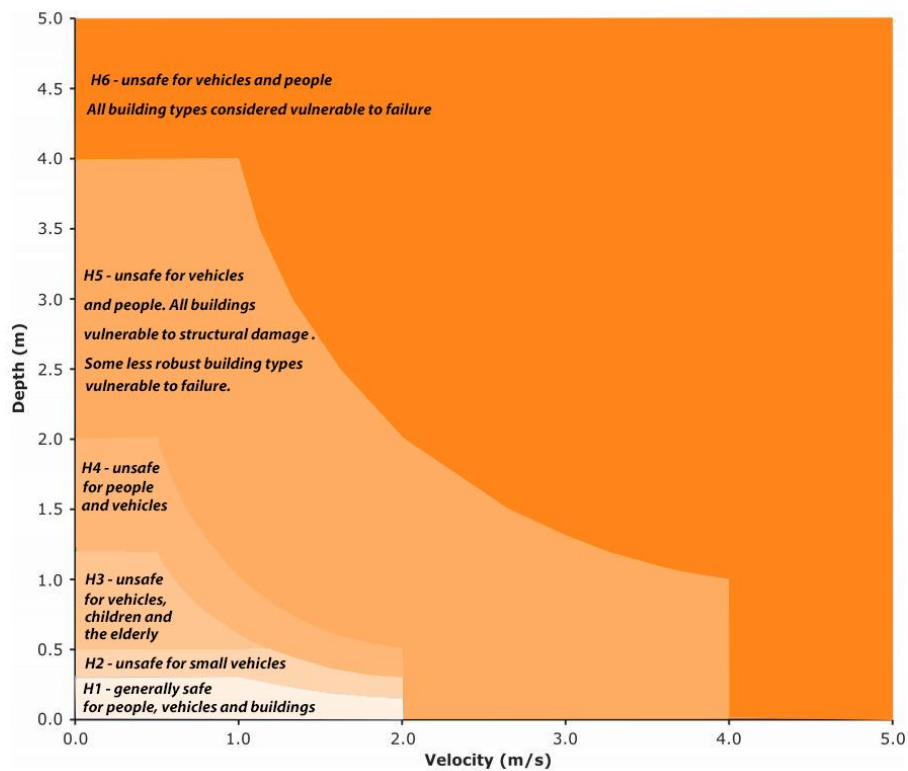


Figure 3: Flood Hazard Categories (AR&R 2019)



6.0 – DEVELOPMENT CONTROLS

The proposed *child care centre* development has been assessed with respect to Wagga Wagga City Council’s Development Control Plan (2010) – Section ‘4’ – *Environmental Hazards and Management*.

The proposed childcare centre is classified as a *Critical Utilities* per CI 4.2 ‘C2’ of the DCP. Given the site is affected by local overland flows, the development has been assessed with respect to the requirements for *Utilities* per Table 4.2.2 – *Requirements for development in Central Business Area (Not protected by levee)*.

Table 1: Development Controls

Development Control	Proposed
Floor Levels	<ol style="list-style-type: none"> 1) The ground-floor habitable floor level of the development has been set at 206.20m AHD which is at the upstream (southern) PMF flood level. No inundation of the development is anticipated for storms up to and including the PMF. The ground floor level also maintains approximately 510mm freeboard to the upstream 1% AEP flood level of 205.69m AHD. 2) A <i>shelter-in-place</i> approach has been adopted with respect to evacuation and hazard management for the proposed development. Further detail is provided below.
Structural Soundness	<ol style="list-style-type: none"> 1) A condition shall be placed on the development, that if approved, a suitably qualified structural engineer shall certify the proposed childcare structure as able to withstand all forces associated with flooding, including, but not limited to, hydrostatic, hydrodynamic, buoyancy, scour and debris impact for all flood events up to the PMF level of 206.20m AHD. All materials used in construction shall be flood-compatible materials up to this level as specified in s7.0 of this report. 2) All fencing, including acoustic fencing, adjacent the northern, southern and western boundaries of the site shall maintain a minimum 20mm gap from the underside of fence to the natural ground level to allow adequate equalisation of flood waters.
Flood Affection	<ol style="list-style-type: none"> 1) Overland flows for the 1% AEP event generally enter the property from the south, and flow north. Flows are more severe towards the western extremity of the site, which coincides approximately with a naturally occurring gully in the local catchment. Concurrently, flood depths for the 1% AEP flood event are generally categorised as sheet flow and less than 150mm in depth. <p>The proposed building structure features a southern setback of approximately 5.92m. The outdoor play areas in the southern setback will effectively maintain existing natural ground levels. There is ample clearance to the southern boundary to allow any backwater effects associated with the proposed structure on flood flows, to be limited and contained wholly within the site boundaries. Similarly, the western (rear) setback of the building structure is approximately 9.8m, and natural ground levels will be maintained in the outdoor play area. These are the areas where flooding is most severe, and the flowpath to the rear of the property, is effectively free of obstructions.</p> <p>As such, no impacts to the flow regime or adverse changes to flood afflux are anticipated as a result of the proposed development.</p>



Development Control	Proposed
Evacuation	<p>1) The ground-floor habitable floor level is set at the PMF flood level of 206.20m AHD. Concurrently, the property is affected by overland flooding, with limited upstream catchment areas. The time to concentration for the catchment is estimated to be 25 minutes, and as such, flooding affecting the property can be categorised as flash flooding. Flood waters are anticipated to rise and recind very quickly. As such, sheltering in place, on the ground-floor of the childcare, will provide protection of occupants for all storms up to and including the PMF event.</p> <p>Children and staff are not anticipated to be in the outdoor play areas during inclement weather or rain. As such, consideration has not been given to freeboard requirements for outdoor play areas. Furthermore, flood hazards for storms up to the 1% AEP event are generally categorised as H1 which is considered safe for people. If inclement weather is forecast for storms larger than 1% AEP up to the PMF, it is anticipated that all staff and children will be inside the building.</p> <p>2) The existing ground-floor levels of the dwelling on the site is 206.23m AHD, which remains above the PMF level. The existing ground-floor level of the outbuilding is at 205.58m AHD, which remains significantly below the Flood Planning Level and the PMF. Given the age of the structures, it is unlikely these buildings have been designed to withstand the forces of floodwaters. As such, the childcare development serves to improve emergency flood management for the property, by providing a purpose designed and built structure providing a <i>shelter-in-place</i> evacuation strategy to occupants for all storms up to the PMF.</p> <p>3) A shelter-in-place approach has been adopted for the childcare centre, and evacuation from the premises is not required for storms up to and including the PMF. The duration of occupants sheltering in place is anticipated to be limited, as flooding affecting the property can be categorised as flash flooding, where flood waters will rise and recind in generally less than two hours.</p>
Management and Design	<p>1) Given the proposed ground floor level remains above the PMF level, all goods stored within the premises will comply with this requirements. No dangerous goods are to be stored in the external storage provided in the southern setback of the development.</p> <p>2) All parts of the building below the PMF level of 206.20m AHD shall be constructed of flood compatible materials per the requirements outlined in section 7.0 of this report.</p> <p>3) The depth of flooding for storms up to the 1% AEP flood event in the front setback of the property which is the primarily vehicular access is limited to 180mm in the north-eastern corner. Vehicular access for egress of evacuation is not anticipated for storms larger than the 1% AEP up to the PMF as a <i>shelter-in-place</i> approach has been adopted.</p>



7.0 – BUILDING COMPONENTS AND METHOD

All structures of the proposed childcare development are to be constructed of flood compatible building components below the specified **PMF level of 206.20m AHD.** .

7.1 – ELECTRICAL & MECHANICAL EQUIPMENT

Main power supply subject to the approval of the relevant authority the incoming main commercial power service equipment, including all metering equipment, shall be located above the relevant flood level. Means shall be available to easily disconnect the dwelling from the main power supply.

All wiring, power outlets, switches, etc., should, to the maximum extent possible, be located above the relevant flood level. All electrical wiring installed below the relevant flood level should be suitable for continuous submergence in water and should contain no fibrous components. Earth core leakage systems (or safety switches) are to be installed. Only submersible-type splices should be used below the relevant flood level. All conduits located below the relevant designated flood level should be so installed that they will be self-draining if subjected to flooding.

All equipment installed below or partially below the relevant flood level should be capable of disconnection by a single plug and socket assembly. Should any electrical device and/or part of the wiring be flooded it should be thoroughly cleaned or replaced and checked by an approved electrical contractor before reconnection.

7.2 – HEATING & AIR-CONDITIONING SYSTEMS

Heating and air conditioning systems should, to the maximum extent possible, be installed in areas and spaces of the house above the relevant flood level. When this is not feasible every precaution should be taken to minimise, the damage caused by submersion according to the following guidelines.

Heating systems using gas or oil as a fuel should have a manually operated valve located in the fuel supply line to enable fuel cut-off. The heating equipment and fuel storage tanks should be mounted on and securely anchored to a foundation pad of sufficient mass to overcome buoyancy and prevent movement that could damage the fuel supply line. All storage tanks should be vented to an elevation of 600 millimetres above the relevant flood level.

All ductwork located below the relevant flood level should be provided with openings for drainage and cleaning. Self-draining may be achieved by constructing the ductwork on a suitable grade. Where ductwork must pass through a water-tight wall or floor below the relevant flood level, the ductwork should be protected by a closure assembly operated from above relevant flood level.



7.3 – FLOOD COMPATIBLE MATERIALS

Table 2: Flood compatible building components and materials

Building Component	Flood Compatible Material
Flooring & Subfloor Structure	<ul style="list-style-type: none"> — Monolithic slab on grade construction — Suspended reinforced concrete slab
Floor Covering	<ul style="list-style-type: none"> — Clay tiles — Concrete, precast or in-situ — Concrete tiles — Epoxy, formed in place — Mastic flooring, formed in place — Rubber sheets or riles with chemical set adhesives — Silicone floors formed in-place — Vinyl sheets or tiles with chemical set adhesives — Ceramic tiles, fixed with mortar or chemical set adhesives — Asphalt tiles, fixed with water resistant adhesive.
Wall Structure	<ul style="list-style-type: none"> — Solid brickwork, blockwork, reinforced concrete or mass concrete.
Roofing structure (for situations where the relevant flood level is above the ceiling)	<ul style="list-style-type: none"> — Reinforced concrete construction — Galvanised metal construction
Doors	<ul style="list-style-type: none"> — Solid panel with waterproof adhesive — Flush door with marine ply filled with closed cell foam — Painted metal construction — Aluminium or galvanised steel frame.
Wall & Ceiling lining	<ul style="list-style-type: none"> — Fibro-cement board — Brick, face or glazed — Clay tile glazed in waterproof mortar — Concrete — Concrete block — Steel with waterproof applications — Stone, natural solid or veneer with waterproof grout — Glass blocks — Glass — Plastic sheeting or wall with waterproof adhesives.
Insulation Windows	<ul style="list-style-type: none"> — Foam (closed cell type) — Aluminium frame with stainless steel rollers or similar corrosion and water-resistant materials.
Nails, Bolts, Hinges & Fittings	<ul style="list-style-type: none"> — Brass, nylon or stainless steel — Removable pin hinges — Hot dipped galvanised steel wire nails or similar.



8.0 – CONCLUSIONS & RECOMMENDATIONS

This report has considered the impacts of flooding with respect to the proposed childcare development at 32 Halloran Street Turvey Park. Considerations include flood related development controls specified by Wagga Wagga City Council, as well as potential impacts to surrounding properties.

Consideration has been given to finished floor levels, built form and materials and flood hazards. Construction must be undertaken in strict accordance with the recommendations made herein for compliance with relevant flood planning controls.

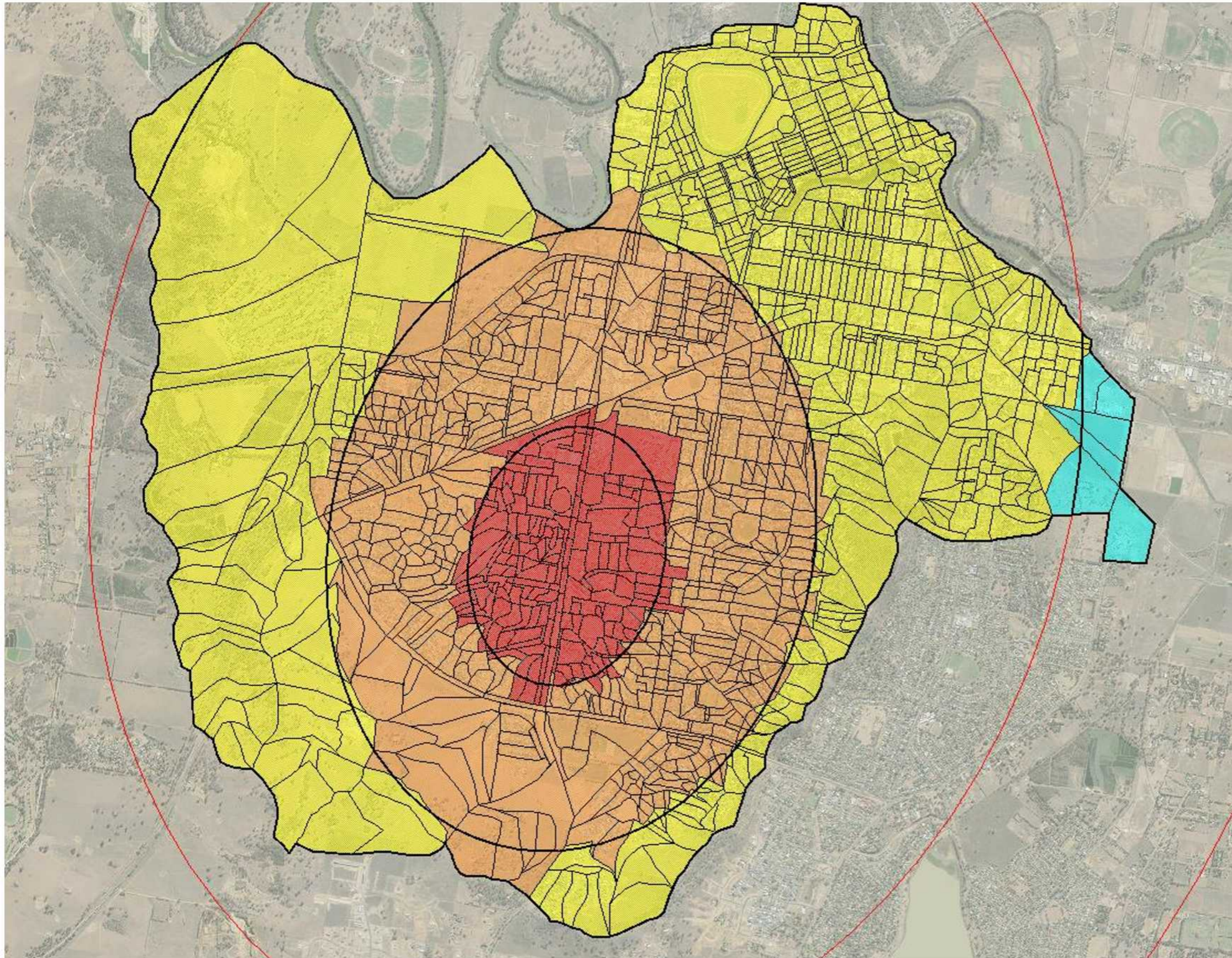


APPENDIX 'A' - FLOOD INFORMATION

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ADOPTED PMP ELIPSES



PMF TUFLOW MODEL RESULTS – PRE-DEVELOPMENT CONDITIONS
[Colour legend refers to depth of inundation in metres]

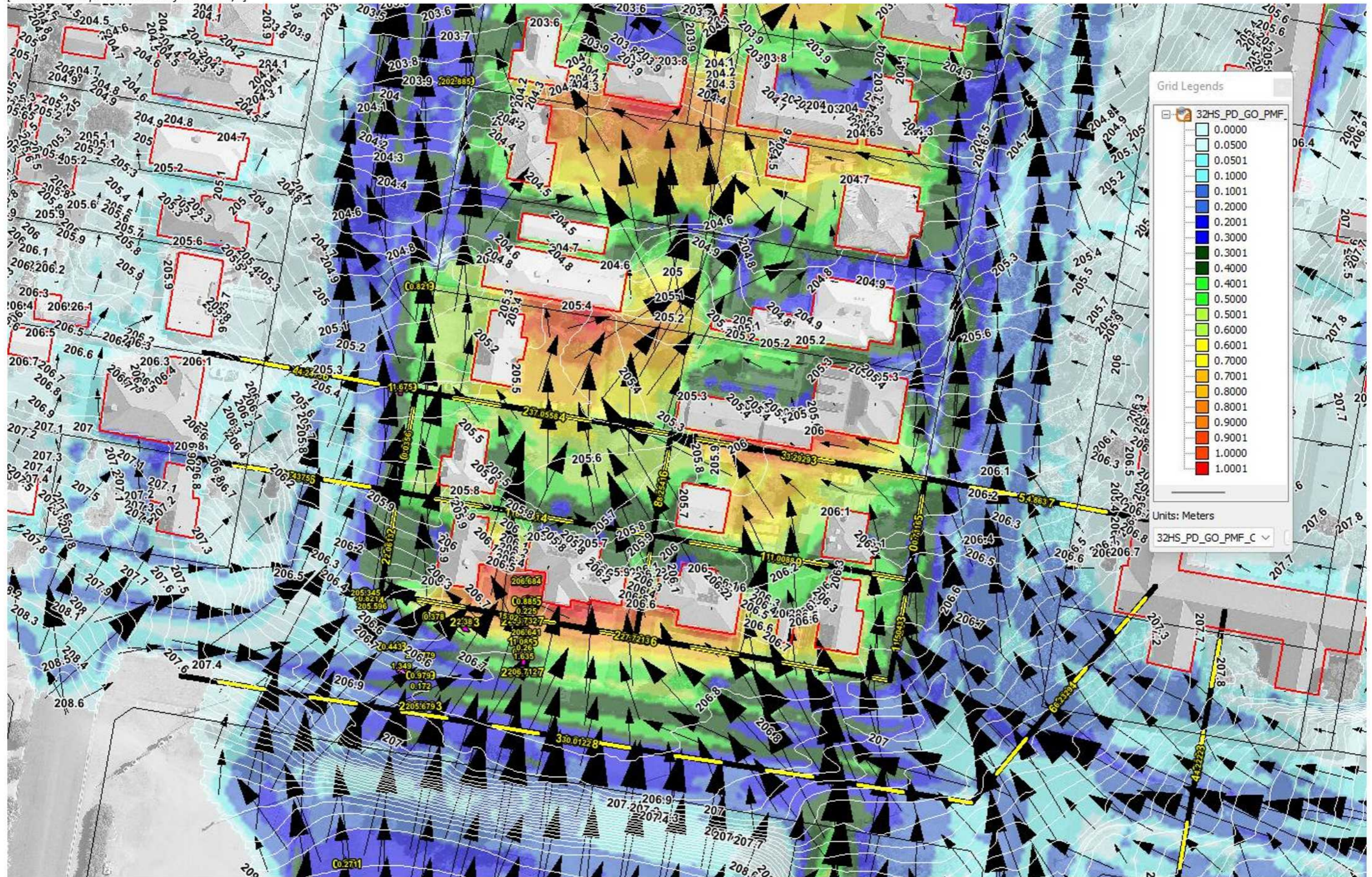


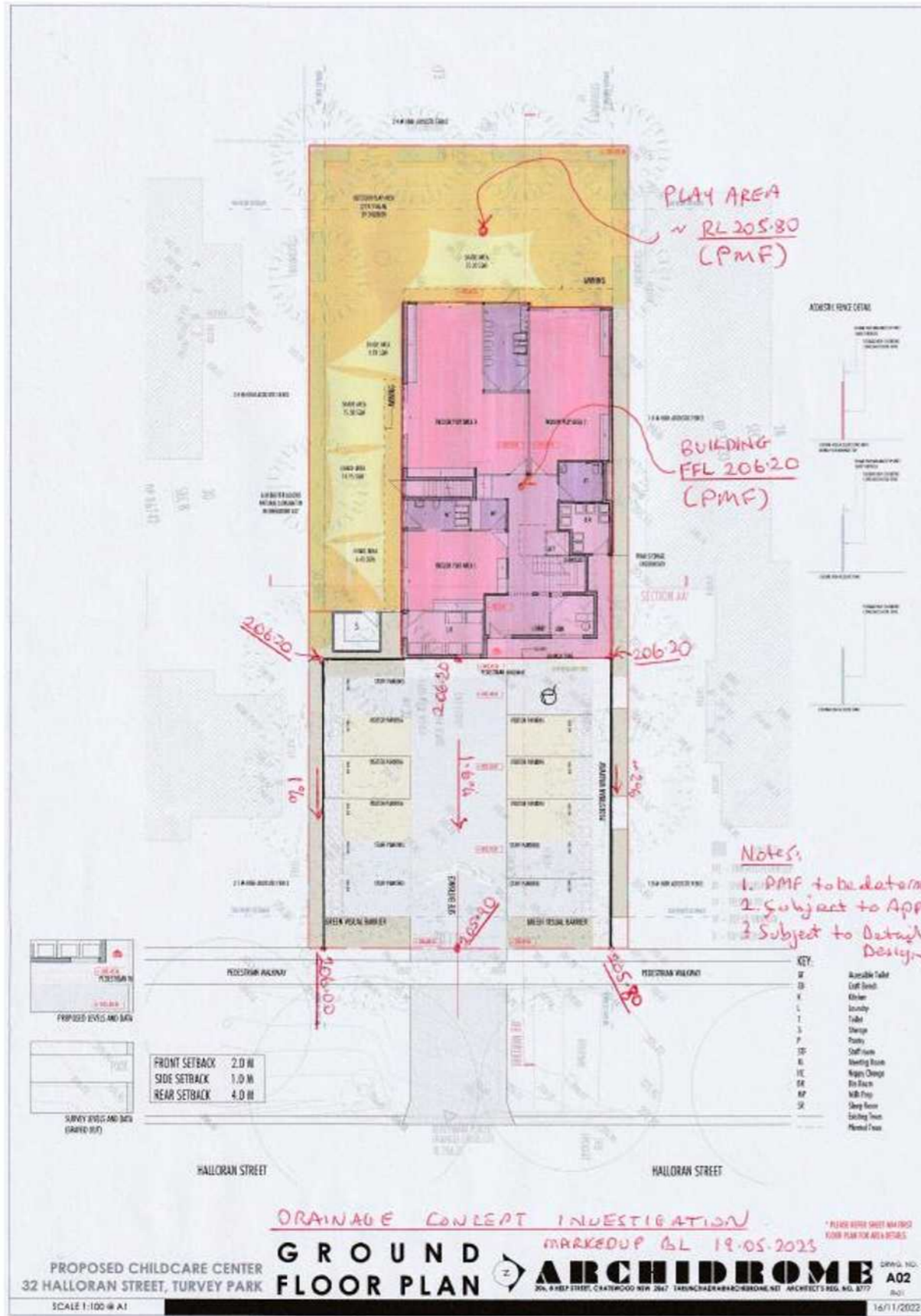
PMF TUFLOW MODEL RESULTS – PRE-DEVELOPMENT CONDITIONS

[Colour legend refers to depth of inundation in metres]

[Black and white text is water surface elevation contours in m AHD]

[Yellow text is peak overland flow in m³/s]



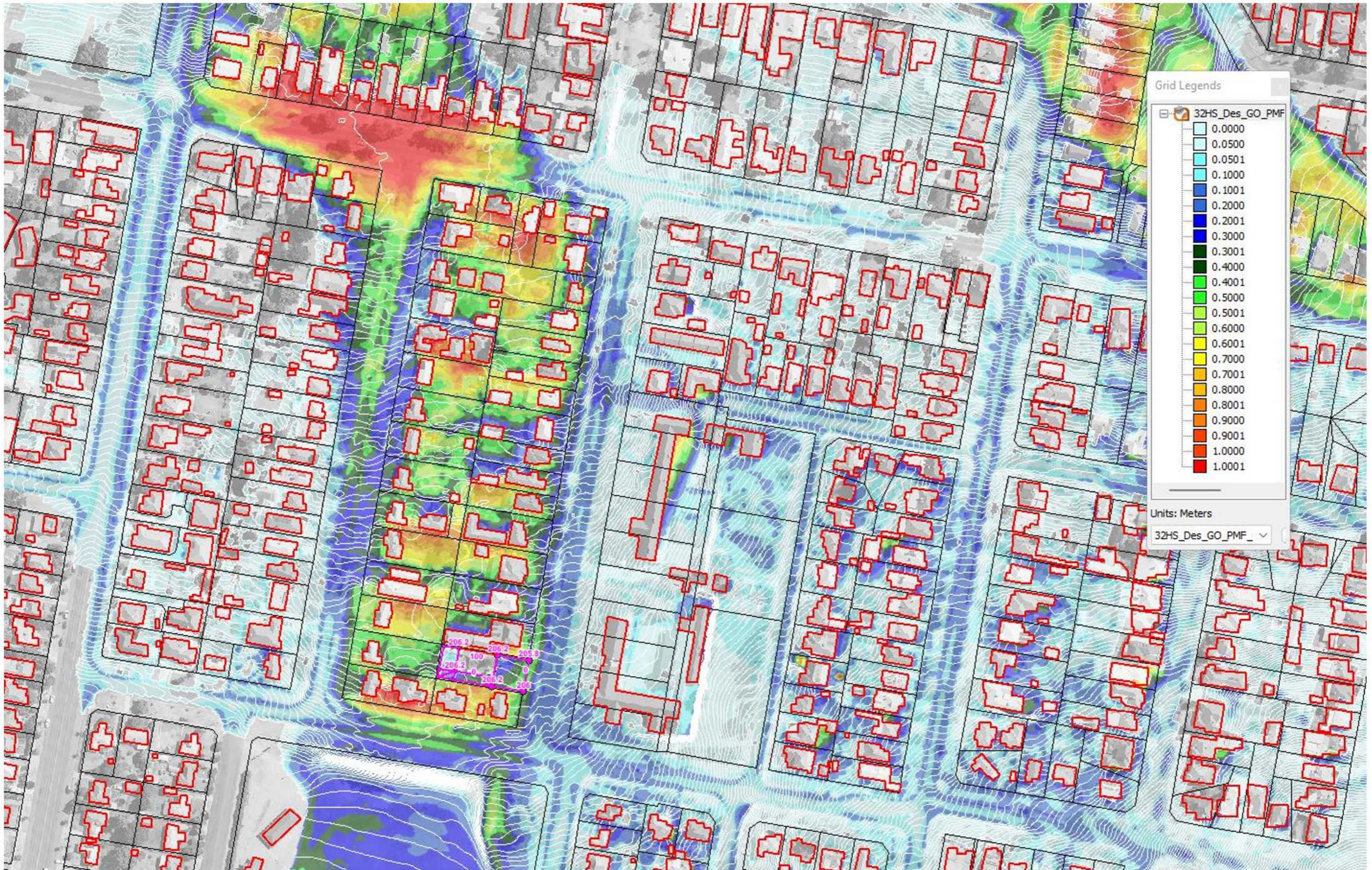


NOTE: PMF LEVELS SHOWN ON SKETCH HAVE BEEN SUPERSEDED BY CURRENT INVESTIGATION - REFER UPDATED PEAK PMF LEVELS OVER.

Play area has been lowered to a maximum elevation of RL 206.2 m AHD around perimeter of building, grading at 1% toward property boundary.

A 1m offset has been provided around the southern, western and northern boundaries of the allotment where natural surface levels have been adopted.

PMF TUFLOW MODEL RESULTS – POST-DEVELOPMENT CONDITIONS
[Colour legend refers to depth of inundation in metres]

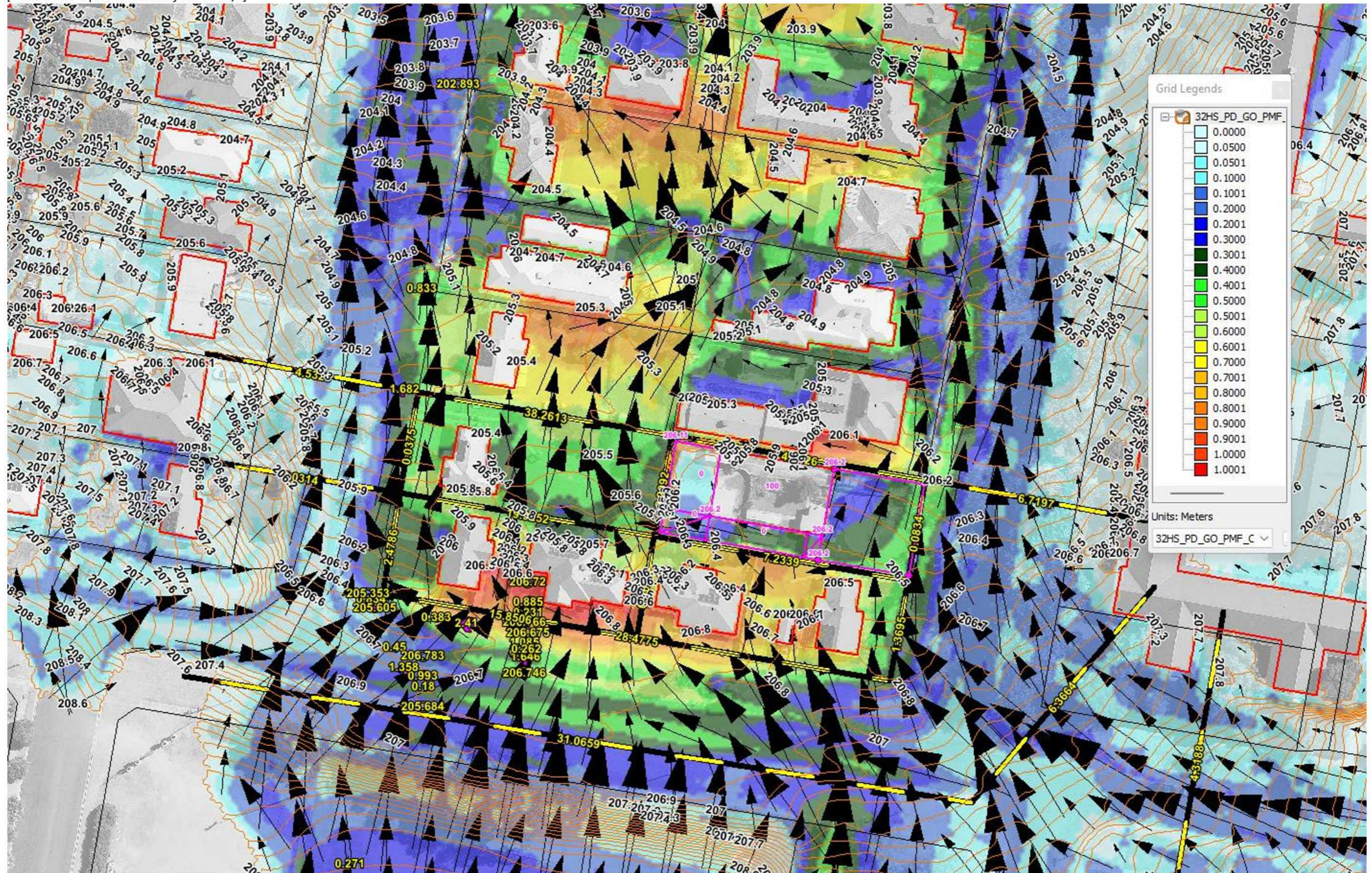


PMF TUFLOW MODEL RESULTS – POST-DEVELOPMENT CONDITIONS

[Colour legend refers to depth of inundation in metres]

[Black and white text is water surface elevation contours in m AHD]

[Yellow text is peak overland flow in m³/s]



IMPACT OF PROPOSED DEVELOPMENT ON FLOOD BEHAVIOUR – PMF

[Colour legend refers to change in peak flood level attributable to the proposed development (referred to as afflux) in metres]

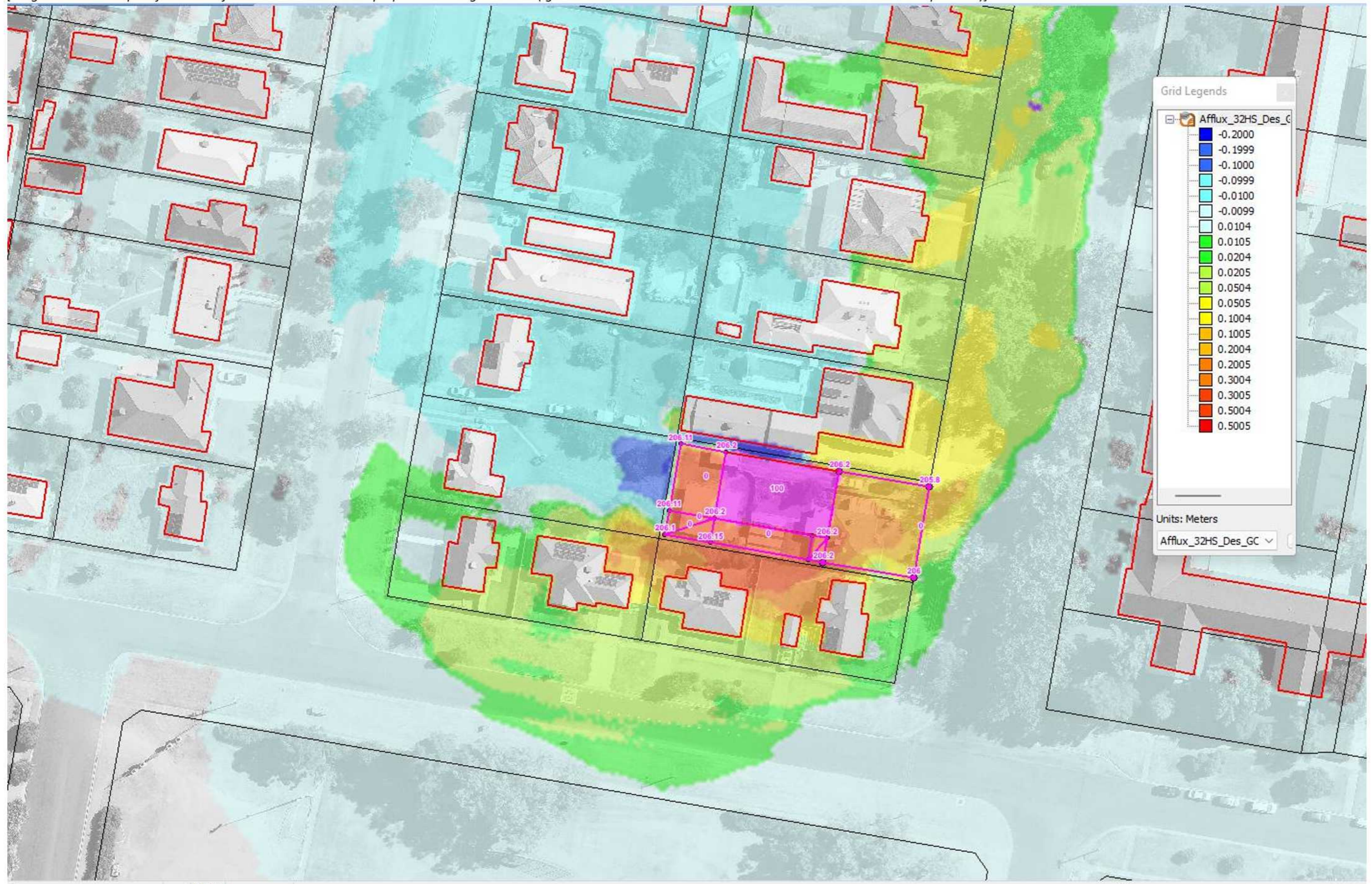
[Magenta text is adopted finished surface levels external to the proposed building in m AHD (ignore '0's and '100' as these relate to additional TUFLOW model input data)]



IMPACT OF PROPOSED DEVELOPMENT ON FLOOD BEHAVIOUR – PMF

[Colour legend refers to change in peak flood level attributable to the proposed development (referred to as afflux) in metres]

[Magenta text is adopted finished surface levels external to the proposed building in m AHD (ignore '0's and '100' as these relate to additional TUFLOW model input data)]



PEAK PMF FLOOD LEVELS BORDERING PROPOSED DEVELOPMENT
[Black and white text is water surface elevation contours in m AHD]
[Blue text is peak flood level in m AHD]

