Flood Assessment

Yeronga Priority Development Area – Parkside Yeronga

Stantec c-/ Economic Development Queensland

06 September 2022

WATER TECHNOLOGY
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Client	Stantec c-/ Economic Development Queensland
Client Project Manager	John Marshall (EDQ), Anthony Raadschelders (Stantec)
Water Technology Project Manager	James Weidmann
Water Technology Project Director	Alister Daly
Authors	James Weidmann / Alister Daly
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RPEQ 7118

Limitations:
Certification is provided for this hydraulic assessment as it pertains to the design at the time of writing. The final detailed civil arrangements will be subject to additional and final hydraulic assessment in due course.

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Level 5, 43 Peel Street
South Brisbane QLD 4101
Telephone (07) 3105 1460
Fax (07) 3846 5144
ACN 093 377 283
ABN 60 093 377 283

Quality ISO 9001 SAI GLOBAL
Environment ISO 14001 SAI GLOBAL
Health & Safety AS 4801 SAI GLOBAL

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1 INTRODUCTION AND BACKGROUND

1.1 Introduction

Water Technology Pty Ltd (WT) has been commissioned by Stantec on behalf of Economic Development Queensland (EDQ) to undertake a detailed flood impact assessment for a proposed development located at 70 Park Road, Yeronga (the Site). The development, known as Parkside Yeronga, involves a subdivision of land historically occupied by the Yeronga TAFE facility. The Site locality and pre-demolition site condition is shown in Figure 1-1. The site is approximately 3.1 ha in total area and is located within the Brisbane City Council (BCC) Local Government Area (LGA). The Site is affected by backwater flooding from the Brisbane River and overland flow from external catchments to the south and east of the site. The hydraulic modelling undertaken for this study assesses the overland flow flooding impacts of the proposed development.

This report addresses relevant flooding and stormwater issues raised in the Further Issues information request from the State Department, Infrastructure, Local Government and Planning (SDILGP), dated 28th October 2021 (ref: DEV2021/1221). The information request additionally contains items raised by the Department of Transport and Main Roads (TMR) primarily relating to the railway located downstream of the site. This report has been prepared to address all outstanding flooding items contained in the information request. The assessment undertaken is also intended to demonstrate that the proposed development is consistent with the Preliminary Approval for Material Change of Use and Development Approval for the Reconfiguration of Lots conditions received 3 May 2022.

FIGURE 1-1 SITE LOCATION (AERIAL IMAGE PRE-DEMOLITION)

1.2 Proposed Development

Figure 1-2 below shows the proposed development layout plan provided by Wolter Consulting Group. We note that this layout has since been revised, however, this does not fundamentally affect the outcomes of this hydraulic assessment. The development layout and associated civil drawings provided by Stantec are included in Appendix A. We understand that the approved development includes the following:

- Reconfiguration of the lot (1 into 11 lots, easement and road);
- Road and drainage improvement works in Villa Street; and
- Construction of ultimate drainage works on Villa Street and diversion trunk pipe and overland flow swale on the Site's eastern boundary.

Hydraulic assessment undertaken and documented in this report is consistent with the ultimate and interim design case with drainage swale on Lot 10.

We understand that demolition of the Yeronga TAFE buildings and facilities on the site occurred in early 2019. Our assessment is based on assessing impacts of the proposed development compared to pre-demolition conditions. This is discussed in further detail herein.

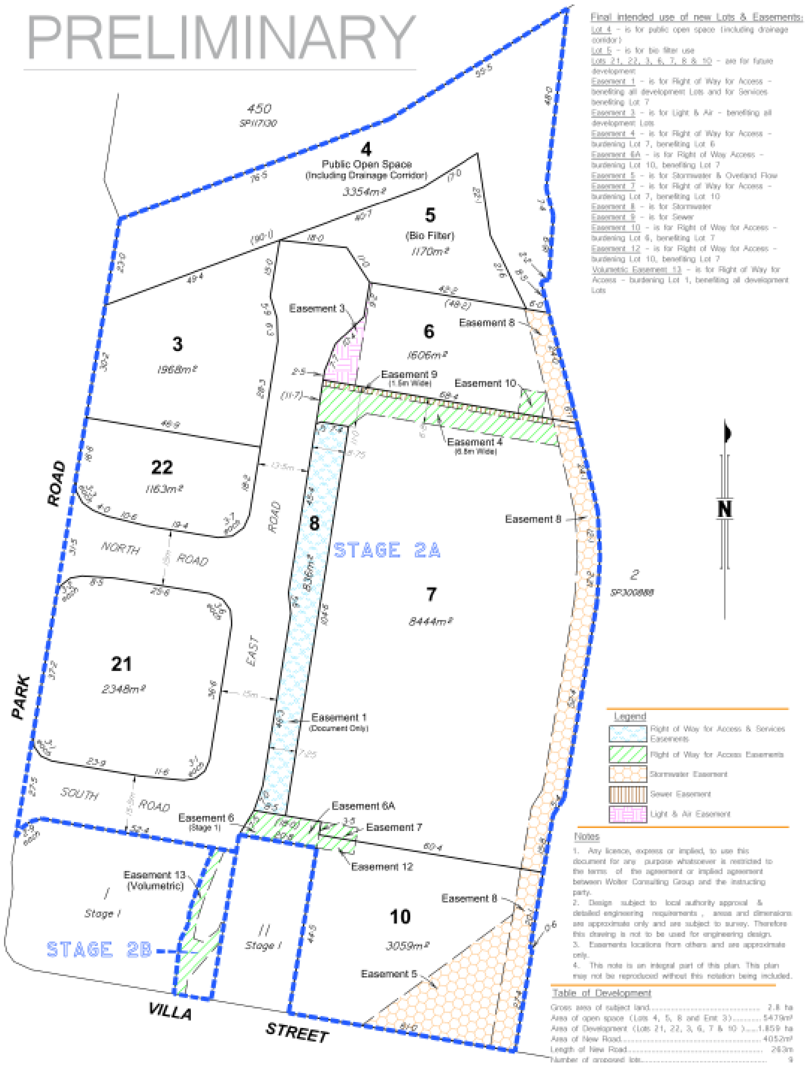

FIGURE 1-2 PROPOSED DEVELOPMENT LAYOUT PLAN (SOURCE: WOLTER CONSULTING GROUP, 2022)

1.3 Scope of Report and Overview of Approach

This report has been prepared for the purpose of addressing flooding impact matters raised by TMR and EDQ in respect to the development and proposed works on Villa Street, and to support the development application for the site. This report does not specifically address BCC's overland flow code as these provisions do not apply in respect to a State Government development and there is no requirement to obtain a DA via BCC, however, the assessments undertaken have had regard for the BCC code provisions where relevant.

The assessment undertaken is also intended to demonstrate that the proposed development is consistent with the Preliminary Approval for Material Change of Use conditions received 3 May 2022.

The scope of this report specifically includes consideration of flooding impacts of the development and drainage works. Issues relating to regional flooding from the Brisbane River and other stormwater quality management issues have been addressed separately by Stantec.

Detailed hydrologic and hydraulic modelling has been undertaken to demonstrate that the proposed development can be fundamentally supported. The following sections of this report outline in further detail the methodologies, details and results of the technical assessments completed.

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2 SITE DESCRIPTION

2.1 Topography and Drainage

The Site was historically occupied by the Yeronga TAFE until all buildings were demolished in early 2019. The flood assessment has been based on the pre-demolition conditions which are represented in the publicly available 2014 LiDAR. Figure 2-1 illustrates the Site topography based on available 2014 LiDAR topographic survey and includes the BCC stormwater networks layers.

The Site grades from the southern boundary towards the northern boundary at an average slope of approximately 6%. Elevations at the Site range from approximately 20 mAHD in the south of the Site to 6 mAHD in the north.

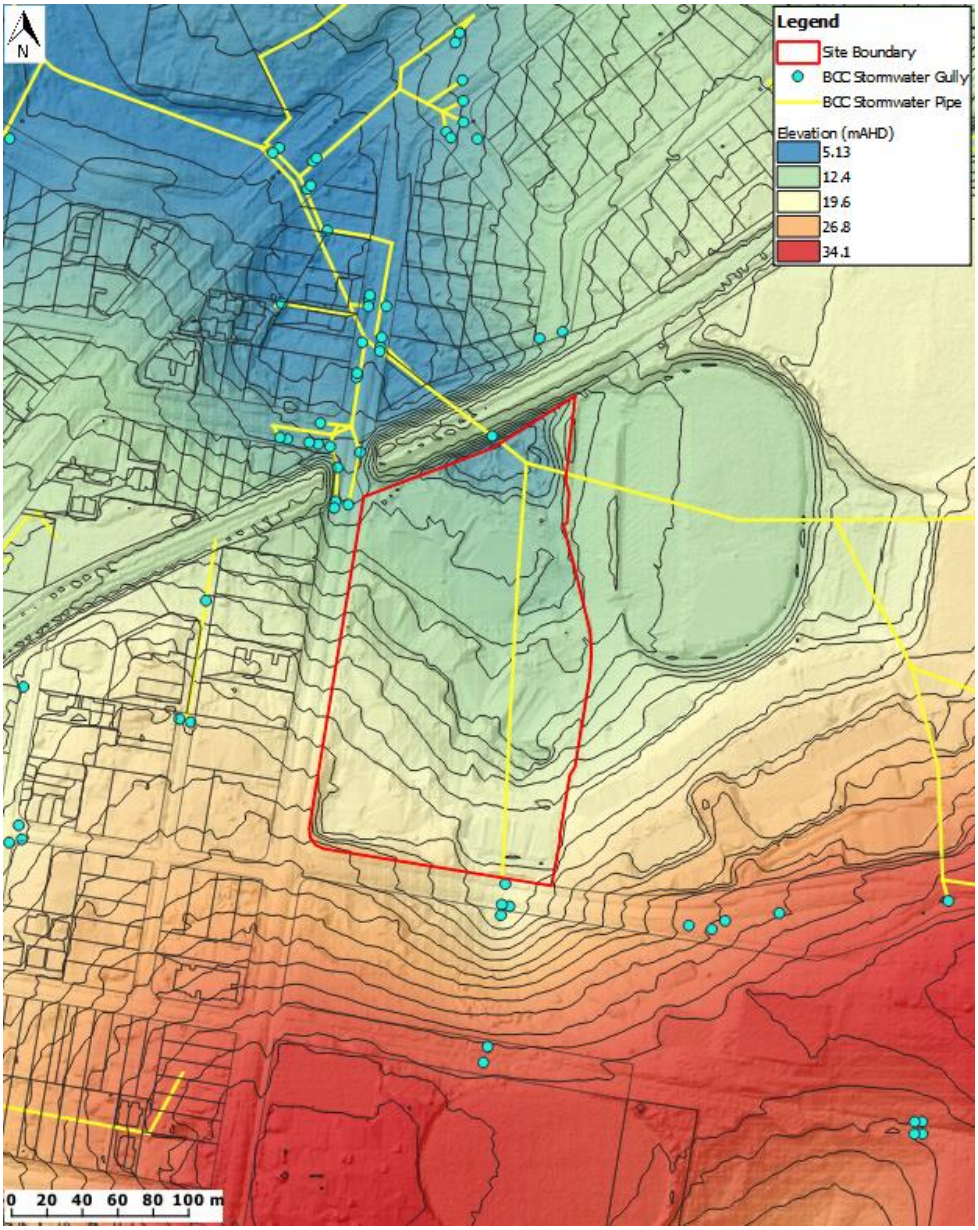

FIGURE 2-1 PRE DEMOLITION SITE TOPOGRAPHY – BASED ON 1M LIDAR 2014

2.2 Available Data

The following data has been sourced and used to inform the current assessment:

- LiDAR and associated contour data captured in 2014 for BCC LGA. Note that this dataset is suitable for the assessment given that the base case scenario considered the site prior to demolition occurring in early 2019;
- Council stormwater pipe and pit network data, obtained via BCC online data portal;
- Proposed development layout supplied by Wolter Consulting Group (refer to Appendix A);
- DRAINS model provided by Stantec;
- Pre-demolition survey undertaken by RPS (provided in Appendix B);
- Post-demolition survey undertaken by Wolter Consulting Group;
- Civil design surface and stormwater design plans provided by Stantec;
- Site photos provided by Stantec;
- Rainfall data from the Bureau of Meteorology (BoM); and
- Aerial imagery obtained from Google Earth and MetroMap.

3 HYDROLOGIC MODELLING

3.1 Overview

To assess stormwater characteristics at the Site, hydrologic models have been established for the catchment using the Watershed Network Bounded Model (WBNM) software. Resulting flows were incorporated into the hydraulic model discussed in the following section. This assessment has been undertaken in accordance with ARR19 methodology using the Storm Injector software.

In the absence of stream gauges, the hydrologic models were validated to the Rational Method, in accordance with Section 4.3 of the IPWEA Queensland Urban Drainage Manual (QUDM) Fourth Edition (2017). Additional comparisons were made with the DRAINS model supplied by Stantec. The following sections of this report provide further details with respect to the stormwater modelling methodology.

3.2 Base Case Model

3.2.1 Sub-Catchment Breakdown

Sub-catchments have been delineated based on the LiDAR topography and available pipe network data. The WBNM model catchment layout is shown in Figure 3-1 below. Note that a diversion has been included in the model to represent minor flows captured in the stormwater system on Villa St (flowing north) with excess flows routed west down to the sag on Villa St. Sub-catchment details for the WBNM model and included in Appendix C.

The model layout includes the site, upstream catchments to the west, east and south, and extends downstream of the site a sufficient distance to fully include downstream areas that are included in the hydraulic model.

3.2.2 Rainfall and Losses

Rainfall intensity data has been obtained online from the Australian Bureau of Meteorology's 2016 Design Intensity Frequency and Duration (IFD) Rainfall System via the Storm Injector software. Median preburst depths have been applied and initial and continuing losses have been applied from the pre-bursts. Rainfall losses adopted have included a 5mm initial loss and 1mm/hr continuing loss which is consistent with the DRAINS model and have also been subject to validation using the Rational Method. Digital models including Storm Injector files will be provided separately to this report.

Hydrology for the 1%, 2%, 5%, 10%, 20%, 50% and 63.2% AEP events was analysed for this assessment and represents an appropriate range of flow conditions for assessment the impacts of the proposed development.

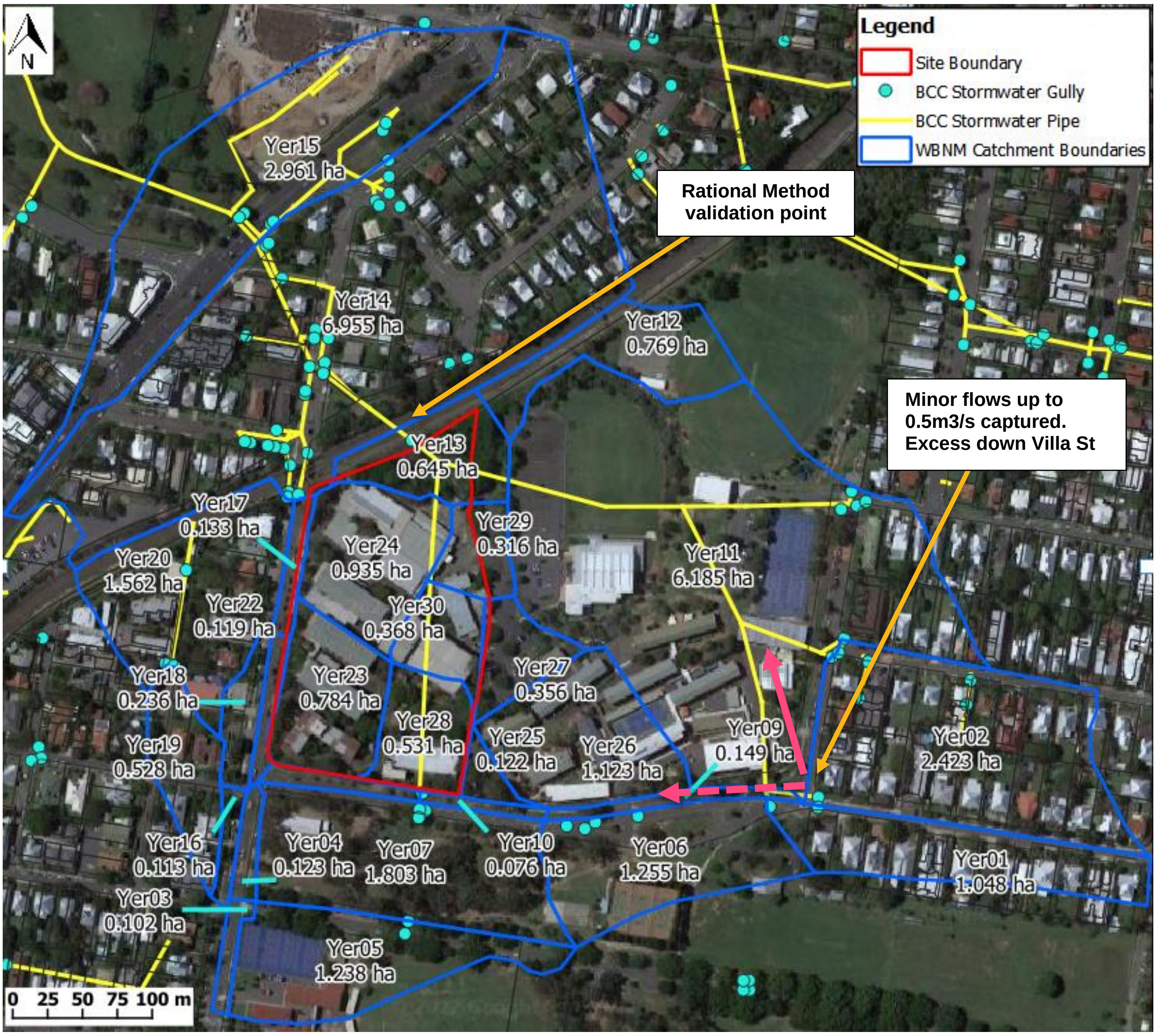

FIGURE 3-1 SUB-CATCHMENT LAYOUT – BASE CASE

3.2.3 Base Case Model Validation

The WBNM model was validated against the Rational Method for the base case catchment conditions and in the absence of available stream gauges. The time of concentration was calculated using an assumed average flow velocity and including an additional 5-min for standard inlet time. Table 3-1 summarises the Rational Method parameters used. Figure 3-1 shows the Rational Method validation location, with Table 3-2 summarising the Rational Method results. The hydrology model flows show good correlation with the Rational Method and are slightly higher than the Rational Method. The flow comparisons show that the WBNM model can be suitably adopted for all hydrological modelling prepared as part of this assessment.

Additional spot checks and comparisons were made with the DRAINS model provided by Stantec. The spot checks of peak flow at various locations (discharges to Villa St and in pipes discharging to the downstream area of the site) were comparable to the WBNM model results.

An impervious percentage of 90% has been assumed for the pre-demolition TAFE site.

TABLE 3-1 VALIDATION LOCATION RATIONAL METHOD PARAMETERS – BASE CASE

Parameter	Input	Reference
Catchment area (ha)	20.5	Sub-catchment area
Discharge coefficient C_{10}	0.82	QUDM 2016 Table 4.5.4
Time of concentration (min)	23	Calculated using flow path length, assumed average velocity and adding 5min standard inlet time

TABLE 3-2 WBNM RATIONAL METHOD VALIDATION RESULTS – BASE CASE

AEP Event	WBNM Peak Flow (m^3/s)	Rational Method Peak Flow (m^3/s)	Difference (%)
1%	10.0	9.6	+5
2%	8.9	8.3	+8
5%	7.4	6.5	+15
10%	6.3	5.4	+18
50%	3.2	2.7	+16

3.3 Post-Development Case Model

The base case model was used as the basis for the post-development model, with minor catchment modifications to represent the post-development internal catchments and overland flow drain. Figure 3-2 below shows the modified catchment boundaries for the Site. The update ensured that the hydrology for the Site and overland flow drain were represented as accurately as possible and that inflows for the hydraulic model were appropriately defined.

Note that the impervious percentage of 90% for the pre-demolition TAFE site has been assumed for the post-development case. This is consistent with the proposed layout of development. Given the proposed land use and impervious percentage of the proposed development is not intensified or increased, the hydrology of the site will not be fundamentally affected, and provision of on-site detention is not required.

Note that catchment "Yer21" major storm will be discharged to the drain on the eastern boundary. For the purpose of the assessment, we have included the total flow from "Yer21" in the drain which traverses along the eastern site boundary.

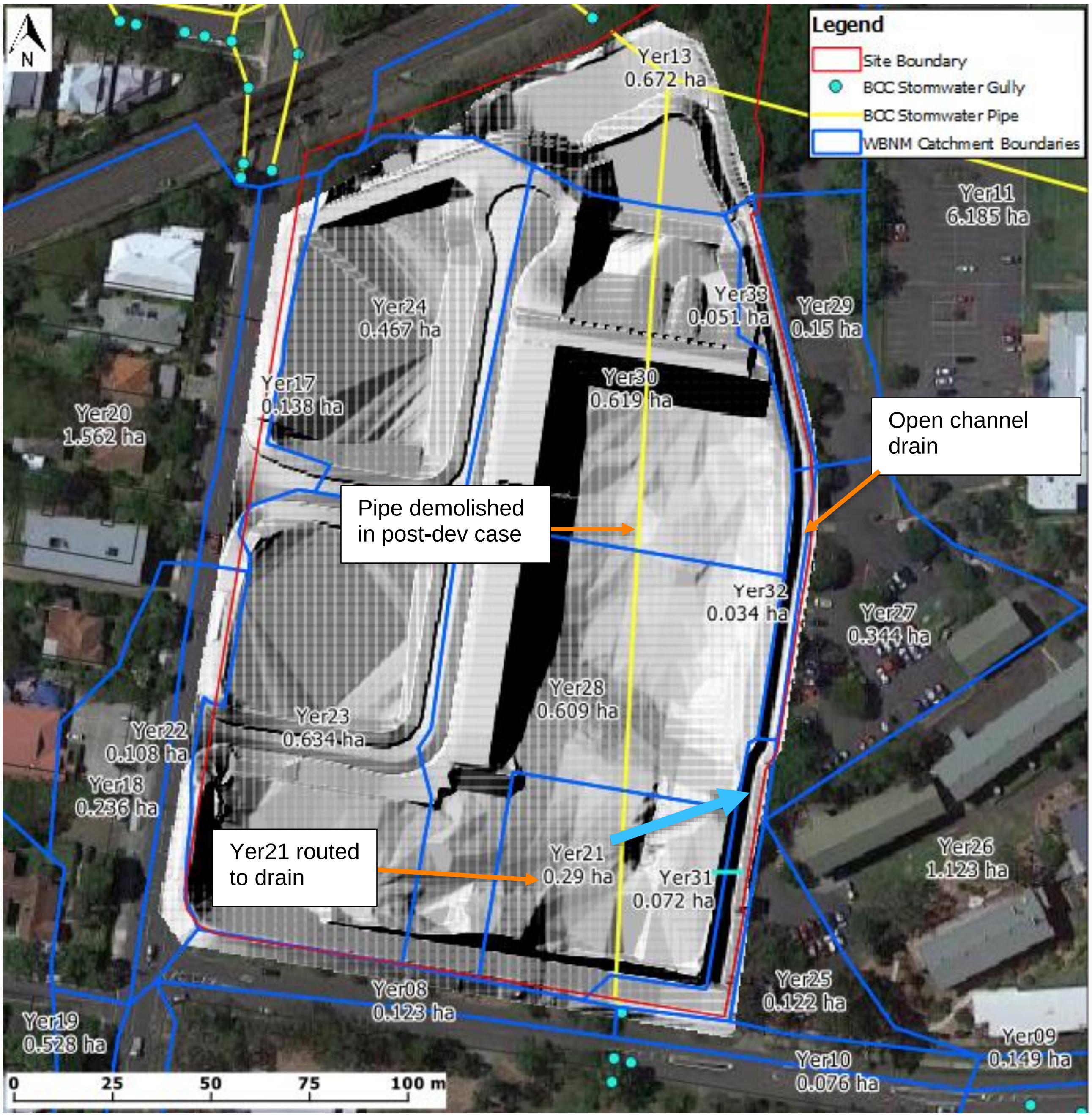

FIGURE 3-2 SUB-CATCHMENT LAYOUT – POST-DEVELOPMENT CASE

3.4 Hydrological Model Results

Base case box plots for all events analysed at the rail corridor (Catchment Yer13) are included in Appendix D. We note that the changes made in the post-development WBNM model were minor and do not fundamentally change the resulting critical durations or total flows downstream.

The critical duration at the railway corridor is generally the 15-minute, 25-minute and 30-minute storms across the AEPs analysed based to the hydrologic model. The base case and post development model outputs were used to inform the hydraulic model flows as discussed in the following section. Determination of the critical durations was undertaken using the hydraulic model due to the complexity of the catchment and effect of natural flood storage and changes in conveyance characteristics. Testing in the hydraulic model using the 1% and 10% AEP hydrology showed that the 25-minute storm was found to be critical at the railway corridor.

Base case and post-development run-off from the site will not be fundamentally worsened given that the impervious area and catchment characteristics are similar in both cases.

4 HYDRAULIC MODELLING

4.1 Overview

To assess the hydraulic flooding conditions in the catchment and to quantify the change in hydraulic behaviour as a result of the proposed development, a TUFLOW hydraulic model has been developed. TUFLOW is an effective 1d/2d hydraulic simulation software which is capable of assessing various water environments, including flooding within urban drainage catchments. The TUFLOW model developed for this flood study was based on the TUFLOW software version 2020-10-AC-iSP-w64 which incorporates the Highly Parallelised Compute (HPC) solution scheme.

Hydraulic models have been developed to assess the following scenarios:

- Base Case – representing the Site pre-demolition conditions;
- Post-Development Case – based on the base case model, with the inclusion of the civil design surface and associated drainage features; and
- Severe Storm Sensitivity Case – this case assesses a 1% AEP storm with complete blockage (100%) applied to the stormwater pits on Villa Street and 50% blockage applied to the new trunk 1050 RCP aligned with the eastern site boundary drain. This case was simulated to ensure that the overland flow drain is adequately sized and to inform civil design levels at the site as well as design planning levels. Results are discussed in Section 4.4.1.
- Railway pit blockage sensitivity – 60% total blockage applied to the railway pit inlet to test the sensitivity of this structure to blockage.

The following sections of this report provide further detailed information on the hydraulic model developed for this study.

4.2 Base Case Model

The topography for the TUFLOW model was based on 1m resolution LiDAR datasets captured in 2014 and has been modelled using the same 1m resolution. The extent of this model has been set to ensure the overland flow paths at the site are suitably represented at the site as well as in both upstream and downstream areas from the site. The downstream boundary has been positioned perpendicular to the drain downstream of Fairfield Road and is located a sufficient distance downstream of the site to assess local flooding impacts of the proposed development.

The TUFLOW model layout is shown in Figure 4-2 below. The model roughness layout for the base case is shown in Figure 4-3. A summary of the model for the base case assessment is as follows:

- The model topography is based on a 1m grid resolution;
- Detailed ground survey has been included based on the pre-demolition survey provide by RPS;
- Building footprints in the base case have been represented using Z-shapes;
- Some internal drainage has been included to ensure that overland flow through the site does not pond unrealistically and is conveyed downstream. The internal drainage pits and pipe arrangement has been informed by the pre-demolition survey, LiDAR and aerial imagery;
- Downstream boundary (2D and 1D boundary) set using a HQ type normal slope of 0.1% based on the ground topography slope at this location. The location of the boundary was chosen to be sufficiently

downstream of the site and railway corridor which forms a major hydraulic control, to ensure that the boundary conditions did not affect the outcomes of the assessment;

- Stormwater network has been informed by BCC-supplied stormwater pipe and pit network, pre-demolition site survey and additional data and photos provided by Stantec;
- Some upstream drainage from the catchment to the east and downstream of the railway has been simplified due to incomplete records;
- Depth-discharge curves have been derived for all pits where data was available. All curves have assumed 50% grate blockage. Where structures have been assumed, these have been represented as R type pits;
- The pit on the upstream side of the railway has been represented as a pit structure with 30% inlet blockage based on photos provided by Stantec. A selected image of the pit is shown in Figure 4-1 below; and
- Inflows from the WBNM model have been applied using 2d_sa polygons and 2d_sa pit inflows.

The floodplain roughness for the TUFLOW model has been represented using Manning's 'n'. A summary of the roughness value for each land use type is summarised below in Table 4-1, with the spatial extent illustrated in Figure 4-3. Note that areas that do not get wet (such as buildings raised out of the topography) are not relevant to the roughness mapping.

Testing was undertaken using the base case model to determine the critical durations of the 1% and 10% AEP events. In both cases, the critical event downstream of the site at the railway corridor was the 25-minute storm. For the purpose of assessing impacts, the 25-minute storm was adopted for all AEPs analysed, noting that this duration storm produces appropriate flows in all AEPs.

TABLE 4-1 MANNINGS 'N' ROUGHNESS

Material Type	Manning's 'n' Roughness
Roads and Pavement	0.020
Open Space	0.045
Low Vegetation	0.050
Medium Vegetation	0.070
Urban Residential	0.200
Buildings	2.000
Swale (sensitivity)	0.100

FIGURE 4-1 PIT ADJACENT TO RAILWAY

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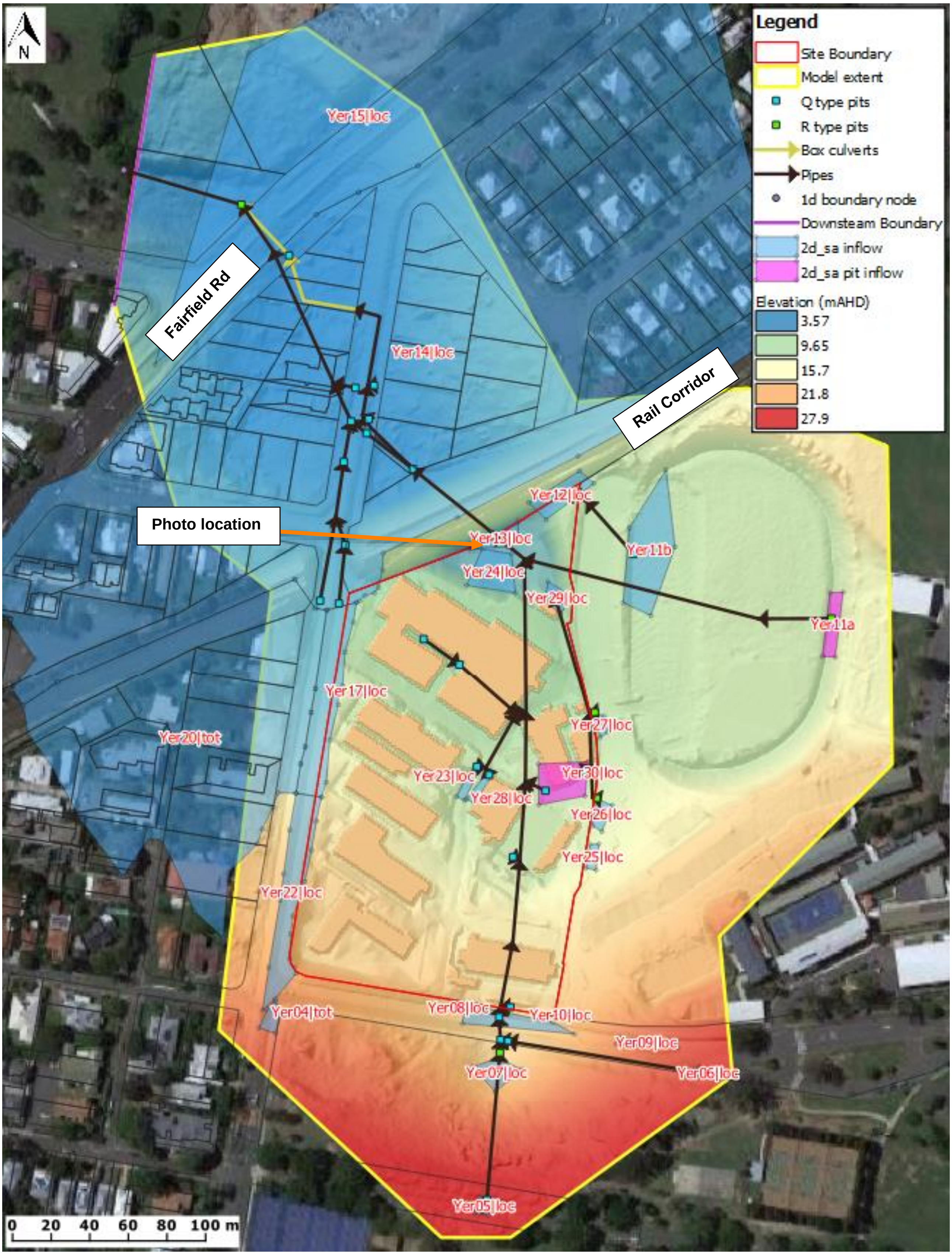

FIGURE 4-2 TUFLOW MODEL LAYOUT AND TOPOGRAPHY – BASE CASE

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FIGURE 4-3 TUFLOW ROUGHNESS LAYOUT – BASE CASE

4.3 Post-Development Case Model

The post-development case model is based on the base case model and includes the following additional features:

- The civil design surface provided by Stantec. The design surface includes the proposed overland flow drain along the eastern boundary of the site.
- All proposed drainage associated with the overland flow path. The proposed stormwater design provided by Stantec was used to inform the model set up.
- As per the base case model, depth-discharge curves have been derived for proposed new pit structures with a 50% blockage applied to grates.
- 20% standard design blockage has been applied to the trunk 1050mm RCP aligned with the overland flow drain.
- The overland flow drain has been represented in the 2D domain and for the impacts assessment has been applied with a Manning's roughness of 0.020 to represent the proposed concrete invert. A sensitivity case using a roughness of 0.100 in accordance with overland flow path BCC guidelines has been undertaken to inform design level control.
- A drain along the Villa Street frontage of Lot 10 (shown in Figure 4-4) is proposed to convey any flow overtopping the Villa Street footpath to the overland flow drain to the east. In reality, this can take many forms, such as an overland flow drain, concrete lined channel and pit and pipe structure with grates. Details for this aspect have not yet been determined. For the hydraulic modelling, this drain has been represented with a z-line gully and is only intended to represent conveyance of flow to the overland flow drain. We note that the sag and Villa Street footpath do not overtop in the standard design event analysed with standard blockage applied to the street inlets. A severe storm analysis has been simulated to inform the detailed civil design of the drain along Lot 10.
- Note that the internal stormwater network has not been modelled and flows have been introduced at the downstream part of the site. To ensure that flows in the culvert under the railway were adequately represented, a sag pit in the proposed cul-de-sac was modelled with a pipe connecting to the pit upstream of the railway, as per the drawings provided by Stantec. We note that a drop structure may be required to achieve constructible invert levels for the pipe, and may be located in the access ramp for the bioretention basin.
- A low-flow splitter from the sag pit to the bioretention basin has not been modelled. As noted on the Stantec engineering drawings, the splitter will be designed to divert a peak flow of up to approximately 0.45m3/s. The peak total flow from catchment "Yer24" is approximately 0.45m3/s, therefore, this has been introduced directly into the bioretention basin. To ensure that the bioretention does not completely contain frequent event flows, a pit outlet has been placed in the basin at the filter media level and connects into a new manhole downstream.

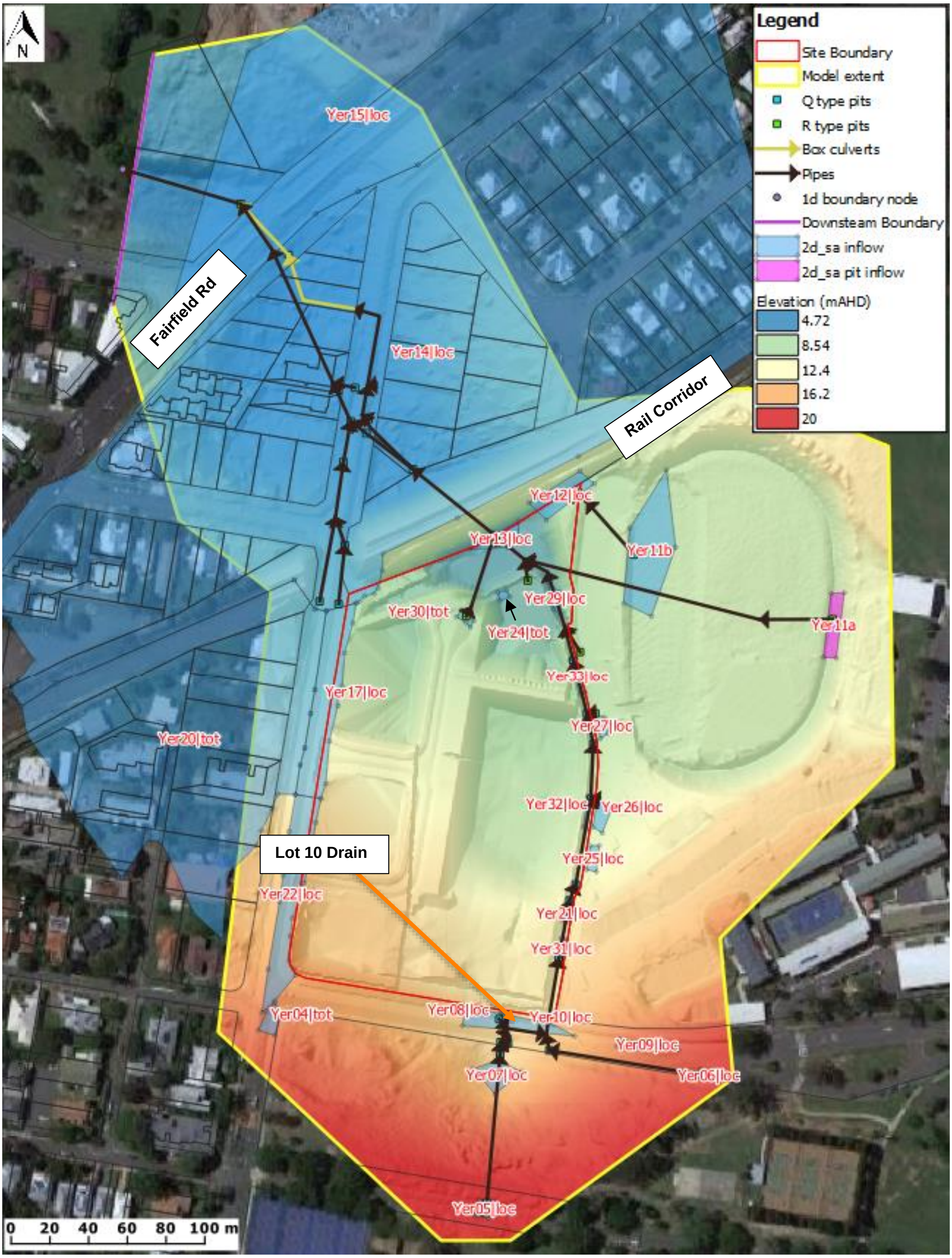


FIGURE 4-4 TUFLOW MODEL LAYOUT AND TOPOGRAPHY – POST-DEVELOPMENT CASE

FIGURE 4-5 TUFLOW ROUGHNESS LAYOUT – POST-DEVELOPMENT CASE

4.4 Results and Discussion

Base case and post-development case flood maps for maximum depth, water level, velocity and hazard are included in Appendix E. The adopted hazard categories are based on the Australian Emergency Management Institutes categories (ZAEM1 output in TUFLOW) which are shown in Figure 4-6.

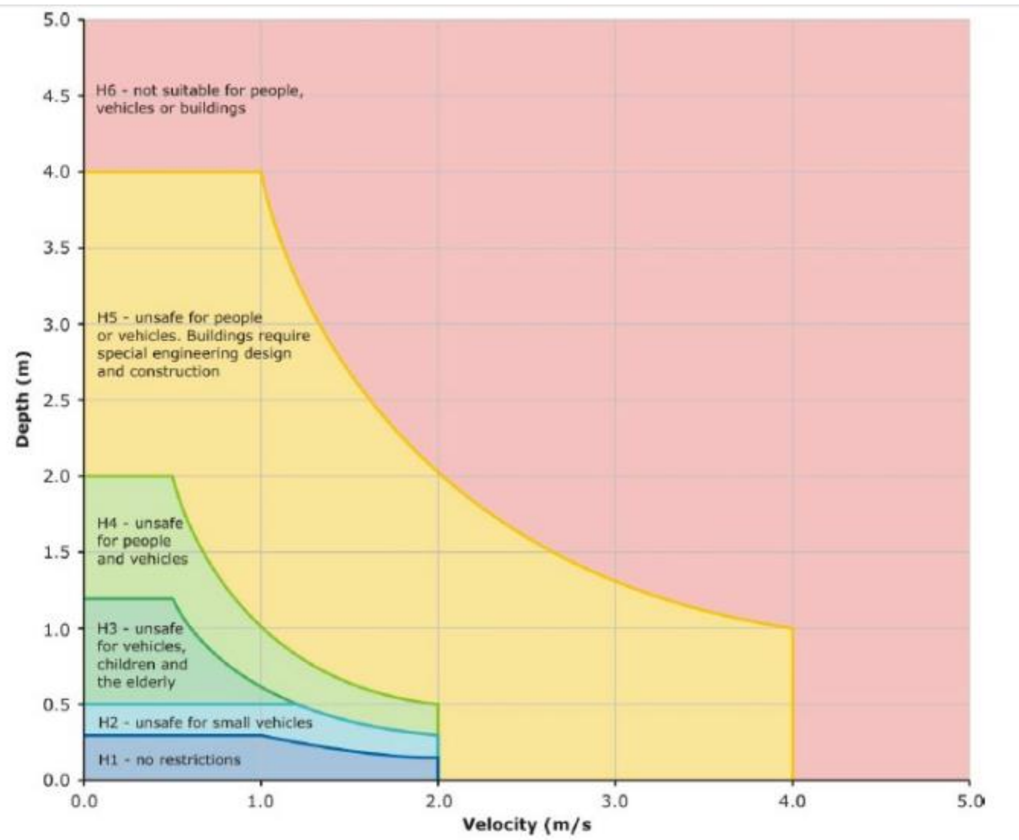
Flood level and velocity change maps are included in Appendix F.

All aspects of Condition 10 of the Development Approval have been addressed as part of this assessment. Non-worsening of flooding conditions in respect to maximum flood water level and velocity has been achieved. Lot 10 has been included as fully developed. QUDM safety and trafficability criteria for flood conditions on Villa Street and adjacent footpath has been achieved.

A summary of the results is provided as follows:

- Water levels upstream and adjacent to the railway corridor are not worsened in any of the design events simulated.
- There are no surface water level increases downstream of the railway in any of the design events simulated. We note that any potential changes to flood levels will not affect floor level control as this is highly dominated by Brisbane River flooding downstream of the railway.
- Peak flood velocities on private property external to the site are not affected. Localised increases in Villa Street are minor and a natural consequence of reducing ponding in the sag.
- Due to the increased trunk drainage capacity, flow increases are predicted in the 1050mm RCP downstream of the site and under the railway corridor. Hydrographs for the pipe in the 1%, 10% and 50% AEP events are shown in Figure 4-7, Figure 4-8 and Figure 4-9 respectively. The hydrographs demonstrate that increases in peak flows are predicted due to the increased pipe capacity upstream, with the frequent events being unlikely to be affected.
- Increases in peak flows also occur in pipes downstream of the site. The stormwater network downstream of the railway has a large capacity and these small increases in peak flow do not cause actionable surface water level increases downstream.
- The time of inundation is not increased in the post-development case compared to the base case.
- Maximum velocities in the concrete lined drain are generally up to 1.6 m/s (n.b. based on a Mannings n=0.020). We note that a localised area of higher velocity is shown to occur at the downstream end of the open drain and to the east of the bioretention basin. This occurs at a slight constriction and increase in grade. Widening and/or rock protection will be required to prevent scour and can be readily addressed as part of future works.
- Ponding in Villa Street has been dramatically reduced by virtue of the upgraded stormwater pits and downstream trunk pipe. Trafficability and flood hazard in Villa Street have been notably improved by the proposed development.
- The maximum ponding depth in the existing 1% AEP case in Villa Street are approximately 0.71m in the gutter and 0.35m on the road crown. In the post-development case, the maximum 1% AEP ponding depth in Villa Street is 0.21m in the gutter, with no ponding occurring over the road crown. Thus, Villa Street is trafficable in the 1% AEP event.
- The Villa Street footpath does not overtop in the standard design events analysed and therefore there is an acceptable risk to pedestrians and represents a marked improvement compared to the base case. In the severe storm case (1% AEP with 100% blockage of Villa Street drainage) the dv product is ~0.18m^2/s which is less than the permitted 0.4m^2/s (despite the severe storm assessment being above and beyond the typical design standard).

- Minimum design levels for the site can be readily achieved and are discussed in detail in the following section.
- In respect to the 20% AEP flood level impact mapping, a small area of water level increase up to 21mm is shown in pink downstream of the railway. This is not related to the development as there are reductions on the upstream side of the railway, and there are no impacts in any other AEP event. It occurs over a hard building structure, which isn't accurately represented in the Lidar topography. In the immediate surrounds, water levels are not fundamentally different, and the area of green below it indicates that there are water level reductions adjacent. The green area also indicates that the artefact is likely related to the way TUFLOW introduces and distributes water into the model. The impacts are numerical only, and are not real.



Hazard Classification	Description
H1	Relatively benign flow conditions. No vulnerability constraints.
H2	Unsafe for small vehicles.
H3	Unsafe for all vehicles, children and the elderly.
H4	Unsafe for all people and all vehicles.
H5	Unsafe for all people and all vehicles. Buildings require special engineering design and construction.
H6	Unconditionally dangerous. Not suitable for any type of development or evacuation access. All building types considered vulnerable to failure.

FIGURE 4-6 AUSTRALIAN EMERGENCY MANAGEMENT INSTITUTE HAZARD CATEGORIES

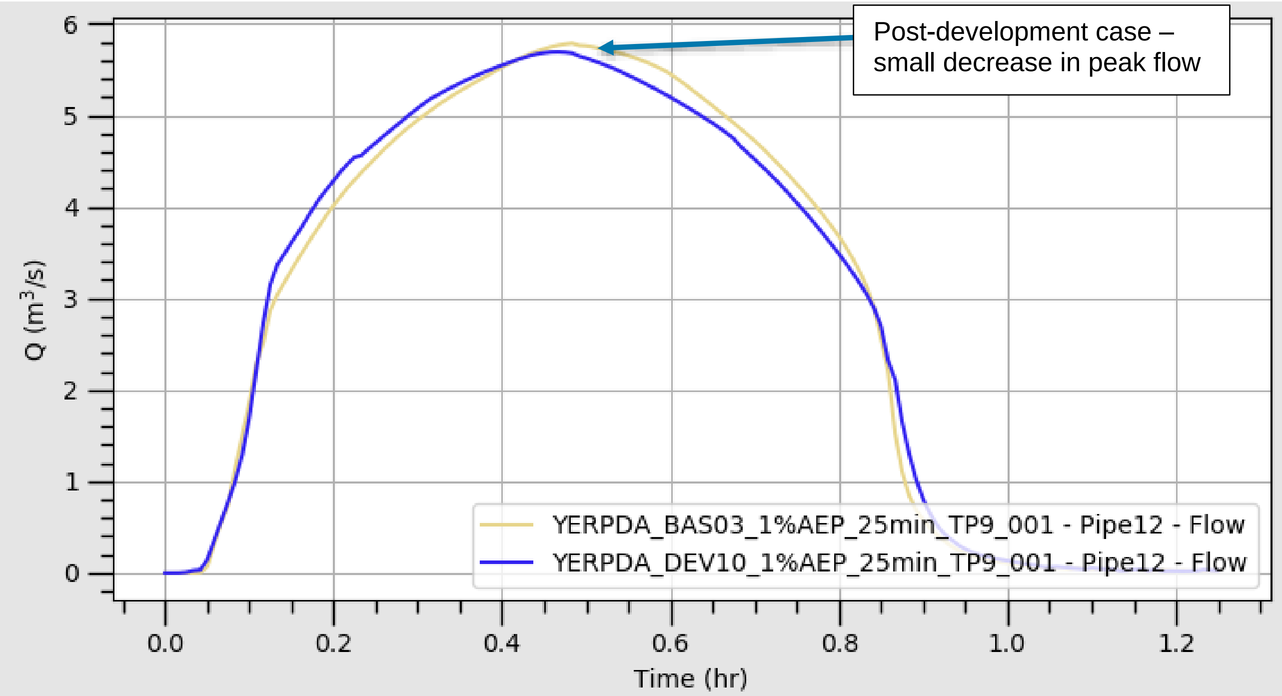


FIGURE 4-7 RAILWAY CULVERT CRITICAL HYDROGRAPHS – 1% AEP

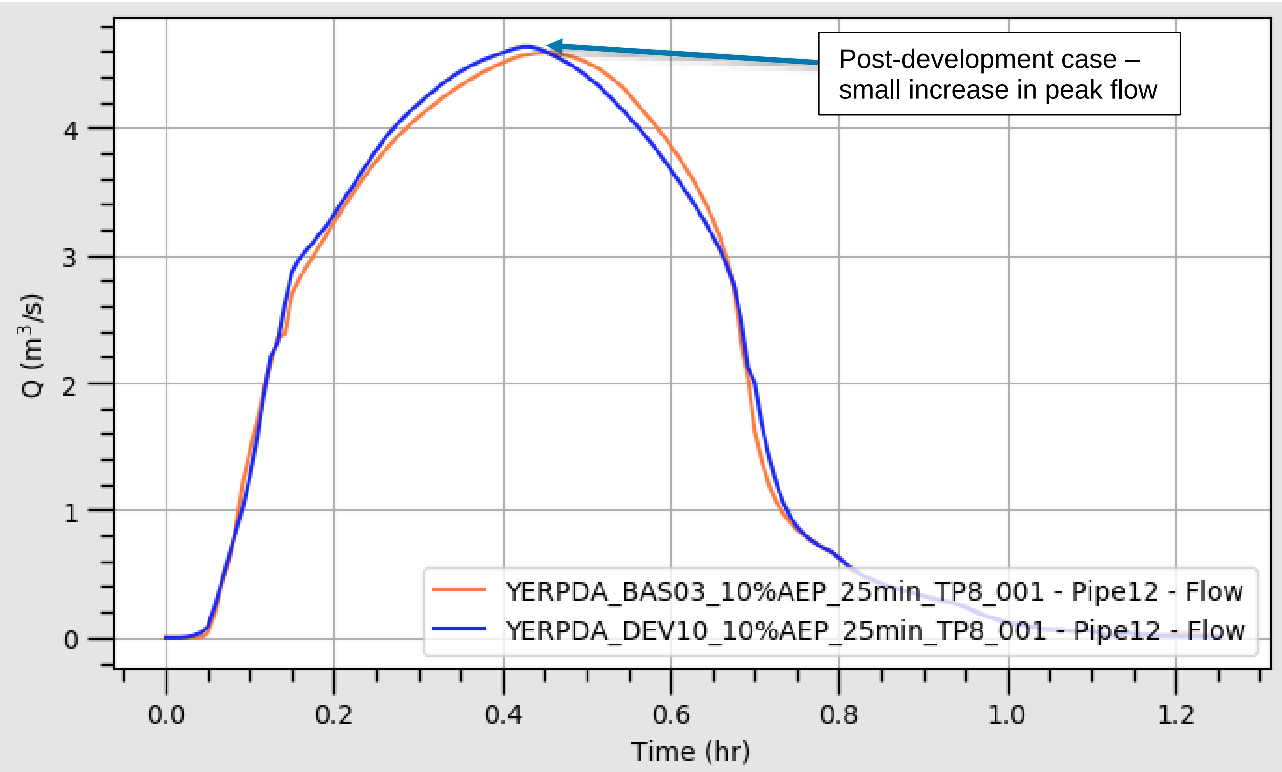


FIGURE 4-8 RAILWAY CULVERT CRITICAL HYDROGRAPHS – 10% AEP

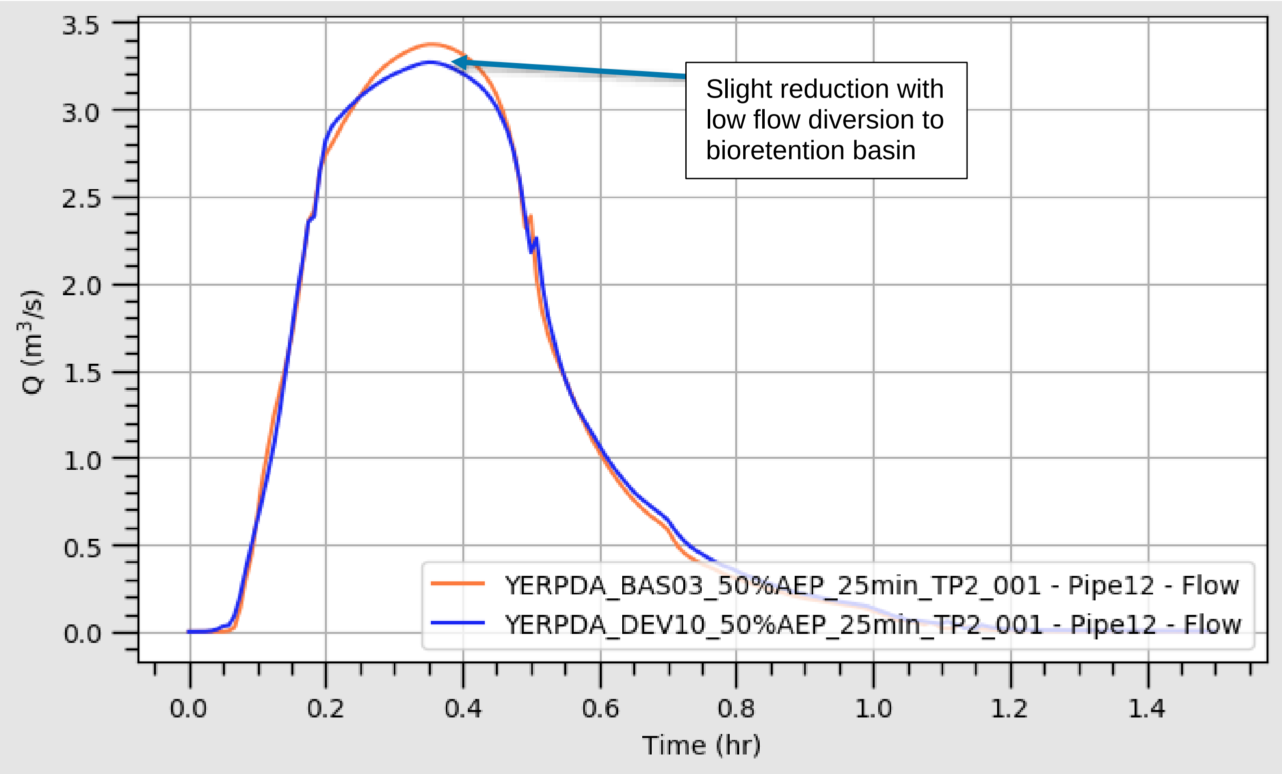


FIGURE 4-9 RAILWAY CULVERT CRITICAL HYDROGRAPHS – 50% AEP

4.4.1 Minimum Design Levels

The site is subject to overland flow path mapping according to the BCC City Plan (2014). Overland flow flood levels will be the dominant flood event which control minimum design planning levels at the site as they are comparably higher than the 1% AEP Brisbane River level (8.3mAHD), the latter only affecting the bottom portion of the site adjacent to the railway. Based on the typical BCC City Plan (2014) requirements, the 2% AEP event design water levels with an additional 500mm should be adopted for minimum design levels across the site, except for the flood protection along the Villa Street frontage of Lot 10.

The former TAFE site employed an earthen bund downstream of Villa Street as shown in Figure 4-10 below. The top level of the bund (based on the 2014 LiDAR) is 19.0mAHD. It is recommended that the same level be adopted for the design planning levels proposed along the street frontage. We note that this is higher compared to the 2% AEP level plus 500mm and provides additional protection having regard to blockage or the instance where vehicles drive through the flooded sag forming bow waves.

Design levels can vary with the water level grade along the drain on the eastern site boundary. We have provided the design case flood results to Stantec to inform minimum design levels at the site, which are based on the 1% AEP design event (with high roughness in the drain and without high pipe blockage – TUFLOW case “DEV10a”) plus 500mm.

The severe storm assessment discussed in the following section confirms that the minimum design levels for the site are appropriate.

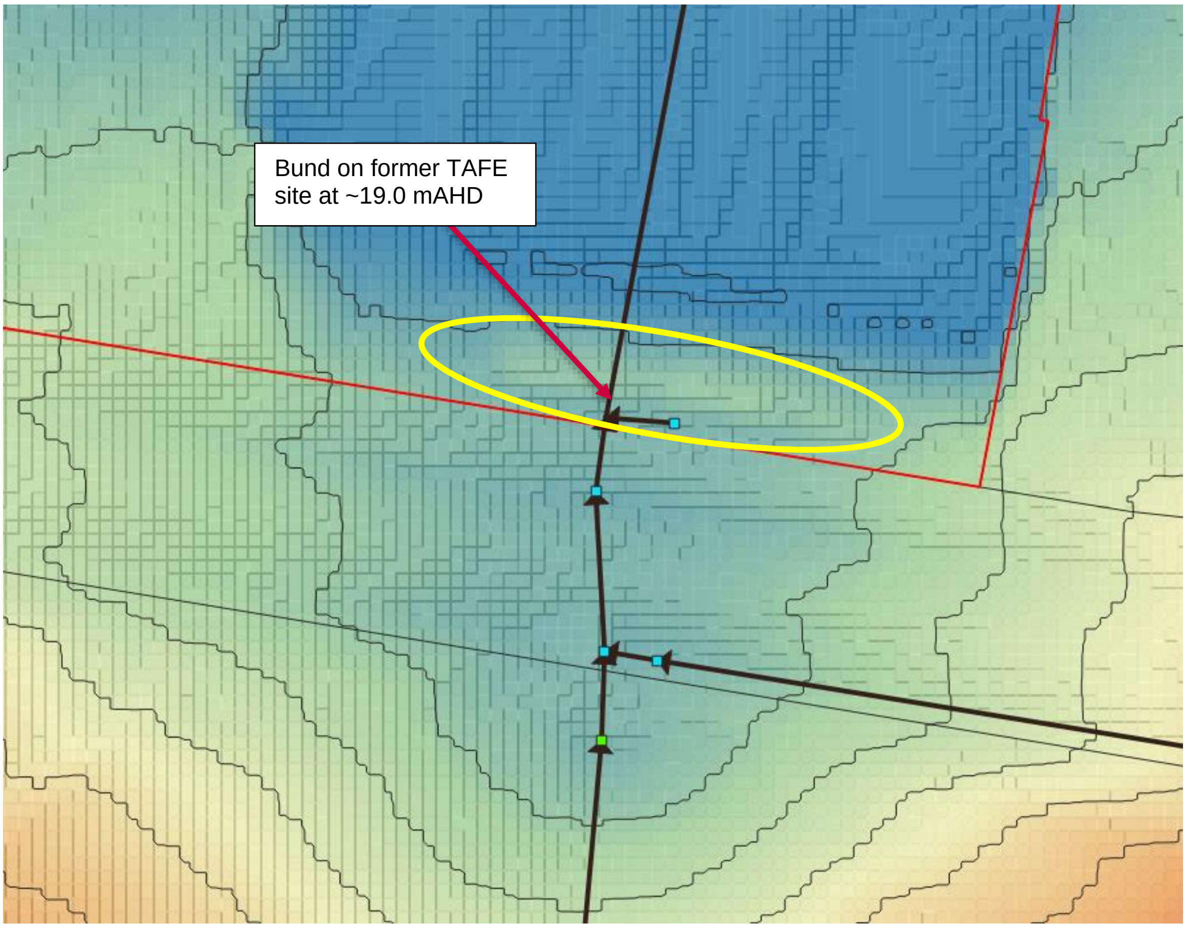


FIGURE 4-10 VILLA STREET FRONTAGE BUND – BASE CASE TOPOGRAPHY

4.4.2 Severe Storm Assessment

A severe storm assessment has been undertaken using the 1% AEP storm with consideration of extreme blockage of the proposed new trunk drainage. The purpose of this assessment is to ensure that the drain is appropriately sized and ensure the minimum design level for the wall on the Villa Street frontage of Lot 10 is not compromised.

A 100% blockage condition was applied to the most upstream section of the trunk 1050mm RCP (immediately downstream of the Villa Street pits) such that the only flow relief is provided by the drain adjacent to Lot 10 and the overland flow swale. The remain sections of pipe were given 50% blockage.

Figure 4-11 shows the maximum flood depth and level in the severe storm case. The maximum water level adjacent to Lot 10 is approximately 18.6 mAHD. The proposed design level for the wall along the Lot 10 frontage is 19.00mAHD, therefore, freeboard is not compromised in the severe storm case. The median peak 1% AEP flow in the cut off drain adjacent to Lot 10 is 0.6m^3/s.

As previously noted, the Villa Street footpath does not overtop in the standard design events analysed. In the severe storm assessment, results show that the maximum depth over the footpath is approximately 0.2m and maximum velocity is approximately 0.8m/s. This represents a low hazard (dv = ~0.18m^2/s which is less than the QUDM criteria of 0.4m^2/s) and will not present a significant safety risk for children or adults, especially considering the extreme and unlikely nature of the severe storm conditions. We note that water on the road is generally ponded and slow-moving.

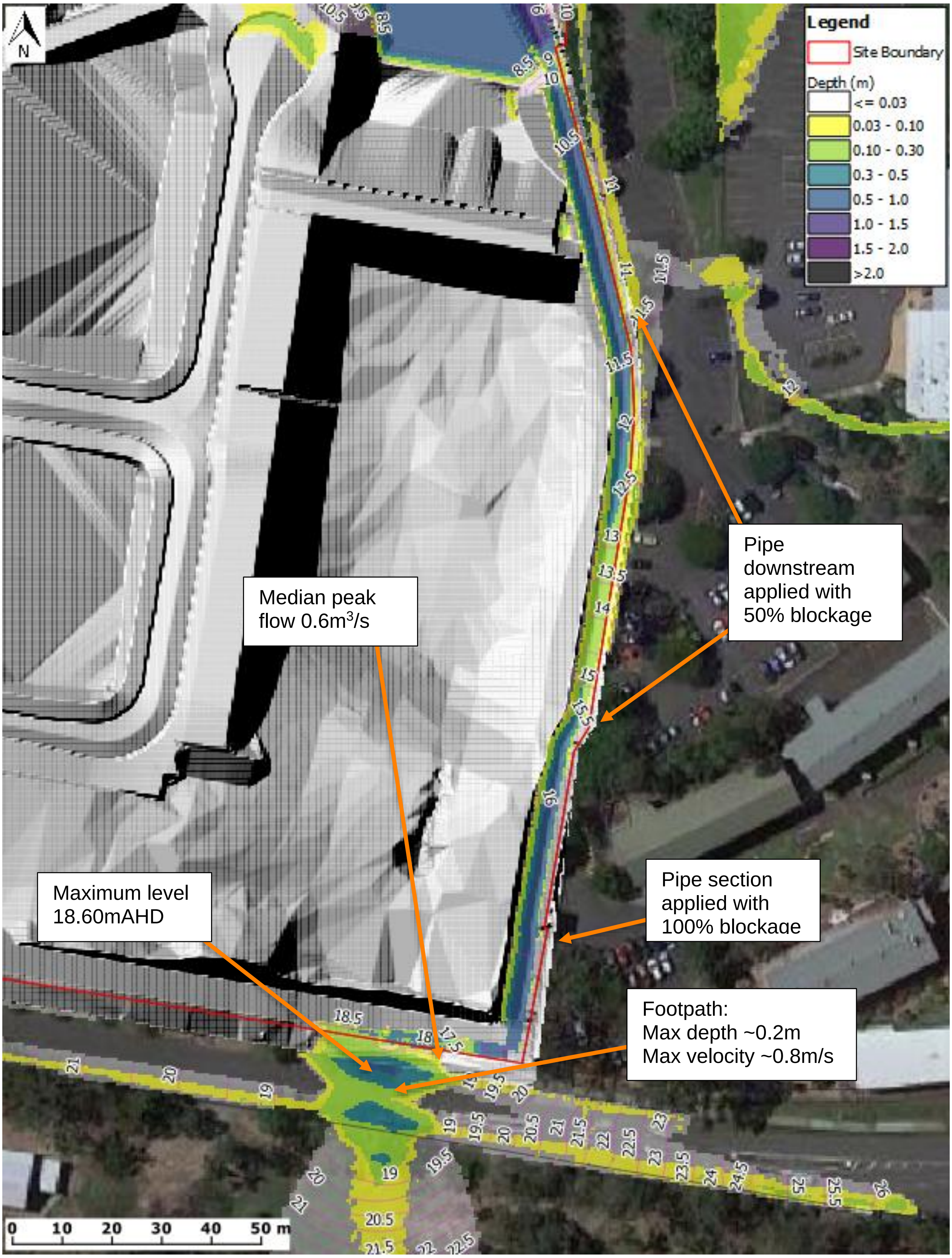


FIGURE 4-11 MAXIMUM FLOOD DEPTH AND LEVEL – 1% AEP SEVERE STORM CASE

4.4.3 Railway Pit Blockage Sensitivity

An additional sensitivity check has been undertaken by applying a total 60% blockage on the railway pit. This was simulated for the ten (10) 25-min 1% AEP storm events. This high blockage scenario only resulted in a modest 22mm water level increase upstream of the railway embankment on the site when compared to the post-development case with regular blockage applied. The pit is therefore not sensitive to blockage.

We also note that in the event of a severe blockage of the railway culvert or pit upstream of the railway corridor, relief is provided to the west via Park Road at approximately 9.5mAHD. Proposed floor levels adjacent to the bioretention basin are approximately 10mAHD, therefore it is extremely unlikely floor levels will be compromised due to blockage of the pit or culvert. However, we recommend that the pit cover be upgraded to incorporate a dome cover to reduce the risk of severe blockage. This flow path also provides relief in the event of a severe local event coinciding with Brisbane River flooding.

5 CONCLUSION

Water Technology Pty Ltd (WT) has been commissioned by Stantec on behalf of Economic Development Queensland (EDQ) to undertake a detailed flood impact assessment for a proposed development located at 70 Park Road, Yeronga (the Site). The development, known as Parkside Yeronga, involves a subdivision of land historically occupied by the Yeronga TAFE facility. The hydraulic modelling undertaken assesses the overland flow flooding impacts of the proposed development. Design aspects relating to Brisbane River flooding and floodplain storage have been addressed separately by Stantec.

This report addresses and satisfies the relevant conditions of the Development Approval (EDQ Ref: DEV1021/1221, dated May 2022).

A summary of the hydraulic assessment outcomes from this study are summarised as follows:

- Detailed hydrological modelling has been undertaken to define hydrology for the catchment and inform inflows or the hydraulic model.
- Detailed hydraulic modelling using TUFLOW has been undertaken to assess the adopted base case (pre-demolition) and post-development site conditions.
- Non-worsening water level increases (flood impacts) have been achieved for all standard design events including the 1%, 2%, 5%, 10%, 20%, 50% and 63.2% AEP events.
- There is no predicted increase in maximum flood velocity external to the site on private property.
- The time of inundation is not fundamentally affected.
- Due to the increased trunk drainage capacity, flow increases are predicted in the culvert under the railway corridor. The increases in peak flow also occur in pipes downstream of the site. The stormwater network downstream of the railway has a large capacity and these small increases in peak flow do not cause material surface water level increases downstream.
- Minimum design levels for the site can be readily achieved, with design levels provided to Stantec that are based on the 1% AEP design event plus 500mm, apart from the higher standard recommended for the Villa Street frontage of Lot 10.
- Ponding in Villa Street has been dramatically reduced by virtue of the upgraded stormwater pits and downstream trunk pipe. Trafficability and flood hazard in Villa Street have been notably improved by the proposed development.
- The Villa Street footpath does not overtop in the standard design event analysed therefore there is an acceptable risk to pedestrians and represents a marked improvement compared to the base case.

It has been demonstrated that the proposed development will not result in adverse flooding conditions external to the site. On this basis, we believe that the development can readily be readily supported subject to reasonable and relevant conditions.

APPENDIX A
PROPOSED DEVELOPMENT LAYOUT PLAN AND CIVIL DRAWINGS

APPENDIX B
PRE DEMOLITION SURVEY

APPENDIX C
WBNM MODEL CATCHMENT DETAILS

APPENDIX D
SELECTED BASE CASE BOX PLOTS

APPENDIX E
BASE CASE AND POST DEVLOPMENT FLOOD MAPPING

APPENDIX F
FLOOD LEVEL CHANGE MAPPING

Melbourne

15 Business Park Drive
Notting Hill VIC 3168
Telephone (03) 8526 0800
Fax (03) 9558 9365

Brisbane

Level 5, 43 Peel Street
South Brisbane QLD 4101
Telephone (07) 3105 1460
Fax (07) 3846 5144

Adelaide

1/198 Greenhill Road
Eastwood SA 5063
Telephone (08) 8378 8000
Fax (08) 8357 8988

Perth

Ground Floor
430 Roberts Road
Subiaco WA 6008
Telephone 0438 347 968

Geelong

PO Box 436
Geelong VIC 3220
Telephone 0458 015 664

Gippsland

154 Macleod Street
Bairnsdale VIC 3875
Telephone (03) 5152 5833

Wangaratta

First Floor, 40 Rowan Street
Wangaratta VIC 3677
Telephone (03) 5721 2650

Wimmera

PO Box 584
Stawell VIC 3380
Telephone 0438 510 240

www.watertech.com.au

info@watertech.com.au