APPENDIX J

LP CONSULTING
AUSTRALIA PTY LTD

- DESIGN AND PROJECT MANAGEMENT
- CIVIL ENGINEERING
- WATER AND WASTEWATER ENGINEERING
- BUILDING AND INFRASTRUCTURE
- HYDRAULIC AND FIRE SERVICES
- SYDNEY WATER REGISTERED WATER SERVICING COORDINATOR, DESIGNER AND PROJECT MANAGER
- EXPERT TECHNICAL ADVICE

STORMWATER ENVIRONMENTAL ASSESSMENT REPORT

for

BUILDING RECYCLING OPERATIONS PTY LTD
191 Miller Road Chester Hill

Ref: 2016-0932

BUILDERS RECYCLING

Revision No	Status	Issue Date	Prepared By	Reviewed By	Approved By
A	For Client Review	22/05/2018	IY	LP	JD
B	For Authority Submission	23/05/2018	IY	LP	JD
C	For Client Review	10/09/2018	IY	LP	JD
D	For Authority Submission	13/09/2018	IY	LP	JD
E	For Authority Submission	22/11/2018	LP	LP	LP

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1.0 INTRODUCTION AND SITE LOCATION

This report has been prepared by LP Consulting Australia Pty Ltd *(LP Consulting)* on behalf of Builders Recycling Operations Pty Ltd (BRO) to address stormwater-related matters associated with the movement of soil and water across the site. This involves hydrological analysis using local rainfall data in conjunction with the catchment and contributing subcatchment areas within the site boundaries.

The subject property is located at 191 Miller Rd, Chester Hill. A Google aerial photograph is included below.

The site operates as a commercial waste recycling plant and consists of various buildings, stockpiled waste, temporary waste piles and recycled material waste piles. Miller Road runs in a north-south alignment along the western side of the site. The property is adjacent to a railway reserve along the northern boundary, with existing residential houses located to the east and existing industrial development to the south.

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The aerial photograph below indicates the extent of the site boundary with a red outline, and yellow shading within the property.

Correspondence from the NSW Department of Planning and Environment dated 20/12/2017 lists a series of Environmental Assessment Requirements (EARs) relating to a modified approval previously obtained for the site.

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Below is a modified extract of the EARs letter indicating only the concerns relating to soil and water. This report seeks to address those items in particular. A complete copy of the correspondence can be viewed in the attached Appendix A.

NSW GOVERNMENT | Planning & Environment

Contact: Emma Barnet
Phone: (02) 9274 6412
Email: emma.barnet@planning.nsw.gov.au

Our ref: MP 06_0052 MOD 3

Mr Chris Wilson
CW Strategic Planning Services
PO Box 42
Forestville NSW 2087

Dear Mr Wilson

Chester Hill Materials Recycling Facility (MP 06_0052 MOD 3)
Environmental Assessment Requirements (EARs)

I refer to your letter dated 17 November 2017, seeking Secretary's environmental assessment requirements to modify the Minister's approval for the Chester Hill Materials Recycling Facility at 191 Miller Street, Chester Hill in the City of Canterbury Bankstown local government area.

In accordance with section 75W(3) of the *Environmental Planning and Assessment Act 1979* (EP&A Act), the Secretary may notify the Proponent of environmental assessment requirements (EARs) with respect to the proposed modification. The Proponent must comply with these requirements before the matter is considered by the Minister. The EARs below have been prepared in consultation with the Environmental Protection Authority (EPA), Roads and Maritime Services (RMS), Department of Primary Industry, Fire and Rescue NSW (FRNSW) and the City of Canterbury Bankstown Council (Council), and are based on the information provided to date. The Department is still waiting on comments from FRNSW, these will be provided as soon as they are received.

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Your modification request should be accompanied by an Environmental Assessment (EA) which addresses the requirements of the agencies (refer to **Attachment A**) and includes the following:

- **soil and water**, including:
  - an assessment of potential impacts to soil and water resources, topography, hydrology, drainage lines or watercourses near the site;
  - details of stormwater/wastewater/leachate management systems including the capacity and integrity of on-site detention systems and measures to treat, reuse or dispose of water;
  - characterisation of the surface water quality at any discharge point against relevant water quality criteria and proposed mitigation measures to manage any impacts to surface water or groundwaters impacts;
  - a revised site water balance and a detailed description of the measures to minimise water use at the site; and
  - an assessment of flooding impacts associated with the development including details of the flood liability of the site and changes to flooding behaviour.

Soil & Water related matters associated with stormwater drainage

(refer to complete letter for other matters of concern)

In addition, you must also directly consult with other relevant government agencies including but not limited to the EPA, RMS, FRNSW and Council in preparing the EA, and provide a detailed account of the results of the consultation.

Following the provision of the EA, the Department will advise you of the applicable fee (under Division 1A, Part 15 of the *Environmental Planning and Assessment Regulation 2000*) and consultation requirements.

If you have any enquiries about these requirements, please contact Emma Barnet on the above details.

Yours sincerely

C. Ritchie

Chris Ritchie
Director
Industry Assessments
As delegate of the Secretary

20/12/17.

2.0 EXISTING SURVEY LEVELS

A detailed survey plan was prepared by Matthew Freeburn Land, Engineering & Mining Surveyor (Ref: 34546) dated 28/9/2017 indicating existing survey levels across the site. It is noted that ground levels are frequently variable, due to the movement of waste material stockpiles. However, the general direction of natural surface fall is approximately from the northeast sloping down towards the western side of the property.

The survey image below is extracted from the survey plan and indicates contour levels of a constant elevation with blue lines. Adjacent contours have an elevation difference of 0.5 metres.

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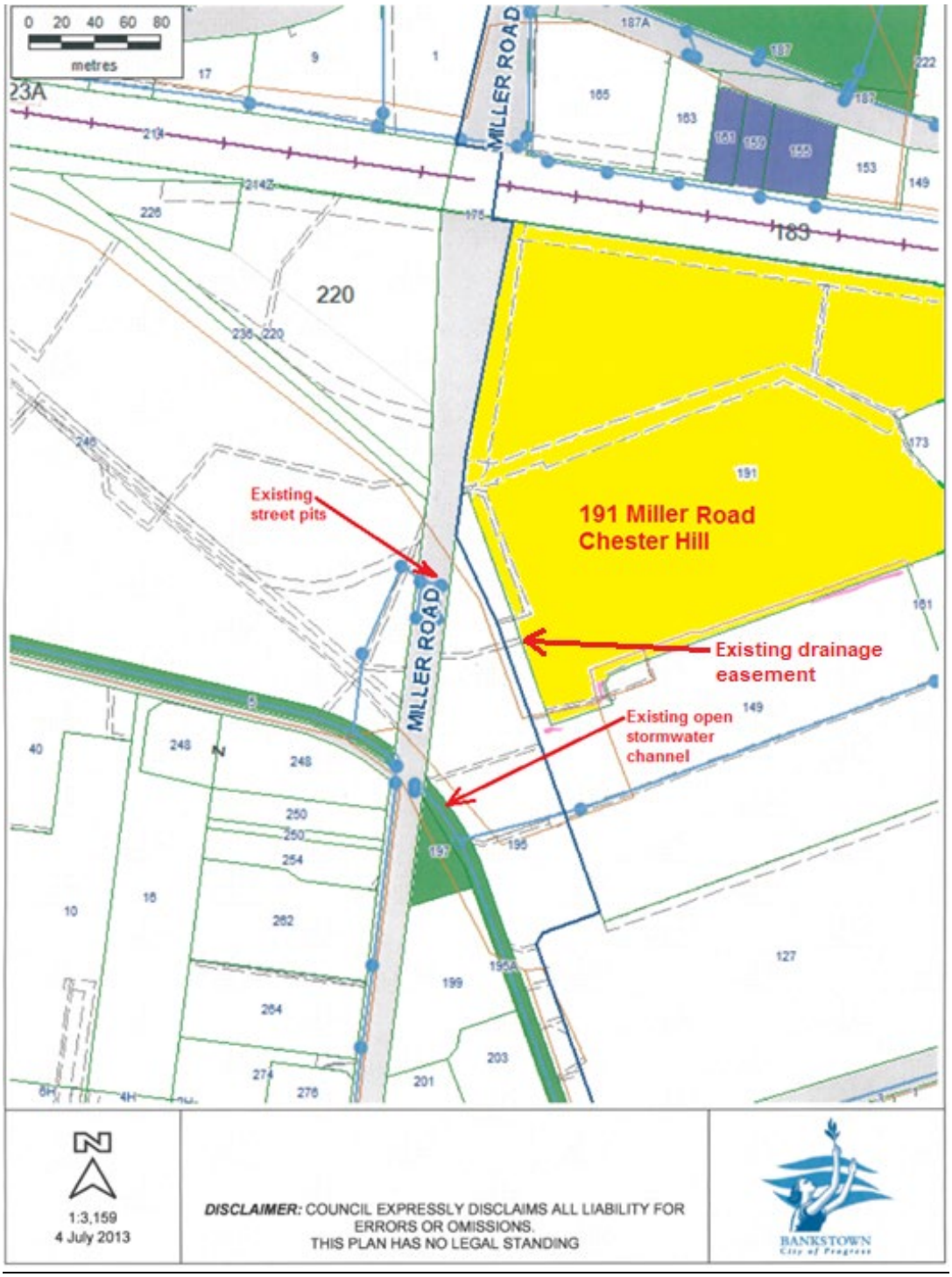
3.0 EXISTING PUBLIC DRAINAGE INFRASTRUCTURE

A number of existing kerb entry pits are located along Miller Road and generally drain in a southerly direction towards an open stormwater channel approximately 200 metres from the front of the site. The plan below indicates the site location in yellow shading, with nearby Council pits shown as blue circles. An existing drainage easement contains an 825mm pipe which passes through the western neighbour at 195 Miller Road.



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4.0 EXISTING SITE CHARACTERISTICS

The following series of photographs shows observed characteristics of ground surfaces and drainage features within and around the site.

The photograph below indicates the railway line to the north of the site.

The photograph below indicates the entrance to the site from Miller Road.

The photograph below indicates two neighbouring driveways to the south of the site entrance.

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The photograph below indicates two neighbouring driveways to the south of the site entrance.

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The photograph below indicates existing street pits along Miller Road (looking north).

The photograph below indicates existing street pits along Miller Road (looking south).

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The photograph below indicates the stormwater channel approximately 200 metres south of the site entry.

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The photograph below indicates vehicular access on the eastern side of a main stockpile.

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The photograph below indicates an example of depressed surface ponding in a low lying parking area.

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5.0 PROPOSED BUILDING WORKS

Proposed modification to the site includes the erection of an enclosure for the sorting and recycling of waste, including a large roofed area and adjacent hardstand surfaces for the operational areas of the facility. Below are two sample views of the conceptual building structure.

VIEW OF PROPOSED BUILDING
LOOKING APPROXIMATELY NORTHEAST:

VIEW OF PROPOSED BUILDING
LOOKING APPROXIMATELY SOUTHEAST:

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The highly variable shapes of the existing large stockpile areas are to be replaced and managed in a more efficient manner with the modified resource recovery facility, with the protective “umbrella” arrangement provided by the new roof, which will cover a ground surface area of more than 20,000m2, or 2 hectares. Extensive impervious concrete slab paving will also reduce existing infiltration and leaching from waste materials into the underlying soil. Associated beneficial impacts would include a reduction of random uncontrolled soil erosion behaviour and the undesirable accumulation of sediment deposits on the lower sides of the former stockpile mounds.

The existing network of underground pipes and pits has been found to comprise relatively small diameter pipes (up to 375mm dimeter) in relation to the site catchment, and no existing detention tanks are present to reduce the peak flow of stormwater leaving the site. As a result, new drainage lines are proposed to be installed in conjunction with the upgraded recycling facility, with existing drainage connections to be maintained as appropriate, where they are not being disturbed by the new development works.

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6.0 OVERLAND FLOWS

Reference is made to Bankstown City Council's Development Engineering Standards as amended in June 2009 – Section 9.5 regarding the preservation of unobstructed overland flow paths. The extract below indicates that proposed boundary fencing should permit the passage of surface flows by providing a gap of at least 50mm height above ground level.

9.5 Overland Flow Paths (OLFP) for Stormwater From Upstream Catchments

Overland Flow paths must be considered and designed where stormwater runoff, in excess of the design capacity of the pipelines for the upstream catchment, has the potential to flow through a development site. Overland flow paths must be considered and designed for the stormwater runoff developed from within the site as well.

The developer may be required to provide Council with a flood study to determine the OLFP requirements, for assessment with the DA plans.

If a development site has all of or part of a natural depression forming an OLFP within it, then Council may require an unobstructed OLFP, of adequate capacity, be maintained or constructed within the development site. Often the natural depression coincides with a drainage easement, over a pipeline within the development site. If the drainage easement is not coincidental to the natural depression where overland flow may occur, then Council may require a depression be created over the easement or an easement for overland flow be created over the natural depression area. In general, Council does not allow structures that will obstruct, block or adversely divert overland flow to be placed or constructed in the OLFP.

Developers should plan a development so OLFP's are directed along driveways, through common grassed areas and where fencing requirements are minimised or limited. OLFP's through courtyard areas are discouraged and should not be proposed on new development sites. Redirection of OLFP is permitted within the property provided there is no adverse effect on adjacent properties.

9.5.4 Requirements For Site Boundary Fencing

All boundary fencing must be elevated at least 50 mm from the finished ground level to the bottom of the fence panel or pailings to allow for overland flow. Boundary fencing crossing Council's drainage easement or OLFP, if required by Council, must incorporate provision for the passage of overland flow from stormwater runoff. Council may require the fence to be raised higher off of the finished ground level or openings be placed in the bottom of the fence where necessary to achieve acceptable overland flow path levels as recommended in an approved flood study for new developments.

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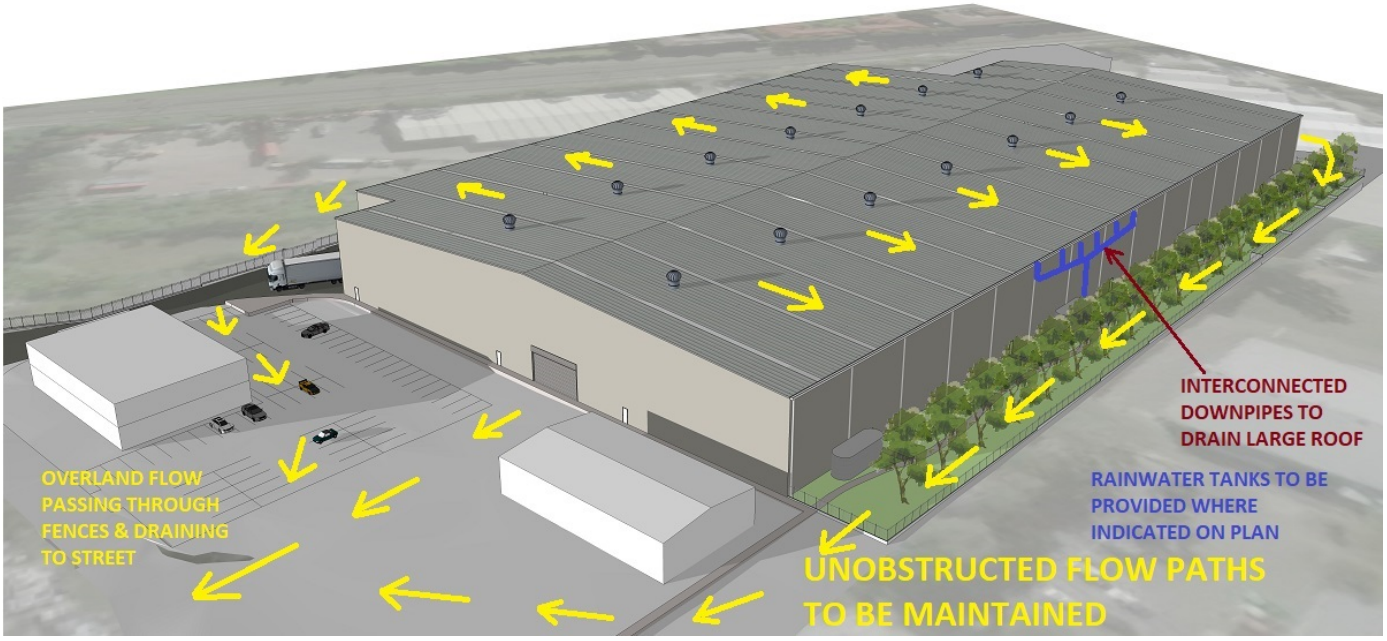
The conceptual image below shows the anticipated direction of flows during severe storms, with the natural direction of fall conveying stormwater runoff in a westerly direction towards Miller Road.



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It is noted that an existing earth channel is currently located along the southern boundary. The photograph below indicates this open channel provides significant flow width for the conveyance of overland flows, and it is intended that this area will be landscaped with stable vegetation at the rear of the new building structure, whilst maintaining its function as an overland flow route. The existing temporary straw bales in the channel will no longer be considered necessary when the loose earth is replaced by landscaping.

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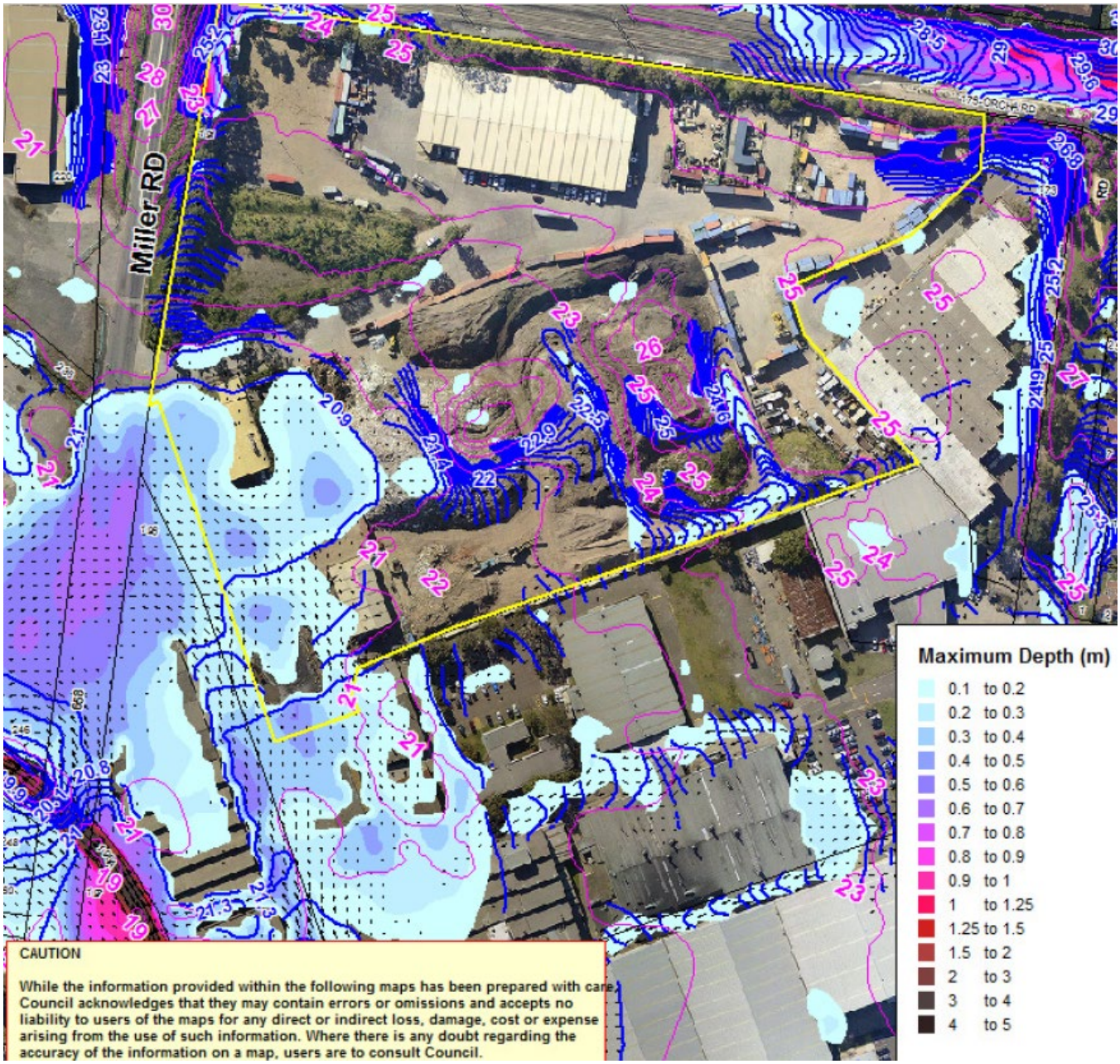
7.0 FLOODING EFFECTS

Reference is made to the Stormwater System Report (Ref: WP-SIA/156/2017) provided by Canterbury Bankstown Council dated 23 February 2017. Based on the information provided in this Council report (see attached Appendix B), no additional flood or overland flow study is required.

The flood map extract below indicates 100 year Average Recurrence Interval (ARI) flood depths. Pink surface contours and blue water surface contours indicate the main western area of flooding occurs below RL21.00, up to an anticipated ponding level of approximately RL20.90.

Ponding in localised depressions around the existing stockpile mounds is intended to be removed in conjunction with the new building proposal.



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Council's applicable flood-related requirements are identified in the tabular matrix notes included below.

SCHEDULE 5–CATCHMENTS AFFECTED BY STORMWATER FLOODING

Flood Precinct	Low		Medium							High		
	critical uses and facilities, sensitive uses and facilities	Subdivision, residential, commercial and tourist industrial, related developments, recreation and non urban, concessional development	critical uses and facilities, sensitive uses and facilities	subdivision	Residential	commercial and industrial	tourist related development	recreation and non urban	concessional development	critical uses and facilities, sensitive uses and facilities, subdivision, residential, commercial and tourist industrial, related development, recreation and non urban	recreation and non urban	concessional development
Floor Level					1,2,6	1,3,6	4,6	1,2,6	5,6		1,7	5,6
Building Components					1	1	1	1	1		1	1
Structural Soundness					1	1	1	2	1		3	4
Flood Effects				1,3	2,3	2,3	2,3	2,3	2,3		2,3	2,3
Parking and Driveway Access				1	2,3,4,5,6	2,3,4,5,6	2,3,4,5,6	3,5,6,7,8	5,6,9		3,5,6,7,8	5,6,9
Evacuation				1	2,6	3,6	3,6	4,6	5		4,6	5
Management and Design				1		2,3,4	2,3,4	2,3,4	2,3,4		2,3,4	2,3,4

= POTENTIALLY UNSUITABLE LAND USE = Not relevant

APPLICABLE NOTES FOR MEDIUM FLOOD RISK INDUSTRIAL DEVELOPMENT

Notes to Table

1. Freeboard equals an additional height of 500mm.
2. The relevant environmental planning instrument (generally the LEP) identifies development permissible with consent in various zones in Bankstown. However, constraints specific to individual sites may preclude Council granting consent for development on all or part of a site, whether or not there is compliance with this DCP, and whether or not the use is permissible under the LEP. The above matrix identifies where certain development types will be considered unsuitable due to flood related risks. If development consent is granted, compliance with the controls in this DCP may also lead to design constraints that could reduce the development yield for the site.
3. Uses identified as "potentially unsuitable" will generally not be considered as a result of their overall incompatibility with flood risk. Such uses may however be considered where they show compliance with the objectives and the performance criteria of the DCP. In such cases, these uses will also need to comply with controls as specified by Council.

Floor Level

1. Non habitable floor levels should be no lower than the 20–year flood unless justified by a specific assessment.
3. The level of habitable floor areas to be equal to or greater than the 100–year flood level plus *freeboard*. If this is impractical for development in a Business zone the floor level should be as high as possible (Refer Note to Table 9).
6. A restriction on the use of the land is to be registered on the Certificate of Title where the lowest floor level is elevated more than 1.5 metres above finished ground level, requiring that the undercroft area is not to be enclosed. The use of roller shutters, hit and miss brickwork and similar methods is however permissible where there is no significant flood impact. Non–habitable uses (laundry, toilet, bathroom and similar uses) can be enclosed where there is no significant flood impact.

Building Components

1. All structures to have flood compatible building components below the 100–year flood level plus *freeboard*.

Structural Soundness

1. Applicant to demonstrate that the structure can withstand the forces of floodwater, debris, and buoyancy up to and including a 100–year flood plus *freeboard*, or up to the probable maximum flood (PMF) if required to satisfy the evacuation requirement (see below); an engineers report may be required.

Flood Effects

2. Applicant to demonstrate to Council's satisfaction (by way of an engineers report if requested) that the development will not increase flooding effects elsewhere, having regard to: loss of flood storage; changes in flood levels, flows and velocities; the cumulative impacts of multiple developments in the vicinity. The report should also identify the presence of any "major overland flow paths" (refer to Note 8 in Notes to Table). *Note: Where major overland flow paths are present, this may result in restrictions of the proposed development to maintain the functioning of the flowpath, and/or to manage the impacts of development on properties. Refer also to Council's Development Engineering Standards Policy.*
3. Council may require that the creation of an easement, or that a Restriction be placed on the Title Certificate identifying the location of "major overland flow paths" or locations of significant backwater flooding.

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Parking and Driveway Access

2. The minimum surface level of open car parking spaces or carports shall be as high as practical, and not below:
   (i) the 20 year flood level or
   (ii) the level of the crest of the road at the location where the site has access (which ever is the lower).

   In the case of garages, the minimum surface level shall be as high as practical but no lower than the 20–year flood. Surface levels should also be determined having regard to the control Number 4 below relating to depths of inundation over driveways.

3. Garages capable of accommodating more than 3 vehicles on land zoned for urban purposes, or enclosed car parking must be protected from inundation from the 100 year flood;

4. The level of the driveway providing access between the road and the parking spaces should be as high as practical, and not lower than 0.3 metres below the 100–year flood level. However, Council may consider a lower level for the driveway in the following circumstances, where risk to human life is not compromised.
   a. Where the road is lower than the parking space, no part of the driveway should be inundated to a greater depth than the roadway
   b. Where the car parking space is lower than the road, the depth of inundation over the driveway must not be greater than the car park inundation depth, and the driveway must rise continuously in an egress direction
   c. Where the car parking space and road are both below the 100–year flood level, the depth of inundation over the driveway must not be greater than the depth at either the car parking space or the road. Where feasible, the driveway should rise continuously in the egress direction.

5. Enclosed car parking and car parking areas capable of accommodating more than 3 vehicles (other than on rural zoned land with a floor level below the 20 year flood level or more than 0.8 metres below the 100 year flood level shall have adequate warning signs, signage and exits.

6. Restraints or vehicle barriers to be provided to prevent floating vehicles leaving the site in a 100–year flood.

Evacuation

3. Reliable access for pedestrians or vehicles is required. An engineers report may be needed to address this matter and should consider access for pedestrians or vehicles to a publicly accessible location above the 100–year flood level. Where feasible, an area of refuge within the building or development site that is above the PMF level, and which is equal to 20% of the gross floor area of the development, or such other area capable of accommodating the number of people likely to require evacuation;

6. The development should be consistent with any flood evacuation strategy, flood plan or similar strategy that has been adopted by Council.

Management and Design

2. A Site Emergency Response Flood Plan is required where floor levels are below the prescribed floor level (which is the floor level that applies to that particular type of development).

3. Applicant to demonstrate that there is an available area above the 100-year flood level plus freeboard to store goods;

4. No storage of materials below the prescribed floor level which may cause pollution or be potentially hazardous during floods.

It is noted that Council's site-specific Stormwater System Report takes precedence over the general Council guidelines, and that no additional flood study is considered necessary.

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8.0 DETENTION STORAGE

Reference is made to Bankstown City Council's Development Engineering Standards as amended in June 2009 – Section 10 regarding on-site detention systems. The extract below indicates that flood-affected areas can be excluded from detention calculations. This is usually because submerged detention storages tend to offer limited performance benefits to the reduction of peak flows. However, locating a new detention tank in a more elevated position within the proposed works area is considered to provide desirable functional performance if the outlet pipe is set higher that the downstream flood level, thereby reducing submergence effects.The detention tank has been located in a position where the low level outlet is set above the 1 in 100 year flood level and the access hatches are above flood level.

10 ON-SITE DETENTION (OSD) SYSTEMS

10.1 General

10.1.1 Applicability

On Site Detention (OSD) is required where an increase in stormwater runoff, from a new development site, has an adverse affect to the receiving stormwater system. Provision of OSD is intended to reduce the potential for local flooding and damage to existing properties by limiting runoff from new developments, to pre-developed levels. A suitably qualified Civil Engineer shall be engaged to prepare calculations and designs in accordance with these requirements. Notwithstanding the following criteria, Council may consider the need for OSD on a case-by-case basis where justified by sound engineering principles.

10.2.2 Location Of OSD System

OSD is to be located away from any natural watercourses and OLFP's from catchments external to the site, and are not to be inundated by a natural watercourse or externally sourced OLFP in any events up to and including the 100-year ARI event. Developers and designers shall use principles of good aesthetics and landscaping and consider long-term viability and maintenance when locating the OSD system.

10.3.6 Design Parameters For OSD

Rainfall Intensities must be in accordance with the table shown in this guideline. Design calculations for determining OSD storage volumes and permissible site discharges are to be in accordance with one of the calculation methods detailed in this guideline.

Design flow rates from all development sites requiring (OSD) shall be computed by a time-area hydrograph method such as ILSAX, DRAINS or other industry-accepted method. The simplified method, given below, may be used for single dwellings and dual occupancies where required.

SIMPLIFIED METHOD

The following design parameters shall apply:

- Permitted site discharge = 0.026 L/s for each square metre of impervious area
- Permitted OSD discharge = (Permitted site discharge – site runoff unrouted through OSD)
- Storage volume = 0.025 cubic metre for each square metre of impervious area

TIME-AREA HYDROGRAPHS METHOD

The storage required is a volume that will restrict total flows from the development site to match the site runoff prior to development, for a given ARI. The volume/discharge relationship determined shall be for all ARI's for the range of 5 to 100 years ARI. The effects of all storms from 10, 20, 30 and 45 minutes are to be examined.

For sites affected by floodway from Council's and / or Sydney Water drainage systems, the portion of the site area affected by the floodway may be excluded from the total site area for the purpose of determining detention storage and permissible site discharge requirements.

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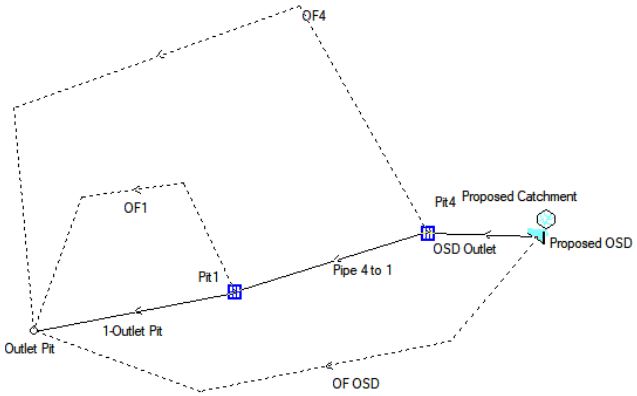
To determine hydrological effects, a DRAINS software model was prepared for the assessment of detention storage performance. The model was analysed for the 5 year, 20 year and 100 year Average Recurrence Interval (ARI) storm events and incorporated a range of various storm durations (5 min, 10 min, 15min, 20 min, 25 min, 30 min, 45min, 1 hr, 1.5 hr & 2 hr).

The following characteristic values were used for the model:

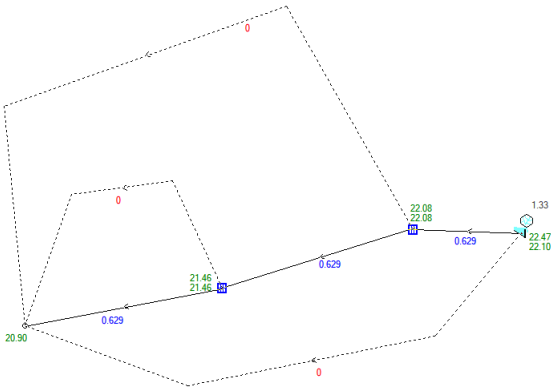
1.	Paved area depression storage	1mm
2.	Grassed area depression storage	5mm
3.	Soil Type	3 (for slow infiltration rates)
4.	Antecedent Moisture Content (AMC)	3 (rather wet soil at the start of a storm)

Surface flow travel times were calculated using the Kinematic Wave Equation within the DRAINS software. Flow path length, subcatchment slope, impervious and pervious percentage and roughness values were input into each catchment node to determine the flow time and associated runoff for each subcatchment.

The indicative node diagram below was developed for DRAINS on-site detention modelling purposes.



Drains Model Diagram – Proposed case



DRAINS Model Results - 100 Year ARI

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The DN600mm outlet pipeline from the On Site Detention tank accommodates opposing flow from downstream flooding effects and reduces the impact of submergence by raising the detention tank outlet higher than the flood level of RL20.90.

Below is a tabular summary of the detention tank flow performance results. The proposed flows for various storm durations shown in the light green columns do not exceed existing flows for the corresponding durations in the yellow columns.

STORMWATER DETENTION CALCULATION SUMMARY

Project: 2016-0932 191 Miller Rd Chester Hill

Effective detention storage up to RL 22.80 (lowest connected grate)

	5 YEAR ARI					20 YEAR ARI					100 YEAR ARI				
Storm Duration	Existing Runoff L/s	Detained Flow L/s	Overflow L/s	Total Outflow L/s	Max Water RL m	Existing Runoff L/s	Detained Flow L/s	Overflow L/s	Total Outflow L/s	Max Water RL m	Existing Runoff L/s	Detained Flow L/s	Overflow L/s	Total Outflow L/s	Max Water RL m
5min	302	288		244	21.35	557	364		509	21.43	944	390		522	21.54
10min	423	359		465	21.91	620	386		542	21.40	876	427		574	21.45
15min	493	371		487	21.32	807	404		558	21.38	1040	446		604	21.37
20min	515	380		497	21.27	756	420		576	21.30	1010	465		625	21.30
25min	603	388		517	21.22	822	427		562	21.25	1000	467		619	21.30
30min	544	380		505	21.22	750	419		527	21.25	936	457		602	21.29
45min	435	371		480	21.22	626	408		555	21.15	825	454		620	21.19
1.0hr	464	380		502	21.11	664	423		554	21.15	859	478		626	21.18
1.5hr	487	382		506	21.11	685	424		561	21.14	876	485		615	21.17
2.0hr	496	378		517	21.10	691	421		576	21.10	883	474		629	21.46

RESTRICTIVE PIPE OUTLET DIAMETER =	600 mm
MINIMUM INTERNAL TANK AREA =	342.0 m2
REQUIRED STORAGE VOLUME =	513 m3
DEVELOPMENT WORKS AREA =	20944 m2
EXISTING IMPERVIOUS PROPORTION =	11 %
PROPOSED IMPERVIOUS PROPORTION =	100 %
DOWNSTREAM FLOOD LEVEL RL =	20.90

It is proposed than a 600mm diameter pipe outlet would be able to adequately restrict flows from a 513m3 detention tank for the equivalent catchment of 2.0944 hectares associated with the proposed works.

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9.0 RAINWATER STORAGE

Rainwater storage requirements are often imposed on new residential developments to satisfy State Environmental Policy Building Sustainability Index (BASIX) assessment requirements. However, commercial and industrial developments generally do not have the same requirement, although Councils generally encourage rainwater reuse when the roof catchment and non-potable demand is available to make efficient use of the system.

Relatively clean runoff from the roof drainage system is normally collected for reuse purposes and remains separate from the more contaminated runoff collected from surface drainage which may accumulate leaves, sediment and other debris. Non-potable water demand includes the supply to hose taps, landscape irrigation and toilet flushing.

The following considerations can influence the decision to install a rainwater tank.

a) A large roof area can collect and direct a significant amount of water, but if non-potable demand is small, much of that water will tend to remain unused while it is being stored in a tank.
b) A small non-residential site population does not generate a large demand for toilet flushing purposes.
c) A large impervious site often has relatively small landscaped areas which do not require a large volume for irrigation purposes.
d) Delivering water at a suitable pressure and flowrate typically requires a pump system and associated electricity costs.
e) Ideally, an efficient rainwater tank system will not remain full of water and will not remain empty, but operate with a “healthy” water balance of rising and falling water levels during periods of wet weather and dry weather.

Leafguards provided on lengths of roof guttering are recommended, particularly in bushfire prone areas where dry leaves and other flammable debris may be collected at roof level. This can also reduce the pollutants which may find their way into a rainwater storage tank and cause discolouration of the non-potable water supply. A rainwater pump is to be provided to pressurise the rainwater service and maintain minimum flow performance requirements at the relevant fixtures and taps. A backup mains supply should be fitted with an appropriate backflow prevention device to ensure that contaminants in the rainwater tank will not pollute the public drinking water system and that taps will still function during a power failure.

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For stormwater concept design purposes a rainwater storage volume of 4 x minimum 10,000L tanks = 40m3 is proposed to collect a roof catchment of 6200m2 from the eastern side of the new structure. Larger tank sizes may be adopted, but manufacturers will often limit the size of the overflow pipe to maintain structural integrity.

Based on water balance calculations as summarized below, this volume would be anticipated to be adequate for non-potable demand for 89% of the time.

WATER REUSE TANK CALCULATION (based on Bureau of Meteorology rainfall records over 20 years = 7305 days from 1983 - 2002)

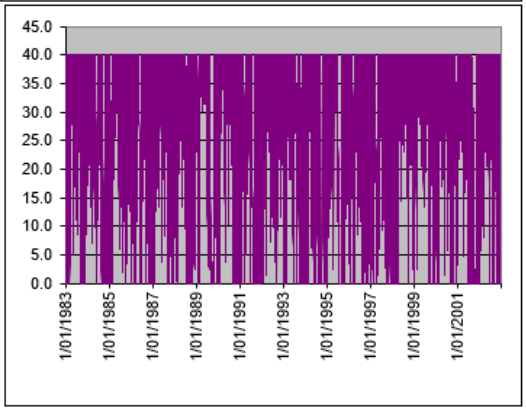
Proportion of TOTAL rainfall runoff volume drained :
83 % of drained runoff overflows from tank
17 % of drained runoff captured for reuse

20yr Runoff Coefficient =	**0.945**	based on	**100**	% impervious	proportion of drained area		
Area drained to tank =	**6200**	m2 (=	31	% of	**20200**	m2 site)	
Irrigation demand =	**4.30**	mm/day =	30.10	mm/week	for summer/spring (Sep-Feb)		
	2.15	mm/day =	15.05	mm/week	for winter/autumn (Mar-Aug)		
Irrigation area =	**1000**	m2 (=	5	% of	20200	m2 site)	
Any additional demand =	**0.27**	m3/day (e.g. laundry, toilets, car washing for NON-POTABLE USE ONLY)					
Tank Storage =	**40**	m3	(Initial storage taken as		**0**	m3 at start of year)	
Non-potable water demand =		25471.8	m3 over	7305	days		
Water from main needed for		835	days out of	7305	days =	11	% of the time (water is drawn from the mains supply)
Water drawn from main =		3294.8	m3 or kL	Rate of water reuse =		89	% of the time (the rainwater tank has sufficient water for reuse)
Water reused from tank =		22177.1	m3 over	7305	days		
Rate of water reuse =		87	% of non-potable demand supplied by tank storage				
Runoff from all storms =		129054.4	m3 (Non-potable demand is			20	% of this volume)

Max overflow volume in a day = 1262.1 m3
Storms usually peak between 2pm & 6pm due to daily heating of the earth's surface by the sun, which is a maximum during the afternoon (see www.bom.gov.au/weather/nsw/sevwx/about.shtml)
Mean overflow rate for a 4 hour duration = 88 L/s

CALCULATION NOTES
(A) = date
(B) = rainfall
(C) = runoff coeff * (B) / 1000 * area drained to tank
(D) = seasonal irrigation demand / 1000 * irrigation area + any additional non-potable demand
(E) = (C) - (D)
(F) = tank capacity if ["previous (F)" storage + (E) change in storage] exceeds capacity
(F) = 0 empty tank if ["previous (F)" storage + (E) change in storage] < 0
(F) = ["previous (F)" storage + (E) change in storage] if capacity is sufficient to store
(G) = overflow difference if ["previous (F)" storage + (E) change in storage] exceeds capacity
(G) = 0 overflow if ["previous (F)" storage + (E) change in storage] is within capacity
(H) = 1 if (F) = 0 no water stored in tank
(I) = positive (E) change in storage if (H) > 1
(I) = 0 no mains drawoff if (H) = 0 tank storage sufficient

(A) Date	(B) Sydney Airport Rainfall mm	(C) Runoff to tank m3	(D) Water Demand m3	(E) Change in storage m3	(F) Residual Tank Storage m3	(G) Overflow from Tank m3	(H) Days to fill from main	(I) Water from main m3
					0.0			
1-Jan-83	1.8	10.5	4.6	6.0	6.0	0.0	0	0.0
2-Jan-83	0	0.0	4.6	-4.6	1.4	0.0	0	0.0
3-Jan-83	19.3	113.1	4.6	108.5	40.0	69.9	0	0.0
4-Jan-83	0.2	1.2	4.6	-3.4	36.6	0.0	0	0.0
5-Jan-83	0	0.0	4.6	-4.6	32.0	0.0	0	0.0
6-Jan-83	0	0.0	4.6	-4.6	27.5	0.0	0	0.0
7-Jan-83	0	0.0	4.6	-4.6	22.9	0.0	0	0.0
8-Jan-83	0	0.0	4.6	-4.6	18.3	0.0	0	0.0
9-Jan-83	0	0.0	4.6	-4.6	13.8	0.0	0	0.0
10-Jan-83	0	0.0	4.6	-4.6	9.2	0.0	0	0.0
11-Jan-83	0	0.0	4.6	-4.6	4.6	0.0	0	0.0
12-Jan-83	0	0.0	4.6	-4.6	0.0	0.0	0	0.0
13-Jan-83	0	0.0	4.6	-4.6	0.0	0.0	1	4.6
14-Jan-83	0	0.0	4.6	-4.6	0.0	0.0	1	4.6
15-Jan-83	0	0.0	4.6	-4.6	0.0	0.0	1	4.6
16-Jan-83	0	0.0	4.6	-4.6	0.0	0.0	1	4.6
17-Jan-83	0	0.0	4.6	-4.6	0.0	0.0	1	4.6
18-Jan-83	0	0.0	4.6	-4.6	0.0	0.0	1	4.6
19-Jan-83	0	0.0	4.6	-4.6	0.0	0.0	1	4.6
20-Jan-83	0	0.0	4.6	-4.6	0.0	0.0	1	4.6
21-Jan-83	0	0.0	4.6	-4.6	0.0	0.0	1	4.6
22-Jan-83	2.8	16.4	4.6	11.8	11.8	0.0	0	0.0
23-Jan-83	0	0.0	4.6	-4.6	7.3	0.0	0	0.0



For calculation purposes:

Assumed irrigation demand is based on 30mm per week watering in Summer and Spring months, and 15mm per week in Winter and Autumn months, with a landscaped area allowance of 1000m2 on the south side of the new structure.

Non-potable demand for toilet flushing is based on an average of six 3L flushes or 18L per person per day for 15 site personnel:

15 people x 0.018m3/day per person = 0.27m3/day

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Each minimum 10,000L rainwater tank is intended to collect a series of interconnected downpipes from the eaves gutter above and drain to the detention tank via a 300mm overflow pipe.

Sample images of a prefabricated rainwater tank are included below.

Capacity: 10,000 L

Inlet Height: 1.49 m

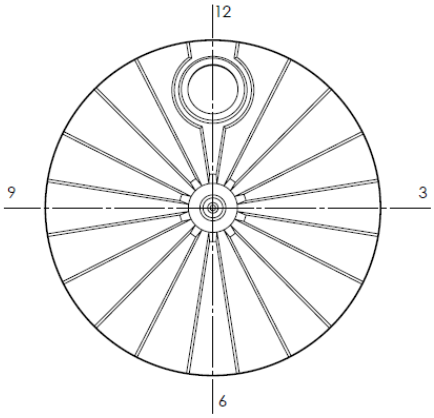
Total Height: 1.7

Diameter: 3.08 m

States Available: ACT, NSW, SA, VIC

Product Grouping: Industrial Water Tanks

Available Colours

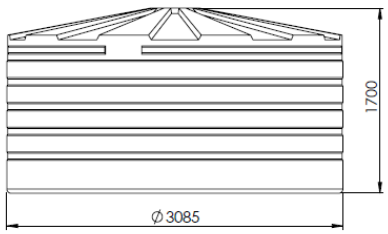


TOP VIEW

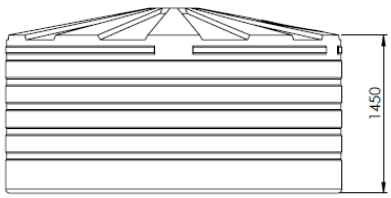
ACCESSORIES LIST

ITEM	SIZE	DETAIL	DESCRIPTION	RADIAL DEGREE	HEIGHT FROM BASE

NOTE:
Dimensions may vary due to the rotational moulding process, Bushmans recommends top and sides clearance of 100mm minimum when estimating space required for the tank.



REAR VIEW



SIDE VIEW

TS2200 V001		
HEIGHT (mm)	WIDTH (mm)	VOLUME (LTR)
1700	3085	10000

Bushmans INDUSTRIAL

BUSHMANS INDUSTRIAL
BUSHMANS HEAD OFFICE
GPO 4218, NSW, SYDNEY, 2001 WWW.BUSHMANTANKS.COM.AU

Drawn	TP	Project Title	TS2200 V001
Date	04/10/2016	Material	LLDPE
Scale	1:30	Finish	-

Drawing Title: TS2200 Industrial Grade 10,000L Schematic

All Size Drawing Sheet of

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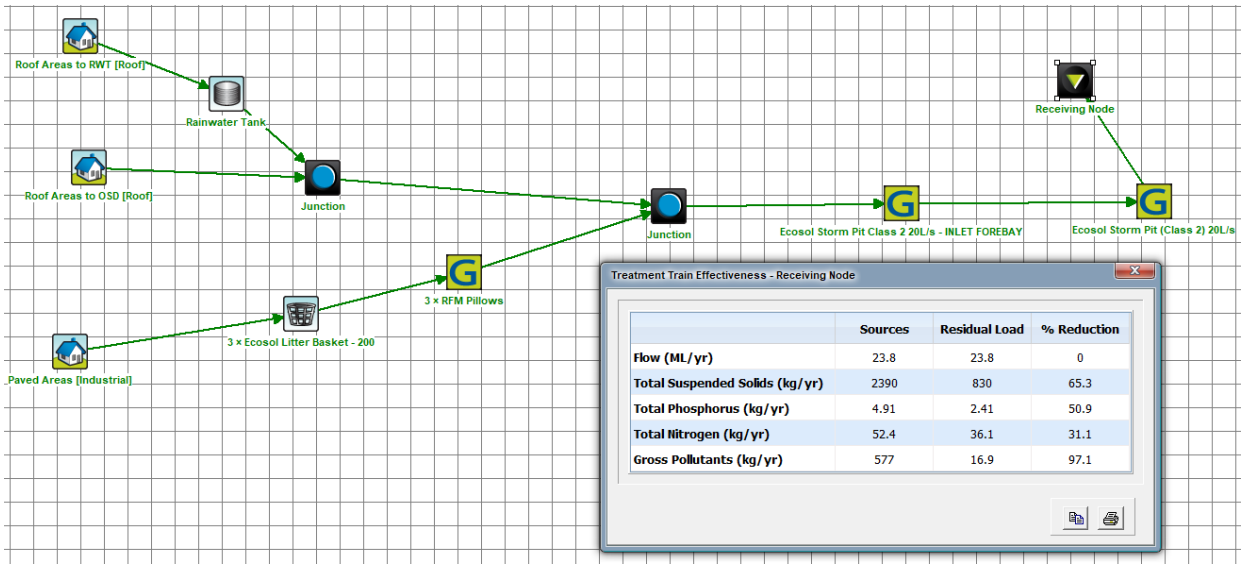
10.0 STORMWATER QUALITY IMPROVEMENT MEASURES

Stormwater quality improvement devices are typically selected to satisfy the relevant pollutant target performance criteria as demonstrated by a software package known as MUSIC (Model for Urban Stormwater Improvement Conceptualisation). Refer to the screenshot below for MUSIC model performance characteristics.



	Sources	Residual Load	% Reduction
Flow (ML/yr)	23.8	23.8	0
Total Suspended Solids (kg/yr)	2390	830	65.3
Total Phosphorus (kg/yr)	4.91	2.41	50.9
Total Nitrogen (kg/yr)	52.4	36.1	31.1
Gross Pollutants (kg/yr)	577	16.9	97.1

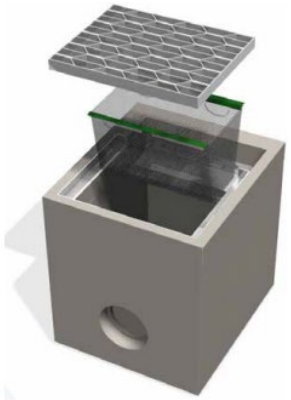
Although the 2 hectare site area is predominantly roofed, it has been conservatively assumed that about half of the covered area could contain surface contaminants being conveyed at ground level and be considered as paved runoff rather than “clean” roof runoff. Most of the actual stormwater runoff would be collected from the new roof and remain unpolluted.

Proposed measures include the following items to achieve beneficial environmental effects :-

- ❖ 40m3 rainwater tank storage collecting roofwater runoff for non-potable demand;
- ❖ Ecosol litter baskets to collect gross pollutants
- ❖ Ecosol Storm Pit Class 2_20L filtration device

Sample images of the Ecosol devices are included below.

Ecosol™ Litter Basket



Ecosol™ Storm Pit (Class 2)

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11.0 TEMPORARY EROSION & SEDIMENT CONTROL MEASURES

During construction works the management of soil and water movement requiring erosion and sediment control is to be undertaken in accordance with the Landcom publication *Soils and Construction: Managing Urban Stormwater 4th Edition, March 2004* (also known as "the Blue Book") and local Council requirements.

The following **Erosion and Sediment Control Assessment** references the Blue Book guidelines.

Assumed area of soil disturbance = 20200m2
Take Rainfall Erosivity Factor R = 2750 for Chester Hill (from Appendix B: Map 10 on Page B-12)
Take Site Slope = 2%
Indicative Erosion Hazard is Low (based on Section 4.4.1 Figure 4.6 on Page 4-10)
Used Revised Universal Soil Loss Equation (RUSLE) to check:
Take Soil Erodibility Factor K = 0.047 (from Appendix C: Table 20 for Birrong on Page C-104)
Take Slope Length/Gradient Factor LS = 0.41 (from Appendix A: Using 80m Length in Table A1 on Page A-9)
Take Erosion Control Practice Factor P = 1.3 (from Appendix A: Figure A5 on Page A-12)
Take Ground Cover & Management Factor C = 1.0 (from Appendix A: Figure A5 on Page A-12)
Soil Loss = 2750 x 0.047 x 0.41 x 1.3 x 1.0 = 69t/ha/yr
Soil Loss Class = 1 (between 0 & 150t/ha/yr) (based on Section 4.4.2 Table 4.2 on Page 4-13)
Erosion hazard is therefore Very Low & there are no seasonal restrictions on site activity
For a soil density of 1.0t/m3 Average Annual Soil Loss = 69m3/yr
Since this is less than 150m3/yr, a sediment basin is not considered necessary (refer to Section 6.3.2(d) on Page 6-8)
For the area to be disturbed on this site, sediment fences are considered satisfactory (refer to Section 2.1 on Page 2-1, Section 4.4.1(a) on Page 4-9 & Section 4.3.2(h)(iv) on Page 4-4).
Lengths of sediment fencing should be arranged to limit subcatchment flows to 50L/s (refer to Section 6.3.7(e) on Page 6-34 & Section 2.3.1(e) on Page 2-4)
For 10yr 5min Intensity = 155mm/h & 10yr 1hr Intensity = 48.4mm/h a fully pervious area of up to 2800m2 can be accommodated by one length of sediment fencing (refer to Figure 6-10 on Page 6-34)

During construction works temporary measures are anticipated to include:-

- Sediment fencing on the low side of earthmoving operations;
- A gravel layer at the construction vehicle access point into the area of works
- Regular monitoring of soil movement characteristics and cleaning of sediment deposits as required during construction
- Regular dewatering of low points in the excavation works as necessary
- Security fencing around the area of construction works

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12.0 CONCLUSION

The assessment of soil and water considerations for the development works are summarised as follows:

1. Beneficial impacts to soil and water movement are anticipated as a result of the proposed facility upgrade, with unobstructed overland flow paths generally maintained in the natural direction of fall dictated by the existing surface topography. The existing southern earth channel is to planted with landscaping, improving the stability of the surface which formerly experienced the movement of loose earth material. Existing underground drainage routes are to be preserved, with additional new pits and pipes discharging to the existing drainage easement passing through the western neighbour at 195 Miller Road.
2. Stormwater flows across the proposed works area are to be managed with a new on-site detention storage system, including provision for the capture of gross pollutants and sediment to improve the quality of discharge from the premises. Extensive impervious concrete slab paving will also reduce existing infiltration and leaching from waste materials into the underlying soil.
3. Modelling of stormwater quality improvement has been undertaken with MUSIC software to demonstrate associated pollutant reduction percentages.
4. Rainwater tanks are proposed to capture a large quantity of rainfall collected on the new roof surface and reduce drawoff from the public potable main water supply by addressing non-potable irrigation and toilet flushing demand with the stored rainwater supply. Based on the estimated demand, water balancing calculations indicate adequate rainwater storage would be available for 89% of the time.
5. Flooding impacts have been addressed with consideration for stormwater system report information provided by Canterbury Bankstown Council, and a detention tank design that reduces submergence effects by positioning the tank so that its discharge outlet is higher than the downstream flood level.

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APPENDIX A

Environmental Assessment Requirements Correspondence

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NSW GOVERNMENT | Planning & Environment

Contact: Emma Barnet
Phone: (02) 9274 6412
Email: emma.barnet@planning.nsw.gov.au

Mr Chris Wilson
CW Strategic Planning Services
PO Box 42
Forestville NSW 2087

Our ref: MP 06_0052 MOD 3

Dear Mr Wilson

Chester Hill Materials Recycling Facility (MP 06_0052 MOD 3)
Environmental Assessment Requirements (EARs)

I refer to your letter dated 17 November 2017, seeking Secretary's environmental assessment requirements to modify the Minister's approval for the Chester Hill Materials Recycling Facility at 191 Miller Street, Chester Hill in the City of Canterbury Bankstown local government area.

In accordance with section 75W(3) of the *Environmental Planning and Assessment Act 1979* (EP&A Act), the Secretary may notify the Proponent of environmental assessment requirements (EARs) with respect to the proposed modification. The Proponent must comply with these requirements before the matter is considered by the Minister. The EARs below have been prepared in consultation with the Environmental Protection Authority (EPA), Roads and Maritime Services (RMS), Department of Primary Industry, Fire and Rescue NSW (FRNSW) and the City of Canterbury Bankstown Council (Council), and are based on the information provided to date. The Department is still waiting on comments from FRNSW, these will be provided as soon as they are received.

Your modification request should be accompanied by an Environmental Assessment (EA) which addresses the requirements of the agencies (refer to **Attachment A**) and includes the following:

- **Description of the modification**
- **Need and justification for the modification**
- **strategic context**, including:
  - demonstration that the proposal is consistent with all relevant legislation, strategies, environmental planning instruments and development control plans (DCPs); and
  - demonstration that the proposal is subject to section 75W of the EP&A Act.
- **other approvals**, including the identification of any proposed variations to other licences and approvals.
- **suitability of the site,** including:
  - details of all approvals and approved plans for the existing facility, including for all structures, plant and equipment;
  - results of any recent independent audits of the operation of the existing facility against the approval; and
  - a detailed justification that the site can accommodate the proposed increase in processing capacity, having regard to the scope of the operations of the existing facility and its environmental impacts and relevant mitigation measures.
- **details of the existing operations on the site**, including:
  - existing and approved operations/facilities, including any statutory approvals that apply to these;
  - a summary of the existing conditions of approval that would be relevant to the proposal;
  - a summary of the existing environmental management and monitoring regime;
  - detailed plans of the existing and proposed site layout; and
  - detailed plans of all structures proposed to be constructed and modified.
- **description of the modification**, including:
  - a detailed description of the proposed modification, including changes to the operation of the site and likely staging;

- details of any workshop or garaging of waste vehicles;
- the justification and need for the modification;
- details of any requested changes to the approved conditions of approval; and
- an assessment of all potential impacts of the proposal on the existing environment and measures to avoid, minimise, mitigate and/or manage these potential impacts.

- **waste management** – including:
  - details of how waste will be managed during the demolition of structures and relocation of waste material on-site;
  - a detailed plan and programme for the removal of all waste on site including any asbestos waste;
  - a description of the waste streams that would be accepted at the site including maximum daily, weekly and annual throughputs and the maximum volume of waste to be stored on site at any one time;
  - a description of waste processing operations, including a description of the technology to be installed, resource outputs and their intended fate, and the quality of control measures that would be implemented;
  - details of how waste would be stored and handled on-site, transported to and from the site and details of how the receipt of non-conforming waste would be dealt with; and
  - the measures that would be implemented to ensure the development is consistent with the aims, objectives and guidance in the NSW *Waste Avoidance and Resource Recovery Strategy 2014-2021.*
- **noise and vibration,** including a quantitative assessment of the construction, operation and transportation noise and vibration impacts on all affected receivers, prepared in accordance with relevant Environment Protection Authority guidelines.
- **air quality and odour,** including a quantitative assessment of the potential air quality, dust and odour impacts for all phases of the proposal in accordance with relevant Environment Protection Authority guidelines.
- **traffic and access**, including:
  - a traffic impact assessment for all phases of the modification which considers traffic types and volumes likely to be generated, impacts on road safety and impacts on the capacity of the road network including the intersections of Hume Highway and Miller Road and Miller Road and Christina Road; and
  - justification for the site access arrangements, internal road network and parking arrangements.
- **soil and water**, including:
  - an assessment of potential impacts to soil and water resources, topography, hydrology, drainage lines or watercourses near the site;
  - details of stormwater/wastewater/leachate management systems including the capacity and integrity of on-site detention systems and measures to treat, reuse or dispose of water;
  - characterisation of the surface water quality at any discharge point against relevant water quality criteria and proposed mitigation measures to manage any impacts to surface water or groundwaters impacts;
  - a revised site water balance and a detailed description of the measures to minimise water use at the site; and
  - an assessment of flooding impacts associated with the development including details of the flood liability of the site and changes to flooding behaviour.
- **fire and incident management** – including:
  - identification of the aggregate quantities of combustible waste products to be stockpiled at any one time;
  - identification of foreseeable on-site and off-site fire events and other emergency incidents; and
  - technical information on the environmental protection equipment to be installed on the premises such as air, water and noise controls, spill clean-up equipment and fire (including management of fire water, location of fire hydrants and water flow rates at the hydrant) management and containment measure;
- **hazards**, including a preliminary risk screening completed in accordance with *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development* and *Applying SEPP 33* (DoP, 2011), with a clear indication of class, quantity and location of all dangerous goods and hazardous materials associated with the development. Should preliminary screening indicate that the project is "potentially hazardous" a Preliminary Hazard Analysis (PHA) must be prepared in accordance with *Hazardous* Industry *Planning Advisory Paper No. 6 - Guidelines for Hazard Analysis* (DoP, 2011) and *Multi-Level Risk Assessment* (DoP, 2011).

- **contamination**, including:
  - a detailed assessment of the extent and nature of any contamination of the soil, groundwater and soil;
  - an assessment of potential risks to human health and the environmental receptors in the vicinity of the site;
  - a description and appraisal of any mitigation and monitoring measures; and;
  - consideration of whether the site is suitable for the proposed development.

  visual, including:
  - a description of the potential visual impacts from proposed buildings and associated structures; and
  - details of the measures proposed to minimise visual impacts, such as landscaping.
- **a table indicating where each element of the EARs is addressed in the EA**.
- **identification of conditions to be modified including a detailed justification**.

In addition, you must also directly consult with other relevant government agencies including but not limited to the EPA, RMS, FRNSW and Council in preparing the EA, and provide a detailed account of the results of the consultation.

Following the provision of the EA, the Department will advise you of the applicable fee (under Division 1A, Part 15 of the *Environmental Planning and Assessment Regulation 2000*) and consultation requirements.

If you have any enquiries about these requirements, please contact Emma Barnet on the above details.

Yours sincerely

Chris Ritchie
Director
Industry Assessments
As delegate of the Secretary

20/12/17.

ATTACHMENT A

APPENDIX B

Stormwater System Report

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E: info@lp-consulting.com.au
A: Suite 9.04, Level 9, 109 Pitt Street Sydney NSW 2000
P: P.O. Box 814 Kensington NSW 1465

ACN: 165 018 968
ABN: 61 165 018 968

Level 1, 66 - 72 Rickard Road, Bankstown NSW
PO Box 8, Bankstown NSW 1885
Tel: (02) 9707 9010 - Fax: (02) 9707 9408
DX 11220 BANKSTOWN
council@cbcity.nsw.gov.au

CITY OF CANTERBURY BANKSTOWN

To: Mr John Wills
Suite 1C, 79 Oxford St
BONDI JUNCTION NSW 2022

STORMWATER SYSTEM REPORT
191 Miller Road, CHESTER HILL NSW 2162

Date: 23-Feb-2017
Ref: WP-SIA/156/2017
Development type: **Industrial**

NO — FLOOD/OVERLAND FLOW STUDY REQUIRED

The site is affected by the following Council stormwater system components:

- Variable width drainage easement located along the western site boundary the site.
- Overland flowpath [floodway] for excess stormwater runoff from the upstream catchment and associated with the drainage system located south & west of the site.

The site will be subject to stormwater inundation from this overland flowpath during large storm events. Refer to the attached **"100 Year ARI Flood Extent Maps from Villawood Catchment Study"** showing the flood contours to m AHD**. Provision should be made on site, and at boundary fences, for this stormwater runoff to pass unobstructed over the site. Stormwater flowing naturally onto the site must not be impeded or diverted.

For this development, a flood /overland flow study to determine the 100 year ARI* water surface level is not necessary provided that the **proposed development including floor levels, shall comply with the development controls specified in Part B12 Schedule 5, of Bankstown's Development Control Plan 2015 - Catchments Affected by Stormwater Flooding.**

The Development Application submission shall be based on an AHD datum for levels where sites are affected by overland flow / flooding. Refer Bankstown Council's *Development Engineering Standards**.**

The proposed development including floor levels, shall comply with the development controls specified in Part B12 Schedule 5, of Bankstown's Development Control Plan 2015 - Catchments Affected by Stormwater Flooding.

Runoff on the site, and naturally draining to it is to be collected and disposed of to Council's requirements detailed in Bankstown Council's *Development Engineering Standards****.

All structures and buildings must be located clear of pipelines and easements. Proposed structures may require special footings due to their proximity to stormwater easements and pipelines. Refer to Bankstown Council's *Development Engineering Standards****.

This report is given without the benefit of development plans or a site survey. Council may choose to vary some report requirements following evaluation of detailed plans when they are submitted.

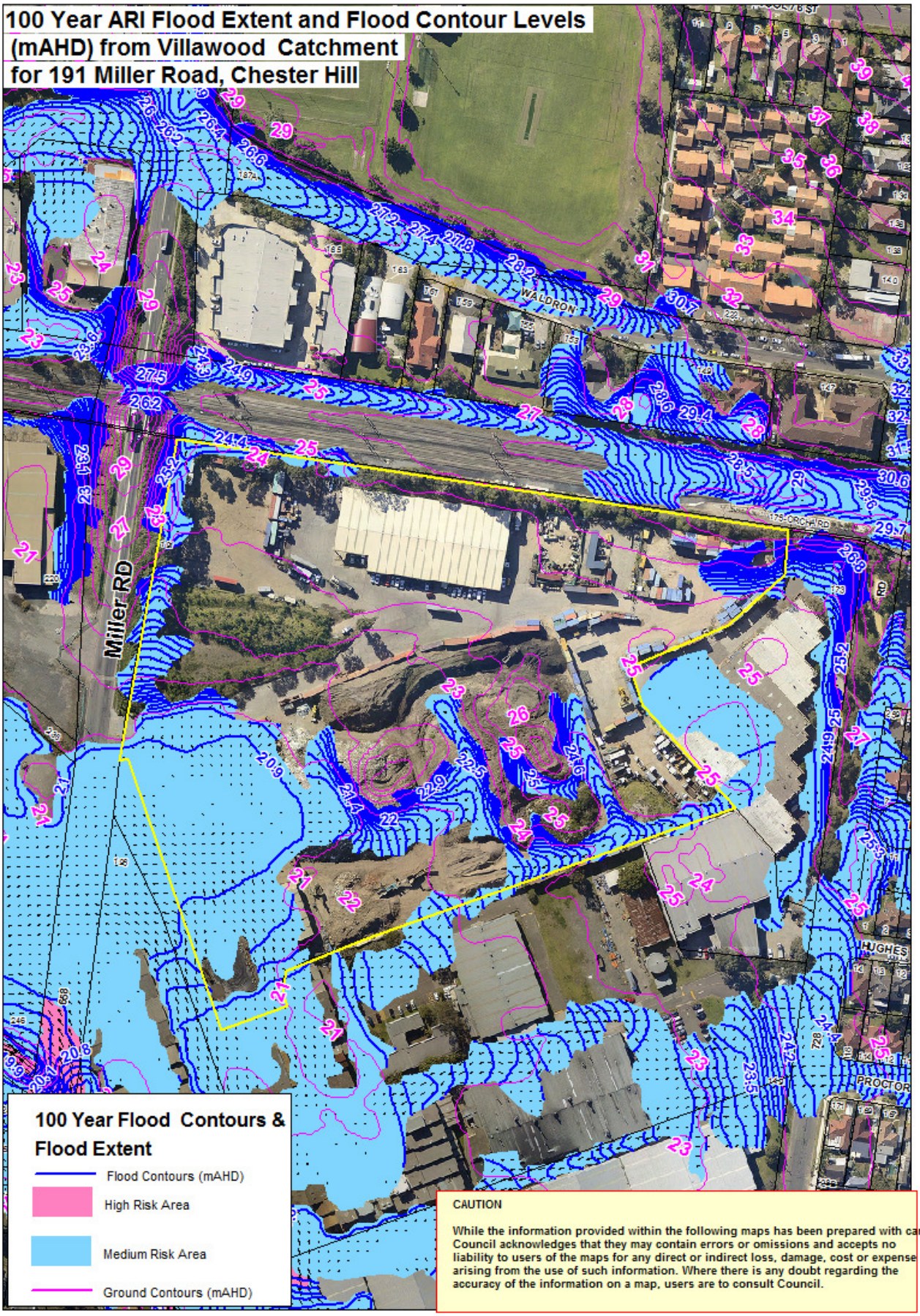
This report relates to the exposure of the subject site to Council's stormwater system, both underground and overland. It does not assess the suitability or otherwise of this site for the proposed development.

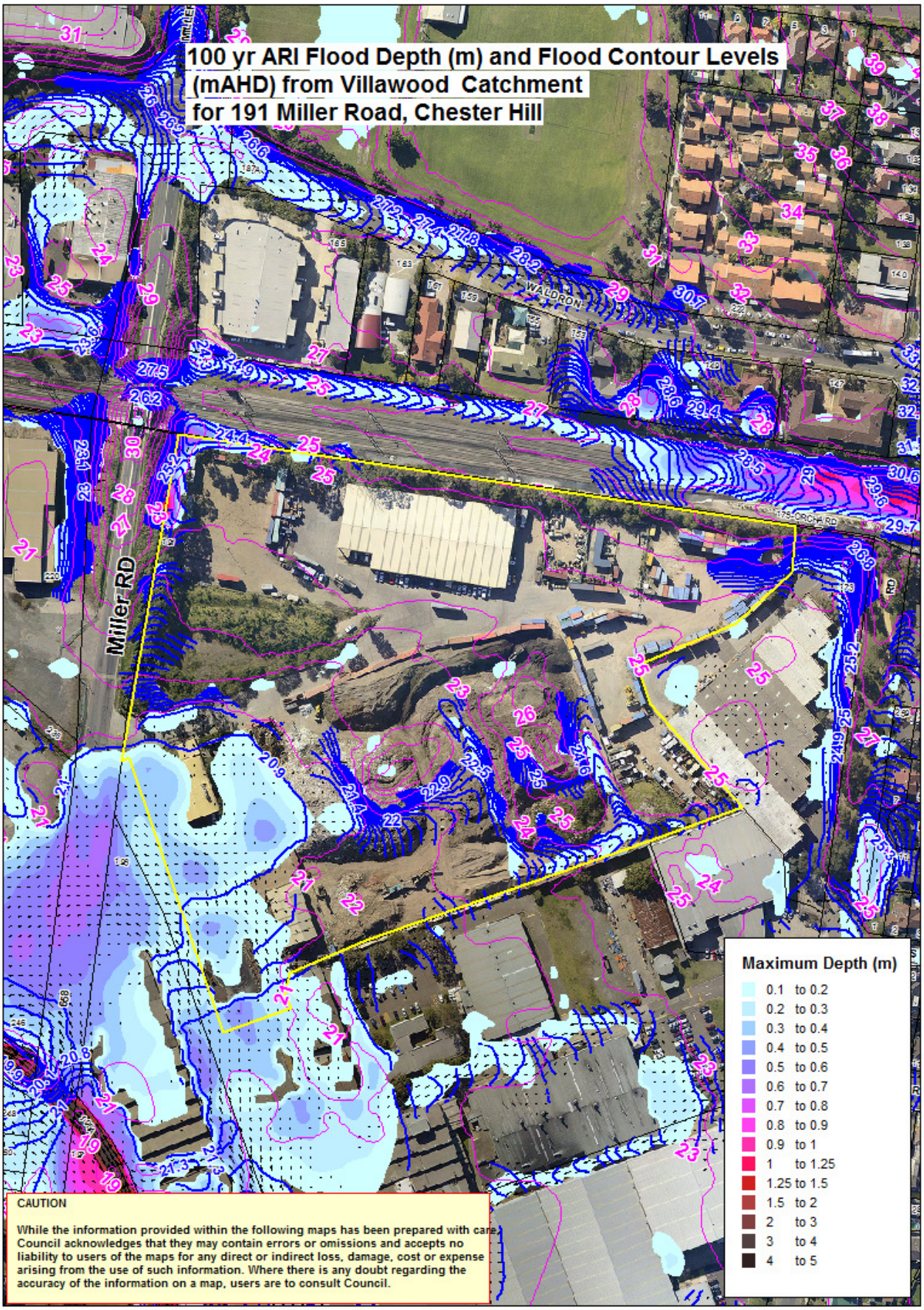
* Average Recurrence Interval

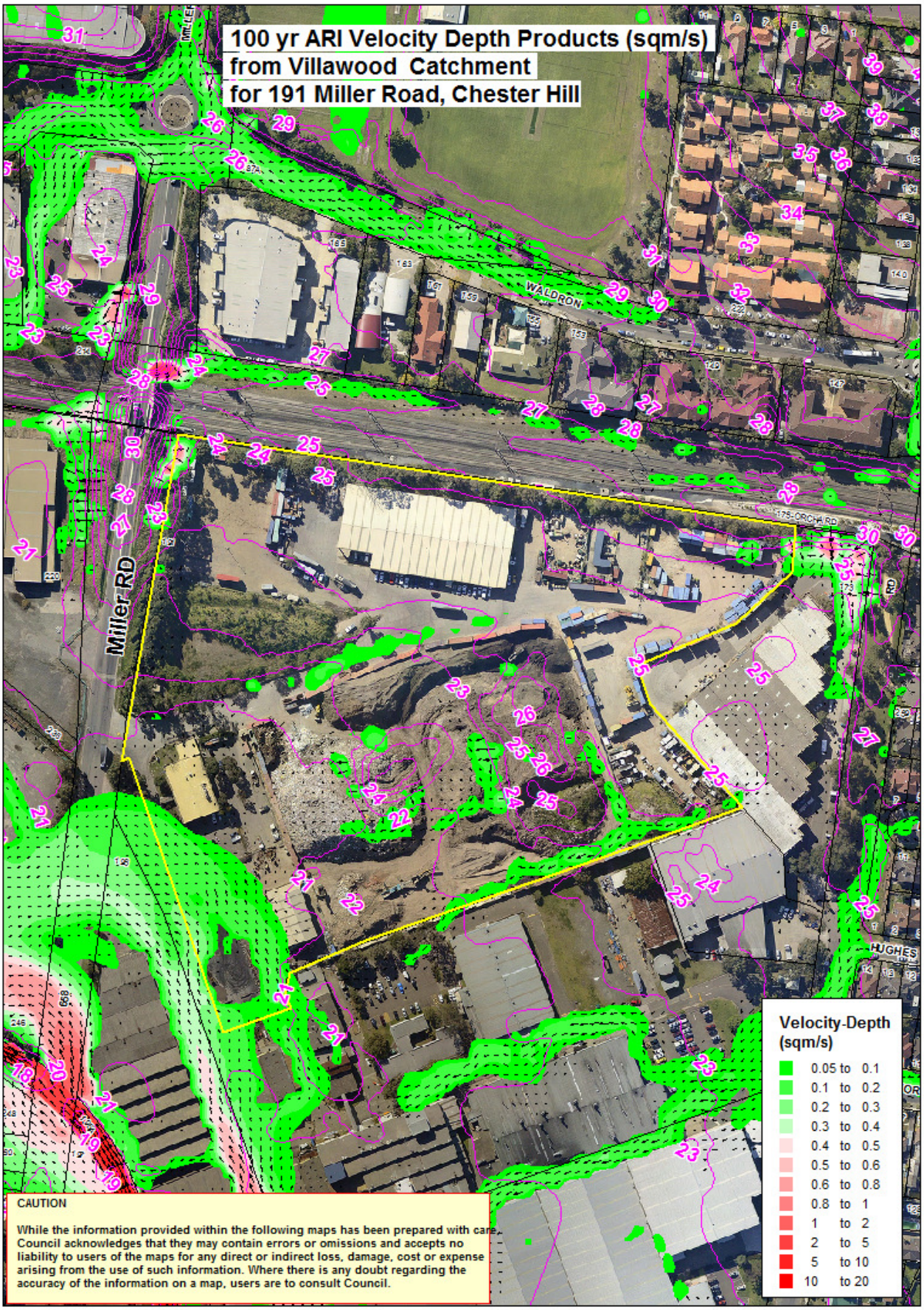
** Australian Height Datum

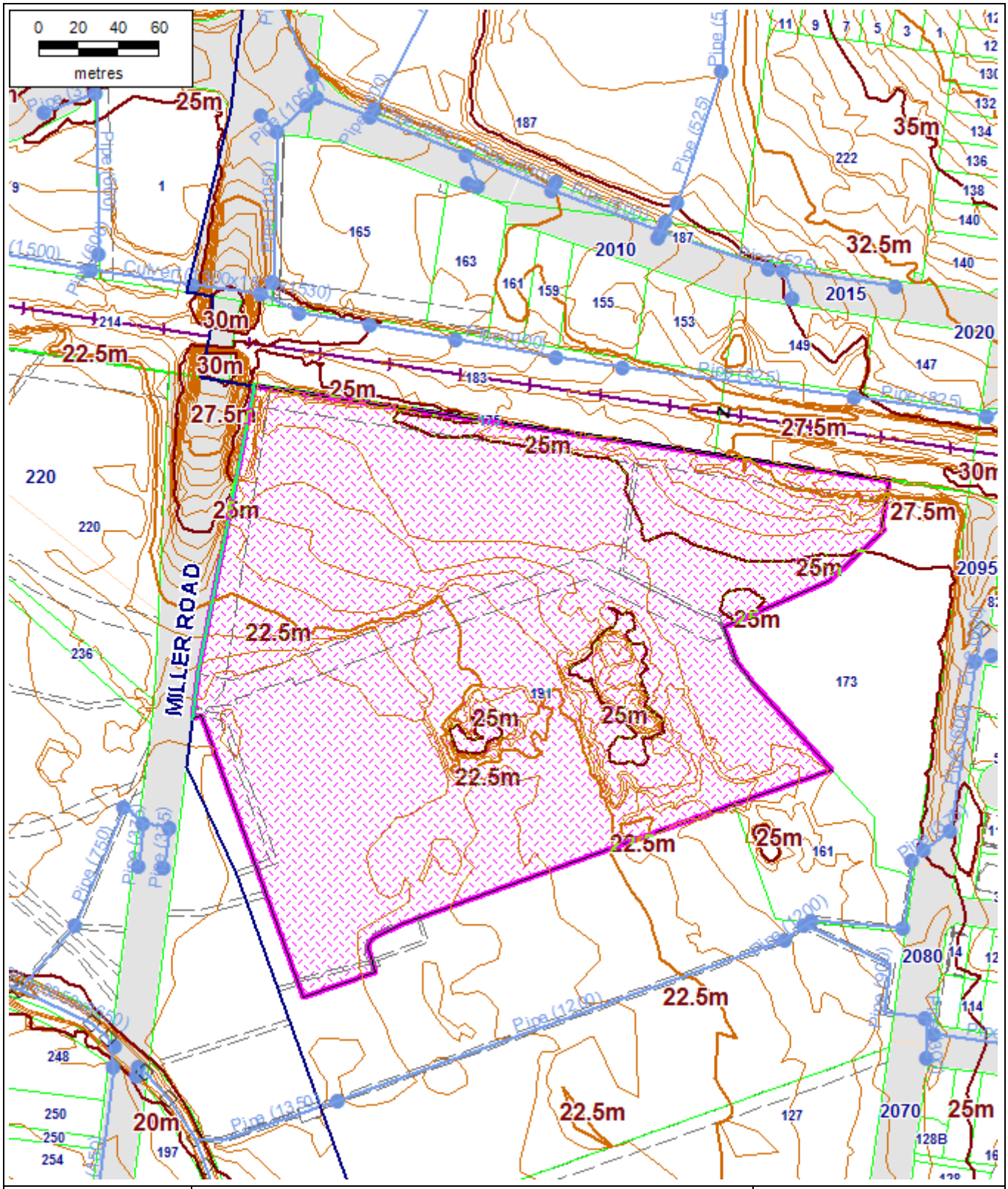
*** Bankstown Council's *Development Engineering Standards* and *Bankstown's Development Control Plan 2015* is available from Council's Customer Service Centre.

Pushpa Goonetilleke
ENGINEER


100 Year ARI Flood Extent and Flood Contour Levels (mAHD) from Villawood Catchment for 191 Miller Road, Chester Hill
Miller RD
WALDRON
ORCHARD
HUGHES
PROCTOR
100 Year Flood Contours & Flood Extent
Flood Contours (mAHD)
High Risk Area
Medium Risk Area
Ground Contours (mAHD)
CAUTION
While the information provided within the following maps has been prepared with care, Council acknowledges that they may contain errors or omissions and accepts no liability to users of the maps for any direct or indirect loss, damage, cost or expense arising from the use of such information. Where there is any doubt regarding the accuracy of the information on a map, users are to consult Council.


100 yr ARI Flood Depth (m) and Flood Contour Levels (mAHD) from Villawood Catchment for 191 Miller Road, Chester Hill
Miller RD
WALDRON
CHESTER HILL RD
Maximum Depth (m)
0.1 to 0.2
0.2 to 0.3
0.3 to 0.4
0.4 to 0.5
0.5 to 0.6
0.6 to 0.7
0.7 to 0.8
0.8 to 0.9
0.9 to 1
1 to 1.25
1.25 to 1.5
1.5 to 2
2 to 3
3 to 4
4 to 5
CAUTION
While the information provided within the following maps has been prepared with care, Council acknowledges that they may contain errors or omissions and accepts no liability to users of the maps for any direct or indirect loss, damage, cost or expense arising from the use of such information. Where there is any doubt regarding the accuracy of the information on a map, users are to consult Council.


100 yr ARI Velocity Depth Products (sqm/s)
from Villawood Catchment
for 191 Miller Road, Chester Hill
Miller RD
WALDRON
175 ORCHARD RD
HUGHES
Velocity-Depth (sqm/s)
0.05 to 0.1
0.1 to 0.2
0.2 to 0.3
0.3 to 0.4
0.4 to 0.5
0.5 to 0.6
0.6 to 0.8
0.8 to 1
1 to 2
2 to 5
5 to 10
10 to 20
CAUTION
While the information provided within the following maps has been prepared with care, Council acknowledges that they may contain errors or omissions and accepts no liability to users of the maps for any direct or indirect loss, damage, cost or expense arising from the use of such information. Where there is any doubt regarding the accuracy of the information on a map, users are to consult Council.



1:2,775
15 May 2018

191 Miller Road, Chester Hill

GIS Map

DISCLAIMER: COUNCIL EXPRESSLY DISCLAIMS ALL LIABILITY FOR ERRORS OR OMISSIONS.
THIS PLAN HAS NO LEGAL STANDING

The NEW City of CANTERBURY BANKSTOWN

1:2,775
15 May 2018

191 Miller Road, Chester Hill

Aerial Map

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THIS PLAN HAS NO LEGAL STANDING

The NEW City of CANTERBURY BANKSTOWN

Legend

- Suburb
- Drainage Conduits
- Drainage Devices
- Sydney Water
- Contour Major 5m
- Contour Intermediate 2.5m
- Contour Minor 0.5m
- Parcel
- Parcel Associate
- Parcel Vinculum
- Jetty
- Easements
- Road Boundaries
- Aerial Photo 2014(LPI)
- Road Names
- Road Sections
- Airport Internal Road
- Water Boundary
- Railway
- Airport Taxiway