Preliminary Servicing Strategy

Planning Proposal

for

16-21 Cusack Place
Yass NSW 2582

Lot 1 DP 1007355

and

Lots 2, 3 & 4 DP 1185025

Prepared for

Catalyze Property Consulting Pty Ltd

5QS Ref: 218025/A

2 November 2021

5QS CONSULTING GROUP

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Prepared for:

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Prepared by:
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Table of Contents

1 Introduction

1 5QS Consulting Engineers NSW/ACT has been commissioned by Catalyze Property Consulting Pty Ltd to prepare a Preliminary Servicing Strategy as part of a planning proposal to rezone Lot 1 DP1007355 and Lots 2, 3 and 4 in DP1185025 [*the Site*] from their existing zoning of R5 – Large Lot Residential with 2ha minimum lot sizes, to R1 – Residential with 700m^2 minimum lot sizes.

2 The Site is 42.88ha and is located on the southern side of Yass between Wee Jasper Road to the west and Cusack Place to the south. The eastern boundary abuts large lot residential development on Dobbins Drive and Craig Close and the Northern site boundary abuts a mix of developed and underdeveloped residential land.

3 The smallest current minimum lot size [*MLS*] in Yass is 700m^2. An indicative upper yield of 700m^2 residential lots able to be developed on the Site, based on a site allowance of 1000m^2 per lot, which takes into account an allowance for land required for road construction and infrastructure etc., was assessed to be in the order of 420 lots. However, the actual lot yield will be approximately 300 lots when the impact of development constraints are taken into account in the detailed subdivision design.

4 The Preliminary Servicing Strategy has not been based on a specific subdivision layout and is not intended to be indicative of a specific future development proposal.

5 This report provides a preliminary servicing strategy for water supply, sewer, stormwater and floodwater management to demonstrate the Site is appropriate for rezoning from a servicing perspective. Detailed design of the individual services is outside of the scope of this Preliminary Servicing Strategy and will be undertaken at Development Application stage.

6 The Site is impacted by easements for high voltage overhead power lines owned by Transgrid and Essential Energy. It has been assumed during the development of the preliminary serving strategy that poles supporting overhead power lines owned by Essential Energy may be relocated within the existing easements wherever necessary to enable future services to be constructed across such easements. This detail will be resolved as part of the detailed design work to accompany the DA.

2 Site Description

2.1 Topography

7 Topographically the Site straddles a north south trending ridge with a side slope down to the east at grades of 5 - 10% for distances varying from 50m to 250m. The Site slopes from the ridge down to the west at slopes progressively reducing from 10% to a south to north trending drainage depression located approximately 500m to the west. The Site then rises over a low spur with side slopes of up to 2% to Wee Jasper Road, a further 200m to the west.

8 The Site varies in elevation from 530m AHD on the western drainage depression, rises to 563.5m AHD on the central knoll at the ridge and falls to 542mAHD on the two shallow drainage depressions crossing the eastern boundary.

9 The Site contained four distinct drainage catchments.

i. A catchment, of approximately 11.27ha, on the eastern side to the ridge draining east towards developed rural residential properties beyond the eastern property boundary.

ii. A basin, of approximately 8.72ha, to the north and west of the ridge draining northward toward a combination of developed and undeveloped urban residential properties.

iii. A generally concave planar catchment, of approximately 19.82ha, to the west of the ridge draining to a shallow south to north drainage depression which conveys overland flow stormwater from a catchment located to the south of the Site, northward through the Site.

iv. A small catchment, of approximately 3.05ha, on the western side of the low south-north trending spur between the drainage depression and Wee Jasper Road drained to the west toward Wee Jasper Road.

10 The stormwater catchments may be seen in the attached drawing 218025/PSS-01.

2.2 Soil Landscape

11 The site lies within the Boorowa Soil Landscape as described in the *Soil Landscapes of the Goulburn 1:250,000 Sheet* published by the Soil Conservation Service of NSW (1991). [*Ref V*]

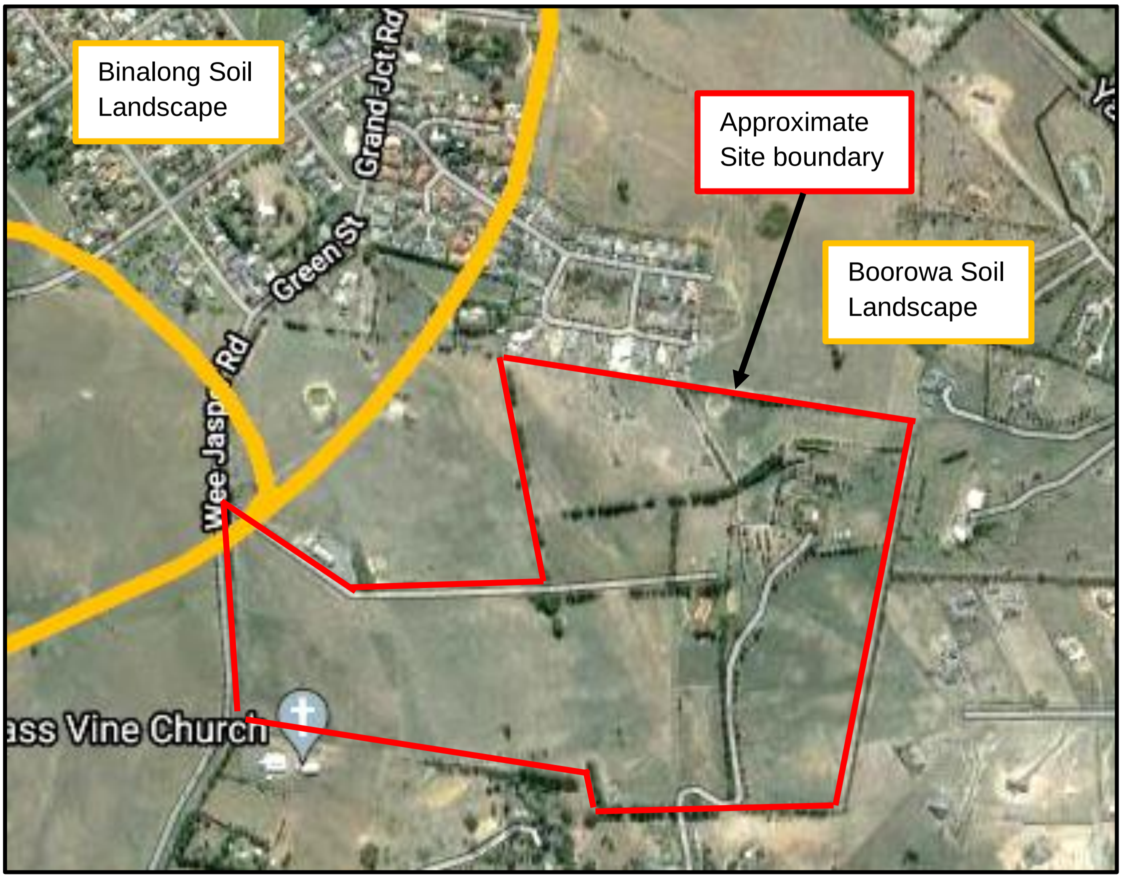


Fig 1 – Extract from the Soil Landscapes of the Goulburn 1:250 000 sheet

12 The Boorowa Soil Landscape occurs on gently undulating to undulating rises near Boorowa and between Yass and Murrumbateman, formed on coarse porphyritic rocks of the Douro Volcanics. The soils on crests and slopes are yellow to light reddish duplex soils similar to Yellow Podzolic Soils. Soil reaction is neutral. Mottling of the subsoil is common and this usually overlies a slightly alkaline grey yellow mottled, medium to heavy clay layer which may have an undulating upper boundary. This has been interpreted as an earlier land surface (vanDijk 1959) or a subsolum feature (van Dijk 1969). Other soils include Red and yellow Earths and non-calcic Brown Soils with Yellow Solodic Soils in drainage lines.

13 The Boorowa Soil Landscape landform is typically gently undulating low rises and hills with slope gradients 1 – 10% on a local relief < 30m. There are permanent erosional stream channels some gullying of drainage lines that are non-directional to convergent, integrated or interrupted tributary drainage patterns. Elevations vary between 530 and 600m AHD.

Table 1 - *Summary of Key Features of Yellow Podsolic Soils:*

Feature	Description
Landform element	Sideslopes
Surface condition	Hardsetting
Drainage	Moderate to imperfect
Soil permeability	Moderate
Watertable depth	Usually not present
Depth to bedrock	>1.5m
pH (topsoil)	5.5 – 6.0
Soil salinity	Not present
USCS (subsoil)	CL, CH

2.3 Geology

14 The Yass Special 1:50,000 Geology map (Part Sheet 8628) [*Ref VI*] indicates the Site is underlain by five different geological units of the Silurian and Siluro-Devonian Periods as shown in the image in Fig 2 and described in Table 2, below.

Table 2 – *Geological Member Descriptions*

	Member	Description
	Quaternary Residual Soil	Residual deposits of clayey, coarse to fine grained sand and sandy clay with sporadic ferruginous to siliceous, pebble to cobble-sized corestones.
Shby	Yarwood Siltstone Member	Fossiliferous calcareous mudstone or siltstone (Lower Trilobite Bed)
Sdws	Yanawe Formation	Beige, medium-grained, moderately sorted quartz-lithic volcanic sandstone, interbedded with very fine-grained volcanic sandstone, bedding is poorly developed.
Sdwu	Yanawe Formation	Medium to very fine-grained, thin- to medium-bedded, massive arkosic to volcanic-rich sandstone, limestone and calcareous mudstone (included undifferentiated Sdwe, Sdwx, Sdwg and Sdwt).
Sdyc	Cliftonwood Limestone Member	Well-bedded stromatolitic calcareous mudstone, poorly fossiliferous black limestone, micritic nodular limestone, intraclastic limestone, and interbedded mudstone and fine- to medium-grained sandstone; algal biomicrite and intramicrudite with abundant shelly fossils.

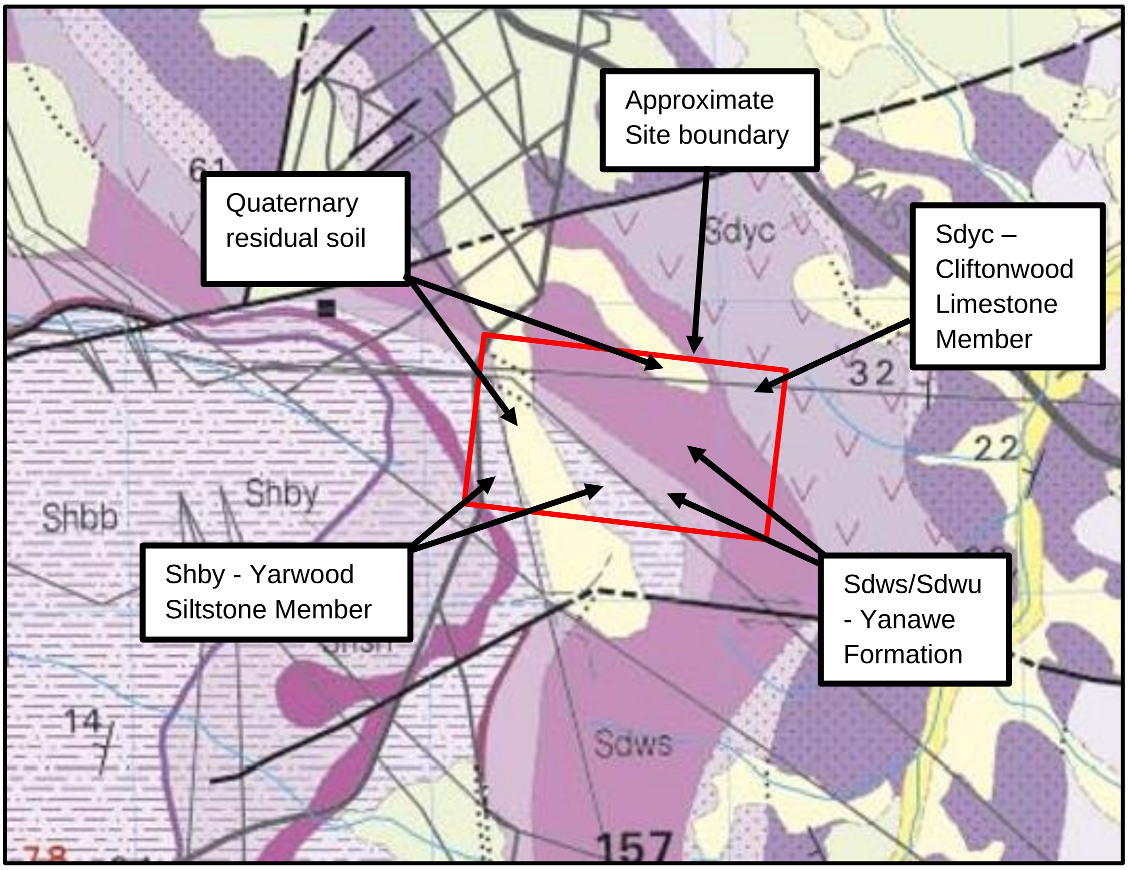


Fig 2 - Extract of the Yass Special 1:50,000 Geology (Part Sheet 8628)

2.4 Groundwater Bores

15 The Site is within the Murrumbidgee River basin. A search of registered groundwater bores on http://realtimedata.waternsw.com.au:80/allgroundwatersitedetails/allgroundwatermap/southwestregion/ identified two registered groundwater bores on the Site: GW055660 and GW404259. The groundwater bore locations may be seen on Drawing/PSS-01, attached. The WaterNSW Work Summary sheet for each groundwater bore is attached.

Table 3 - *Registered Groundwater Bore Logs*

GW055660		
From (m)	**To (m)**	
0	10.0	Clay
10.0	31.0	Slate
Water Bearing Zone		28.0m – 29.0m below surface level
Standing Water Level		10.0m below surface level

GW404259		
From (m)	**To (m)**	
0	6.0	Clay bands
6.0	19.0	Decomposed Granite
19.0	29.0	Soft Granite
29.0	90.0	Granite
Water Bearing Zone		28.0m – 29.0m below surface level
Standing Water Level		10.0m below surface level

2.5 Developed Site Lot Yield

16 The Site has an area of 42.88ha which encompasses 4 catchments which impact on the provision of sewer and stormwater drainage.

17 An indicative upper yield of 700m^2 residential lots able to be developed on the Site, based on a site allowance of 1000m^2 per lot, which takes into account an allowance for land required for road construction and infrastructure etc, was assessed to be in the order of 420 lots.

18 After considering the impact of constraints on the development of the Site, a realistic estimate of the potential yield of lots in each of the catchment areas has been assessed to be in the order of approximately 300 lots, distributed as indicated in Table 4, below.

Table 4 - *Potential Development Lot Yield*

Catchment	Area (ha)	Lot Yield
1	3.05	15 - 20
2	19.82	100 - 120
3	11.77	75 - 85
4	8.71	65 - 75

2.6 Site Constraints

19 The Site was assessed to be impacted by the following potential constraints which will need to be addressed during the detailed design of the services for the Site:

2.5.1 Floodwater

20 A shallow depression extends through the western portion of the Site and conveys stormwater runoff from the southern stormwater Catchment 5 through the Site to Lot 52 DP1255194.

Plate 1 - Northern view along the drainage depression though Lots 51 & 52 DP1255194 from the northern boundary of Lot 2 DP1185025

Plate 2 – Floodway from the Site discharging through a multi-pipe culvert at Green Street. Southern view towards the Site.

21 The flood modelling and mapping undertaken by Lyall & Associates as part of the Yass Floodplain Risk Management Study and Plan [*Ref VII*] was terminated within Lots 51 & 52 of DP1255194. The hydraulic categorisation of the floodplain for the 1% Annual Exceedance Probability (AEP) storm event reported on the Yass Floodplain Risk Management Study and Plan Fig 2.15 (sheet 2 of 4), attached, identified the drainage depression to be a floodway with flood storage along the edges of the drainage depression.

22 The provision for routing the anticipated floodwater through the Site will need to be addressed in the detailed design of the road network and stormwater management infrastructure as part of the DA process.

2.6.2 Electrical Easements High Voltage Overhead Power Lines

23 The Site is encumbered by easements and overhead high voltage transmission powerlines for 22kV, 66kV and 132kV services.

24 Development within the easements is limited, however, the installation of services in close proximity of the towers, poles and guys will need to be carefully managed in the design and construction stages.

25 Relocation of poles supporting the 22kV power lines may be a cost-effective option in some circumstances.

2.6.3 Developed Adjoining Rural Residential Properties

26 Rural residential properties on Dobbin Drive and Craig Close contiguous with the eastern boundary of the Site have been developed in a manner that will provide limited opportunity for the provision of easements to convey concentrated stormwater flows from the Site to O'Briens Creek, approximately 800m downslope to the east of the Site.

Plate 3 – Development at the western end of Craig Close on the alignment of the outlet path from Detention Basin 3

27 Alternate strategies for the management of stormwater and sewage will be required and can be resolved as part of the detailed design process to support the DA.

2.6.4 Remote Access to Existing Sewerage Network

28 The Site is remote from the Yass Valley Council's Sewerage pipe network. The nearest point of connect by gravity drainage is to an access chamber in the eastern side verge at 112 Grand Junction Road and the southern side verge of Lumdsen Avenue.

3 Water Supply

29 A DN100 water main extends along the eastern side of Wee Jasper Road, along Gums Lane and along Cusack Place.

30 The existing water main will need to be augmented in order to provide reticulated town water to a possible 300 new residential dwellings and associated firefighting hydrants.

31 Connection to the existing or augmented water main can occur at the location of the access road from Wee Jasper Road into the Site and at the northern end of Cusack Place. Connection at 2 locations will provide for a loop service through the Site.

32 A future connection to the council's water reticulation network could occur from Lumsden Avenue or future development within Lot 2 DP1166247.

33 Subject to detailed design, the elevation change of 30m across the site, which equates to a 300kPa pressure loss for the higher lots compared to the lower level lots, may require the water pressure to be boosted in order to ensure a minimum service pressure of 200kPa (20m head) is available for domestic use and firefighting purposes under peak demand conditions.

34 The Yass Valley Settlement Strategy 2036 (August 2019) at page 57 noted that at the completion of the raising of the Yass Dam in 2013, the dam could cater for a total of 6008 residential connections. By 2019 there were 3284 residences connected to the Yass Dam water supply, leaving a spare capacity of 2784 connections.

35 A water main reticulation concept has been provided in drawing PSS-02, attached. Preliminary design indicates that the reticulation pipe network will comprise a combination of DN100 to DN200 pipes to provide sufficient capacity at adequate service pressure.

4 Sewer

36 Topographically, the Site has 4 catchments that could be drained by gravity sewer networks.

37 The Eastern Catchment could include approximately 75 to 85 lots. The Eastern Catchment is unable to be connected by a gravity main to a council sewer network to the east of the Site. An 85 lot subdivision would not be cost effective to be serviced by a dedicated sewer pump station which would transfer sewage via a rising main to a gravity main located on the western side of the ridge.

38 A directional drilled tunnel for a gravity sewer main from a collection well located adjacent to the eastern Site boundary, draining to the gravity sewer network in the Central Catchment on the western side of the ridge could deliver sewage from the Eastern Catchment to a gravity system. The gravity main required to be constructed beneath the ridge to connect the Eastern Catchment to the Central Catchment would be in the order of 600m long.

39 The sewer main would be drilled through a mixture of sedimentary and soft volcanic rocks described in Section 2.2 and the groundwater borehole logs summarized in Table 3. The depth of the under-hill directional drilled gravity main would vary up to 25m below the overlying ground surface level.

40 The Central Catchment, which could include up to approximately 100 to 120 lots, and the Eastern Catchment would connect to the council's sewer network at a chamber located in Grand Junction Road, approximately 600m north of the Site, shown in Plate 4. The connecting gravity main would need to pass through Lot 52 DP1255194 and the undeveloped extension of the Grand Junction Road reserve located between Lot 1 DP781307 and Lot 4 DP833773.

41 The Northern Catchment which could contain approximately 65 to 75 lots, would be able to drain to the north through Lot 2 DP1166247 and connect to the council's gravity sewer network at an access chamber located in the southern verge of Lumsden Avenue at the eastern side of Lot 1 DP1137506, shown in Plate 5.

42 The Western Catchment which could contain 15 to 20 lots, falls towards Wee Jasper Road and may be difficult to drain by a conventional gravity main. Domestic effluent from residential development in the Western Catchment, where not able to be drained by gravity sewers to the Central Catchment area, could, subject to lot size, be managed

by On-site Wastewater Management or be collected and conveyed to the gravity system in the Central Catchment via a pressure sewer system.

43 A gravity sewer reticulation concept that could drain residential development on the Site has been provided in drawing PSS-03, attached.

Plate 4 - Potential connection of the Central Catchment area to the sewer access chamber in Grand Junction Road in front of house No 112.

Plate 5 - Potential connection of the Northern Catchment area to the sewer access chamber at the eastern end of Lumsden Ave.

5 Stormwater and Floodwater Management

5.1 Stormwater Management

44 The Site contained four distinct stormwater drainage catchments, summarized in Table 5, below.

Table 5 - *Stormwater Catchments*

Catchment	Area (ha)	Description
1	3.05	A small catchment on the western side of the low south-north trending spur between the drainage depression and Wee Jasper Road drained to the west toward Wee Jasper Road.
2	19.82	A generally concave planar catchment to the west of the ridge draining to a shallow south to north drainage depression which also conveys overland flow stormwater from a 5th catchment located to the south of the Site, northward through the Site.
3	11.27	A steep catchment on the eastern side to the ridge draining east towards developed rural residential properties beyond the eastern property boundary
4	8.72	A steep basin to the north and west of the ridge draining northward toward a combination of developed and undeveloped urban residential properties.

45 The stormwater catchments may be seen in the attached drawings: 218025/PSS-01 & 04.

46 Catchment 1 will discharge directly to Wee Jasper Road. There is no stormwater drainage infrastructure in Wee Jasper Road, therefore, development within Catchment 1 that was able to limit developed run off to Wee Jasper Road would be an advantage.

47 Catchment 2, will need to discharge managed stormwater flows into the shallow depression / floodway extending through Lot 51 and Lot 52 DP1255194, Lot 1 DP781307 and Lot 2 DP725457, before discharging into multi-pipe culvert beneath Green Street, shown in Plate 2. It is understood that the owners of these Lots are open to establishing easements that are reasonably required to achieve this outcome and have confirmed this intention via a letter.

48 It is anticipated that an off-line detention basin will be required in Catchment 2, in order to manage the storage, detention and release of the developed stormwater runoff from Catchment 2, while allowing runoff from Catchment 5 to flow through the Site unimpeded or routed through an integrated stormwater management system in Catchment 2.

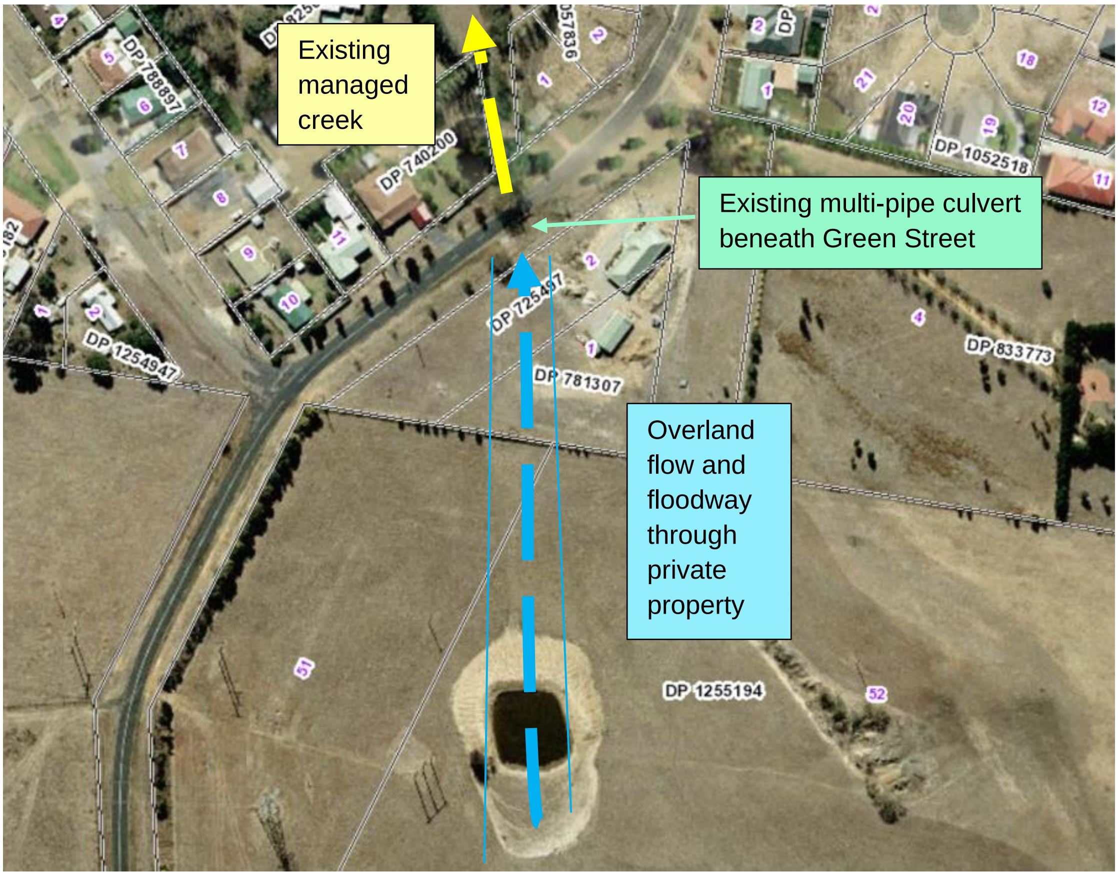


Fig 3 – Overland floodway from Catchment 2

49 Catchment 3 will need to discharge managed stormwater flows into a table drain located on the northern side of Craig Close, see Plate 3, which conveys existing stormwater runoff from the large lot residential properties on Craig Close to O'Briens Creek, some 800m to the east of the Site.

50 It is anticipated that management of the stormwater runoff from residential development within Catchment 3, with require 2 in-line stormwater detention basins located on drainage depressions upslope of the eastern property boundary in order to limit the discharge to the pre-developed runoff flows.

51 Discharge of stormwater runoff from Catchment 3 is expected to be discharged into Lots 13 & 12 DP1092801, however, this will be subject to detailed design and negotiations with the owners of these properties. In the event that this is not achievable, other strategies will be investigated and implemented.

52 Catchment 4 will need to discharge managed stormwater flows into a trunk drainage pipeline that will need to be extended along Lumsden Avenue, approximately 50m north of the Site. Major overland flows in excess of the capacity of the pipeline will need to be routed to Lumsden Avenue.

53 It is anticipated that management of the stormwater runoff from residential development within Catchment 4, with require an in-line stormwater detention basin located on drainage depressions upslope of the northern property boundary in order to limit the discharge to the pre-developed runoff flows.

54 Discharge of stormwater runoff from Catchment 4 is expected to be discharged into Lot 2 DP1166247 before reaching Lumsden Avenue.

55 Preliminary assessment of the required volume of stormwater runoff that will need to be stored in each basin in order to limit the stormwater discharge for the Site to pre-development flows is summarized in Table 6, below.

Table 6 - *Indicative Detention Basin Storage Volumes*

Catchment	Detention Basin No	Storage Volume (m^3)
2	1	2,300
3	2	750
3	3	700
4	4	1,000

56 The residential development would be able to be serviced by a conventional pit and pipe network collecting and conveying minor flows for a storm events nominated by Council with o=major overland flows being routed along the road network or dedicated floodways.

57 The use of Water Sensitive Urban Design [WSUD] techniques could be advantageous on the Site as this has the potential to reduce the developed runoff flows and improve the water quality of the runoff.

5.2 Floodwater Management

58 Catchment 5, located to the south of the Site will introduce a small amount of overland flow run-on to Catchment 2 and 3.

59 In addition, Catchment 5 will discharge concentrated run-on to the southern end of the shallow drainage depression in Catchment 2. The concentrated flows will need to be routed though Catchment 2 by either ensuring the flow can pass through Catchment 2 unimpeded or route the flow into the Catchment 2 detention system.

6 Conclusion

60 This report demonstrates that subject to detailed design at DA stage, the Site can be adequately serviced to support residential development. As such, the Planning Proposal can be supported from a servicing perspective.

Rob Barker

FIE Aust, CPEng, NER (Civil, Structural)
APEC Engineer, IntPE(aus)

7 Reference Documents

I. Yass Valley Settlement Strategy 2036 (August 2019)

II. Water Supply Code of Australia – V 3.1

III. Gravity Sewerage Code of Australia – V 3.1

IV. Australian Rainfall & Runoff - Book IV – Estimation of Peak Discharge

V. *Soil Landscapes of the Goulburn 1:250,000 Sheet* published by the Soil Conservation Service of NSW (1991).

VI. Yass Special 1:50,000 Geology (Part Sheet 8628) - NSW Trade & Investment Resources & Energy

VII. Yass Floodplain Risk Management Study and Plan, Lyall & Associates

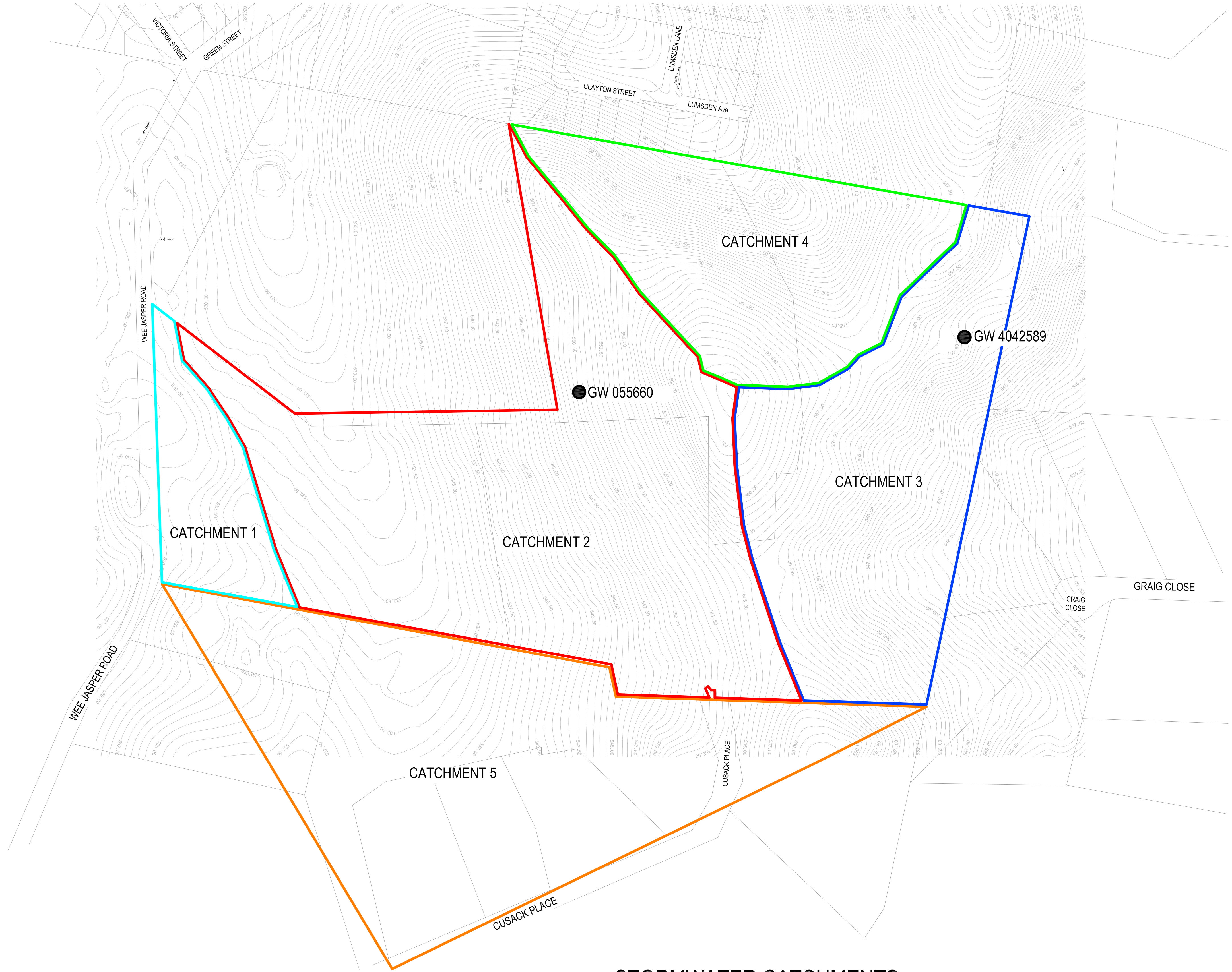
VIII. Floodplain Development Manual: the management of flood liable land – NSW

IX. NSW Flood Prone Land Policy

Index to Annexures

Annexure 1

5QS Drawings: 218025 /PSS – 1 to 4



STORMWATER CATCHMENTS

SCALE 1:5000

LEGEND

- EXISTING PROPERTY BOUNDARY
- CATCHMENT 1 = 3.05ha
- CATCHMENT 2 = 19.82ha
- CATCHMENT 3 = 11.27ha
- CATCHMENT 4 = 8.72ha
- CATCHMENT 5 = 17.4ha
- GW REGISTERED GROUND WATER BORE.

DATA SOURCE: © Department Finance, Services & Innovation [14/05/2018]

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-	15.10.21	Report Issue	RB	ST	RB

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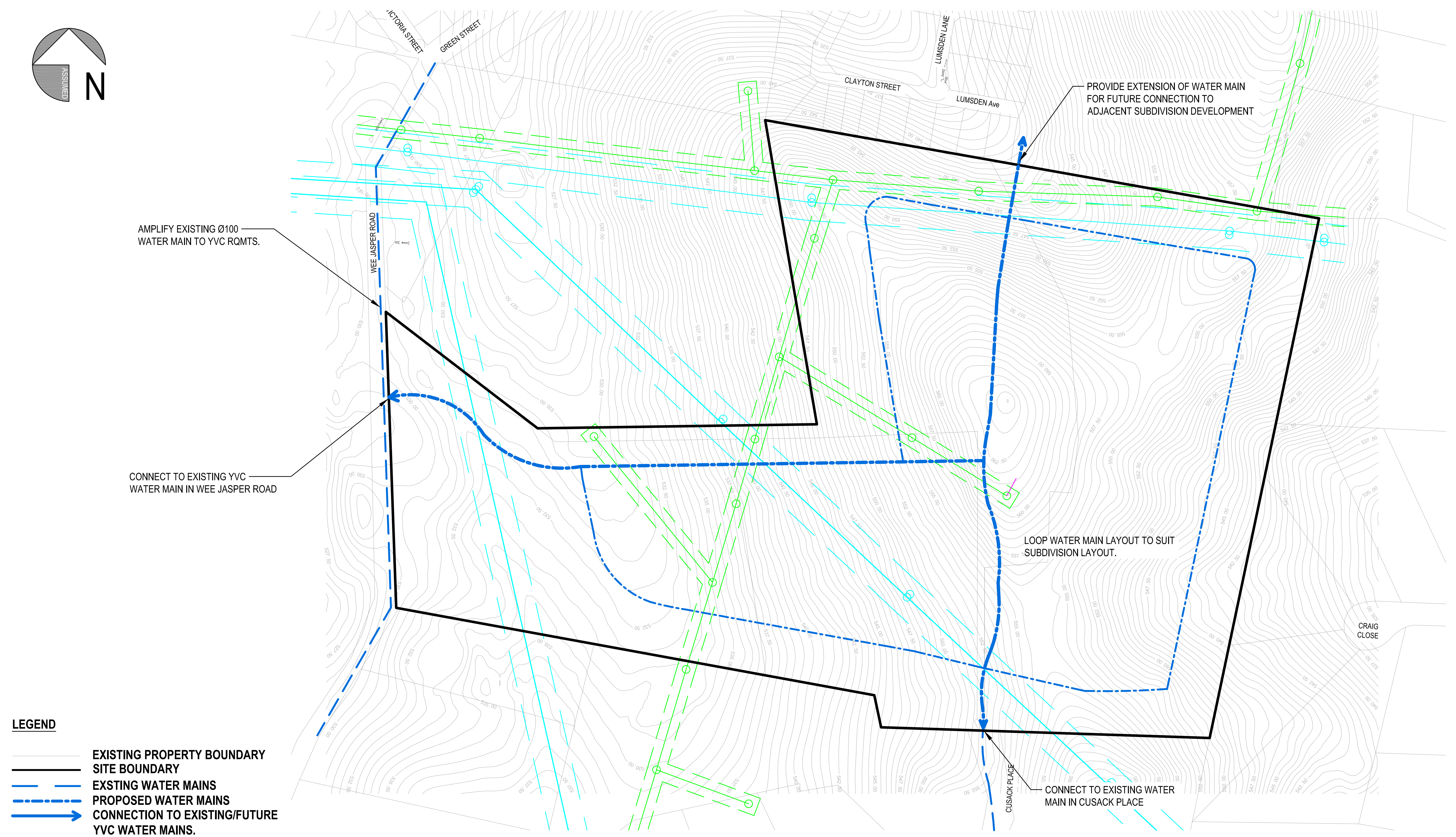
STORMWATER CATCHMENTS
PROPOSED REZONING
LOT 1 DP1007355, LOTS 2, 3 & 4 DP1185025
CATALYZE PROPERTY CONSULTING

Drawing: 218025
Sheet: PSS - 01
Revision: -
Original Sheet Size: A3



WATER MAIN RETICULATION CONCEPT

SCALE 1:4000

DATA SOURCE: © Department Finance, Services & Innovation [14/05/2018]

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WATER MAIN RETICULATION CONCEPT
PROPOSED REZONING
LOT 1 DP1007355, LOTS 2, 3 & 4 DP1185025
CATALYZE PROPERTY CONSULTING

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Sheet: PSS - 02
Revision: -
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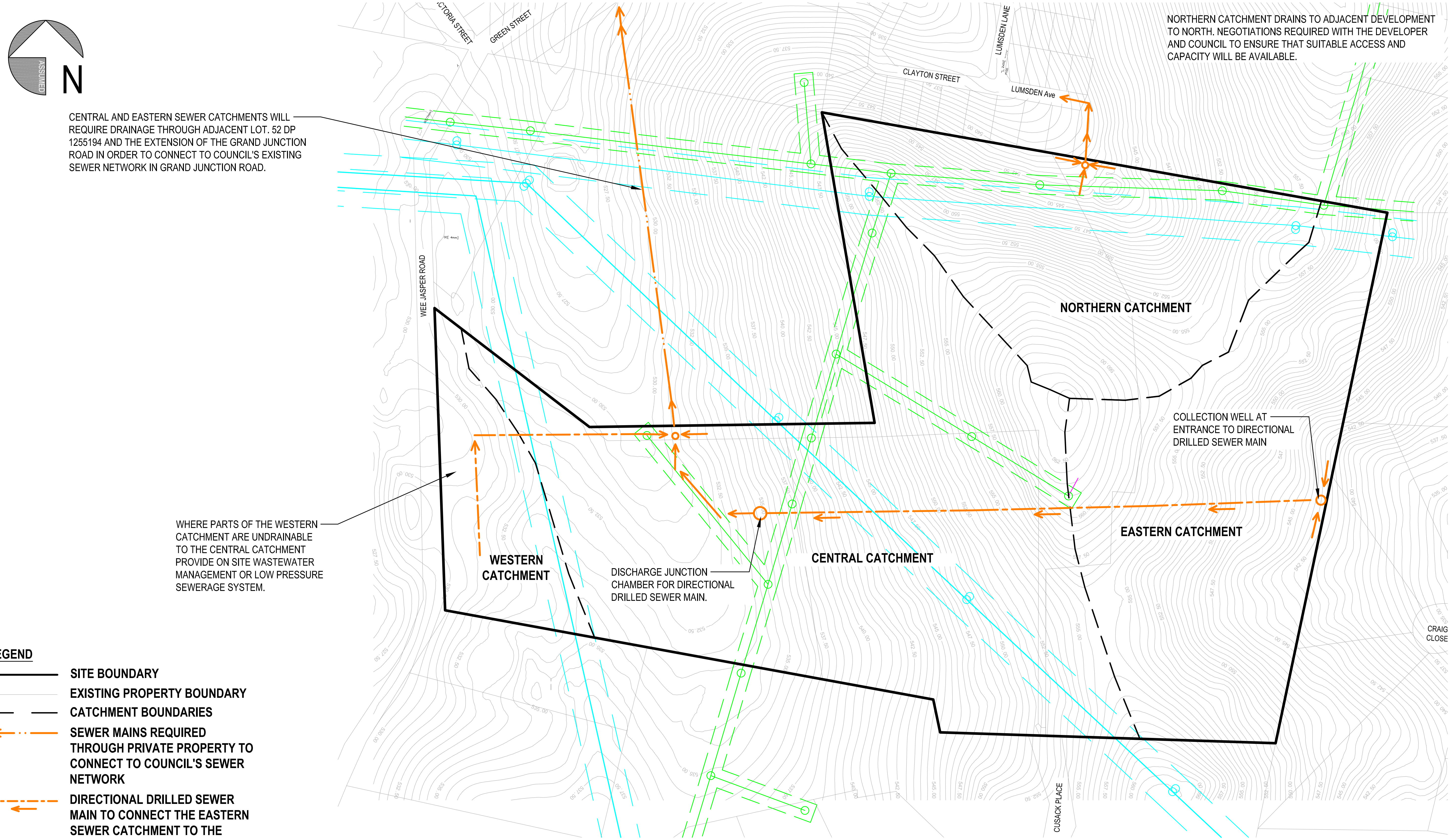

LEGEND

SITE BOUNDARY
EXISTING PROPERTY BOUNDARY
CATCHMENT BOUNDARIES
SEWER MAINS REQUIRED THROUGH PRIVATE PROPERTY TO CONNECT TO COUNCIL'S SEWER NETWORK
DIRECTIONAL DRILLED SEWER MAIN TO CONNECT THE EASTERN SEWER CATCHMENT TO THE CENTRAL SEWER CATCHMENT

SEWER RETICULATION CONCEPT

SCALE 1:4000

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SEWER RETICULATION CONCEPT
PROPOSED REZONING
LOT 1 DP1007355, LOTS 2, 3 & 4 DP1185025
CATALYZE PROPERTY CONSULTING

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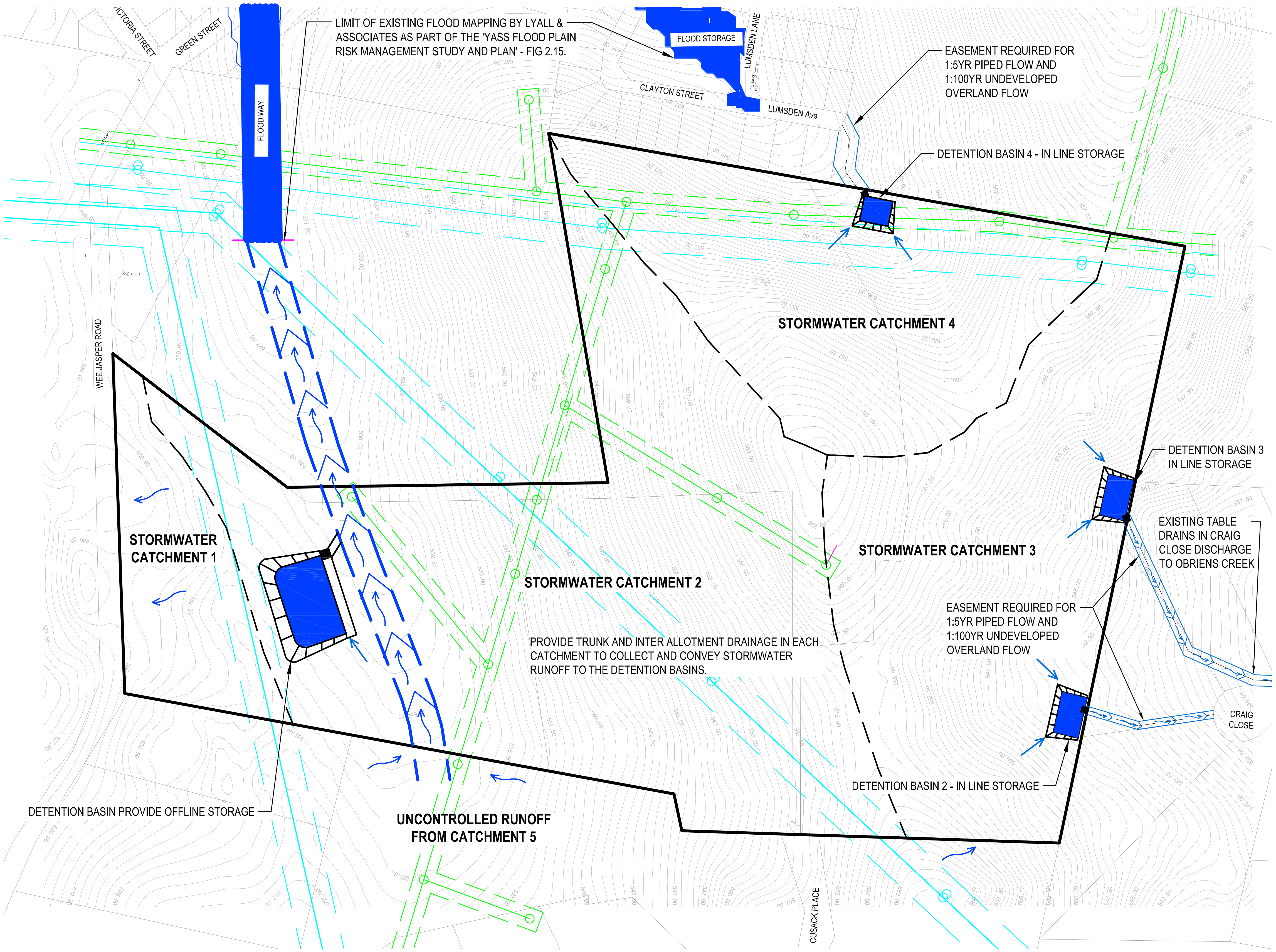
Sheet: PSS - 03
Revision: -
Original Sheet Size: A3



DETENTION BASINS
PROVIDE STORMWATER DETENTION STORAGE FOR DIFFERENCE IN RUNOFF BETWEEN DEVELOPED AND UNDEVELOPED SITE FOR ALL STORM EVENTS UP TO 1% AEP, OR AS OTHERWISE SPECIFIED BY COUNCIL

LEGEND

- SITE BOUNDARY
- EXISTING PROPERTY BOUNDARY
- CATCHMENT BOUNDARIES
- OVER LAND FLOW FLOOD WAY
- FLOOD WAY FROM LYALL & ASSOCIATES AS PART OF THE 'YASS FLOOD PLAIN RISK MANAGEMENT STUDY AND PLAN' - FIG 2.15.

STORMWATER & FLOODWATER CONCEPT

SCALE 1:4000

NOTES:
ANY EASEMENTS REQUIRED ARE SUBJECT TO NEGOTIATIONS WITH LAND OWNERS.

DATA SOURCE: © Department Finance, Services & Innovation [14/05/2018]

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STORMWATER & FLOODWATER MANAGEMENT CONCEPT
PROPOSED REZONING
LOT 1 DP1007355, LOTS 2, 3 & 4 DP1185025
CATALYZE PROPERTY CONSULTING

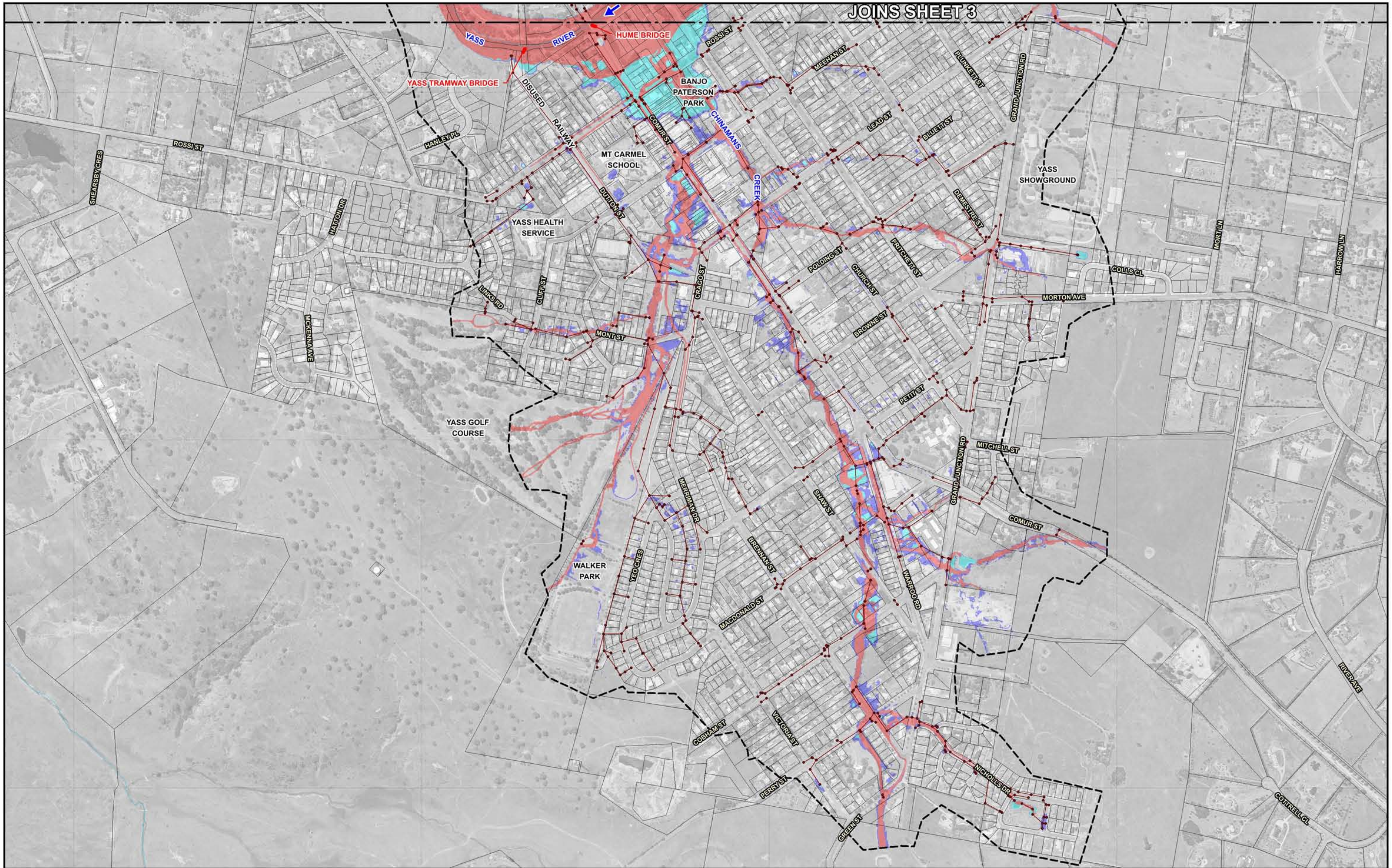
Drawing: 218025
Sheet: PSS - 04
Revision: -
Original Sheet Size: A3

Annexure 2

Lyall & Associates:

Yass Floodplain Risk Management Study and Plan

Fig 2.15



N

100 0 100 200 300 m

Scale: 1:10,000

Lyall & Associates

NOTE:
The ground surface model incorporated in TUFLOW is based on LiDAR survey which has been sampled on a 2 m grid and does not necessarily incorporate localised features which can influence flooding behaviour in individual allotments.

Flood depths are therefore approximate only and require interpretation by a suitably qualified engineer to determine flooding behaviour in individual allotments. Any assessment of flooding in individual allotments may also require a site survey.

LEGEND

- Two-Dimensional Model Boundary
- Modelled Stormwater Drainage System
- Floodway
- Flood Storage
- Flood Fringe

YASS FLOODPLAIN RISK MANAGEMENT STUDY AND PLAN

Figure 2.15
(Sheet 2 of 4)

HYDRAULIC CATEGORISATION OF FLOODPLAIN
1% AEP

Annexure 3

Groundwater Bore Logs

WaterNSW
Work Summary

GW055660

Licence: 40WA406068

Licence Status: CURRENT

Authorised Purpose(s): STOCK,DOMESTIC
Intended Purpose(s): STOCK, DOMESTIC

Work Type: Bore
Work Status:
Construct.Method: Rotary Air
Owner Type: Private

Commenced Date:
Completion Date: 01/05/1981

Final Depth: 31.00 m
Drilled Depth: 31.00 m

Contractor Name: (None)
Driller:
Assistant Driller:

Property: N/A NSW
GWMA: -
GW Zone: -

Standing Water Level (m):
Salinity Description:
Yield (L/s):

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MURRAY	HUME	L6 DP561225 (14)
Licensed:	MURRAY	HUME	Whole Lot //

Region: 40 - Murrumbidgee
CMA Map: 8628-2N

River Basin: 410 - MURRUMBIDGEE RIVER
Area/District:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: (Unknown)
Northing: 6140539.000
Easting: 675668.000
Latitude: 34°51'44.4"S
Longitude: 148°55'18.3"E

GS Map: -
MGA Zone: 55
Coordinate Source: GD.,ACC.MAP

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1	1	Casing	Welded Steel	0.00	31.00	144			Seated on Bottom
1	1	Opening	Slots - Vertical	26.00	30.00	144		1	A: 1.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
28.00	29.00	1.00	Fractured	10.00		1.00			

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	10.00	10.00	Clay	Clay	
10.00	31.00	21.00	Slate Water Supply	Slate	

***** End of GW055660 *****

WaterNSW
Work Summary

GW404259

Licence:

Licence Status:

Authorised Purpose(s):
Intended Purpose(s): STOCK, DOMESTIC

Work Type: Bore
Work Status: Supply Obtained
Construct.Method: Rotary Air
Owner Type: Private

Commenced Date:
Completion Date: 10/09/2004

Final Depth: 90.00 m
Drilled Depth: 90.00 m

Contractor Name: Central West Water Drillers
Driller: Michael Patrick O'neill
Assistant Driller: Michael Cassidy

Property:
GWMA:
GW Zone:

Standing Water Level (m): 52.000
Salinity Description: Good
Yield (L/s): 1.520

Site Details

Site Chosen By:

	County	Parish	Cadastre
Form A:	MURRAY	HUME	1//1007355
Licensed:			

Region: 40 - Murrumbidgee
CMA Map: 8628-2N
River Basin: 410 - MURRUMBIDGEE RIVER
Area/District:
Grid Zone:
Scale:

Elevation: 0.00 m (A.H.D.)
Elevation Source: Unknown
Northing: 6140577.000
Easting: 676098.000
Latitude: 34°51'42.9"S
Longitude: 148°55'35.2"E

GS Map: -
MGA Zone: 55
Coordinate Source: GIS - Geogra

Construction

Negative depths indicate Above Ground Level; C-Cemented; SL-Slot Length; A-Aperture; GS-Grain Size; Q-Quantity; PL-Placement of Gravel Pack; PC-Pressure Cemented; S-Sump; CE-Centralisers

Hole	Pipe	Component	Type	From (m)	To (m)	Outside Diameter (mm)	Inside Diameter (mm)	Interval	Details
1		Hole	Hole	0.00	90.00	200			Rotary Air
1	1	Casing	Pvc Class 9	-0.30	82.00	140	129		Driven into Hole, Seated on Bottom, Riveted and Glued, S: 87.00-90.00m
1	1	Opening	Slots - Horizontal	76.00	82.00	140		0	Casing - Louvre Slot, PVC Class 9, Riveted and Glued, SL: 200.0mm, A: 2.00mm

Water Bearing Zones

From (m)	To (m)	Thickness (m)	WBZ Type	S.W.L. (m)	D.D.L. (m)	Yield (L/s)	Hole Depth (m)	Duration (hr)	Salinity (mg/L)
80.00	85.00	5.00	Unknown	52.00		1.14			
86.00	87.00	1.00	Unknown	52.00		0.38		00:30:00	

Drillers Log

From (m)	To (m)	Thickness (m)	Drillers Description	Geological Material	Comments
0.00	6.00	6.00	CLAY - RED	Clay Bands	
6.00	19.00	13.00	GRANITE - DECOMPOSED	Granite	

19.00	29.00	10.00	GRANITE - SOFT	Granite	
29.00	90.00	61.00	GRANITE	Granite	

Remarks

10/09/2004: Form A Remarks:
ENTERED BY PATRICIA EWERS ON 5TH MARCH 2008.

INFORMATION NOT PROVIDED ON FORM:

NO INFORMATION ON DRAWDOWN LEVEL
NO INFORMATION ON SALINITY
NO INFORMATION ON PUMPING TESTS ON BORE COMPLETION
NO DETAILS ON GRAVEL PACK
NO INFORMATION ON WHO CHOSE BORE LOCATION

***** End of GW404259 *****

Annexure 4

Yass Valley Council:
Stormwater Drainage Design Specification-V1.3

yass valley council

the country the people

Stormwater Drainage Design Specification

1. Introduction

1.1 This *Stormwater Drainage Design Specification* shall be consulted to guide the design of all stormwater works within the Yass Valley Local Government Area. This specification only addresses quantity issues. Stormwater discharge quality requirements will be addressed in the conditions of development consent.

1.2 Drainage design shall be in accordance with the Australian Rainfall and Runoff (AR&R).

1.3 All calculations must be carried out by competent persons who are qualified and experienced in stormwater system design and are capable of utilising drainage models that are accepted as the current industry standard.

2. Precedence

This document should be read in conjunction with Aus-Spec No 1 and any conditions of Development Consent (if applicable).

If there is conflict, the order of precedence is:
1. Conditions of Consent
2. This specification
3. Aus-Spec No 1.

3. Council Maintained Stormwater Requirements Summary

The following form the key design requirements for stormwater systems to be owned and/or maintained by Yass Valley Council.

3.1 All pipes and pits to be reinforced concrete;
3.2 Pits to be minimum 25Mpa concrete;
3.3 The minimum pipe diameter for Intra-Allotment Drainage (IAD) is 150 mm;
3.4 The minimum pipe diameter for driveway or road culverts is 300mm although 375mm is the desirable minimum;
3.5 Easements equal to the pipe width plus 1m each side (2.5m minimum) are required over new drainage lines or where subdivision occurs impacting existing lines passing through private property.
3.6 Pits shall be constructed at pipe intersections or changes of direction over 5%.
3.7 Maximum velocity of flow in pipes is to be 7m/s.
3.8 Maximum unrestrained outlet velocity 2.5m/s or 5m/s if lined (refer Section 8)
3.9 Minimum grade of pipes to be 0.5%.
3.10 Minimum flow velocity of 0.6m/sec.
3.11 All pipes shall be rubber ring jointed spigot/socket concrete pipes unless approved otherwise
3.12 Pipe bedding and cover requirements shall be determined from the Concrete Pipe Association "Concrete Pipe Guide" or Australian Standard 3725 "Loads on Buried Pipes" The minimum for Domestic Driveways being 300mm cover for Class 2, 200mm cover for Class 3 and 100mm cover for Class 4.
3.13 All pipes in road crossings shall be a minimum of Class 3.
3.14 Stormwater detention is required where the impervious surface exceeds 50% of the Lot land area and shall ensure that the post development flow rate at the point of discharge is no greater than the pre-development flow rate.
3.15 An overland flow path, catering for a 100year Average Recurrence Interval (ARI) flow, shall be provided over or adjacent to all piped systems. The overland flow path shall be protected against alteration or obstruction by a "Section 88 restriction" on relevant property titles.
3.16 Design ARIs shall be :

Urban/Village Streets[1] and IAD	5 years
Rural and Rural residential[2]	5 years
Yass Commercial and Industrial	10 years
Trunk Drainage[3]	20 years
Overland flow path[4]	100 years

Notes:
1. Trafficable flow to be designed for 1 in 20 years and flow depth x velocity shall be less than $0.3m^2/s$.
2. Except for roads higher category roads which shall comply with the requirements of the Roads Standards Policy RD-POL-9.
3. Trunk Drainage may be required to be designed to cater for the 1:100 year ARI piped flow where the overland flow path is constrained.
4. For flow in streets, the flow depth x velocity shall be less than $0.4m^2/s$.

4. IFD Table

The rainfall Intensity-Frequency-Duration table to be used for AR&R based calculations in the Yass Valley area is:

YASS VALLEY IFD TABLE

	Average Recurrence Interval (ARI) years						
Duration	1yr	2yr	5yr	10yr	20yr	50yr	100yr
5m	56.0	73.0	99.0	116.0	137.0	169.0	195.0
6m	52.0	68.0	92.0	108.0	128.0	157.0	181.0
7m	48.5	64.0	86.0	101.0	120.0	147.0	169.0
8m	46.0	61.0	82.0	95.0	113.0	139.0	159.0
9m	43.9	58.0	78.0	91.0	108.0	132.0	151.0
10m	42.3	55.0	74.0	87.0	103.0	125.0	144.0
12m	38.7	51.0	68.0	79.0	94.0	115.0	131.0
14m	36.1	47.5	63.0	74.0	87.0	106.0	121.0
16m	33.9	44.5	59.0	69.0	81.0	99.0	113.0
18m	32.0	42.0	56.0	65.0	77.0	93.0	106.0
20m	30.6	39.9	53.0	61.0	72.0	88.0	100.0
25m	27.1	35.5	46.9	54.0	64.0	77.0	88.0
30m	24.7	32.2	42.4	48.9	58.0	70.0	79.0
35m	22.6	29.6	38.8	44.7	53.0	63.0	72.0
40m	21.0	27.4	35.9	41.3	48.5	58.0	66.0
45m	19.7	25.6	33.5	38.5	45.1	54.0	62.0
50m	18.5	24.1	31.4	36.1	42.2	51.0	58.0
55m	17.5	22.8	29.7	34.0	39.8	47.8	54.0
1hr	16.7	21.7	28.1	32.2	37.7	45.2	51.0
75m	14.5	18.8	24.4	27.9	32.6	39.0	44.1
90m	12.9	16.7	21.6	24.7	28.9	34.6	39.1
2hr	10.7	13.9	17.9	20.4	23.8	28.5	32.1
3hr	8.2	10.6	13.6	15.5	18.1	21.6	24.3
4hr	6.77	8.76	11.20	12.80	14.90	17.70	20.00
6hr	5.18	6.70	8.56	9.72	11.30	13.40	15.10
8hr	4.29	5.54	7.07	8.01	9.29	11.00	12.40
10h	3.70	4.78	6.09	6.90	7.99	9.48	10.70
12hr	3.29	4.24	5.39	6.10	7.06	8.37	9.41
16hr	2.69	3.47	4.43	5.02	5.83	6.92	7.79
20hr	2.30	2.97	3.80	4.32	5.01	5.96	6.72
24hr	2.02	2.61	3.35	3.81	4.43	5.27	5.95
36hr	1.50	1.94	2.51	2.86	3.34	3.99	4.50
48hr	1.20	1.56	2.02	2.32	2.71	3.23	3.66
60hr	1.00	1.31	1.70	1.95	2.28	2.73	3.10
72hr	0.86	1.12	1.46	1.68	1.97	2.36	2.68

5. *Fraction Impervious*

Hydraulic calculations shall be based on the following fraction impervious figures:

LAND USE	**FRACTION IMPERVIOUS**
Normal Residential Lot size < 1000m^2	0.6
Normal Residential Lot size > 1000m^2	0.4
Normal Residential Lot including half road	0.65
Half Width Road Reserve	0.85
Medium Density Residential	0.85
Commercial Areas	0.95
Industrial Areas	0.90
Public Recreation Areas	0.5
Parkland, Public Reserve	0.1

6. *Coefficient of Runoff*

6.1 Coefficients of runoff shall be determined in accordance with Australian Rainfall and Runoff. Full details of coefficients used shall be provided in the calculation documents.

6.2 Fraction impervious effects on the coefficient of runoff, "C", shall be consistent with the following table:

Fraction Impervious	**C_2**	**C_5**	**C_{10}**	**C_{20}**	**C_{100}**
0.0 - 0.1	0.24	0.27	0.28	0.29	0.33
0.2	0.3	0.33	0.35	0.37	0.42
0.3	0.35	0.40	0.42	0.44	0.50
0.4	0.41	0.46	0.49	0.51	0.58
0.5	0.47	0.53	0.56	0.58	0.67
0.6	0.53	0.59	0.62	0.66	0.75
0.7	0.59	0.66	0.69	0.73	0.83
0.8	0.65	0.72	0.76	0.80	0.91
0.9	0.71	0.79	0.83	0.87	1.00
1	0.77	0.86	0.90	0.93	1.00

7. HGL Calculations

7.1 Hydraulic grade lines (HGL) shall be provided for all systems involving pipe sizes over 450mm.

7.2 Hydraulic calculations shall substantiate the hydraulic grade line (HGL) adopted for the design of the system and shall be shown on the drawings.

7.3 Details of all calculations shall be submitted with the plans.

7.4 Controls for a downstream hydraulic grade line design are as follows:-

- Hydraulic grade line levels based on downstream calculations including pit losses at the starting pit in the design event.
- If the downstream start point is a pit and the HGL is unknown, a level of 0.15 metres below the pit inlet in the downstream pit shall be adopted.
- If the outlet is an open channel and the design storm is the minor event, the outlet pipe shall be the downstream control and;
    - Where the design storm is the 100 year ARI event, and the design flood levels in the channel are unknown, the top of the outlet pipe shall be the control.
    - Where flood levels are known, the control shall be the 100 year ARI design flood level.
- The HGL level in drainage pits shall be limited to 150mm below the inlet grate, gutter or lid.

8. STORMWATER DISCHARGE

8.1 Permanent, durable and effective scour protection and/or energy dissipaters shall be provided at all culvert outlets. Energy dissipaters shall be provided to ensure the discharge velocity is less than 2.5m/s in an unlined receiving environment or less than 5m/s in a lined receiving environment.

8.2 Points of discharge of concentrated stormwater onto an adjoining property shall not be permitted without the approval of the affected property owner(s). Where an agreement is reached with the adjoining owner(s), a letter and a drawing shall be signed and submitted as evidence of the agreement, prior to issue of the Construction Certificate. An easement shall cover the area of concern.

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4952 1666	Newcastle | Hunter | Northern NSW
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