Ref: BMY:HW:190623E

6th February 2020

Valley Planning
PO Box 3064
THORNTON NSW 2322

ATTENTION: MR CHRIS SPEEK

Dear Chris,

RE: STORMWATER MANAGEMENT REPORT
LOT 350, DP 776503, 18 WINTERLAKE ROAD, WARNERS BAY

1.0 INTRODUCTION

ADW Johnson have been commissioned by Valley Planning, on behalf of Dr David Hardy, to prepare a Stormwater Management Letter to accompany a rezoning application associated with the abovementioned address. The intent of the rezoning is to enable the subdivision of the existing property (Lot 350 DP 776503) into four residential lots.

It is understood the rezoning and future subdivision of the subject lot will be linked to a larger rezoning of the adjacent property, being undertaken by a separate applicant. Throughout its review of the adjoining rezoning application, Lake Macquarie Council has requested the following:

- Undertake stormwater quality and quantity modelling to outline how the proposed subdivision can meet Lake Macquarie Council's standards in isolation to the adjoining development;
- Outline measures to convey the 1% AEP from the existing gully around existing and proposed lots to Winterlake Road.

The intent of this letter is to determine suitable on-lot stormwater quality and quantity controls to enable the proposed rezoning, and future subdivision, to be completed in isolation to the adjoining property, whilst also meeting the requirements of Lake Macquarie City Council.

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It should be noted that this report is for a rezoning application only, and as such is high level in nature. Further details will be provided at the DA and CC phases of the project.

2.0 SITE DESCRIPTION

The subject site, as can be seen in **Appendix A**, is identified as Lot 350 DP 76503 and is approximately 5.1 ha in size. The site is bounded to south, west and north by undeveloped bushland and the east by existing residential development.

The subject site is for the most part covered in dense bushland, with open grasslands filling out the remainder. An existing dwelling is located in the north east corner of the site.

2.1 Site Topography

The subject site generally slopes to the south east at grades in the order of 20-25% with some flatter areas located around the existing property in the north east corner and at the southern extents of the site.

Two natural gullies travers the upper regions of the site before merging at the south east corner. The eastern most gully will require diversion works at the southern end to meet council's requirements.

2.2 Stormwater Catchments

For the purposes of the stormwater quantity and quality modelling, the catchments for both the pre and post developed scenarios have been assumed to be the individual lots. It has been assumed that the upstream flows will be diverted around any proposed stormwater controls and will remain in their natural state. It has been further assumed that lot 104 will not require any controls as no development will occur on this lot given the existing dwelling is in place. The stormwater catchments can be seen in **Appendix A**.

The pre-development and post-development catchments are outlined in **Tables 1** and **2** respectively below.

Table 1. Pre-development catchments.

Catchment	Area (m^2)	% Impervious	Manning's 'n'	Slope (%)
Lot 101	572	0	0.05	12
Lot 102	1672	0	0.05	15
Lot 103	2896	0	0.05	30

Table 2. Post-development catchments.

Catchment	Area (m^2)	% Imp	Impervious			Pervious		
			Area (m^2)	Manning's 'n'	Slope (%)	Area (m^2)	Manning's 'n'	Slope (%)
Lot 101 Roof	250	100	250	0.013	25	0	-	-
Lot 101 O/L	322	16	52	0.014	12	270	0.03	12
Lot 102 Roof	250	100	250	0.013	25	0	-	-
Lot 102 O/L	1422	45	641	0.014	15	781	0.03	15
Lot 103 Roof	250	100	250	0.013	25	0	-	-
Lot 103 O/L	2646	51	1359	0.014	30	1287	0.03	30

Note: Impervious percentages for Lot O/L (overland) flows have been calculated such that the summation of this O/L impervious area with the roof area add to a total lot impervious area of 60%.

3.0 STORMWATER QUANTITY AND QUALITY MODELLING

The proposed treatment measures for the development are underground on-site detention (OSD) tanks for each lot. These detention tanks will have a staged-outlet such that peak-flows from the lots post development match the pre-development peak-flows. The tanks will also have a StormFilter filtration system installed to address water quality requirements.

3.1 Stormwater Quality

MUSIC (Model for Urban Stormwater Improvement Conceptualisation) is the industry standard model for prediction of stormwater quality outcomes from proposed developments.

Given the provision underground tanks, it has been assumed that the most efficient way to meet water quality targets would be through the use of a filter cartridge system located within the tank. For the purpose of this modelling, Ocean Protect Stormfilter cartridge systems have been assumed to be provided. As mentioned earlier, this report is for rezoning only and therefore a different system may be used at the DA stage, assuming it can meet council's required targets. It is noted that a number of different proprietary products can produce similar results.

The results of the modelling can be seen in **Tables 3**, **4** and **5** below.

Table 3. MUSIC modelling results from Lot 101.

Lot 101	Without Treatment (kg/yr)	With Treatment (kg/yr)	% Reduction	% Reduction Required
Gross Pollutants	7.52	0	100	70
Total Suspended Solids	17.5	2.77	84.2	80
Total Phosphorus	0.0547	0.01	81.7	45
Total Nitrogen	0.623	0.211	66.1	45

Table 4. MUSIC modelling results from Lot 102.

Lot 101	Without Treatment (kg/yr)	With Treatment (kg/yr)	% Reduction	% Reduction Required
Gross Pollutants	25.5	0	100	70
Total Suspended Solids	113	19.3	82.9	80
Total Phosphorus	0.218	0.0529	75.7	45
Total Nitrogen	1.85	0.859	53.5	45

Table 5. MUSIC modelling results from Lot 103.

Lot 101	Without Treatment (kg/yr)	With Treatment (kg/yr)	% Reduction	% Reduction Required
Gross Pollutants	46	0	100	70
Total Suspended Solids	229	33.6	85.3	80
Total Phosphorus	0.406	0.0945	76.7	45
Total Nitrogen	3.26	1.63	50	45

3.2 Stormwater Quantity

Hydrological assessment was undertaken to determine peak flows over the site during the 63% to the 1% AEP storm events. XP-RAFTS has been used to simulate each catchment's response to storm events to generate hydrographs and predict an estimate of peak discharges both the pre-development and post-development scenarios. Rainfall data was obtained from the Bureau of Meteorology for the Warners Bay Area for the model simulation.

The OSD storage/outlet configurations for each of the lots can be found in **Table 6** below.

Table 6. Storage/outlet configuration requirements for each lot.

Lot	Modelled OSD Tank Dimensions	Storage	Outlets
101	1.5m x 1.5m x 1.5m	3.4m^3	110mm orifice @ base
102	5m x 2m x 1.5m	15m^3	150mm orifice @ base 150mm orifice @ 1m
103	7.5m x 2m x 1.5m	22.5m^3	225mm orifice @ base 150mm orifice @ 0.6m

Note: tank dimensions shown in length x width x height. Outlets should be configured such that the invert of the orifice is at the location specified.

The results of the detention modelling are shown below in **Table 7**.

Table 7. Storage/outlet configuration requirements for each lot.

Lot	AEP	Pre-Development Peak Flow (m^3/s)	Post-Development Peak Flow with OSD Tank (m^3/s)	100yr Water Level (mm)	Max Tank Height (mm)
Lot 101	63%	0.01	0.01	1280	1500
	10%	0.02	0.02		
	1%	0.03	0.03		
Lot 102	63%	0.03	0.03	1450	1500
	10%	0.06	0.06		
	1%	0.09	0.09		
Lot 103	63%	0.06	0.06	1275	1500
	10%	0.12	0.12		
	1%	0.17	0.15		

4.0 EXISTING GULLY DIVERSION

As mentioned in section 1, council has raised concerns around the flow path of the eastern most gully and has requested that control measures be implemented to ensure the 1% AEP can safely be diverted to Winterlake Road.

Using the abovementioned XP-RAFTS model, and the parameters outlined in **Table 8** below, the 1% AEP flow through the gully was found to be 3.5 m^3/s. It is noted that this flow relates to the confluence of the eastern and western gullies and is therefore considered to be a worst-case scenario.

Table 8. Upstream Catchment Parameters

Catchment	Area (ha)	% Impervious	Manning's 'n'	Slope (%)
Upstream	7.4	0	0.055	25

In order to safely convey the 1% AEP flow from the confluence of the gullies to Winterlake Road, it is proposed to provide a 1m high berm along the rear boundary of the proposed lot 101 and the existing Lot 7 DP252309. The berm will then direct flows towards lot 102 where a high capacity raised grated surface inlet pit will be placed to capture the 1% AEP flow incorporating a suitable blockage factor. The flows will then be conveyed to Winterlake Road by a box culvert system, which once again will incorporate a suitable blockage factor. Based upon initial calculations the approximate sizing for the pit and culvert system would be:

- 2000mm x 2000mm raised grated surface inlet pit;
    - Assuming a 50% blockage factor on the pit, this would require approximately 0.65m of ponding to capture the 1% AEP flow; and
- 1800mm wide x 900mm high box culvert assuming a 50% blockage factor.

It is noted that in the unlikely event of a complete blockage of the system, the berm would continue along the back of proposed lot 101 to ensure any flows that do not enter the pit

and pipe system are conveyed down the proposed driveway access handle to Winterlake Road. An indicative design can be seen in **Appendix A**.

Further modelling details are anticipated to be undertaken during the DA and CC phase of the project.

5.0 CONCLUSION

This letter has been prepared to address the stormwater management controls required to enable the proposed rezoning, and subsequent subdivision, of lot 350 DP 776503.

Initial modelling has shown that underground on-site detention tanks, with the inclusion of a filter cartridge system, will ensure that the proposed subdivision will comply with council's stormwater management objectives.

The provision of a suitably sized pit and pipe network will enable upstream flows to be safely conveyed from the subject lot to Winterlake Road, with a further overland flow system being provided for an emergency situation.

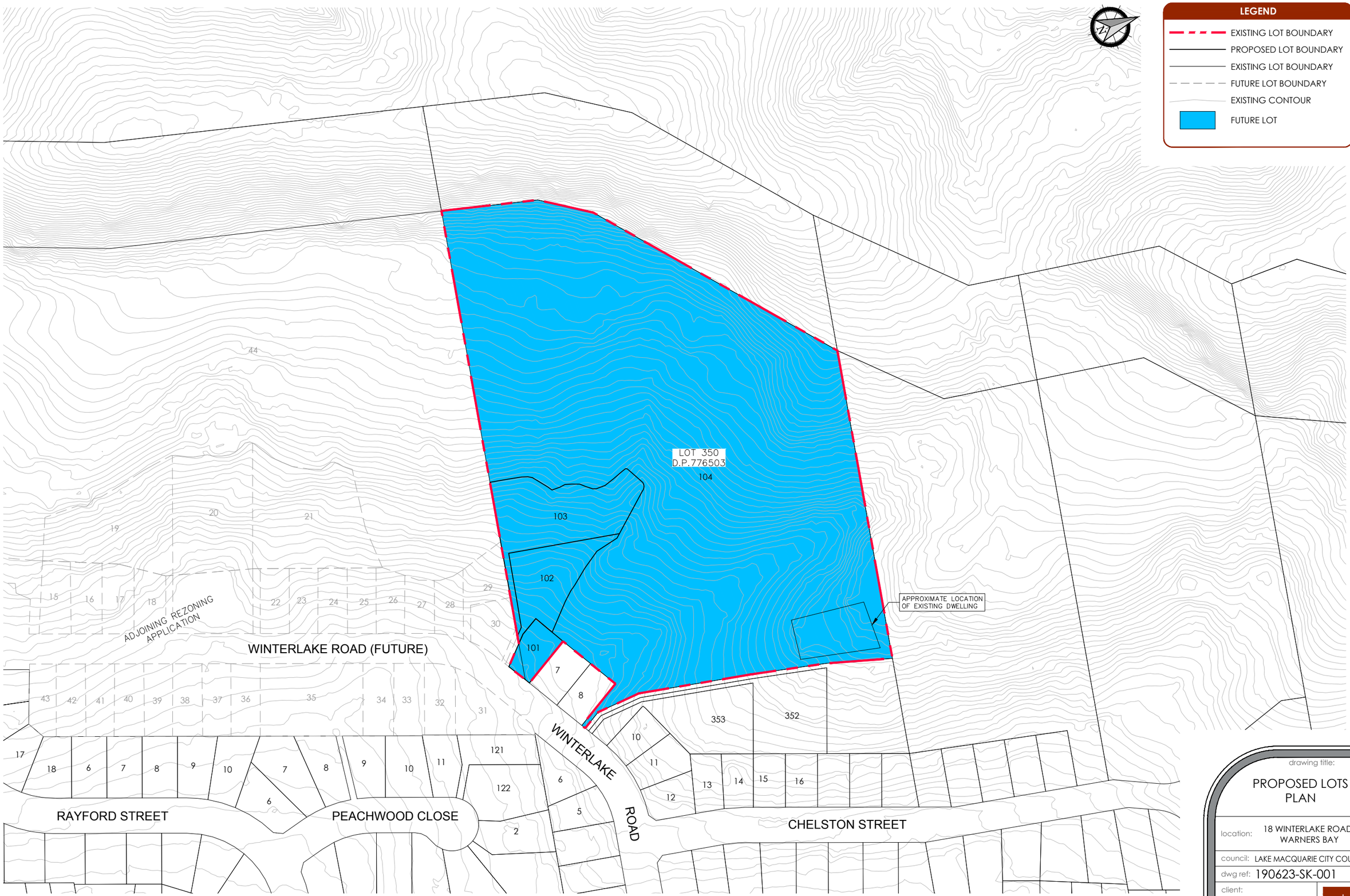
It is our opinion that adequate stormwater management controls can be incorporated into the proposed subdivision to meet council's requirements and therefore, from a stormwater management perspective, the rezoning should be supported.

Yours faithfully,

BEN MYLES
CIVIL ENGINEER
ADW JOHNSON
CENTRAL COAST

Appendix A

DRAWINGS



drawing title:

PROPOSED LOTS PLAN

location: 18 WINTERLAKE ROAD, WARNERS BAY

council: LAKE MACQUARIE CITY COUNCIL

dwg ref: 190623-SK-001

client:

DR. DAVID HARDY

ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
A	05.02.20	INITIAL ISSUE	JJ	BM	DATUM: AHD CONTOUR INTERVAL: 1.0m	A1 1:1000 — 0 25 50m — A3 1:2000	

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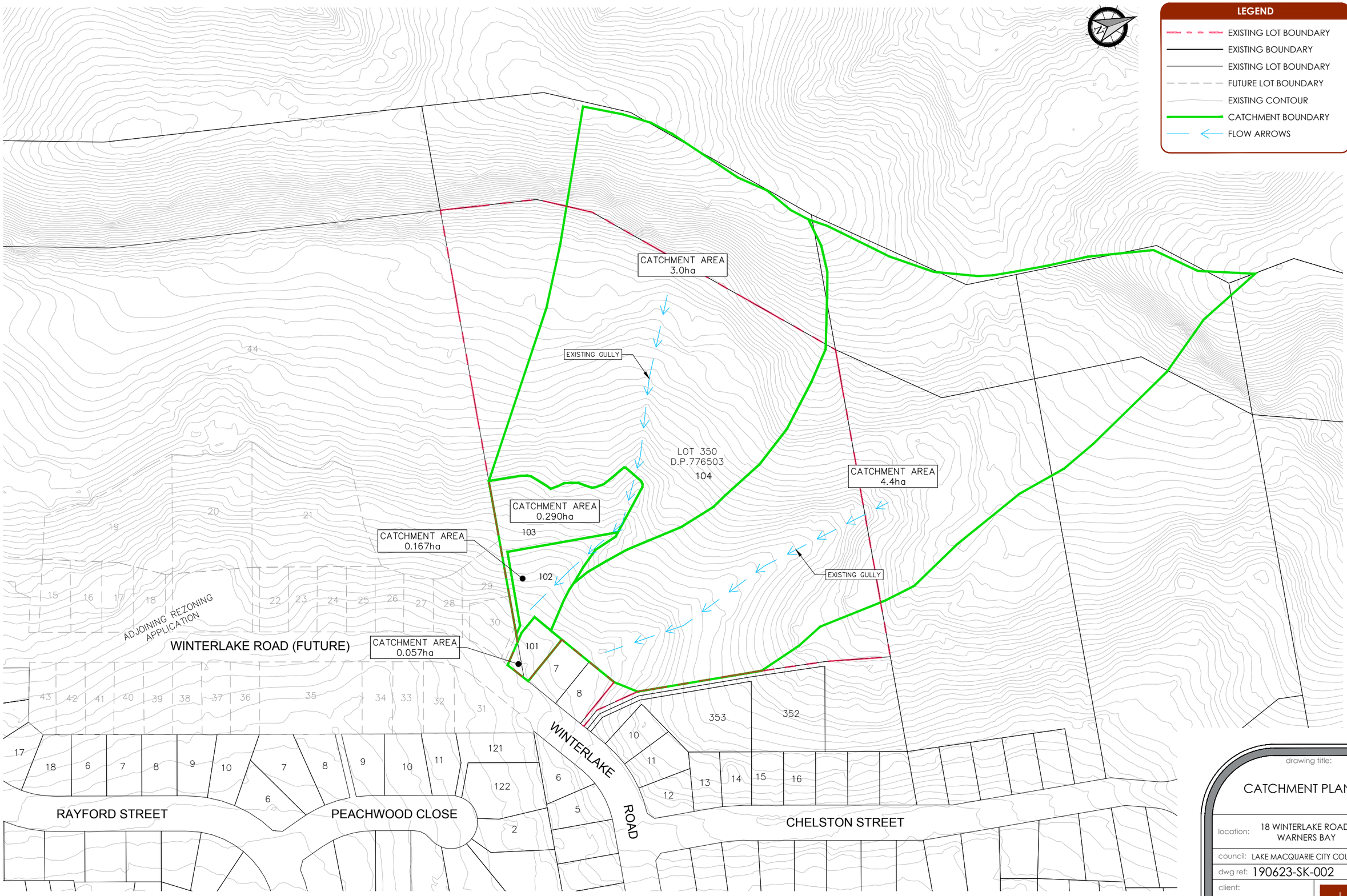
190623-SK-002-A



drawing title:

CATCHMENT PLAN

location: 18 WINTERLAKE ROAD, WARNERS BAY

council: LAKE MACQUARIE CITY COUNCIL

dwg ref: 190623-SK-002

client:

DR. DAVID HARDY

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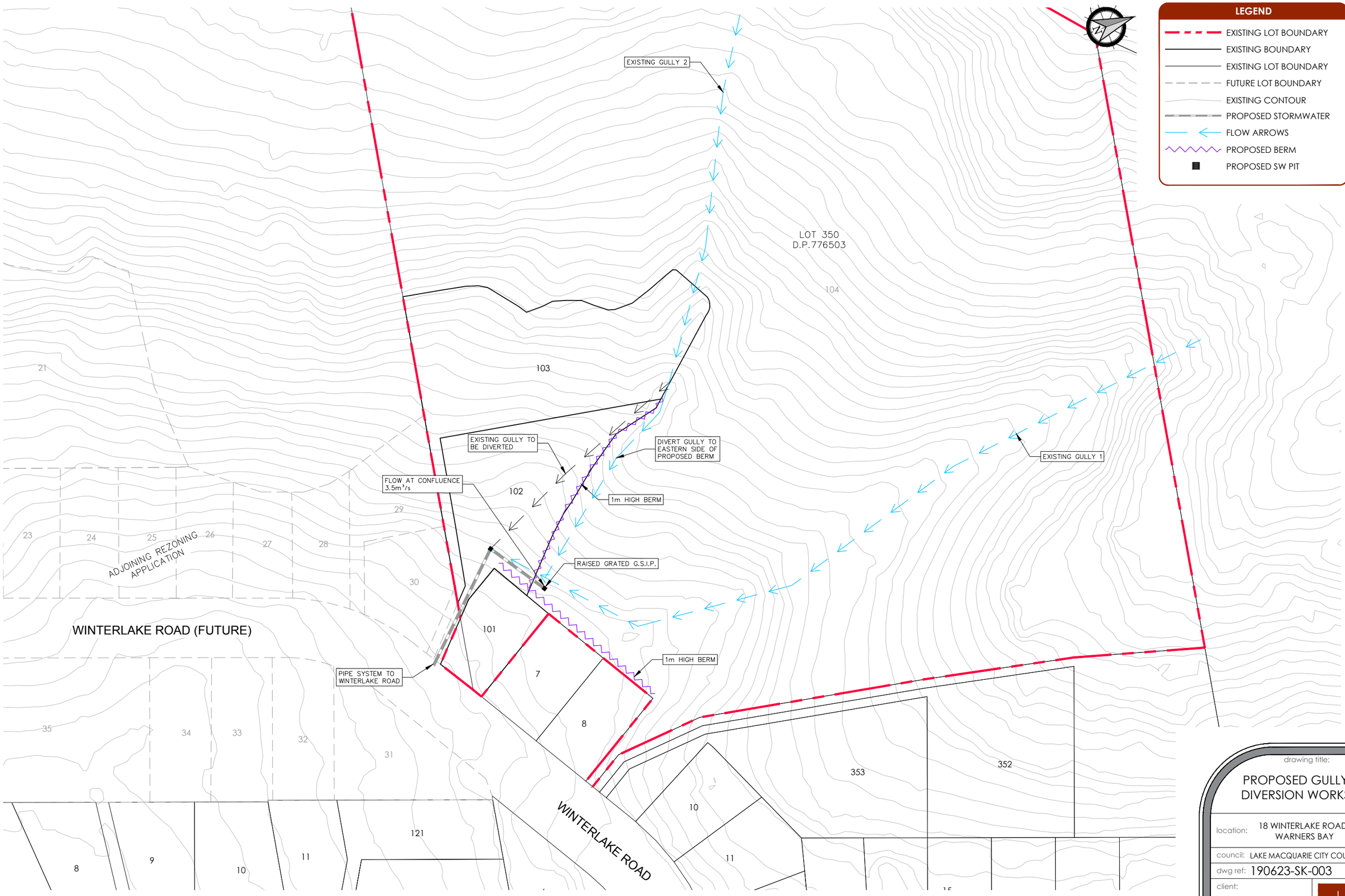
ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
A	05.02.20	INITIAL ISSUE	JJ	BM	DATUM: AHD CONTOUR INTERVAL: 1.0m	A1 1:1000 0 25 50m A3 1:2000	

• project management • civil engineering • infrastructure • superintendency • social impact • town planning • surveying • development feasibility • visualisation • urban design



LEGEND

- EXISTING LOT BOUNDARY
- EXISTING BOUNDARY
- EXISTING LOT BOUNDARY
- FUTURE LOT BOUNDARY
- EXISTING CONTOUR
- PROPOSED STORMWATER
- FLOW ARROWS
- PROPOSED BERM
- PROPOSED SW PIT

ver.	date	comment	drawn	pm	level information	scale (A1 original size)	notes
A	05.02.20	INITIAL ISSUE	JJ	BM	DATUM: AHD CONTOUR INTERVAL: 1.0m	A1 1:500 (0, 12.5, 25.0m) A3 1:1000	

drawing title:

PROPOSED GULLY DIVERSION WORKS

location: 18 WINTERLAKE ROAD, WARNERS BAY

council: LAKE MACQUARIE CITY COUNCIL

dwg ref: 190623-SK-003

client:

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