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Servicing Report

for

Woy Woy Road, Kariong

for Darkinjung Local Aboriginal Land Council

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Executive Summary

Northrop Consulting Engineers has been engaged by Darkinjung Local Aboriginal Land Council (DLALC) to prepare a servicing report to support the proposed rezoning of 300 Woy Woy Road, Kariong. The report assesses the sites capacity to accommodate the proposed rezoning, outlining the availability of all necessary utility infrastructure including water, sewer, gas, electrical and communication services as well as identifying the required stormwater and flooding mitigation measures.

The 13.2ha site is currently zoned E2 - Environmental Conservation and is largely undeveloped bushland with the exception of several fire trails and an electrical powerline easement. The application is seeking to rezone approximately 6.1ha of the site to R2 – Low Density Residential with the residual area to be maintained as bushland under the existing E2 – Environmental Conservation zoning.

A preliminary management strategy for the site has been considered to outline the measures required to mitigate the effects of future development on stormwater quantity and quality. Through hydrological modelling it was found that development would result in increased peak flows which would likely have an adverse impact on downstream properties. Detention measures have therefore been proposed to attenuate runoff to pre-developed flow rates. It is anticipated that detention basins will be located within dedicated drainage reserves designed to cater for the full contributing catchment once developed. Inundation or flood waters were not found to affect the site.

Through the adoption of Water Sensitive Urban Design (WSUD) principals Council's water quality reduction targets were shown to be achievable for the future zoning. In accordance with Council's guidelines a treatment train approach could be implemented in the future with rainwater tanks and an end-of-line gross pollutant trap to provide primary treatment and a biofiltration basin to provide secondary treatment.

Existing water and sewer information is available to the development. Preliminary advice received from CCC indicates that higher elevation lots may require pressure boosting due to the proximity of the reservoirs. Council have also advised that there may be capacity constraints with downstream sewer infrastructure which may require developer-funded augmentation. A detailed water and sewer servicing strategy will be required to be completed post rezoning.

Based on asset mapping available through Dial Before You Dig existing electrical, telecommunication and gas utilities are located near to the site. Extension of these existing networks is considered feasible to service future industrial development of the site.

Based on the assessment undertaken to date the site is recommended for rezoning on the grounds of stormwater, flooding and essential utility services.

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Appendices

1. Introduction

Northrop Consulting Engineers has been engaged by Darkinjung Local Aboriginal Land Council (DLALC) to prepare a servicing report to support the rezoning of Lot 512 and 513 DP727686 located at 300 Woy Woy Road, Kariong (the site). This report provides an overview of the flood management requirements of the site as well as the availability of water, sewer, stormwater, gas, electrical and communication infrastructure. The report aims to demonstrate that the site has capacity to accommodate the proposed rezoning and all information contained in this report has been completed to a level commensurate with that required for a Planning Proposal. It is noted that further details will be provided at subsequent Development Application and Construction Certificate Stages.

1.1 Site Description

Located within the Central Coast suburb of Kariong the site is irregular in shape and has a total area of approximately 13.2ha. Shown in **Figure 1**, the site is bordered by Woy Woy Road to the west, existing rural residential properties to the north and bushland within the Brisbane Water National Park to the south east. Notably, the Kariong K3 - K4 reservoir neighbours the site's north eastern corner.

Figure 1 – Existing Site (Aerial image source https://maps.six.nsw.gov.au/)

As depicted, the site is largely undeveloped bushland with the exception of several tracks, including the Lyre Trig and Tank Fire Trails, which intersect the site. In addition to the trails, a high voltage power line extends within an east-west easement through the centre of the site. Positioned near a localised crest land predominately falls to the west characterised by moderately undulating slopes at average longitudinal grades of approximately 10%.

The site is currently zoned E2 - Environmental Conservation.

1.2 Proposed Development

The development proposes a residential subdivision across Lot 512 and part Lot 513. To facilitate this proposal the application is seeking rezoning of approximately 6.1ha from E2 – Environmental Conservation to R2 – Low Density Residential.

Figure 2 below illustrates the extent of the proposed residential rezoning. The residual site area, approximately 7.1ha being the southern portion of lot 512, is to be maintained as bushland under the existing E2 – Environmental Conservation zoning.

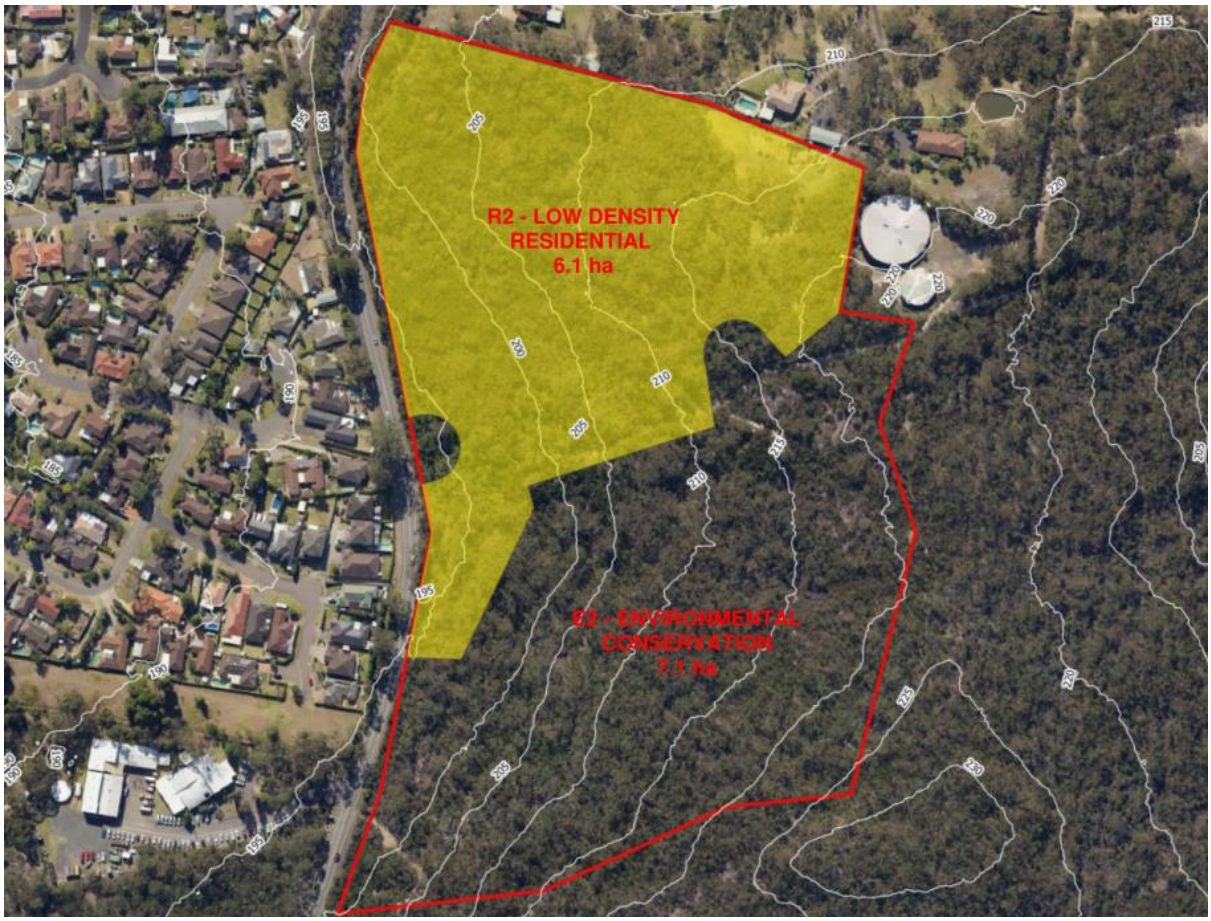

Figure 2 – Proposed R2 – Low Density Residential Extent

Under the application the proposal is also seeking to amend the Minimum Lot Size to 550m^2 to achieve approximately 50 residential lots within the development envelope. It is noted however that lot yield and final layouts are subject to modification during preparation of the final planning proposal.

2. Stormwater and Flooding

2.1 Existing Catchment

The site is positioned near the catchment ridgeline falling to the west towards the Peppermint Park drainage reserve. Forming a second order water course approximately 400m downstream, runoff from the site contributes to the Piles Creek catchment, a tributary of Mooney Mooney Creek, before ultimately reaching the Hawkesbury River. Across the site evaluations range between 195 – 220m AHD with surface gradients between 6 - 13%.

Figure 2 below illustrates the location of the downstream watercourse in relation to the site. As depicted no watercourse or waterbodies exist across the site with only a minor upstream catchment sheeting across the boundary from the east.

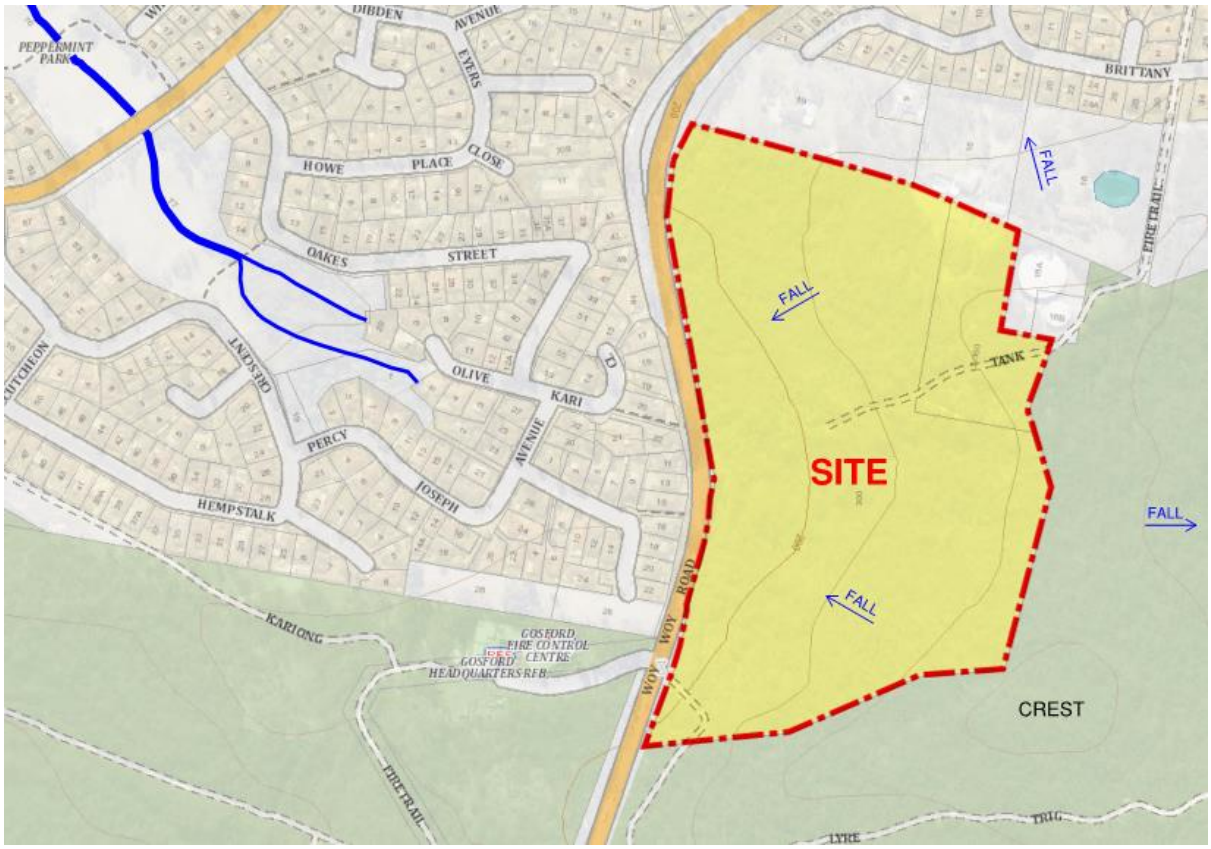

Figure 2 – Existing Downstream Watercourse (Source https://maps.six.nsw.gov.au/)

2.2 Site Flooding

The site is not identified as being subject to inundation or flooding.

With a densely vegetated upstream catchment of less than 3ha, sheet runoff is also not anticipated to affect any future onsite development.

2.3 Stormwater Management

Central Coast Council (CCC) currently has two operational Development Control Plans (DCPs). Situated within the old Gosford Local Government Area (LGA) the proposed rezoning will need to generally comply with the 2013 Gosford DCP. In accordance with the DCP a Water Cycle Management Plan (WCMP) will be required to mitigate runoff from future subdivision development. Specifically, the WCMP is to detail measures to be undertaken within the development site to address the issues of site discharge, water quality and reductions in potable water demand.

In accordance with the 2007 Gosford City Council Water Cycle Management Guidelines the following design objectives are to be adopted:

- Limit post development flows from the proposed development site to less than or equal to predevelopment flows for all storm events up to and including the 1% AEP storm event.
- Mitigate the impacts of urban development on stormwater quality through the adoption of Water Sensitive Urban Design (WSUD) principles and devices to achieve the nominated pollutant load reduction targets.
- Maximise onsite reuse potential through the incorporation of rainwater harvesting tanks on future dwellings with minimum retention volumes proportional to the total site area.

Further to the DCP management guidelines, future development will need to adhere to the specific design requirements of CCC's 2018 Civil Works Design Specification. Considered pertinent to assessing the feasibility of the rezoning application, the sections below outline a preliminary strategy for the onsite detention and water quality measures required to mitigate the effects of future development. It is anticipated that details of the minor and major conveyance infrastructure will be provided once subdivision layouts have been determined during the Development Application and Detailed Design phases.

2.3.1 Onsite Stormwater Detention

Preliminary hydrological modelling has been undertaken to assess the contributing catchment in both the pre and post developed scenarios for a range of storm durations and frequencies. The model was then used to develop mitigation measures which have been designed to ensure no net increase in peak flows for a range of events from the 20% AEP to the 1% AEP over a range of durations from the 5 minutes to 3 hours. This range of events was considered appropriate for the site with water quality treatment devices expected to effectively attenuate more frequent storm events and peak median events anticipated during shorter durations given the site's relatively small catchment and steep grades.

Modelling was undertaken using the computer software package DRAINS utilizing the ILSAX hydrological method. In accordance with CCC's design guidelines a type 3 soil was assigned with a grassed depression storage of 5mm and impervious depression storage of 1mm. Rainfall data for the model was obtained from the Bureau of Meteorology using AR&R2019 intensity data.

For the existing scenario the catchment was categorised as 100% permeable with bushland characteristics observed. For the post developed scenario, the site was modelled using an 80% impervious fraction in accordance with Section 10.4.3.1 – Minimum Lot Design Impervious Fraction of the CCC's Civil Works Specification. The results from the peak storm events have been summarised below in **Table 1**.

Table 1: Peak Storm Event Site Discharge Flow Rates

AEP % Storm Event	Pre-developed Scenario Peak Discharge Flowrate (m3/s)	Critical Duration	Post-developed Scenario Peak Discharge Flowrate (m^3/s)	Critical Duration
20	1.10	20 min	1.91	10 min
10	1.55	15 min	2.35	10 min
5	1.98	15 min	2.82	10 min
2	2.72	10 min	3.63	10 min
1	3.47	10 min	4.23	10 min

As summarised in **Table 1** it is evident that the proposed development will increase peak flows within the catchment over a range of rainfall events. This net increase in peak flows is likely to have adverse effects on downstream properties and the regional hydrology. Detention measures have therefore been proposed to mitigate the negative impacts on the catchment regime at the site boundaries.

Through runoff routing in DRAINS it was determined a detention volume of approximately 1200m^3 will be required to reduce peak developed flow rates to pre-developed, greenfield rates. The results from the peak storm events with the integrated detention basin have been summarised below in **Table 2**. The model includes a basin with a total depth of 1.45m in the 1% AEP event and top water surface area of approximately 1050m^2.

Table 2: Peak Storm Event Site Discharge Flow Rates with Onsite Detention

AEP % Storm Event	Pre-developed Scenario Peak Discharge Flowrate (m^3/s)	Critical Duration	Detention Basin Peak Discharge Flowrate (m^3/s)	Critical Duration
20	1.10	20 min	1.05	25 min
10	1.55	15 min	1.19	20 min
5	1.98	15 min	1.90	20 min
2	2.72	10 min	2.70	25 min
1	3.47	10 min	3.36	25 min

As summarised onsite detention can be provided to effectively attenuate runoff up to the 1% AEP peak flow in accordance with the intent of the DCP. Detailed design to confirm the basin volume and outlet configuration will need to be undertaken at subsequent Development Application and Construction Certificate stages. It is anticipated that detention facilities will be located within a dedicated drainage reserve within the development envelope.

2.3.2 Stormwater Quality

Preliminary stormwater quality modelling has been undertaken using the conceptual computer software MUSIC (Version 6.3). MUSIC serves as a planning and decision support system that is used to estimate the efficiency of Stormwater Quality Improvement Devices (SQIDs) at capturing common stormwater pollutants including Total Suspended Solids, Total Nitrogen, Total Phosphorous and Gross Pollutants from stormwater runoff. Modelling involves the use of historical or synthesized long-term rainfall data and algorithms that can simulate the performance of stormwater treatment measures to determine stormwater pollution control.

Water quality is proposed to be managed through a treatment train approach to meet pollutant removal efficiency targets specified in Council's Civil Works Specification Design Guideline 2018. The relevant targets have been reproduced in **Table 3** below.

Table 3: Pollutant Removal Efficiency Targets.

Pollutant	Treatment Efficiency Target
Total Suspended Solids (TSS)	80% reduction in pollutant loads
Total Nitrogen (TN)	45% retention of average annual load
Total Phosphorous (TP)	45% retention of average annual load
Gross Pollutant (GP)	90% reduction in mean annual load (for pollutants greater than 5mm in diameter)

CCC's MUSIC-Link for upland development has been utilised for all rainfall and source node pollutant data inputs. Source nodes were classified as one of three land use categories being roof, road or residential areas.

A preliminary treatment train consisting of the below devices has been considered for the site:

- Reuse Tanks – Individual 4kl rainwater harvesting tanks have been proposed for future lots. All tanks are to be fitted with proprietary first flush devices as minimum treatment prior to onsite reuse. By capturing the first portion of runoff from the roof areas the first flush devices will effectively remove course sediment and attached nutrients from the system.
- GPTs – An end of line proprietary gross pollutant trap has been proposed to provide primary treatment. The devices are designed to remove litter, debris and course sediment from runoff to protect downstream treatment measures.
- Biofiltration Basin – A bioretention basin has been proposed as an end of line secondary treatment measure for stormwater runoff prior to discharging into downstream receiving waters. Within a biofiltration basin stormwater runoff is designed to pond and infiltrate through a porous filter media which supports nutrient removing plant species. Infiltrated stormwater is captured in a subsurface drain and returned to the network. Stormwater will enter these the basin via riprap-lined weir designed to dissipate energy. A high flow bypass will be provided to prevent scour damage in higher intensity rainfall events.

The estimated pollutant load reductions modelled in MUSIC are presented in **Table 4.**

Table 4: Stormwater Quality Results

Parameter	Source Load (kg/yr)	Residual Load	% Reduction
TSS	10800	1830	83.0
TP	20.5	7.79	62.0
TN	136	68.9	49.7
GP	1550	8.23	99.5

As summarised in **Table 4**, a treatment train approach can effectively achieve pollutant load reductions as indented by the Civil Works Specification Design Guideline. The model includes a biofiltration basin with a surface area of 400m^2. Detailed modelling of the proposed treatment train to confirm device size, inlet configuration and compliance with the required pollutant load reduction targets will be required to support any future subdivision applications.

A depiction of the proposed stormwater mitigation facility for the site has been provided within Appendix A, refer drawing NL91021_KA.01 – Preliminary Stormwater Strategy.

3. Water and Sewer

3.1 Potable Water

The site is located within the Kariong K3/ K4 reservoir supply zone. No potable water connection currently services Lots 512 and 513. Future servicing will require the construction of new water mains from the existing supply network servicing adjacent residential zones. Due to the proximity of lots on the western boundary to the reservoir, some lots may require pressure boosting.

Previous correspondence received from CCC highlights two possible water connection points, an existing DN250 AC located on the corner of Milyerra Road and Woy Woy Road, or alternatively the existing DN250 CICL main adjacent to the reservoirs west of the site. Preliminary investigation into available pressure indicates that due to the proximity of the reservoirs, some lots may require pressure boosting which would be feasible via a local booster. The final water servicing methodology will need to be considered as part of a detailed servicing strategy but appears feasible for the site.

3.2 Sewer

Lots 512 and 513 are currently not serviced by sewer connections. Gravity sewer mains will need to be extended from the adjacent residential area. Preliminary advice received from CCC indicates there may be capacity constraints with the receiving pump station therefore developer-funded augmentation of these pump stations may be required. CCC will provide detailed information on available capacity post-approval.

4. Service Infrastructure

4.1 Electricity

Electrical infrastructure exists in the adjacent residential area. In addition, high voltage electrical infrastructure currently passes through the site. Confirmation of available capacity will be sought from Ausgrid once final lot yield is confirmed.

4.2 Telecommunications

It is anticipated that telecommunications infrastructure can be extended from adjacent residential areas. Confirmation of connection requirements will be confirmed with applicable service providers following gateway approval.

4.3 Gas

Gas services are available within the adjacent residential areas. It is anticipated that gas servicing can be extended to the site from adjacent services. An economic valuation is typically undertaken by Jemena once the final layout is known which will determine the viability of gas servicing.

5. Conclusion

Based on the assessment undertaken to date the site is recommended for planning proposal on the grounds of stormwater flooding and essential services. As outlined above the site is considered to have sufficient capacity to accommodate the proposed rezoning with further investigations required to support the detailed design of the subdivision application.

The outcomes of the preliminary stormwater management strategy indicate that detention measures can be adopted to attenuate post developed flows to pre-developed rates. In addition to this, though the adoption of WSUD principals water quality reduction targets can be achieved.

Future servicing Determination of the actual servicing requirements for each site would be subject to an application to each authority at the time of development application. Augmentation to existing infrastructure would be undertaken by the developer in conjunction with local servicing authorities and neighbouring developments.

Appendix A

Figure

LEGEND

- SITE BOUNDARY
- EXTENT OF PROPOSED RESIDENTIAL REZONING AREA
- EXISTING CONTOURS
- PROPOSED STORMWATER FACILITY.

REVISION	DESCRIPTION	ISSUED	VER'D	APP'D	DATE
1	ISSUED FOR INFORMATION	LS		BB	15.11.19

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DARKINJUNG LALC

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PROJECT
512, WOY WOY ROAD
KARIONG N.S.W 2250

DRAWING TITLE
PRELIMINARY STORMWATER STRATEGY

JOB NUMBER
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DRAWING NUMBER
KA.01

REVISION
1

DRAWING SHEET SIZE = A1