

23 September 2024

Outline Planning Consultants Pty Ltd
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Dear Gary,

Preliminary Groundwater Assessment Report: Lot 1, DP 1239728, 1848 Castlereagh Highway, Tallawang, NSW – Gulgong Quarry Project

1 Overview

Martens and Associates (**MA**) has been engaged by Outline Planning Consultants Pty Ltd (**OPC**) to prepare a Preliminary Groundwater Assessment for a proposed quarry, the Gulgong Quarry Project, at 1848 Castlereagh Highway, Tallawang, NSW (the **Site**).

2 Proposed Development

OPC advises that the proposed development will include the establishment of a new quarry, to be executed in three stages:

- **Stage 1:** Initial quarrying operations (approximately 4.98 ha with excavation to approximately 40 m depth) and associated sediment basin in the southern portion of proposed quarry. Stage 1 quarry floor level will be approximately 496 mAHD – 516 mAHD.
- **Stage 2:** Lateral expansion to the north creating a total pit of approximately 7.34 ha with a floor level similar to Stage 1.

Refer to Attachment A for the conceptual design of these stages.

3 Scope

Scope of works for this assessment included the following:

- Description of Site setting and existing conditions.
- Review of available groundwater data from nearby licensed monitoring wells.
- Review of applicable water sharing plan.
- Review of mapping for nearby groundwater dependant ecosystems (**GDEs**).
- Provide comment on likely groundwater conditions.

- Comment on the likelihood of the development to intercept the water table.

4 Site Description

4.1 Site Identification

Site identification details and associated information is summarised in Table 1. The location of the Site and general surrounding area is shown in Attachment B.

Table 1: Site identification information.

Item	Description
Site address	1848 Castlereagh Highway, Tallawang, NSW.
Legal identifier	Lot 1 DP 1239728.
Quarry area	Stage 1: 4.98 ha (approximately). Stage 2: 7.34 ha (approximately).
Geographic coordinates	Northeast corner of Site (datum GDA202 – MGA56). <ul style="list-style-type: none"> • Easting: 161727. • Northing: 6430712. (Source: SIXMaps).
Local government area	Mid Western Regional Council.
Zoning	RU1 Primary production.
Current land use	The Site is predominantly a grassed paddock which is part of a larger rural landholding. A small borrow pit has been previously established within the proposed quarry area with the material used for farming / rural purposes.

5 Environmental Setting

Information relating to the environmental setting of the proposed development area is presented in Table 2.

Table 2: Environmental setting information.

Item	Description
Topography	The proposed Site within undulating terrain on the eastern side of the Tallawang Creek Valley. The proposed quarry is located on a hill with elevation of 537 mAHD. The surrounding areas to the north, west and south contains several other hills with elevations ranging from 537 mAHD to 570 mAHD.
Geology	Review of NSW surface geology (MinView, 2024) indicates the proposed quarry site lies across the boundary of the following two geological units: <ul style="list-style-type: none"> • Ludlow Tannabutta Group, also known as Dungeree Volcanics, shown underlying most of the eastern portion of the Site. Rock type generally comprises shale, slate, quartz and felsic volcanic rich sandstone. • Late Odovician mudstones of the Tucklan Formation located to the west. Rock types generally comprise of dark mudstone, basalt to latite boulder conglomerate or breccia, lithic sandstone, basalt, andesite, dolerite, latite, limestone and rare chert.

Item	Description
Soil landscape	Review of NSW eSPADE (NSW DPE, 2023) indicates the Site consists of the Tucklan landscape on undulating low hills. Relief is 40 – 80 m on slopes of 3 – 15%. Soils are mainly Euchrozems with Red Podzolic Soils and Non calcic Brown Soils on rises.
Acid sulfate soils	Review of Atlas of Australian Acid Sulfate Soils (ASS) indicates an extremely low probability of ASS occurrence.
Salinity	Review of Western Central West Hydrogeological Landscapes (eSPADE, 2024) indicates salinity at the site is considered high.
Surface hydrology	The site drains east via overland flow towards Tallawang Creek (located approximately 1.5 km to the east).

6 Current Water Access License

Review of NSW Water Register indicates there are no current Water Access Licenses (**WAL**) for the Site.

7 Existing Water Sharing Plan

The following water sharing plan currently applies to the site under the Water Management Act (2000):

- Water Sharing Plan for NSW Murray Darling Basin Fractured Rock Groundwater Source 2020.

Environmental objective one of the plan is the protection of the condition of groundwater sources and their dependent ecosystems.

The aquifer located beneath the development area is recognised as the Lachlan Fold Belt MDB Groundwater Source, which is the largest of the groundwater systems in NSW. It generally consists of less productive aquifers due to typical low encountered yield rates and not having significant connection with the overlying surface water systems and other contiguous groundwater systems.

8 Hydrogeology

8.1 Lachlan Fold Belt Fractured Rock Units

LFB rock units are anticipated to contain an upper (shallow) aquifer (weathered regolith) and a lower (deep) aquifer bedrock. Expected hydrogeological based on regional studies (NSW DPIW, 2017, WSP 2021) are summarised in Table 3.

Table 3: Lachlan Fold Belt fractured rock hydrogeological unit characteristics.

Characteristic	Upper Aquifer	Lower Aquifer
Unit thickness	2 – 5 m	>1,000 m
Aquifer confinement	Unconfined	Semi confined to confined
Hydraulic conductivity	0.01 – 40 m/day	Variable – dependent on fracture and joint system connection and aperture
Yield	<1 L/second (low)	<3 L/second yield (low) where fractures are absent.

Characteristic	Upper Aquifer	Lower Aquifer
Hydraulic gradient	Low to moderate Is dependent upon weathering profile and topography.	Low
Groundwater flow	Vertical seepage to lower aquifer and lateral flow through weathered rock. Likely to extend into overlying sediments through capillary action.	Flow confined to secondary flow conduits facilitated by fracture and joint systems.
Water quality (TDS)	<1,500 mg/L (fresh to slightly saline)	<3,000 mg/L (fresh to slightly saline)

8.2 Registered Bores and Groundwater Uses

Review of WaterNSW Realtime Water Database identified four licensed groundwater bores within approximately 2.0 km of the Site (Table 4).

Table 4: Registered bores and groundwater use.

Bore ID	Registered Use	Approximate Distance from Site (m)	Approximate Direction from Development	Bore Depth (m)	Standing Water level (mbgl)
GW044690	Domestic, Stock	1,430	Southeast	33.5	No water encountered to approx. RL 449 mAHD
GW066655	Domestic, Stock	1,440	Northeast	38.4	21.3 mbgl (water approx. RL 464 mAHD)
GW801045	Stock, Irrigation	1,500	East	45.7	9.1 mbgl (water approx. RL 471 mAHD)
GW058156	Domestic, Stock	1,500	Northeast	40.0	No water encountered to approx. RL 468 mAHD.

The location of the groundwater bores in proximity to the Site is shown on Map 03 in Attachment B.

8.3 Site Investigations

Douglas Partners conducted intrusive investigations between 4 to 15 April 2024 which included drilling of two boreholes in the proposed quarry location to depths ranging from 13.5 mbgl (522.2 mAHD) to 15.6 mbgl (approximately 501.6 mAHD). Groundwater was not observed during augering to depths of 1.12 - 1.35 mbgl. Groundwater observation below these depths was not possible due to the introduction of drilling fluids during rock coring. Monitoring wells were not installed as part of the DP (2024) investigation.

8.4 Groundwater Quality

The NSW DPIE (2019) document *Murray Darling Basin Fractured Rock Water Resource Plan: Groundwater Resource Description* outlines that water quality within the Lachlan Fold Belt fractured rock aquifer varies significantly based on rock type, fractured density, aquifer depth and climate.

9 Groundwater Dependent Ecosystems

Review of the Australian Groundwater Dependent Ecosystems (**GDE**) Atlas (BOM, 2023) was conducted for the identification of GDE with 2,000 m of the proposed quarry. Moderate to high potential GDEs located within 2,000 m of the proposed quarry are detailed in Table 5. The closest

moderate or high potential GDE is approximately 610 m from the proposed quarry and is a small area of roadside vegetation. The location of GDEs is shown on Map 05 in Attachment B.

When considering the mapped GDEs it is noteworthy that the proposed stage 1 quarry floor is proposed at not lower than 514 mAHD and the stage 2 quarry floor not lower than 497 mAHD. The separation distance between the quarry and mapped potential GDEs, as well as the relative elevation of the proposed floor and the mapped potential GDEs, indicates that the proposed development would not impact on the areas identified as potential GDEs.

Table 5: Summary of groundwater dependent ecosystems.

Ecosystem Type	Supplied Ecosystem	GDE Potential	Approximate Distance from Site (m)	Direction from Site	Approximate Elevation (mAHD)
Vegetation	Blakelys Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	High	795	Southwest	514
Vegetation	Blakelys Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	High	610	Northeast	496
Vegetation	Blakelys Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	High	1,210	North	497
Vegetation	Blakelys Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	High	1,300	Southeast	483
Vegetation	Blakelys Red Gum – Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Moderate	1,635	East	471

Review of Mid Western Regional Local Environmental Plan 2012 revealed the western portion of the Site is mapped as groundwater vulnerability. These areas are identified as “guide in determining which areas are more susceptible to groundwater contamination within the mapped area”. The proposed quarry operations are not to be undertaken in this part of the site.

10 Discussion and Conclusion

We make the following summary comments:

- Excavation for the proposed quarry will be > 40 m and final depth will be 497 mAHD.
- There are no licensed bores located on the Site.
- The nearest licensed groundwater bore to the proposed quarry (approximately 1.43 km to the southeast) was drilled to a depth of 33.5 m (449 mAHD) and no water was encountered on the drill log.
- The nearest groundwater bore with water level information is located approximately 1.5 km to the east of the proposed quarry, on the edge of the Tallawang Creek floodplain. Groundwater depth in this location was approximately 9 mbgl (or 471 mAHD).



- Recent intrusive investigation works completed by Douglas Partners to 15 mbgl were inconclusive with regards to Site groundwater observations.
- The distance to mapped potential GDEs, and the elevation of the mapped potential GDEs, are such that the proposed quarry is considered unlikely to have potential to impact on the hydrology and hydrogeology of these features in a significant way.

Given the proposed depth of quarry excavation, topography and licensed groundwater bore information, there is not evidence that confirms that the proposed quarrying work will intercept permanent groundwater. Further, the elevation and location of mapped potential GDEs are such that the proposed development is not likely to have any significant affect on the mapped potential GDEs. Further site specific data may be developed through the installation of appropriate site groundwater bores and monitoring.

If you require any further information, please do not hesitate to contact our offices.

For and on behalf of

Martens & Associates Pty Ltd

Andrew Norris

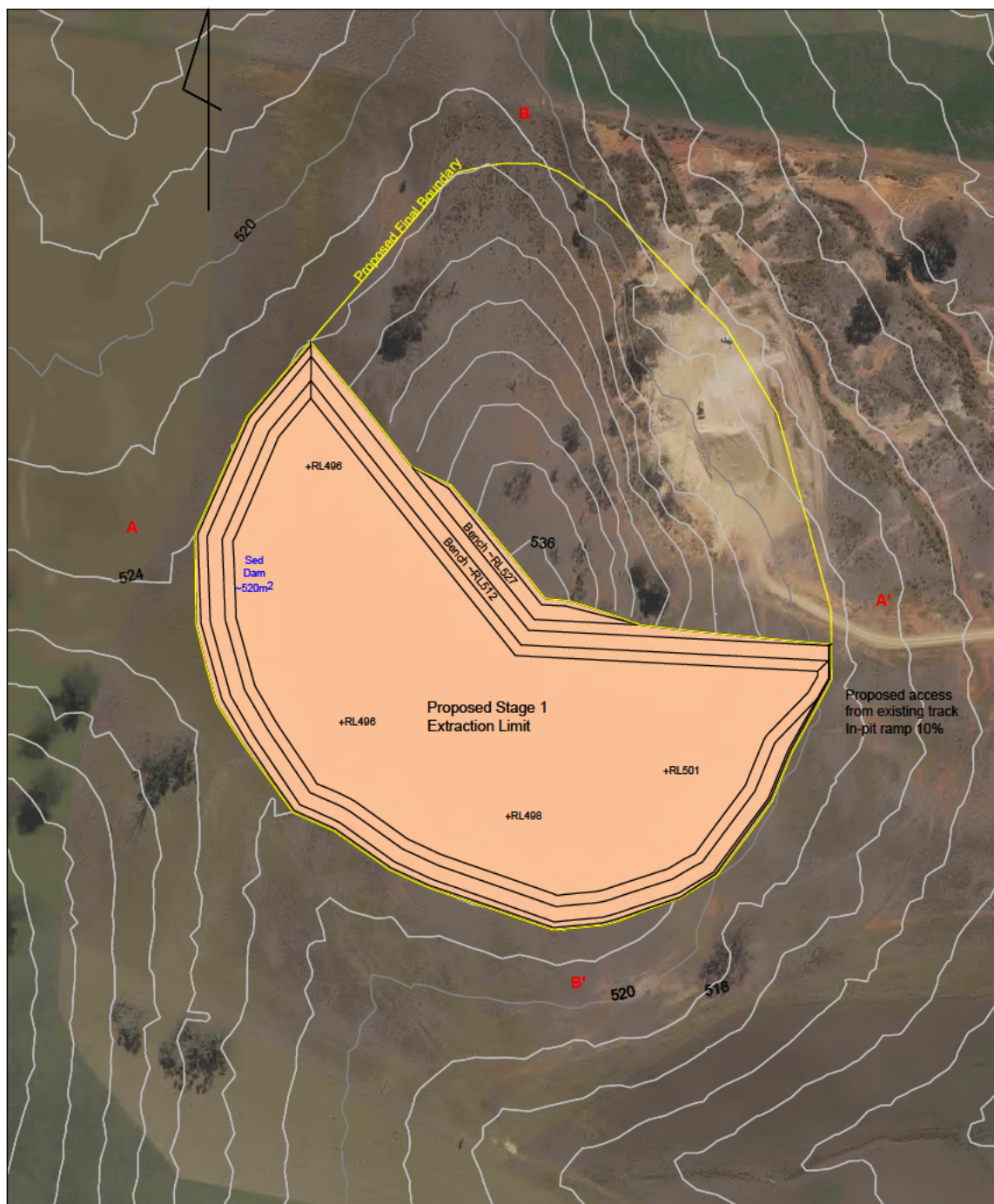
Principal Engineer / Director

References

- BOM (2023) Australian Groundwater Atlas and Australian Groundwater Dependent Ecosystems Atlas. Bureau of Meteorology, Canberra. Available at <http://www.bom.gov.au/water/groundwater/index.shtml>.
- Colquhoun, G.P., Hughes, K.S., Deysing, L., Ballard, J.C., Folkes, C.B, Phillips, G., Troedson, A.L. and Fitzherbert, J.A. (2022) New South Wales Seamless Geology dataset, version 2.2 [Digital Dataset]. Geological Survey of New South Wales, Department of Regional NSW, Maitland 2023.
- Douglas Partners (2024) *Report of Preliminary Geotechnical Investigation, Proposed Quarry, 1848 Castlereagh Hwy, Tallawang, NSW.*
- GSNSW (2023) *MinView. Geological Survey of New South Wales, Department of Regional NSW, Maitland.* Accessed at: <https://minview.geoscience.nsw.gov.au/>.
- Land Insight (2024). *Enviro-Screen Report Lot 1 DP1239728 Tallawang, NSW.*
- Outline Planning Consultants (2024). *Gulgong Quarry Project, Environmental Impact Statement, Lot 1 DP 1239728, No. 1848 Castlereagh Highway, Gulgong NSW 2852.*
- Martens and Associates (2024). *Water Balance Assessment, 1848 Castlereagh Highway, Tallawang, NSW.* Report ref: P2410271JR01V01.
- Mid-Western Regional Local Environmental Plan 2012.
- NSW Department of Primary Industries - Office of Water (currently NSW DoI-W) (2017), Lachlan and South Western Fractured Rock (GW11) and New England Fractured Rock and Northern Basalts (GW17) Water Resource Plans - Groundwater; Status and Issues Paper, August 2017.
- Water Sharing Plan for NSW Murray-Darling Basin Fractured Groundwater Source 2020.
- WaterNSW (2024) Real-Time Water Database. Department of Planning and Environment. Available at: <https://realtimedata.waternsw.com.au/water.stm>,



Attachment A - Conceptual Staging Plan



Gulgong Quarry Conceptual Design Stage 1



Disclaimer:

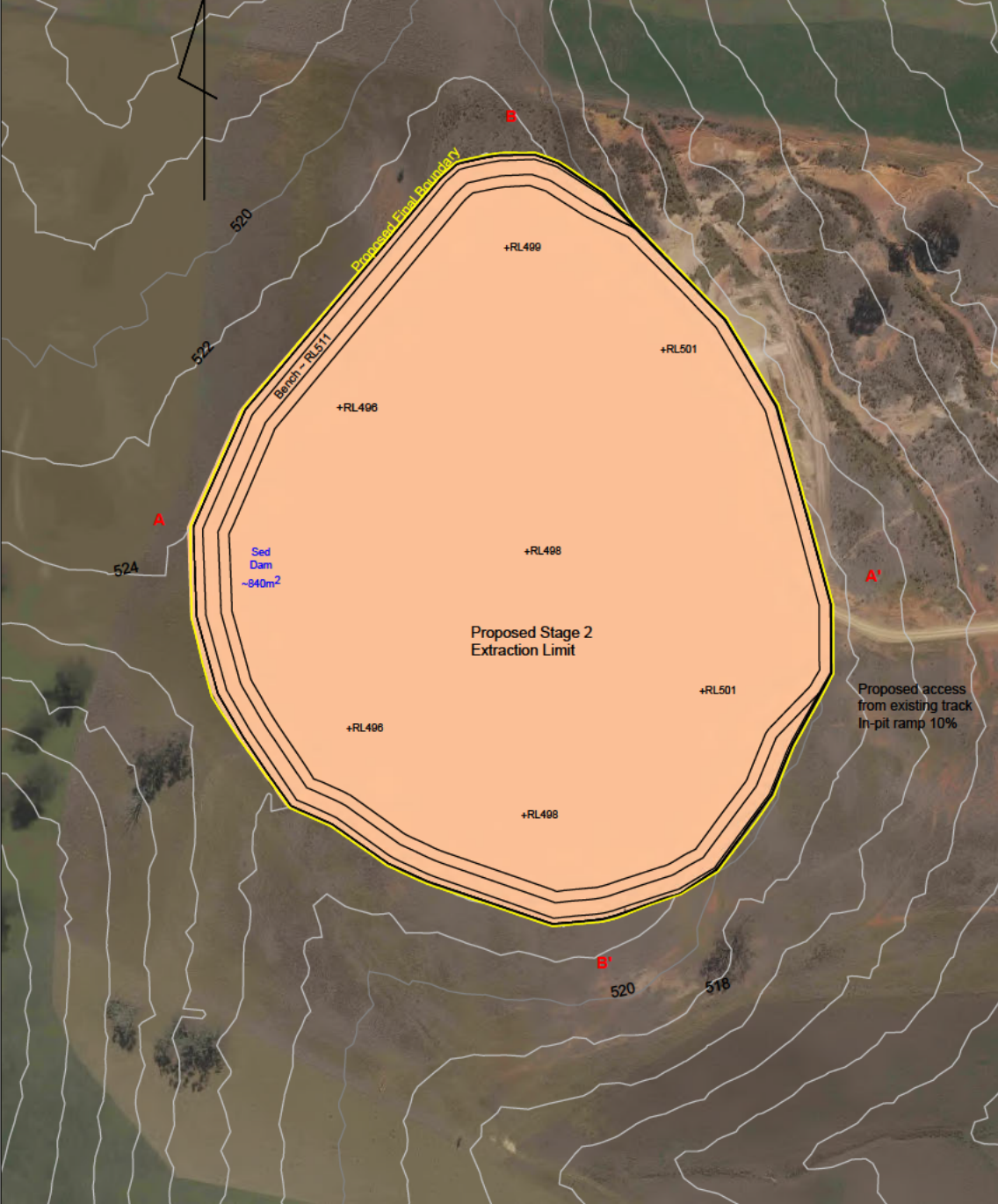
- This plan is a conceptual design only
- This plan is not suitable for operational use
- This plan should be used for visual reference only

Drawn by: A Richards Date: 06/09/2024

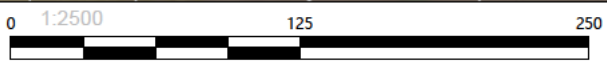
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Date of Survey: unknown

Project: Gulgong Quarry Conceptual Design



Gulgong Quarry Conceptual Design Stage 2



Disclaimer:

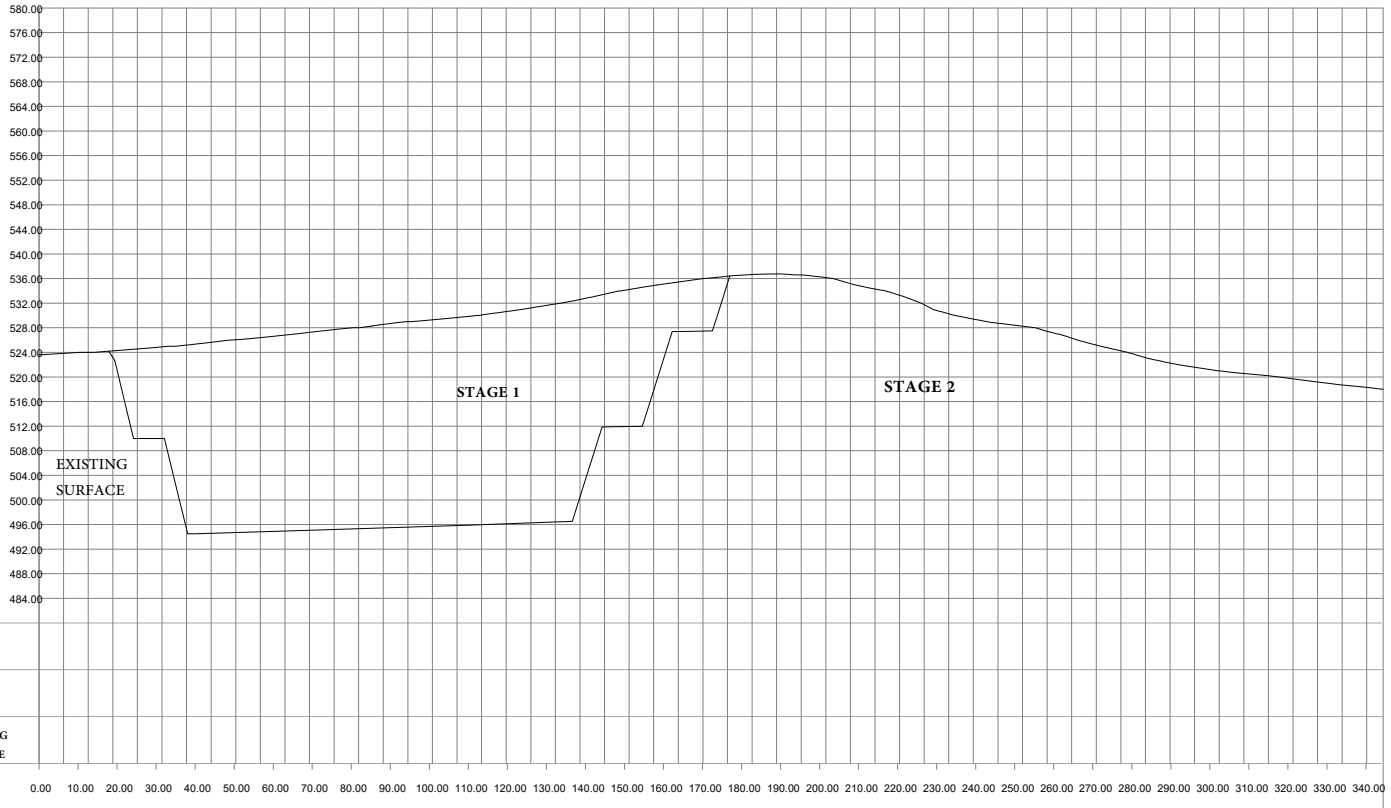
- This plan is a conceptual design only
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Drawn by:	A Richards	Date:	06/09/2024
Approved by:		Date:	
Date of Survey: unknown			
Project: Gulgong Quarry Conceptual Design			

Gulgong Conceptual Design Stages - AA' Section View (East - West)

A

A'



STAGE 1

STAGE 2

EXISTING SURFACE

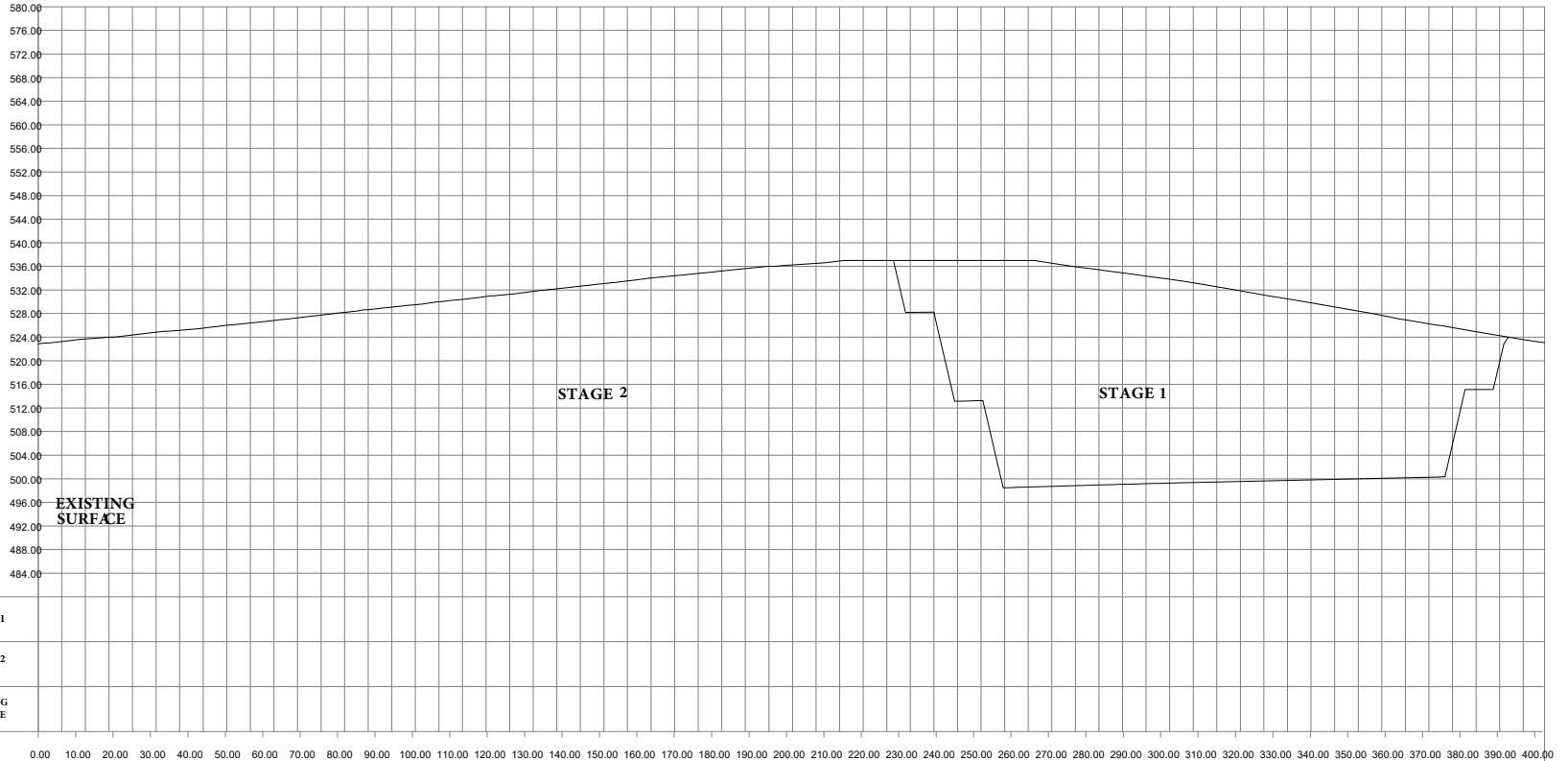
Station

Scale Horizontal 1:630 Vertical 1:400

Gulgong Conceptual Design Stages - BB' Section View (North - South)

B

B'



STAGE 1

STAGE 2

EXISTING SURFACE

Station 0.00 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00 90.00 100.00 110.00 120.00 130.00 140.00 150.00 160.00 170.00 180.00 190.00 200.00 210.00 220.00 230.00 240.00 250.00 260.00 270.00 280.00 290.00 300.00 310.00 320.00 330.00 340.00 350.00 360.00 370.00 380.00 390.00 400.00

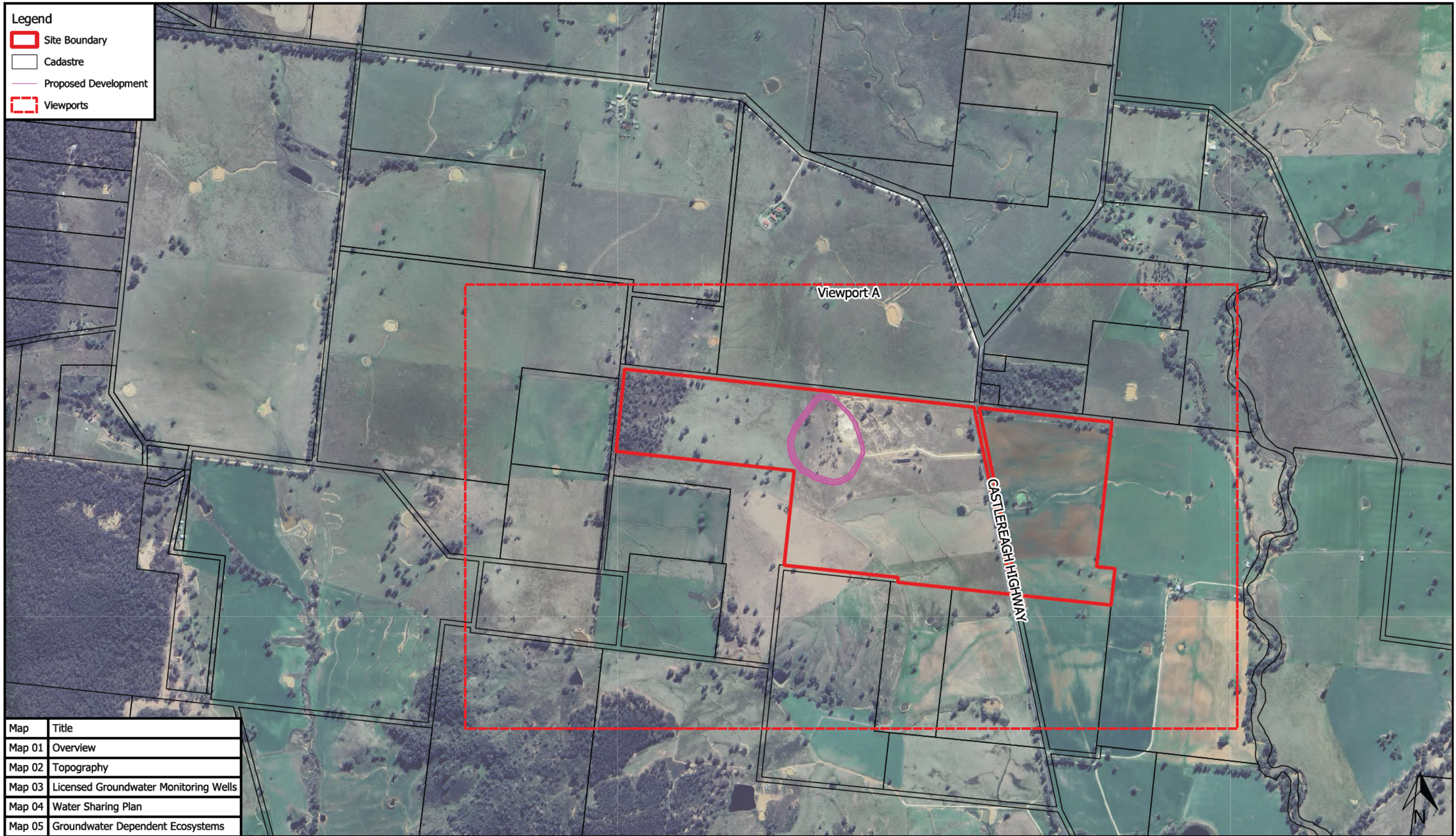
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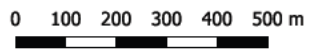
Attachment B - Maps

Legend

- Site Boundary
- Cadastre
- Proposed Development
- Viewports



Map	Title
Map 01	Overview
Map 02	Topography
Map 03	Licensed Groundwater Monitoring Wells
Map 04	Water Sharing Plan
Map 05	Groundwater Dependent Ecosystems



1:15000 @ A3

Viewport

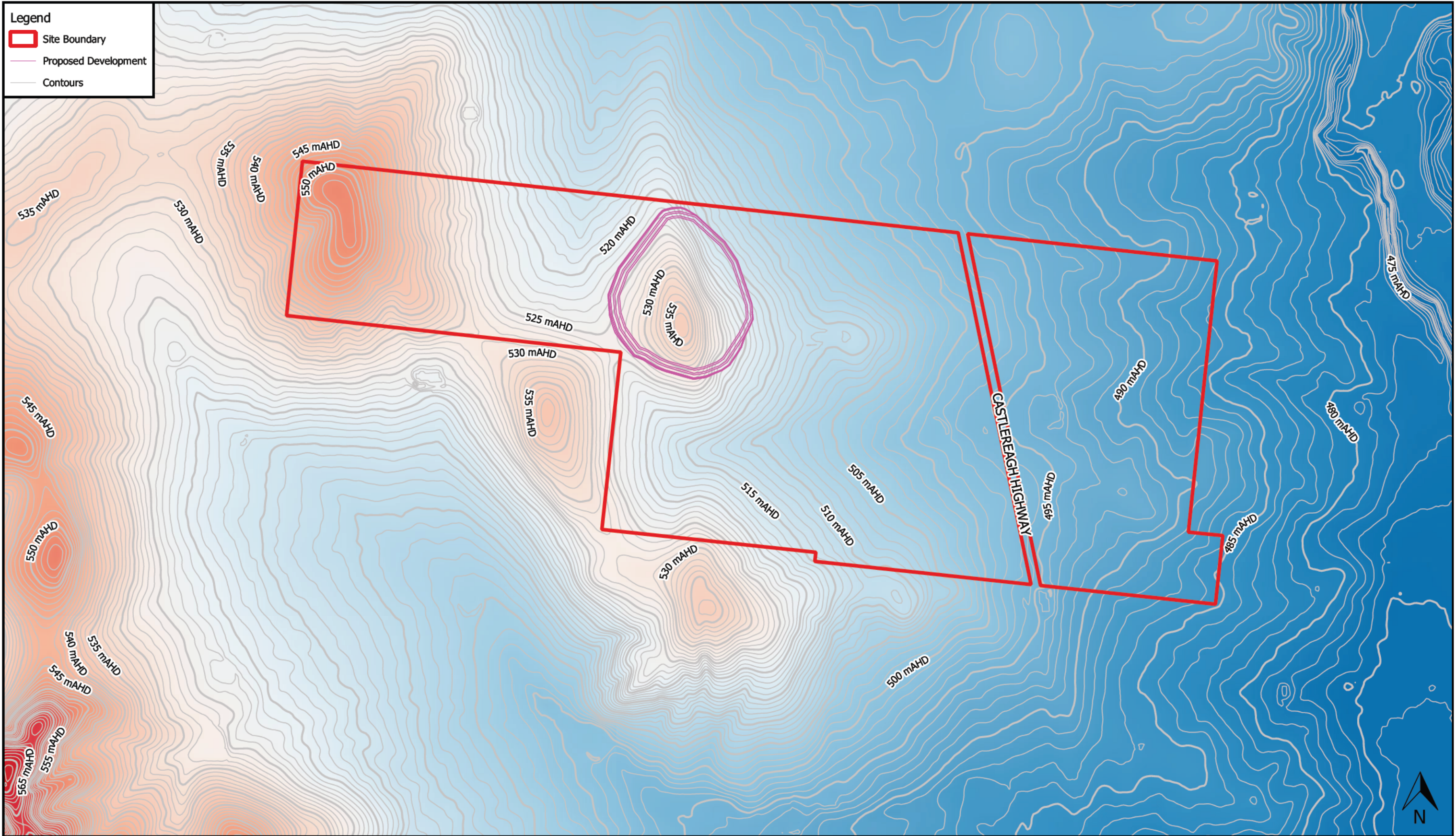
- Notes:**
- Aerial from Google Satelite (2024).
 - Cadastre and Site Boundary from NSW Spatial Services Clip & Ship (2024).
 - Proposed Development from Outline Planning Consultants (2024).

Project No: P2410271 Map Set: MS01-R01 EPSG: 7856 © Martens & Associates Pty Ltd | E mail: martens.com.au | WEB: www.martens.com.au

Map Title / Figure:
Overview

Legend

- Site Boundary
- Proposed Development
- Contours



0 90 180 270 360 450 m

1:8000 @ A3

Viewport A

- Notes:
- Site Boundary from NSW Spatial Services Clip & Ship (2024).
 - Proposed Development from Outline Planning Consultants (2024).
 - Contours from Elvis LIDAR (2012).

Map Title / Figure:

Topography



0 100 200 300 400 500 m

1:15000 @ A3

Viewport

- Notes:
- Aerial from Google Satelite (2024).
 - Cadastre and Site Boundary from NSW Spatial Services Clip & Ship (2024).
 - Proposed Development from Outline Planning Consultants (2024).
 - Groundwater bores from NSW Bureau of Meteorology databases of groundwater boreholes (2024).

Map Title / Figure:
Licensed Groundwater Monitoring Wells

Map 03	Map
Lot 1/DP1239728 - Castlereagh Highway, Tallawang NSW	Site
Concept Engineering Works	Project
Groundwater Assessment	Sub-Project
Talinga Pastoral Co	Client
04/09/2024	Date

Legend

- Site Boundary
- Cadastre
- Proposed Development

Water Sharing Plan

- NSW Murray Darling Basin Fractured Rock Groundwater Source



0 90 180 270 360 450 m

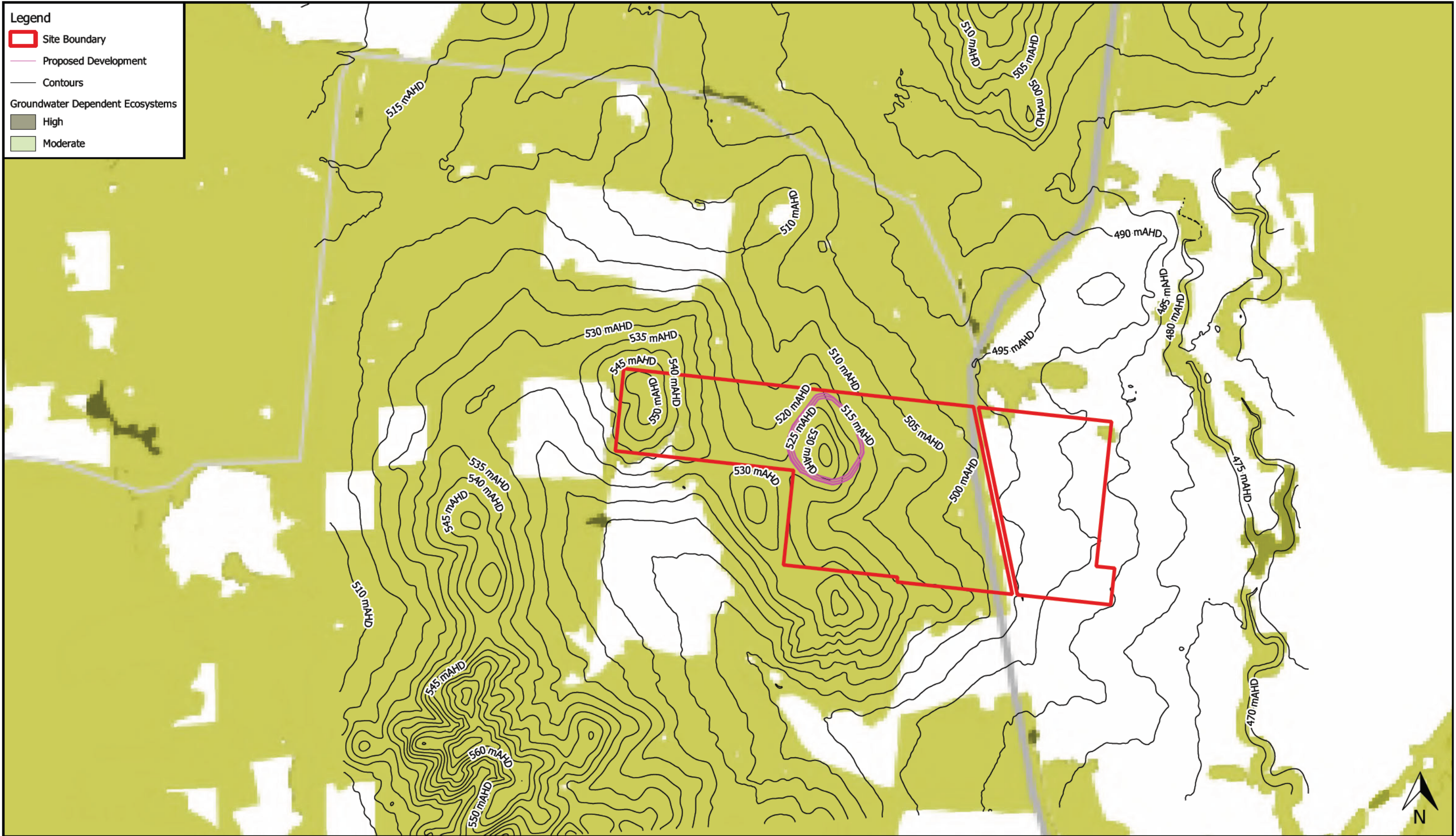
1:8000 @ A3

Viewport A

- Notes:**
- Aerial from Google Satelite (2024).
 - Cadastre and Site Boundary from NSW Spatial Services Clip & Ship (2024).
 - Proposed Development from Outline Planning Consultants (2024).
 - Water Sharing Plan from NSW Department of Planning, Industry and Environment (2024).

Map Title / Figure:
Water Sharing Plan

	Map 04	
Lot 1/DP1239728 - Castlereagh Highway, Tallawang NSW		Map
Concept Engineering Works		Site
Groundwater Assessment		Project
Talinga Pastoral Co		Sub-Project
04/09/2024		Client
		Date



Legend

- Site Boundary
- Proposed Development
- Contours

Groundwater Dependent Ecosystems

- High
- Moderate

0 100 200 300 400 500 m

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Viewport

- Notes:**
- Site Boundary from NSW Spatial Services Clip & Ship (2024).
 - Contours from Elvis LIDAR (2012).
 - Proposed Development from Outline Planning Consultants (2024).
 - Moderate and high potential Groundwater Dependent Ecosystems from NSW Bureau of Meteorology (2024).

Map Title / Figure:
Groundwater Dependent Ecosystems

	Map 05		Map
Lot 1/DP1239728 - Castlereagh Highway, Tallawang NSW			Site
Concept Engineering Works			Project
Groundwater Assessment			Sub-Project
Talinga Pastoral Co			Client
04/09/2024			Date