Stockton Quarry - Dry Sand Extraction Project

SSD - 52984212

MAXIMUM EXTRACTION DEPTH MANAGEMENT PLAN

April 2026

Source: ***Stockton Quarry Dry Sand Extraction Project (Boral, 2024)***

Document Name	Stockton Quarry Maximum Extraction Depth Management Plan

Rev No.	Date	Prepared By	Approved By	Comments
1.0	April 2025	Chris Jones (IEMA) Kristen McMahon (IEMA) April Shearer (IEMA) Rod Johnson (Boral)	Rod Johnson (Boral)	Initial Document
1.1 & 1.2	June 2025	Chris Jones (IEMA) Kristen McMahon (IEMA) April Shearer (IEMA) Reviewed by Katarina David (Hydrogeologist)	Rod Johnson (Boral)	Revised Document
1.3	October 2025	Chris Jones (IEMA) Kristen McMahon (IEMA) April Shearer (IEMA) Reviewed by Katarina David (Hydrogeologist)	Rod Johnson (Boral)	Revised Document
1.4	December 2025	Chris Jones (IEMA) Kristen McMahon (IEMA) April Shearer (IEMA) Reviewed by Katarina David (Hydrogeologist)	Rod Johnson (Boral)	Revised Document
1.5	April 2026	Chris Jones (IEMA) Kristen McMahon (IEMA) Reviewed by Katarina David (Hydrogeologist)	Rod Johnson (Boral)	Revised Document

Table of Contents

Tables

Figures

Appendices

1 INTRODUCTION

1.1 BACKGROUND

Boral Resources (NSW) Pty Ltd owns and operates Stockton Sand Quarry, located on Coxs Lane, Fullerton Cove, a long-standing operation that extracts and transports sand for use in the building, landscaping and construction markets. The site has an area of approximately 246 hectares (ha) and has been used for the purposes of extractive industries (sand quarrying) since the 1970s. At present, there is an existing quarry located on the windblown (transgressive) sand dunes of Stockton Bight, which transports up to 500,000 tonnes per annum (tpa) of product (the existing windblown project).

SSD-52984213 was approved by the Department of Planning, Housing and Infrastructure (DPHI) on 8 August 2024, relevant to this management plan is in the central portion of the quarry and covers an area of approximately 38 ha. The project site contains the proposed clearance area, which comprises all areas to be disturbed by vegetation clearing and sand extraction operations as well as new entry/exit roads, a two-way haul road, a laydown area, and a pad for a wash plant and water recycling and filter press. The regional site context is shown in **Figure 1**.

The site is accessed via Coxs Lane over an adjacent Crown Reserve (Lot 7300 DP1130730) under Licence agreement with the DPHI Crown Lands. Land use surrounding the site is a mix of rural, residential, public recreation and environmental conservation areas. The local site context is shown in **Figure 2** and **Figure 3**.

1.2 PROJECT OVERVIEW

The project involves the extraction of sand above the water table from approximately 26.5 m Australian height datum (AHD) (in Stage 1) to an interim minimum extraction level of 5 m AHD, maintaining the required minimum 0.7 m buffer above the water table. Using dozer, excavator, haul trucks and front-end loader. This control will be incorporated until the revision of this plan.

Thereafter, extraction limits will be managed in accordance with the updated Maximum Extraction Depth Management Plan (MEDMP) and Water Management Plan with revised groundwater data reviewed by a hydrogeologist, in line with Condition B26 of SSD-52984213. Maintaining transition to a minimum extraction level of 3.7m AHD in future updates of this plan.

The sand would be extracted from five stages, starting in Stage 1. Due to the quality of sand anticipated to be found in Stage 1, this material would be dry screened before being dispatched. Sand extracted from Stages 2-5 (inclusive) would be processed through a wash plant and water recycling and filter press due to the higher volume of organics likely to be found. There are an estimated 3.1 million tonnes (Mt) of dry sand resource above the water table, within the project site.

Consistent with the originally proposed and exhibited dredge application, the project seeks a site-wide extraction and dispatch limit (i.e. the existing windblown project and the project combined) of no more than 750,000 tpa. Key infrastructure approved via the consent for the site is outlined in **Table 1** and **Table 2** below.

Table 1: Hours of Operation

Activity	Hours of permissible Operation (as per Condition A12 of SSD-52984213)
Construction Work	7 am to 6 pm Monday to Friday 8 am to 1 pm Saturday At no time on Sundays or public holidays
Quarrying operations including loading and dispatch of laden trucks	6:15 am to 6 pm Monday to Friday 6:15 am to 3 pm Saturday At no time on Sundays or public holidays
Maintenance, security, office work, cleaning, etc	May be conducted at any time, provided that these activities are not audible at any residence on privately-owned land

Table 2: Project Summary

Project Element	Project Description (SSD-52984213)
Location	Inland Dunes
Staff	Up to six full time and up to two casual
Total resource	3.1 million tonnes
Consent period	10 years from commencement (or until the current dredge application is approved and commenced)
Production and transport limits	Up to 750,000 tpa (inclusive of the windblown sand operations) until either the current dredge application is approved and commenced or the windblown sand development consent lapses in 2028, after which production/transportation would reduce to up to 500,000 tpa
Extraction method and stages	Stages 1-5 dry extraction using front end loaders
Processing	Stage 1 - as needed dry screen prior to dispatch (dependent on quality) Stages 2-5 - dry extraction (sand of lower quality would be processed through a wash plant and water recycling and filter press prior to being stockpiled)
Vegetation clearing, offsets and rehabilitation	Clearing of 38.14 ha of vegetation with staged offsets to reflect extraction Stages Preliminary clearing/offset stage to allow for a site wide drilling program to commence prior to extraction Standalone rehabilitation strategy comprising progressive stabilisation and rehabilitation of disturbed areas with species endemic to coastal woodland
Site infrastructure and plant	Retain all existing improvements and augment/upgrade to include: • new prefabricated office building • relocation of onsite materials storage (currently in the footprint of proposed Stage 1) • replacement of roofing for the workshop • new 20,000 litre water storage tank • new laydown area • new wash plant and water recycling and filter press

1.3 PURPOSE AND SCOPE

The Maximum Extraction Depth Management Plan (MEDMP) has been developed to provide an overview of extraction activities undertaken at the site. It has been prepared in accordance with Condition B26 of SSD-52984213 and guides the management and monitoring of extraction for the duration of the project during construction and operational phases. This plan complements the Water Management Plan (WMP). Together, they address Conditions B26 and B35 of SSD-52984213 and form a framework with the Environmental Management Strategy under Condition C4 of the consent.

1.3.1 Objectives

As per SSD-52984213 the objectives of this MEDMP are to:

- Detail a survey plan of the approved disturbance area which accurately maps the current topography and sand resource that can be extracted.
- Detail a maximum extraction depth program for quarrying operations, which includes a methodology to ensure sand extraction remains 0.7 m above the 99th percentile groundwater level.
- A trigger action response to ensure compliance with Condition A7 and A8.
- Detail protocols to review the groundwater levels the site and to demonstrate in the Annual Review (AR) that quarrying operations remain compliant.

1.3.2 Preparation

SSD-52984213 is granted without any conditions requiring specialist involvement in the preparation of the MEDMP. This plan has been prepared by Boral Resources in consultation with:

- *Chris Jones, Kristen McMahon and April Shearer* of IEMA – Preparation of the Max Extraction Depth Management Plan.

1.3.3 Submission

As per Condition B26(a) of SSD 52984213 the MEDMP must be submitted for approval to the Planning Secretary prior to commencing quarrying operations within the approved disturbance area.

SSD-52984213 further states:

> *Condition B27. Quarrying operations within the approved disturbance area must not commence until the maximum extraction depth management plan is approved by the Planning Secretary.*
>
> *Condition B28. The maximum extraction depth management plan, as approved by the Planning Secretary, must be implemented prior to the commencement of quarrying operations in the approved disturbance area.*

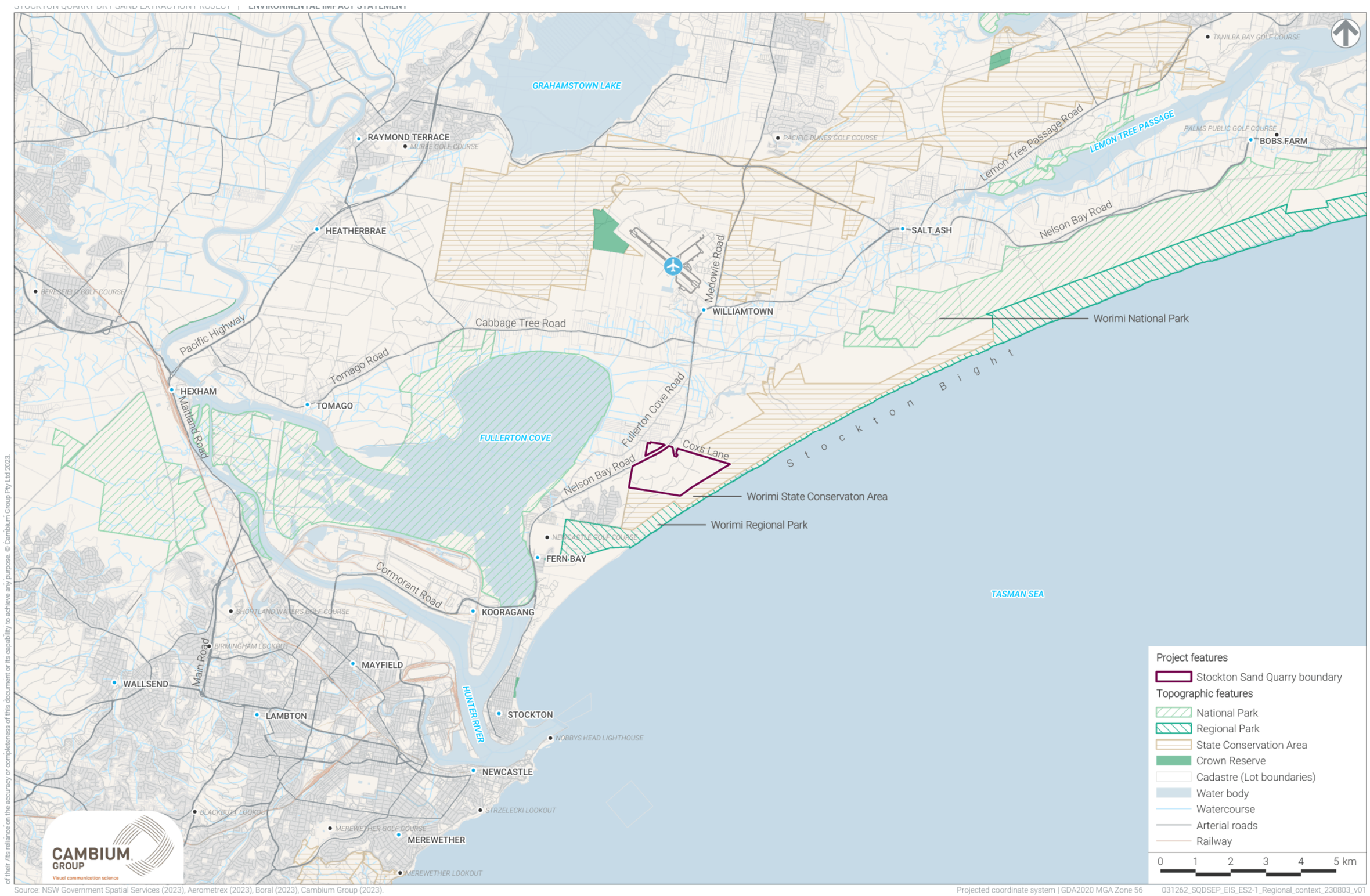


Figure 1: Regional Context (EIS, 2023)

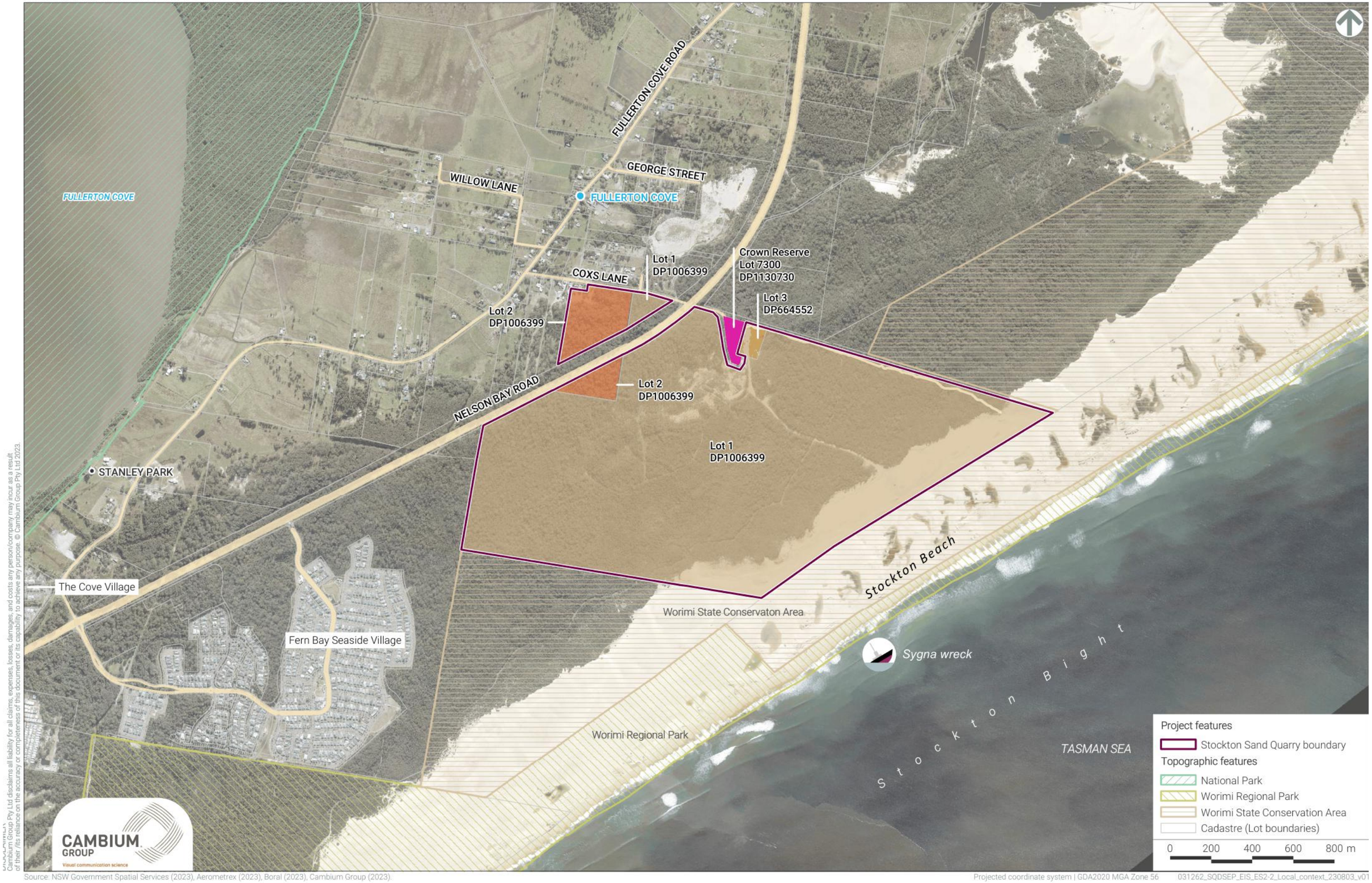


Figure 2: Local Context (EIS, 2023)

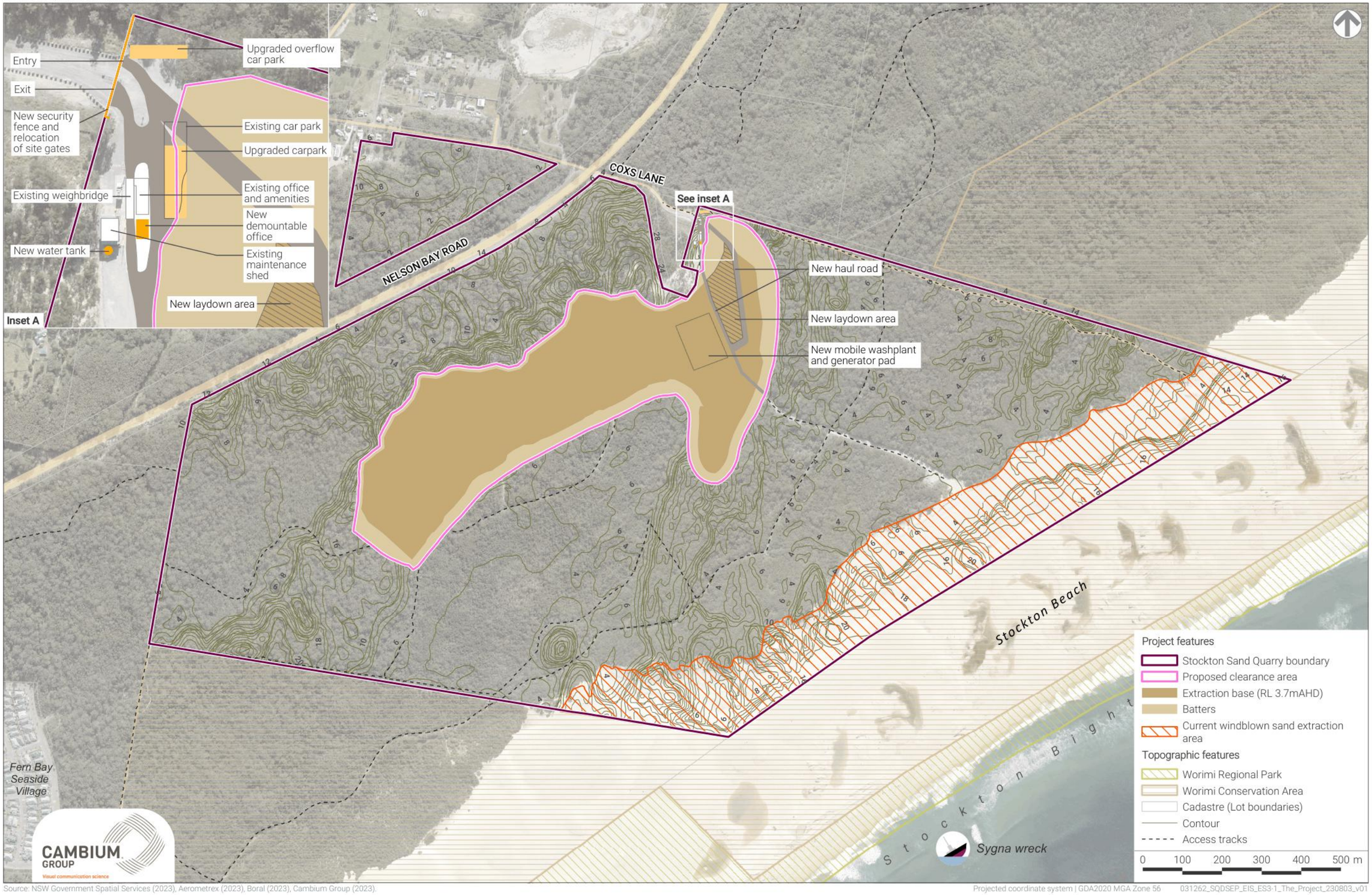


Figure 3: The Project Area including Proposed Extraction Area (EIS, 2023)

1.4 PROPOSED ACTIVITIES UNDER THIS VERSION OF THE WMP

In accordance with SSD-52984213 Condition A18 (a) and (c) Boral propose a risk-based staged approach in the initial phase of construction and early operations to manage the groundwater level and acid sulfate soil risk are outlined in ***Table 3***.

Table 3: Proposed Stage Approach - Controls and Activities Under this MEDMP

Stage	Activities and Controls
Works to be completed under this management plan (Stage 1 and Backfilling)	
Stage 1 Conservative Extraction control	• No extraction will occur below 5 m AHD during the initial phase. • No excavation will occur below the groundwater table. • A groundwater buffer consistent with 99th percentile plus 0.7m will be maintained at all times.
	The 5 m AHD limit is a temporary control pending: • Completion of additional borehole installation, • Review of ASS baseline investigation results, • Review of groundwater monitoring data, • Update and approval of the WMP.
Backfilling to 3.7 m AHD	• Ensures compliance with the consented extraction base, • Does not alter the approved extraction depth, • Avoids unnecessary sterilisation of approved resource.
Groundwater Pumping Operational Supply	• Groundwater pumping will be limited to a maximum of 16 ML/year in the Stage 1 of the project until ASS sampling and drilling program completed (**Section 1.4.3**). • Use is restricted to dust suppression, firefighting storage and rehabilitation only. • No groundwater dewatering for extraction below the water table will occur under this version of the WMP. • Groundwater may be extracted from licensed supply bores in accordance with approved volumes and monitoring requirements. • Abstraction will not exceed volumes assessed in the Groundwater Impact Assessment for the relevant stage, appropriate approvals and volumes outlines in the approved WMP.
Future revision and approval of this management plan is required prior to commencing Stage 2 works	
Stage 2 Low-Lying Area Preparation (not under this current management plan)	Prior to extraction within Stage 2 low-lying areas: • Areas below the approved extraction base will be backfilled to a minimum of 3.7 m AHD across the disturbance footprint as previously agreed to with the DPHI. • Final levels will be verified via drone survey and/or registered surveyor. • Extraction compliance levels will be pegged where required.

1.4.1 Groundwater Protection Controls

- No groundwater dewatering in Stage 1 works that will facilitate extraction below the water table will occur under this version of the plan.

- Operational groundwater extraction may occur from licensed supply bores for dust suppression, firefighting and rehabilitation only, and will be limited to a maximum of 16 ML per annum under WSW and WAL approvals in Stage 1 works. Operational abstraction will not be used to depress groundwater levels to facilitate deeper extraction.

- Groundwater levels will be monitored in accordance with the WMP. If monitoring identifies groundwater levels approaching the approved buffer, extraction depths and abstraction rates will be reviewed.

- Water demand that change beyond Stage 1 (e.g., due to wash plant operation), the water balance, licensing position and impact assessment will be updated and submitted to the Department prior to any increase in groundwater take.

1.4.2 Proposed Monitoring Bore Network

The proposed drilling program network will comprise of an approximate 63 proposed drill holes across the disturbance area of the site for an acid sulphate soils assessment, of which a suitable monitoring suite will then be retained for groundwater level, quality and ASS monitoring.

Additional sampling will then be the basis of the updated groundwater elevation, quality and ASS data across the footprint. The results will be incorporated within the update of the ASSMP, WMP and MEDMP, it is predicted that the program will take approximately 3 months to install and 6 to 9 months to obtain results. The management plan will be updated as a result of the drilling program and ASS testing.

The TARP will be updated to reflect this risk-based approach during the period before the next review of this management plan, inclusive of any relevant historical data from established borehole monitoring data, acid sulfate results, levels and quality from the bores that are being installed. The WMP must be read in conjunction with the MEDMP, which sets extraction depth protocols. Together, the plans ensure compliance with SSD-52984213 conditions.

1.4.3 Groundwater Extraction Stage 1

Based on hydrogeologists advice, the proposed operational groundwater extraction limit of 16 ML/year during Stage 1 represents a substantial reduction from the extraction volume assessed in the EIS groundwater modelling (130 ML/year). As such, any groundwater drawdown associated with this reduced level of extraction would be reduced relative to the assessed scenario. Groundwater extraction during Stage 1 will be limited to operational uses only (dust suppression, firefighting and rehabilitation) with a low limit of 16 ML/year.

The hydrogeologist believes that the Stage 1 sand extraction will remain above the water table therefore it will not cause groundwater dewatering. As the sand extraction activities will remain above the groundwater table, no dewatering will occur. Accordingly, this operational extraction scenario does not introduce a pathway for Acid Sulfate Soil (ASS) exposure.

1.5 CONSULTATION

SSD-52984213 is granted without any conditions requiring consultation for the development of the MEDMP. Although submission for approval to the DPHI was required with the following comments outlined in **Table 4**.

Table 4: Consultation

Date	Agency	Summary of Consultation	Summary of feedback
April 2025	**Department of Planning, Housing and Infrastructure (DPHI)**	DPHI have been provided with a copy of this management plan to review. The requirement for submission in accordance with Condition B26(a)	Revised comments from DCCEEW and Hunter Water Corporation.
June 2025	**Department of Climate Change, Energy, the Environment and Water** **(DCCEEW)**	DPHI have provided DCCEEW with a copy of this management plan to review.	DPHI referred the MEDMP to DCCEEW and recommendations included further information and revision for: • Groundwater baseline data • Groundwater modelling • Maximum extraction depth • Trigger action response plan Additional water licensing recommendation
June 2025	**Hunter Water Corporation** **(HWC)**	DPHI have provided HWC with a copy of this management plan to review.	Actions and responses in the TARP to be amended. Recommendations have been implemented in MEDMP.
August 2025	**DPHI, DCCEEW, HWC**	Strategic approach of raising the extraction height to 4.5m AHD and 12 months of groundwater monitoring of piezometer network installed. TARP reflects the changes.	The RFI has been reviewed by all groups and is satisfied with the updated approach. Additional review and update as per comments implemented.
December 2025	**DPHI**	DPHI were provided with a revision for approval and provided an additional request for information.	Minor administrative updates, clarifications and addition of the 99th percentile map.
January 2026	**DPHI**	Groundwater and extraction TARP's to be reviewed. Figure 6 updated. General administrative updates. Updated approach extraction to 5mAHD until revision of this plan.	Boral have completed the RFI, TARPs reviewed and Sections added to outline the proposed establishment phase under this version. General administrative updates completed.

2 LEGAL AND OTHER REQUIREMENTS

2.1 DEVELOPMENT CONSENT (SSD-52984213)

SSD-52984213 stipulates the required extraction depth management criteria that the construction and operational activities of Site must comply with and sets out the core requirements of this MEDMP. Relevant conditions associated with this approval (including Statement of Commitments) and where they have been addressed in this document are reproduced in **Table 5** below.

Table 5: SSD-52984213 Consent Conditions Summary

Condition	Condition of Development Consent	Referenced in MED Report
A7	**Extraction Depth** A 0.7 metre buffer must be maintained above the 99th percentile groundwater level as calculated in the EIS and updated during the life of the development.	**Section 5 & 6** **Section 3.5.2**
A8	Extractive materials must not be extracted below 3.7 m AHD.	**Section 5 & 6**
B26	**Extraction depth** A maximum extraction depth management plan must be prepared for the development. The plan must:	**This Document**
	(a) be prepared and submitted to the Planning Secretary for approval prior to the commencement of quarrying operations;	**Section 1.3.3**
	(b) include the results of the drilling program described in the EIS;	**Section 3.6**
	(c) include a survey plan of the approved disturbance area which accurately maps the current topography and sand resource that can be extracted down to 3.7 m AHD;	**Figure 3**
	(d) include a contour map of the 99th percentile groundwater level at the site;	**Figure 6**
	(e) include a maximum extraction depth program for quarrying operations, including: (i) a methodology to ensure sand extraction remains 0.7 m above the 99th percentile groundwater level; and (ii) a trigger action response plan to ensure compliance with conditions A7 and A8;	**Section 5 & 6**
	(f) include protocols to: (i) review and update the 99th percentile groundwater level at the site; and (ii) demonstrate in the annual review required by condition C10 that quarrying operations remained above the 99th percentile groundwater level and include an extraction plan down to 3.7 m AHD for the following year.	(f) (i) **Section 5 & 11** (f)(ii) **Section 11.1**
B27	Quarrying operations within the approved disturbance area must not commence until the maximum extraction depth management plan is approved by the Planning Secretary.	**Section 1.3.3**
B28	The maximum extraction depth management plan, as approved by the Planning Secretary, must be implemented prior to the commencement of quarrying operations in the approved disturbance area.	**Section 1.3.3**
B29	The maximum extraction depth management plan must be reviewed and updated every two years or immediately following any non-compliance with conditions A7 or A8	**Section 11**
B30	Any areas within the extraction stages as shown on Figure 2 of Appendix 3 that are below 3.7 m AHD must be backfilled prior to the commencement of quarrying operations within the approved disturbance area in accordance with an approved water management plan required by condition B35, unless otherwise agreed by the Planning Secretary.	**Figure 13**
C4	**MANAGEMENT PLAN REQUIREMENTS** Management plans required under this consent must be prepared in accordance with relevant guidelines, and include:	

Condition	Condition of Development Consent	Referenced in MED Report
	(a) a summary of relevant background or baseline data;	**Section 3**
	(b) details of: (i) the relevant statutory requirements (including any relevant approval, licence or lease conditions); (ii) any relevant limits or performance measures and criteria; and (iii) the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;	(i-iii) **Section 2** (iii) **Section 5 & 6**
	(c) any relevant commitments or recommendations identified in the document/s listed in condition A2(c);	**Section 5**
	(d) a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria;	**Section 5 & 6**
	(e) a program to monitor and report on the: (i) impacts and environmental performance of the development; and (ii) effectiveness of the management measures set out pursuant to condition C4(c)C5(c);	(i) **Section 5.1** (ii)**Section 8**
	(f) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;	**Section 6 & 7**
	(g) a program to investigate and implement ways to improve the environmental performance of the development over time;	**Section 11**
	(h) a protocol for managing and reporting any: (i) incident, non-compliance or exceedance of the impact assessment criteria or performance criteria; (ii) complaint; or (iii) failure to comply with statutory requirements;	**Section 7**
	(i) public sources of information and data to assist stakeholders in understanding environmental impacts of the development; and	**Section 7.4**
	(j) a protocol for periodic review of the plan	**Section 11**

2.2 EPL REQUIREMENTS

The Protection of Environment Operations (POEO) Act 1997 is administered by the Environmental Protection Agency (EPA). The objectives of the POEO Act are to protect, restore and enhance the quality of the environment. Under the POEO Act, an EPL is required for premises at which a 'scheduled activity' is conducted. Scheduled activities that occur at site are land based extractive activities. There are no specific requirements for Maximum Extraction Depth.

3 BASELINE ENVIRONMENT

3.1 TOPOGRAPHY

Elevations of the dunes adjacent to the quarry range from 8-16 m AHD, with some areas in excess of 20 m AHD, while the lowest interdunal areas are approximately 4 m AHD (RPS, 2016). Topography in the project site forms the shape of a basin, reflective of former sand extraction in this area and the site ranges from approximately 26.5 m AHD to approximately 5 m AHD, as detailed from the EIS.

3.2 RAINFALL AND EVAPORATION

The Scientific Information for Landowners (SILO) database offers comprehensive long-term rainfall and climate data. For the Williamtown RAAF site station (Latitude -32.7939, Longitude 151.8364), data from 1957 to 2023 shows that monthly rainfall averages between 61 mm and 131 mm, with an annual average of 1,130mm shown in **Figure 4**. Rainfall is typically higher in late summer and winter, and lower in spring and early summer. The annual total actual evap otranspiration (949 mm) is less than the total yearly rainfall. Evapotranspiration is lower in winter compared to summer and is generally surpassed by rainfall from March to August.

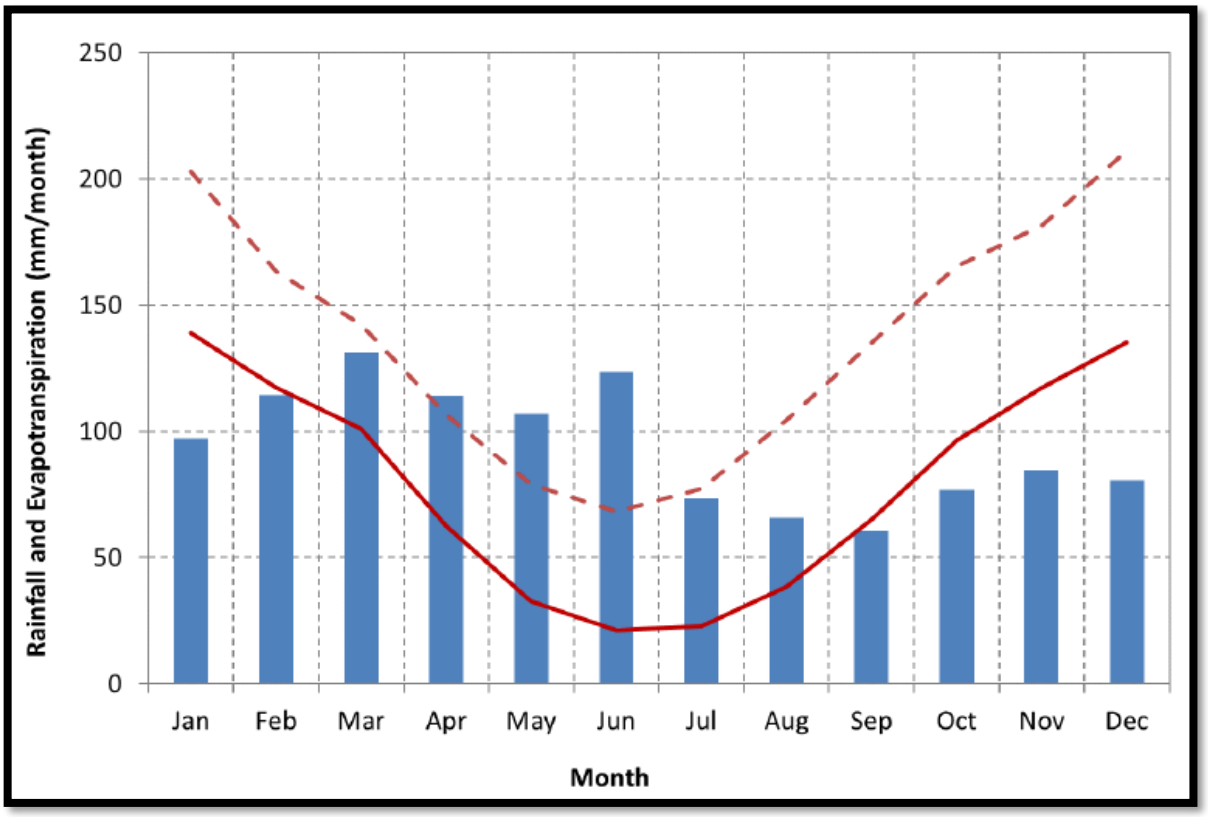


Figure 4: Average Monthly Rainfall and Evaporation 1957-2023 (Source: SILO)

3.3 GEOLOGY AND SOILS

The groundwater assessment for the EIS completed by Umwelt (2023) details the geology within the site. The site is located in Stockton Bight, stretching from Nobbys Head to Birubi Point, and is primarily composed of coastal dune deposits, including both vegetated and unvegetated dunes. Younger dunes (~500 years old) near the coast and older, vegetated dunes (4,000-5,200 years old) are predominant, with the sands being predominantly fine-grained quartz. The underlying geology features the Tomago Sand Beds, an inner barrier

dune system, which are not penetrated by bores. Below these beds lies the Medowie Clay Member, consisting of low-permeability clays and silts, while the southern edge of the site is bordered by Permian-aged coal measures and sandstone. The soil at the site is categorised into three landscapes: Stockton Beach, Boyces Track, and Hawks Nest.

- The Stockton Beach landscape is characterised by deep, unstratified, fine to medium-grained loose aeolian sand with shell fragments and is prone to wind erosion (ERM, 2005).
- The Boyces Track landscape includes steep Holocene sand dunes with deep, well-drained podzols
- Hawks Nest landscape features low Holocene sandsheets and low transgressive dunes with similar deep, well-drained podzols and siliceous sands, along with small shallow swamps in poorly drained areas (ERM, 2005).

An assessment of acid sulphate soils (ASS) conducted in 2018 by Environmental Earth Sciences (EES) found that the site has a low probability for ASS. Most boreholes tested exhibited high alkalinity and acid buffering capacity, with only one sample showing a moderate risk (EES, 2021). The site's southern boundary has a low probability of ASS between 1-3 meters below ground surface, and the remainder of the site is greater than 3 meters BGS. Additionally, according to the Strategic Agricultural Land Map - Sheet STA_047 (DP&E, October 2013), the nearest Biophysical Strategic Agricultural Land (BSAL) is located about 13.2 km to the northwest, and the site does not impact any BSAL or agricultural resources.

3.4 HYDROLOGY

As stated in the Groundwater Assessment completed by Umwelt for the EIS, there are no mapped watercourses within the project area or immediate surrounds. The South Pacific Ocean is present approximately 900 m east of the project area, and Fullerton Cove is approximately 2 km to the west and the Hunter River approximately 4 km to the south-west and Tilligerry Creek approximately 3 km north to north-east. Following high intensity rainfall water can pond at surface; however, there is no surface flow from site (Southeast Engineering and Environmental, 2023). This is due to the high infiltration rates of the sands and influence of vegetation on evapotranspiration.

3.5 GROUNDWATER

3.5.1 Groundwater Sources

The Stockton Sandbeds and transgressive dune sands are the main aquifer at the quarry and comprise the Stockton Groundwater Source of the Water Sharing Plan for the North Coast Coastal Sands Groundwater Sources. Underlying and hydraulically connected with the Stockton Sandbeds are the Tomago Sandbeds of the Tomago Groundwater Source.

3.5.2 Groundwater Levels

The 2023 groundwater assessment (Umwelt, 2023) for the Stockton Dry Sand Project indicates that groundwater levels were relatively low before 2021 but began to rise in late 2020. Groundwater responds quickly to rainfall, reflecting rapid infiltration, with levels peaking in summer due to increased rainfall. The elevation of groundwater ranges from 0.9 m AHD to 1.1 m AHD at low levels and 2.9 m AHD to 3.1 m AHD at high levels. Depths to groundwater vary between 0.2 meters (GW2) and 17 meters (MW1).

Groundwater flows locally from south-east to north-west, moving away from the coast towards Fullerton Cove and Tilligerry Creek. It is interpreted in the assessment that the gradient of this flow is very slight, approximately 0.2 meters per 800 meters, but steepens near bore MW X1 in the far north-west. The assessment concludes that the excavation will not intercept the groundwater table or impact groundwater levels or flow.

To comply with Condition A7 of the Development Consent, a 0.7-meter buffer is added to the 95th and 99th

percentile groundwater levels. The proposed maximum operating depth for excavation is set at the 99th percentile plus 0.7 meters, ensuring no interaction with the water table. The spatial distribution of this maximum operating depth ranges from 3.5 mAHD to about 3.65 mAHD, being lower in the west and higher in the east. Hydrographs of the groundwater bore levels relating to the site are included in **Appendix A**.
As part of the project requirements, preliminary clearing of approximately 0.5 ha of vegetation is proposed across the project site prior to extraction, to facilitate a widespread drilling program to obtain samples for acid sulphate soil testing and some will be used for ongoing groundwater monitoring and data collection.

Table 6 below provides the groundwater elevation data for the determination of the extraction depth limit, the MWX wells and the GW wells will be used to monitor water levels across site for the life of the project. until the revision of this plan and while additional data is collected, a conservative extraction control of 5 m AHD will be enacted.

3.5.3 Groundwater Quality/Chemistry

Groundwater samples at the site are collected quarterly and analyzed for pH, electrical conductivity (EC), major ions, total dissolved solids (TDS), total alkalinity, nitrate, total phosphorus, and metals. Since 2007, the groundwater has generally been of freshwater quality, with EC ranging from 200 µS/cm to 1,000 µS/cm. Elevated EC levels often follow periods of above-average rainfall, suggesting soil salt flushing in the coastal dunes. Most bores have a slightly acidic to neutral pH, between 6 and 7.6. However, bores MW5 and MW1 have shown a decline in pH since 2007, with MW1 recording a lower pH of 5 to 6.5 since 2019. This trend aligns with surface water monitoring showing pH between 4.3 and 5 near MW1 and MW5.

The groundwater assessment states that iron concentrations in the groundwater are generally below 4 mg/L, except in bores MW7 and MW8, which have recorded higher levels. Bore MW8 had up to 21 mg/L of iron, but this has decreased to around 6 mg/L by 2023. Bore MW7 showed similar trends but at lower concentrations, decreasing from 12 mg/L in 2019 to about 5 mg/L in 2023. Bore MW9 previously had higher iron concentrations up to 8 mg/L in 2007, but these have now dropped to less than 1 mg/L. Groundwater quality monitoring will continue as part of the ongoing program.

3.5.4 Groundwater Recharge and Discharge

Recharging at the site mainly occurs through rainfall infiltration due to the sandy soil's high porosity, with minimal surface runoff and high rates in bare sand areas. Vegetated areas experience slower recharge due to evapotranspiration. Localised groundwater flow is slightly reversed near coastal dunes, but overall discharge flows toward the sea at depth. Managing extraction depths should consider these recharge and discharge patterns to maintain sustainable groundwater levels.

3.5.5 Groundwater Dependent Ecosystems

The EIS notes that the dry sand extraction at the site will occur above the water table, ensuring no impact on groundwater-dependent ecosystems (GDEs). The nearest listed GDEs are the Tilligerry Creek Wetlands and Hunter River Wetlands, located over 10 km to the north-east and south-west of the site, respectively. The project will maintain a minimum 0.7-meter buffer from the water table, ensuring no groundwater interception. Consequently, no adverse impacts on these GDEs are anticipated.

3.6 MONITORING BORE NETWORK

The monitoring bore network for site is displayed in **Table 7** below, along with the contours of the maximum extraction depth in **Figure 5**. Additionally, the drilling program network will comprise of an approximate 63 proposed drill holes across the site for an acid sulphate soils assessment, of which at least 8 will be retained for groundwater level and quality monitoring, outlined in **Appendix B**. This will be the basis of additional collection of groundwater level data across the extraction footprint. The results will be incorporated within the 12-month update of the Maximum Extraction Depth Management Plan. The Water Management Plan will define the frequency of the monitoring based on the inputs of Boral's preferred hydrologist. The data supports the proposed extraction control floor of **5 m AHD** as conservative approach, with the additional option to bench the working face to reduce the risk of groundwater interception at the northern edge of the footprint.

The TARP will be updated to reflect this risk-based approach during the establishment phase, inclusive of the relevant historical data. See **Appendix C** for bore locations.

Table 6: Groundwater Elevation Data (mAHD) (Umwelt, 2023)

Location	Min Elevation	Max Elevation	Mean Elevation	Standard Deviation	Median	95th %ile	99th %ile	99th %ile + 0.7m (m) (Max Operating Depth)
GW1	1.26	3.09	2.53	0.35	2.57	3.03	3.08	**3.78**
GW2	1.15	3.09	1.92	0.51	1.85	2.92	3.03	**3.73**
GW3	1.12	3.15	1.84	0.44	1.76	2.66	2.90	**3.60**
GW4	1.05	3.01	1.70	0.44	0.61	2.63	2.89	**3.59**
MWX1	0.61	2.34	1.33	0.39	1.43	2.00	2.23	**2.93**
MWX2	0.89	2.95	1.70	0.52	1.83	2.69	2.86	**3.56**
MWX3D	0.94	3.01	1.66	0.52	1.73	2.66	2.89	**3.59**
MWX3S	0.95	3.01	1.63	0.5	1.74	2.56	2.90	**3.60**
MWX4D	0.99	3.08	1.80	0.54	1.91	2.82	3.00	**3.70**
MWX4S	1.00	3.09	1.83	0.54	1.9	2.77	3.00	**3.70**
MWX5	1.14	3.20	1.89	0.47	1.94	2.72	2.92	**3.62**
MWX6	1.16	3.20	1.89	0.48	1.99	2.74	2.97	**3.67**
MWX7	1.03	3.02	1.84	0.54	1.9	2.87	2.95	**3.02**

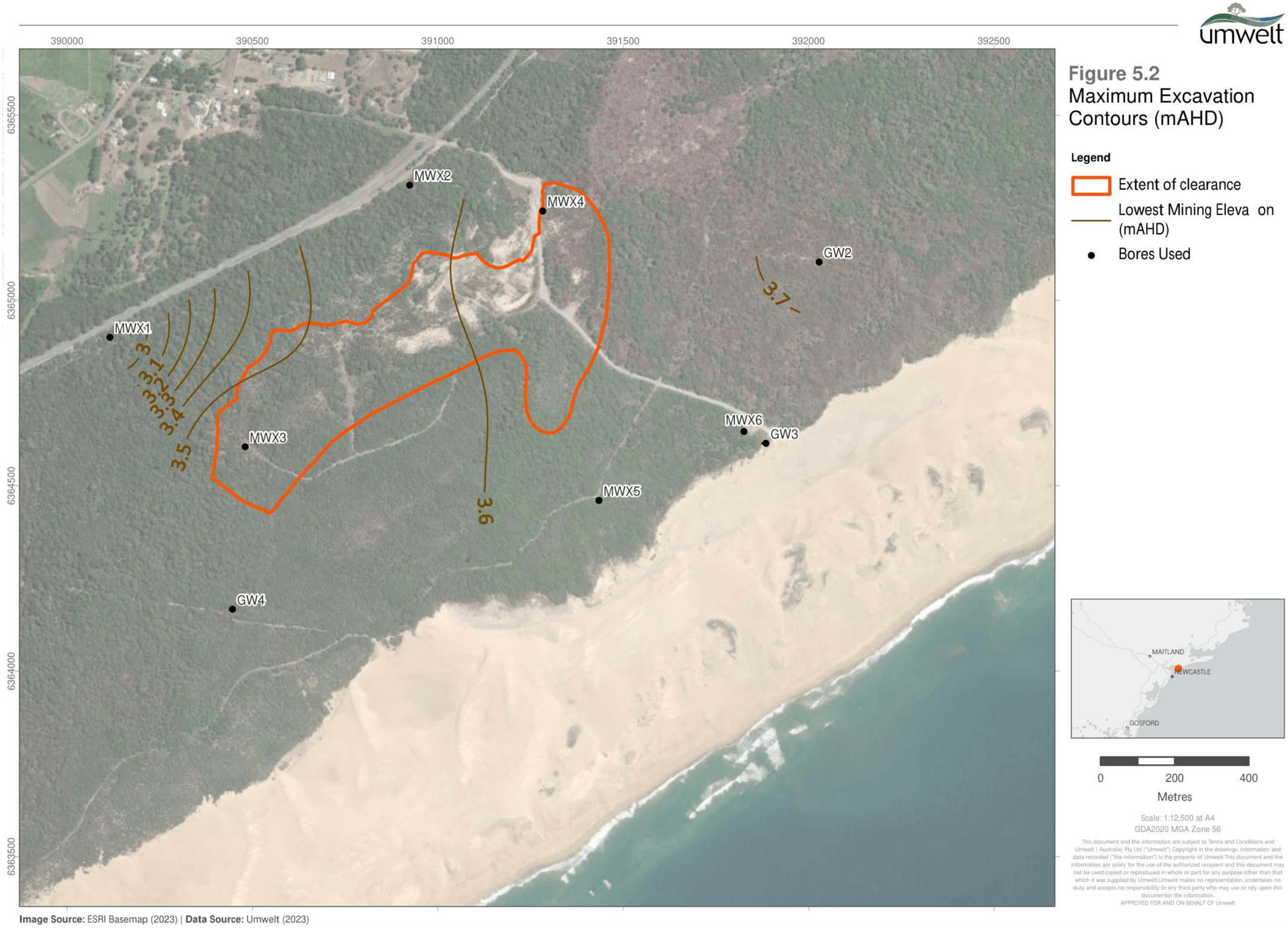


Figure 5: Maximum Excavation Contours and Monitoring Network (Umwelt, 2023)

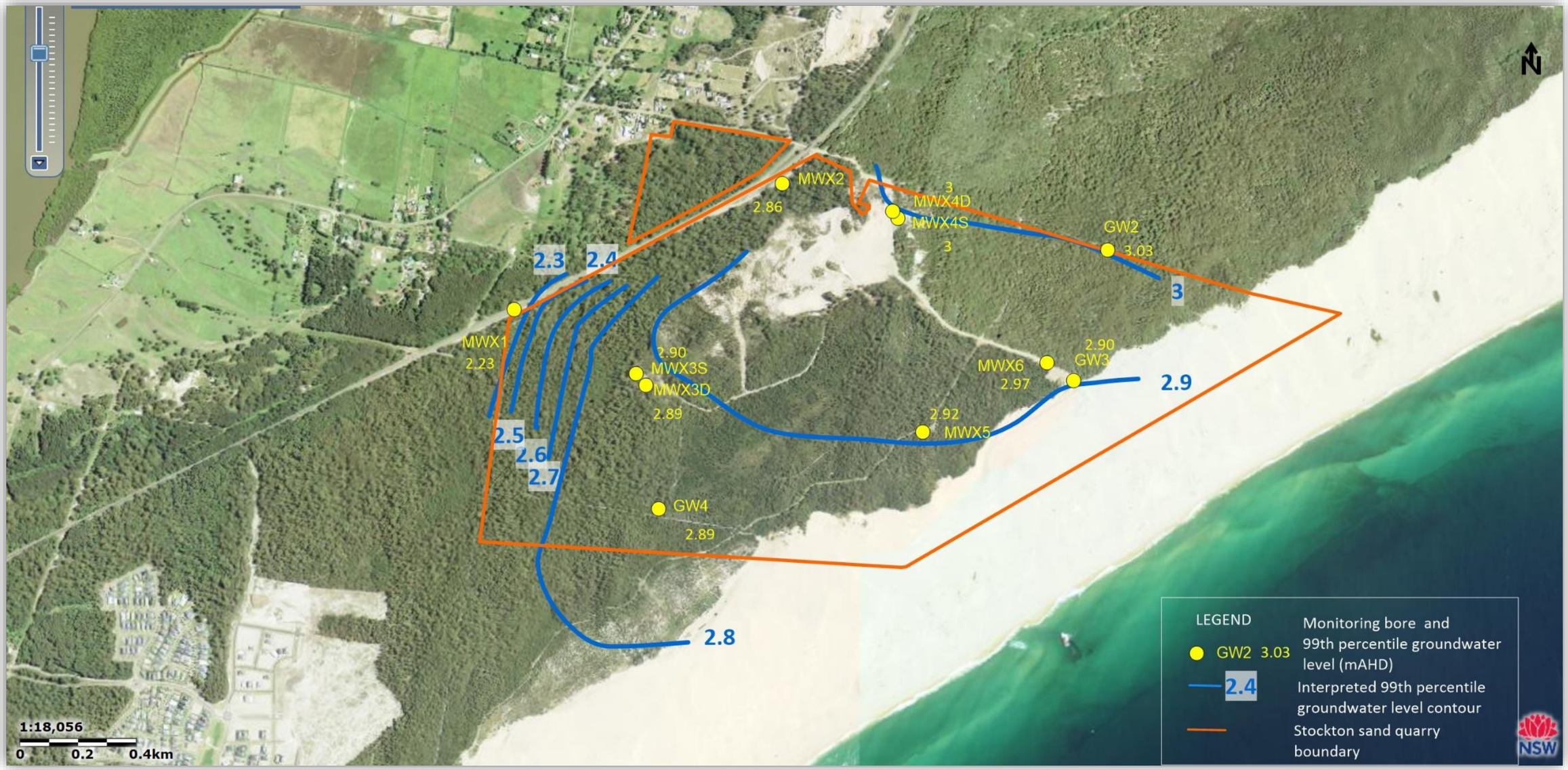


Figure 6: 99th Percentile Contour Plan for Groundwater levels (based on Table 5 of this plan).

Table 7: Monitoring Bore Network

Bore ID	Easting	Northing	Ground Elevation(mAHD)	Year Installed	Screen Top (mbgl)	Screen Bottom (mbgl)	Note
GW1	391407	6364885	9.60	1997	6.2	6.9	Logger installed, not actively used
GW2	392029	6365103	2.67	1997	2.9	3.6	Logger installed, data used
GW3	391885	6364615	3.02	1997	3.5	4.2	Logger installed, data used
GW4	390446	6364167	3.24	1997	4.1	4.8	Logger installed, data used
MWX1	390115	6364901	6.10	2017	12.2	9.2	Logger installed, data used
MWX2	390924	6365311	5.74	2017	n/a	n/a	Logger installed, data used
MWX3D	390480	6364605	6.43	2017	26.0	5.3	Logger installed, data used
MWX3S	390480	6364604	6.39	2017	11.4	8.4	Logger installed, data used
MWX4D	391283	6365241	9.90	2017	24.5	8.7	Logger installed, data used
MWX4S	391284	6365241	10.21	2017	12.1	8.9	Logger installed, data used
MWX5	391435	6364461	3.82	2017	24.2	21.2	Logger installed, data used
MWX6	391826	6364647	3.15	2017	27.6	24.6	Logger installed, data used
MWX7	391159	6365084	4.61	2017	-	11.24	-

Note: MWX 7 is an offsite bore and will be monitored for quality and trends quarterly

4 MINIMUM EXTRACTION LEVEL (MEL)

4.1 ESTIMATED MAXIMUM GROUNDWATER LEVELS

The groundwater assessment (Umwelt, 2023) conducted for the Stockton Dry Sand Project indicates that groundwater levels were relatively low before 2021, with a noticeable increase beginning in late 2020. Rainfall triggers a swift response in groundwater levels, reflecting rapid infiltration. Seasonally, groundwater levels peak during the summer months, correlating with increased rainfall during this period. Groundwater elevations at the site range from 0.9 mAHD to 1.1 mAHD at lower levels and from 2.9 mAHD to 3.1 mAHD at higher levels. Depths to groundwater vary between 0.2 meters (GW2) and 17 meters (MW1).

Conditions A7 and A8 outlined in SSD-52984213 state the following limits on extraction activities:

> *Condition A7 A 0.7 metre buffer must be maintained above the 99th percentile groundwater level as calculated in the EIS and updated during the life of the development.*
>
> *Condition A8 Extractive materials must not be extracted below 3.7 m AHD.*

In response to the extraction condition, extraction will not occur below 3.7m AHD to prevent groundwater interception. As a precautionary interim measure Boral will only extract material down to 5m AHD to allow a sufficient buffer to the water table, inherently maintaining the 0.7m buffer above the 99th percentile groundwater level outlined in **Table 6**. **Figure 7** & **Figure 8** outline the high-level and low-level contours of the site derived from the **Table 6**.

A groundwater monitoring data is currently being undertaken from a piezometer network which is being installed within the extraction footprint. The drilling program network will comprise of an approximate 63 proposed drill holes across the site for an acid sulphate soils assessment, of which at least 8 will be retained for groundwater level and quality monitoring. This will be the basis of additional collection of groundwater table data across the footprint. The results will be incorporated within the update of the Maximum Extraction Depth Management Plan. The Water Management Plan will define the frequency of the monitoring based on the inputs of the hydrogeologist's review.

Temporary control for Stage 1: MED of 5 m AHD.

The MED is defined as 3.7mAHD as defined by Condition A8, and will be revised in the next review of this management plan.

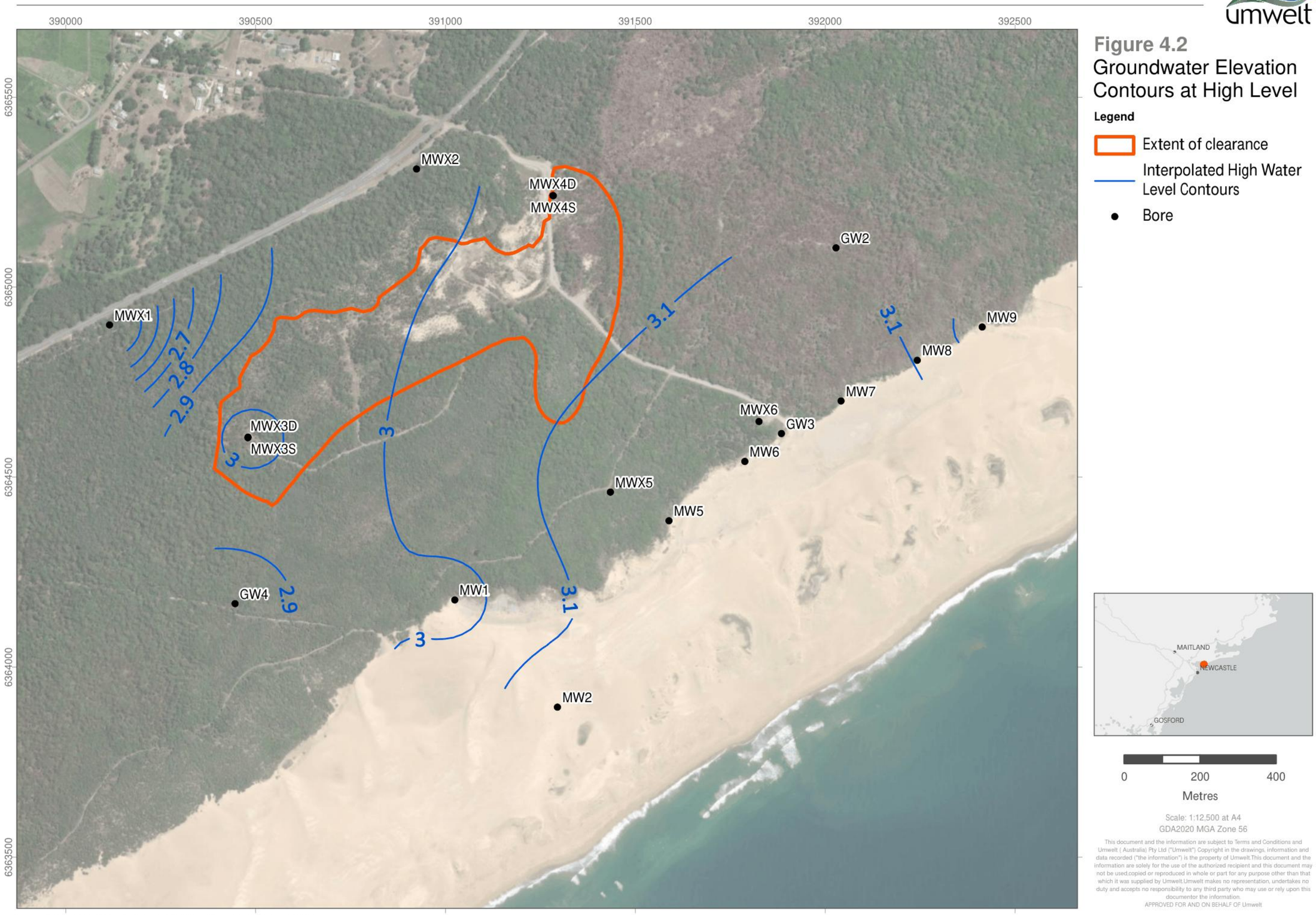


Image Source: ESRI Basemap (2023) | **Data Source:** Umwelt (2023)

Figure 7: Groundwater Elevation Contours at High Level (Umwelt, 2023)

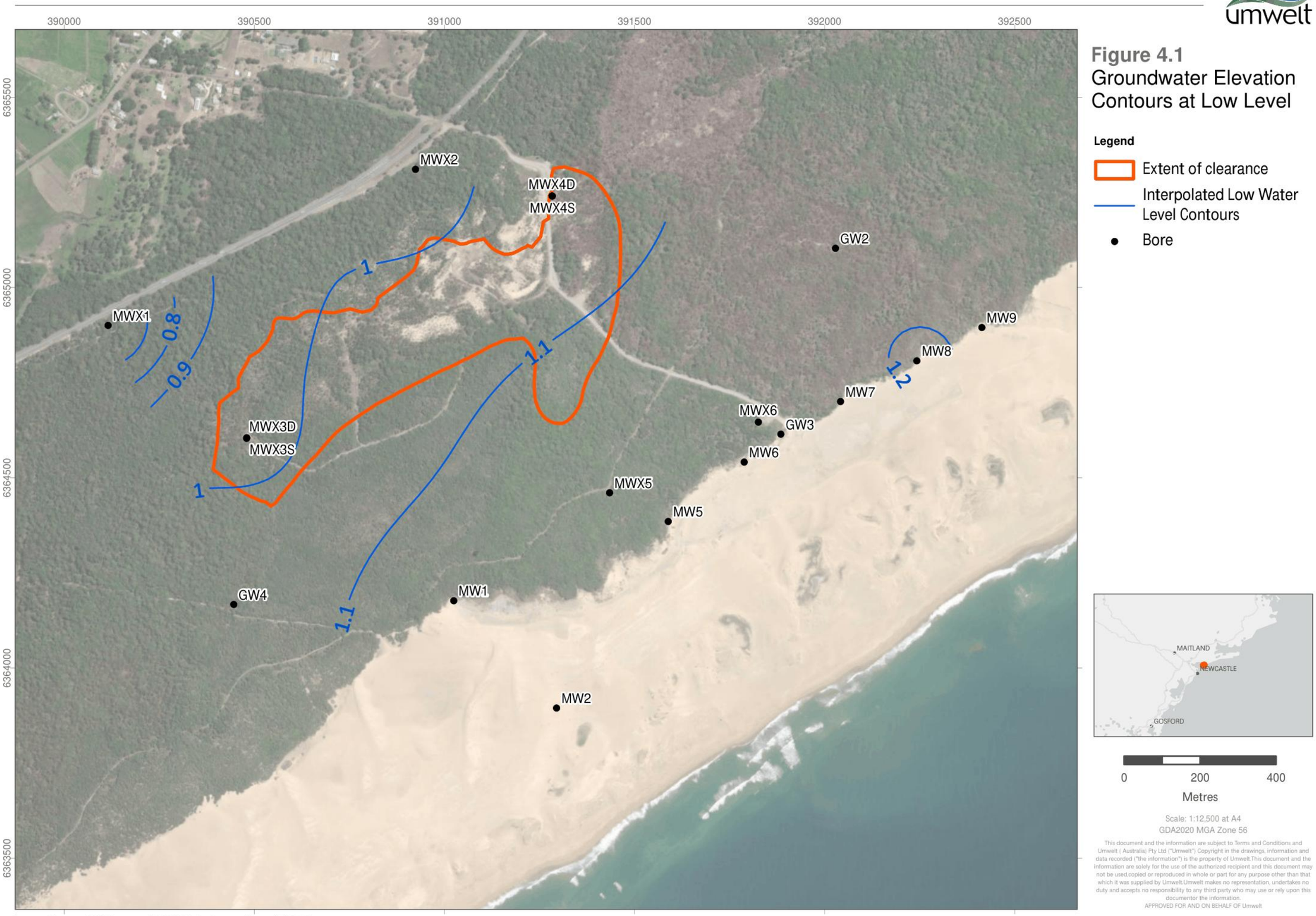


Figure 8: Groundwater Elevation Contours at Low Level (Umwelt, 2023)

4.2 EFFECT OF SAND REMOVAL ON GROUNDWATER LEVELS

Extraction will be undertaken at the surface above the groundwater table. Statistical analysis of groundwater level data from monitoring bores around the site has been undertaken (Umwelt, 2023) with a suggested extraction depth of the 99th percentile groundwater level, plus 0.7m buffer (DPIE, 2021) to the shallow groundwater water table. The Conceptual Ecohydrological Models (CEM) developed for the site indicate that sand extraction is unlikely to directly impact groundwater. The models, developed from long-term monitoring of groundwater levels and chemistry as well as borehole logs, show that the site consists of a single hydrogeological stratigraphical unit (HSU) comprising porous, unconsolidated sand extending to a depth of at least 30 meters. This high-porosity sand allows groundwater to move through the pores between sand grains.

Groundwater flow at the site flows from the east-south-east towards the west-north-west, towards Fullerton Cove, which is consistent with natural flow patterns and does not indicate high salinity levels from coastal recharge. Recharge occurs primarily through direct rainfall infiltration, especially where vegetation is sparse.

Additionally, there are no surface water bodies within the extraction area, so there is no interaction between groundwater and surface water. Monitoring data reveal that the groundwater is fresh with minimal seasonal or long-term variations in quality. Given that the sand extraction occurs above the water table and considering the high hydraulic conductivity of the site, it is concluded that the extraction process is unlikely to directly intercept or adversely impact groundwater. Schematic representations (cross sections) of the CEM are presented in **Table 9**, **Figure 10** & **Figure 11**. The figures show the proposed extraction area, which is maintained above the water table, and further demonstrate that sand extraction is unlikely to directly intercept groundwater.

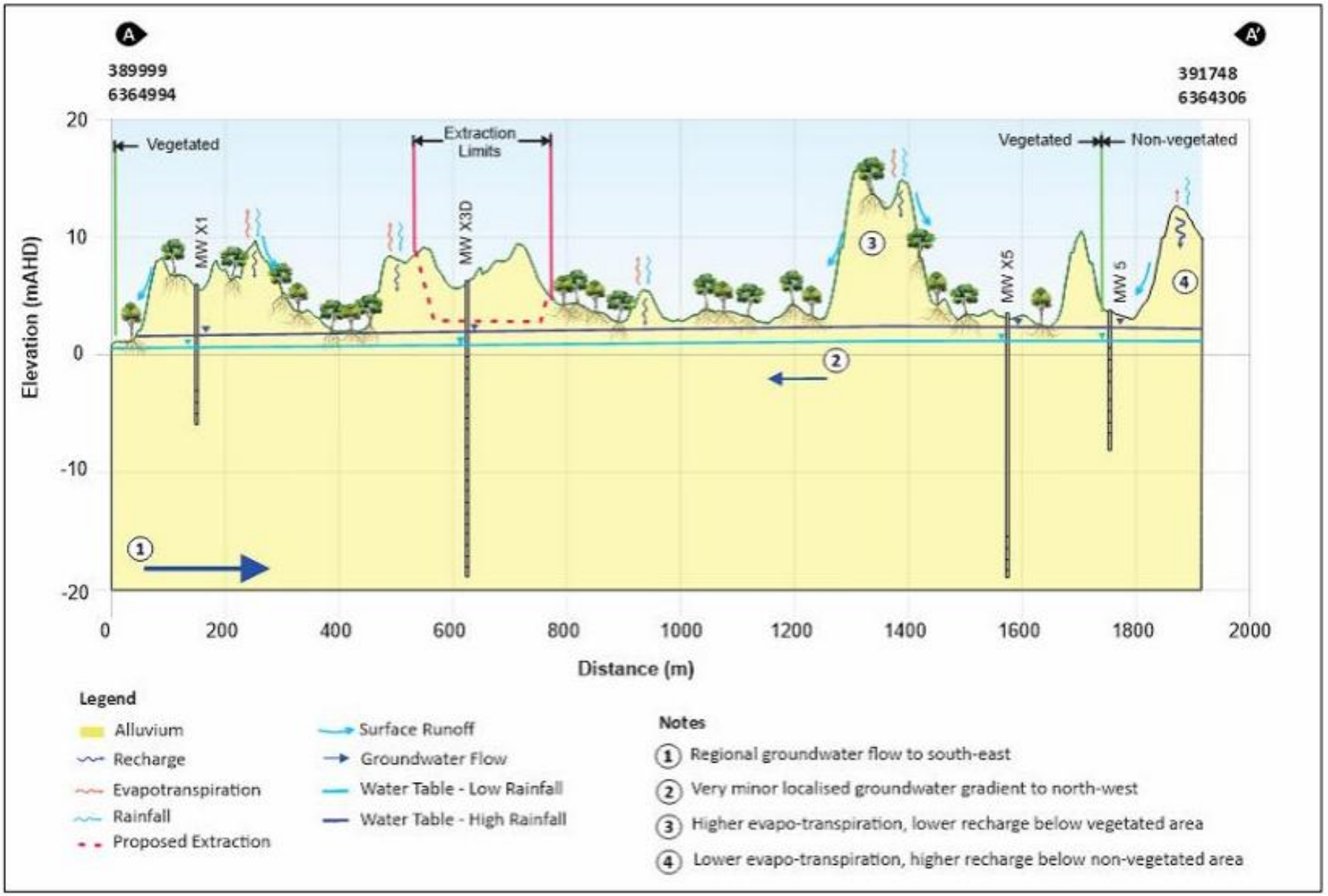


Figure 9: Conceptual Ecohydrological Model – Section A (Umwelt, 2023)

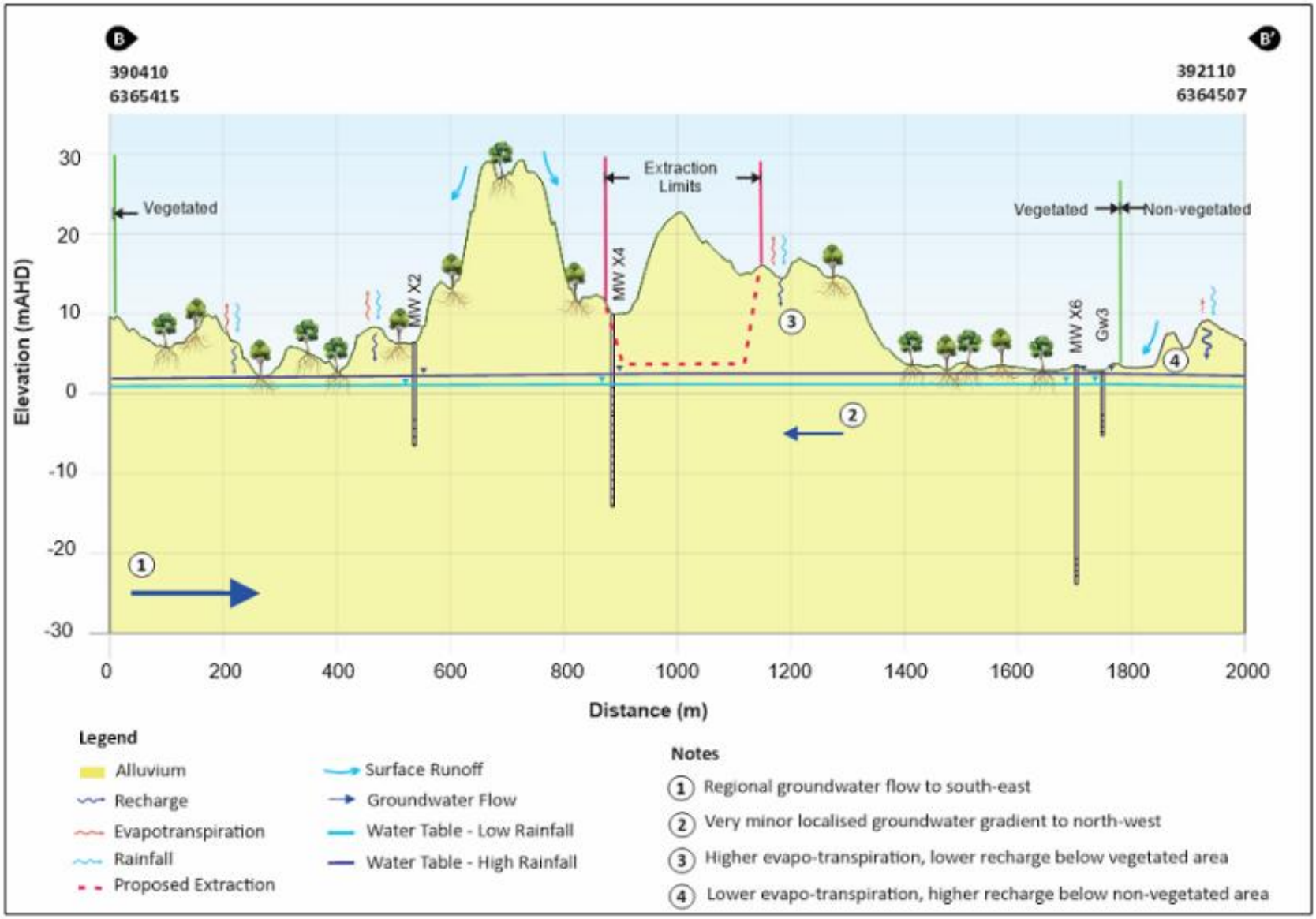


Figure 10: Conceptual Ecohydrological Model – Section B (Umwelt, 2023)

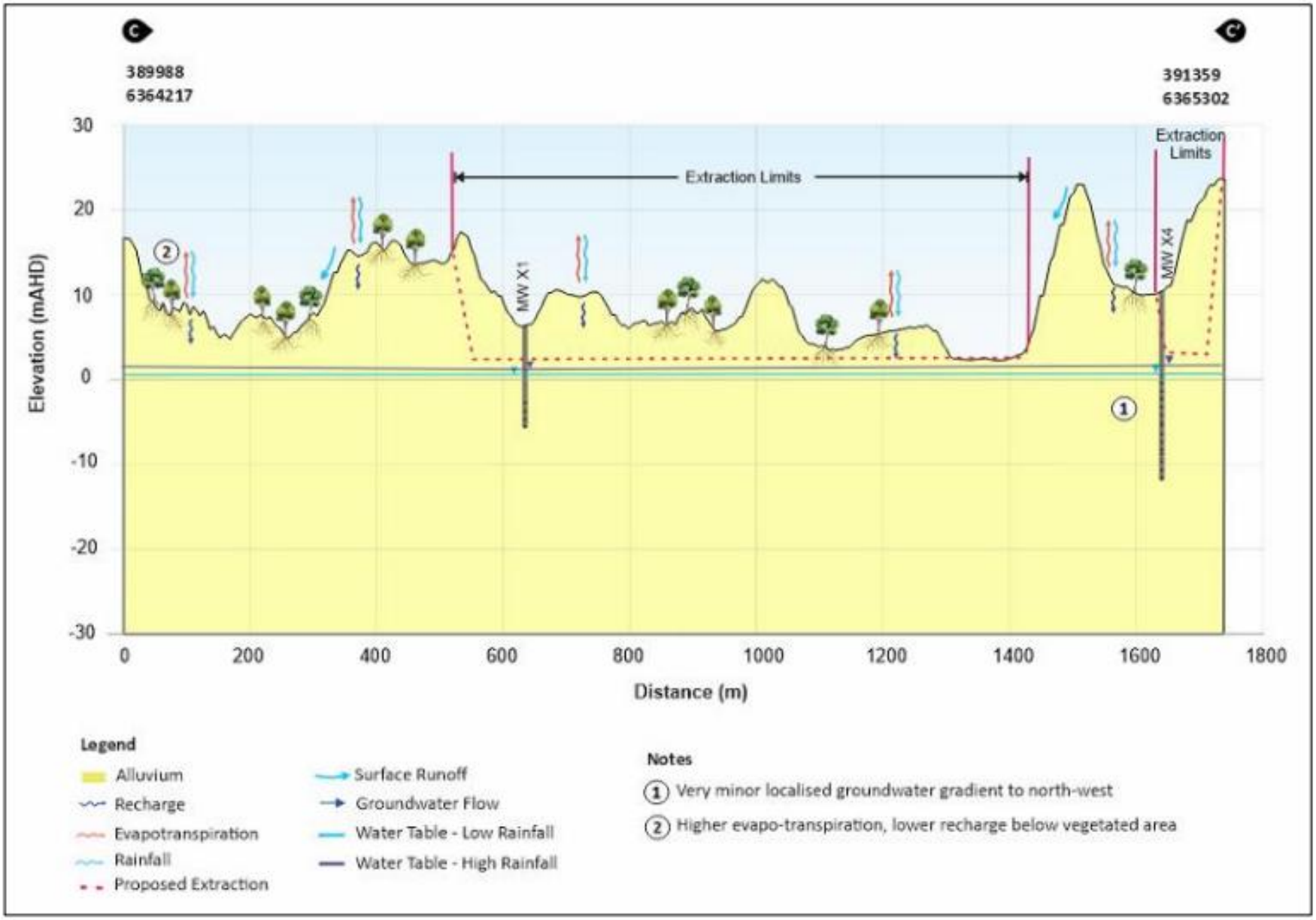


Figure 11: Conceptual Ecohydrological Model – Section C (Umwelt, 2023)

4.3 SPECIFICATION OF MINIMUM EXTRACTION LEVELS (MEL)

The minimum extraction level defines the lowest permissible excavation elevation (m AHD) to protect groundwater, while the maximum extraction depth is the site-specific vertical depth derived from that level based on existing ground surface elevations.

Based on the **Section 4.1** the project would generally involve the extraction of sand above the water table from approximately 26.5 m Australian height datum (AHD) (in Stage 1) to a minimum 0.7 m above the water table, with an extraction control floor height of 5m AHD in consultation with DCCEEW and DPHI as a conservative approach until additional bore data is collected to produce the 99th percentile for the bores which will be installed.

The Minimum Extraction Level (MEL) for the Stockton Quarry project is designed to prevent groundwater interaction by setting strict depth limits based on observed groundwater levels. Extraction activities must not go below 3.7 meters Australian Height Datum (AHD) across the site as per Condition A8. The MEL will be based on the 99th percentile groundwater level plus an additional 0.7-meter buffer once the entire bore network is confirmed.

The 5m AHD control with a trigger response action and response serves as a conservative approach while the ASS and drilling program occur and ensures extraction remains above the maximum anticipated groundwater elevation, reducing the risk of aquifer interference. A reassessment based on the observed data in the next groundwater data review informed by the updated groundwater data of the piezometer network currently being installed, (with results analysed and updated by a suitably qualified and experienced hydrogeologist) will be undertaken. The MEDMP will be updated accordingly and re-submitted. Groundwater trigger levels are currently set to correspond to the 99th percentile + 0.7 m buffer established in the WMP (see Table 19). If monthly groundwater data indicate the buffer is reduced below 0.7 m, extraction must cease and reassessment occur.

5 MONITORING AND COMPLIANCE

The EIS identifies commitments to limit extraction to above the groundwater table, maintain a buffer above the 99th percentile groundwater level, implement groundwater monitoring, and apply a trigger action response framework linked to groundwater behaviour. These commitments have now been explicitly carried through to the minimum extraction level, groundwater monitoring protocol, and TARP provisions of the updated management plan. An interim conservative minimum extraction level has also been adopted to reflect the EIS intent for a precautionary approach during early operations.

The requirements of the operator regarding operations above the maximum extraction level are:

- Ensuring that a sufficient depth of topsoil is stripped and stockpiled to meet the difference between operational floor elevation (MEL) and rehabilitated elevation level (REL), which is to be >0.3 m vertical separation above approved consent level of 3.7 mAHD.

- Monitoring for rising water levels, which respond to natural stresses and potentially as a result of or enhanced by the operation of the quarry. Review against rainfall patterns as described in **Section 6**.

5.1 MAXIMUM EXTRACTION DEPTH PROGRAM

The following sections detail the maximum extraction depth program developed for quarrying operations on site. As required by SSD-52984213 Condition B26 (e)(i) and (e)(ii) the program includes the following:

> *"(e) include a maximum extraction depth program for quarrying operations, including:*
>
> *(i) a methodology to ensure sand extraction remains 0.7 m above the 99th percentile groundwater level; and*
>
> *(ii) a trigger action response plan to ensure compliance with conditions A7 and A8;*

The site would progress in five stages as shown on the proposed extraction staging plan (**Figure 12**). As described in the EIS, site preparation would involve clearing and grubbing of established vegetation from previous rehabilitation and possible screening of accumulated leaf litter and organic matter. Cleared vegetation would be mulched or stockpiled on-site for later use in rehabilitation. Similarly, any stripped topsoil would be retained for use in rehabilitation. Progressive rehabilitation will occur after each stage of extraction. Further details of site rehabilitation are provided in the Rehabilitation Management Plan.

5.2 MONITORING GROUNDWATER LEVELS

This MEDMP should be read in conjunction with the Water Management Plan (WMP) which provides detailed methodologies for determining 99th percentile groundwater levels and site-specific extraction depth controls. Together, the MEDMP and WMP provide a framework for compliance with Conditions B26–B28 and B35 of SSD-52984213. The WMP governs parameter selection, bore maintenance, and quality trigger thresholds, while MEDMP sets extraction floor limits and depth-related triggers.

To remain in accordance with the ANZG (2018) guidelines which encourage flexible and dynamic guideline related to risk (downgradient receptors) the site-based approach to guideline value derivations has been adopted. Such defined trigger levels are designed to provide early warning for any adverse conditions. Given that the risk is only from groundwater level rise, as this may mean that the sand extraction would intercept groundwater, there is no limit set to lower groundwater levels. If such levels occur this would not be related to the operation of the quarry as it needs to remain above the water table , but due to natural reasons and therefore there will be no impact to downstream environment. Groundwater levels are strongly dependent on rainfall recharge. Rainfall recharge at the site has a long term trend of wetter and drier season. Wetter season

(with monthly rainfall exceeding 80 mm) occurs from January to June, and the lower rainfall season occurs from July to December outlined in **Table 8**. For completeness of the groundwater level data set , the minimum groundwater levels observed on site will be included in the MEDMP at the revision of this plan.

In accordance with the groundwater assessment (Umwelt, 2023) forming the EIS, the groundwater monitoring program includes measuring groundwater levels with a manual dip meter, as well as downloading the logger data. Groundwater quality sampling is also undertaken on a quarterly basis for the MWX Series bores, and will be undertaken in accordance with industry standards, with data stored within a central database and routine QA/QC conducted to verify data input. A review of groundwater monitoring results is undertaken on an annual basis and included within the Annual Review. **Table 8** outlines the groundwater level trigger values applicable to site's existing monitoring bores.

Groundwater Level Measurement

1. Use a dip meter to manually measure the depth to groundwater from the top of the casing (ToC). Survey of ToC for all bores will be provided. Monitoring is performed monthly and is the most direct and simple method for groundwater level monitoring.
2. Additionally, level loggers are installed that continuously record groundwater levels at set hourly intervals in line with the review frequency outlined in the water management plan, these loggers measure water pressure and temperature, which is converted into water elevation and stored for download.

Data Quality Control

1. Regularly calibrate field equipment and level loggers to ensure accurate readings. Conduct quality assurance/quality control (QA/QC) checks by cross-verifying manual dipping measurements with logger data.
2. Store and organise downloaded data in a central database, with periodic reviews to identify anomalies and ensure completeness. Submission of the Annual Review helps ensure consistency and validate the groundwater monitoring program's effectiveness.

This layered approach provides a comprehensive monitoring method, ensuring that groundwater levels are tracked accurately, allowing for timely adjustments in quarry operations if levels approach any regulatory thresholds or buffer zones. Groundwater elevations are measured in m AHD.

Table 8: Maximum Groundwater Level (mAHD) 2017-2025

Wet/Dry Season	MWX1	MWX2	MWX3S	MWX3D	MWX4S	MWX4D	MWX5	MWX6	MWX7
Jan to June	2.31	2.95	3.01	3.01	3.03	3.02	3.14	3.20	3.02
July to Dec	2.20	2.76	2.83	2.83	2.92	2.91	2.92	2.98	2.91

5.3 MONITORING FLOOR ELEVATION

5.3.1 Survey Pegs

An extensive network of survey pegs control will be placed around the site to ensure operations do not extract below MEL.

5.3.2 Survey Control

Annual height survey report by qualified surveyor.

5.3.3 Routine Survey

When extraction occurs during operation, routine downloaded monthly GPS surveys to maintain compliance. Rehabilitation areas are at least 0.3m higher than the post reviewed MEL, requiring sufficient surveying to demonstrate the required level. A drone survey in conjunction with software such as propellor will be completed annually to demonstrate maintaining extraction depth and provide floor height data.

5.3.4 99th Percentile Review

The 99th percentile groundwater level will be reviewed:

- following completion of the establishment phase of bore installation monitoring period.
- annually thereafter as part of the Annual Review.
- following any period of anomalously high groundwater levels or significant rainfall events that may influence groundwater conditions.

Additionally, Boral will demonstrate in the annual review required by Condition C10 that quarrying operations remained above the 99th percentile groundwater level and include an extraction plan down to 3.7 m AHD in the next revision of this plan.

5.4 EXTRACTION (STAGE 1)

Stage 1 would involve dry sand extraction to a maximum depth of 5 m AHD for the establishment of operation, to ensure that a minimum buffer of 0.7 m above the 99th percentile groundwater level is maintained. The depth of the water table and the adequacy of the buffer is considered further in the groundwater assessment (refer Chapter 7, Appendix E of the EIS).

For the Stage 1 establishment phase of operation, extraction will remain above a precautionary floor of 5 m AHD. This is a conservative control while additional bores have been installed and developed sufficient monitoring records collected to establish bore-specific 99th percentile groundwater levels across the site. The approach ensures compliance with Conditions A7 and A8 of Development Consent SSD-52984213 and addresses DCCEEW Water Group Recommendation 1.2 (13 June 2025), which requires clear percentile-based and pre-emptive groundwater management triggers. The control of 5 m AHD is therefore higher than outlined in Condition A7. Observed 2017 to 2025 maximum groundwater levels (**Table 8**) are approximately 3.20 m AHD, confirming the control remains conservative for the data assessed in the EIS and most recent data collected.

A front-end loader would push into the exposed sand face and as the sand is relatively free-flowing, material would fall towards the front-end loader at the natural angle of repose. Sand extracted from Stage 1 would generally contain a low volume of organics. Due to the quality of the sand, it would not require processing (i.e. washing and filtering), rather the sand would be dry screened for immediate sale or stockpiled.

Stage 1 would also include delivery and installation of a prefabricated office building and commencement of the other alterations to the existing site depot.

5.5 EXTRACTION (STAGES 2-5)

As Stage 1 is nearing completion, Stage 2 will commence. As per **Section 1.4** the proposed approach will be defined in the revision of the MEDMP prior to any works commencing.

To limit the loss of sand to wind erosion, a maximum extent of 200- 300 m of vegetation and ground cover would be cleared at any one time. As with Stage 1, Stages 2-5 would involve dry extraction temporary control to 5 m AHD under this MEDMP. The method described in Stage 1 would be repeated in each subsequent

stage, with extraction progressing in a south-westerly direction from Stage 2 until the completion of Stage 5. Sand extracted from Stages 2-5 would generally contain higher volumes of organics and would require further processing (i.e. washing and filtering) through the wash plant and water recycling and filter press. Stages of the proposed dry sand extraction are provided in **Figure 12** below.

5.6 FLOOR ELEVATION COMPLIANCE (PRE CONSTRUCTION)

To comply with Condition B30 which outlines that any areas within the extraction stages as shown on Figure 2 of Appendix 3 of the Consent (**Figure 12** below) that are below 3.7 m AHD must be backfilled prior to the commencement of quarrying operations within the approved disturbance area in accordance with an approved water management plan required by condition B35, unless otherwise agreed by the Planning Secretary.

Figure 13 and **Figure 14** is provided as a cross section of the proposed project, generally the extraction compliance level is above 3.7m AHD, although any Stages below 3.7m AHD will be backfilled prior to any extraction and confirmed through survey prior to any Stage works.

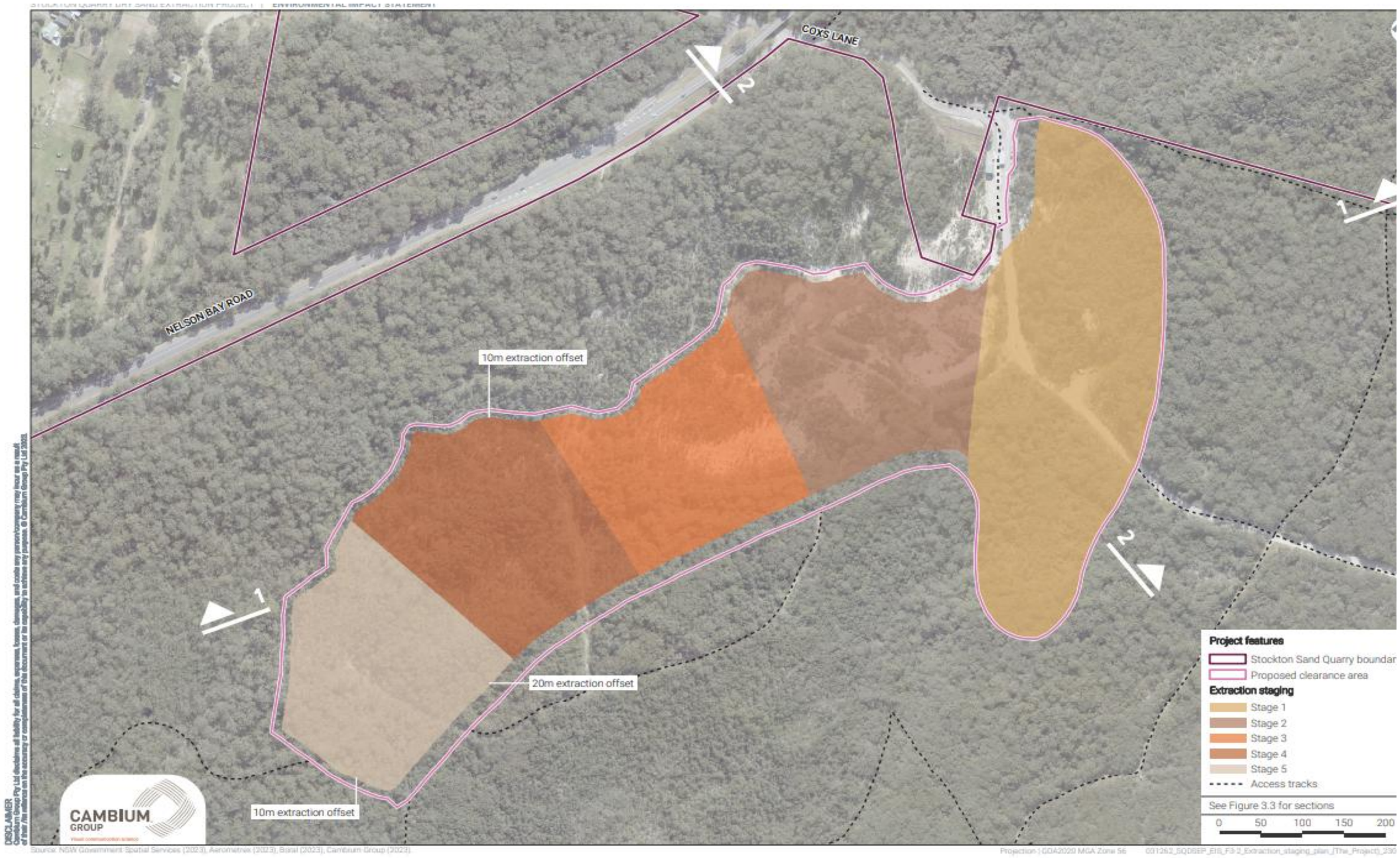


Figure 12: Extraction Staging Plan (1-5), (Development Consent, 2023)

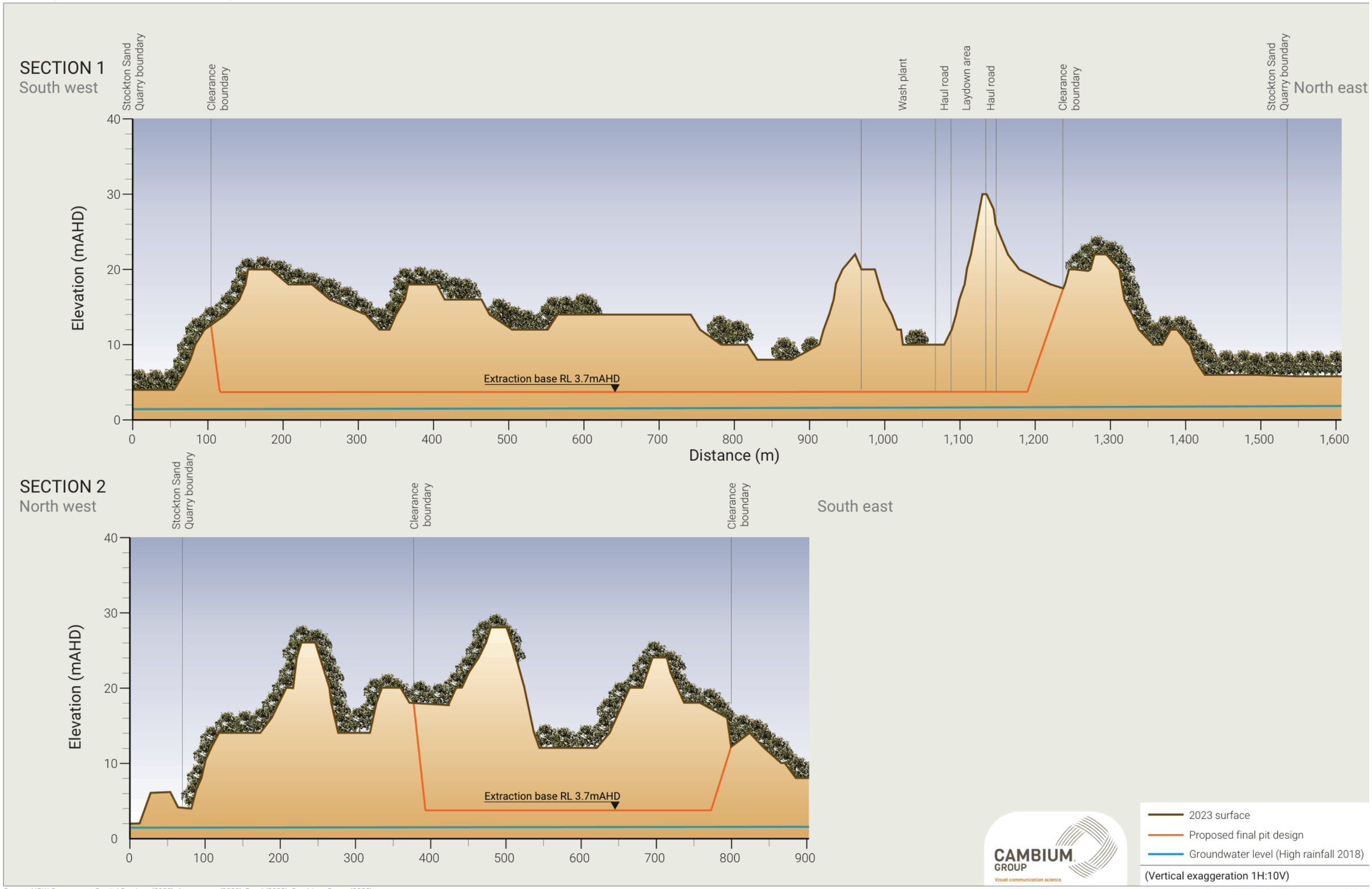


Figure 13: Cross Sections of the Proposed Dry Sand Extraction (EIS, 2023)

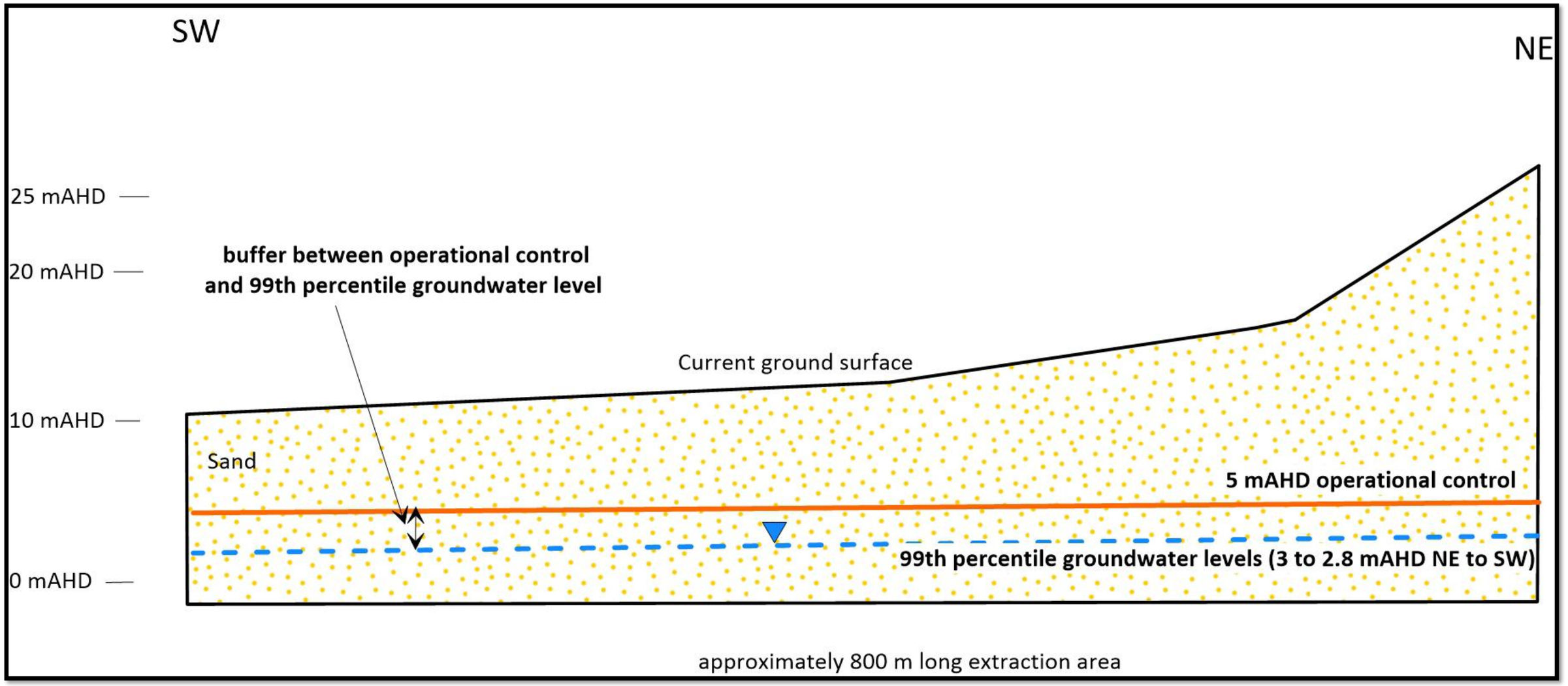


Figure 14: Cross Section of Proposed 5mAHD Operational Control

6 CONTINGENCY PLAN

6.1 TRIGGER ACTION RESPONSE PLAN

In accordance with the Development Consent B26 (ii) a trigger action response plan to ensure compliance with Conditions A7 and A8.

:

> *"(e) include a maximum extraction depth program for quarrying operations, including:*
>
> *(i) a methodology to ensure sand extraction remains 0.7 m above the 99th percentile groundwater level; and*
>
> *(ii) a trigger action response plan to ensure compliance with conditions A7 and A8;*

This TARP framework satisfies Condition B26(ii) by using site-specific percentile controls where data exists and a conservative 5 m AHD control for proposed bores, providing the operational rule:

- *Established bores within the network currently are managed against their 99th percentile + 0.7 m buffer.*
- *Proposed additional bore compliance is to keep extraction above 5 m AHD until 99th percentiles are confirmed across the disturbance footprint of the site (from the drilling program currently being undertaken).*

Together, these measures ensure continuous compliance with Conditions A7 and A8 and maintain groundwater protection across the site.

Short-term – Stage 1

- Adopt a conservative operational control of 5 m AHD above the consent floor of 3.7 m AHD to comply with the requirement of Condition A8 '*extractive material must not be extracted below 3.7 m AHD.'*
- Keep extraction above 5 m AHD until 99th percentiles water level and ASS risk is confirmed for the additional bores installed across the internal footprint site.
- Start continuous logging of selected bores immediately with regular monitoring for exceedances based on relative depth of the floor for newly installed bores until the update and approval of this plan.
- Monthly trend plots and annual evaluation maintain continuous verification of the required buffer.
- GW data reviewed monthly, trends documented, and percentiles of bore installation, and to include data from current and proposed bores.
- Following monthly data review the 99th percentile trigger levels will be reviewed and updated if required.

Long-term – Stage 2

- With ~1 year of logger and manual dip data from footprint bores, calculated site-specific percentiles (95th/99th) for each extraction stage will be completed and results have been reviewed by a suitably qualified specialist and incorporated into the updated WMP/ASSMP (including triggers and TARPs) defining groundwater performance benchmarks.
- Adaptive framework to revise targets based on long-term retained piezometers network, replaced at each stage if inside the direct extraction area.

- This long-term transition will require flexibility and is subject to consultation with the regulatory authorities.

Table 9: Trigger Action Response Plan for Groundwater Levels and Extraction Depth under this plan.

Activity	Trigger / Action / Response	Level - Green	Level - Orange	Level - Red
Groundwater Elevation	**Trigger**	All monitoring bores record groundwater levels below the bore-specific 99th percentile groundwater level (ie not triggered), and the 0.7 m separation buffer to the extraction floor is maintained, with no sustained rising trend.	Groundwater levels show a rising trend over three consecutive monitoring events (3 months) and are approaching the bore-specific 99th percentile groundwater level (between 95th percentile and 99th percentile).	Groundwater level reaches the bore-specific 99th percentile groundwater level, or monitoring indicates the 0.7 m separation buffer between groundwater and the extraction floor is not maintained.
	Action	Continue operations as planned. Maintain monthly monitoring, continue QA/QC and rainfall log correlation. Maintain 5mAHD extraction floor of 5mAHD under this version of the WMP.	Hold further extraction in the affected area until confirmed current floor is above 5 m AHD. Increase groundwater monitoring frequency (weekly). Review rainfall conditions, groundwater trends and extraction schedule.	Cease extraction in the affected area immediately. Confirm floor level and backfill if required to reinstate the 5 mAHD extraction control measure. Re-survey floor RL and review groundwater levels prior to recommencing extraction.
	Response	Keep monthly internal compliance records and trend plots and include results in Annual Review.	Notify site management of trend, brief operators on restricted zones and precautionary approach.	Notify DPHI, HWC and DCCEEW within 7 days of becoming aware as per the definition of 'non-compliance' in the consent. Complete a Water Trigger Investigation as per Section 7.3.1 of the WMP. Continue contingency monitoring weekly until two consecutive readings confirm return to compliant conditions. Consult hydrogeologist. Update risk register.

Activity	Trigger / Action / Response	Level - Green	Level - Orange	Level - Red
Maximum Extractive Depth	**Trigger**	Quarry floor levels remain above 5 m AHD in Stage 1.	Quarry floor levels approaching 5.1 m AHD at any location. .	Quarry floor is below 5m AHD.
	Action	Continue extraction in accordance with approved plans. Undertake routine survey validation of quarry floor levels and ongoing groundwater monitoring. Continue operations surveys as per MEDMP.	When approaching threshold in the active stage, notify operations team and hold deepening until confirming the final review of the most recent survey and GPS data ensure compliance. Notify Quarry Manager and Environmental Representative. Hold further deepening in the affected area. Undertake survey verification of floor levels.	Stop extraction in the area affected, backfill the area to meet minimum elevation of 5mAHD, and conduct an internal compliance investigation before resuming by re-surveying and sign-off prior to restart.
	Response	Continue operations, maintaining records as per the plan.	Toolbox talks regarding approaching extraction depth threshold. Survey stage to ensure accuracy. Review most recent groundwater level data and abstraction records. Conduct toolbox talk with operators regarding depth threshold compliance. Confirm compliance before resuming deepening.	Notify DPHI, HWC and DCCEEW within 7 days of becoming aware as per the definition of 'non-compliance' in the consent. Complete a Water Trigger Investigation as per Section 7.3.2. Continue contingency monitoring weekly until two consecutive readings confirm return to compliant conditions. Consult hydrogeologist for review. Update risk register.

To be read with the WMP
Note:

- *The TARP ensures groundwater monitoring results are reviewed and responded to in a timely manner to maintain the minimum separation between groundwater levels and the extraction floor required under Condition A7 of the Development Consent.*
- *Triggers are based on rising trends and proximity to the control level, ensuring a preventive rather than reactive response consistent with DCCEEW Recommendation 1.2 (13 June 2025).*
- *Bores with no defined 99th percentile will be calculated when the drilling program has completed and the revision of this plan has been approved.*

7 INCIDENT, NON-COMPLIANCE AND COMPLAINT MANAGEMENT

Any environmental incident or noncompliance at the site will be managed in accordance with the consent. Incidents and non-compliances have the following definitions in the SSD52984213.

7.1 INCIDENTS MANAGEMENT

7.1.1 Incident Definition

SSD-52984213 defines an incident as:

An occurrence or set of circumstances that causes or threatens to cause material harm and which may or may not be or cause a non-compliance.

Material harm to the environment is defined under Section 147 of the POEO Act (1997) and under this consent. Harm is considered material if it:

1. Involves actual or potential harm to the health or safety of human beings or to ecosystems that is not trivial.

2. Involves actual or potential loss or property damage of an amount exceeding $10,000 (or such other amount as prescribed by regulations). "Loss or damage" includes the reasonable costs and expenses that would be incurred in taking action to prevent, mitigate, or make good the harm caused to the environment.

7.1.2 Incident Notification

Initial Incident notification and reporting will be conducted in accordance Stockton Quarry's Pollution Incident Response Management Plan (PIRMP) as well as Condition C7 of SSD-52984213, whereby:

"The Department and any other relevant agencies must be notified within 24 hours of an incident occurring. The notification must be made using the Department's Major Projects website and address details of the incident including:

(a) date, time and location of the incident;

(b) a brief description of what occurred and why it has been classified as an incident;

(c) a description of what immediate steps were taken in relation to the incident; and

(d) identifying a contact person for further communication regarding the incident."

7.1.3 Incident Reporting

As per C8, the Department must be provided with a subsequent incident report in accordance with Appendix 6 of the Consent which states:

1. All incident notifications and reports must be submitted via the Department's Major Projects website.

2. The Applicant must provide notification as required under these requirements, even if the Applicant fails it to give the notification required under condition C7 or, having given such notification, subsequently forms the view that an incident has not occurred.

3. Within 7 days (or as otherwise agreed by the Planning Secretary) of the Applicant making the immediate incident notification (in accordance with condition C9), the Applicant is required to submit a subsequent incident report that:

(a) identifies how the incident was detected; identifies when the Applicant became aware of the incident;

(b) identifies any actual or potential non-compliance with conditions of consent;

(c) identifies further action(s) that will be taken in relation to the incident; and

(d) a summary of the incident;

(e) outcomes of an incident investigation, including identification of the cause of the incident;

(f) details of the corrective and preventative actions that have been, or will be, implemented to address the incident and prevent recurrence; and

(g) details of any communication with other stakeholders regarding the incident

Further details regarding Boral's internal and external incident reporting procedure are included in the latest revision of the PIRMP which is available on the Boral website.

7.2 NON-COMPLIANCE MANAGEMENT

7.2.1 Non-Compliance Definition

The consent provides a definition of non–compliance as

"An occurrence, set of circumstances or development that is a breach of this consent"

Boral will manage any incidents or non-compliance in accordance with the incident and non-compliance protocols found in the Environmental Management System (EMS). In summary Boral will, at the earliest opportunity:

"Take all reasonable and feasible measures to ensure that the exceedance ceases and does not recur. Consider all reasonable and feasible options for remediation (where relevant) and submit a report to the DPHI describing those options and any preferred remediation measures or other course of action. Implement remediation measures as directed by the Secretary, to the satisfaction of the Secretary, and Submit an incident report within seven days of the original notification."

7.2.2 Non-Compliance Notification

Non-compliance notification and reporting will be conducted in accordance with Condition C9 whereby:

"Within seven days of becoming aware of a non-compliance occurring, the Department must be notified. The notification must:

(a) be in writing and submitted via the Department's Major Projects Website;

(b) identify the development (including the development application number and name);

(c) set out the condition of this consent that the development is non-compliant with, why it does not comply, the reasons for the non-compliance (if known); and

(d) set out what actions have been, or will be, undertaken to address the non-compliance.

***Note:** A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance.*

7.3 COMPLAINTS MANAGEMENT AND REPORTING

The Site has complaints hotline, with all community or regulator complaints logged in complaints register and investigated and actioned immediately as per EIS 'Environmental Management', the Environmental Management System (EMS) includes a detailed complaints management procedure.

This sub-section records the procedures that would be implemented following the receipt of a related complaint. Complaints can also be directed to the Company via phone or email. These details are presented in **Table 10** below.

Table 10: Complaints Management

Communication Method	Details
Email	info@boral.com.au
Website	https://www.boral.com.au/locations/boral-quarries-stockton-fullerton-cove
Phone	1300 267 253

7.4 PUBLICLY ACCESSIBLE INFORMATION

As per the Environmental Management Strategy prepared for the Stockton Quarry Inland Dune Project all information on potential environmental impacts associated with the Maximum Extraction Depth Management Plan will be provided on the public website located at www.boral.com.au.

All information required for the development in accordance with Part C Condition 12 of the Development Consent SSD-52984213 and any monitoring requirements of the Environmental Protection Licence (EPL 10132) will be provided on the website.

8 OTHER REPORTING

8.1 ANNUAL REPORTING

8.1.1 Annual Review

The site's environmental officer is responsible for managing the environmental reporting program and arranging specialist consultants to prepare reports, as required. The activities and performance outcomes of the Maximum Extraction Depth Management Plan will be presented in the Annual Review (AR).

This will include detailed assessment of monitoring results collected over the course of the MEDMP, an evaluation of any trends occurring across the site, a summary of any incidents or non-conformances with licences/criteria and recommendations for management actions.

In accordance with Condition B26 (f)(ii) the annual review will additionally demonstrate that quarrying operations remained above the 99th percentile groundwater level and include an extraction plan down to 3.7 m AHD (consent level) for the following year.

In accordance with the requirements of Project Approval *Condition C10*, By the end of March in each year after the commencement of development, or other timeframe agreed by the Planning Secretary, a report must be submitted to the Department, to Council and any other interested period upon request reviewing the environmental performance of the development.

As per Condition C10 of the Development Consent, the Annual Review must:

- *describe the development (including any rehabilitation) that was carried out in the previous calendar year, and the development that is proposed to be carried out over the current calendar year;*
- *include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, including a comparison of these results against the:*
  - *I. relevant statutory requirements, limits or performance measures/criteria;*
  - *II. requirements of any plan or program required under this consent;*
  - *III. monitoring results of previous years; and*
  - *IV. relevant predictions in the document/s listed in condition A2(c);*
- *identify any non-compliance or incident which occurred in the previous calendar year, and describe what actions were (or are being) taken to rectify the non-compliance and avoid reoccurrence;*
- *evaluate and report on:*
  - *I. the effectiveness of the noise and air quality management systems; and*
  - *II. compliance with the performance measures, criteria and operating conditions of this consent;*
- *identify any trends in the monitoring data over the life of the development;*
- *identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and*
- *describe what measures will be implemented over the next calendar year to improve the environmental performance of the development.*

8.1.2 EPL 10132 Reporting

Boral must also submit an Annual Return in accordance with condition R1.1 of EPL 10132 which states:

R1.1 The licensee must complete and supply to *the EPA an Annual Return in the approved form comprising*:

1. *a Statement of Compliance,*
2. *a Monitoring and Complaints Summary,*
3. *a Statement of Compliance – Licence Conditions,*
4. *a Statement of Compliance -Load based Fee,*

5. *a Statement of Compliance -Requirement to Prepare Pollution Incident Response Management Plan,*
6. *a Statement of Compliance – Requirements to Publish Pollution Monitoring Data; and*
7. *a Statement of Compliance – Environmental Management Systems and Practices.*

At the end of each reporting period, the EPA will provide to the licensee a copy of the form that must be completed and returned to the EPA.

8.2 INDEPENDENT ENVIRONMENTAL AUDIT

An Independent Environmental Audit (IEA) must be undertaken for the development.

As per Condition C11 of Development Consent, the IEA must:

a. *be conducted within one year of commencement of development under this consent, and every three years after, unless the Planning Secretary directs otherwise;*

b. *be conducted and carried out in accordance with the Independent Audit Post Approval Requirements (NSW Government, 2020) or its latest version; and*

c. *reported and submitted to the Department in accordance with the Independent Audit Post Approval Requirements (NSW Government, 2020) or its latest version*

This management plan will be reviewed for its effectiveness of the management measures set out pursuant to the submission of each IEA.

9 TRAINING AND AWARENESS

All personnel shall undergo water management awareness training through the induction and re-induction process. Water management shall be a component of the competency-based site induction program. The following areas shall be covered in the induction. The Quarry Manager shall be responsible for ensuring the appropriate water management and extraction depth training and is to be included in the induction. Should additional training be required it will be outlined in toolbox talks / prestart meetings.

10 ROLES AND RESPONSIBILITIES

Roles and responsibilities are outlined in **Table 11** below.

Table 11: Roles and Responsibilities

Position	Position Description
Quarry Manager	The Quarry Manager is the person who manages the Quarry and is responsible for the day-to-day activities on the site. The Quarry Manager reports to the Quarry Owner.
Environment Business Support	Assisting the Quarry Manager with responsibilities associated with environmental reporting and monitoring requirements.
On site personnel	Onsite personnel, all employees and contractors working on the site.
Suitably Qualified Person	Where the Quarry Manager sub-contracts tasks within this management plan, the quarry manager is to satisfy themselves as to the suitability of the contractor for the task. A suitably qualified contractor will be able to demonstrate the following for the required task: • Relevant qualifications or training • Relevant experience

11 REVIEW AND IMPROVEMENT

As per Condition B29 of the Development Consent, the maximum extraction depth management plan must be reviewed and updated every two years or immediately following any non-compliance with conditions A7 or A8 as follows:

> *A7. A 0.7 metre buffer must be maintained above the 99th percentile groundwater level as calculated in the EIS and updated during the life of the development.*
>
> *A8. Extractive materials must not be extracted below 3.7 m AHD.*

Additionally, as per Condition C5 of the Development Consent, this plan will be reviewed within three months of:

> *(a) the submission of an incident report under condition C7 or a non-compliance under condition C9;*
>
> *(b) the submission of an Annual Review under condition C10;*
>
> *(c) the submission of an Independent Environmental Audit under condition C11;*
>
> *(d) the approval of any modification of the conditions of this consent (unless the conditions require otherwise); or*
>
> *(e) notification of a change in development phase under condition A14.*

Additionally, in line with Condition C6 of the Development Consent, if necessary, to either improve the environmental performance of the development, cater for a modification or comply with a direction, the strategies, plans and programs required under this consent must be revised, to the satisfaction of the Planning Secretary and submitted to the Planning Secretary for approval within six weeks of the review, if required.

12 REFERENCES

Boral Resources (NSW) Pty Ltd. (2023). *Stockton Quarry Dry Sand Extraction Project Environmental Impact Statement*. Boral Resources.

Umwelt. (2023). *Groundwater Assessment for Stockton Dry Sand Project*. Umwelt Australia Pty Ltd.

Environmental Earth Sciences (EES). (2018*). Acid Sulphate Soil (ASS) Assessment at Stockton Quarry*. Environmental Earth Sciences.

Southeast Engineering and Environmental. (2023). *Surface Water and Hydrology Report for Stockton Quarry*. Southeast Engineering and Environmental.

RPS. (2016). *Topographic Analysis of Stockton Quarry*. RPS Group.

SILO Database. (1957-2023). *Long-Term Rainfall and Climate Data for Williamtown RAAF Site*. Scientific Information for Landowners (SILO).

NSW Department of Planning, Housing and Infrastructure (DPHI). (2024*). State Significant Development (SSD) Consent Conditions for Stockton Quarry SSD-52984213.*

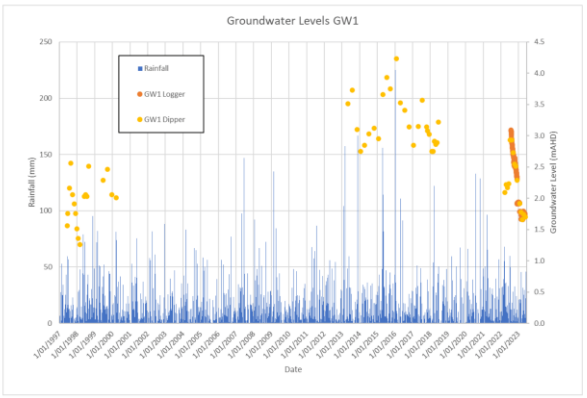
Environmental Protection Agency (EPA). (1997). *Protection of Environment Operations Act (POEO Act)*. New South Wales Environmental Protection Agency.

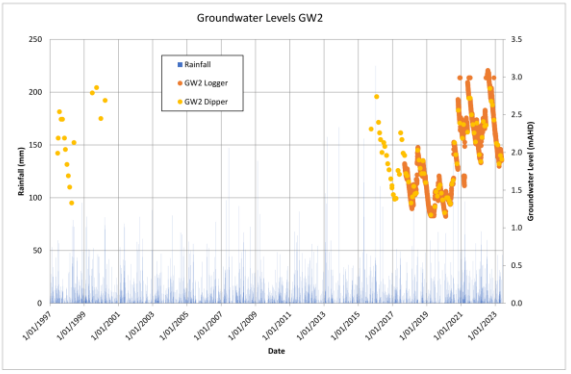
NSW Department of Planning and Environment. (2013). *Strategic Agricultural Land Map* - Sheet STA_047.

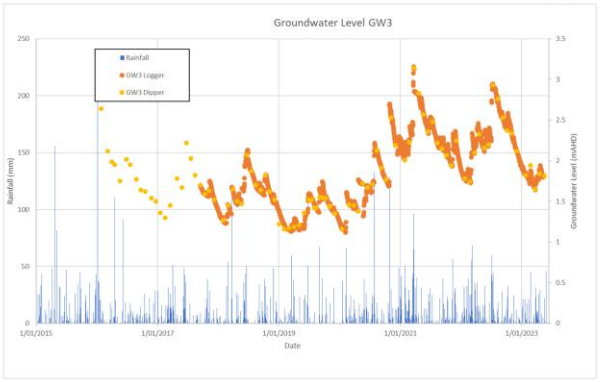
Independent Audit Post Approval Requirements. (2020*). NSW Government Guidelines for Environmental Auditing*.

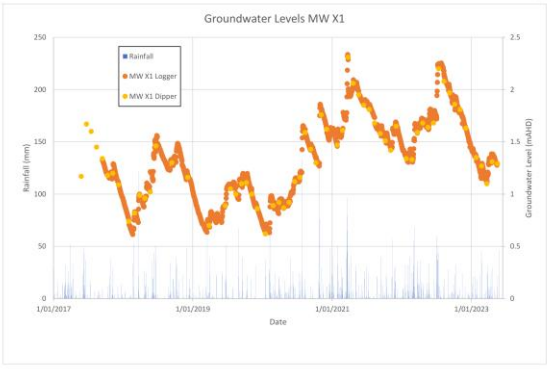
Appendix A

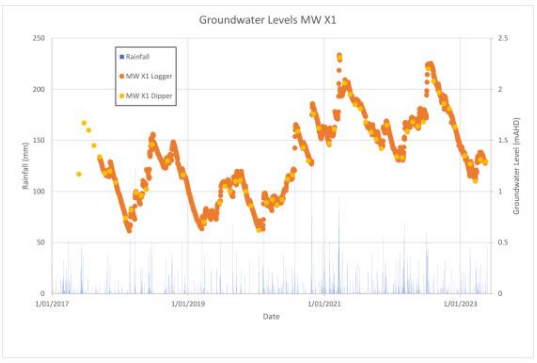
Hydrographs (Umwelt, 2023)

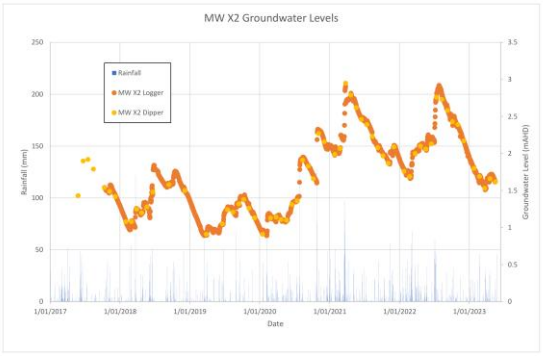

Groundwater Levels GW1
Rainfall
GW1 Logger
GW1 Dipper
Rainfall (mm)
Groundwater Level (mAHD)
Date

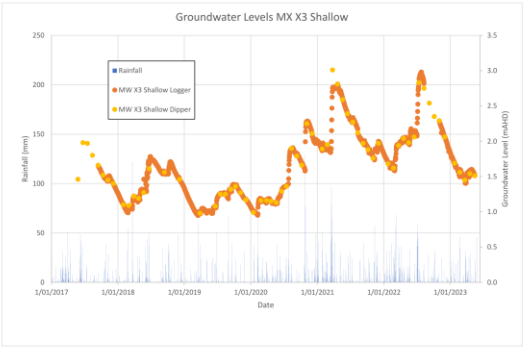

Groundwater Levels GW2
Rainfall
GW2 Logger
GW2 Dipper
Rainfall (mm)
Groundwater Level (mAHD)
Date

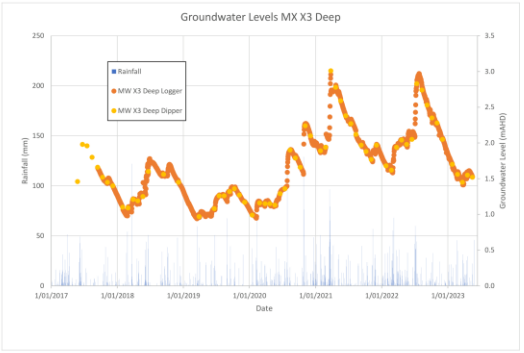

Groundwater Level GW3
Rainfall
GW3 Logger
GW3 Dipper
Rainfall (mm)
Groundwater Level (mAHD)
Date

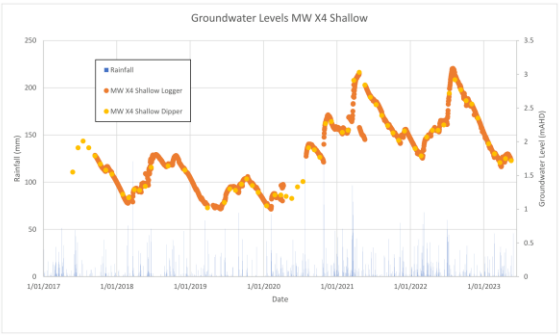

Groundwater Levels MW X1
Rainfall
MW X1 Logger
MW X1 Dipper
Rainfall (mm)
Groundwater Level (mAHD)
Date

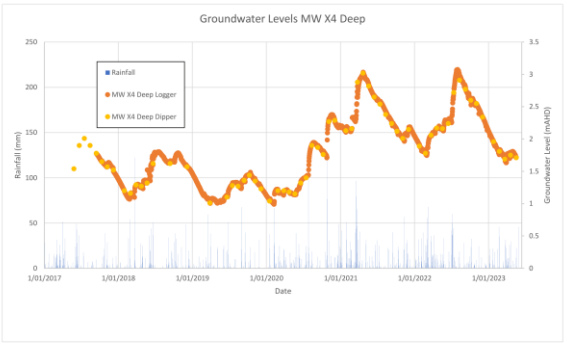

Groundwater Levels MW X1
Rainfall
MW X1 Logger
MW X1 Dipper
Rainfall (mm)
Groundwater Level (mAHD)
Date

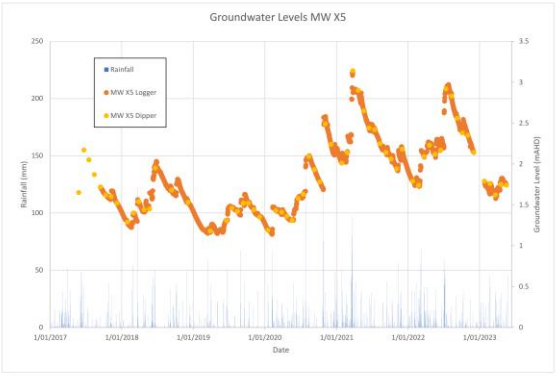

MW X2 Groundwater Levels
Rainfall
MW X2 Logger
MW X2 Dipper
Rainfall (mm)
Groundwater Level (mAHD)
Date

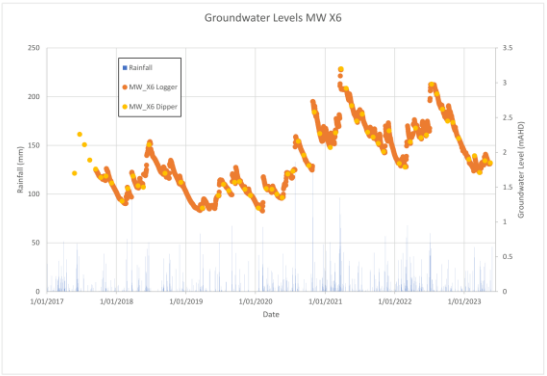

Groundwater Levels MX X3 Shallow
Rainfall
MW X3 Shallow Logger
MW X3 Shallow Dipper
Rainfall (mm)
Groundwater Level (mAHD)
Date
1/01/2017
1/01/2018
1/01/2019
1/01/2020
1/01/2021
1/01/2022
1/01/2023

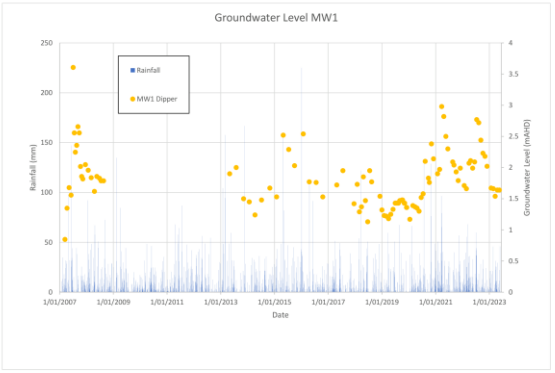

Groundwater Levels MX X3 Deep
Rainfall
MW X3 Deep Logger
MW X3 Deep Dipper
Rainfall (mm)
Groundwater Level (mAHD)
Date
1/01/2017
1/01/2018
1/01/2019
1/01/2020
1/01/2021
1/01/2022
1/01/2023

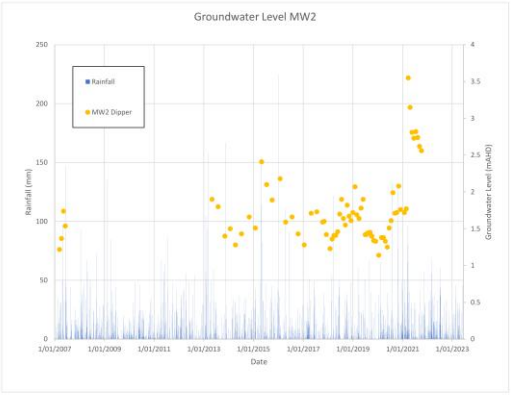

Groundwater Levels MW X4 Shallow
Rainfall
MW X4 Shallow Logger
MW X4 Shallow Dipper
Rainfall (mm)
Groundwater Level (mAHD)
Date
1/01/2017
1/01/2018
1/01/2019
1/01/2020
1/01/2021
1/01/2022
1/01/2023

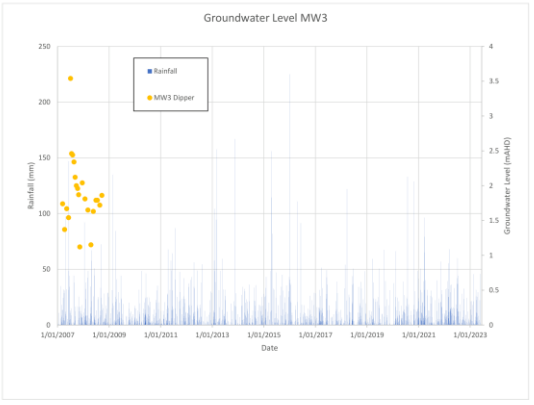

Groundwater Levels MW X4 Deep
Rainfall
MW X4 Deep Logger
MW X4 Deep Dipper
Rainfall (mm)
Groundwater Level (mAHD)
Date
1/01/2017
1/01/2018
1/01/2019
1/01/2020
1/01/2021
1/01/2022
1/01/2023

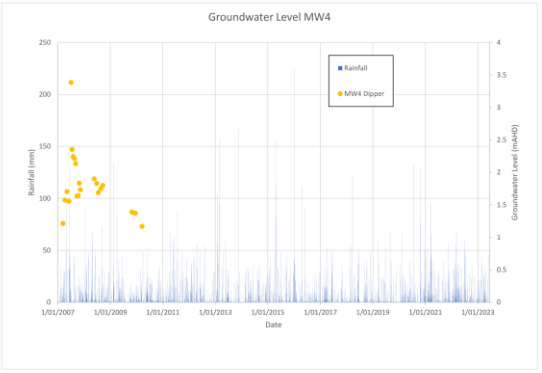

Groundwater Levels MW X5
Rainfall
MW X5 Logger
MW X5 Dipper
Rainfall (mm)
Groundwater Level (mAHD)
Date
1/01/2017
1/01/2018
1/01/2019
1/01/2020
1/01/2021
1/01/2022
1/01/2023

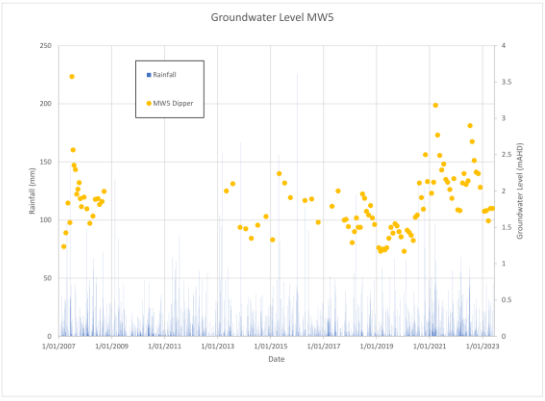

Groundwater Levels MW X6
Rainfall
MW_X6 Logger
MW_X6 Dipper
Rainfall (mm)
Groundwater Level (mAHD)
Date
1/01/2017
1/01/2018
1/01/2019
1/01/2020
1/01/2021
1/01/2022
1/01/2023

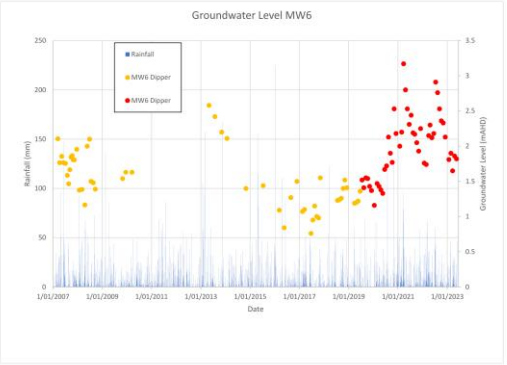

Groundwater Level MW1
Rainfall
MW1 Dipper
Rainfall (mm)
Groundwater Level (mAHD)
Date
1/01/2007
1/01/2009
1/01/2011
1/01/2013
1/01/2015
1/01/2017
1/01/2019
1/01/2021
1/01/2023

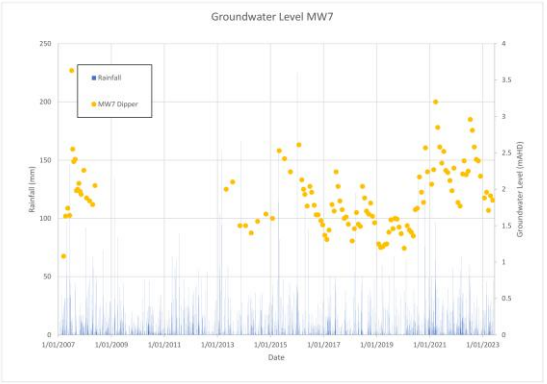

Groundwater Level MW2
Rainfall
MW2 Dipper
Rainfall (mm)
Groundwater Level (mAHD)
Date
1/01/2007
1/01/2009
1/01/2011
1/01/2013
1/01/2015
1/01/2017
1/01/2019
1/01/2021
1/01/2023

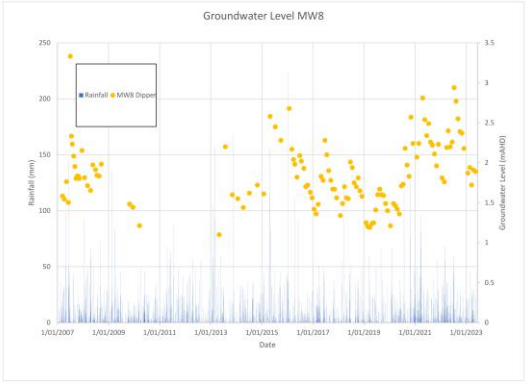

Groundwater Level MW3
Rainfall
MW3 Dipper
Rainfall (mm)
Groundwater Level (mAHD)
Date
1/01/2007
1/01/2009
1/01/2011
1/01/2013
1/01/2015
1/01/2017
1/01/2019
1/01/2021
1/01/2023

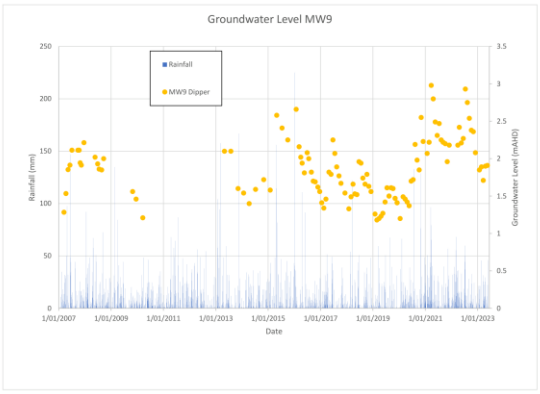

Groundwater Level MW4
Rainfall
MW4 Dipper
Rainfall (mm)
Groundwater Level (mAHD)
Date
1/01/2007
1/01/2009
1/01/2011
1/01/2013
1/01/2015
1/01/2017
1/01/2019
1/01/2021
1/01/2023

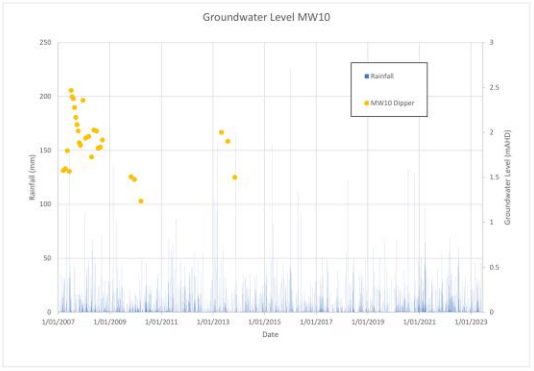

Groundwater Level MW5
Rainfall
MW5 Dipper
Rainfall (mm)
Groundwater Level (mAHD)
Date
1/01/2007
1/01/2009
1/01/2011
1/01/2013
1/01/2015
1/01/2017
1/01/2019
1/01/2021
1/01/2023

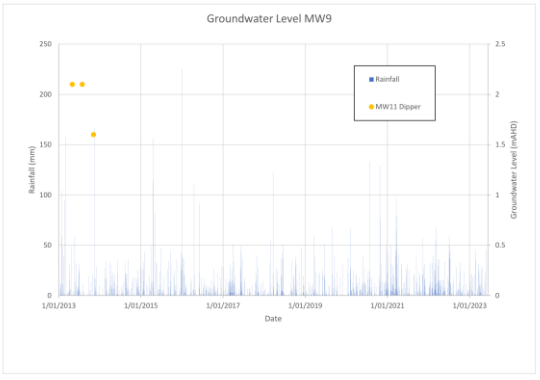

Groundwater Level MW6
Rainfall
MW6 Dipper
MW6 Dipper
Rainfall (mm)
Groundwater Level (mAHD)
Date
1/01/2007
1/01/2009
1/01/2011
1/01/2013
1/01/2015
1/01/2017
1/01/2019
1/01/2021
1/01/2023


Groundwater Level MW7
Rainfall
MW7 Dipper
Rainfall (mm)
Groundwater Level (mAHD)
Date
1/01/2007
1/01/2009
1/01/2011
1/01/2013
1/01/2015
1/01/2017
1/01/2019
1/01/2021
1/01/2023


Groundwater Level MW8
Rainfall
MW8 Dipper
Rainfall (mm)
Groundwater Level (mAHD)
Date
1/01/2007
1/01/2009
1/01/2011
1/01/2013
1/01/2015
1/01/2017
1/01/2019
1/01/2021
1/01/2023

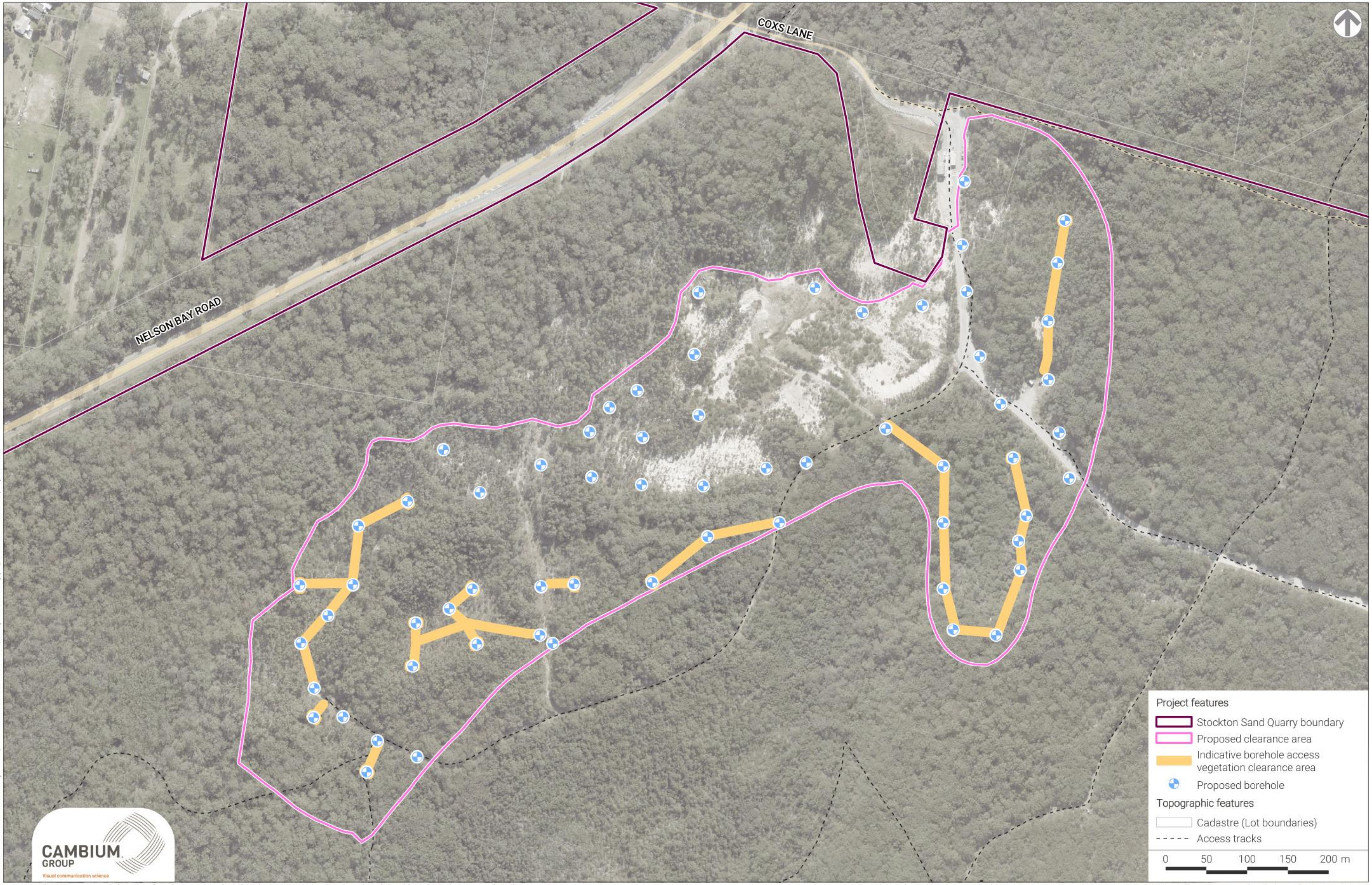

Groundwater Level MW9
Rainfall
MW9 Dipper
Rainfall (mm)
Groundwater Level (mAHD)
Date
1/01/2007
1/01/2009
1/01/2011
1/01/2013
1/01/2015
1/01/2017
1/01/2019
1/01/2021
1/01/2023


Groundwater Level MW10
Rainfall
MW10 Dipper
Rainfall (mm)
Groundwater Level (mAHD)
Date
1/01/2007
1/01/2009
1/01/2011
1/01/2013
1/01/2015
1/01/2017
1/01/2019
1/01/2021
1/01/2023


Groundwater Level MW9
Rainfall
MW11 Dipper
Rainfall (mm)
Groundwater Level (mAHD)
Date
1/01/2013
1/01/2015
1/01/2017
1/01/2019
1/01/2021
1/01/2023

Appendix B

Drilling Program – Preliminary Network (EIS, 2023)



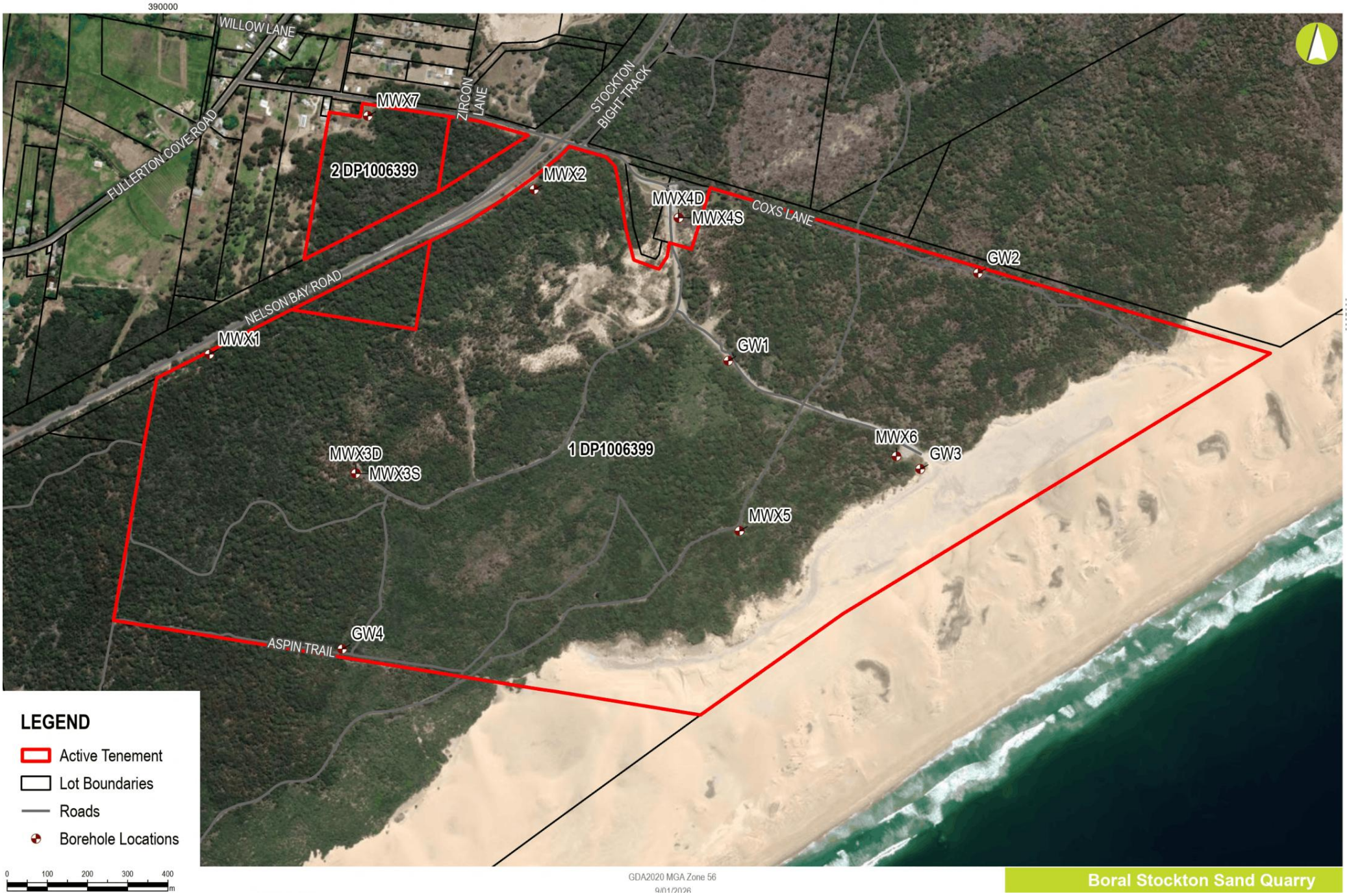
Source: NSW Government Spatial Services (2023), Aerometrex (2023), Niche Environment and Heritage (2023), Boral (2023), Cambium Group (2023).

Projected coordinate system | GDA2020 MGA Zone 56

031262_SQDSEP_EIS_F3.4_Drilling_program_and_preliminary_clearing_230809_v02

Appendix C

Bore Locations – MWX and GW Series (IEMA, 2025)


390000
WILLOW LANE
ZIRCON LANE
STOCKTON BIGHT TRACK
FULLERTON COVE ROAD
NELSON BAY ROAD
COXS LANE
ASPIN TRAIL
MWX7
MWX2
MWX4D
MWX4S
MWX1
MWX3D
MWX3S
MWX6
MWX5
GW1
GW2
GW3
GW4
2 DP1006399
1 DP1006399
LEGEND
Active Tenement
Lot Boundaries
Roads
Borehole Locations
0
100
200
300
400
m
GDA2020 MGA Zone 56
9/01/2026
Boral Stockton Sand Quarry