

14 April 2026

Scott Ellerton
C/- ADW Johnson
Karuah East Quarry Pty Limited
Blue Rock Close
Karuah NSW 2324

**Re: Groundwater Assessment - Karuah Pit Consolidation Project
Karuah East Quarry Modification 11 (MOD 11) MP09_0175**

Dear Scott,

1 Introduction

Karuah East Quarry Pty Limited (KEQPL) owns and operates the Karuah East Quarry (KEQ), and together with Hunter Quarries Pty Ltd (HQPL) who owns and operates the Karuah Hard Rock Quarry, forms the Karuah Quarry Complex located approximately 5 kilometres (km) north-east of Karuah at Andersite Road / Blue Rock Close, Karuah.

The KEQ and KHRQ sites produce a high-quality andesite resource which is supplied to construction, infrastructure, and other development projects across Greater Newcastle, the Hunter Valley and Mid-North Coast regions. KEQ extracts resource from Lots 12 and 13 DP 1024564 (Lot 12 and Lot 13) and KHRQ extracts resource from Lot 11 DP 1024564 (Lot 11) and the under separate State Significant Development (SSD) consents. The Lot and DP numbers are presented on Figure 1.1.

KEQPL and HQPL (who are affiliated companies) are proposing to modify the SSD approvals for the Karuah East Quarry (Project Approval MP09_0175) and the Karuah Hard Rock Quarry (DA 265-10-2004) under the provisions of section 4.55(2) of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The applications are being referred to as the Karuah Pit Consolidation Project and will consist of two concurrent modification applications to the SSD approval for each quarry, that will be known as KEQ MOD 11 and KHRQ MOD 2.

HQPL has recently acquired Lot 11, enabling KEQPL and HQPL to control all landholdings within the Karuah Quarry Complex. This acquisition now allows KEQPL and HQPL to readily extract previously sterilised resource from the remnant dividing highwall between the KEQ and KHRQ extraction pits forming a Consolidated Extraction Area (CEA). The purpose of the modification is to primarily enable the extraction of the previously sterilised andesite resource from the remnant dividing highwall as well as within other cleared areas from the KEQ and KHRQ sites in a coordinated approach.

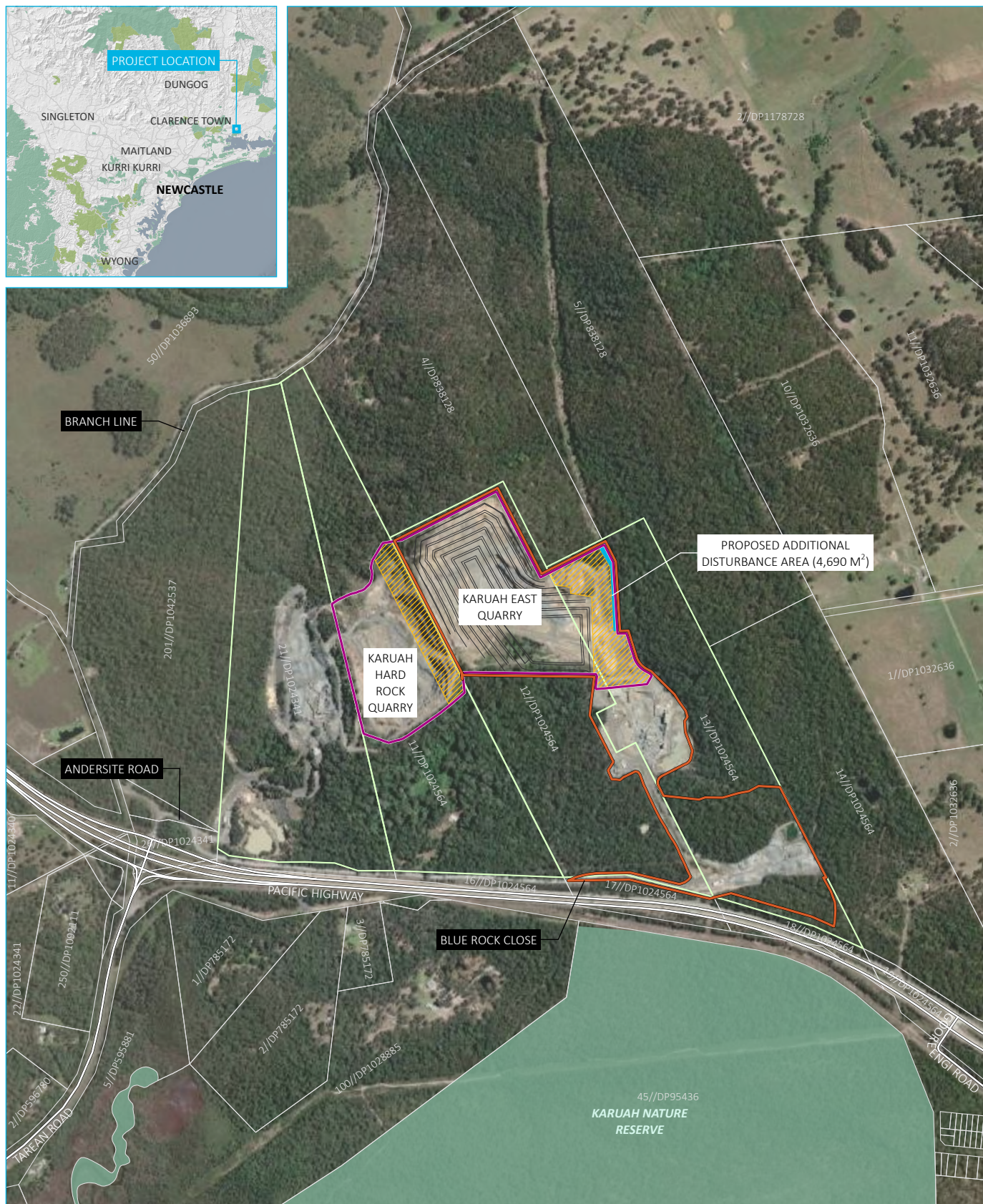
EMM Consulting Pty Limited (EMM) has been commissioned to prepare a Groundwater Assessment to support each Modification Application. This Groundwater Assessment has been prepared specifically to support the KEQ MOD 11 application, which should read in conjunction with the concurrent KHRQ MOD 2 Groundwater Assessment.

The KEQ is currently approved to extract, process and transport up to 1.5 million tonnes (Mt) of quarry products annually. These rates are not affected by the proposal and are not proposed to change.

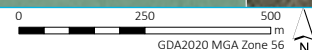
The project background and details of the proposed modification are outlined in the section 4.55(2) Modification Reports for KEQ (ADW Johnson 2026) and KHRQ (ADW Johnson 2026). A summary of the proposed modifications is presented in Table 1.1.

Table 1.1 Proposed Modification works under KEQ MOD 11 and KHRQ MOD 2

KEQ MOD 11 and KHRQ MOD 2	KEQ MOD 11	KHRQ MOD 2
- Extraction of all known resource within the disturbed areas of Lot 11, Lot 12 and Lot 13, including the dividing highwall, within the currently approved extraction depths of RL45 at KEQ and RL65 at KHRQ. - Minor extension and overlap of the extraction boundaries to holistically encompass the highwall structure inclusive of safety offsets. - Material sourced from the overlapping area of the CEA will be transported by internal haul road to either the KEQ or KHRQ for processing, stockpiling, sale and transport to market within currently approved throughput rates. - Changes to blasting activities (cumulative reduction across both sites from 3 to 2 and extending blasting hours to 9:00 am to 5:00 pm weekdays). - Revised final landform resulting in a 'free draining' landscape. - No change to current approved annual extraction limits at either quarry (1.5 million tpa at KEQ and 500,000 tpa at KHRQ).	- Minor extension of the KEQ at the northeastern corner of the site by approximately 4,690 m². - Extension of the KEQ extraction area to the west (highwall removal) and to the east. - Formalise a total life of quarry extraction at KEQ of 28.33 Mt (a nominal reduction from the 29 Mt anticipated in the original KEQ Project Approval documentation). - Update Management Plans as required.	- Extending life of quarry operations from 3 June 2027 to 31 December 2034. - Increase in total quarry resource volume from 11.20 Mt to 13.20 Mt. - Extending operating hours to be consistent with KEQ. - Revised 'free draining' final landform. - Provision of an in-pit sump. The base of this upgraded dam will remain above RL45. - Environmental safeguards incorporated into Management Plans that are in place for the KHRQ operation will be reviewed and updated (where required) to accommodate the proposal.
Coordinated extraction sequence (inclusive of remnant highwall removal)		
Stage 1	- Extract the current top benches of the remnant highwall (RL 135 m) down to RL 90 m (currently lowest KEQ bench at the time of writing (February 2025)), forming a single extraction level/area on Lot 12. - This approach is needed to safely remove the peak of the dividing highwall and make the extraction area level with the current KEQ extraction area.	
Stage 2	Extract Lot 12 from RL 90 m (currently lowest KEQ bench at the time of writing (February 2025)), down to RL 65 m in line with KHRQ pit floor and KEQ boot-bin levels, forming a single extraction level/area over the entire CEA.	
Stage 3	- Extract final benches at KEQ (Lots 12 and 13) from RL 65 m down to RL 45 m. - The KHRQ pit floor is to remain at RL 65 m.	



Source: EMM (2026); ABS (2021); DCSSS (2024); ESRI (2026); GA (2009)



KEY

- Subject cadastral lot
- Karuah East Quarry approved extraction layout
- Project element**
- Karuah East Quarry disturbance area
- Proposed consolidated extraction area
- Proposed additional disturbance area (4,690 m²)
- Proposed extended extraction area

- Existing environment
- Major road
- Cadastral boundary
- NPWS reserve

INSET KEY

- Major road
- NPWS reserve
- State forest

Project area- Karuah East Quarry

Karuah Pit Consolidation
Groundwater Assessment
Figure 1.1

2 Regulatory context

2.1 Water Management Act

The *Water Act 1912* (Water Act) and *Water Management Act 2000* (WM Act) are the two key pieces of legislation governing the management of water resources in NSW. The Water Act is progressively being repealed and replaced by the WM Act as Water Sharing Plans (WSPs) are implemented across NSW. However, the Water Act remains valid for certain aspects of groundwater legislation such as water licensing.

2.2 Water Sharing Plan

Water Sharing Plans (WSPs) are statutory documents dictating the management and sharing of water sources. The WSPs set the water management vision and objectives, management rules for water access licenses (WALs), what water is available within the various water sources, and procedures for dealing in licences and water allocations, water supply works approvals and the extraction of water. WSPs are designed to establish sustainable use and management of water resources and are periodically reviewed (every 10 years).

Each WSP documents the water available and how it is shared between environmental, basic rights, and other consumptive uses. The WSPs outline the water availability for extractive uses within different categories, such as local water utilities, domestic and stock, basic rights, and access licences.

The project site falls within the New England Fold Belt Coast Groundwater Source, managed by the North Coast Fractured and Porous Rock Groundwater Sources WSP 2016.

2.3 Water access licenses

Any groundwater taken, either directly (e.g. quarry inflow or bore extraction) or indirectly (e.g. reduction in baseflow to surface water) needs to be accounted for with a WAL and an approved Work Approval (WA). WALs and WA are managed under the WM Act. A WAL will need to be purchased either by a Controlled Determination (if available when the NSW Government releases water to the market) or purchased from a current holder (either permanently or temporarily) in the same groundwater source.

NOTE: The project will not intersect or take any groundwater, therefore no groundwater licensing (WAL or WA) will be required.

2.4 NSW Aquifer Interference Policy

2.4.1 Overview

The NSW Aquifer Interference Policy (AIP) 2012 defines the regime for protecting and managing the impacts of aquifer interference activities on NSW's water resources (DPIE-Water 2012). The AIP requires consideration of the potential impacts of an aquifer interference activity with respect to the water table, water pressure and water quality. Proponents must estimate the water take (including incidental take) from each water source and connected water sources and assesses the take against minimal impact considerations for each water source. Activities which intersect or 'interfere with' an aquifer may involve:

- the extraction of groundwater that flows into a void to allow an activity to operate safely. This is often called dewatering, and the water extracted is often referred to as 'incidental take of groundwater'
- other impacts resulting from the intersection of the aquifer, such as changes to groundwater flow paths and gradients, subsidence, compaction of the aquifer structure, and artificial aquifer recharge.

Volumes of water incidentally taken during aquifer interference activities, such as the water intercepted during quarry operations, are required to hold a WAL under the WM Act with a sufficient water allocation to account for incidental water ‘take’. Proponents are also required to comply with relevant requirements of the NSW AIP such as ongoing consultation with relevant state agencies.

NOTE: The project will not intersect or take any groundwater, therefore the AIP does not apply.

2.4.2 Identification of high priority groundwater dependent ecosystems

Groundwater dependent ecosystems (GDEs) are ecosystems which have their species composition and natural ecological processes determined to some extent by the availability of groundwater. GDEs can include terrestrial vegetation (i.e. wetlands, shrubs/trees with deep rooting depths), aquatic communities (plant and animal species occupying waterways which receive groundwater), and subterranean systems (i.e. karst and fractures in rock).

The risk assessment guidelines for GDEs (Serov et al 2012) (GDE Risk Assessment Guidelines) inform the assessment and management of GDEs under the *Water Management Act 2000* (WM Act) in NSW. The GDE Risk Assessment Guidelines provide that GDEs:

- explicitly include any ecosystem that uses groundwater at any time or for any duration in order to maintain its composition and condition.

An ecosystem’s dependence on groundwater can be variable, ranging from partial and infrequent dependence, that is, seasonal or episodic (facultative), to total continual dependence (entire/obligate) (refer Figure 2.1).

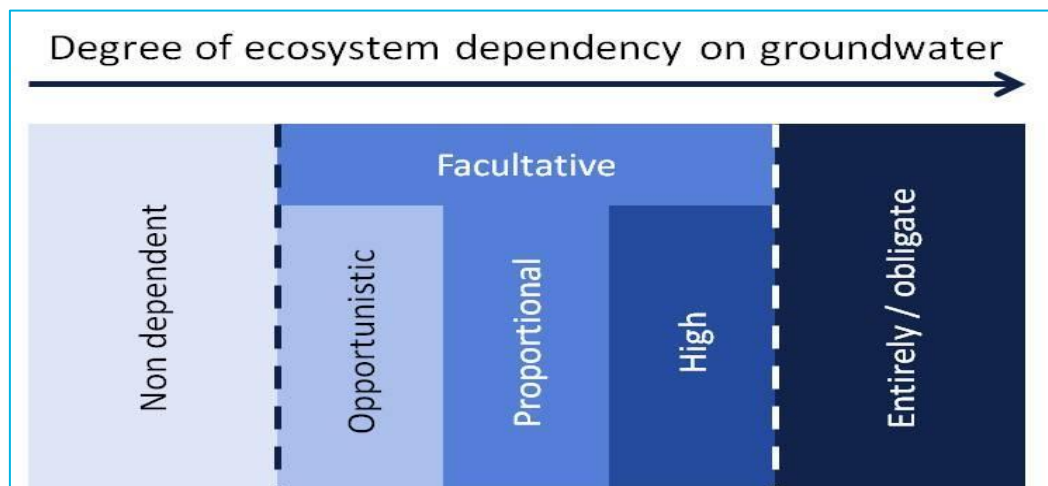


Figure 2.1 Ecosystem level of dependence on groundwater

The WSP lists high priority GDEs within each groundwater source. These GDEs have been characterised in accordance with the water management principles specified in the WM Act as having a unique environmental, cultural or social value to the area.

Changes in groundwater level and quality potentially caused by a development need to be assessed to determine if GDEs will be impacted.

2.4.3 Identification of third-party groundwater users

Third-party bores, or landholder bores, that have the potential to be impacted by a development through changes in groundwater level, pressures or quality require assessment under the AIP.

2.5 Environmental assessment requirements

This Groundwater Assessment has been prepared in accordance with the Assessment Requirements issued by the NSW Department of Planning, Housing & Infrastructure (NSW Planning) issued on 1 October 2025, that requires the Modification Application to consider Water Resources, including groundwater impacts associated with expansion of the extraction area.

3 Existing environment

3.1 Climate

Climate monitoring data collected by the Bureau of Meteorology (BoM) was sourced from the Scientific Information for Land Owners (SILO) database. SILO interpolates climate data to provide a continuous dataset with infilled values for missing data. Climate data was obtained from Tahlee (Carrington, Church Street) BoM station (061072) which is located approximately 5 km from the site.

The average annual rainfall for the Tahlee weather station is 1,122 millimetres (mm). Mean monthly rainfall is well distributed throughout the year without a distinct wet or dry season.

Cumulative rainfall deviation (CRD) from 2010 to present is shown in Figure 3.1. Downward trends show below average rainfall conditions and upward trends show above average rainfall conditions. The CRD shows generally cycles of rainfall patterns: average from 2010 to 2014, above average in 2015, below average from 2016 to 2020, above average from 2021 to 2022, below average rainfall in 2023 and above average rainfalls from 2024 to present.

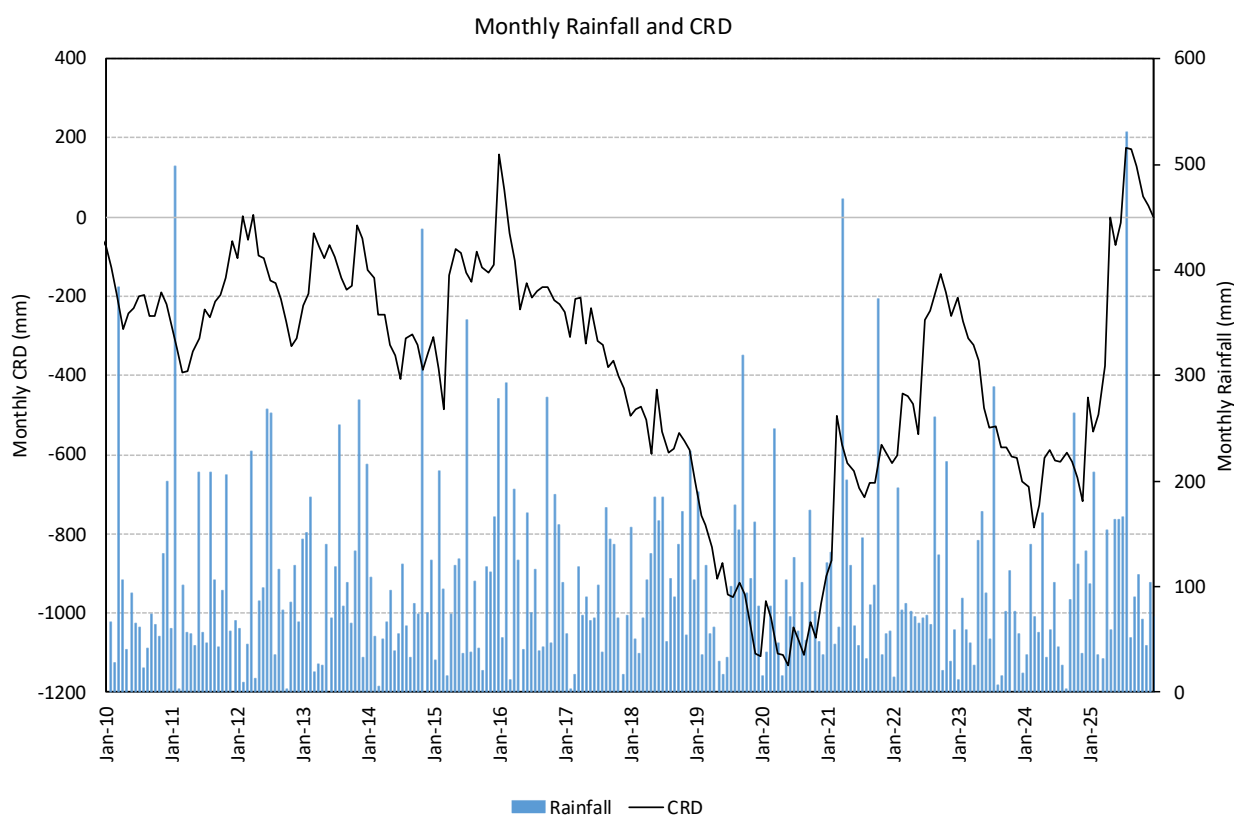


Figure 3.1 Monthly cumulative rainfall deviation from the mean

3.2 Topography

Regionally, the site sits within the lower reaches of the Karuah River catchment. The regional topography typically comprises of moderately undulating terrain, with prominent rounded hill forms and relatively narrow concave gullies within the immediate vicinity of the quarries. The project area slopes to the south and west and has a maximum elevation of approximately 85 metres Australian Height Datum (mAHD).

3.3 Hydrology

The site sits within the lower reaches of the Karuah River catchment. The Karuah River is a major perennial river located to the west and south of the site. Locally the hydrologic regime is characterised by an existing ridgeline which extends northwest-southeast through the site. The eastern portion of the site drain eastwards via tributaries of Bulga Creek. Bulga Creek meanders to the southeast and joins Karuah River at North Arm Cove. The western portion of the site drains westwards via tributaries of Yalimbah Creek. Yalimbah Creek meanders southwards and discharges to Karuah River at Number One Cove.

3.4 Geology

The Project site is located near the Karuah Fault, a north-north-easterly (NNE) trending fault which provides a faulted contact between the Carboniferous Nerong Volcanics and undifferentiated Carboniferous sediments consisting mostly of clastic sedimentary rocks with some interbedded volcanics.

Interbeds of sandstone, conglomerate and volcanoclastic siltstone were noted within the andesite and rhyodacite deposits. These interbedded units are generally 3 to 5 m in thickness and exhibit a low to medium strength.

Geological mapping (Coffey 2010) indicated a shear zone approximately 5 m wide that exhibits intense sub-vertical fracturing within the southern bench of the current quarry pit. Igneous dykes were also identified within the existing quarry walls and drillholes.

3.5 Groundwater users

3.5.1 Groundwater dependent ecosystems

GDEs can include terrestrial vegetation (i.e. wetlands, shrubs/trees with deep rooting depths), aquatic communities (plant and animal species occupying waterways which receive groundwater), and subterranean systems (i.e. karst and fractures in rock), that at some point utilise groundwater.

WSPs list high priority GDEs. The BoM GDE Atlas (2026a) is a second source of GDE data, along with other plans and legislation. Within the project area, the following GDEs were identified:

- **WSP high priority GDEs** (HPGDEs) details coastal wetlands at the headwaters of Yalimbah Creek and Bulga/Bundabah Creek. The Yalimbah Creek wetlands are approximately 1.5 km to the south of the project area, while the Bulga Creek coastal wetlands are approximately 5.5 km to the south-west. Both HPGDEs are separated from the site by agricultural land.
- **State Environmental Planning Policy** (Resilience and Hazards) 2021 (SEPP 21) maps Coastal Wetlands along the lower reaches of both Yalimbah Creek and Bulga Creek.
- **BoM GDE Atlas** shows high, moderate and low potential GDEs comprising of Coastal Swamp Forest within and surrounding the project area.

3.5.2 Landholders

Review of on the (National Groundwater Information System) NGIS database (BoM 2026b) shows there is one landholder bore, GW201611, located approximately 3 km north-west of the project. This bore was drilled in 2004 to a depth of 60 metres (m) targeting the sandstone unit and is listed as a commercial bore. The licence has lapsed.

4 Hydrogeology

The regional groundwater system is characterised as a fractured flow system with low-moderate productivity. Groundwater in the fractured rock groundwater system is present in discrete (secondary porosity) fractures and fissures within the andesite and rhyodacite rather than the bulk rock mass. This is consistent with the observed site geology based on the previous site investigations (Coffey 2012). The aquifer is discontinuous and semi confined to confined (LCC 2018).

Fractured rock aquifers are generally highly heterogenous in nature and tend to exhibit discontinuous fracture networks, resulting in highly variable groundwater flow, storage and quality. Recharge is by rainfall infiltration at outcrop locations and topographic depressions where surface water can pool. Discharges occur where depressions, rivers or creeks intercept the groundwater table and where geology outcrops and/or sub crops.

4.1 Groundwater monitoring

The groundwater monitoring bore network is detailed in Table 4.1 and shown in Figure 4.1. This assessment considers the combined monitoring networks of KEQ, KHRQ and the proposed Karuah South Quarry (KSQ).

Relevant to the proposed KSQ it is noted that following acquisition of Lot 11, HQPL (and affiliated companies) are now also the proponent for the application. It should be noted that:

- if approved, KSQ will not commence operations until after operations at KHRQ have ceased
- HQPL is currently reviewing the business case for the proposed KSQ
- any future revision or amendment to the proposed KSQ will be supported by an updated Groundwater Assessment that accounts for the Karuah Pit Consolidation Project.

Monitoring events occur quarterly for groundwater levels and groundwater quality. The groundwater quality analytical suite is presented in Table 4.2.

Table 4.1 Groundwater monitoring bores

Bore ID	Easting ¹	Northing ¹	Elevation (mAHD ²)	Total depth (m)	Total depth (mAHD ²)	Screen interval (mbgl ³)	Screened geology
KSQ-BH3	406622	6389254	49.2	40.67	8.53	34.67–40.67	Andesite
KSQ-BH4	406759	6389348	55.1	55.75	-0.65	49.10–55.10	Andesite
KSQ-BH7	406551	6389169	42.8	43.48	-0.68	34.15–40.15	Andesite
KSQ-BH8	406807	6389298	39.2	39.98	-0.78	27.67–33.67	Andesite
BH205	407148.7	6389455.77	56.87	40	16.87	31.0–37.0	Hornblende dacite
BH207	407342.5	6389088.23	32.06	30	12.06	10.6–28.6	Sandstone

Bore ID	Easting ¹	Northing ¹	Elevation (mAHD ²)	Total depth (m)	Total depth (mAHD ²)	Screen interval (mbgl ³)	Screened geology
BH208 ⁴	406278.2	6389771.2	52.56	30	22.56	17.5–20.5	Rhyodacite and conglomerate
BH303	406117.7	6389722.96	57.06	35.5	21.56	28.5–33.5	Rhyodacite and conglomerate
BH202	407402.5	6388999.8	41.1	40	1.1	2.0–39.0	Residual soil and Andesite

Notes:

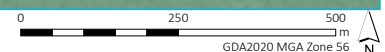
1. Coordinates in MGA Z56H
2. mAHD – metres Australian Height Datum
3. mbgl – metres below ground level
4. BH208 has been decommissioned but has been included for completeness

Table 4.2 Groundwater quality analytes

<i>In-situ analysis</i>	
pH, electrical conductivity (EC), total dissolved solids (TDS), temperature	
Laboratory analysis	
Major ions	calcium (Ca), magnesium (Mg), sodium (Na), potassium (K), chloride (Cl), sulphate (SO ₄), bicarbonate (CaCO ₃), carbonate (CaCO ₃), fluoride (F), alkalinity
Nutrient	total nitrogen, nitrate, total Kjeldahl nitrogen, total phosphorus, phosphate
Dissolved metals	arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), manganese (Mn), mercury (Hg), nickel (Ni), zinc (Zn), total iron (Fe total), filterable iron (Fe)
Petrochemical	total petroleum hydrocarbon (TPH)
	BTEX (benzene, toluene, ethyl benzene, xylene)
	polycyclic aromatic hydrocarbon (PAH)
	organophosphorus pesticides, phenoxy acid herbicides



Source: EMM (2026); DCSSS (2024); ESRI (2026); GA (2009)



KEY

— Subject cadastral lot
— Karuah Pit Consolidation Project proposed extraction layout

Project element

— Karuah East Quarry disturbance area
— Proposed consolidated extraction area
— Proposed additional disturbance area (4,690 m²)
— Proposed extended extraction area

+ Groundwater bore

Existing environment

Major road

Cadastral boundary

NPWS reserve

Groundwater monitoring bores

Karuah Pit Consolidation
Groundwater Assessment
Figure 4.1

4.2 Groundwater levels and flow

The groundwater level hydrographs for the monitoring bores are presented in Figure 4.2 against the cumulative rainfall departure (CRD) from mean monthly rainfall. The CRD represents the long-term difference between observed and average rainfall to identify climatic trends in groundwater levels.

The following groundwater level trends were observed:

- From 2017 to date, GW205 and GW207 water levels have increased approximately 9 m and 5 m, respectively. This is likely a lagged response from rainfall recharge prior to installation. However, over the last five years, less than a 2.5 m variance in groundwater levels has been observed.
- GW208 and GW303 have shown stable trends since monitoring began in 2016. The historical water level variance across the whole dataset is less than 1.5 m.

GW208 was damaged beyond repair in mid-2025 and will be decommissioned.

- GW202 was recently included in the monitoring network and has less than one year of monitoring data. The groundwater level is stable to date. The geology within this bore is unique and the suitability of use of this bore for groundwater quality monitoring purposes will be reviewed once the minimum requirements of 8 samples have been obtained to determine trigger values in accordance with the DES (2021) Guideline.
- The recent data for the KSQ monitoring bores are limited with only one measurement in September 2025 for KSQ-BH3 and KSQ-BH4. KSQ-BH7 and KSQ-BH8 were inaccessible due to vegetation regrowth.

The Karuah South Quarry Groundwater Assessment (LCC 2018) monitored water levels for seven months between April 2018 to November 2018. The assessment found that water levels at KSQ-BH4, KSQ-BH7 and KSQ-BH8 were relatively static with no correlation to rainfall. KSQ-BH3 water levels fluctuated with rainfall events.

The water level measurements between 2017 and September 2025 were consistent for KSQ-BH3, and increased by approximately 6.5 m at KSQ-BH4. Further monitoring will be required to confirm if the increase is representative.

- The highest water level recorded across the site was approximately 42 mAHD at KSQ-BH3 which is located downgradient 200 m south from the quarry extraction area.

The groundwater piezometric surface contours for September 2025 are presented in Figure 4.3. It is noted that no data was available for BH208, KSQ-BH7 and KSQ-BH8 during this monitoring round due to access constraints. From groundwater contours, the following is noted:

- There is no difference between the wet and dry season contours patterns.
- The quarry which is located on the hill is a groundwater divide, with contours showing groundwater flows to the north-west and to the south-east away from the quarry.
- The interpreted groundwater level under the quarry extraction area ranges between 32 to 39 mAHD which is below the approved KEQ pit floor at 45 mAHD.

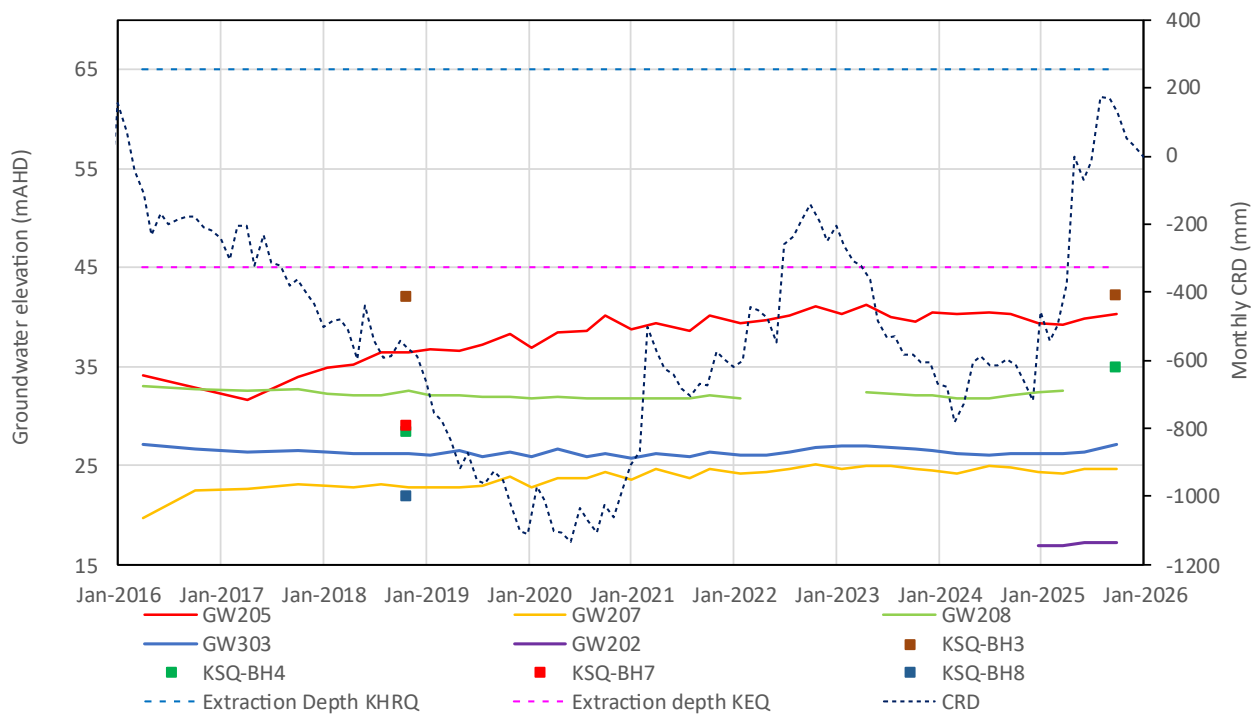


Figure 4.2 Groundwater hydrograph

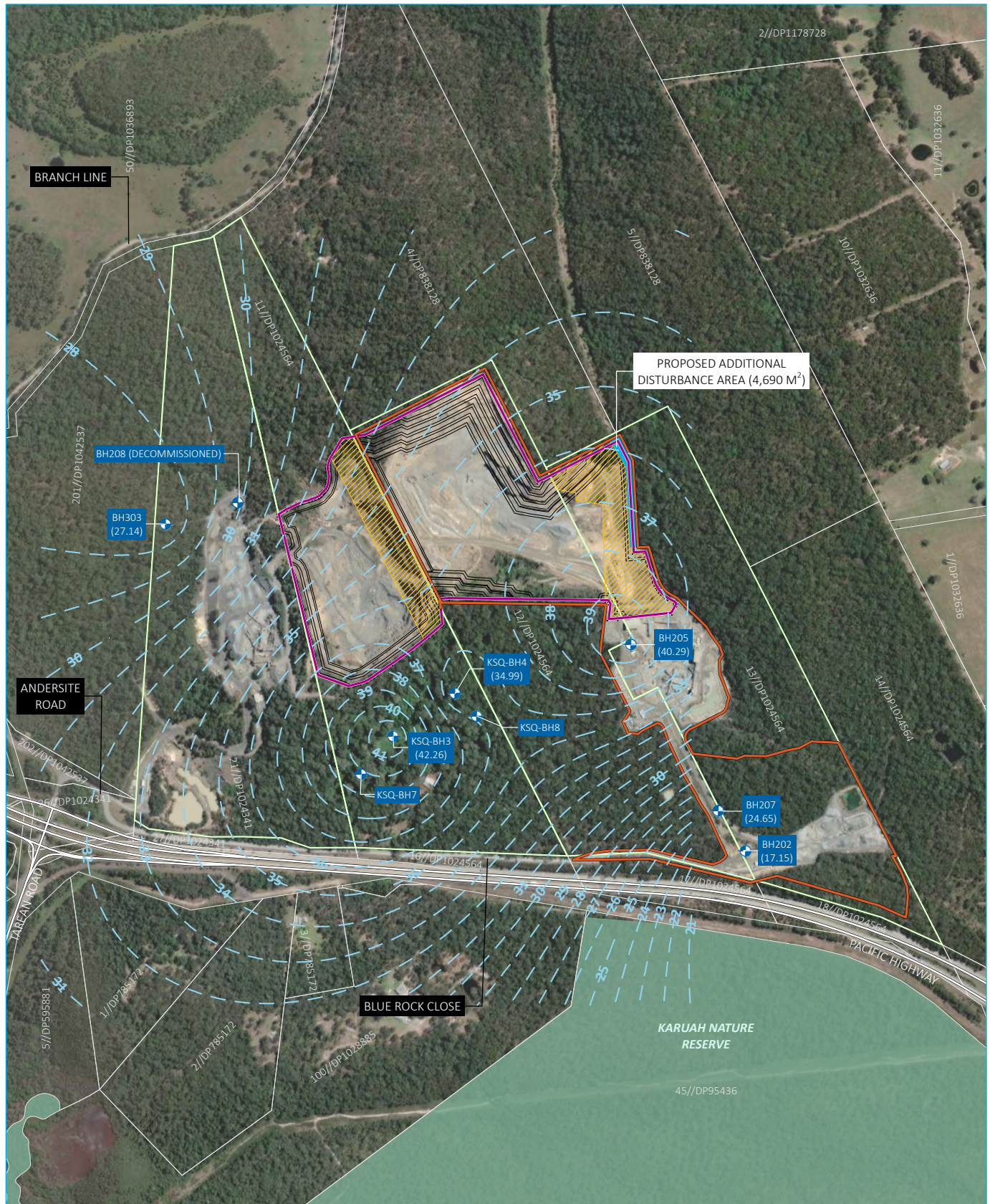
4.3 Groundwater quality

Groundwater quality samples have been collected quarterly with the first sample collected in 2016. In summary the groundwater quality can be described as follows:

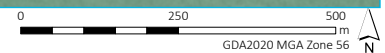
- Moderately acidic to neutral.
- Salinity is generally brackish with an average salinity of around 3,200 microsiemens per centimetre ($\mu\text{S}/\text{cm}$) (ranging between 1,400 to 5,430 $\mu\text{S}/\text{cm}$) with major ion dominated by sodium and chloride.

KSQ-BH3 and KSQ-BH4 is fresh with salinity between 334 and 426 $\mu\text{S}/\text{cm}$.

- Metal concentrations were mostly below the guideline value with the exception of some bores where elevated concentrations of arsenic, iron, nickel and zinc were measured.
- Nutrients are present, possibly due to the use of explosives when quarrying and/or surrounding agricultural land use practices.
- BTEX, PAH, pesticides and petroleum hydrocarbon results were below the laboratory limits of reporting (LOR).
- TRH was generally below the LOR with occasional but not consistent detections within the medium to heavy fraction (TRH C_{16} - C_{34}) with remnant TRH could originate from compressor oil when the bores were developed following installation.



Source: EMM (2026); DCSSS (2024); ESRI (2026); GA (2009)



KEY

- Subject cadastral lot
- Karuah Pit Consolidation Project proposed extraction layout

Project element

- Karuah East Quarry disturbance area
- Proposed consolidated extraction area
- Proposed additional disturbance area (4,690 m²)

- ▨ Proposed extended extraction area
- ◆ Groundwater bore (water level in m AHD)
- Groundwater level contour (m AHD)

Existing environment

- Major road
- Cadastral boundary
- NPWS reserve

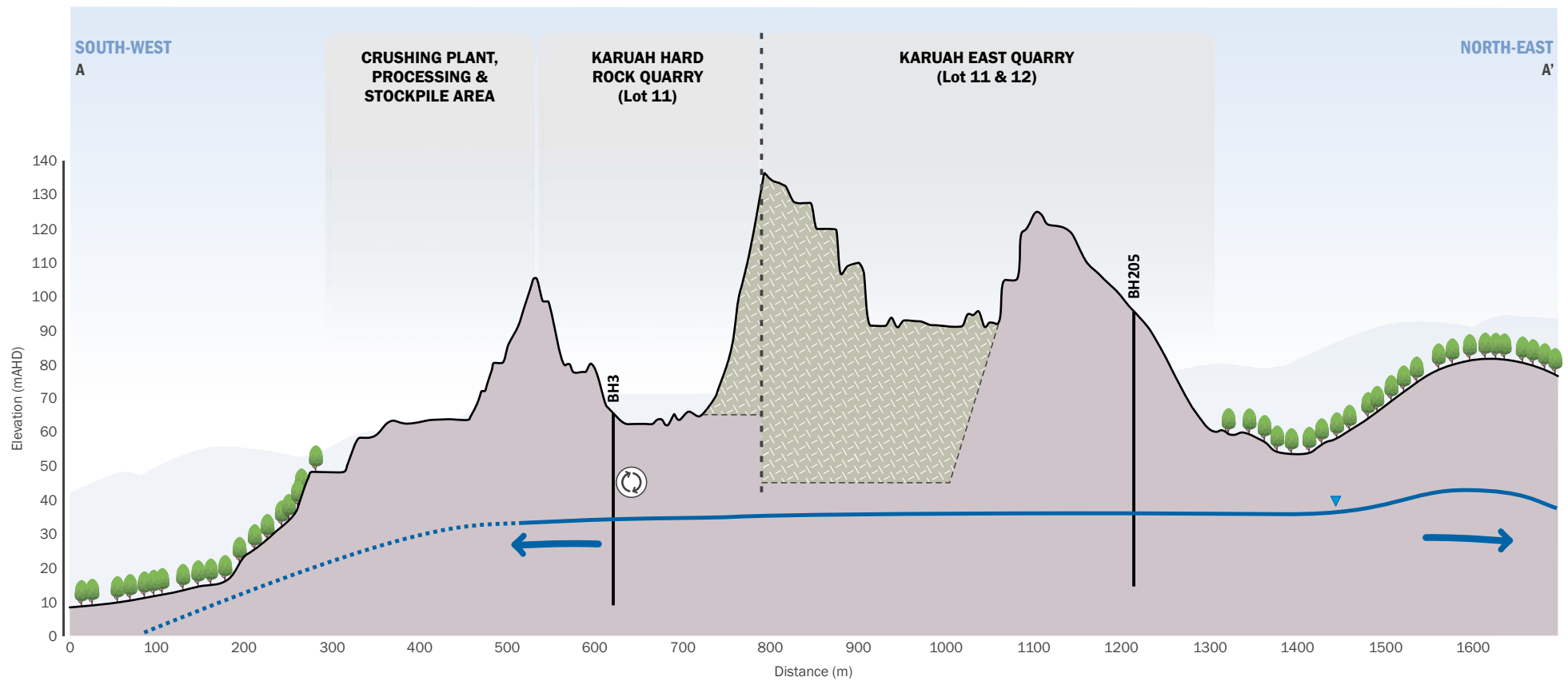
Groundwater level contours
- September 2025

Karuah Pit Consolidation
Groundwater Assessment
Figure 4.3

4.4 Hydrogeological conceptual model

A hydrogeological conceptual diagram is shown in Figure 4.4. The main characteristics of the hydrogeological system is as follows:

- The hard rock aquifer is semi-confined to confined with low primary porosity and groundwater flow is controlled by secondary porosity through a network of discontinuous fractures within the rock matrix.
- Seasonal perching is possible in deeply weathered rock due to residual clays.
- Any interception of groundwater perching, seepages or interflow in the unsaturated zone is expected to be minor. Evaporative potential is expected to exceed any potential inflow (LCC 2018).
- The ionic composition of the groundwater broadly falls into the sodium chloride type which indicates a rainfall dominant recharge groundwater system.
- Groundwater discharges where creeks and rivers intercept the water table, and where the geology outcrops or subcrops.
- The groundwater level is relatively stable and does not display much variation. The groundwater table generally follows the topography.
- The highest water level recorded across the site was approximately 42 mAHD at KSQ-BH3 which is located 200 m south, downgradient from the quarry excavation.
- The interpolated groundwater level under the quarry extraction area ranges between 32 to 39 mAHD. The existing approved extraction depth of 45 mAHD (which is not proposed to change) is above the groundwater watertable.



KEY

- Undifferentiated Carboniferous
- Proposed extraction
- Groundwater elevation
- Groundwater flow
- Borehole
- ↻ Inpit sump



This diagram is a conceptual representation only

Figure 4.4 KHRQ and KEQ section A-A'

5 Impact assessment

Groundwater will not be intercepted by the proposed KEQ MOD 11 application. The indicative groundwater level under the quarry extraction area is between 32 to 39 mAHD with water level fluctuations of less than 2.5 m. The final KEQ pit floor will remain unchanged at 45 mAHD (the existing approved depth), which is approximately 6 m above the maximum groundwater level under the quarry extraction area (Figure 4.3).

Groundwater seepages from the unsaturated zone are minor and is expected to be controlled by evaporation. There is no evidence of groundwater inflow at the existing quarry pit walls at KEQ and KHRQ.

5.1 Aquifer interference policy

The AIP is not applicable for this project for the following reasons:

- There will be no groundwater take because the proposed MOD 11 application will not excavate below the groundwater table.
- The proposed modification will not alter the existing groundwater levels or flow direction and is not expected to impact down hydraulic gradient groundwater users including the listed WSP high priority GDEs, Coastal Wetlands and Coastal Swamp Forests.
- The proposed modification will not intercept groundwater and is not expected to impact the supply of the closest landholder bore (GW201611) which is located approximately 3 km north-west of the project.

5.2 Groundwater quality

The largest risk associated with the modification is potential groundwater contamination resulting from quarry operations. The contamination of the groundwater system may come from the operation of heavy vehicles and equipment, or leachate from waste rock. Potential contamination sources could include spills of diesel, petroleum-based fuels and lubricants.

The extent and degree of potential groundwater contamination is dependent on factors such as geology, depth to groundwater, the infiltration capacity/permeability of the geology and the presence, properties and characteristics of the potential contaminant. The process of infiltration is mostly effective in removing particulate bound pollutants such as heavy metals, and low-density pollutants such as insoluble hydrocarbons. Soluble pollutants such as acids, alkalis, nitrate, salts, and soluble hydrocarbons could infiltrate to the groundwater system if managed incorrectly on site. Any potential groundwater contamination is expected to be minor and localised to within the project area where there are no groundwater users (GDEs or third-party bores).

The groundwater quality results indicate that some background metals and nutrient concentrations exceed the ANZG (2018) guidelines for the freshwater 95% species protection level (EMM 2026). Groundwater seepages and inflows would require treatment before it is discharged into the environment. Currently, all water is retained and used onsite, minimising the need for offsite discharge (Karuah East Quarry Water Management Plan).

Mitigation measures to prevent potential groundwater contamination are detailed in Section 6.

5.3 Development of groundwater triggers

Groundwater level and quality triggers will be developed and incorporated in an updated Water Management Plan as recommended by the advice issued by NSW Department of Climate Change, Energy, the Environment and Water issued on 1 April 2025. The triggers will support a tiered Trigger Action Response Plan so that 'minor' and 'major' changes in groundwater levels and quality are clear and can be reported against.

5.4 Licensing

The proposed modification will not intersect or take any groundwater; therefore, no groundwater licencing is required.

The site water demands are supplied from captured runoff stored in onsite dams under the maximum harvestable right for coastal drainage catchments. In the case where the runoff captured by these dams are unable to meet the site's demands, water will be trucked in from an external supplier if necessary (KEQ Water Management Plan).

6 Management controls and mitigation measures

The groundwater management measures to be implemented to minimise potential groundwater impacts during the operation of the project and the works associated with the proposed modifications include the following:

- Benches and pit floor will be graded to promote drainage toward the entrance of the pit.
- Minor seepage and ponding of water resulting from excessive rainfall/runoff will be managed by conventional drainage measures within the quarry such as periodic pumping of in-pit sumps out to the surrounding drainage controls. Water will be retained on-site for quarry operations and for environmental mitigation.
- Refuelling will be undertaken in the designated non-permeable refuelling areas.
- Runoff water from the site will be collected and monitored for environmental mitigation to prevent chemicals and hydrocarbons such as petroleum, diesel, and oil seeping into the groundwater system.
- Handling and storage of fuel and oil within the project site will be in accordance with Australian Standards, AS 1940-2004 (Storage and Handling of Flammable and Combustible Liquids) and NSW Work Cover 2005 Code of Practice for Storage and Handling of Dangerous Goods to reduce the risk of any spills or environmental release. Above ground storage in a bunded facility will be used.
- Safety Data Sheets (SDS) will be kept in the site safety system for all chemicals used on site. The SDSs will contain information on the environmental impacts of the use of certain chemicals and include detail on emergency response, clean up and disposal. Handling and storage of all chemicals within the project site will be in accordance with Dangerous Goods Act 1975 (NSW), and Australian standards, including AS 1940-2004 (Storage and Handling of Flammable and Combustible Liquids).
- Groundwater level and quality monitoring will continue as detailed in Section 4.1 and the established Water Management Plan for the Karuah East Quarry to identify any potential contamination resulting from quarry operations.
- Quarry rehabilitation to occur consistent with the Rehabilitation and Closure Strategy (IEMA 2026) prepared for MOD 11 and the KEQ Landscape & Rehabilitation Management Plan.
- An updated Water Management Plan reflecting the proposed KEQ MOD 11 application will be prepared.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Quan Bui', with a stylized, cursive script.

Quan Bui

Senior Hydrogeologist

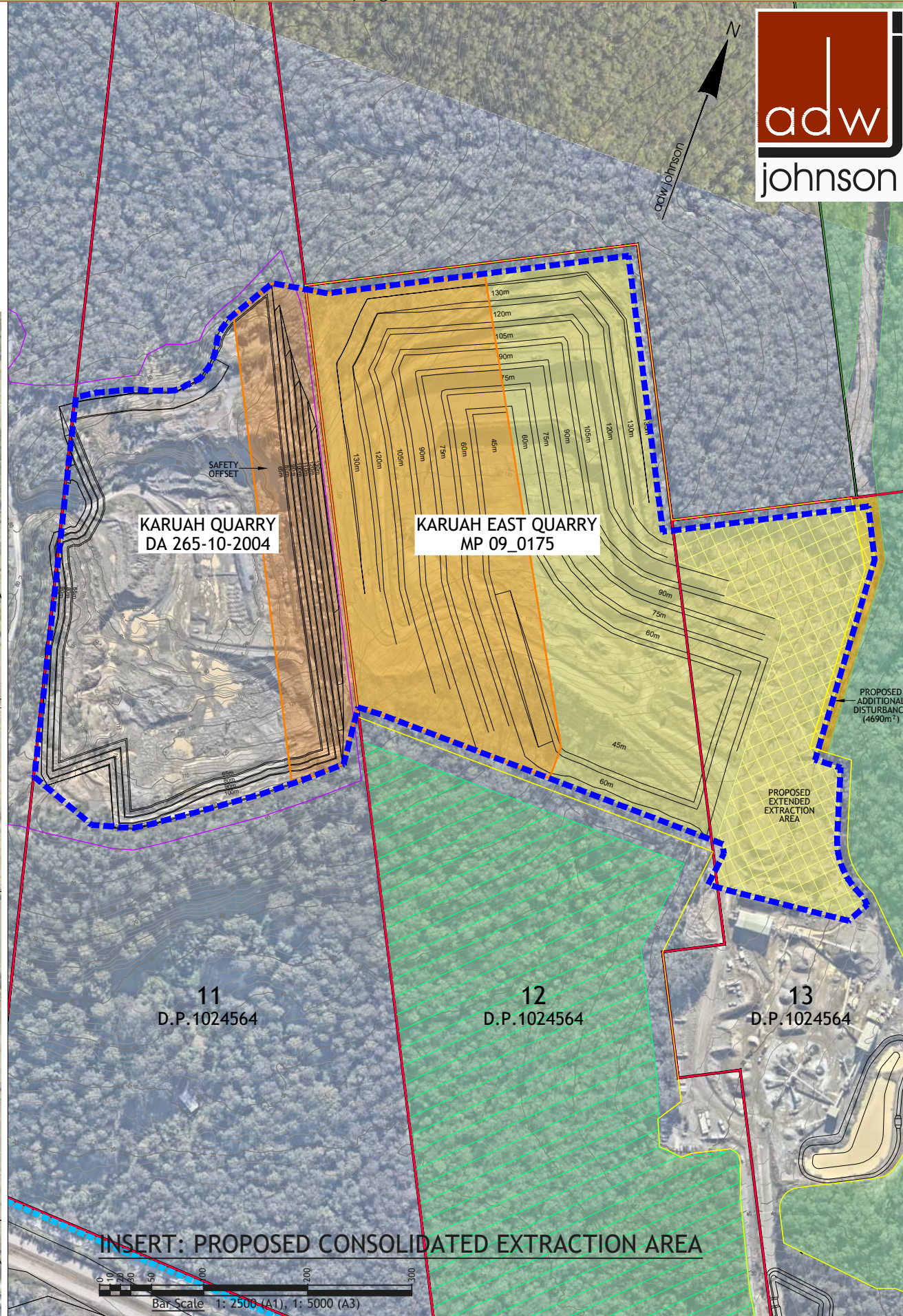
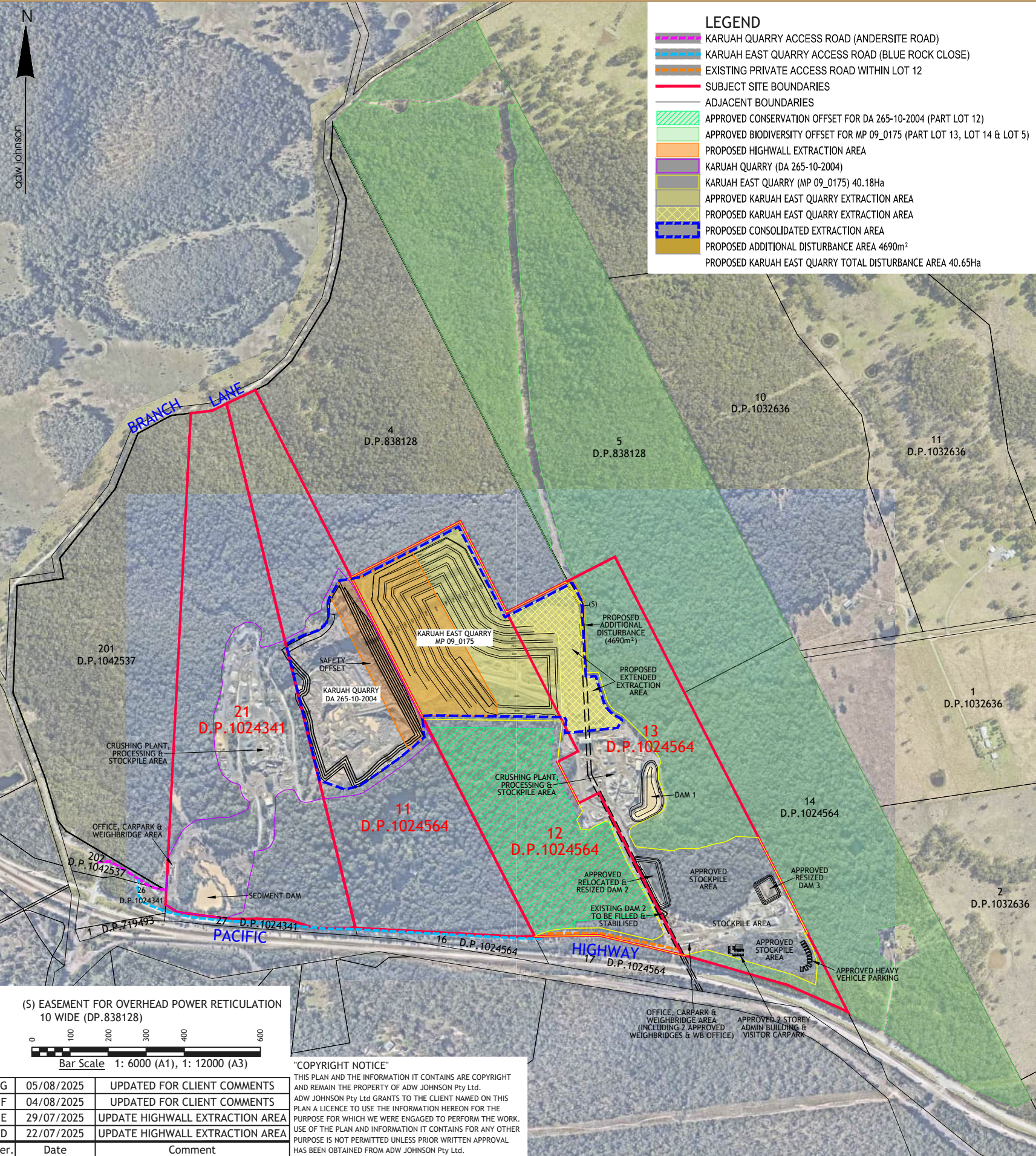
qbui@emmconsulting.com.au

Reference

- ADW Johnson 2026, *Scoping Letter MP 09_0175 – Karuah East Quarry Various Lots, Blue Rock Close, Karuah Proposed S4.55(2) Modification (MOD 11) Karuah Pit Consolidation Project Proposed Extraction Of Resource Within Disturbed Areas Of The Karuah East Quarry (MP 09_0175) And The Karuah Hard Rock Quarry (Da 265-10-2004)*
- ADW Johnson 2026, *s4.55(2) Modification Report Karuah Pit Consolidation Project MOD 11, Karuah East Quarry (MP09_0175)*, 2026.
- ANZG 2018, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia.
- BoM 2026a, *Bureau of Meteorology Groundwater Dependent Ecosystems Atlas*. Accessed 27 January 2026 from <https://www.bom.gov.au/water/groundwater/gde/map.shtml>
- BoM 2026b, *National Groundwater Information System*. Accessed 27 January 2026 from <http://www.bom.gov.au/water/groundwater/ngis/>
- Coffey 2010, *Resource assessment of Proposed Hard Rock Quarry Karuah East*, prepared for ADW Johnson Pty Ltd
- Coffey 2012, *Proposed Karuah East Hard Rock Quarry, groundwater study – groundwater impact assessment*, prepared for ADW Johnson Pty Ltd
- DES. 2021. *Using monitoring data to assess groundwater quality and potential environmental impacts - Version 2*. Brisbane: Department of Environment and Science (DES).
- DPIE-Water 2012, *NSW Aquifer Interference Policy: NSW Government policy for the licencing and assessment of aquifer interference activities*, September 2012.
- EMM 2026, *Karuah East Water Quality Triggers*, Report number E250347 RP1
- Karuah East Quarry (KEQ) 2024, *Water Management Plan September 2024, Version 3C*. Prepared by ADW Johnson Pty Ltd
- Karuah Hard Rock Quarry 2024, *Site Water Management Plan December 2024, Version 8D*. Prepared by Hunter Quarry Pty Ltd
- Larry Cook Consulting (LCC) Pty Ltd 2018, *Karuah South Quarry Groundwater Assessment Specialist Consultant Studies Compendium Volume 1, Part 6*. Report prepared for R.W Corkery & Co Pty Ltd on behalf of Wedgerock Pty Ltd. December 2018
- NSW Department of Planning, Housing & Infrastructure, Project Approval MP 09_0175.
- National Uniform Drillers Licensing Committee (NUDLC), 2020. *Minimum Construction Requirements for Water Bores in Australia. Fourth edition*. National Uniform Drillers Licensing Committee
- Serov P, Kuginis L, Williams JP 2012. *Risk assessment guidelines for groundwater dependent ecosystems. Vol. 1. The conceptual framework*. NSW Department of Primary Industries, Office of Water: Sydney, NSW
- SILO 2025, *SILO - Australian climate data from 1889 to yesterday*, The State of Queensland (Queensland Treasury) 2024. Accessed on 19 January 2026 from <https://www.longpaddock.qld.gov.au/silo/>

Appendix A

Proposed site plans



(S) EASEMENT FOR OVERHEAD POWER RETICULATION
10 WIDE (DP.838128)

0 100 200 300 400 600

Bar Scale 1: 6000 (A1), 1: 12000 (A3)

G	05/08/2025	UPDATED FOR CLIENT COMMENTS
F	04/08/2025	UPDATED FOR CLIENT COMMENTS
E	29/07/2025	UPDATE HIGHWALL EXTRACTION AREA
D	22/07/2025	UPDATE HIGHWALL EXTRACTION AREA
Ver.	Date	Comment

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PROPOSED SITE PLAN
KARUAH EAST QUARRY
LOTS 11, 12 & 13 D.P.1024564
ANDERSITE ROAD & BLUE ROCK CLOSE, KARUAH

Location: Andersite Road &
Blue Rock Close
Karuah
Council: Mid Coast

Datum:
Origin:
Projection:
Origin:
North Direction:
Contour Interval:

A.H.D.
Lidar Data
M.G.A.

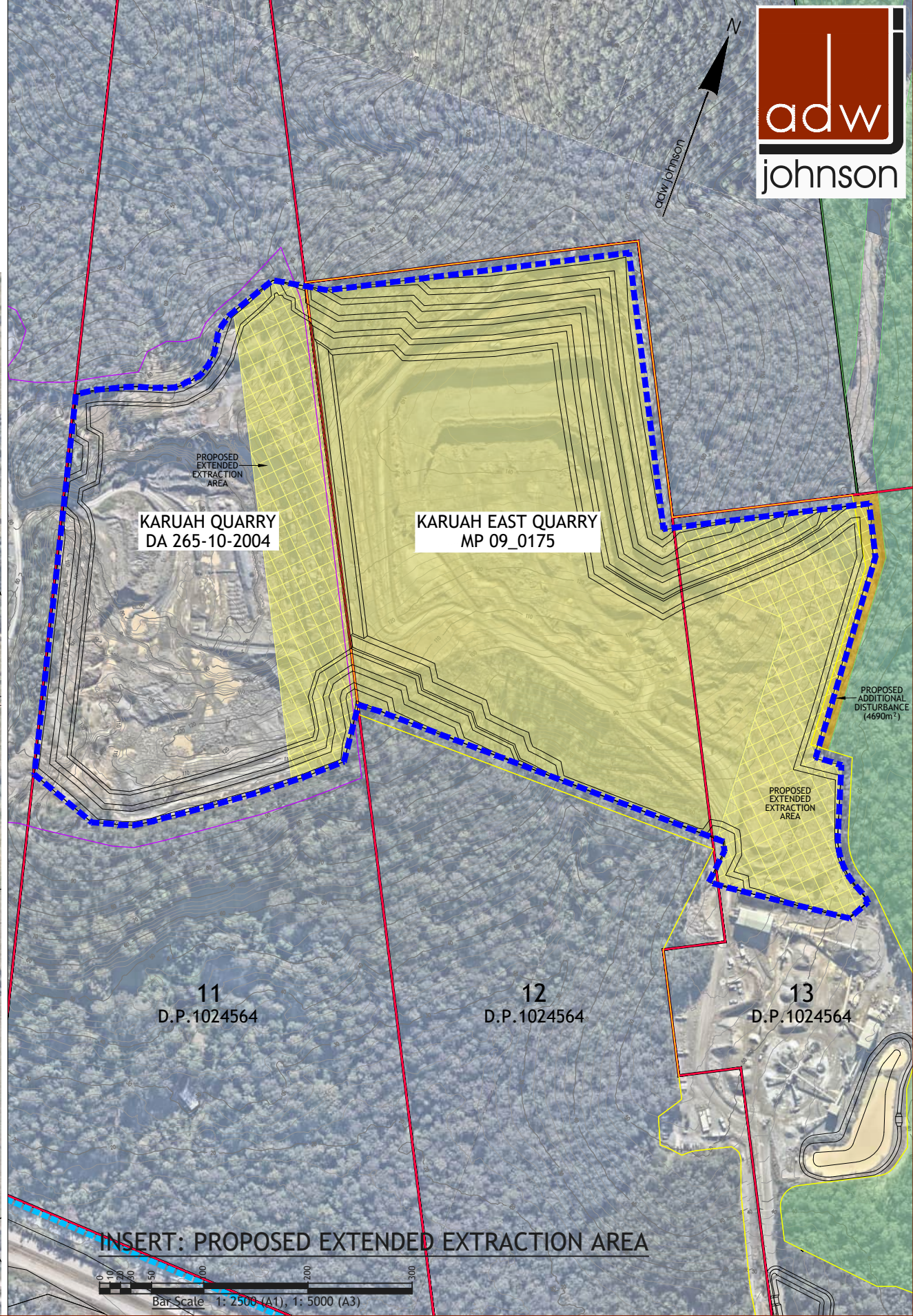
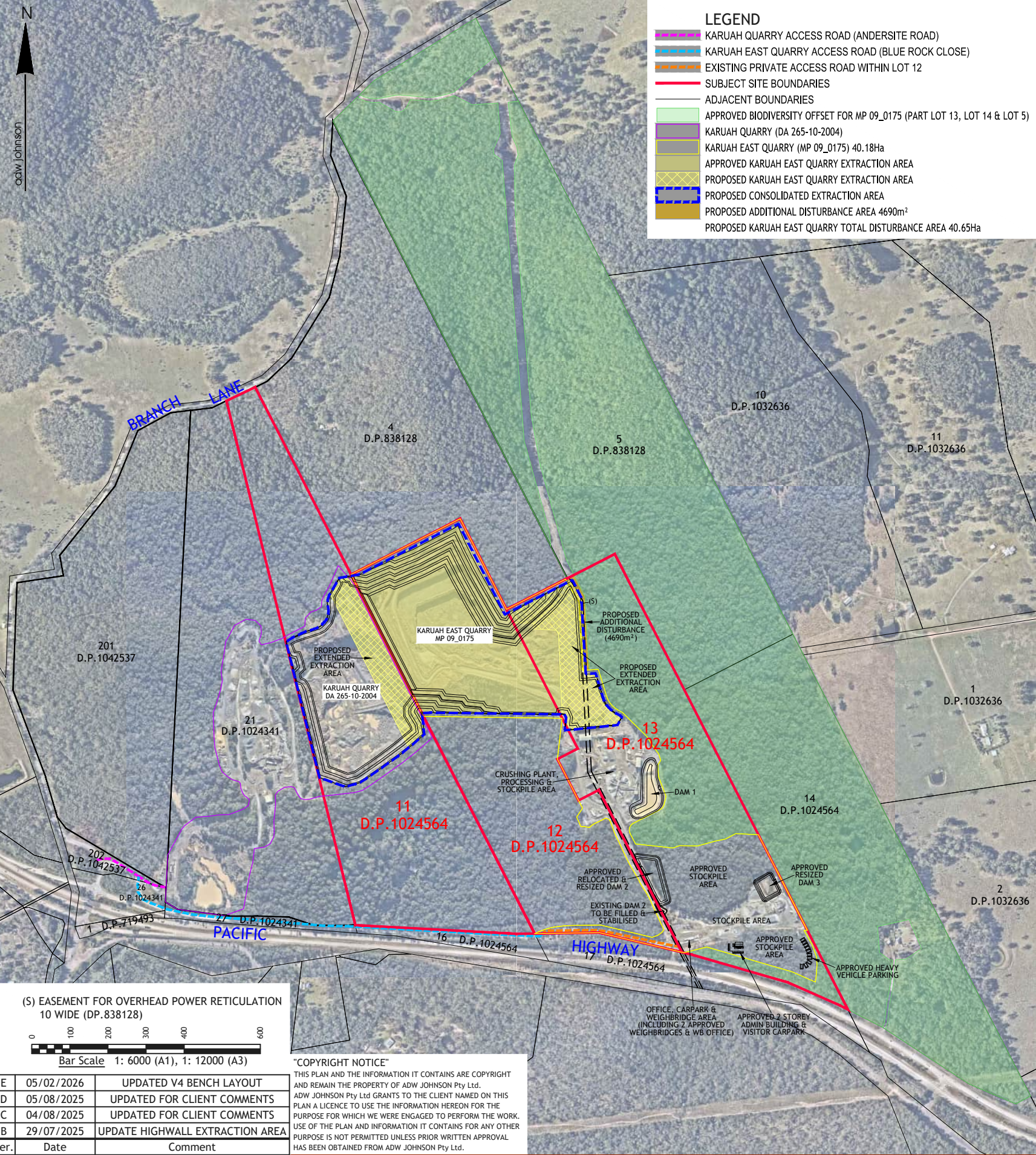
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Plan By:
Project Manager:
Office:
Plan Purpose:

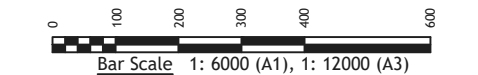
23rd July 2025
1 of 1
ZJ
MR
Hunter
Scoping

Version:
Client:
Survey:
AutoCAD:
Our Ref:

E (05/02/2026)
Hunter Quarries Pty Ltd
N/A
Dwg\11819-SITE-018-E
11819



(S) EASEMENT FOR OVERHEAD POWER RETICULATION
10 WIDE (DP.838128)



E	05/02/2026	UPDATED V4 BENCH LAYOUT
D	05/08/2025	UPDATED FOR CLIENT COMMENTS
C	04/08/2025	UPDATED FOR CLIENT COMMENTS
B	29/07/2025	UPDATE HIGHWALL EXTRACTION AREA
Ver.	Date	Comment

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