Aus 10 Rhyolite Pty Limited

ABN: 90 002 325 144

2021 Annual Review

for the

Tinda Creek Quarry

Prepared by:

R.W. CORKERY & CO. PTY. LIMITED

April 2022

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Aus 10 Rhyolite Pty Limited

ABN: 90 002 325 144

2021 Annual Review

for the

Tinda Creek Quarry

Period: 1 January 2021 to 31 December 2021

Prepared for:

Aus 10 Rhyolite Pty Limited
ABN: 90 002 325 144
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Ref No. 980/18

April 2022

R.W. CORKERY & CO. PTY. LIMITED

Table A
Title Block

Name of operation	Tinda Creek Sand Quarry
Name of operator	Aus 10 Rhyolite Pty Limited t/a Hy-Tec Concrete and Aggregates
Development consent / project approval #	SSD_4978
Name of holder of development consent / project approval	Aus 10 Rhyolite Pty Limited
Mining Lease #	No Mining Lease applicable to site under *Mining Act* (1992).
Name of holder of mining lease	N/A
Water licence #	WAL 24367 / WAL 24381 / WAL 42446
Name of holder of water licence	Aus 10 Rhyolite Pty Limited
MOP/RMP start date	N/A
MOP/RMP end date	N/A
Annual Review start date	1 January 2021
Annual Review end date	31 December 2021
I, Darryl Thiedeke, certify that to the best of my knowledge this audit report is a true and accurate record of the compliance status of the Tinda Creek Quarry for the period 1 January 2021 to 31 December 2021 and that I am authorised to make this statement of behalf of Aus 10 Rhyolite Pty Limited. *Note.* *a) The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.* *b) The Crimes Act 1900 contains other offences relating to false and misleading information: Section 192G (Intention to defraud by false or misleading statement – maximum penalty 5 years imprisonment); Section 307A, 307B and 307C (false or misleading application/information/documents – maximum penalty 2 years imprisonment or $22,000, or both).*	
Name of authorised reporting officer	Darryl Thiedeke
Title of authorised reporting officer	National Planning and Development Manager
Signature of authorised reporting officer	
Date	8 April 2022

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LIST OF ACRONYMS

AHD	Australian height datum
ANZECC	Australian and New Zealand Environment. Conservation Council
ARI	average recurrence interval
AUSRIVAS	Australian River Assessment System
CCC	Community Consultative Committee
DD	deposited dust
DPE	Department of Planning and Environment
DPIE	Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
EMM	EMM Consulting Pty Ltd
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPA	Environment Protection Authority
EPL	Environment Protection License
MAC	Muller Acoustic Consulting Pty Ltd
PM	particulate matter
RCE	Riparian and Channel and Environment Inventory Assessment
RFS	Rural Fire Service
RWC	R.W. Corkery and Co. Pty Limited
SIGNAL	stream invertebrate grade number average level
SSD	State Significant Development
TRH	total recoverable hydrocarbon
TSP	total suspended particulate
WAL	Water Access Licence

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1. STATEMENT OF COMPLIANCE

Table 1
Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	Yes / No
DC # SSD_4978	No
EPL # 12007	No

Table 2
Non-compliances

Relevant Approval	Condition #	Condition Description (summary)	Compliance Status	Comment	Where Addressed in Annual Review
SSD_4978	2 (1)	This condition relates to specific performance criteria established under the consent and the requirement to prevent and/or minimise material harm to the environment.	Low	Two discharge events (one uncontrolled, one controlled) from the closed water management system occurred in March 2021. Incident reporting following the events confirmed that material harm to the environment had not occurred.	Section 10.2, **Appendix 1**
SSD_4978	2 (2)	This condition relates to operation of the Quarry in accordance with the conditions of consent.	Administrative	Non-compliance with three conditions of SSD_4978 occurred during the reporting period (all of which relate to two water discharge incidents) precluding the achievement of compliance with this condition.	**Appendix 1**
SSD_4978	3 (12)	This condition relates to compliance with Section 120 of the POEO Act and/or EPL an offsite discharge.	Low	Two discharge events (one uncontrolled, one controlled) from the closed water management system occurred in March 2021. Incident reporting following the events confirmed that material harm to the environment had not occurred.	Section 10.2
SSD_4978	3 (13)	This condition relates to implementation of an approved Water Management Plan.	Low	A Water Management Plan has been prepared and approved by the Secretary and is being implemented at the Quarry. Two discharge events (one uncontrolled, one controlled) from the closed water management system occurred in March 2021.	Sections 7.1 and 10.2
EPL 12007	A3.1	This condition relates to activities being carried out in accordance with the proposal contained in the license application.	Low	Two discharge events (one uncontrolled, one controlled) from the closed water management system occurred in March 2021. Incident reporting following the events confirmed that material harm to the environment had not occurred.	Section 10.2, **Appendix 2**

Table 2 (Cont'd)
Non-compliances

Relevant Approval	Condition #	Condition Description (summary)	Compliance Status	Comment	Where Addressed in Annual Review
EPL 12007	A3.2	This condition relates to activities being carried out in accordance with SSD_4978	Low	The non-compliances recorded under SSD_4978 preclude the achievement of compliance with this condition.	Section 10.2, **Appendix 2**
EPL 12007	L1.1	This condition relates to compliance with Section 120 of the POEO Act and the EPL	Low	Two discharge events (one uncontrolled, one controlled) from the closed water management system occurred in March 2021. Incident reporting following the events confirmed that material harm to the environment had not occurred.	Section 10.2, **Appendix 2**
EPL 12007	O1.1	This condition relates to activities being carried out in a competent manner.	Low	Two discharge events (one uncontrolled, one controlled) from the closed water management system occurred in March 2021. Incident reporting following the events confirmed that material harm to the environment had not occurred. The poly pipes were replaced with steel pipes to reduce impacts in the case of a hole developing.	Section 10.2, **Appendix 2**

Compliance Status Key

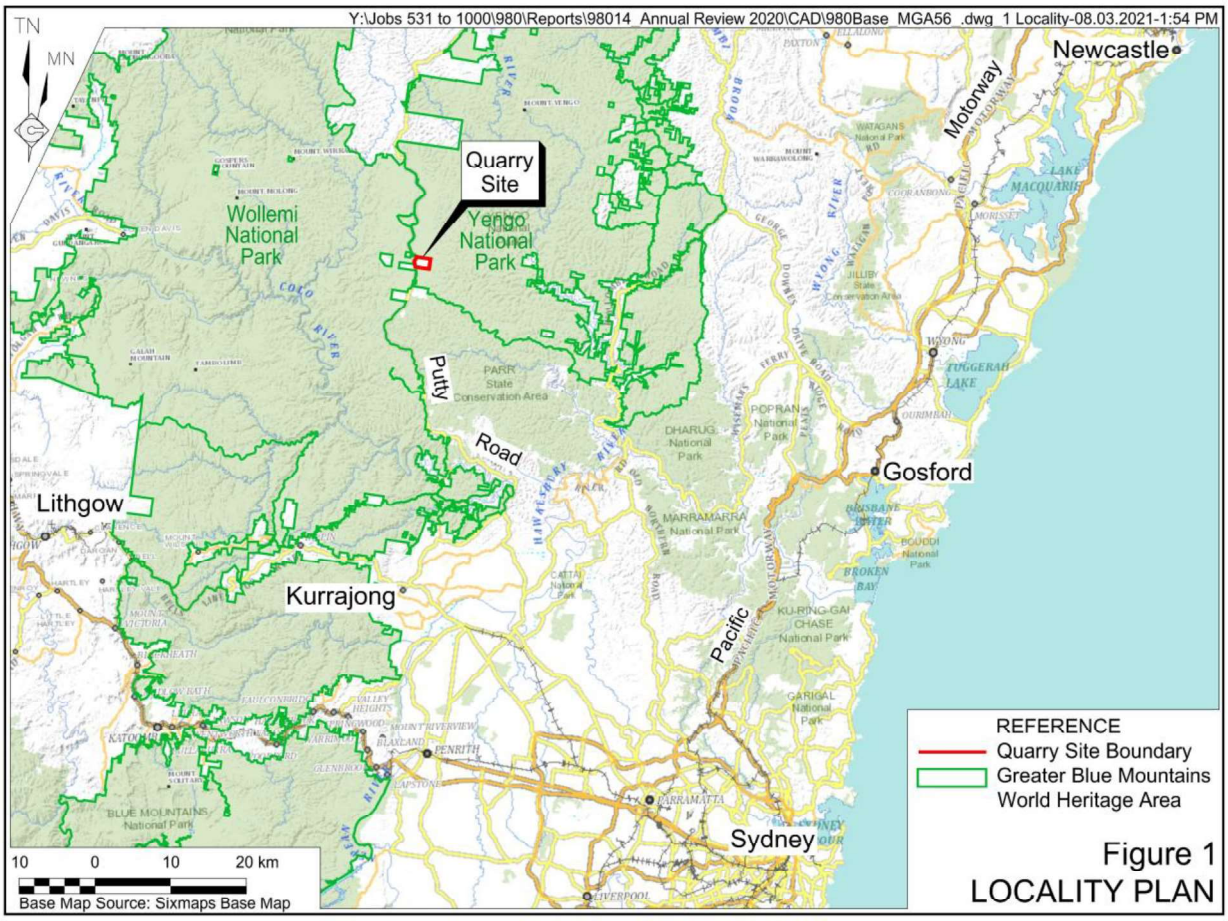
Risk level	***Colour code***	***Description***
High	*Non-compliant*	*Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence.*
Medium	*Non-compliant*	*Non-compliance with:* • *potential for serious environmental consequences, but is unlikely to occur; or* • *potential for moderate environmental consequences but is likely to occur.*
Low	*Non-compliant*	*Non-compliance with:* • *potential for moderate environmental consequences, but is unlikely to occur; or* • *potential for low environmental consequences but is likely to occur.*
Administrative non-compliance	*Non-compliant*	*Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions).*

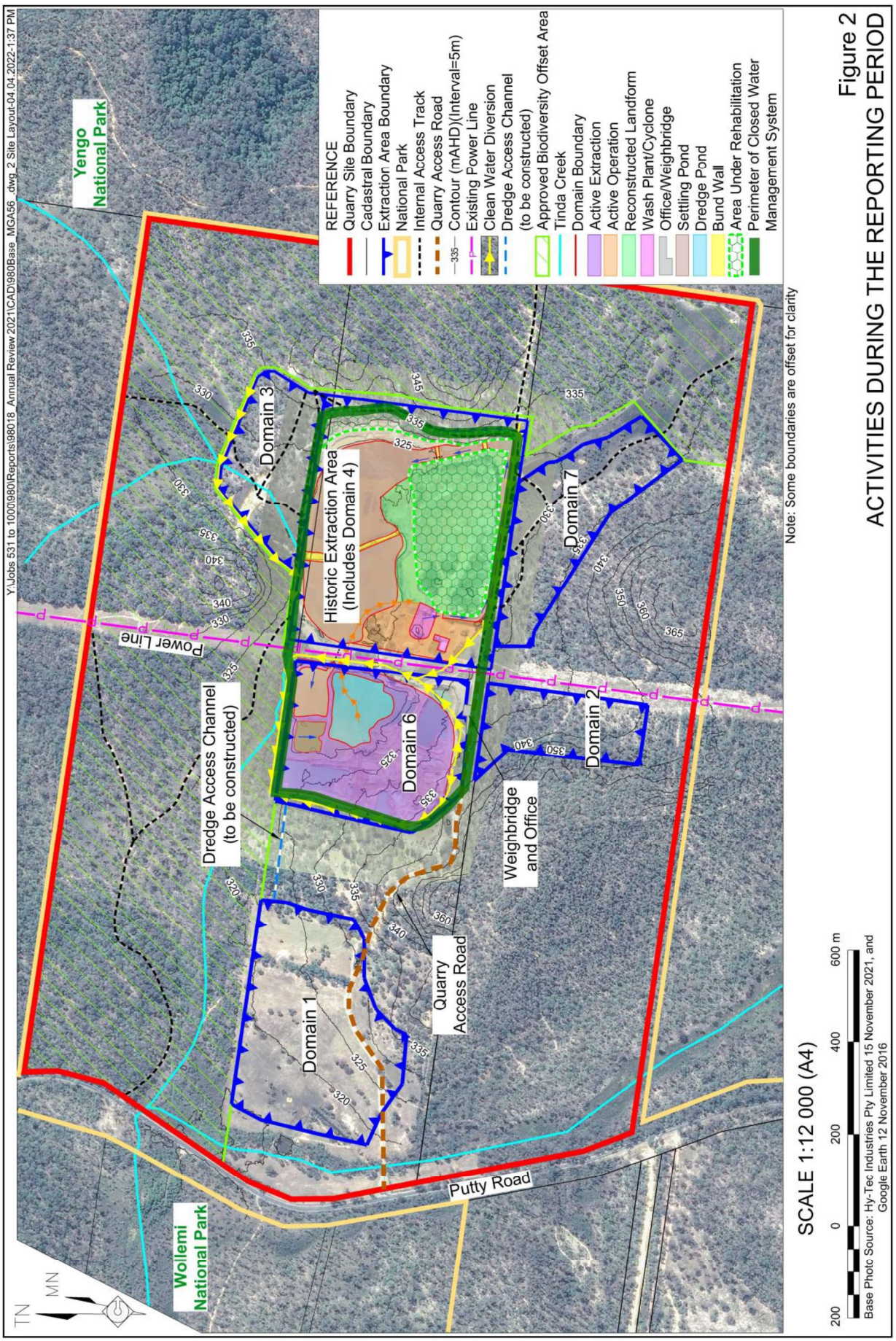
2. INTRODUCTION

2.1 SCOPE AND FORMAT

This *Annual Review* has been compiled by R.W. Corkery & Co. Pty Limited (RWC) on behalf of Aus 10 Rhyolite Pty Limited. This report is applicable for the period 1 January 2021 to 31 December 2021 ("the reporting period"). The information presented within this *Annual Review* has been prepared based upon observations made during a site visit on 14 February 2022 and information provided by Hy-Tec.

The Tinda Creek Sand Quarry (the Quarry) is owned and operated by Aus 10 Rhyolite Pty Limited trading as Hy-Tec Concrete and Aggregates hereafter referred to as Hy-Tec. The Quarry Site is located approximately 67km north of Windsor along Putty Road, NSW (see **Figure 1**). Development Consent SSD_4978 (SSD_4978) was granted on 10 April 2015 to permit the extraction and despatch of up to 300 000 tonnes of sand from the Quarry each year for the duration of the Project. **Figure 2** displays the layout of the Quarry.




Y:\Jobs 531 to 1000\980\Reports\98018_Annual Review 2021\CAD\980Base_MGA56_dwg_2 Site Layout-04.04.2022-1:37 PM
Yengo National Park
Wollemi National Park
Putty Road
Power Line
Dredge Access Channel (to be constructed)
Historic Extraction Area (Includes Domain 4)
Domain 1
Domain 2
Domain 3
Domain 6
Domain 7
Quarry Access Road
Weighbridge and Office
REFERENCE
Quarry Site Boundary
Cadastral Boundary
Extraction Area Boundary
National Park
Internal Access Track
Quarry Access Road
Contour (mAHD)(Interval=5m)
Existing Power Line
Clean Water Diversion
Dredge Access Channel (to be constructed)
Approved Biodiversity Offset Area
Tinda Creek
Domain Boundary
Active Extraction
Active Operation
Reconstructed Landform
Wash Plant/Cyclone
Office/Weighbridge
Settling Pond
Dredge Pond
Bund Wall
Area Under Rehabilitation
Perimeter of Closed Water Management System
Note: Some boundaries are offset for clarity
SCALE 1:12 000 (A4)
200 0 200 400 600 m
Base Photo Source: Hy-Tec Industries Pty Limited 15 November 2021, and Google Earth 12 November 2016
TN MN
Figure 2
ACTIVITIES DURING THE REPORTING PERIOD

This *Annual Review* has been prepared in accordance with *Condition 5(4)* of Development Consent SSD_4978 to record the activities and environmental monitoring undertaken at the Quarry during the reporting period and to outline the activities and environmental monitoring planned throughout the next reporting period (1 January 2022 to 31 December 2022). *Condition 5(4)* requires the preparation of a report which must:

a) describe the development (including 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 (Sections 4, 8 and 11);

b) include a comprehensive review of the monitoring results and complaints records of the development over the previous calendar year, which includes a comparison of these results against:

- *the relevant statutory requirements, limits or performance measures/criteria;*
- *the monitoring results of previous years; and*
- *the relevant prediction in the EIS* (Sections 6, 7 and 9);

c) identify any non-compliance over the last year, and describes what actions were (or are being) taken to ensure compliance (Section 10);

d) identify any trends in the monitoring data over the life of the development (Section 6 and 7);

e) *identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies* (Section 6 and 7); and

f) describe what measures will be implemented over the current calendar year to improve the environmental performance of the development (Sections 6, 7 and 11).

2.2 KEY PERSONNEL CONTACT DETAILS

The key personnel contact names, position and phone numbers are as follows.

Name	Position	24 Hour Contact
Bryan Grant	Quarry Manager	0400 967 633

3. APPROVALS

Hy-Tec is required to operate the Tinda Creek Quarry in accordance with the conditions of development consent under the *NSW Environmental Planning and Assessment Act 1979* (EP&A Act) and the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and four licences as described in **Table 3**.

Table 3
Tinda Creek Sand Quarry – Approvals and Licences

Consent/Lease/Licence	Issue Date	Expiry Date	Details / Comments
Development Consent SSD_4978	10/04/2015	31/12/2045	Issued by Department of Planning and Environment
Approval EPBC 2013/7028	04/10/2016	31/12/2045	Issued by the Department of the Environment and Energy
Environment Protection Licence No 12007	03/03/2017	12 May+	Issued by Environment Protection Authority
Water Access License 24381 40 Units	01/09/2014	Continuing	Nominated Water Supply Works (Excavation) approval number 10WA112523 issued on 01/07/2011. Valid until 08/11/2025
Water Access License 24367 15 Units	02/02/2012	Continuing	Nominated Water Supply Works (Bore) approval number 10WA112531 amended on 11/11/2020. Valid until 13/04/2025*
Water Access License 42446 60 Units	20/06/2019	Continuing	Nominated Water Supply Works (Bore) approval number 10WA112531 amended on 11/11/2020. Valid until 13/04/2025*

+ Anniversary Date

* Works Approval 10WA112531 has a conditional limit of 44ML per annum.

No modifications or variations to the development consent or licenses outlined in **Table 3** were sought within the reporting period.

SSD_4978 was granted in accordance with Part 4 of the EP&A Act by the Minister for Planning on 10 April 2015 to extract and transport no more than 300 000 tonnes of sand products from the Quarry Site each calendar year until 31 December 2045. SSD_4978 superseded DA 134/95 to allow for the expansion of extraction beyond the previously approved extraction area boundary. Sand extraction within the new approved extraction area commenced in September 2015. DA 134/95 was formally surrendered on 10 December 2015.

Hy-Tec also operates in accordance with Approval EPBC 2013/7028 granted under the EPBC Act. This approval relates principally to operations that may impact the threatened Koala and small flower Grevillea identified within the Quarry Site. This approval also recognises the international recognition of natural heritage values of the nearby Greater Blue Mountains Area. A compliance review of the conditions of EPBC 2013/7028 is completed annually and placed on the Hy-Tec website. During the reporting period, Hy-Tec remained compliant with the conditions of EPBC 2013/7028.

Hy-Tec also operates the Tinda Creek Quarry in accordance with Environment Protection Licence (EPL) 12007. This licence incorporates standard conditions for extractive industries and includes limits for noise emissions from the Quarry Site.

An internal compliance review of the conditions of SSD_4978 and EPL 12007 is presented as **Appendix 1** with the outcomes discussed in Section 1 and Section 10.

Water Access Licence (WAL) 24381 (40 units), WAL 42446 (60 units) and WAL 24367 (15 units) have been issued to permit extraction of water from the Sydney Basin North Groundwater Source. Water within this source is managed through the water sharing plan for the *Greater Metropolitan Region Groundwater Sources 2011*. The WALs permit extraction of groundwater in accordance with the conditions provided in the licences. Two Water Supply Works approvals have been issued to Hy-Tec to permit extraction of groundwater associated with the WALs.

WAL 24381 and the nominated works approval 10WA112523 permit the use of water accessed from the groundwater setting through extraction activities and principally accounts for evaporation from exposed faces. Anecdotally, Quarry personnel have observed very little seepage into operating domains, however this license accounts for the possible evaporation.

WAL 42446 and WAL 24367 and the nominated works approval 10WA112531 permit the use of groundwater sourced via a production bore from the underlying aquifer. This water, when required is used to top up the dredge pond to ensure the dredge can operate efficiently. Water Supply Works (Bore) approval number 10WA112531 has a conditional limit of 44ML per annum. This limit has been imposed to account for potential impacts to the groundwater setting including groundwater dependent ecosystems in the vicinity of the existing production bore. Hy-Tec intends to install a second production bore and is currently investigating a suitable location to source the remaining 31ML groundwater allocation under existing entitlements which is anticipated to be completed during the next reporting period.

4. OPERATIONS SUMMARY

4.1 INTRODUCTION

The following subsections provide a summary of activities undertaken during the reporting period. Activities were generally consistent with those described in previous environmental management reporting. **Plates 1** to **7** display a series of photographs of the Tinda Creek Quarry taken on 14 February 2022 that are representative of existing conditions at the Quarry.

4.2 CLOSED WATER MANAGEMENT SYSTEM

Condition 12 of Schedule 3 of SSD_4978 requires that the catchment of the closed water system must not exceed 40ha at any one time. The closed water management system includes the area within the clean water diversions (**Figure 2**).

During the reporting period the closed water management system covered an area of approximately 36ha and remained unchanged from the previous year.

4.3 EXTRACTION OPERATIONS

Extraction and processing during the reporting period occurred entirely within Domain 6 (see **Figure 2**). The total volume of sand produced 94 041t which is within the limits specified in Condition 6 of Schedule 2 of SSD_4978. Sand was extracted via excavator then loaded onto a single articulated dump truck and hauled to the dredge where the material was tipped into a dump pocket in front of the dredge throughout the reporting period (refer **Plate 3**).

This process involves the removal of water, sand, silt and clay in the form of a slurry which is then pumped to the processing area and stockpiled prior to transportation (refer **Plate 4**). Sand transported from site during the reporting period and forecast for the 2022 reporting period is displayed in **Table 4**.

Table 4
Sand Transportation from Site

Material	Approved annual limit (SSD_4978)	2017 reporting period	2018 reporting period	2019 reporting period	2020 reporting period	2021 reporting period	2022 reporting period (approximate forecast)
Sand	300 000 t	190 642t	116 865t	46 942t	93 488t	96 703t	145 000t
Source: Hy-Tec							

A copy of the annual return for extractive materials submitted to MEG for 2020/2021 is included within **Appendix 2**.

During the reporting period, the reported sand transported from site (96 703t) was slightly more than the volume of sand produced (93 765t) which is below the 300 000tpa limit approved within the development consent.

Y:\Jobs 531 to 1000\980\Reports\98018_Annual Review 2021\CAD\980Base_MGA56_.dwg_Plates 2021-25.03.2022-10:30 AM

Plate 1: Weighbridge Office and Weighbridge - February 2022

Plate 2: Extraction within Domain 6 - February 2022

Plate 3: Dredge Pond with Pump in the Foreground and Cutter Suction Dredge in the Background - February 2022

Plate 4: Sand Stockpile and Loader - February 2022

The Quarry was closed to sales for a period of 7 business days in March 2021 due to closed transport routes as a result of flooding across the Hawkesbury River and associated regions.

During the reporting period (and for all historic operations) extraction operations did not exceed the limit of 15m below the natural ground surface described in *Condition 2(6)* of SSD_4978. Hy-Tec has established a site-based standard procedure for survey and confirmation of the depth of extraction. The site-based procedure is undertaken on a monthly basis.

It is expected that sand processing and transportation from Site will increase in 2022.

4.4 HOURS OF OPERATION

The permissible operating hours as set out in *Condition 3(3)* of SSD_4978 were adhered to throughout the reporting period. Extended hours for major supply contracts were not required during the reporting period.

4.5 TRANSPORT LEVELS

SSD_4978 specifies that haulage activities at Tinda Creek Quarry should not exceed 34 trucks per day, averaged over a calendar month. A total of 2 586 laden loads were despatched from the Quarry during the reporting period. A summary of the vehicle movements at Tinda Creek Quarry is provided from the Hy-Tec website and are summarised in **Table 5**. There were no recorded exceedances of average daily vehicle movements (based on a calendar month averaging period) within the reporting period.

Table 5
Monthly Laden Truck Movements at Tinda Creek Quarry

Month	Laden Truck Loads	Mean Daily Laden Truck Loads[1]
January	210	6.8
February	289	10.3
March	264	8.5
April	315	10.5
May	309	10.0
June	220	7.3
July	103	3.3
August	165	5.3
September	387	12.9
October	99	3.19
November	61	2.03
December	164	5.29
Annual Total	**2586**	**-**
Annual Daily Average	**7.08**	**-**
Note 1: Daily despatch averaged over the calendar month is presented, consistent with the requirements of Condition 7 of Schedule 2 of SSD_4978.		
Source: Hy-Tec		

4.6 CONSTRUCTION ACTIVITIES

During the reporting period a diversion bund was established on the southern side of the access road to divert clean water running towards the Site. This effectively included the access road and office/weighbridge area within the closed water management system. Following the water discharge events in March 2021, further construction work was undertaken to raise the bund wall on the northern side of the Site, in July, to increase the capacity of the silt ponds and reduce the likelihood of further discharge. The final bund wall is displayed in **Plate 5**.

4.7 IMPORTATION OF VENM/ENM

During the reporting period, a total of 970.3t of ENM was imported to site for use in rehabilitation activities, namely landform establishment in the Domain 4 rehabilitation area. Records required under *The excavated natural material order 2014* are held by Hy-Tec for the material imported and additional testing was undertaken by Hy-Tec as a contingency (consistent with internal procedures established by the Company). .

4.8 WASTE MANAGEMENT

Waste management practices continued in accordance with the provisions of the *Protection of the Environment Operations* (Waste) *Regulation 2014* throughout the reporting period. Hy-Tec has engaged licensed waste contractors to recycle and dispose of waste throughout the reporting period.

4.9 NEXT REPORTING PERIOD

Sand extraction and processing from Domain 6 will continue throughout the 2022 reporting period. Extraction from Domain 7 is expected to commence during 2022, with extraction unlikely to proceed into Domains 1, 2 or 3.

Other construction activities due to commence during 2022 include road maintenance, processing plant maintenance and continuation of raising of the silt pond walls.

Rehabilitation within areas of the former Domain 4 no longer required for operations will continue over the next reporting period. A dedicated campaign of weed management is proposed and topsoil removed from Domain 7, once it is commenced, will be applied to the surface. Once the existing weeds are under control, direct seeding of the area will be undertaken in accordance with the approved Landscape Management Plan.

Processing activities will continue, consistent with historic processing activities. Average daily laden truck levels will remain within approved limits.

5. ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

No actions were required as a result of the Department's review of the Annual Review 2020.

6. ENVIRONMENTAL PERFORMANCE

6.1 METEOROLOGICAL MONITORING

Hy-Tec installed a meteorological station in July 2016 in accordance with the requirements of *Condition 3(10)* of SSD_4978. The meteorological station complies with the requirements in the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales* guideline. The location of the meteorological station is shown on **Figure 3**.

6.1.1 Rainfall

A summary of the rainfall data for the reporting period is provided in **Table 6**. A total of 770.8mm of rain was recorded from 1 January 2021 to 31 December 2021. Total rainfall during 2021 was lower than in 2020, however remained significantly higher than each of the four years preceding 2020. Rainfall varied between individual months.

Table 6
Summary of Average Rainfall Records Since 2007

	Year														
Month	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Jan	50.5	95.5	29.0	48.5	66.5	133.0	138.0	8.0	163.0	272.0	36.2*	25.6	30.0	64.8	61.8
Feb	152.0	146.5	137.5	119.5	47.0	179.0	202.0	64.0	46.5	0.0	34.2*	58.4	25.2	208.4	81
Mar	80.5	43.0	30.0	85.5	97.0	145.0	103.0	135.2	96.5	0.0	208.0	64.4	86.8	134.2	205.8
Apr	61.5	81.5	117.0	26.0	60.0	64.0	63.5	60.5	285.5	0.0	22.4^	13.4	12.4	57.6	30.2
May	29.0	10.5	56.5	59.5	96.0	-	31.0	0.0	56.5	0.0	16.6	6.2	4.4	20.0	39.6
Jun	210.0	94.0	39.5	43.0	85.5	29.0	84.5	29.0	20.5	126.0	54.0	33.0	22.0	12.8	30.4
Jul	13.0	24.5	17.5	38.5	25.5	27.0	18.5	13.0	34.0	55.0	2.6	5.0	12.2	114.6	25.6
Aug	107.0	40.5	4.0	13.5	90.0	4.0	11.0	74.5	26.5	36.5	11.6	10.0	26.0	51.4	53.8
Sep	18.5	58.5	21.0	18.0	69.0	27.5	31.5	29.0	26.5	45.5	0.0	20.0	51.6	37.6	13.8
Oct	22.0	93.5	85.5	85.0	65.5	17.5	26.5	48.0	34.0	40.4	61.6	88.8	19.6	66.6	29.2
Nov	157.5	75.0	31.5	127.5	159.0	70.5	106.5	16.5	141.0	72.2	35.8	13.2	24.4	34.2	169.2
Dec	76.0	71.0	103.5	120.5	72.5	18.5	27.0	150	116.0	69.0	65.0	2.8	0.0	186.0	30.4
Totals (mm)	**977.5**	**834.0**	**672.5**	**785.0**	**933.5**	**715.0**	**843.0**	**627.7**	**1046.5**	**716.6**	**548.0**	**340.8**	**314.6**	**988.2**	**770.8**

* Estimated from Putty Tea RMS as Quarry weather station out of service.

^ Data downloaded between 31/3/2017 – 9/4/2017 due to weather station fault

6.2 AIR QUALITY

6.2.1 Introduction

Air quality monitoring is required to be undertaken in accordance with the approved *Air Quality Management Plan*.

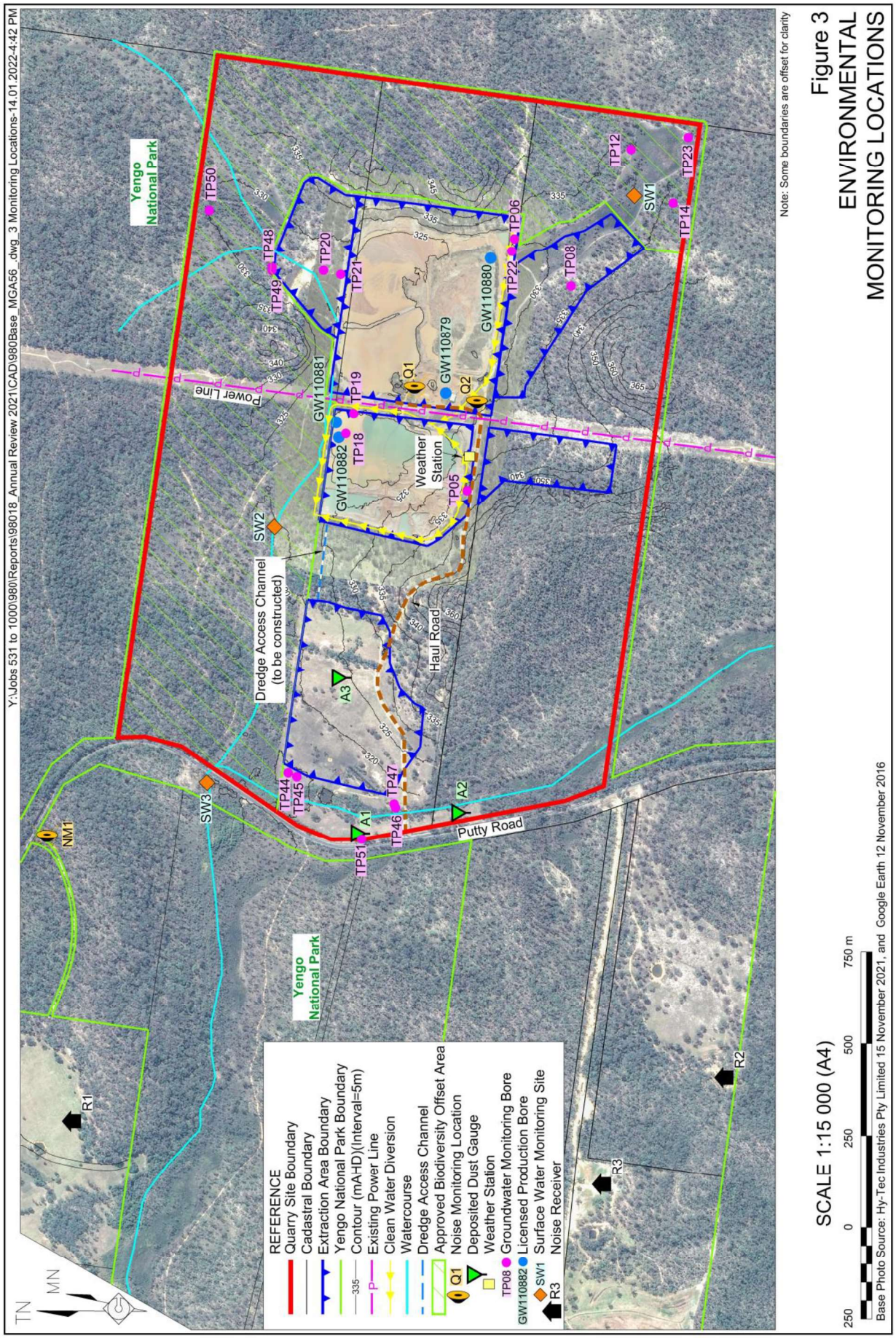


Figure 3
ENVIRONMENTAL
MONITORING LOCATIONS
Note: Some boundaries are offset for clarity
SCALE 1:15 000 (A4)
250 0 250 500 750 m
Base Photo Source: Hy-Tec Industries Pty Limited 15 November 2021, and Google Earth 12 November 2016
REFERENCE
Quarry Site Boundary
Cadastral Boundary
Extraction Area Boundary
Yengo National Park Boundary
Contour (mAHD)(Interval=5m)
Existing Power Line
Clean Water Diversion
Watercourse
Dredge Access Channel
Approved Biodiversity Offset Area
Noise Monitoring Location
Deposited Dust Gauge
Weather Station
Groundwater Monitoring Bore
Licensed Production Bore
Surface Water Monitoring Site
Noise Receiver
Yengo National Park
Yengo National Park
Power Line
Dredge Access Channel (to be constructed)
Haul Road
Putty Road
Weather Station
TP50
TP48
TP49
TP20
TP21
TP19
TP18
TP05
TP06
TP22
TP08
TP12
TP23
TP14
SW1
SW2
SW3
GW110881
GW110882
GW110879
GW110880
Q1
Q2
A1
A2
A3
TP44
TP45
TP47
TP46
TP51
NM1
R1
R2
R3
TN
MN

6.2.2 Air Quality Criteria

The air quality criteria for the Quarry are provided in *Condition 3(7)* of SSD_4978 and are summarised in **Table 7**. Deposited dust (DD) is currently the only air quality parameter that is required to be monitored as specified in the approved *Air Quality Management Plan.* The level of monitoring is considered appropriate as all extraction and processing is essentially a 'wet' process and generates limited dust. Deposited dust levels are used as an indicator of the overall air quality performance of operations.

Table 7
Air Quality Criteria

Pollutant	Criterion	Averaging Period
Total suspended particulates (TSP)	90µg/m^3	Annual mean
Particulate matter <10µm (PM_{10}) <10µm (PM_{10})	30µg/m^3	Annual mean
Particulate matter <10µm (PM_{10})	50µg/m^3	24-hour average
Deposited dust	4 g/m^2/month*	Annual mean
* or 2g/m^2/month above the annual background level		

6.2.3 Air Quality Monitoring Results

Monthly deposited dust monitoring was undertaken throughout the reporting period. The location of dust monitoring gauges DG1, DG2 and DG3 are shown on **Figure 3**. **Figure 4** and **Table 8** present the results of the deposited dust monitoring program over the reporting period. It is noted that the approved Air Quality Management Plan requires deposited dust monitoring at location DG1 only. Monitoring at locations DG2 and DG3 is undertaken on a voluntary basis and therefore is not subject to compliance under SSD 4978.

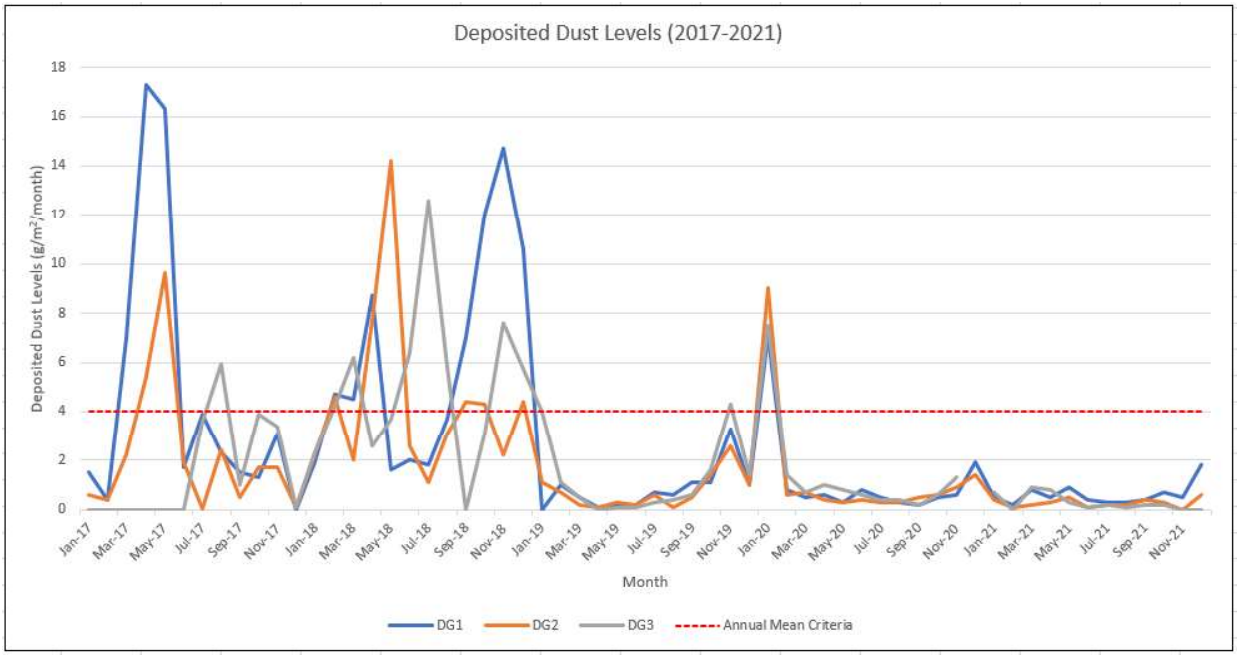


Figure 4 Deposited Dust Levels 2017 to 2021

Table 8
Measured Performance – Deposited Dust

	Deposited Dust Level[1]			
Date	**DG1**	**DG2**	**DG3**	**Criterion**
January	0.5	0.4	0.7	-
February	0.2	0.1	<0.1	-
March	0.8	0.2	0.9	-
April	0.5	0.3	0.8	-
May	0.9	0.5	0.3	-
June	0.4	0.1	0.1	-
July	0.3	0.2	0.2	-
August	0.3	0.2	0.1	-
September	0.4	0.4	0.2	-
October	0.7	0.3	0.2	-
November	0.5	<0.1	<0.1	-
December	1.8	0.6	<0.1	-
Annual Average	0.6	0.3	0.4	4
Note 1: Units – g/m^2/month			Red text indicates elevated results	

6.2.4 Analysis of Results

Deposited dust levels were all well below the trigger value at each dust gauge throughout the reporting period.

Deposited dust levels remained lower than 2017 and 2018 due to the installation of bird deterrence collars on 4 January 2019, which prevented the entry of insects, organic matter, and bird droppings in samples. As a result of the low records, the annual average level is well below the criteria level for the reporting period.

It is noted that the EIS does not include a quantitative assessment of potential air quality impacts as the operation is essentially a 'wet' process and significant air quality impacts were not anticipated.

6.3 OPERATIONAL NOISE

6.3.1 Introduction

Noise monitoring is required to be undertaken in accordance with the conditions listed in the development consent, EPL and approved *Noise Management Plan*. The following subsections provide a brief summary of noise criteria that apply at the Quarry, the results of noise monitoring activities and a discussion of the results recorded during the reporting period.

Following discussions with DPE in January 2017, it was agreed that additional monitoring would be undertaken to provide an estimate of the contribution of the Quarry to noise levels at residential locations. The results of this monitoring for 2021 are presented in Section 6.3.5 and in **Appendix 3**.

6.3.2 Noise Criteria

Condition 3(4) of SSD_4978 is relevant to noise compliance assessment and sets the criteria for noise generated by the development at any residence on privately-owned land as outlined in **Table 9**.

Table 9
Noise Monitoring Criteria SSD_4978 (dB(A))

Receiver	Day / Evening	Night	
	LAeq (15 min)	LAeq (15min)	LA1 (max)
All receivers	35	35	45

Condition L3 of EPL 12007 is relevant to the noise compliance assessment and stipulates the noise criteria at any monitoring point established under the EPL as outlined in **Table 10**.

Table 10
Noise Monitoring Criteria EPL 12007 (dB(A)) – All Receivers

Time Period	Measurement Parameter	Noise level dB(A)
All hours	LAeq (15 minute)	35
Night	Lmax OR LA1, 1min	45

6.3.3 Noise Monitoring Results

Attended noise monitoring was undertaken by Muller Acoustic Consulting Pty Ltd (MAC) on 11 May 2021 in accordance with the approved *Noise Management Plan*. A report prepared by MAC is included as **Appendix 3**.

A summary of the attended noise monitoring results at NM1 is provided in **Table 11**. In all instances the Quarry contribution to noise levels was <35dB$_{LAeq\ (15\ minute)}$.

Table 11
Summary of Attended Noise Monitoring at Receiver NM1

Page 1 of 2

Time (hrs)	Measure (dBA re 20µPa)			Descriptor and Noise Contribution (dBA)
	LAmax	LAeq	LA90	
Morning Shoulder (6:00am)	67	45	23	Traffic 25-67 Birds 20-48 Quarry Hum <20
Morning Shoulder (6:15am)	65	45	20	Traffic 20-65 Birds 20-51 Quarry Hum <20
Morning Shoulder (6:30am)	61	41	20	Traffic 20-61 Birds 21-44 Quarry Hum <20
Morning Shoulder (6:45am)	69	48	21	Traffic 20-64 Birds 20-45 Aircraft 20-30 Quarry Hum <20

Table 11 (Cont'd)
Summary of Attended Noise Monitoring at Receiver NM1

Time (hrs)	Measure (dBA re 20µPa)			Descriptor and Noise Contribution (dBA)
	LAmax	LAeq	LA90	
Day (7:45am)	74	51	20	Traffic 20-74 Birds 20-44 Aircraft 20-33 Quarry Hum <20
Day (8:00am)	72	48	17	Traffic 20-72 Birds 20-53 Quarry Hum <20
Day (8:15am)	67	49	21	Traffic 20-68 Birds 20-41 Quarry Hum <20
Day (8:30am)	68	47	19	Traffic 20-68 Birds 20-42 Quarry Hum <20

6.3.4 Attended Noise Measurement Compliance Assessment

The compliance assessment summary for R1 (see **Figure 3**) is presented in **Table 12** for day and morning shoulder assessment periods and compares operational contributions against the relevant criteria.

Table 12
Day and Morning Shoulder Noise Compliance Assessment at R1

Period	Quarry Noise Contribution $L_{Aeq(15min)}$	Quarry Noise Criteria $L_{Aeq(15min)}$	Compliant
Day	<20	35	Yes
Morning Shoulder	<20	35	Yes

The overall contribution of the Quarry to ambient noise was found to be less than 20dB(A) at the time of the monitoring which is within the limits set by both SSD_4978 and EPL 12007. These results indicate that the Quarry is complying with all relevant noise assessment criteria.

The results of the noise monitoring program are also comparable with historic noise monitoring data from Tinda Creek Quarry. Attended noise monitoring conducted from 2016 to 2021 estimated Quarry noise contribution to be less than 25dB(A) in 2016, less than 20bB(A) in 2017 and 2018, less than 35dB(A) in 2019, less than 30dB(A) in 2020 and less than 20dB(A) in 2021. This indicates that current noise mitigation measures are effective in restricting noise to an acceptable level.

6.3.5 Quarry Noise Predictions at Residences

On 20 January 2017, the DPE requested that Hy-Tec undertake additional noise monitoring to record existing noise levels (sound power levels) that were being produced at the Quarry and undertake an assessment to predict the noise impact of the Quarry at nearby privately-owned

residences. The request was only made for the year 2017, however Hy-Tec has taken on the initiative to continue to assess the noise levels at surrounding residences that could potentially be impacted by noise generated from Quarry operations.

Sound power levels were measured at locations Q1 and Q2 (see **Figure 3**) with the results of this assessment presented in **Appendix 3**. In summary, it was concluded that Quarry noise at R1, R2, and R3 after taking into consideration the attenuation caused from distance and topography is 19dB(A), 18dB(A), and 19dB(A) at the respective residences. These results all fall well below the criteria nominated by both the SSD_4978 and the EPL12007 of 35dB(A). It is noted that the noise levels are also well below the predicted noise levels modelled during the preparation of the EIS which ranged from <30dB(A) to 35dB(A) at the nearest receivers.

6.4 ABORIGINAL HERITAGE

No actions or impacts related to Aboriginal heritage occurred during the reporting period.

6.5 NON-ABORIGINAL HERITAGE

No actions or impacts related to non-Aboriginal heritage occurred during the reporting period.

7. WATER MANAGEMENT

7.1 GROUNDWATER

7.1.1 Groundwater Quality Monitoring

Groundwater quality monitoring was conducted by Hy-Tec in accordance with the approved *Water Management Plan*. Groundwater quality monitoring was undertaken at six-month intervals over the reporting period at the locations shown on **Figure 3**. The groundwater quality assessment trigger values recorded in the approved *Water Management Plan* are presented in **Table 13**.

Table 13
Groundwater Quality Trigger Criteria

Analyte	Lower Trigger Value	Upper Trigger Value
pH	<4.5	>7.0
Conductivity (µS/cm)	N/A	900
Nitrate (mg/L)	N/A	7.5
Ammonia (mg/L)	N/A	0.2
TRH (C6-C9) (mg/L)	N/A	5.0
TRH (C10-C14) (mg/L)	N/A	5.0
TRH (C15-C28) (mg/L)	N/A	5.0
TRH (C29-C36) (mg/L)	N/A	5.0
Source: Water Management Plan (RWC, 2019) – Table 18		

The results of the groundwater quality monitoring data are outlined in **Tables 14** and **15**. All results for Total Recoverable Hydrocarbon (TRH) were below the limit of recording and it is assumed there was none present. TRH is not discussed further in this review.

7.1.2 Analysis of Groundwater Quality Results

General observations from the groundwater quality monitoring data are as follows:

- There have been no exceedances of the relevant criteria throughout the reporting period.
- The slightly acidic pH is consistent with historic data and likely to represent the breakdown of plant material.
- The outcomes for EC are consistent with historic data and within the assumed trigger levels.
- It is highly unlikely that quarrying activities are impacting groundwater quality.
- pH, conductivity, nitrate and ammonia results are consistent with groundwater monitoring data obtained during previous monitoring campaigns. No distinct temporal trends are evident within the measured parameters.

Table 14
Water Monitoring Results – 23 April 2021

Bore Hole	pH	EC (µS/cm)	Nitrate (mg/L)	Ammonia (mg/L)
TP05	6.1	220	0.10	0.1
TP06	5.9	70	0.10	0.1
TP08	5.6	95	0.10	0.1
TP12	5.6	60	0.75	0.1
TP14	5.7	55	0.10	0.1
TP20	5.6	45	0.31	0.1
TP21	5.9	65	0.27	0.1
TP22*	-	-	-	-
TP23	5.4	60	1.70	0.1
TP44	6.0	220	3.60	0.1
TP45	6.0	230	2.00	0.1
TP46	6.1	100	0.49	0.1
TP47	6.0	120	0.10	0.1
TP48^	-	-	-	
TP49	5.5	250	0.22	0.1
TP50	5.3	340	0.13	0.1
TP51	6.1	90	0.35	0.1

*Samples were not taken due to broken standpipe.
^Samples were not taken due to a blockage at the top of the bore.

Table 15
Water Monitoring Results – 27 August 2021

Bore Hole	pH	EC (µS/cm)	Nitrate (mg/L)	Ammonia (mg/L)
TP05	5.9	185	<0.1	0.1
TP06	5.9	60	<0.1	<0.1
TP08	5.5	90	<0.1	<0.1
TP12	5.6	60	0.13	<0.1
TP14	5.8	55	<0.1	<0.1
TP20	5.8	60	0.62	<0.1
TP21	5.8	60	0.66	<0.1
TP22	5.7	85	<0.1	<0.1
TP23	5.4	55	1.5	<0.1
TP44	5.6	225	<0.1	<0.1
TP45	5.7	190	0.13	<0.1
TP46	6.1	95	<0.1	<0.1
TP47	6.2	120	<0.1	<0.1
TP48	6.2	110	<0.1	<0.1
TP49	5.5	240	0.27	<0.1
TP50	5.3	330	<0.1	<0.1
TP51	6.2	90	<0.1	<0.1

The EIS noted that the groundwater tended to be slightly acidic due to the generation of organic acid from the breakdown of plant material (min pH = 4.6, max pH = 6.7). The EIS further noted that conductivity was generally very low (min µS/cm = 45, max µS/cm = 1 320). The groundwater quality results are generally consistent with those presented in the EIS and it is unlikely that extractive operations are impacting on the quality of the groundwater.

It is noted that bores TP18 and TP19 had been removed as a part of the development of Domain 6. Additional monitoring bores TP44, 45, 46, 47, 48, 49, 50 and 51 were installed in 2017. Samples were not taken in April 2021 at bore TP22 due to damage to the standpipe, and at bore TP48 due to a blockage at the top of the bore. Prior to sampling in August, the broken standpipe of TP 22 was repaired by maintenance personnel, and the blockage in TP48 was flushed by the Quarry manager.

7.1.3 Groundwater Level Monitoring

Groundwater levels at the monitoring bores were monitored monthly in accordance with the approved *Water Management Plan*.

Groundwater levels in the monitoring bores are used to assess the impacts of Quarry operations on the surrounding aquifers. This analysis involves assessing the risk of Quarry operations impacting on the Greater Blue Mountains Heritage Area. No significant impacts were anticipated to groundwater flow as a result of quarrying activities.

Table 16 presents the drilled depth and groundwater investigation trigger level for each bore within the groundwater monitoring network.

Table 16
Groundwater Investigation Trigger Levels

Bore	Drilled Depth (m)	Trigger Level mBGL
TP22	12	4.43
TP06	18	5.91
TP12	15	6.67
TP23	15	6.77
TP14	20	9.08
TP08	18	6.76
TP05	15	8.75
TP18*	18	3.30
TP19*	12	4.79
TP20	12	5.84
TP21	12	5.84
TP44	18.5	3.11
TP45	9	3.36
TP46	20	1.71
TP47	12	0.69
TP48	18	5.85
TP49	10	5.80
TP50	20	7.67
TP51	16	2.49
* Bore no longer accessible		
Source: Water Management Plan (RWC, 2019) - Table 17		

Groundwater level monitoring has been undertaken at 11 groundwater bores since October 2010 (bores TP05, TP06, TP08, TP12, TP14, TP18, TP19, TP20, TP21, TP22, TP23). In March 2018, monitoring also commenced at a further five bores located to the west of the Quarry (TP44, TP45, TP46, TP47, and TP51) and three bores in the vicinity of Domain 7 (TP49, TP48 and TP50). The locations of the monitoring bores are shown on **Figure 3**.

The results of the 2021 groundwater levels monitoring are outlined in **Table 17** and displayed in **Figure 5**. The historical groundwater levels are presented in **Figure 6** and **Figure 7**. Monitoring results are displayed for both the original monitoring bores and the newly constructed bores.

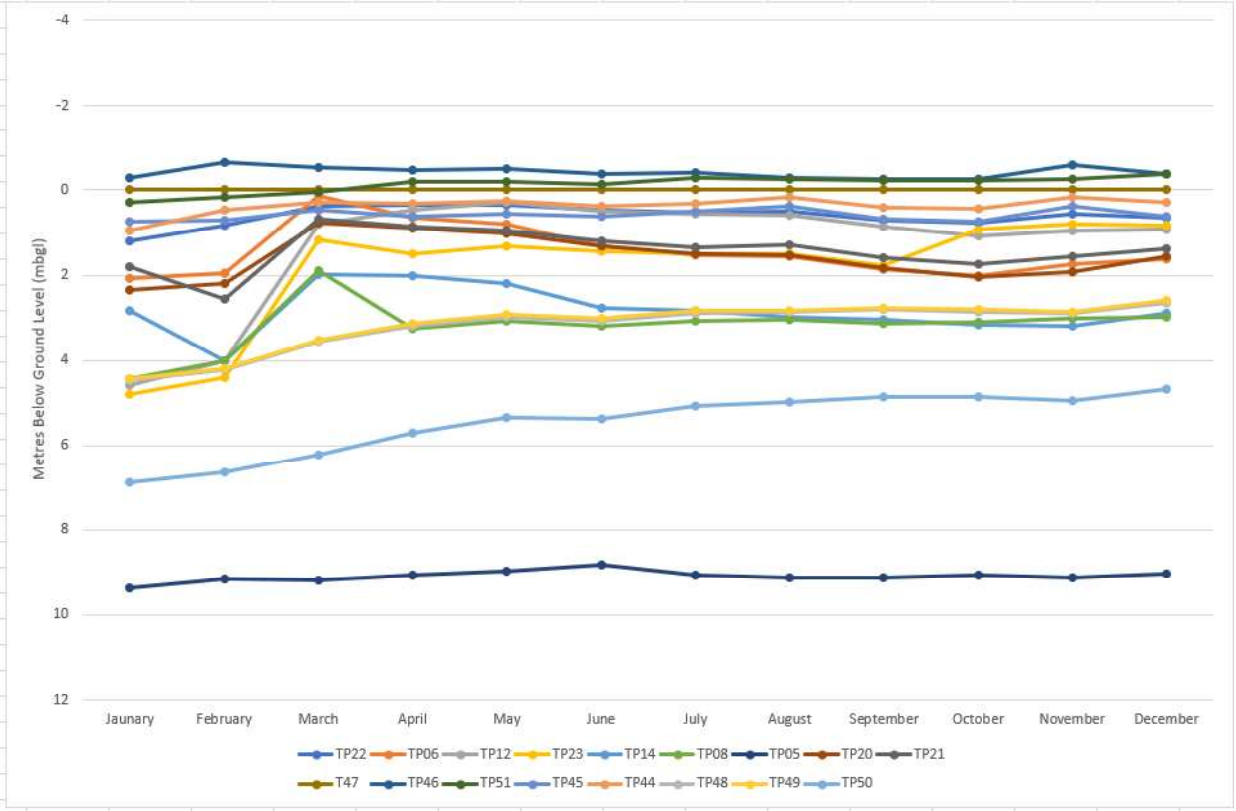


Figure 5 2021 Groundwater Level Monitoring Results

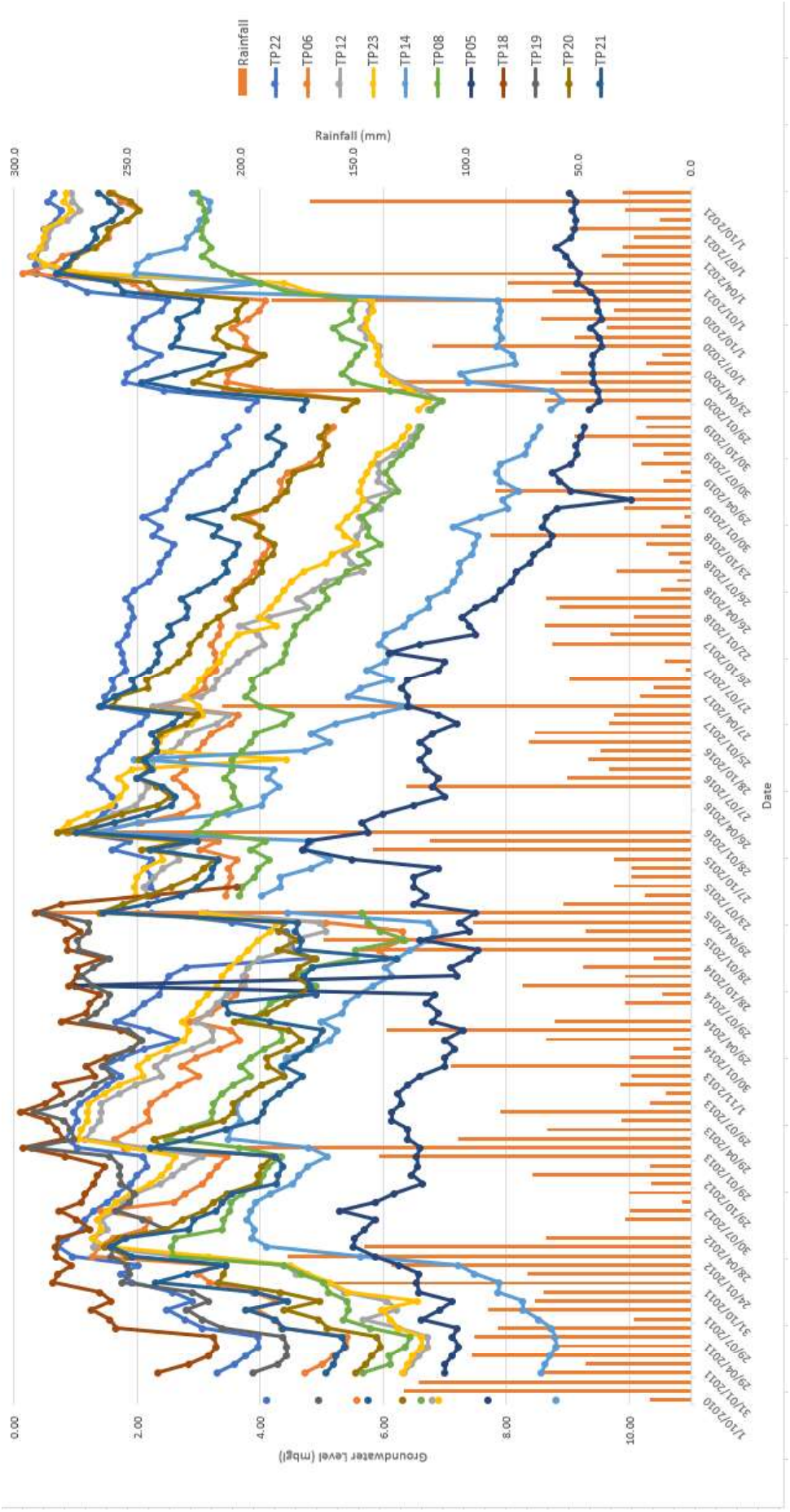


Figure 6 **Hydrography for Site Bores with Monthly Rainfall (Historic Bores)**

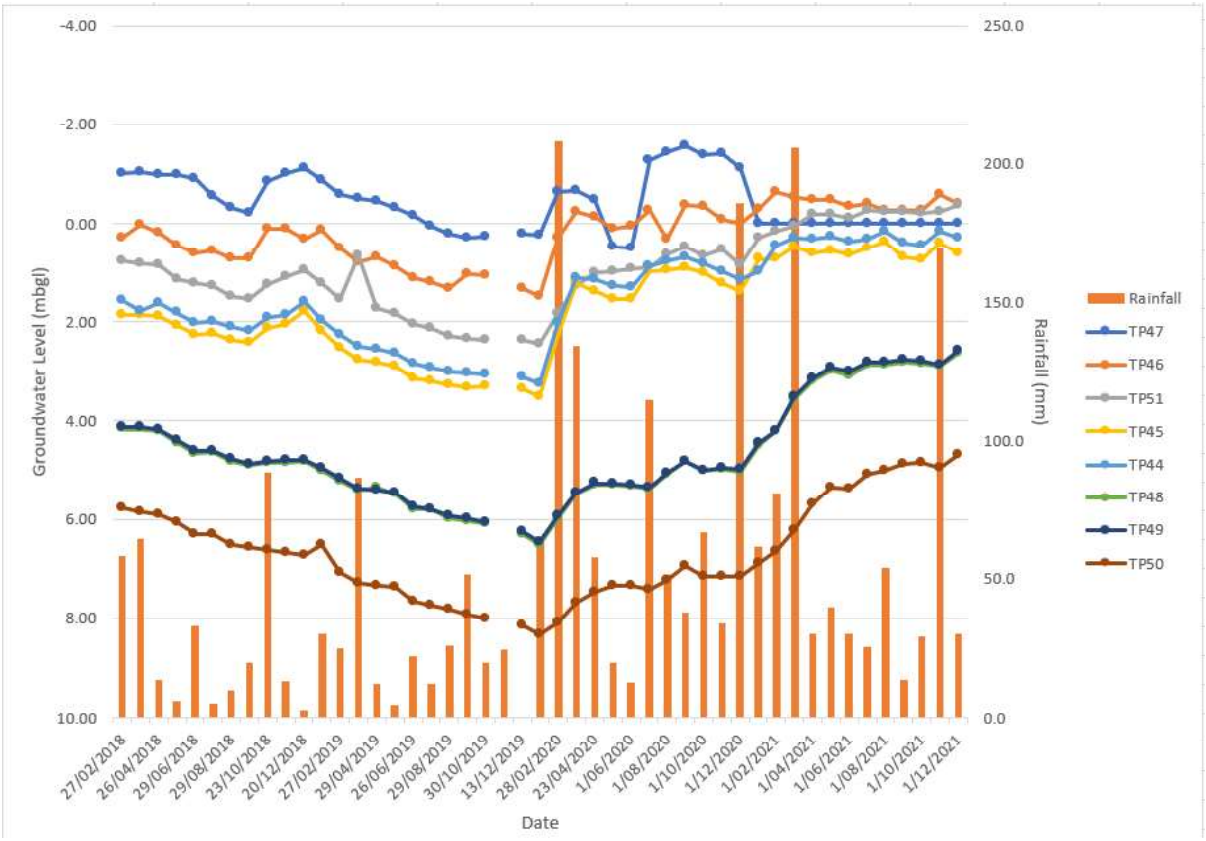


Figure 7 Hydrography for Site Bores with Monthly Rainfall (New Bores)

Table 17
Results of 2021 Groundwater Levels Monitoring Program

Bore Hole	Trigger	Month											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		Depth to water (mbgs)											
TP22	**4.43**	1.19	0.85	0.38	0.36	0.35	0.46	0.52	0.49	0.70	0.78	0.55	0.65
TP06	**5.91**	2.09	1.95	0.15	0.64	0.80	1.33	1.54	1.56	1.87	2.02	1.75	1.62
TP12	**6.67**	4.60	4.01	0.79	0.47	0.28	0.51	0.56	0.60	0.88	1.08	0.95	0.93
TP23	**6.77**	4.79	4.39	1.17	1.51	1.31	1.43	1.50	1.51	1.77	0.93	0.82	0.85
TP14	**9.08**	2.83	4.01	1.98	2.00	2.20	2.78	2.82	2.98	3.03	3.17	3.19	2.90
TP08	**6.76**	4.44	4.02	1.9	3.25	3.07	3.20	3.07	3.05	3.12	3.10	3.02	2.98
TP05	**8.75**	9.37	9.15	9.19	9.05	8.97	8.81	9.05	9.11	9.13	9.07	9.13	9.04
TP20	**5.84**	2.34	2.21	0.76	0.90	1.01	1.32	1.50	1.53	1.84	2.044	1.91	1.56
TP21	**5.84**	1.79	2.57	0.69	0.86	0.97	1.19	1.34	1.29	1.59	1.74	1.56	1.37
TP47	**0.69**	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TP46	**1.71**	-0.29	-0.64	-0.53	-0.48	-0.49	-0.36	-0.40	-0.27	-0.26	-0.26	-0.59	-0.39
TP51	**2.49**	0.30	0.17	0.05	-0.20	-0.18	-0.12	-0.27	-0.24	-0.23	-0.22	-0.25	-0.38
TP45	**3.36**	0.73	0.71	0.48	0.62	0.56	0.63	0.50	0.37	0.68	0.75	0.39	0.62
TP44	**3.11**	0.97	0.46	0.30	0.33	0.27	0.37	0.32	0.17	0.40	0.44	0.17	0.29
TP48	**5.85**	4.48	4.21	3.55	3.18	2.97	3.08	2.88	2.87	2.81	2.85	2.89	2.64
TP49	**5.80**	4.45	4.20	3.52	3.14	2.93	3.01	2.83	2.83	2.77	2.80	2.87	2.59
TP50	**7.67**	6.88	6.64	6.22	5.70	5.33	5.36	5.08	4.99	4.86	4.85	4.95	4.69
Red text indicates exceed trigger levels													

7.1.4 Analysis of Groundwater Level Results

Figure 5 indicates that over the reporting period groundwater levels have remained relatively stable. However, when viewed in conjunction with historic records (**Figure 6** and **Figure 7**) it is evident that groundwater levels have recovered or stabilised following a period of drought. This is attributed to a 25% increase in rainfall compared with the average year. A large increase in water level was observed in the historic bores (TP06-TP22) in January 2021, followed by a slight decrease/stabilisation over the rest of the year. Several bores continue to indicate artesian conditions in the aquifer resulting in water levels above ground level in the monitored bores (within the casing). This is considered to likely represent confined aquifer conditions with subsequent pressure forcing water into the bore and then stabilising within the casing.

Groundwater levels in monitoring bore TP05 were below the investigation trigger levels for the entire reporting period. Groundwater levels at this bore have consistently been below the trigger levels, established in the Water Management Plan, for the past three years. These results have been assessed by a hydrogeologist and determined not to be caused by quarrying activities. It is indicated that this trigger level may no longer be appropriate for this bore. It is noted that TP05 is expected to be removed during the 2022 reporting period as it is within the approved extraction area. It is envisaged that a replacement bore would be located parallel with TP05 on the opposite side of the Quarry Access Road. The final location of the bore would be presented in an updated Water Management Plan.

Historically, TP05, which is close to the active Domain 6 has not been as responsive to recharge as other bores. At the upgradient north-eastern site of the Site the water levels continued rising, while at the south-eastern upgradient corner of the Site the groundwater levels declined slightly or remained stable.

Monitoring bores TP46, TP47 and TP51 located downgradient of the Quarry retain high groundwater level (artesian) conditions, however TP47 does not accurately measure the water level as it continues flowing at an elevation of 1.7 m above ground level. The continued rise in groundwater levels in the upgradient areas following rainfall in November 2021 and artesian conditions at the downgradient areas indicates regional groundwater recharge with continued discharge downgradient. All bores continued to respond to rainfall/recharge consistent with historical trends.

7.1.5 Groundwater Usage

Hy-Tec have the capacity to extract 44 megalitres (ML) of water per year under its water access licences and water supply works approvals (see Section 3 and **Table 3**). Water extracted from the deeper aquifers are primarily used to fill the dredge pond and for use in dust suppression during extended dry periods.

The approved *Water Management Plan* requires that the quantity of water obtained from production bores is monitored on a monthly basis. **Table 18** presents a summary of the groundwater usage from January 2021 until December 2021.

Table 18
Groundwater Usage – Meter Reading and Monthly Usage

Date	Meter Reading (KL)	Usage (ML)
January	53830	0.019
February	53840	0.010
March	53850	0.010
April	53970	0.120
May	53985	0.015
June	53994	0.009
July	53997	0.003
August	54009	0.012
September	54015	0.006
October	54213	0.198
November	54729	0.516
December	54950	0.221
Total	**649 382**	**1.139**

A total of 1.1ML of groundwater was utilised over the reporting period which represents a decrease of 4.2ML compared to 2020. Hy-Tec is approved to use 44ML of water per annum (based on a water year (July to June)). It is noted that between July 2020 to June 2021 a total of 5.5ML of water was used.

The overall reduced water use during the reporting period resulted from higher than average rainfall that was captured in the closed water management system and used rather than water sourced from the production bore.

7.2 SURFACE WATER

7.2.1 Introduction

The Tinda Creek Quarry is situated near the top of the Tinda Creek catchment. Tinda Creek itself typically experiences intermittent, short duration flows immediately following heavy rainfall events. Previous monitoring, conducted in 2008 and 2015, indicates that quarrying activities have not impacted negatively on the Tinda Creek system and the downstream portions of the creek remain consistent with other creek systems in the vicinity of the Quarry.

The Quarry utilises a closed water management system in order to minimise any potential impacts on downstream water quality, flow regimes and habitats. This system has been successfully implemented for the past 30 years and involves a number of pump lines and catch drains.

Clean water diversion drains have been constructed within the Quarry Site in order to prevent clean runoff entering the operations area. The diversion drain system shown on **Figure 3** comprises the following components.

- Southern Diversion
- Southern Diversion Extension
- Existing Diversion.

Clean water diversion for operations in Domain 6 were constructed in 2017. During the reporting period the clean water diversion drain was moved to the southern side of the access road.

During the reporting period the closed water management system covered an area of approximately 36ha and remained within the limit of 40ha at any one time, as described in *Condition 3(12)* of SSD_4978.

7.2.2 Surface Water Monitoring

Surface water monitoring was conducted generally in accordance with the approved *Water Management Plan* over the reporting period. A summary of the required surface water monitoring is provided in **Table 19**.

Table 19
Surface Water Monitoring Regime

Monitoring Type	Location	Parameters Monitored	Frequency of Monitoring	Monitoring Method
Dredge Pond Level	Dredge Pond	Level (depth below ground)	Monthly	Observation or dip
Surface Water Quality	Upstream and downstream of Quarry	pH, EC, turbidity	Monthly if water is flowing in Tinda Creek. Samples will also be taken after more than 50mm of rain in 24 hours if water is flowing.	Grab Sample
Drainage Lines and Diversion Drains	Upstream and downstream of quarry	Stability, erosion, and sediment build up	Monthly and event based	Observation and photography
Closed Water Management System	Quarry	Stability, erosion, and sediment build up	Monthly and event based	Observation and photograph

7.2.3 Dredge Pond Water Levels

The *Water Management Plan* requires that dredge pond water levels are assessed on a monthly basis. The depth of water in any operating dredge pond is to remain more than 5m to avoid triggering further investigations. Documented monthly monitoring of dredge pond levels was undertaken by Hy-Tec from January 2021 to December 2021. Water levels were recorded as between 9.63 mbgs and 10.69 mbgs during each survey. On the basis of these results no further investigations were required.

7.2.4 Surface Water Quality

Insufficient water was available to sample upstream and downstream of the Quarry throughout the reporting period, with the exception of November 2021. The results are presented in **Table 20**. Sufficient water was available to sample in March and April (see **Table 21**), however this was due to the discharge events (discussed in Sections 7.2.5 and 10.2) and therefore was sampled separately to the required monthly monitoring. The results are presented in **Tables 22** and **23**.

Table 20
Surface Water Quality Results – November 2021

Parameter	ANZECC Trigger*	SW1	SW2	SW3
pH	6.5-8.0	5.93	5.81	6.45
Electrical Conductivity	30-350	64	49	114
Turbidity	2-25	2.6	78.2	15.2
* ANZECC (2000) guideline triggers are based on values for upland streams in NSW (see Table 3.3.2 and Table 3.3.3 of ANZECC (2000)).				

The pH values recorded at the Quarry are below the ANZECC (2000) trigger for upland creek systems, however, runoff from sedgelands tends to have lower pH due to the presence of humic acid in the surface litter and the upper soil profile. This can result in pH values as low as 4.5 to 5.0 in surface runoff. These results are consistent with the baseline results presented in the approved *Water Management Plan*. The exceedance in turbidity in SW2 is attributed to heavy rainfall and the impacts of the 2019 bushfires which removed most of the groundcover and shrub layer, thereby exacerbating the runoff of suspended sediment into these ponds.

7.2.5 Drainage Lines, Diversion Drains and Water Management System

Hy-Tec have implemented a range of measures to ensure sediment movement within the Quarry (in clean water diversion drains) is limited. These measures include the following.

- Construction and maintenance of spoon drains.
- Lining of drains with geofabric and rock armouring.
- Installation of a gabion mattress at the end of drain in the vicinity of Domain 6 to capture sediment and slow the flow of water.
- Installation of rows of hay bales and silt fencing.
- Re-seeding of the drain to establish a suitable ground cover.

Condition M2.1 of the EPL 12007 requires that the licensee undertake monthly inspections of the surface water system at the premises. The monthly inspection must:

- be undertaken immediately upstream and downstream of the Quarry disturbance area;
- include visual inspection for litter, oil and grease and sediment within the surface water system, including diversion channels;
- include visual inspection of the physical integrity of the surface water system, including any signs of erosion; and
- include visual inspection of the water level/flow in Tinda Creek.

A summary of the monitoring data as required by EPL 12007 is presented in **Table 21**.

Table 21
Results of Surface Water Monitoring – 2021

Observation	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Litter	No	No	No	No	No	No	No	No	No	No	No	No
Oil/Grease	No	No	No	No	No	No	No	No	No	No	No	No
Sediment	No	No	No	No	No	No	No	No	No	No	No	No
Erosion	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Water Level/Flow	No	No	Yes*	Yes*	No	No	No	No	No	No	Yes	No
*Water flow recorded in March and April was due to discharge events (see **Tables 22** and **23**).												

Minor erosion was observed in the Southern Diversion adjacent to Domain 4, however this was contained within the diversion channel. The erosion was evident through most of the reporting period (**Table 21**) however is not reflective of quarry operations or caused impacts to the natural environment as all sediment was contained within the closed water management system.

Two incidents relating to the Water Management System occurred during the reporting period.

- On 2 March 2021 a hole developed in the dredge transfer pipe which transfers high solids slurry from the dredge pond to the Site's wash plant. This resulted in approximately 10m^3 of material being discharged a drainage channel located in the powerline easement between Domain 4 and Domain 6. Once discovered, the dredge was immediately shut down.
- Between 26 March and 1 April 2021, a controlled discharge was undertaken, in consultation with the EPA, following a significant rainfall event. this was deemed necessary to reduce the risk of an uncontrolled discharge event occurring from the closed water management system.

Hy-Tec considers that the discharge events did not result in material harm to the environment as observations of the receiving environment after the event indicated that sediment fences remained in place and there were no signs of sedimentation in surrounding vegetation. **Table 22** presents the results of water monitoring taken after the first March incident with no discernible impact recorded.

Table 22
Summary of Surface Water Monitoring Results - March Discharge Event

Event	Monitoring Location	Parameter		
		pH (pH Unit)	Turbidity (NTU)	EC (µS/cm)
02/03/2021	Powerline Channel at Burst Pipe Location	5.99	29.6	83.0
	Powerline Channel Downstream of Burst Pipe	5.35	265.0	93.0
	Test Point 4 in Creek	5.99	120.0	82.0
	Farm Dam	6.63	163.0	69.0
	Powerline Channel and Creek Intersection	6.08	116.0	93.0
	Creek Crossing	6.87	103.0	152.0

Table 23 presents the results of water monitoring taken immediately after the second March discharge event with no discernible impact recorded. These results were provided to the EPA at the time of monitoring as part of incident reporting and the Annual Return.

Table 23
Summary of Surface Water Monitoring Results – Second March Discharge Event

Date	Monitoring Location	Parameter		
		pH (pH Unit)	Turbidity (NTU)	EC (µS/cm)
26/03/2021	Creek Crossing	5.84	28.7	49
	Dredge Pond and Discharge	5.47	290.0	46
	Putty Road	5.97	41.9	53
	Site 8 (Aquatic Sampling Point)	6.47	46.8	68
27/03/2021	Creek Crossing	5.69	25.3	52
	Dredge Pond and Discharge	5.40	231.0	47
	Putty Road	5.98	65.0	54
	Site 8 (Aquatic Sampling Point)	6.32	346.0	65
29/03/2021	Creek Crossing	5.90	22.5	54
	Dredge Pond and Discharge	5.38	219.0	46
	Putty Road	6.22	41.0	89
	Site 8 (Aquatic Sampling Point)	6.27	53.6	61
30/03/2021	Creek Crossing	5.96	20.5	56
	Dredge Pond and Discharge	5.52	217.0	47
	Putty Road	6.24	19.9	90
	Site 8 (Aquatic Sampling Point)	6.33	38.5	62
31/03/2021	Creek Crossing	6.06	18.7	62
	Dredge Pond and Discharge	5.43	213.0	47
	Putty Road	6.23	19.0	90
	Site 8 (Aquatic Sampling Point)	7.10	50.0	62
01/04/2021	Creek Crossing	6.23	18.2	56
	Dredge Pond and Discharge	5.59	220.0	48
	Putty Road	6.27	17.3	92
	Site 8 (Aquatic Sampling Point)	6.38	47.2	64
Average	Creek Crossing	5.95	22.32	54.83
	Dredge Pond and Discharge	5.47	231.67	46.83
	Putty Road	6.15	34.02	78.00
	Site 8 (Aquatic Sampling Point)	6.48	97.02	63.67

Hy-Tec's response to the discharge events and measures implemented since they occurred are discussed in Section 10.2.

8. REHABILITATION AND LANDSCAPE MANAGEMENT

8.1 REHABILITATION MANAGEMENT

Rehabilitation objectives for the Quarry are described in Schedule 3, Condition 17 of SSD_4978 and reiterated in the approved *Landscape Management Plan* for the Quarry. The objectives for progressive and final rehabilitation of the Quarry include the following.

- The Quarry Site is safe, stable and non-polluting.
- Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of local native species and habitat, including at least 0.35ha of Mellong Sandmass Sedgeland.
- Surface infrastructure is to be decommissioned and removed (unless the Secretary agrees otherwise).
- Minimise the size, depth, batter slope and the drainage catchment of the final void.
- Ensure that the volume of VENM and ENM detailed in the EIS is imported for rehabilitation of the site.
- Ensure that the surface area of the final voids is no greater than 16ha in total.
- Ensure that final voids are separated from the surface water drainage system, unless the Secretary agrees otherwise.
- Restore alignment and hydraulic function of watercourses, as far as practical.
- Ensure public safety.

Rehabilitation works continued in the 2ha domain in the south-eastern quadrant of the Quarry Site and the north-eastern corner of the historic extraction area of Domain 4 as shown on **Figure 2**. Rehabilitation works comprised primarily landform construction through backfilling the area with overburden, silt and clay material (refer **Plate 7**) with coarse woody debris applied as available to enhance the natural regeneration. This activity was consistent with the methods and timing presented in the *Landscape Management Plan*.

Hy-Tec considers that the potential for successful rehabilitation of the Quarry Site remains positive following the Gospers Mountain Bush Fire in early 2020. During the life of the Quarry, natural regeneration following bush fire has demonstrated the natural resilience of the vegetation. The resilience of the vegetation is evident and the speed of regeneration (following rainfall) evident. This is consistent with the response to fires that occurred in October 2013, with Quarry personnel reporting that within a matter of months the vegetation was re-establishing and within one year there was almost no evidence of the fire.

8.2 LANDSCAPE MANAGEMENT

Landscape management was undertaken generally in accordance with the approved *Landscape Management Plan* which was prepared in accordance with *Condition 3(19)* of SSD_4978. Activities involved predominantly weed management, maintenance of clean water diversions and some vegetation maintenance.

Local Land Services initiated a 1080 Wild Dog Baiting Program within the Hawkesbury and Blue Mountains region in May 2021. This included the Quarry Site. A total of 22 meat baits were put out, of which 4 were taken over a 3 week period. Local Land Services also held a deer shooting program in February 2021. A total of 7 wild deer were shot by officers within the Quarry Site during the reporting period.

The *Landscape Management Plan* includes a range of monitoring activities to be undertaken by Hy-Tec to demonstrate compliance with the objectives and performance criteria for landscape and rehabilitation management. A summary of these activities is provided in **Table 24**.

Table 24
Ecological Monitoring Requirements at Tinda Creek Quarry

Type of Monitoring	Parameters Monitored	Frequency	Monitoring Method	Responsibility
Rehabilitation	Inspections of survey markers, drainage lines, water management systems and rehabilitation areas.	Monthly	Visual Inspection	Quarry Manager
	Survey of 9 x BAM plot as per Section 13.2.2.	Annually	Field Survey	Quarry Manager / Ecologist
Koala	Targeted Spot Assessment Technique, Call playback surveys, Spotlight surveys.	Bi-annually (every two years)	Field Survey	Quarry Manager / Ecologist
Grevillea parviflora subsp. *parviflora*	Surveys during known flowering period (July to December), stem counts in permanent plots, photo monitoring, habitat quality.	Annually	Field Survey	Quarry Manager / Ecologist
Nest Boxes	Condition assessment.	Annually (if required).	Field Survey	Quarry Manager / Ecologist
Voluntary Undertaking	Natural regeneration.	Annually	Visual Inspection / Photographs	Quarry Manager
Aquatic Monitoring	Stream width and edge habitat, stream features including substrate, vegetation and organic material, site observation including catchment description and local land use practises, and riparian characteristics.	Annually	Field Survey and Photography	Quarry Manager / Ecologist

8.2.1 Rehabilitation Monitoring

Visual inspections of the areas under active rehabilitation were undertaken monthly during the reporting period (rather than six-monthly) and cross-over with requirements for monitoring of erosion and sediment controls and surface water quality in accordance with the *Water Management Plan*. A summary of the outcomes of monitoring during the reporting period is provided in **Table 25**. Visual inspections of the Quarry Site were supplemented by monitoring undertaken by EMM in December 2021 (EMM, 2022) with the outcomes of this monitoring presented in **Appendix 4**.

Table 25
Rehabilitation Inspections

Rehabilitation Monitoring Aspect	Comment
Monitoring is to include: • soil conditions and erosion (i.e. stability); • drainage and sediment control structures; • runoff water quality; • germination rates; • plant health; • natural regeneration; and • weed infestation.	Visual inspections were undertaken monthly by the Quarry Manager with photographic evidence of drain conditions and stability recorded. Only minor structural issues were identified in clean water diversion structures during the reporting period. Nonetheless, it is considered that existing erosion and sediment controls were functioning appropriately (see **Plate 5** and Section 7.2.5). There was generally insufficient water in the clean water diversions to permit water quality testing. Drainage structures are stabilised with vegetation, with some of the monitored areas amongst sedge vegetation containing original vegetation. Following the construction of a raised northern bund to the silt ponds, hydromulching was applied. However, at the time reporting was completed there was little evidence that seeding had been successful. During the reporting period campaigns of weed spraying and manual removal occurred.

8.2.2 Long-Term Rehabilitation Monitoring

Long-term rehabilitation monitoring was undertaken by EMM in December 2021 (EMM, 2022). The outcomes of this monitoring are described in detail in the monitoring report presented as **Appendix 4** of this report. **Table 26** presents an overview of key monitoring aspects and outcomes.

8.2.3 Biodiversity Offset Area Monitoring

Monitoring within the Biodiversity Offset Area was undertaken by EMM in December 2021 in accordance with the *Landscape Management Plan*. The monitoring plots that were re-visited with the approximate locations presented in **Figure 8**. However, the Gospers Mountain bush fire destroyed many of the timber marker pegs making the exact location of some plots difficult to determine. As such, it was not possible to make a direct comparison between the 2021 monitoring data and previous years. **Table 27** presents the monitoring aspects and general conclusions of the monitoring campaign. A more detailed review of the monitoring outcomes and the data collected from monitoring plots is provided in **Appendix 4**.

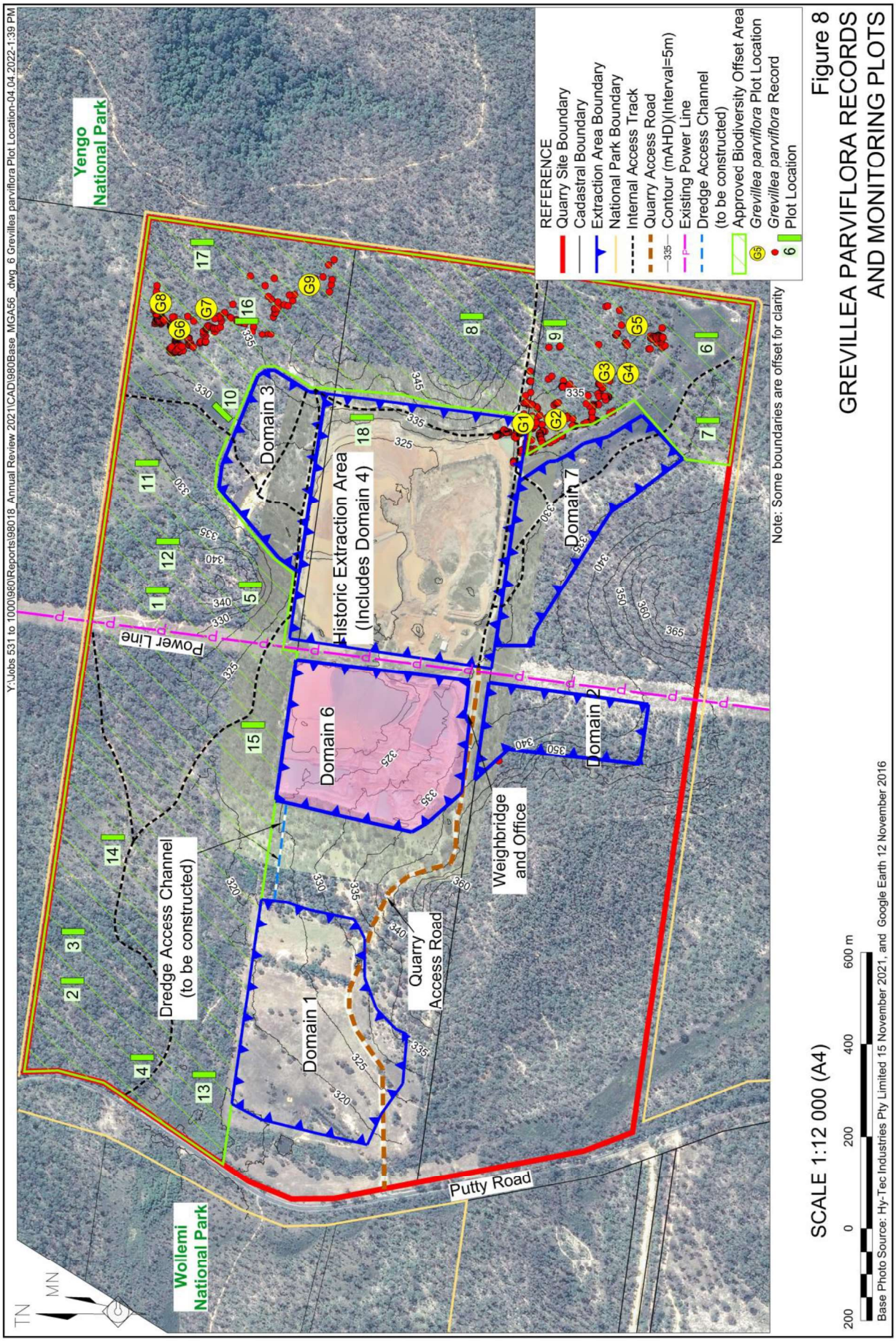


Figure 8
GREVILLEA PARVIFLORA RECORDS AND MONITORING PLOTS

Table 26
Long-Term Rehabilitation Monitoring

Rehabilitation Monitoring Aspect	Comment
Monitoring is to: • compare results against rehabilitation objectives and targets • identify possible trends and continuous improvement • link to records of rehabilitation to determine causes and explain results • assess effectiveness of environmental controls implemented • where required, identify modifications required for the monitoring program, rehabilitation practices or areas requiring research • compare flora species present against original seed mix and/or analogue sites • assess vegetation health • assess vegetation structure (e.g. upper, mid. and lower storey) • the presence and abundance of any weed species • assessment of natural regeneration/recruitment of new species • where applicable, assess native fauna species diversity and the effectiveness of habitat creation for target fauna species	The majority of the rehabilitation objectives do not yet apply, however progressive rehabilitation and management of the rehabilitating landscape remains consistent with these objectives (described in Section 8.1). It is noted that impacts from the Gospers Mountain bush fire have significantly impacted previously rehabilitated areas. EMM (2022) observed that native species richness is lower than analogue sites within the rehabilitation area. The effects of the 2019 Gospers Mountain bush fire are still apparent, with vegetation composition, structure and function still significantly altered. Weed species are present in both the regeneration and adjacent remnant areas. However, cover and abundance is substantially greater within the rehabilitation area (45.3% cover), influenced mostly by African Lovegrass which is likely to have had a negative influence on native species and has since increased in cover since the 2019 monitoring survey. Weed control will be required as the African Lovegrass density will negatively affect native plant species germination and growth post-fire. Pest species including deer, feral cat and wild dogs occur throughout Wollemi and Yengo National Parks directly adjacent to the Quarry Site. Control will therefore be impossible given that these species will continue to move from the national parks into unoccupied habitat within the Quarry Site.

Table 27
Biodiversity Offset Area Monitoring

Biodiversity Offset Area Monitoring Aspect	Comment
Monitoring is to include: • general vegetation health • evidence of natural seedling recruitment • occurrence and abundance of weed species • structure and floristics of vegetation cover • signs of disturbance (by stock, people or feral animals) • nature and extent of erosion • evidence of fire • characteristic of ground cover (e.g. leaf litter, rocks, logs and soil) • nectar or fruit resources and perch sites • water resources • secondary evidence of fauna use such as scats, tree scratches or diggings.	EMM (2022) noted no obvious adverse effects from the Quarry on vegetation communities within the Biodiversity Offset Area. The area was significantly impacted by the Gospers Mountain bush fire. Extensive regeneration has occurred post-fire since significant rain events. A number of threatened species occur within the Biodiversity Offset Area, including a population of Grevillea parviflora. The Grevillea population has likely increased during the reporting period. No Koala were identified during survey by EMM (2022) and no scats were evident in surveyed BAM plots. Some scratches were observed. More detailed Koala survey occurs every two years and is due next year. Weeds occur along some of the access tracks within the Biodiversity Offset Area with enough cover and abundance to be considered for control methods. No weed species recorded are listed as 'Weeds of National Significance'.

8.2.4 Koala Monitoring

Detailed Koala survey occurs every two years and is due to be undertaken in 2022. EMM undertook Koala population monitoring surveys in December 2021 (EMM, 2022) coincident with monitoring at established plots. No Koala's or Koala scats were identified during the surveys, however potential Koala scratches were identified using the Spot Assessment Technique at plot locations. The results were not definitive evidence of the Koalas presence as the abundance of the Common Brushtail Possum and Lace Monitor could be responsible. Koala presence has been confirmed by Quarry personnel through previous motion-activated camera photographs showing a Koala within the Quarry Site, however none were identified during the reporting period.

The approved *Landscape Management Plan* for the Quarry contains a Koala Plan of Management (Appendix 1 of the plan) that specifies performance criteria for Koala management. These include the following:

- No koalas will be harmed as a result of any tree-clearing practices that take place as a result of this Project.
- Potential quarry-induced impacts will not result in the alteration to the floristics, structure or condition of non-cleared areas of potential koala habitat.

No vegetation clearing was required during the reporting period and Quarry personnel have reported no incidents involving Koala vehicle strikes. There is no evidence that there are Quarry-related impacts occurring to Koala habitat.

8.2.5 Aquatic Monitoring

On 3 November 2021, Niche (2021) undertook aquatic monitoring to monitor the river health of Tinda Creek and its tributaries and to assess any potential impacts from Quarry development. A report detailing the methods, outcomes and conclusions of the aquatic monitoring program is provided as **Appendix 5**. The monitoring program is consistent with the previous monitoring presented as Appendix 2 of the *Landscape Management Plan* (Umwelt, 2016).

The monitoring program in 2021 included the following:

- Assessment of stream condition using Riparian and Channel and Environment inventory assessment (RCE).
- Assessment of habitat condition using AUSRIVAS proforma.
- Assessment of water quality against default ANZECC trigger values.
- Assessment of the macroinvertebrate community condition using Stream Invertebrate Grade Number Average Level (SIGNAL) and AUSRIVAS.

In comparison to the comparatively wet sampling season of 2020, fewer sites held water in spring 2021. Aquatic environments downstream of Tinda Creek Quarry infrastructure were found to have a continued good level of riparian regrowth after the 2019-2020 bushfire events, as well as stable channel morphology. The macroinvertebrate communities had recorded generally poor SIGNAL2 and AUSRIVAS results, however these results were comparable between the test site and reference sites, and equivalent or improved when compared to previous results. As such, the

streams are likely being influenced by natural stress associated with intermittent/ephemeral streams and reflect conditions experienced within the locality, not impacts associated with the operation of the Tinda Creek Quarry.

Based on the evidence available, there appears to be no obvious disturbance resulting from the Tinda Creek Quarry operations at downstream sites. However elevated turbidity (suspended sediment levels) was recorded at all monitoring sites. This is most likely due to the 2019 bushfires which exacerbated the continuous input of suspended sediment into these ponds.

pH levels were significantly higher at Monitoring Site 6, above ANZECC guidelines, however this did not appear to result in any impact to macroinvertebrate communities. This will be considered in ongoing monitoring to identify any emerging trends.

8.2.6 Nest Box Monitoring

No nesting boxes have been installed at the Quarry and therefore no monitoring has been required to date.

8.2.7 Threatened Species Monitoring

Threatened fauna monitoring was undertaken by EMM in December 2021, predominantly focused on the Biodiversity Offset Area (EMM, 2022). The outcomes of these surveys are presented in **Appendix 4**.

The Site is a known and potential habitat for 18 threatened fauna species, however no threatened fauna species were identified during the monitoring.

During the ecological mentoring surveys, EMM (2022) identified two potential threatened flora species within the study area, *Hibbertia puberula subsp. extensa* and *Callistemon linearifolius*. Hy-Tec is in the process of completing an update to the existing Landscape Management Plan and will consider the locations and management to be applied for these species in that document. This is likely to include a process to avoid impacts were possible.

8.2.8 Grevillea parviflora Monitoring

Monitoring of the condition and persistence of the small flower *Grevillea parviflora* subsp. *parviflora* was undertaken in December 2021 and is considered to provide an indication of the condition of this species for the reporting period. A series of nine 10m x 10m plots were revisited within the approved Biodiversity Offset Area to facilitate annual stem counts of the species. The locations of these plots can be seen on **Figure 8**. The goal of this monitoring program is to assess the ongoing viability and health of the species and to ensure the habitat is maintained or improved over the life of the operations. The monitoring results are included in **Table 28**.

Despite inherent inaccuracies in *Grevillea parviflora* subsp. *parviflora* monitoring plot boundary locations (and difficulty in separating resprouting / clonal plants from new seedlings), the results of the survey plot counts provide a general indication of population condition. A total of 285 plants were recorded within the nine plots during the survey. This is an increase of 105 plants

recorded compared with 2020. It is noted that the methodology applied to survey was different between monitoring events with Niche counting stems but accounting for separate stems at ground level, EnviroKey counting plants but also considering separation at ground surface diversion and EMM counting stems. EMM (2022) concluded that whilst definitive conclusions are difficult to draw, a conservative reading of the data suggests numbers are likely increasing.

Table 28
Ecological Monitoring Requirements at Tinda Creek Quarry

Plot Number	2018^[1] Count	2019* Count	2020* Count	2021^ Count
G1	18	38	0	21
G2	50	7	0	103
G3	32	25	18	14
G4	44	1	10	53
G5	20	19	35	9
G6	23	35	16	26
G7	16	0	0	25
G8	14	0	0	12
G9	3	0	1	22
Total	220	125	80	285
Note 1: Average number of stems from March 2018 and September 2018. * Count of number of individuals. ^ Count of number of stems.				
Source: EMM (2022) – Table 3.6				

8.2.9 Conclusion

Consistent with previous years, Hy-Tec has continued to operate the Tinda Creek Quarry with minimal evident impact to the surrounding landscape within the Quarry Site, the Biodiversity Offset Area and in aquatic environments downstream of the Quarry. High sediment levels were recorded at all aquatic monitoring sites and were likely due to the 2020 bushfires which exacerbated the continuous input of suspended sediment into these ponds. This is not considered indicative of any trends in aquatic ecology impact. Rehabilitation progress during the reporting period has been steady, with regeneration evident within the Quarry Site.

EMM supported the recommendation from EnviroKey (2021) suggesting the monitoring program should be reduced in the Biodiversity Offset Area and increased in the rehabilitation areas. This is due to the lack of any evident impact from Quarry operations in the Biodiversity Offset Area and the need to monitor and improve conditions in areas that are subject to rehabilitation.

Weed coverage within the rehabilitation area has increased, possibly in response to the recent bushfires. A dedicated program of weed management is recommended followed by direct seeding to establish native vegetation to compete with weed species in these locations. Dependent on suitable climatic conditions, additional weed management and planned seeding is planned to take place in 2022.

Within the Biodiversity Offset Area EMM recommended closure of unused tracks to allow vegetation to regenerate naturally (providing they are not required for monitoring). Weed control is also recommended using spot spray techniques on foot and by hand only (as to prevent the spread of weed seeds by vehicles). Weeds should be monitored visually every three months and sprayed as necessary.

It is apparent from the recent ecological monitoring that the Gospers Mountain bushfire has increased flora species richness as well as the number of *Grevillea parviflora* present in the monitored plots. This is consistent with expected bushfire response. However, weed coverage in rehabilitation areas and the biodiversity offset area has also increased and will require further targeted weed management.

Aquatic ecological monitoring has identified that reduced ground cover has led to an overall increase in sediment in watercourses including Tinda Creek. This is expected to improve over time and is not resulting from quarrying activities.

9. COMMUNITY

9.1 COMMUNITY COMPLAINTS

The complaints register for 2021 is provided in **Appendix 6**. The register is available from the Hy-Tec website and updated each month. Two community complaints were recorded in April and June 2021. The complaints related to trucks driving dangerously on Putty Road. Both incidents were investigated and it was confirmed that neither of the trucks were associated with Hy-Tec or the Quarry.

Complaints will continue to be logged within the complaints register and investigated fully when they are received. The complaints register will continue to be kept in the weighbridge office and updated on the Hy-Tec website on a monthly basis.

9.2 COMMUNITY LIAISON

A total of two Tinda Creek Quarry Community Consultative Committee (CCC) meetings were conducted remotely via email during the reporting period due to the COVID-19 pandemic. Presentations were emailed to all CCC members on the scheduled meeting date of 13 May 2021 and 11 October 2021. Members were requested to review the documents and provide any questions/comments within 7 days. After this time, this information was collated and forwarded through to the company for its response. Minutes of the meetings are provided in **Appendix 7**.

There were no issues raised during the CCC meetings that were considered to be complaints or required investigation by Hy-Tec.

Given the remote location of the Quarry, no further community engagement activities occurred within the reporting period.

10. INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

10.1 INTRODUCTION

The following subsections outline incidents and non-compliances that occurred during the reporting period. An internal review of compliance with the conditions of SSD_4978 was undertaken by Hy-Tec and RWC and is included as **Appendix 1**. The operation remained generally compliant with development conditions throughout the reporting period with the exception of the non-compliances listed below.

10.2 INCIDENTS

Two incidents requiring notification to DPE and the Environment Protection Authority (EPA) occurred during the reporting period. Both incidents related to water discharge from the closed water management system. An update to the Water Management Plan for the Quarry is underway to better reflect the possibility of water discharge from the Quarry and management of these events should they occur.

Incident – 2 March 2021

On 2 March 2021 a dredge transfer pipe transferring high solids slurry from the dredge pond to the Site's wash plant ruptured. Approximately 10m^3 of raw feed material was discharged into the local surface drainage channel located in the powerline easement corridor. The channel contained control measures including rock lined sediment traps, silt fencing and hay bale sediment traps. All materials that were discharged were contained within the drainage channel. The material was removed from this location and placed in the rehabilitation area. The EPA and DPE was notified of the incident on 2 March 2021.

Following the event the existing silt fencing was taken down and replaced with new silt fencing. Many of the existing hay bales were removed and replaced with new hay bales. At some of the sediment control walls, additional hay bales were placed as a second row. Existing rock lined sediment traps were sediment traps were taken up and replaced with new rock lined sediment traps in the affected area. The ruptured pipe was replaced.

In April 2021, the existing poly pipes crossing the powerline easement corridor were changed to steel pipes. Steel pipes generally develop pin holes when worn, as opposed to splitting or developing larger holes, reducing the potential size of a discharge in the event a hole occurs.

Incident – 26 March 2021 to 1 April 2021

In March 2021, Hy-Tec undertook controlled discharge of water from the closed water management system in response to a significant rainfall event (228mm over 5-days). Prior notification of the discharge was provided to the relevant NSW Government authorities (DPE and the EPA) and the EPA provided verbal acknowledgement of the notification and process for discharge and monitoring. The water was discharged to a rock-lined drain that entered Tinda Creek. It is noted that high sediment loads were present in the natural environment due to the rainfall runoff naturally occurring. The controlled discharge was undertaken principally to avoid

uncontrolled discharge in the event that heavy rainfall continued to ensure the quarry would be able to re-commence operations in a safe manner. Hy-Tec monitored water quality during and after discharge.

On the basis of the above, Hy-Tec is confident that it has remained compliant with Section 120 of the POEO Act during 2021.

10.3 DEVELOPMENT CONSENT SSD_4978

Hy-Tec was not compliant with Conditions 2(1), 2(2), 3(12) and 3(13) of SSD_4978 due to the two discharge events described in Section 10.2. Hy-Tec considers that neither event resulted in material harm to the environment, however, for conservatism both incidents have been recorded as non-compliant against relevant conditions.

10.4 ENVIRONMENT PROTECTION LICENCE

Hy-Tec was non-compliant with Conditions A3.1, A3.2, L1.1 and O1.1 of EPL 12007. These non-compliances resulted directly from the two unplanned discharge events described in Section 10.2. The relevant authorities were advised of the non-compliances at the time of each incident and stated in the Annual Return 2021.

10.5 WATER ACCESS LICENCES

Works Approval 10WA112531 permits extraction of 44ML of water per annum via the production bore based on a water year (i.e. July to June). A total of 5.5ML of water was used between July 2020 to June 2021.

10.6 VOLUNTARY UNDERTAKING

During a site inspection and audit by officers of DPE on 6 June 2017, it was identified that equipment and other materials historically stored within the southeast corner of the Quarry Site constituted a breach of *Condition 3(30)* of SSD_4978 in relation to waste management at the Quarry. The material was subsequently removed by Hy-Tec and the Company entered into a voluntary undertaking regarding revegetation in this area. The requirements of the voluntary undertaking were completed in February 2020 after DPIE requested additional evidence of vegetation regeneration. It is noted that this area was significantly impacted by the Gospers Mountain Bush Fire and much of the regrowth vegetation was burnt. Inspection of the area was undertaken by site personnel during the reporting period and it was noted that the area is beginning to re-establish after the bush fire event in 2019/2020.

11. ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

The following operational activities are planned throughout the 2022 reporting period.

- Extraction will continue within Domain 6, and clearing and extraction will commence in Domain 7 including construction of diversion channel and bundings (see **Figure 9**).
- Hy-Tec anticipates that an agreement and timing for transfer of the biodiversity offset area to Yengo National Park will be finalised in early 2022. Once this agreement is reached, Hy-Tec will notify the Department of the details of the agreement.
- A Variation to EPBC 2013/7028 is expected to occur in relation to final arrangements to secure the biodiversity offset area.
- Updates to the Landscape Management Plan and Water Management Plan for the operation are in preparation and will be finalised in early 2022. No additional impacts to matters approved under EPBC Approval 2013/7028 are expected as a result of the updated plans. Copies of the final plans will be provided to DAWE in accordance with Condition 19 of EPBC Approval 2013/7028.
- The production forecast for 2022 is to extract, process and transport approximately 144 000t of sand product.
- Ongoing monitoring and maintenance of erosion and sediment controls and diversion drains.
- Maintenance and improvement to processing infrastructure would be continued to enhance washing processes and improve water re-use in production.
- Maintenance of the Quarry Access Road.
- Continuation of progressive rehabilitation as practicable. This will primarily continue within the south-eastern rehabilitation area, utilising topsoil to begin revegetation of the area.
- Continuation of water management and dust control measures.
- Continue to monitor deposited dust and confirm the success of bird control measures through review of results against historic trends.
- Waste will continue to be collected by licensed contractors and volumes and dates recorded.
- Continuation of annual LiDAR Survey or other aerial imagery capture of the Quarry Site.
- Continued implementation of all requirements and conditions prescribed under Development Consent SSD_4978, EPL 12007 and approved management plans.

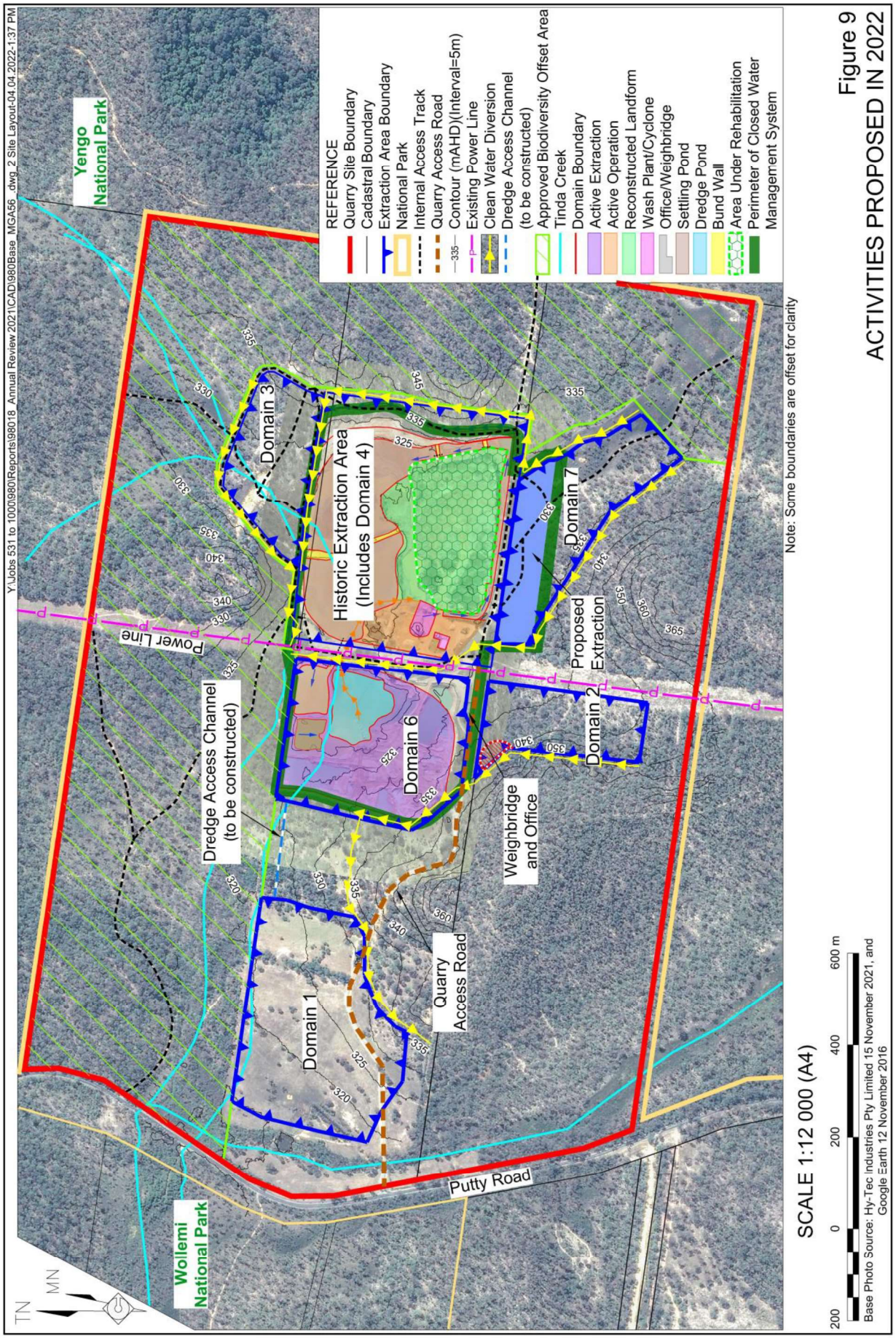


Figure 9
ACTIVITIES PROPOSED IN 2022
REFERENCE
Quarry Site Boundary
Cadastral Boundary
Extraction Area Boundary
National Park
Internal Access Track
Quarry Access Road
Contour (mAHD)(Interval=5m)
Existing Power Line
Clean Water Diversion
Dredge Access Channel (to be constructed)
Approved Biodiversity Offset Area
Tinda Creek
Domain Boundary
Active Extraction
Active Operation
Reconstructed Landform
Wash Plant/Cyclone
Office/Weighbridge
Settling Pond
Dredge Pond
Bund Wall
Area Under Rehabilitation
Perimeter of Closed Water Management System
Note: Some boundaries are offset for clarity
Yengo National Park
Wollemi National Park
Putty Road
Power Line
Dredge Access Channel (to be constructed)
Historic Extraction Area (Includes Domain 4)
Domain 3
Domain 6
Domain 7
Proposed Extraction
Domain 2
Domain 1
Weighbridge and Office
Quarry Access Road
TN
MN
SCALE 1:12 000 (A4)
200 0 200 400 600 m
Base Photo Source: Hy-Tec Industries Pty Limited 15 November 2021, and Google Earth 12 November 2016
Y:\Jobs 531 to 1000\980\Reports\98018_Annual Review 2021\CAD\980Base_MGA56_dwg_2 Site Layout-04_04.2022-1:37 PM

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Appendices

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Appendix 1

Internal Compliance Audit (SSD_4978) – 1 January 2021 to 31 December 2021

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Table A1
Internal Compliance Audit of Relevant Conditions of Development Consent SSD_4978 for Tinda Creek Sand Project from 1 January 2021 to 31 December 2021

Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
SCHEDULE 2: ADMINISTRATION CONDITIONS				
Obligation to Minimise Harm to the Environment				
1.	In addition to meeting the specific performance criteria established under this consent, the Applicant shall implement all reasonable and feasible measures to prevent and/or minimise any material harm to the environment that may result from the construction, operation, or rehabilitation of the development.	N	Two discharge events occurred in March 2021 (one uncontrolled and one controlled). Incident reporting following the events confirmed no material harm to the environment occurred. The poly pipes were replaced with steel pipes to reduce impacts in the case of a hole developing.	O/D
TERMS OF CONSENT				
2.	The Applicant shall carry out the development generally in accordance with the: (a) EIS; (b) Statement of Commitments; and (c) conditions of this consent.	N	A total of three non-compliance issues under SSD_4978 were identified during the reporting period as detailed in this table.	O/D
3.	If there is any inconsistency between the above documents, the most recent document shall prevail to the extent of the inconsistency. However, the conditions of this consent shall prevail to the extent of any inconsistency.	Noted		
4.	The Applicant shall comply with any reasonable requirement/s of the Secretary arising from the Department's assessment of: (a) any strategies, plans, programs, reviews, audits, reports or correspondence that are submitted in accordance with this consent; (b) any reports, reviews or audits commissioned by the Department regarding compliance with this consent; or (c) the implementation of any actions or measures contained in these documents.	Y	No requests were received from DPE during the reporting period.	D

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Internal Compliance Audit of Relevant Conditions of Development Consent SSD_4978 for Tinda Creek Sand Project from 1 January 2021 to 31 December 2021

Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
SCHEDULE 2: ADMINISTRATION CONDITIONS (Cont'd)				
LIMITS ON CONSENT				
Extraction Operations				
5.	The Applicant may undertake extraction operations on the site until 31 December 2045.	Noted		
Production Limits				
6.	The Applicant shall not: (a) extract or process more than 300,000 tonnes of sand in any calendar year; or (b) undertake extraction operations beyond 15 m below the natural ground surface.	Y	Approximately 93 765 tonnes of sand were extracted and processed and depth restrictions were not exceeded during the reporting period.	D
Transportation Limits				
7.	The Applicant shall not: (a) transport more than 300,000 tonnes of sand from the site in a calendar year; and (b) dispatch more than 34 trucks per day or receive more than 34 trucks per day, averaged over a calendar month.	Y	Product despatch was limited to 97 677 tonnes and truck level limits were not exceeded during the reporting period.	D
SURRENDER OF EXISTING DEVELOPMENT CONSENT				
8.	Within 6 months of the date of this consent, unless the Secretary agrees otherwise, the Applicant shall surrender the development consent (DA 0134/95) for the existing operations on the site in accordance with Section 104A of the EP&A Act. Prior to the surrender of development consent DA 0134/95, the conditions of this consent shall prevail to the extent of any inconsistency with the conditions of that consent.	Y	DA 1034/95 was surrendered on 10 December 2015.	D
STRUCTURAL ADEQUACY				
9.	The Applicant shall ensure that any new buildings and structures, and any alterations, or additions to existing buildings and structures, are constructed in accordance with the relevant requirements of the BCA.	Noted	No new buildings and structures were constructed during the reporting period.	O
DEMOLITION				
10.	The Applicant shall ensure that all demolition work on site is carried out in accordance with Australian Standard AS 2601-2001: The Demolition of Structures, or its latest version.	Noted	No demolition occurred during the reporting period.	O
11.	The Applicant shall: (a) repair, or pay the full costs associated with repairing, any public infrastructure that is damaged by the development; and	Noted	There was no damage or necessary relocation of public infrastructure during the reporting period.	O

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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
SCHEDULE 2: ADMINISTRATION CONDITIONS (Cont'd)				
PROTECTION OF PUBLIC INFRASTRUCTURE				
	(b) relocate, or pay the full costs associated with relocating, any public infrastructure that needs to be relocated as a result of the development. *Note: This condition does not apply to any damage to roads caused as a result of general road usage.*			
OPERATION OF PLANT AND EQUIPMENT				
12.	The Applicant shall ensure that all plant and equipment used on site is: (a) maintained in a proper and efficient condition; and (b) operated in a proper and efficient manner.	Y	All equipment was maintained and operated in an acceptable manner during the reporting period.	D
UPDATING & STAGING STRATEGIES, PLANS OR PROGRAMS				
13.	With the approval of the Secretary, the Applicant may submit any strategies, plans or programs required by this consent on a progressive basis. To ensure the strategies, plans or programs under the conditions of this consent are updated on a regular basis, the Applicant may at any time submit revised strategies, plans or programs to the Secretary for approval. With the agreement of the Secretary, the Applicant may prepare any revised strategy, plan or program without undertaking consultation with all parties under the applicable condition of this consent.	Noted	Not required during the reporting period.	D
14.	Until they are replaced by an equivalent strategy, plan or program approved under this consent, the Applicant shall implement the existing strategies, plans or programs for the site that have been approved under DA 0134/95.	Noted	All management strategies, plans and programs have been updated and approved.	D
PRODUCTION DATA				
15.	The Applicant shall: (a) provide annual quarry production data to DRE using the standard form for that purpose; and (b) include a copy of this data in the Annual Review (see condition 4 of schedule 5).	Y	See **Appendix 2**.	
DEVELOPER CONTRIBUTIONS				
16.	The Applicant shall pay Council road maintenance contributions consistent with Council's Section 94 Contributions Plan, or its latest version.	Y	Road maintenance contributions are paid monthly.	D

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<table>
<tr><th>Condition No.</th><th>Paraphrased Requirement</th><th>Compliance</th><th>Comment</th><th>Basis*</th></tr>
<tr><td colspan="5">SCHEDULE 3: ENVIRONMENTAL PERFORMANCE CONDITIONS</td></tr>
<tr><td colspan="5">IDENTIFICATION OF APPROVED LIMITS OF EXTRACTION</td></tr>
<tr><td>1.</td><td>Prior to undertaking extraction operations under this consent, the Applicant shall:
(a) engage a registered surveyor to mark out the boundaries of the approved limits of extraction within the site; and
(b) submit a survey plan of these boundaries with applicable GPS coordinates to the Secretary.</td><td>Y</td><td>All relevant boundaries have been surveyed and marked to comply with this condition.</td><td></td></tr>
<tr><td>2.</td><td>While extraction operations are being carried out, the Applicant shall ensure that these boundaries are clearly marked at all times.</td><td>Noted</td><td>All boundaries were clearly marked during the reporting period.</td><td></td></tr>
<tr><td colspan="5">HOURS OF OPERATION</td></tr>
<tr><td>3.</td><td>The Applicant shall comply with the operating hours set out in Table 1.
Table 1: Operation Hours
<table>
<tr><th>Activity</th><th>Operating Hours</th></tr>
<tr><td>Extraction operations and deliveries</td><td>7 am to 6 pm, Monday to Friday
7 am to 3 pm, Saturday
No activities on Sundays or Public Holidays</td></tr>
<tr><td>Dispatch</td><td>5 am to 10 pm, Monday to Friday
6 am to 3 pm, Saturday</td></tr>
<tr><td>Construction activities</td><td>7 am to 6 pm, Monday to Friday
8 am to 1 pm, Saturday
No construction to be undertaken on Sundays or Public Holidays</td></tr>
<tr><td>Maintenance activities</td><td>24 hours a day, 7 days per week, providing maintenance activities are inaudible at any privately-owned residence</td></tr>
</table></td><td>Y</td><td>Hy-Tec complied with all approved operating hours during the reporting period.</td><td>D</td></tr>
<tr><td colspan="5">NOISE</td></tr>
<tr><td colspan="5">Noise Criteria</td></tr>
<tr><td>4.</td><td>The Applicant shall ensure that the noise generated by the development does not exceed the criteria in Table 2 at any residence on privately-owned land.
Table 2: Noise criteria dB(A)
<table>
<tr><th rowspan="2">Receiver</th><th>Day/Evening</th><th colspan="2">Night</th></tr>
<tr><th>$L_{Aeq(15\ min)}$</th><th>$L_{Aeq(15\ min)}$</th><th>$L_{A1(max)}$</th></tr>
<tr><td>All receivers</td><td>35</td><td>35</td><td>45</td></tr>
</table></td><td>Y</td><td>Noise monitoring undertaken during the reporting period demonstrates that Hy-Tec complied with this criteria. There were no noise complaints during the reporting period.</td><td>D</td></tr>
</table>

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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
SCHEDULE 3: ENVIRONMENTAL PERFORMANCE CONDITIONS (Cont'd)				
NOISE (Cont'd)				
Operating Conditions				
5.	The Applicant shall: (a) implement all reasonable and feasible mitigation measures to minimise the construction, operational and road noise of the development; (b) regularly assess noise monitoring data and relocate, modify and/or stop operations on site to ensure compliance with the noise criteria in this consent; (c) minimise the noise impacts of the development during meteorological conditions under which the noise criteria in this consent do not apply (see Appendix 6); and (d) carry out regular noise monitoring to determine whether the development is complying with the relevant conditions of this consent, to the satisfaction of the Secretary.	Y	See previous response. Hy-Tec has not been required to modify operations due to noise-related concerns during the reporting period.	
Noise Management Plan				
6.	The Applicant shall prepare and implement a Noise Management Plan for the development to the satisfaction of the Secretary.	Y	A Noise Management Plan has been approved by the Secretary and is implemented at the Quarry. The Noise Management Plan is available from the Hy-Tec website.	
AIR QUALITY				
Air Quality Criteria				
7.	The Applicant shall implement all reasonable and feasible avoidance and mitigation measures so that particulate matter emissions generated by the development do not exceed the criteria in Tables 3 to 5 at any residence on privately-owned land. Table 3: Long-Term Criteria for Particulate Matter **Pollutant** / **Averaging period** / **[d] Criterion** Total suspended particulates (TSP) / Annual / [a] 90 µg/m3 Particulate matter < 10µm (PM_{10}) / Annual / [a] 30 µg/m3	Y	Dust monitoring undertaken during the reporting period indicates that the operation complied with the criteria in this condition. The introduction of bird deterrence on deposited dust gauges in January 2019 has reduced deposited dust levels significantly. This indicates that previously elevated deposited dust levels are not attributable to Quarry operations.	D

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<tr><td colspan="5">SCHEDULE 3: ENVIRONMENTAL PERFORMANCE CONDITIONS (Cont'd)</td></tr>
<tr><td colspan="5">AIR QUALITY (Cont'd)</td></tr>
<tr><td colspan="5">Air Quality Criteria (Cont'd)</td></tr>
<tr><td></td><td>Table 4: Short-Term Criteria for Particulate Matter
<table>
<tr><th>Pollutant</th><th>Averaging period</th><th>[d] Criterion</th></tr>
<tr><td>Particulate matter < 10µm (PM_{10})</td><td>24 hour</td><td>[a] 50 µg/m3</td></tr>
</table>
Table 5: Long-Term Criteria for Deposited Dust
<table>
<tr><th>Pollutant</th><th>Averaging period</th><th>Maximum increase in deposited dust level</th><th>Maximum total deposited dust level</th></tr>
<tr><td>[c] Deposited dust</td><td>Annual</td><td>[b] 2g/m^2/month</td><td>[a] 4g/m^2/month</td></tr>
</table></td><td></td><td></td><td></td></tr>
<tr><td colspan="5">Operating Conditions</td></tr>
<tr><td>8.</td><td>The Applicant shall:
(a) implement all reasonable and feasible measures to minimise the dust emissions of the development;
(b) minimise surface disturbance of the site; and
(c) monitor and report on compliance with the relevant air quality criteria in this consent;
to the satisfaction of the Secretary.</td><td>Y</td><td>Dust impacts were effectively managed during the reporting period.</td><td>D</td></tr>
<tr><td colspan="5">Air Quality Management Plan</td></tr>
<tr><td>9.</td><td>The Applicant shall prepare and implement an Air Quality Management Plan for the development to the satisfaction of the Secretary.</td><td>Y</td><td>An Air Quality Management Plan has been approved by the Secretary and is implemented at the Quarry.
The Air Quality Management Plan is available from the Hy-Tec website.
Monitoring not undertaken at DG3 in December as personnel became bogged when attempting to access the gauge, however, it is noted that monthly dust monitoring is only required at DG1.</td><td>D</td></tr>
<tr><td colspan="5">METEOROLOGICAL MONITORING</td></tr>
<tr><td>10.</td><td>For the life of the development, the Applicant shall ensure that there is a suitable meteorological station operating in the vicinity of the site that complies with the requirements in the Approved Methods for Sampling of Air Pollutants in New South Wales guideline.</td><td>Y</td><td>A meteorological station was installed in July 2016.</td><td>D</td></tr>
</table>

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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
SCHEDULE 3: ENVIRONMENTAL PERFORMANCE CONDITIONS (Cont'd)				
SOIL AND WATER				
Water Supply				
11.	The Applicant shall ensure that it has sufficient water for all stages of the development, and if necessary, adjust the scale of operations under the consent to match its available water supply to the satisfaction of the Secretary.	Noted	Hy-Tec is approved to use 44ML of water per annum (based on a water year (July to June)). A total of 5.50ML was used between July 2020 to June 2021.	D
Operating Conditions				
12.	The Applicant shall: (a) comply with Section 120 of the POEO Act, unless an EPL authorises otherwise; (b) ensure that the catchment of the water management system is not larger than 40 ha, unless the Secretary agrees otherwise; (c) maintain the dredge and silt ponds to capture a 1 in 100 ARI storm event plus adequate freeboard to ensure no offsite discharge; and (d) ensure that the loss of groundwater and surface water to Tinda Creek is no greater than predicted in the EIS.	N	Two discharge events occurred in March 2021 (one uncontrolled and one controlled). Incident reporting following the events confirmed no material harm to the environment occurred. The poly pipes were replaced with steel pipes to reduce impacts in the case of a hole developing.	D
Water Management Plan				
13.	The Applicant shall prepare and implement a Water Management Plan for the development to the satisfaction of the Secretary.	N	A Water Management Plan has been prepared and approved by the Secretary and is being implemented at the Quarry. Groundwater level monitoring was undertaken throughout the reporting period with levels below trigger thresholds investigated. Two discharge events (one controlled and one uncontrolled) from the closed water management system occurred in March 2021.	D

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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
SCHEDULE 3: ENVIRONMENTAL PERFORMANCE CONDITIONS (Cont'd)				
HERITAGE				
Heritage Management Plan				
14.	The Applicant shall prepare and implement a Heritage Management Plan for the development to the satisfaction of the Secretary.	Y	A Heritage Management Plan has been approved by the Secretary and is implemented at the Quarry. The Heritage Management Plan is available from the Hy-Tec website	
LANDSCAPE AND REHABILITATION				
Biodiversity Offset Strategy				
15.	The Applicant shall implement the biodiversity offset strategy described in the EIS, as summarised and revised in Table 6, and shown conceptually in Appendix 5, to the satisfaction of the Secretary. Table 6: Biodiversity Offset Strategy (ha) **Area** / **Offset Type** / **Minimum Size (ha)** On-site Offset Area / Existing vegetation to be enhanced / 106.6	NYA	Hy-Tec has been in discussions with NPWS and DPE regularly regarding the actions necessary to implement the biodiversity offset strategy.	
Security of Offsets				
16.	Within 2 years of this consent, unless otherwise agreed with the Secretary, the Applicant shall make suitable arrangements to provide appropriate long-term security for the offset area, to the satisfaction of the Secretary.	NYA	Hy-Tec is currently consulting with DPE and NPWS on an appropriate mechanism to secure the offset area. It is noted that the area is not being disturbed and environmental management is implemented in accordance with an approved Landscape Management Plan.	
Rehabilitation Objectives				
17.	The Applicant shall rehabilitate the site to the satisfaction of the Secretary. The final landform must: (a) be generally consistent with the proposed rehabilitation strategy in the EIS, and the final landform shown conceptually in Appendices 4 and 5. and	Y	Progressive rehabilitation is consistent with the EIS. The final landform is yet to be developed.	O

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<tr><td colspan="5">SCHEDULE 3: ENVIRONMENTAL PERFORMANCE CONDITIONS (Cont'd)</td></tr>
<tr><td colspan="5">LANDSCAPE AND REHABILITATION (Cont'd)</td></tr>
<tr><td colspan="5">Rehabilitation Objectives (Cont'd)</td></tr>
<tr><td></td><td>(b) comply with the objectives in Table 7.
Table 7: Rehabilitation Objectives
<table>
<tr><th>Feature</th><th>Objective</th></tr>
<tr><td>Site (as a whole)</td><td>• Safe, stable and non-polluting
• Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of local native species and habitat, including at least 0.35 ha of Mellong Sandmass Sedgeland</td></tr>
<tr><td>Surface Infrastructure</td><td>• To be decommissioned and removed (unless the Secretary agrees otherwise)</td></tr>
<tr><td>Final Voids</td><td>• Minimise the size, depth, batter slope and the drainage catchment of the final void
• Ensure that the volume of VENM and ENM detailed in the EIS is imported for rehabilitation of the site
• Ensure that the surface area of the final voids is no greater than 16 ha in total
• Separated from the surface water drainage system, unless the Secretary agrees otherwise</td></tr>
<tr><td>Watercourses</td><td>• Restore alignment and hydraulic function, as far as practical</td></tr>
<tr><td>Community</td><td>• Ensure public safety</td></tr>
</table></td><td>Y</td><td>Progressive rehabilitation complied with these objectives during the reporting period.</td><td>O</td></tr>
<tr><td colspan="5">Progressive Rehabilitation</td></tr>
<tr><td>18.</td><td>The Applicant shall rehabilitate the site progressively, that is, as soon as reasonably practicable following disturbance. Interim stabilisation measures must be implemented where reasonable and feasible to control erosion (both wind and water) in disturbed areas that are not active and which are not ready for final rehabilitation.</td><td>Y</td><td>Rehabilitation continued in Domain 4 during the reporting period with this landform progressively being stabilised prior to revegetation.</td><td>O</td></tr>
<tr><td colspan="5">Landscape Management Plan</td></tr>
<tr><td>19.</td><td>The Applicant shall prepare and implement a Landscape Management Plan for the development to the satisfaction of the Secretary.</td><td>Y</td><td>A Landscape Management Plan has been approved by the Secretary and is being implemented at the Quarry.
The Landscape Management Plan is available from the Hy-Tec website.
An updated Landscape Management Plan is currently in preparation to revise ongoing management and monitoring measures.</td><td>D</td></tr>
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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
SCHEDULE 3: ENVIRONMENTAL PERFORMANCE CONDITIONS (Cont'd)				
LANDSCAPE AND REHABILITATION (Cont'd)				
Conservation and Rehabilitation Bond				
20.	Within 6 months of the approval of the Landscape Management Plan, the Applicant shall lodge a Conservation and Rehabilitation Bond with the Department to ensure that the biodiversity offset strategy and rehabilitation of the site are implemented in accordance with the performance and completion criteria set out in the plan and relevant conditions of this consent. The sum of the bond shall be determined by: (a) calculating the cost of implementing the biodiversity offset strategy over the next 3 years; (b) calculating the cost of rehabilitating the site, taking into account the likely surface disturbance over the next 3 years of extraction operations; and (c) employing a suitably qualified quantity surveyor or other expert to verify the calculated costs, to the satisfaction of the Secretary.	Y	A Conservation and rehabilitation bond was lodged with DPE on 11 December 2017.	D
	Within 3 months of each Independent Environmental Audit (see condition 9 of schedule 5), the Applicant shall review, and if necessary revise, the sum of the Conservation and Rehabilitation Bond to the satisfaction of the Secretary.	Y	An Independent Environment Audit was undertaken on 9 and 10 October 2019. An updated bond estimate has been provided to DPE for review but is not yet approved. A non-compliance has previously been noted against this condition but as the updated estimate is complete is not considered a non-compliance for this review.	D
TRANSPORT				
Monitoring of Product Transport				
22.	The Applicant shall keep accurate records of all laden truck movements to and from the site (hourly, daily, weekly, monthly and annually) and publish these records on its website every 6 months.	Y	See Section 4.2.2 of the Annual Review. Truck movement records are also available from the Hy-Tec website.	D

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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
SCHEDULE 3: ENVIRONMENTAL PERFORMANCE CONDITIONS (Cont'd)				
TRANSPORT (Cont'd)				
Operating Conditions				
23.	The Applicant shall ensure that: (a) all laden vehicles have appropriate signage, including a contact phone number, so they be easily identified by road users; (b) all laden vehicles entering or exiting the site have their loads covered; (c) all laden vehicles exiting the site are cleaned of sand and other material that may fall on the road, before leaving the site; and (d) no trucks queue at the entrance to the site before 6am.	Y	All laden vehicles complied with these requirements during the reporting period.	D
Access Road and Intersection Construction				
24.	Within 12 months from the date of this consent, unless the Secretary agrees otherwise, the Applicant shall upgrade the site access road and its intersection with Putty Road in accordance with applicable AUSTROADS standards, and to the satisfaction of RMS.	Y	Intersection upgrade completed in November 2015.	D
Transport Management Plan				
25.	The Applicant shall prepare and implement a Transport Management Plan for the development to the satisfaction of the Secretary.	Y	A Transport Management Plan has been approved by the Secretary and is implemented at the Quarry. The Transport Management Plan is available from the Hy-Tec website	D
VISUAL				
26.	The Applicant shall: (a) implement all reasonable and feasible measures to minimise the visual and off-site lighting impacts of the development on local residences and road users; and (b) ensure that all external lighting associated with the development complies with the relevant Australian Standards…. to the satisfaction of the Secretary.	Y	Visual amenity was managed effectively during the reporting period. No complaints were received during the reporting period regarding visual impacts.	
BUSHFIRE MANAGEMENT				
27.	The Applicant shall ensure that the development is suitably equipped to respond to any fires on site; and assist the Rural Fire Service, emergency services and National Parks and Wildlife Service as much as practicable if there is a fire in the surrounding area.	Y	Firefighting equipment is readily available at the Quarry.	D

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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
SCHEDULE 3: ENVIRONMENTAL PERFORMANCE CONDITIONS (Cont'd)				
WASTE				
28.	The Applicant shall ensure that only certified VENM and ENM is imported to the site to aid in the minimisation of final voids.	Y	No material was imported during the reporting period.	D
29.	The Applicant shall manage on-site sewage treatment and disposal in accordance with the requirements of its EPL, and to the satisfaction of the EPA and Council.	Y	There were no compliance issues with regards to sewerage management during the reporting period.	D
30.	The Applicant shall: (a) minimise the waste generated by the development; (b) ensure that the waste generated by the development is appropriately stored, handled, and disposed of; and (c) report on waste management and minimisation in the Annual Review, to the satisfaction of the Secretary.	Y	Historically stored waste located on the premises was identified as part of site visit by DPE representatives in June 2017. The items were disposed of in September 2017, and the area is being revegetated, in liaison with the DPE and EPA.	D
SCHEDULE 4: ADDITIONAL PROCEDURES				
NOTIFICATION OF LANDOWNERS				
1.	As soon as practicable after obtaining monitoring results showing an exceedance of any relevant criteria in schedule 3, the Applicant shall notify affected landowners in writing of the exceedance, and provide regular monitoring results to each affected landowner until the development is again complying with the relevant criteria.	Y	Hy-Tec did not receive monitoring results that indicated impacts at a nearby residence.	D
INDEPENDENT REVIEW				
2.	If an owner of privately-owned land considers the development to be exceeding the relevant criteria in schedule 3, then he/she may ask the Secretary in writing for an independent review of the impacts of the development on his/her land. If the Secretary is satisfied that an independent review is warranted, then within 2 months of the Secretary's decision the Applicant shall:	NYA	No requests for an independent review of impacts of the Quarry were received during the reporting period.	
SCHEDULE 5: ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING				
ENVIRONMENTAL MANAGEMENT				
Environmental Management Strategy				
1.	The Applicant shall prepare and implement an Environmental Management Strategy for the development to the satisfaction of the Secretary.	Y	An Environmental Management Strategy has been approved by the Secretary and is implemented at the Quarry. The Environmental Management Strategy Plan is available from the Hy-Tec website.	D

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Table A1 (Cont'd)
Internal Compliance Audit of Relevant Conditions of Development Consent SSD_4978
for Tinda Creek Sand Project from 1 January 2021 to 31 December 2021

Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
SCHEDULE 5: ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING (Cont'd)				
ENVIRONMENTAL MANAGEMENT (Cont'd)				
Adaptive Management				
2.	The Applicant shall assess and manage development-related risks to ensure that there are no exceedances of the criteria and/or performance measures in schedule 3. Any exceedance of these criteria and/or performance measures constitutes a breach of this consent and may be subject to penalty or offence provisions under the EP&A Act or EP&A Regulation. Where any exceedance of these criteria and/or performance measures has occurred, the Applicant shall, at the earliest opportunity: (a) take all reasonable and feasible measures to ensure that the exceedance ceases and does not recur; (b) consider all reasonable and feasible options for remediation (where relevant) and submit a report to the Department describing those options and any preferred remediation measures or other course of action; and (c) implement remediation measures as directed by the Secretary; to the satisfaction of the Secretary.	Y	There were no exceedances of criteria during the reporting period. Hy-Tec has implemented additional management and mitigation measures in response to the overtopping incidents in March 2021 (see Section 10.2).	D
Management Plan Requirements				
3.	The Applicant shall ensure that the management plans required under this consent are prepared in accordance with any relevant guidelines, and include: (a) detailed baseline data; (b) a description of: • the relevant statutory requirements (including any relevant approval, licence or lease conditions); • any relevant limits or performance measures/criteria; and • 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; (c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;	Y	All management plans and strategies have been approved by the Secretary.	D

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Internal Compliance Audit of Relevant Conditions of Development Consent SSD_4978
for Tinda Creek Sand Project from 1 January 2021 to 31 December 2021

Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
SCHEDULE 5: ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING (Cont'd)				
ENVIRONMENTAL MANAGEMENT (Cont'd)				
Management Plan Requirements (Cont'd)				
	(d) a program to monitor and report on the: • impacts and environmental performance of the development; and • effectiveness of any management measures (see (c) above); (e) a contingency plan to manage any unpredicted impacts and their consequences; (f) a program to investigate and implement ways to improve the environmental performance of the development over time; (g) a protocol for managing and reporting any: • incidents; • complaints; • non-compliances with statutory requirements; and • exceedances of the impact assessment criteria and/or performance criteria; and (h) a protocol for periodic review of the plan.			
Annual Review				
4.	By the end of December each year, or other timing as may be agreed by the Secretary, the Applicant shall review the environmental performance of the development to the satisfaction of the Secretary.	Y	This document.	D
Revision of Strategies, Plans and Programs				
5.	Within 3 months of a modification to this consent or following the submission of an: (a) annual review under condition 4 above: (b) incident report under condition 7 below; or (c) audit report under condition 9 below, the Applicant shall review, and if necessary revise, the strategies, plans, and programs required under this consent to the satisfaction of the Secretary. *Note: This is to ensure the strategies, plans and programs are updated on a regular basis, and incorporate any recommended measures to improve the environmental performance of the development.*	Y	Hy-Tec have advised that a review has been carried out accordingly. An updated Landscape Management Plan is currently in preparation to revise ongoing management and monitoring measures.	D

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Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
SCHEDULE 5: ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING (Cont'd)				
ENVIRONMENTAL MANAGEMENT (Cont'd)				
Community Consultative Committee				
6.	The Applicant shall establish and operate a Community Consultative Committee (CCC) for the development to the satisfaction of the Secretary. This CCC must be operated in general accordance with the Guidelines for Establishing and Operating Community Consultative Committees for Mining Developments (Department of Planning, 2007, or its latest version), and be operating within 6 months of the date of this consent.	Y	Virtual CCC Meetings were held on 13 May 2021 and 11 October 2021.	D
REPORTING				
Incident Reporting				
7.	The Applicant shall immediately notify the Secretary and any other relevant agencies of any incident that has caused, or threatens to cause, material harm to the environment. For any other incident associated with the Development, the Applicant shall notify the Secretary. Within 7 days of the date of the incident, the Applicant shall provide the Secretary and any relevant agencies with a detailed report on the incident, and such further reports as may be requested.	Y	DPE and EPA were notified of the unplanned discharge event from the sediment pond in March 2021. Consultation with DPE and EPA occurred prior to the planned discharge in March 2021, whereby the discharge was agreed to be necessary (see **Appendix 8**). Hy-Tec accepted this is still noted as a non-compliance for EPA 2020/2021 Annual Return period.	D
Regular Reporting				
8.	The Applicant shall provide regular reporting on the environmental performance of the development on its website, in accordance with the reporting arrangements in any plans or programs approved under the conditions of this consent.	Y	All relevant documents and monitoring results are available from the Hy-Tec website.	O
INDEPENDENT ENVIRONMENTAL AUDIT				
9.	Within a year of the date of this consent, and every 3 years thereafter, unless the Secretary directs otherwise, the Applicant shall commission and pay the full cost of an Independent Environmental Audit of the development.	Y	An Independent Environment Audit was undertaken on 9 and 10 October 2019.	D

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Internal Compliance Audit of Relevant Conditions of Development Consent SSD_4978 for Tinda Creek Sand Project from 1 January 2021 to 31 December 2021

Condition No.	Paraphrased Requirement	Compliance	Comment	Basis*
SCHEDULE 5: ENVIRONMENTAL MANAGEMENT, REPORTING AND AUDITING (Cont'd)				
INDEPENDENT ENVIRONMENTAL AUDIT (Cont'd)				
10.	Within 6 weeks of the completion of this audit, unless the Secretary agrees otherwise, the Applicant shall submit a copy of the audit report to the Secretary, together with its response to any recommendations contained in the audit report, including a timetable for the implementation of any measures proposed to address the recommendations in the audit report. If the Applicant intends to defer the implementation of a recommendation, reasons must be documented.	Y	The audit report and response from Hy-tec were provided to DPIE on 21 November 2019	D
11.	Within 6 months of the date of this consent, the Applicant shall: (a) make copies of the following publicly available on its website: • the EIS; • current statutory approvals for the development; • approved strategies, plans and programs required under the conditions of this consent; • a comprehensive summary of the monitoring results of the development, reported in accordance with the specifications in any conditions of this consent, or any approved plans and programs; • a complaints register, which is to be updated monthly; • minutes of CCC meetings; • the annual reviews of the development (for the last 5 years); • any independent environmental audit of the development, and the Applicant's response to the recommendations in any audit; • any other matter required by the Secretary; and (b) keep this information up-to-date, to the satisfaction of the Secretary.	Y	All relevant documents and monitoring results are available from the Hy-Tec website.	D

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Table A2
Internal Compliance Audit of Relevant Conditions of Environment Protection Licence 12007 for Tinda Creek Sand Project from 1 January 2021 to 31 December 2021

Cond. No.	Paraphrased Requirement		Compliance	Comment	Basis*
1. Administrative Conditions					
What the licence authorises and regulates					
A1.1	This licence authorises the carrying out of the scheduled activities listed below at the premises specified in A2. The activities are listed according to their scheduled activity classification, fee-based activity classification and the scale of the operation. Unless otherwise further restricted by a condition of this licence, the scale at which the activity is carried out must not exceed the maximum scale specified in this condition.		Yes	Scheduled Activity Fee Based Activity Scale > 100 000 – 500 000m^3 annual extractive capacity	D
	Scheduled Activity	**Fee Based Activity**	**Scale**		
	Extractive activities	Water-based extractive activity	>100000 – 500000m3 annual extractive capacity		
A1.2	Notwithstanding condition A1.1, the scale of the water-based extractive activity authorised under this licence must not exceed more than 300,000 tonnes of sand extracted or processed in any calendar year, being the amount equivalent to the annual extraction limit approved by the development consent granted under the Environmental Planning and Assessment Act 1979 for the premises specified in A2.		Yes	Water-based extractive activity did not exceed more than 300 000 tonnes of sand extracted or processed during the reporting period.	D
Premises or plant to which this licence applies					
A2.1	The licence applies to the following premises: TINDA CREEK QUARRY 6102 PUTTY ROAD MELLONG NSW 2756 LOT 1 DP 628806, LOT 2 DP 628806, LOT 3 DP 628806 AS DEPICTED IN THE MAP OF THE APPROVED PROJECT AREA FOR SSD 4978 IN CONDITION A2.2		N/A		
A2.2	The premises location is shown on the map below		N/A		

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Table A2 (Cont'd)
Internal Compliance Audit of Relevant Conditions of Environment Protection Licence 12007 for Tinda Creek Sand Project from 1 January 2021 to 31 December 2021

Cond. No.	Paraphrased Requirement	Compliance	Comment	Basis*
1. Administrative Conditions (Cont'd)				
Information supplied to the EPA				
A3.1	Works and activities must be carried out in accordance with the proposal contained in the licence application, except as expressly provided by a condition of this licence. In this condition the reference to "the licence application" includes a reference to: a) the applications for any licences (including former pollution control approvals) which this licence replaces under the Protection of the Environment Operations (Savings and Transitional) Regulation 1998; and b) the licence information form provided by the licensee to the EPA to assist the EPA in connection with the issuing of this licence.	N	Two discharge events occurred in March 2021 (one uncontrolled and one controlled). Incident reporting following the events confirmed no material harm to the environment occurred. The poly pipes were replaced with steel pipes to reduce impacts in the case of a hole developing.	D
A3.2	Works and activities must be carried out in accordance with the Development Consent for State Significant Development 4978 approved by the Department of Planning and Environment on 10 April 2015.	N	Two discharge events occurred in March 2021 (one uncontrolled and one controlled). Incident reporting following the events confirmed no material harm to the environment occurred. The poly pipes were replaced with steel pipes to reduce impacts in the case of a hole developing.	D
2. Discharges to Air and Water and Applications to Land				
P1 Location of monitoring/discharge points and areas				
P1.1	The following points referred to in the table below are identified in this licence for the purposes of weather and/or noise monitoring and/or setting limits for the emission of noise from the premises.	Yes	A Noise Management Plan has been approved by the Secretary and is implemented at the Quarry. The Noise Management Plan is available from the Hy-Tec website and identifies monitoring locations.	D

EPA ID No.	Type of monitoring point	Location Description
1	Noise monitoring	The boundary of "Receiver 1" as detailed in Figure 6.1 of the document titled "Tinda Creek Sand Quarry Noise Management Plan Final October 2015", submitted to the EPA on 18 November 2015

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<table>
<tr><th>Cond. No.</th><th>Paraphrased Requirement</th><th>Compliance</th><th>Comment</th><th>Basis*</th></tr>
<tr><td colspan="5">3. Limit Conditions</td></tr>
<tr><td colspan="5">L1 Pollution of waters</td></tr>
<tr><td>L1.1</td><td>Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.</td><td>N</td><td>Two discharge events occurred in March 2021 (one uncontrolled and one controlled). Incident reporting following the events confirmed no material harm to the environment occurred.</td><td>D</td></tr>
<tr><td colspan="5">L2 Waste</td></tr>
<tr><td>L2.1</td><td>The licensee must not cause, permit or allow any waste generated outside the premises to be received at the premises for storage, treatment, processing, reprocessing or disposal or any waste generated at the premises to be disposed of at the premises, except as expressly permitted by the licence.</td><td>Yes</td><td>No waste material was received on site during the reporting period.</td><td>D</td></tr>
<tr><td>L2.2</td><td>This condition only applies to the storage, treatment, processing, reprocessing or disposal of waste at the premises if those activities require an environment protection licence.</td><td>Yes</td><td>No waste material was received on site during the reporting period.</td><td>D</td></tr>
<tr><td colspan="5">L3 Noise Limits</td></tr>
<tr><td>L3.1</td><td>Noise generated at the premises that is measured at each noise monitoring point established under this licence must not exceed the noise levels specified in Column 4 of the table below for that point during the corresponding time periods specified in Column 1 when measured using the corresponding measurement parameters listed in Column 2.

POINT 1
<table><tr><th>Time period</th><th>Measurement parameter</th><th>Measurement frequency</th><th>Noise level dB(A)</th></tr><tr><td>All hours</td><td>LAeq (15 minute)</td><td>-</td><td>35</td></tr><tr><td>Night</td><td>Lmax OR LA1,1min</td><td>-</td><td>45</td></tr></table></td><td>Yes</td><td>Noise monitoring undertaken during the reporting period demonstrates that Hy-Tec complied with the criteria. There were no noise complaints during the reporting period.</td><td>D</td></tr>
<tr><td>L3.2</td><td>For the purposes of the table under Condition L3.1 "Night" has the same meaning as in the NSW Industrial Noise Policy (EPA, 2000).</td><td>Noted</td><td></td><td></td></tr>
</table>

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Cond. No.	Paraphrased Requirement	Compliance	Comment	Basis*
3. Limit Conditions (Cont'd)				
L4 Hours of Operation				
L4.1	Unless permitted by another condition of this licence, activities at the premises must: a) only be undertaken between 7:00 am and 6:00 pm Monday to Friday; b) only be undertaken between 7:00 am and 3:00 pm Saturday; and c) not be undertaken on Sundays or public holidays.	Yes	Hy-Tec reports that all hours of operation were complied with during the reporting period.	D
L4.2	In addition to the limitations imposed by Condition L4.1, construction activities must not be undertaken: a) between 7:00 am and 8:00 am Saturdays; and b) between 1:00 pm and 3:00 pm Saturdays.	Yes	No construction activities were undertaken in the reporting period with the exception of raising the northern wall of the sediment pond. Hy-Tec reports that hours of operation were adhered to.	D
L4.3	In addition to the hours of operation specified in Condition L4.1, dispatch activities may be undertaken: a) between 5:00 am and 10:00 pm Monday to Friday; and b) between 6:00 am and 3:00 pm Saturdays	Yes	Hy-Tec reports that dispatch occurred during the approved hours throughout the reporting period.	D
L4.4	Maintenance activities may be undertaken at any time if those activities are inaudible at all residential premises.	Yes	Hy-Tec has confirmed that all maintenance activities were inaudible at residential premises. No noise complaints were received through the reporting period.	D
4. Operating Conditions				
O1 Activities must be carried out in a competent manner				
O1.1	Licensed activities must be carried out in a competent manner. This includes: a) the processing, handling, movement and storage of materials and substances used to carry out the activity; and b) the treatment, storage, processing, reprocessing, transport and disposal of waste generated by the activity.	N	Two discharge events occurred in March 2021 (one uncontrolled and one controlled). Incident reporting following the events confirmed no material harm to the environment occurred. The poly pipes were replaced with steel pipes to reduce impacts in the case of a hole developing.	D

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Cond. No.	Paraphrased Requirement	Compliance	Comment	Basis*
4. Operating Conditions (Cont'd)				
O2 Maintenance of plant and equipment				
O2.1	All plant and equipment installed at the premises or used in connection with the licensed activity: a) must be maintained in a proper and efficient condition; and b) must be operated in a proper and efficient manner.	Yes	Hy-Tec reports that all plant and equipment was maintained and operated in a proper and efficient manner.	D
O3 Dust				
O3.1	The premises must be maintained in a condition which minimises or prevents the emission of dust from the premises.	Yes	Hy-Tec reports that quarry-generated dust was minimal throughout the reporting period. No complaints relating to dust impacts were received.	D
O3.2	The licensee must ensure that all laden vehicles exiting the site have their loads covered.	Yes	Hy-Tec reports that all loads were covered during the reporting period.	D
5. Monitoring and Recording Conditions				
M1 Monitoring Records				
M1.1	The results of any monitoring required to be conducted by this licence or a load calculation protocol must be recorded and retained as set out in this condition.	Yes	All monitoring was conducted and retained in accordance with M1 of EPL 12007	D
M1.2	All records required to be kept by this licence must be: a) in a legible form, or in a form that can readily be reduced to a legible form; b) kept for at least 4 years after the monitoring or event to which they relate took place; and c) produced in a legible form to any authorised officer of the EPA who asks to see them.	Yes	All records have been kept in accordance with condition M1 of EPL 12007.	D
M1.3	The following records must be kept in respect of any samples required to be collected for the purposes of this licence: a) the date(s) on which the sample was taken; b) the time(s) at which the sample was collected; c) the point at which the sample was taken; and d) the name of the person who collected the sample.	Yes	Hy-Tec confirms that all relevant details have been recorded for monitoring activities.	D

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Cond. No.	Paraphrased Requirement	Compliance	Comment	Basis*
5. Monitoring and Recording Conditions (Cont'd)				
M2 Environmental Monitoring				
M2.1	a) The licensee must undertake monthly inspections of the surface water management system at the premises. b) The monthly inspections must: (i) be undertaken immediately upstream and downstream of the quarry disturbance area; (ii) include visual inspection of litter, oil and grease and sediment levels within the surface water system, including diversion channels; (iii) include visual inspection of the physical integrity of the surface water management system, including any signs of erosion; and (iv) include visual inspection of the water level and flow in Tinda Creek.	Yes	Monthly inspections of the surface water management system were undertaken throughout the reporting period in accordance with condition M2 of EPL 12007.	D
M3 Recording of pollution complaints				
M3.1	The licensee must keep a legible record of all complaints made to the licensee or any employee or agent of the licensee in relation to pollution arising from any activity to which this licence applies.	Yes	A complaints register is maintained with two complaints received during the reporting period. Both complaints were investigated and determined to have not been caused by Quarry operations.	D
M3.2	The record must include details of the following: a) the date and time of the complaint; b) the method by which the complaint was made; c) any personal details of the complainant which were provided by the complainant or, if no such details were provided, a note to that effect; d) the nature of the complaint; e) the action taken by the licensee in relation to the complaint, including any follow-up contact with the complainant; and f) if no action was taken by the licensee, the reasons why no action was taken.	Yes	A complaints register is maintained with two complaints received during the reporting period. Both complaints were investigated and determined to have not been caused by Quarry operations.	D
M3.3	The record of a complaint must be kept for at least 4 years after the complaint was made.	Yes	A complaints register is maintained with two complaints received during the reporting period. Both complaints were investigated and determined to have not been caused by Quarry operations.	D
M3.4	The record must be produced to any authorised officer of the EPA who asks to see them.	NYA	No requests were provided during the reporting period.	D
M4 Telephone complaints line				
M4.1	The licensee must operate during its operating hours a telephone complaints line for the purpose of receiving any complaints from members of the public in relation to activities conducted at the premises or by the vehicle or mobile plant, unless otherwise specified in the licence.	Yes	A telephone complaints line was maintained, however, no complaints were received during the reporting period.	D

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Cond. No.	Paraphrased Requirement	Compliance	Comment	Basis*
5. Monitoring and Recording Conditions (Cont'd)				
M4 Telephone complaints line (Cont'd)				
M4.2	The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.	Yes	The telephone complaints number is displayed on a sign at the front gate of the Quarry.	D
M4.3	The preceding two conditions do not apply until 3 months after: the date of the issue of this licence.	Noted		
M5 Noise Monitoring				
M5.1	To assess compliance with the noise limits specified within this licence, the licensee must undertake operator attended noise monitoring at each specified noise monitoring point in accordance with the table below. POINT 1 Assessment period: All hours when in use; Minimum frequency in a reporting period: Yearly; Minimum duration within assessment period: 1 hour; Minimum number of assessment period: 1 operation day	Yes	Noise monitoring was undertaken by Muller Acoustic Consultants in May 2021 in accordance with the approved Noise Management Plan.	D
M5.2	The licensee must undertake noise monitoring as directed by an authorised officer of the EPA.	NYA	No request was made for additional noise monitoring during the reporting period.	D
M5.3	All noise monitoring required by this licence must be undertaken in accordance with Australian Standard AS 2659.1 - 1998: Guide to the use of sound measuring equipment - Portable sound level meters, or any revisions of that standard that may be made by Standards Australia, and the compliance monitoring guidance provided in the NSW Industrial Noise Policy.	Yes	Noise monitoring was undertaken in accordance with Australian Standard AS 2659.1 – 1998.	D
6. Reporting Conditions				
R1 Annual Return Documents				
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 - Requirement 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.	Yes	Annual Return submitted to EPA on 08/07/2021.	D

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for Tinda Creek Sand Project from 1 January 2021 to 31 December 2021

Cond. No.	Paraphrased Requirement	Compliance	Comment	Basis*
6. Reporting Conditions (Cont'd)				
R1 Annual Return Documents (Cont'd)				
R1.2	An Annual Return must be prepared in respect of each reporting period, except as provided below.	Noted		
R1.3	Where this licence is transferred from the licensee to a new licensee: a) the transferring licensee must prepare an Annual Return for the period commencing on the first day of the reporting period and ending on the date the application for the transfer of the licence to the new licensee is granted; and b) the new licensee must prepare an Annual Return for the period commencing on the date the application for the transfer of the licence is granted and ending on the last day of the reporting period.	Noted		
R1.4	Where this licence is surrendered by the licensee or revoked by the EPA or Minister, the licensee must prepare an Annual Return in respect of the period commencing on the first day of the reporting period and ending on: a) in relation to the surrender of a licence - the date when notice in writing of approval of the surrender is given; or b) in relation to the revocation of the licence - the date from which notice revoking the licence operates.	Noted		
R1.5	The Annual Return for the reporting period must be supplied to the EPA via eConnect EPA or by registered post not later than 60 days after the end of each reporting period or in the case of a transferring licence not later than 60 days after the date the transfer was granted (the 'due date').	Yes	Annual Return submitted to EPA 08/07/2021.	D
R1.6	The licensee must retain a copy of the Annual Return supplied to the EPA for a period of at least 4 years after the Annual Return was due to be supplied to the EPA.	Noted		
R1.7	Within the Annual Return, the Statements of Compliance must be certified and the Monitoring and Complaints Summary must be signed by: a) the licence holder; or b) by a person approved in writing by the EPA to sign on behalf of the licence holder.	Yes	Compliance declaration was signed by a Director and Company Secretary.	D
R2 Notification of environmental harm				
R2.1	Notifications must be made by telephoning the Environment Line service on 131 555.	Noted	Notifications during the reporting period were not made using this number but to the relevant EPA Officer. In all instances the Officer acknowledged receipt of the information.	

Yes = Complied with during 2020 No = Not complied with during 2020 ND = Not Determined
NYA = Not Yet Applicable HNC = Historical Non-Compliance ANC = Administrative Non-Compliance
* = Basis for assessment of compliance D = Documentation/Discussion O = Observation during audit
Yes# / No# = Complied / not complied with and compliance no longer required to be assessed

Table A2 (Cont'd)
Internal Compliance Audit of Relevant Conditions of Environment Protection Licence 12007
for Tinda Creek Sand Project from 1 January 2021 to 31 December 2021

Cond. No.	Paraphrased Requirement	Compliance	Comment	Basis*
6. Reporting Conditions (Cont'd)				
R2 Notification of environmental harm (Cont'd)				
R2.2	The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.	Y	The EPA were notified of uncontrolled discharge event on 2 March 2021, the same day the event occurred.	D
R3 Written Report				
R3.1	Where an authorised officer of the EPA suspects on reasonable grounds that: a) where this licence applies to premises, an event has occurred at the premises; or b) where this licence applies to vehicles or mobile plant, an event has occurred in connection with the carrying out of the activities authorised by this licence, and the event has caused, is causing or is likely to cause material harm to the environment (whether the harm occurs on or off premises to which the licence applies), the authorised officer may request a written report of the event.	Y	No requests for written reports of an event were made by the EPA.	D
R3.2	The licensee must make all reasonable inquiries in relation to the event and supply the report to the EPA within such time as may be specified in the request.	Y	No requests for written reports of an event were made by the EPA.	D
R3.3	The request may require a report which includes any or all of the following information: a) the cause, time and duration of the event; b) the type, volume and concentration of every pollutant discharged as a result of the event; c) the name, address and business hours telephone number of employees or agents of the licensee, or a specified class of them, who witnessed the event; d) the name, address and business hours telephone number of every other person (of whom the licensee is aware) who witnessed the event, unless the licensee has been unable to obtain that information after making reasonable effort; e) action taken by the licensee in relation to the event, including any follow-up contact with any complainants; f) details of any measure taken or proposed to be taken to prevent or mitigate against a recurrence of such an event; and g) any other relevant matters.	Y	No requests for written reports of an event were made by the EPA.	D

Yes = Complied with during 2020 No = Not complied with during 2020 ND = Not Determined
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* = Basis for assessment of compliance D = Documentation/Discussion O = Observation during audit
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Table A2 (Cont'd)
Internal Compliance Audit of Relevant Conditions of Environment Protection Licence 12007
for Tinda Creek Sand Project from 1 January 2021 to 31 December 2021

Cond. No.	Paraphrased Requirement	Compliance	Comment	Basis*
6. Reporting Conditions (Cont'd)				
R3 Written Report (Cont'd)				
R3.4	The EPA may make a written request for further details in relation to any of the above matters if it is not satisfied with the report provided by the licensee. The licensee must provide such further details to the EPA within the time specified in the request.	Noted	No feedback has been received by EPA in relation to the R3 written Report.	D
R4 Other reporting conditions				
Noise Monitoring Results				
R4.1	a) The licensee must submit the results of any noise monitoring undertaken in accordance with the requirements of Condition M5.1 or Condition M5.2 to the EPA within three weeks of the noise monitoring being undertaken. b) The noise monitoring results submitted to the EPA must include: (i) a map of each noise monitoring location in relation to the noise source, including relevant distances; (ii) an analysis of the noise monitoring results; (iii) any detected exceedance of the noise limits specified in Condition L4.1; (iv) details of any remedial action taken or proposed to be taken in relation to any exceedance of the noise limits specified in Condition L4.1; (v) details of the prevailing meteorological conditions during the period when the noise monitoring was undertaken; and (vi) confirmation that noise monitoring was/was not undertaken in accordance with Condition M5.3.	Yes	A copy of the Noise Monitoring Assessment is available on the Hy-Tec website and was provided to the EPA within the allocated timeframe. No exceedances were recorded during the reporting period.	D
Surface Water Management System reporting				
R4.2	In accordance with section 5.3 of the approved Water Management Plan for the premises, the licensee must notify the EPA when surface water triggers are exceeded and provide a written report to the EPA.	NYA	No surface water triggers were exceeded during the reporting period.	D
R4.3	The report to the EPA must include: a) the results of surface water management system inspections required in condition M2.1 for the month related to the exceedance, including photographs; and b) appropriate mitigation and contingency measures to be implemented within one month of the exceedance being detected.	NYA	No surface water triggers were exceeded during the reporting period.	D

Yes = Complied with during 2020 No = Not complied with during 2020 ND = Not Determined
NYA = Not Yet Applicable HNC = Historical Non-Compliance ANC = Administrative Non-Compliance
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Table A2 (Cont'd)
Internal Compliance Audit of Relevant Conditions of Environment Protection Licence 12007 for Tinda Creek Sand Project from 1 January 2021 to 31 December 2021

Cond. No.	Paraphrased Requirement	Compliance	Comment	Basis*
6. Reporting Conditions (Cont'd)				
R4 Other reporting conditions (Cont'd)				
R4.4	The report must be submitted to the EPA within one month of surface water triggers being detected and be directed to the Manager, Sydney Industry Section by email to metro.regulation@epa.nsw.gov.au	NYA	No surface water triggers were exceeded during the reporting period.	D
7. General Conditions				
G1 Copy of licence kept at the premises or plant				
G1.1	A copy of this licence must be kept at the premises to which the licence applies.	Yes	A copy of the licence is available at the Quarry.	D
G1.2	The licence must be produced to any authorised officer of the EPA who asks to see it.	Noted		
G1.3	The licence must be available for inspection by any employee or agent of the licensee working at the premises.	Noted		

Yes = Complied with during 2020 No = Not complied with during 2020 ND = Not Determined
NYA = Not Yet Applicable HNC = Historical Non-Compliance ANC = Administrative Non-Compliance
* = Basis for assessment of compliance D = Documentation/Discussion O = Observation during audit
Yes# / No# = Complied / not complied with and compliance no longer required to be assessed

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Appendix 2

Annual Return 2021

(Total No. of pages including blank pages = 4)

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Extractive Materials Return 2020-2021

Regional NSW

Form S1 – Period Ending 30 June 2021

Quote RIMS ID in all correspondence

Quarry Id: Rims ID: 401060 Operators Name: AUS-10 RHYOLITE T/AS HY-TEC INDUSTRIES Address: PO BOX 6770 SILVERWATER NSW 1811 Email: darryl.thiedeke@hy-tec.com.au Quarry Name: TINDA CREEK QUARRY Quarry Address: 6102 PUTTY RD, MELLONG NSW 2756	**Inquiries** please telephone: (02) 4063 6713 **Completed or Nil Returns** Email – mineral.royalty@planning.nsw.gov.au Postal Address (see below) ***Please amend name, postal address and location of mine or quarry if incorrect or incomplete.***

The return should be completed and forwarded to **Senior Advisory Officer, RESOURCE ECONOMICS, STRATEGY, PERFORMANCE & INDUSTRY DEVELOPMENT, DEPARTMENT OF REGIONAL NSW, PO BOX 344 HUNTER REGION MAIL CENTRE NSW 2310 on or before 31 October 2021**. If completion of the return is unavoidably delayed, an application for extension of time should be requested **before** the due date. If no work was done during the year, a **NIL** return must be forwarded.

The return should relate to the **above quarrying establishment** and should cover the operations of quarrying and treatment (such as crushing, screening, washing etc.) carried out at or near the quarry. A return is required even if the operations are solely of a developmental nature and whether the area being worked is held under a mining title or otherwise.

Director, Resources Policy

Please complete all the following information to assist in identifying the location of the Quarry

Typical Geology **Friable Sandstone / Lacustrine**

Nearest Town to Quarry **Wilberforce**

Local Council Name **Hawkesbury Shire Council**

Deposited Plan and Lot Number/s of Quarry **Lots 1 to 3 DP628806**

Email Address of Operator **As above**

Name of Owner or Licensee **As above**

Postal Address of Licensee **As above**

Licence/Lease Number/s (if any)

From Mining, Exploration & Geoscience (NSW Mineral Resources) **N/A**

From Crown Lands or other NSW Department **N/A**

If any output was obtained from land NOT held under licence from the above Departments, state the Name/s and Address/es of the Owners of the land **N/A**

To the best of my knowledge, information entered in this return is correct and no blank spaces left where figures should have been inserted.

- **SIGNATURE of PROPRIETOR or MANAGER** _____ **DATE** 27.10.2021
- **CONTACT PERSON for this return** **Darryl Thiedeke**
- **NAME** (Block letters) **DARRYL THIEDEKE** **Telephone** **02 96472866**

Extractive Materials Return 2020-2021

NSW GOVERNMENT | Regional NSW

Form S1 – Period Ending 30 June 2021

Sales During 2020-2021

Production information may be published in aggregated form for statistical reporting. However, production data for individual operations is kept strictly confidential.

Product	Description	Quantity Tonnes
Virgin Materials		
Crushed Coarse Aggregates		
Over 75mm		
Over 30mm to 75mm		
5mm to 30mm		
Under 5mm		
Natural Sand	Washed fine sand	**124,060**
Manufactured Sand		
Prepared Road Base & Sub Base		
Other Unprocessed Materials		
Recycled Materials		
Crushed Coarse Aggregates		
Over 75mm		
Over 30mm to 75mm		
5mm to 30mm		
Under 5mm		
Natural Sand		
Manufactured Sand		
Prepared Road Base & Sub Base		
Other Unprocessed Materials		
River Gravel		
Over 30mm		
5mm to 30mm		
Under 5mm		
Construction Sand	Excluding Industrial	
Industrial Sand		
Foundry, Moulding		
Glass		
Other (Specify)		
Dimension Stone	Building, Ornamental, Monumental	
Quarried in Blocks		
Quarried in Slabs		
Decorative Aggregate	Including Terrazzo	
Loam	Soil for Topdressing, Garden soil, Horticultural purposes)	
TOTAL SITE PRODUCTION		**124,060t**
Gross Value ($) of all Sales		**$3.3M**
Type of Material		
Number of Full-Time Equivalent (FTE) Employees	**Employees** 6	**Contractors** 1

Please Note: A return for clay-based products can be obtained by contacting the inquiry number.

Appendix 3

Noise Monitoring Assessment

Prepared by Muller Acoustic Consulting Pty Ltd

(Total No. of pages including blank pages = 24)

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Noise Monitoring Assessment

Tinda Creek Quarry
Tinda Creek, NSW

May 2021

Prepared for: RW Corkery & Co Pty Limited
May 2021
MAC180647RP4

Muller Acoustic Consulting

Document Information

Noise Monitoring Assessment

Tinda Creek Quarry, Tinda Creek, NSW

May 2021

Prepared for: RW Corkery & Co Pty Limited
Level 1, 12 Dangar Road
Brooklyn NSW 2083

Prepared by: Muller Acoustic Consulting Pty Ltd
PO Box 678, Kotara NSW 2289
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www.mulleracoustic.com

Document ID	Status	Date	Prepared By	Signed	Reviewed By	Signed
MAC180647RP4	Final	14 May 2021	Robin Heaton	Robin Heaton	Oliver Muller	

CONTENTS

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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by RW Corkery & Co Pty Limited (RWC) on behalf of Hy-Tec Industries Pty Ltd (Hy-Tec) to complete a Noise Monitoring Assessment (NMA) for the Tinda Creek Quarry, Tinda Creek, NSW (the 'project').

The monitoring has been conducted in accordance with the approved Tinda Creek Quarry Noise Management Plan and in general accordance with Conditions L3.1 and M5 of EPL#12007 (EPL).

The assessment was conducted in accordance with the following documents:

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI), 2017;
- Environment Protection Licence EPL#12007;
- Umwelt Pty Ltd, Tinda Creek Quarry Noise Management Plan (NMP); and
- Australian Standard AS 1055:2018 - Acoustics - Description and measurement of environmental noise.

The assessment was undertaken on Tuesday 11 May 2021 and forms part of the noise monitoring program to address conditions of EPL#12007 and the Noise Management Plan.

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A**.

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2 Noise Criteria

2.1 Attended Noise Compliance

Section L3.1 of the Tinda Creek EPL, approved on 3 March 2017, outlines the applicable noise criteria for all privately owned residential receivers surrounding the project. The operating criteria specified in the EPL at all receivers is 35dB $LA_{eq(15min)}$ for all periods and 45dB LA_{max} during the night time period. **Table 1** presents the criteria for privately owned residential receivers surrounding the project, as outlined in the EPL.

Table 1 Noise Criteria

Receiver	All Hours dB(A) $LA_{eq(15min)}$	Night (10pm to 7am) dB(A) LA_{max}
All privately owned residences	35	45

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3 Methodology

3.1 Locality

The project is located on Putty Road, Tinda Creek, NSW, approximately 67km north of Windsor, NSW. Receivers in the locality surrounding the project are primarily rural/residential. Putty Road is situated to the west of the site with the Yengo National park bordering the site in all other directions.

3.2 Noise Monitoring Locations

Section M5.1 of the EPL specifies that noise monitoring is to be conducted for a minimum duration of one hour at the boundary of R1, (6255 Putty Road, Mellong) as detailed in Figure 6.1 of the Tinda Creek Noise Management Plan.

It should be noted that access to the property was not possible during the time of the noise measurements. Therefore, attended measurements were conducted at the boundary gate (NM1) of the property, as shown in **Figure 1**.

Following a request from the Department of Environment and Planning (DPE) on 20 January 2017, two additional near-field monitoring locations were selected to quantify project noise levels and limiting noise influence from Putty Road. The locations include a position adjacent to the dam and a second location adjacent to the main plant. The noise levels monitored at these locations were used to quantify the overall sound power of the onsite operations, which was then used to calculate the noise contribution at surrounding noise sensitive receivers (ie R2 and R3).

The three monitoring locations, their MGA 56 coordinates and duration of measurement period are outlined in **Table 2** and are presented visually in the locality plan shown in **Figure 1**.

Table 2 Receiver Locations

Receiver ID	Receiver Location	MGA56 Coordinates		Duration	Periods Monitored
R1	6255 Putty Road	284801	6329055	1 Hour	Morning Shoulder, Day
Q1	Dam Plant	285984	6327973	15 mins	Morning Shoulder, Day
Q2	Main Plant	285991	6327885	15 mins	Morning Shoulder, Day

3.3 Assessment Methodology

All noise surveys were conducted in general accordance with the procedures described in Australian Standard AS 1055:2018, "Acoustics - Description and Measurement of Environmental Noise" and the EPL. The acoustic instrumentation used carries current NATA calibration and complies with AS IEC 61672.1-2019-Electroacoustics - Sound level meters - Specifications. Calibration of all instrumentation was checked prior to and following measurements. Drift in calibration did not exceed ±0.5dBA.

Attended noise measurements were carried out using a Svantek Type 1, 971 noise analyser on Tuesday 11 May 2021. Four noise measurements of 15 minutes in duration were conducted at NM1 (R1) monitoring location during the day and morning shoulder monitoring periods. Where possible, throughout each survey, the operator quantified the contribution of each significant noise source.

Additionally, unattended noise monitoring was conducted at nearfield locations for a period of one hour during the day and morning shoulder monitoring periods to quantify the noise emissions from the quarry. These measurements were carried out using Svantek Type 1, 977 and Svantek Type 1, 971 noise analysers.

3.4 Operational Log

Transportation activities commenced at 5:30am and work shifts including operation of processing equipment commenced at 7am on the day of the survey. Morning shoulder measurements were conducted from 6am to 7am to capture the onsite loading and transportation operations. Daytime operations commenced at approximately 7am with the daytime monitoring conducted from 7:30am to 8:30am.

FIGURE 1

LOCALITY PLAN

REF: MAC180647

0 500m

KEY

- R1 — RECEIVER LOCATION
- NM1 — NOISE MONITORING LOCATION
- PROJECT BOUNDARY

MAC
Muller Acoustic Consulting

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4 Results

4.1 Morning Shoulder Results

Four attended noise measurements of 15-minutes in duration were completed during the morning shoulder assessment period at NM1 on Tuesday 11 May 2021. **Table 3** presents the monitored noise level contributions and observed meteorological conditions for each measurement.

Table 3 Operator-Attended Noise Survey Results – Morning Shoulder Period, Location NM1

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
11/05/2021	06:00	67	45	23	WD: W WS: 0.1m/s Rain: Nil	Traffic 25-67 Birds 20-48 Site Hum/Site Vehicles <20
11/05/2021	06:15	65	45	20	WD: W WS: 0.1m/s Rain: Nil	Traffic 20-65 Birds 20-51 Site Hum/Site Vehicles <20
11/05/2021	06:30	61	41	20	WD: W WS: 0.1m/s Rain: Nil	Traffic 20-61 Birds 21-44 Site Hum/Site Vehicles <20
11/05/2021	06:45	69	48	21	WD: W WS: 0.1m/s Rain: Nil	Traffic 20-64 Birds 20-45 Aircraft 20-30 Site Hum/Site Vehicles <20
Tinda Creek Quarry $L_{Aeq(15min)}$ Contribution						<20

Unattended noise monitoring was completed during the morning shoulder assessment period at Q1 and Q2 on Tuesday 11 May 2021. **Table 4** presents the monitored 15-minute noise levels, observed on-site activities (from audio recordings) and meteorological conditions at the time of measurements.

Table 4 Unattended Noise Survey Results – Morning Shoulder Period, Location Q1 and Q2

Location	Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Onsite Activities
			L_{Amax}	L_{Aeq}	L_{A90}		
Q1	11/05/2021	06:30	85	67	52	WD: W WS: 0.1m/s Rain: Nil	Vehicle Loading 43-85
Q2	11/05/2021	06:30	76	58	43		

4.2 Day Assessment Results

Four attended noise measurements of 15-minutes in duration were completed during the daytime assessment period at NM1 on Tuesday 11 May 2021. **Table 5** presents the monitored noise level contributions and observed meteorological conditions for each measurement.

Table 5 Operator-Attended Noise Survey Results – Day Period, Location NM1

Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
		L_{Amax}	L_{Aeq}	L_{A90}		
11/05/2021	07:45	74	51	20	WD: W WS: 0.1m/s Rain: Nil	Traffic 20-74 Birds 20-44 Aircraft 20-33 Site Hum/Site Vehicles <20
11/05/2021	08:00	72	48	17	WD: W WS: 0.1m/s Rain: Nil	Traffic 20-72 Birds 20-53 Site Hum/Site Vehicles <20
11/05/2021	08:15	67	49	21	WD: W WS: 0.1m/s Rain: Nil	Traffic 20-68 Birds 20-41 Site Hum/Site Vehicles <20
11/05/2021	08:30	68	47	19	WD: W WS: 0.1m/s Rain: Nil	Traffic 20-68 Birds 20-42 Site Hum/Site Vehicles <20
Tinda Creek Quarry $L_{Aeq(15min)}$ Contribution						<20

Unattended noise monitoring was completed during the daytime assessment period at Q1 and Q2 on Tuesday 11 May 2021. **Table 6** presents the monitored 15-minute noise levels, observed on-site activities (from audio recordings) and meteorological conditions at the time of measurements.

Table 6 Unattended Noise Survey Results – Day Period, Location Q1 and Q2

Location	Date	Time (hrs)	Descriptor (dBA re 20 µPa)			Meteorology	Description and SPL, dBA
			L_{Amax}	L_{Aeq}	L_{A90}		
Q1	11/05/2021	08:00	62	59	58	WD: W WS: 0.1m/s Rain: Nil	Sand Processing Vehicle Loading Generator 53-65
Q2	11/05/2021	08:00	65	54	53		

5 Noise Compliance Assessment

5.1 Attended Noise Measurement Compliance Assessment

The compliance assessment summary results for R1 are presented in **Table 7** for day and morning shoulder assessment periods and compares project contributions against relevant criteria.

Table 7 Day and Morning Shoulder Noise Compliance Assessment

Period	Quarry Noise Contribution	Quarry Noise Criteria	Compliant
	dB $LA_{eq(15min)}$	dB $LA_{eq(15min)}$	
Day	<20	35	✓
Morning Shoulder	<20	35	✓

5.2 Calculated DPE Assessment Methodology

From the noise measurements at monitoring location Q1 and Q2 the $LA_{eq(15min)}$ sound power of the quarry was calculated to be 105dBA. The contribution at each of the receivers R1 to R3 has been calculated taking into account loss due to distance and topography. This noise level was propagated to the surrounding noise sensitive receivers, with the calculated received noise level presented in **Table 8.** Results of the calculations generally align with the measured noise contributions from the project and therefore validate compliance.

Table 8 Calculated DPE Compliance Assessment

Receiver	Quarry Sound Power dB	Distance to Receiver m	Distance attenuation dB	Attenuation due to Topography dB	Calculated Quarry Contribution dB $LA_{eq(15min)}$
R1	105	2050	74	12	19
R2	105	2210	75	12	18
R3	105	2030	74	12	19

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6 Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Monitoring Assessment for RW Corkery & Co Pty Limited on behalf of Hy-Tec Industries Pty Ltd for the Tinda Creek Quarry, Tinda Creek, NSW. The assessment was completed to assess the quarry's compliance with the relevant criteria outlined in EPL#12007 for the nominated residential receiver surrounding the quarry.

Operator attended noise monitoring was undertaken on Tuesday 11 May 2021 at the nominated monitoring locations with quarry noise contributions compared against the relevant criteria.

The assessment has identified that noise emissions generated by Tinda Creek Quarry comply with relevant noise criteria specified in EPL#12007 at the assessed receiver location for both the morning shoulder and daytime monitoring periods.

Furthermore, the calculated noise contribution at two nearfield reference locations demonstrate that project noise contributions satisfy relevant criteria at R1, R2 and R3.

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Appendix A – Glossary of Terms

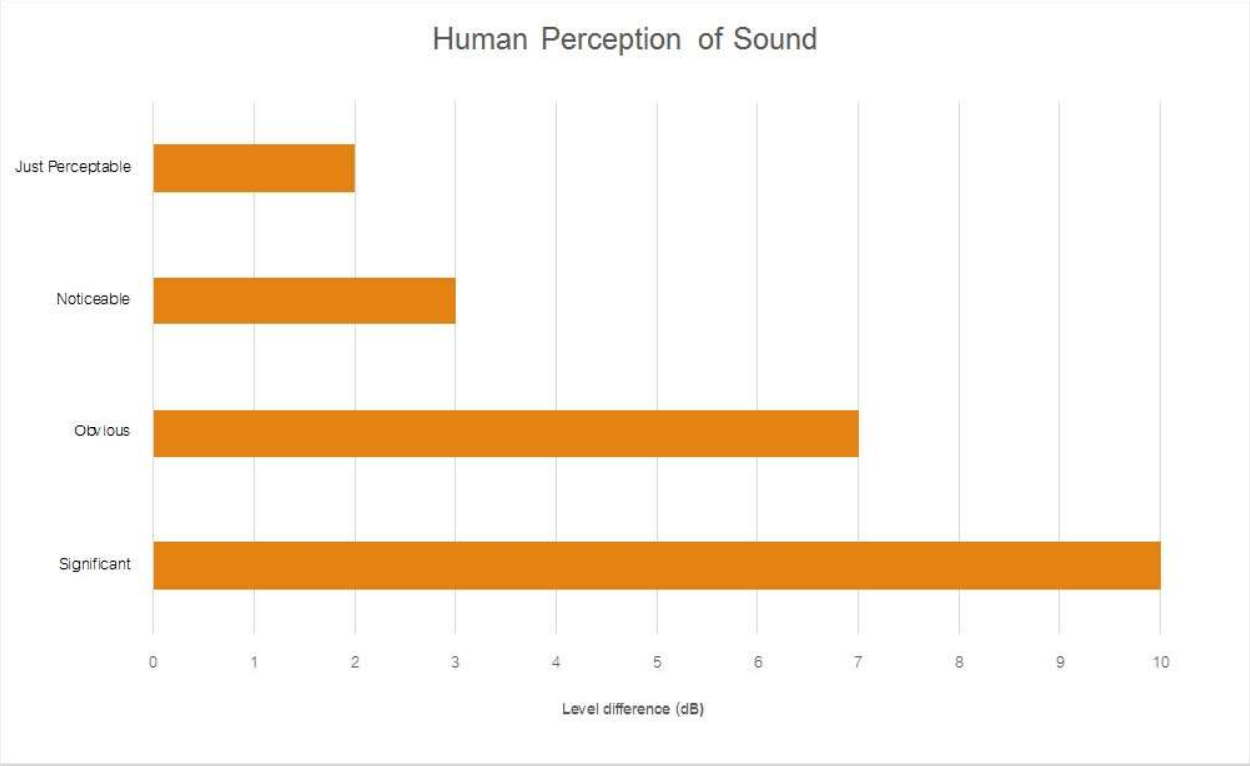
Table A1 provides a number of technical terms have been used in this report.

Table A1 Glossary of Terms	
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured LA90 statistical noise levels.
Ambient Noise	The noise associated with a given environment. Typically a composite of sounds from many sources located both near and far where no particular sound is dominant.
A Weighting	A standard weighting of the audible frequencies designed to reflect the response of the human ear to noise.
dBA	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
dB(Z), dB(L)	Decibels Linear or decibels Z-weighted.
Hertz (Hz)	The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.
LA10	A noise level which is exceeded 10 % of the time. It is approximately equivalent to the average of maximum noise levels.
LA90	Commonly referred to as the background noise, this is the level exceeded 90 % of the time.
LAeq	The summation of noise over a selected period of time. It is the energy average noise from a source, and is the equivalent continuous sound pressure level over a given period.
LAmax	The maximum root mean squared (rms) sound pressure level received at the microphone during a measuring interval.
RBL	The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the intrusiveness criteria for noise assessment purposes and is the median of the ABL's.
Sound power level (LW)	This is a measure of the total power radiated by a source. The sound power of a source is a fundamental location of the source and is independent of the surrounding environment. Or a measure of the energy emitted from a source as sound and is given by: = 10.log10 (W/Wo) Where: W is the sound power in watts and Wo is the sound reference power at 10-12 watts.

Table A2 provides a list of common noise sources and their typical sound level.

Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA	
Source	Typical Sound Level
Threshold of pain	140
Jet engine	130
Hydraulic hammer	120
Chainsaw	110
Industrial workshop	100
Lawn-mower (operator position)	90
Heavy traffic (footpath)	80
Elevated speech	70
Typical conversation	60
Ambient suburban environment	40
Ambient rural environment	30
Bedroom (night with windows closed)	20
Threshold of hearing	0

Figure A1 – Human Perception of Sound



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MAC
Muller Acoustic Consulting

Appendix 4

Offset Vegetation, Revegetation and Koala Monitoring Report 2021

Prepared by EMM Consulting

(Total No. of pages including blank pages = 62)

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Offset vegetation, revegetation and Koala monitoring report 2021

Tinda Creek Quarry

Prepared for Hy-Tec Concrete and Aggregates (Hy-Tec)
March 2022

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Perth WA 6000
T 02 9339 3184

CANBERRA
Level 2, Suite 2.04, 15 London Circuit
Canberra City ACT 2601

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Offset vegetation, revegetation and Koala monitoring report 2021

Tinda Creek Quarry

Report Number

E210625 RP1

Client

Hy-Tec Concrete and Aggregates (Hy-Tec)

Date

17 March 2022

Version

v1

Prepared by

Ross Davey / Paul Rossington
Ecologist/ Associate Ecologist
28 March 2022

Approved by

Sarah Perry
Associate Ecologist
28 March 2022

Table of Contents

Appendices

Tables

Figures

1 Introduction

1.1 Background

EMM Consulting Pty Limited (EMM) was engaged by Hy-Tec Concrete and Aggregates (Hy-Tec), to carry out the fourth year of biodiversity monitoring as defined in the draft Landscape Management Plan (LMP) for the Tinda Creek Quarry (R.W. Corkery & Co. 2021).

Tinda Creek Quarry is located 23 kilometres (km) north of Colo Heights in the Hawkesbury City local government area (LGA). The quarry is situated between Wollemi National Park to the west and Yengo National Park to the east. The regional location is illustrated in Figure 1.1.

The first monitoring survey was undertaken by Niche Environment and Heritage (Niche) in December 2018 (Niche 2019). The methods used by Niche to undertake the monitoring were based on the monitoring framework described in the previous iteration of the LMP, prepared by Umwelt (2016).

Monitoring surveys were completed by EnviroKey during year two (EnviroKey 2020) and year three (EnviroKey 2021).

1.2 The project

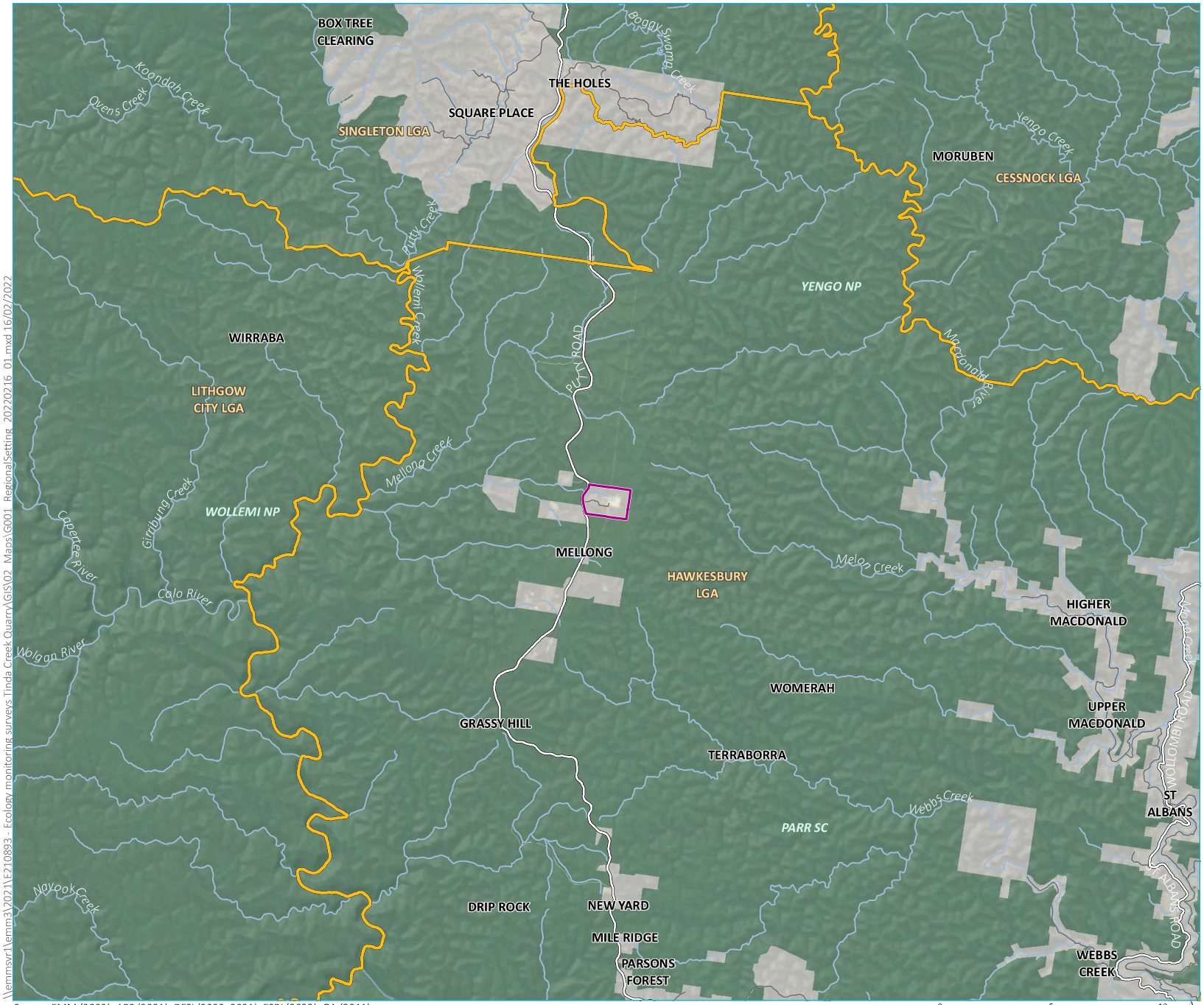
The Tinda Creek Quarry Extension Project involves the extraction of up to 300,000 tonnes per annum (tpa) of sand from six extraction domains. Throughout the project planning process, Hy-Tec committed to the application of the avoid and minimise hierarchy on potential biodiversity impacts. This included avoiding and minimising impacts to key vegetation communities and threatened flora and fauna habitat. An area of 106.6 hectares (ha) of adjacent land has been retained to offset the proposed disturbance area and will be managed for conservation in perpetuity with likely transfer into Yengo National Park, referred to as the Biodiversity Offset Area (BOA). The study area, which includes the BOA, is illustrated in Figure 1.2.

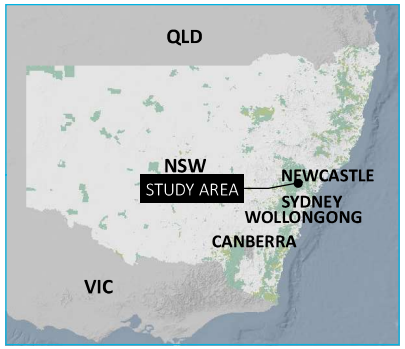
1.3 Purpose and objectives

The draft LMP (R.W. Corkery and Co. 2021) identified the following key ecological values present within the Tinda Creek Quarry project area.

- known and potential habitat for at least 18 threatened fauna species, listed under the *Biodiversity Conservation Act 2016* (BC Act) and/or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act);
- a large population of *Grevillea parviflora* subsp. *parviflora*, listed as Vulnerable under the BC Act and EPBC Act; and
- the presence of groundwater dependent ecosystems (GDEs), Mellong Sandmass Swamp Woodland and Mellong Sandmass Sedgeland, these are naturally rare and isolated communities considered to be of high conservation value.

This monitoring report aims to assess the success of site management, rehabilitation, and the possible impacts to the BOA with reference to performance targets. The surveys were conducted in line with the draft management plans (R.W. Corkery and Co. 2021).





KEY

- Study area
- Major road
- Minor road
- Named watercourse
- Named waterbody
- Local government area
- NPWS reserve
- State forest

Source: EMM (2022); ABS (2021); DFSI (2020, 2021); ESRI (2022); GA (2011)

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Regional setting

Tinda Creek Quarry
Biodiversity monitoring report
Figure 1.1

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KEY

- Study area
- Extraction area
- Quarry access road
- Internal access track
- Major road
- Minor road
- Watercourse/drainage line
- NPWS reserve
- Biodiversity offset area
- Area under rehabilitation

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Source: EMM (2022); ABS (2021); DFSI (2020, 2021); ESRI (2022); GA (2011)

0 250 500 m

GDA2020 MGA Zone 56

N

Identification of the Study Area and Biodiversity Offset Area

Tinda Creek Quarry
Biodiversity monitoring report
Figure 1.2

EMM
creating opportunities

2 Methodology

This section provides a brief description of the methodology used to monitor the biodiversity values within the study area.

2.1 Qualification and experience of personnel

Preparation of this report and associated fieldwork were undertaken by Paul Rossington, an Accredited Assessor under the BC Act (BAAS18065), with field assistant Jennifer Lindsay under the authority of a Scientific License (SL100409).

2.2 Vegetation monitoring

Field surveys were conducted between 20 and 22 December 2021 by Associate Ecologist Paul Rossington and Assistant Ecologist Jennifer Lindsay.

The monitoring design and methodology follows the methods specified in the draft LMP (R.W. Corkery and Co. 2021), including:

- utilisation of the Biodiversity Assessment Method (BAM) data collection method for analysis of vegetation condition;
- establishment of BAM plots in areas that have been subject to rehabilitation;
- BAM plots in analogue sites within areas of native vegetation corresponding to vegetation communities to be rehabilitated to provide vegetation condition benchmarks; and
- comparison of data monitoring within rehabilitation areas and analogue sites to monitor and determine if rehabilitation completion criteria are met.

During the 2018 monitoring survey (Niche 2019) monitoring plots were established however, the 2019 Gospers Mountain Wildfire resulted in damage to field equipment including timber marker pegs. These plots comprised of a 50 x 20 m plot-transect conducted in accordance with the 'Biometric' method, as used in the BioBanking Assessment Methodology (BBAM) (OEH 2014), with a number of extra parameters also recorded (Section 2.1. of Niche 2019).

The draft LMP (R.W. Corkery and Co. 2021) specified the locations of three new BAM plots (B1, B2 and B3) in the rehabilitation area (Plate 2.1).

Six BAM plots (B4 to B9 analogue sites) within areas of remnant vegetation to provide a benchmark in terms of species composition, diversity and structure. These analogue sites will be used for future monitoring assessment to determine if rehabilitation completion criteria are met. Monitoring will be undertaken annually within analogue sites throughout the operational period of the Quarry. BAM plot data is provided in Appendix A.

Plate 2.1 BAM Plot 1 – surveys deferred until further rehabilitation has been undertaken

BAM plot locations are illustrated within Figure 2.1 and Global Positioning System (GPS) coordinates of EMM's BAM plots are presented in Table 2.1.

Table 2.1 EMM's BAM plot locations

BAM plot	Location	
	Latitude	Longitude
B1	-33.1665	150.7060
B2	-33.1659	150.7087
B3	-33.1649	150.7106
B4	-33.1653	150.6937
B5	-33.1655	150.6947
B6	-33.161	150.7075
B7	-33.1628	150.7126
B8	-33.1668	150.7131
B9	-33.1713	150.7122

At each BAM plot, one photo was taken to allow for visualisation of the changes in vegetation and habitat type over time. Photo reference points from the 2021 monitoring survey are presented in Appendix B.

2.3 *Grevillea parviflora* spp. *parviflora* monitoring

All nine of the 10 m x 10 m *Grevillea parviflora* subsp. *parviflora* monitoring plots, established during the initial 2018 monitoring surveys (Niche 2019), were resurveyed. The survey technique involved counting the number of stems of *Grevillea parviflora* subsp. *parviflora* within the monitoring plots. Threatened flora plot locations are illustrated in Figure 2.1 and GPS coordinates of EMM's threatened flora plots are represented in Table 2.2.

Table 2.2 *Grevillea parviflora* subsp. *parviflora* plot locations

Grevillea plot	Location	
	Latitude	Longitude
1	-33.16782	150.710237
2	-33.168618	150.710302
3	-33.16935	150.711094
4	-33.16987	150.711109
5	-33.170039	150.712354
6	-33.161185	150.712342
7	-33.161596	150.712797
8	-33.161022	150.713246
9	-33.163537	150.713348

In accordance with the methodology outlined in the Threatened Biodiversity Profile Search for *Grevillea parviflora* subsp. *parviflora* (OEH 2022a) the stems of the *Grevillea parviflora* subsp. *parviflora* were counted rather than the individual plants. This is due to the particular reproductive and growth habits of this species which include suckering from rootstock and spreading vegetatively.

It is recommended that future *Grevillea parviflora* subsp. *parviflora* monitoring plots are undertaken in line with the OEH (2022a) methodology so that comparing results is more accurate.

Photo monitoring points for *Grevillea parviflora* spp. *Parviflora* can be found in Appendix C.

2.4 Aquatic monitoring

Monitoring of aquatic habitat within and downstream from the Quarry Site were undertaken at seven of the recommended eight aquatic ecology monitoring sites (A1 to A8) (Figure 2.1) (R.W. Corkery and Co. 2021). The GPS coordinates of these sites are shown in Table 2.3.

Table 2.3 Aquatic monitoring plot locations

Aquatic plot	Location	
	Latitude	Longitude
A1	-33.171469	150.711413
A2	-33.162391	150.70945
A3	-33.16626	150.709865
A4	-33.161881	150.702218
A5	-33.163076	150.69359
A6	-33.159565	150.684562
A7	-33.157428	150.673268
A8	-33.151280	150.688925

Aquatic monitoring included the following:

- record of stream width and a description of edge habitat and riparian vegetation;
- description of stream features including substrate, vegetation and organic material; and
- record of general site observations, including a description of the catchment and local land uses.

Aquatic monitoring did not follow AUSRIVAS Australian Rivers Assessment System (Turak et al. 2004) due to the limited or no water at the monitoring sites. Site 8 was not surveyed due to limited water in downstream sites.

Photo monitoring for the aquatic plots can be found in Appendix D.

Source: EMM (2022); ABS (2021); DFSI (2020, 2021); ESRI (2022); GA (2011)

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Ecological monitoring locations

Tinda Creek Quarry
Biodiversity monitoring report
Figure 2.1

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2.5 Koala population monitoring

The Koala (*Phascolarctos cinereus*), listed as Endangered under the EPBC Act and Vulnerable under the BC Act, has been historically recorded in the Tinda Creek region, during the 2018 monitoring survey (Niche 2019), and during the 2020 (EnviroKey 2021).

The draft LMP (R.W. Corkery and Co. 2021) recommends Koala surveys to be undertaken every two years therefore no spotlight or call back surveys were undertaken. However, alongside the BAM plots, evidence of Koalas was searched for using the Spot Assessment Technique (SAT). SAT surveys records evidence of Koalas (scat) under 30 trees per site. Every mature eucalyptus tree within each of the BAM plots was carefully inspected by ecologists familiar with Koala signs. These inspections included scat searches across the entirety of the plot and observing for scratches on the trees. The tree canopy was also thoroughly searched for individual Koalas.

2.6 Limitations

2.6.1 Vegetation monitoring

Due to the 2019 Gospers Mountain Wildfire and the subsequent destruction of pegged plots, the BAM plot locations were identified using Figure 9 of the draft LMP (R.W. Corkery and Co.2021) and undertaken as close as visually identified.

It is important to note that comparisons in vegetation floristics, composition, structure, and function before and after the 2019 fire must take into account the effects of fire on the ecology within the study area.

2.6.2 *Grevillea parviflora* spp. *parviflora* monitoring

Due to the 2019 Gospers Mountain Wildfire and the subsequent destruction of pegged plots Threatened flora plot locations were identified using Map 3 of EnviroKey (2021) and Niche (2019) to ensure the monitoring surveys were as close as visually identified.

Going forward GPS coordinates of the *Grevillea parviflora* subsp. *parviflora* plots undertaken in this monitoring period have been provided in Table 2.2 of this report.

2.6.3 Aquatic monitoring

Aquatic monitoring was limited by the small volume of water within some of the monitoring sites. No flowing water was recorded at any of the seven sites, with a stream channel absent within three sites (Aquatic Sites A1, A3, and A7).

3 Results

3.1 Vegetation monitoring

3.1.1 Species richness and composition

The year four monitoring period (2021) recorded a total of 167 flora species within the BAM plots, comprising 156 native species and 11 exotic species (Appendix A). The average species richness per vegetation community between 2019-2021 is displayed in Table 3.1. Average native species richness increased from 2020 to 2021 in all vegetation communities with the exception of Mellong Sandmass Swamp Woodland. The highest increase between 2020 to 2021 was 19 species recorded within the Hawkesbury Hornsby Plateau Exposed Woodland. The increase in species richness between 2020-2021 is a sign of the vegetation communities recovering from the 2019 Gospers Mountain bushfire and the ability of fire dependent species to re-germinate and proliferate.

Table 3.1 Average native species richness per vegetation community in 2019, 2020, and 2021 within 400 m^2 plots

Vegetation Community	2019	2020	2021
Hawkesbury Hornsby Plateau Exposed Woodland	30.5	32.0	51
Mellong Sandmass Dry Woodland	30.4	29.6	35.5
Mellong Sandmass Sedgeland	12.5	12	25
Mellong Sandmass Swamp Woodland	21.0	21.3	18
Stringybark – Ironbark Forest	23.7	31.0	40
Regenerating Mellong Sandmass Woodland	27	18	25.5

Plots B1, B2 and B3 were undertaken within the rehabilitation site (Figure 2.1). Native species richness, tree count, hollow bearing tree count, length of lots and average litter cover recorded within the rehabilitation site (Plot B2 and Plot B3) has been compared with Plot B7 (an analogue site containing benchmark values).

Table 3.2 BAM plot values within rehabilitation sites and plot B7 (analogue site)

BAM plot	Site type	Native species richness	Tree count: ≥30 cm DBH	Tree count: <30 cm DBH	Number of hollow trees	Length of logs (m)	Average litter cover (%)
B1	Rehabilitation	0	0	0	0	0	-
B2	Rehabilitation	18	0	1	0	0	11
B3	Rehabilitation	33	0	2	0	0	21
B7	Analogue	38	4	4	3	3	83

Note: - metric not measured.

3.1.2 Occurrence and abundance of weeds

Exotic species were recorded across multiple locations within the study area; particularly along the Quarry Access Road, vehicle tracks and within some previously disturbed non-operational areas. Weeds recorded that are considered of particular environmental risk include the exotic perennial grasses African Lovegrass (*Eragrostis curvula*), Coolatai grass (*Hyparrhenia hirta*), and Tussock paspalum (*Paspalum quadrifarium*).

Plots B4 to B9 contained vegetation in generally good condition with minimal exotic cover. Vegetation condition in these areas is anticipated to continue to improve as the post-fire recovery process continues.

Number of weed species recorded during 2020 (EnviroKey) and 2021 are presented in Table 3.3. Plots established by the draft LMP (R.W. Corkery and Co. 2021) (Plots B1, B2, B4 and B5) have no equivalent plots to compare.

Table 3.3 Diversity of weed species in 2020 and 2021

2021 BAM Plots	2020 BBAM Plots (EnviroKey 2021)	Number of weed species (2020) (EnviroKey 2021)	Number of weed species (2021)
B3	Plot 18	2	3
B6	Plot 12	0	2
B7	Plot 16	0	0
B8	Plot 8	1	0
B9	Plot 6	0	1

The diversity and associated cover of exotic species recorded within rehabilitation sites and analogue site is presented in Table 3.4.

Table 3.4 Diversity and cover of exotic species in the rehabilitation site and analogue site

2021 BAM plots	Site type	Number of exotic species	Cover (%)
B1	Rehabilitation	3	80
B2	Rehabilitation	3	0.3
B3	Rehabilitation	3	45.3
B7	Analogue	0	0

Weed occurrence and abundance in all plots appears to be similar to that described in the 2020 monitoring period (EnviroKey 2021), ie low to moderate abundance. The exception to this is Plot B3 within the rehabilitation area that contained substantial regrowth of native vegetation but also a high exotic cover (45.3%), made up mostly of exotic grasses such as African Lovegrass. This is a similar result to 2020 which recorded an exotic cover of 46% (EnviroKey 2021).

3.1.3 Composition, structure and function

The composition, structure and function for each BAM plot is provided in Table 3.5.

Table 3.5 Composition, structure and function of the BAM plots surveyed

BAM plot	Vegetation Community	Tree count: 80 cm plus	Tree count: 50–79 cm	Tree count: 30–49 cm	Tree count: 20–29 cm	Tree count: 10–19 cm	Tree count: 5–9 cm	Tree count: <5 cm	Number of hollow trees	Length of logs (m)	Subplot 1 – Litter cover (%)	Subplot 2 – Litter cover (%)	Subplot 3 – Litter cover (%)	Subplot 4 – Litter cover (%)	Subplot 5 – Litter cover (%)
B1	Regenerating Mellong Sandmass Dry Woodland	0	0	0	0	0	0	0	0	0	-	-	-	-	-
B2	Regenerating Mellong Sandmass Dry Woodland	0	0	0	0	0	0	1	0	0	5	1	40	3	4
B3	Regenerating Mellong Sandmass Dry Woodland	0	0	0	0	1	0	1	0	0	15	25	20	25	20
B4	Mellong Sandmass Swamp Woodland Modified -Overstory Absent	0	0	0	0	0	0	30	0	0	30	15	20	25	15
B5	Mellong Sandmass Dry Woodland Derived Native Grassland	1	0	0	0	0	0	1	0	0	30	80	45	20	90
B6	Stringybark – Ironbark Forest	1	1	0	1	1	1	1	0	74	80	95	80	70	85
B7	Mellong Sandmass Dry Woodland	1	2	1	1	1	1	1	3	3	85	95	90	75	70
B8	Hawkesbury Hornsby Plateau Exposed Woodland	0	0	0	1	1	1	1	0	48	35	40	50	45	30
B9	Mellong Sandmass Sedgeland	0	0	0	0	0	0	5	0	0	20	45	20	15	15

3.2 *Grevillea parviflora* spp. *parviflora* monitoring

Grevillea parviflora subsp. *parviflora* was recorded within all 2021 monitoring plots (Table 3.6). Year three (2020), recorded the species within five of the nine plots (EnviroKey 2021). Year four (2021) plot monitoring indicates the distribution of *Grevillea parviflora* subsp. *parviflora* is increasing with sites 7, 8 and 9 recording *Grevillea parviflora* subsp. *parviflora* in 2021, compared to no individuals recorded in 2019.

Table 3.6 Results from 2019-2021 Grevillea parviflora plot monitoring

Site	2019 count	2020 count[1]	2021 count[2]
1	38	0	21
2	7	0	103
3	25	18	14
4	1	10	53
5	19	35	9
6	35	16	26
7	0	0	25
8	0	0	12
9	0	1	22
Total	**125**	**80**	**285**

Notes: 1. Count of number of individuals.
2. Count of stems.

3.3 Aquatic monitoring

3.3.1 Description of aquatic habitats within the study area

Aquatic habitats within the Quarry Site include Tinda Creek and a range of artificial diversion channels and dams. Tinda Creek is an ephemeral watercourse which has been diverted around the eastern and northern boundaries of operational areas via a small earthen drainage channel. Tinda Creek joins with other ephemeral second order streams at the northern boundary of the Quarry Site.

The land-uses within and adjacent to the aquatic sites include National Parks, clearing associated with private property, BOAs, and rehabilitation areas. The catchment area is comprised of low undulating rises that reach elevations of 310 m to 350 m in the area surrounding the quarry site.

3.3.2 Observations from aquatic monitoring sites

The aquatic monitoring sites were observed completely dry or had pools of moderately turbid and tannin-stained standing water. No flowing water was observed at any of the seven sites. Several of the sites do not contain distinct stream channels but are in low-lying sedgeland swamp areas. The results from the specific sites are detailed below:

- Aquatic Site 1: Sedgeland swamp in good condition with minimal disturbance. No stream channel was present.

- Aquatic Site 2: Dry artificial channel through sedge swamp woodland leading into nearby dam. Vegetation within the site is similar to the surrounding swamp but less dense. The channel is approximately 2 m in width.

- Aquatic Site 3: Highly modified and disturbed area with no stream present.

- Aquatic Site 4: Very narrow stream channel opening into a pond formed from washout/erosion of the bank. The channel was observed stagnant with moderate to high turbidity and tannin content. Fringing vegetation includes *Cyperus* sp., *Juncus* sp. and emergent *Eleocharis sphacelata*. There is evidence of a recent bushfire. The depth of the channel is at approximately 0.3 m and 1.5 m wide. The vegetation on site is shrubland with a sedge ground layer. The vegetation adjacent to the site is Eucalyptus swamp woodland. The substrate is muddy sand.

- Aquatic Site 5: Distinct stream channel opening into an artificial dam/pond. The channel was observed stagnant with moderate turbidity and high tannin content. Fringing vegetation includes *Cyperus* sp., *Juncus* sp. and *Philydrum lanuginosum*. Emergent *Eleocharis sphacelata* and *Potamogeton* sp. are also present. There is evidence of a recent bushfire. The depth of the channel is approximately 0.3 m and 4.5 m wide. The substrate is muddy sand. A large feral Goldfish (*Carassius auratus*) was recorded within the channel.

- Aquatic Site 6: Distinct stream channel observed stagnant with no flow. The channel was observed with moderate turbidity and high tannin content. Fringing vegetation includes *Carex* sp., *Cyperus* sp., *Juncus* sp. and *Philydrum lanuginosum*. There is evidence of a recent bushfire. The depth of the channel is approximately 0.5 m and 2.6 m wide. The substrate is muddy sand.

- Aquatic Site 7: No stream channel was observed. Very shallow stagnant site with no flow. Low turbidity and moderate tannin content. Rust-coloured suspended agal/bacterial scum. Sedgeland species include *Carex* sp. and *Cyperus* sp., *Juncus* sp., *Phragmites* sp., *Typha* sp. and *Philydrum lanuginosum.* The overstory consists of burnt *Leptospermum* sp. Evidence of recent bushfire. The depth of the site is approximately 5 cm and 4 m wide. The substrate is muddy sand.

3.4 Koala population monitoring

3.4.1 Koala distribution and abundance

The Koala is known to occur within the study area, with scats and signs such as scratches recorded during the 2018 (Niche 2019), 2019 (EnviroKey 2020) and 2020 (EnviroKey 2021) monitoring surveys. The species presence has been confirmed by motion-activated cameras provided by Hy-Tec within the study area (EnviroKey 2021).

EMM undertook a desktop search to determine the presence of Koalas within the vicinity of the study area. The search indicated 10 Koala records within a 10 km buffer of the study area (OEH 2022b), with the most recent record of the Koala within the vicinity recorded in 2018.

3.4.2 Availability of habitat

The study area contains two preferred feed tree species for the Koala, Grey Gum (*Eucalyptus punctata)* and Parramatta Red Gum (*E. parramattensis*) (DECC 2008). These trees, and vegetation within the study area (including BOA) were significantly impacted by the 2019 Gospers Mountain Wildfire, the results of which were still visible in the 2021 monitoring period.

3.4.3 Spot assessment technique

No Koala scats were recorded during the 2021 monitoring surveys. As suggested in the 2018 monitoring by Niche (2019), potential scats and scratch trees are consistent but not definitive evidence of Koala presence. Whilst some scratches were recorded during the surveys, an abundance of Possum and Lace Monitor could be responsible for many of the marks left on the trees. Therefore, tree scratches by themselves are not considered a reliable indicator for the presence of Koalas.

3.5 Incidental threatened species sightings

During the 2021 monitoring surveys, EMM recorded two potential threatened flora species within the study area, *Hibbertia puberula subsp. extensa* (listed as Endangered under the BC Act)(Figure 3.1) and potentially Netted Bottle Brush (*Callistemon linearifolius*, listed as Vulnerable under the BC Act) in plots B5 and B9 (Figure 2.1). Both species were sent to the National herbarium, with *Hibbertia puberula subsp. extensa* sample confirmed, and the *Callistemon linearifolius* sample considered likely to be that species but not confirmed.

In addition, the Rosenberg's Goanna (*Varanus rosenbergi*, listed as vulnerable under the BC Act) was recorded while undertaking monitoring work, but this was outside the study area. A total of four of these species were identified on the access track leading out to aquatic sites 6 and 7.

As comprehensive surveys for threatened species were not the focus of this monitoring program, not every threatened species that was sighted had its associated location recorded. Those species that have a location recorded are provided in Figure 3.1.

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Source: EMM (2022); ABS (2021); DFSI (2020, 2021); ESRI (2022); GA (2011)

Threatened species recorded during the 2021 monitoring survey

Tinda Creek Quarry
Biodiversity monitoring report
Figure 3.1

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4 Discussion

4.1 Vegetation monitoring

A comparison of 2020 and 2021 monitoring survey results indicate plant species richness has increased within almost all vegetation communities identified in Table 3.1. The only vegetation community which recorded a decrease in plant species richness was the Mellong Sandmass Swamp Woodland, with a decrease of 3.3 species. These results coincide with an unseasonably wet summer which has encouraged plant growth and post fire effects (since the Gospers Mountain Wildfire of 2019) which has favoured fire-tolerant species.

Native species richness within rehabilitation sites is notably less than the corresponding analogue sites (Table 3.2). For example, Plot B2 contains around half the native species of the analogue site, while the difference between Plot B3 (33 species) and Plot B7 (38 species) is also less.

4.1.1 Vegetation composition, structure and function

Vegetation composition, structure and function across the monitoring site and rehabilitation site was significantly altered during the Gospers Mountain Wildfire of 2019; with the effects still apparent during the 2021 monitoring survey. BAM plots undertaken outside of the rehabilitation area show composition, structure, and function values that are consistent with their vegetation community. When compared to the analogue site, the plots undertaken in the rehabilitation site contain no trees other than those recorded in the smallest range (<5 cm) and one in the 10-19 cm range, while the analogue site has trees present in all range categories (Table 3.5). The analogue site also has notably higher scores in the remaining categories, those being: the number of hollow trees present, the length of logs, and the percentage of litter cover.

4.1.2 Weeds

The transmission line which traverses the study area and regeneration area, as well as Putty Road to a lesser extent, are likely to be source populations for weeds. Further disturbance within new areas of the study area is likely to encourage weeds to become established in those areas. Key weed infestations within native vegetation are illustrated in Figure 4.1. We recommend these be key monitoring and control locations.

As stated in the 2020 monitoring report, there continues to be an opportunity to close irrelevant vehicle tracks within the BOA, and allow them to regenerate naturally. Some weed species continue to invade the track and within 1 m either side. By allowing the vegetation to regenerate over the track, weed invasion into adjoining native vegetation would be greatly minimised.

The rehabilitation site continued to record a high exotic cover. Plot B3 (equivalent to Plot 18 from the 2020 monitoring work) recorded an exotic cover of 46% in 2020 and 45.3% in the 2021 monitoring period. Plot B2 is disturbed and has a low cover of vegetation however, most of the vegetation recorded was native. Plot B1 was not undertaken due to the high cover of exotic species and a low abundance and diversity of native species. If weeds are left unchecked in the rehabilitation area, they could intrude into the BOA and other areas of native vegetation, thereby negatively impacting the biodiversity values of these areas

4.2 Grevillea parviflora subsp. *parviflora*

The total number of *Grevillea parviflora* subsp. *parviflora* has increased in the last monitoring period. While conclusions are difficult to draw due to the change in counting methodology, a conservative reading of the data suggests numbers are likely to be increasing.

4.3 Aquatic monitoring

The surveys were largely inconclusive as there was limited or no water at all sites during the December 2020 survey. However, based on the evidence available, there appears to be no obvious disturbance resulting from the Tinda Creek Quarry operations at downstream sites.

4.4 Koala monitoring

The Koala was recorded using remote cameras provided by Hy-Tec within the study area (EnviroKey 2021). Signs of habitat use by Koala, such as scats and tree scratching, were noted in 2018 (Niche 2019), 2019 (EnviroKey 2020), and 2020 (EnviroKey 2021) monitoring periods. The previous monitoring result indicated Koalas were using the site after the 2019/20 bushfires.

Surveys conducted during 2021 identified many trees with scratches however, as no Koala scats were found scratch marks are not a reliable indicator of Koala presence. Equally, the survey results do not indicate Koala's are absent from the study area. As per the draft LMP (R.W. Corkery and Co. 2021) the 2022 biodiversity monitoring will include spot lighting and call playback targeting Koala.

KEY

- Study area
- Weed control
- Recommended weed monitoring and control location
- Major road
- Minor road
- Vehicular track
- Watercourse/drainage line
- NPWS reserve
- Biodiversity offset area
- Area under rehabilitation

DRAFT

Recommended weed monitoring and control locations

Tinda Creek Quarry
Biodiversity monitoring report
Figure 4.1

EMM
creating opportunities

Source: EMM (2022); ABS (2021); DFSI (2020, 2021); ESRI (2022); GA (2011)

0 250 500 m
GDA2020 MGA Zone 56
N

\\emmsvr1\emm3\2021\E210893 - Ecology monitoring surveys Tinda Creek Quarry\GIS\02 Maps\G005 WeedMonitoring 20220218 02.mxd 18/02/2022

4.5 Landscape Management Plan performance criteria

The approved LMP (R.W. Corkery & Co. 2021) details completion criteria and performance indicators for the rehabilitation area and the BOA. The below table (Table 4.1) details the matters reviewed during monitoring surveys within the rehabilitated areas.

Table 4.1 Completion criteria, performance indicators and monitoring strategy – rehabilitated areas

Objectives	Completion criteria	Performance measurement / indicator	Monitoring strategy	Comments
Ensure that the Quarry Site is safe, stable and non-polluting.	The final landform achieves the nominated design of the EIS or subsequent RehabilitationPlan.	Completed to the satisfaction of the Secretary.	Survey following completion of landform establishment activities.	Not within the scope of this monitoring report.
	The size, depth, batter slopes and the drainage catchment of the final void are consistent with nominated design of the EIS or subsequent Rehabilitation Plan.			Not within the scope of this monitoring report.
	The surface area of thefinal voids is no greaterthan 16 ha in total.			Not within the scope of this monitoring report.
	Final voids are separated from the surface water drainage system, unless the Secretary agrees otherwise.			Not within the scope of this monitoring report.
Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprised of local native species and habitat, including at least 0.35 ha of Mellong Sandmass Sedgeland.	Revegetation within the Quarry Site is generally consistent with the vegetation communities displayed on Figure 8.	At least 75% of trees are healthy. At least 0.35ha of Mellong Sandmass Sedgeland established withinQuarry Site.	Monitoring undertaken as per Section 12.2.	Trees recorded within rehabilitated areas were observed growing and healthy; however, they would not be considered to have achieved 'sustained growth and development' (as specified in Section 10.3.2 of the LMP). Mellong Sandmass Sedgeland is not mapped within the current rehabilitation area, and as such, is not currently intended to be re-established within this area. This vegetation community is however, mapped within domains 3 and 7. It is anticipated that these domains will be extracted in the future and consequently require remediation of Mellong Sandmass Sedgeland that was located in this area. This will be addressed in a future monitoring report.
Decommission and remove surface infrastructure (unless theSecretary agrees otherwise).	Infrastructure not required for future land use removed.	Completed to the satisfaction of the Secretary.	Survey of infrastructureto be completed.	Not within the scope of this monitoring report.

The below table (Table 4.2) details the matters reviewed during monitoring surveys within the BOA.

Table 4.2 Completion criteria, performance indicators and monitoring strategy – BOA

Objectives	Completion criteria	Performance measurement / indicator	Monitoring strategy	Comments
Establish and secure a BOA.	BOA dedicated to Yengo National Park.	Conservation Agreement established to secure land for conservation.	Monitoring of Koala, *Grevillea parviflora* subsp. *parviflora* and nest boxes as per Sections 12.3, 12.4 and 12.5 throughout the life of the Quarry.	Monitoring of Koalas was undertaken within the eight BAM plots surveyed. Monitoring of *Grevillea parviflora* subsp. *parviflora* was undertaken in the dedicated plots for this species.
Maintain and where possible improve biodiversity values withinthe BOA.	Controlled access to the BOA achieved and maintained.	Unauthorised access to the BOA is prevented.	Monthly and quarterly inspections and/or weed control programs.	It is recommended that surplus tracks running through the BOA be closed.
	No significant weed infestation.	There is no weed infestation greater than exists within the analogue sites and there are no contiguous areas of weeds that are greater than 25 m2 in area.		Weeds were prominent along access tracks within the BOA and are considered to be in greater abundance and cover than the analogue sites. There are also contiguous areas of weeds that are greater than 25 m^2 in area cover, such as in Plot B3.
	Feral animal control.	Site does not harbour feral animals.	Monthly inspections.	Not within the scope of this monitoring report.

5 Recommendations

EMM supports the recommendation made in the 2020 monitoring report (EnviroKey 2021) to review the monitoring program. In addition, EMM suggest additional surveys to map the extent of *Hibbertia puberula subsp. extensa* and to confirm whether Netted Bottle Brush is within the study area, as they were recorded incidentally at several locations within the study area. This would consequently allow for impacts to them to be managed in future monitoring campaigns.

5.1 Specific actions in the rehabilitation area

The following recommendations have been made within the rehabilitation area:

- a combination of weed control and direct seeding to be implemented;
- for direct seeding, species should be sourced from the native tree and shrub seed bank indicated in the 2018 monitoring report. If this is not available, they should be sourced from local provenance only;
- weed control should target African Lovegrass as this currently covers almost half of the area surveyed in Plot B3. Weed control should follow the measures outlined in Section 8.3.2 of the LMP (R.W. Corkery & Co. 2021), which includes quarterly inspections; and
- key weed infestations within native vegetation are illustrated in Figure 4.1. We recommend these be key monitoring and control locations.

5.2 Specific actions in the BOA

The following recommendations have been made within the BOA:

- closing surplus tracks so to allow vegetation to naturally regenerate, providing they not be required for monitoring plots;
- weed control to be implemented within plots B5-B9 given the presence of exotic species. Enough weed cover and abundance were detected in plots B5-B9 to be considered for control measures. B4, while outside the BOA, is also considered suitable for weed control measures also;
- spot spray weed on foot and by hand only, to minimise weed seed being spread by vehicles and avoid herbicide overspray killing native plants nearby. It is important that adjacent native plants remain alive to maintain competition against weeds;
- monitor weeds visually at least every three months and spray as necessary to prevent seed-set. Always assess the efficacy of the control method over time (eg if native plants are inadvertently killed and weed cover is not decreasing, cease weed control and reassess methods); and
- key weed infestations within native vegetation are illustrated in Figure 4.1. We recommend these be key monitoring and control locations.

6 Conclusion

Year four of monitoring (2021) was completed by EMM during December 2021 by two suitably qualified ecologists. This report details the methodology and results of the year four monitoring period.

The data captured within this report demonstrates that the BOA is secure, with native species richness increasing and weed numbers stable. The quarry operations do not appear to be having an adverse impact on the BOA.

The rehabilitation area requires further action to establish vegetation communities with benchmark conditions. Weed cover within this area remains high, and as expected composition attributes such as tree numbers and leaf litter cover are below that of the analogue site. If these weeds are left unchecked, they could intrude into the BOA and other areas of native vegetation, thereby negatively impacting the biodiversity values of these areas. The recommendations outlined in Section 5 should be followed to ensure that the rehabilitation area is progressing towards the analogue site.

The total number of *Grevillea parviflora* subsp. *parviflora* has likely increased in the last monitoring period. While conclusions are difficult to draw due to the 2019/20 bushfires, a conservative reading of the data suggests numbers are likely to be increasing.

Monitoring surveys conducted for the Koala were unable to conclude presence or absence of the species. While no scats were recorded, it is important to note that Koalas are a highly mobile, and their absence during monitoring does not indicate their absence from the study area or because of quarry operations.

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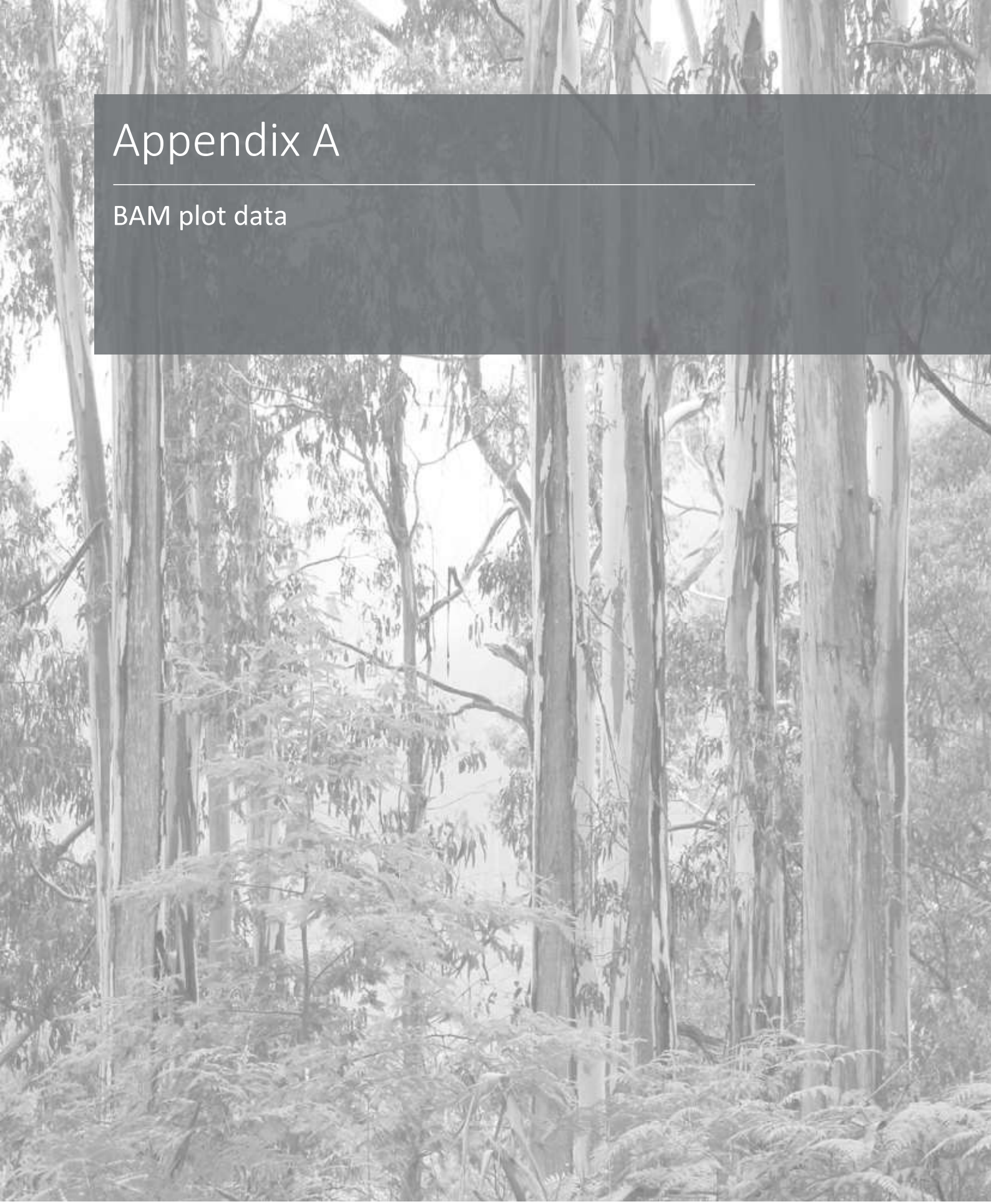


Appendix A

BAM plot data

BAM Site – Field Survey Form

Plot ID:	P2	Date:	20/12/21	Project number:	E210893	Plot dimensions:	50 x 20
Datum:	GDA94	Easting:	286,331	Recorders:	PR		
Zone:	56	Northing:	6,327,988	IBRA region:		Midline bearing:	140
Plant Community Type:				Condition class:		PCT confidence:	
Vegetation Class:				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	0
	Shrubs:	5
	Grasses etc.:	8
	Forbs:	5
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0
	Shrubs:	11
	Grasses etc.:	14.6
	Forbs:	0.5
	Ferns:	0
	Other:	0
High Threat Weed cover:		0.3

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	5	1	40	3	4
Average litter cover (%):	10.6				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E210893				
Recorders:	PR	**Plot ID:**	P2	**Date:**	20/12/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Shrub (SG)	*Leptospermum polygalifolium (Tantoon)*	5	20		N
Grass & grasslike (GG)	*Rytidosperma spp.*	10	500		N
Grass & grasslike (GG)	*Entolasia stricta (Wiry Panic)*	0.2	100		N
Shrub (SG)	*Leptospermum trinervium (Slender Tea-tree)*	5	10		N
Shrub (SG)	*Hibbertia spp.*	0.1	2		N
Shrub (SG)	*Acacia penninervis (Mountain Hickory)*	0.8	7		N
Shrub (SG)	*Platysace ericoides*	0.1	10		N
Forb (FG)	*Patersonia sericea (Silky Purple-Flag)*	0.1	2		N
Forb (FG)	*Goodenia paniculata*	0.1	100		N
Forb (FG)	*Epaltes australis (Spreading Nut-heads)*	0.1	20		N
Grass & grasslike (GG)	*Hemarthria uncinata (Matgrass)*	2	150		N
Forb (FG)	*Dianella revoluta (Blueberry Lily)*	0.1	1		N
Grass & grasslike (GG)	*Eragrostis benthamii*	0.1	10		N
Grass & grasslike (GG)	*Schoenus brevifolius*	0.1	4		N
Grass & grasslike (GG)	*Juncus spp. (A Rush)*	2	15		N
Grass & grasslike (GG)	*Lepyrodia spp.*	0.1	2		N
Grass & grasslike (GG)	*Juncus planifolius*	0.1	3		N
	Paspalum dilatatum (Paspalum)	0.1	8		HTE
	Andropogon virginicus (Whisky Grass)	0.1	6		HTE
	Eragrostis curvula (African Lovegrass)	0.1	1		HTE
Forb (FG)	*Hypericum gramineum (Small St John's Wort)*	0.1	2		N

BAM Site – Field Survey Form

Plot ID:	P3	Date:	22/12/21	Project number:	E210893	Plot dimensions:	50 x 20
Datum:	GDA94	Easting:	286,509	Recorders:			
Zone:	56	Northing:	6,328,098	IBRA region:		Midline bearing:	0
Plant Community Type:				Condition class:		PCT confidence:	
Vegetation Class:				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	17
	Grasses etc.:	10
	Forbs:	6
	Ferns:	0
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	0.7
	Shrubs:	7.7
	Grasses etc.:	1.3
	Forbs:	0.8
	Ferns:	0
	Other:	0
High Threat Weed cover:		45.3

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	1		
5 – 9 cm:	0		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	15	25	20	25	20
Average litter cover (%):	21				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

Thanks

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E210893				
Recorders:		**Plot ID:**	P3	**Date:**	22/12/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus haemastoma (Broad-leaved Scribbly Gum)*	0.7	2		N
Shrub (SG)	*Persoonia oblongata*	1	11		N
Shrub (SG)	*Callistemon rigidus (Stiff Bottlebrush)*	0.2	3	no	N
Shrub (SG)	*Leptospermum trinervium (Slender Tea-tree)*	4	30		N
Shrub (SG)	*Melaleuca thymifolia (Thyme Honey-myrtle)*	0.1	4		N
Shrub (SG)	*Grevillea obtusiflora*	0.1	6		N
Shrub (SG)	*Melichrus procumbens (Jam Tarts)*	0.1	1		N
Shrub (SG)	*Bossiaea heterophylla (Variable Bossiaea)*	0.2	30		N
Shrub (SG)	*Platysace ericoides*	0.2	40		N
Shrub (SG)	*Hibbertia fasciculata*	0.1	50		N
Shrub (SG)	*Pimelea latifolia*	0.1	8		N
Forb (FG)	*Trachymene spp. (Trachymene)*	0.3	100		N
Shrub (SG)	*Brachyloma daphnoides (Daphne Heath)*	0.1	1		N
Shrub (SG)	*Isopogon anemonifolius (Broad-leaf Drumsticks)*	0.1	1		N
Forb (FG)	*Gonocarpus teucrioides (Germander Raspwort)*	0.1	20		N
Shrub (SG)	*Hibbertia puberula*	0.1	2	yes	N
Grass & grasslike (GG)	*Lomandra cylindrica*	0.3	40		N
Shrub (SG)	*Leptospermum polygalifolium (Tantoon)*	1	5		N
Forb (FG)	*Scaevola ramosissima (Purple Fan-flower)*	0.1	1		N
Forb (FG)	*Laxmannia gracilis (Slender Wire Lily)*	0.1	30		N
	Eragrostis curvula (African Lovegrass)	45	1500		HTE
Shrub (SG)	*Conospermum ericifolium*	0.1	2		N
	Axonopus fissifolius (Narrow-leafed Carpet Grass)	0.2	10		HTE
Shrub (SG)	*Acacia ulicifolia (Prickly Moses)*	0.1	5		N
Grass & grasslike (GG)	*Themeda triandra*	0.2	10		N
Grass & grasslike (GG)	*Entolasia spp.*	0.1	1		N
Grass & grasslike (GG)	*Austrostipa pubescens*	0.1	1		N
	Andropogon virginicus (Whisky Grass)	0.1	4		HTE
Grass & grasslike (GG)	*Lomandra obliqua*	0.1	2		N
Forb (FG)	*Patersonia glabrata (Leafy Purple-flag)*	0.1	1		N
Grass & grasslike (GG)	*Schoenus spp.*	0.1	1		N
Grass & grasslike (GG)	*Eragrostis brownii (Brown's Lovegrass)*	0.1	7		N
Forb (FG)	*Goodenia heterophylla*	0.1	1		N
Grass & grasslike (GG)	*Panicum simile (Two-colour Panic)*	0.1	8		N
Shrub (SG)	*Persoonia spp.*	0.1	1		N
Grass & grasslike (GG)	*Cyathochaeta diandra*	0.1	1		N
Grass & grasslike (GG)	*Lepyrodia spp.*	0.1	1		N

BAM Site – Field Survey Form

Plot ID:	P4	Date:	21/12/21	Project number:	E210893	Plot dimensions:	50 x 20
Datum:	GDA94	Easting:	284,938	Recorders:	PAR		
Zone:	56	Northing:	6,328,018	IBRA region:		Midline bearing:	325
Plant Community Type:				Condition class:		PCT confidence:	
Vegetation Class:				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	2
	Shrubs:	6
	Grasses etc.:	8
	Forbs:	4
	Ferns:	2
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	4.1
	Shrubs:	4.7
	Grasses etc.:	125.5
	Forbs:	0.9
	Ferns:	0.3
	Other:	0
High Threat Weed cover:		15.4

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	30		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	30	15	20	25	15
Average litter cover (%):	21				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E210893				
Recorders:	PAR	**Plot ID:**	P4	**Date:**	21/12/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus haemastoma (Broad-leaved Scribbly Gum)*	4	40		N
Tree (TG)	*Angophora bakeri (Narrow-leaved Apple)*	0.1	10		N
Shrub (SG)	*Persoonia oblongata*	0.2	7		N
Grass & grasslike (GG)	*Aristida vagans (Threeawn Speargrass)*	25	2000		N
Grass & grasslike (GG)	*Aristida ramosa (Purple Wiregrass)*	20	1500		N
Fern (EG)	*Cheilanthes spp. (Cloak Fern, Mulga Fern, Rock Fern)*	0.2	200		N
Shrub (SG)	*Leptospermum trinervium (Slender Tea-tree)*	4	45		N
Grass & grasslike (GG)	*Lomandra longifolia (Spiny-headed Mat-rush)*	50	3		N
	Axonopus fissifolius (Narrow-leafed Carpet Grass)	15	1000		HTE
	Gamochaeta spp.	0.1	80		E
Forb (FG)	*Gonocarpus teucrioides (Germander Raspwort)*	0.1	40		N
Grass & grasslike (GG)	*Cyperus spp.*	0.1	4		N
Grass & grasslike (GG)	*Lomandra spp. (Mat-rush)*	10	800		N
Fern (EG)	*Schizaea bifida (Forked Comb Fern)*	0.1	2		N
	Conyza bonariensis (Flaxleaf Fleabane)	0.1	1		E
	Eragrostis curvula (African Lovegrass)	0.3	8		HTE
Shrub (SG)	*Dillwynia spp.*	0.2	6		N
Forb (FG)	*Caladenia spp.*	0.1	1		N
Forb (FG)	*Chrysocephalum apiculatum (Common Everlasting)*	0.6	100		N
Grass & grasslike (GG)	*Dichelachne spp. (A Plumegrass)*	0.3	20		N
Grass & grasslike (GG)	*Eragrostis brownii (Brown's Lovegrass)*	20	2000		N
	Hypochaeris radicata (Catsear)	0.1	6		E
	Andropogon virginicus (Whisky Grass)	0.1	2		HTE
Shrub (SG)	*Persoonia spp.*	0.1	1		N
Shrub (SG)	*Brachyloma daphnoides (Daphne Heath)*	0.1	1		N
Grass & grasslike (GG)	*Themeda triandra*	0.1	5		N
Shrub (SG)	*Acacia spp. (Wattle)*	0.1	2		N
Forb (FG)	*Caesia parviflora var. minor (Small Pale Grass-lily)*	0.1	1		N
	Richardia brasiliensis (Mexican Clover)	0.1	1		E

BAM Site – Field Survey Form

Plot ID:	P5	Date:	21/12/21	Project number:	E210893	Plot dimensions:	50 x 20
Datum:	GDA94	Easting:	285,023	Recorders:	PAR		
Zone:	56	Northing:	6,327,994	IBRA region:		Midline bearing:	350
Plant Community Type:				Condition class:		PCT confidence:	
Vegetation Class:				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	3
	Shrubs:	15
	Grasses etc.:	11
	Forbs:	8
	Ferns:	1
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	16.4
	Shrubs:	29.1
	Grasses etc.:	43.2
	Forbs:	3.2
	Ferns:	0.1
	Other:	0
High Threat Weed cover:		0.1

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	1		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	30	80	45	20	90
Average litter cover (%):	53				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E210893				
Recorders:	PAR	**Plot ID:**	P5	**Date:**	21/12/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus punctata (Grey Gum)*	15	2		N
Tree (TG)	*Eucalyptus haemastoma (Broad-leaved Scribbly Gum)*	0.4	6		N
Shrub (SG)	*Leptospermum trinervium (Slender Tea-tree)*	20	400		N
Shrub (SG)	*Leptospermum polygalifolium (Tantoon)*	5	200		N
Forb (FG)	*Stylidium graminifolium (Grass Triggerplant)*	0.2	20		N
Grass & grasslike (GG)	*Themeda triandra*	15	700		N
Shrub (SG)	*Gompholobium spp.*	0.1	5		N
Forb (FG)	*Laxmannia spp.*	2	5000		N
Grass & grasslike (GG)	*Eragrostis brownii (Brown's Lovegrass)*	5	2000		N
Grass & grasslike (GG)	*Cyathochaeta diandra*	0.3	40		N
Grass & grasslike (GG)	*Aristida vagans (Threeawn Speargrass)*	10	1000		N
Forb (FG)	*Gonocarpus teucrioides (Germander Raspwort)*	0.4	100		N
Forb (FG)	*Hypericum gramineum (Small St John's Wort)*	0.1	50		N
Forb (FG)	*Dianella revoluta (Blueberry Lily)*	0.2	20		N
Grass & grasslike (GG)	*Lomandra longifolia (Spiny-headed Mat-rush)*	10	30		N
Tree (TG)	*Allocasuarina littoralis (Black She-Oak)*	1	30		N
Shrub (SG)	*Comesperma ericinum (Pyramid Flower)*	0.1	6		N
	Hypochaeris radicata (Catsear)	0.1	7		E
	Axonopus fissifolius (Narrow-leafed Carpet Grass)	0.1	5		HTE
Shrub (SG)	*Choretrum spp.*	2	15		N
Shrub (SG)	*Dillwynia spp.*	0.1	6		N
Fern (EG)	*Schizaea rupestris*	0.1	5		N
Shrub (SG)	*Persoonia oblongata*	0.1	4		N
Shrub (SG)	*Cryptandra amara (Bitter Cryptandra)*	0.1	3		N
Shrub (SG)	*Leptospermum juniperinum (Prickly Tea-tree)*	1	30		N
Grass & grasslike (GG)	*Dichelachne spp. (A Plumegrass)*	0.1	1		N
	Conyza spp. (A Fleabane)	0.1	1		E
Forb (FG)	*Microtis spp.*	0.1	8		N
Shrub (SG)	*Persoonia spp.*	0.1	1		N
Grass & grasslike (GG)	*Lepyrodia scariosa*	0.2	30		N
Forb (FG)	*Drosera spp.*	0.1	1		N
Grass & grasslike (GG)	*Xyris gracilis*	0.1	6		N
Shrub (SG)	*Callistemon spp.*	0.1	1	yes	N
Grass & grasslike (GG)	*Aristida spp. (A Wiregrass)*	2	500		N
Shrub (SG)	*Persoonia linearis (Narrow-leaved Geebung)*	0.1	2		N
Forb (FG)	*Patersonia sericea (Silky Purple-Flag)*	0.1	6		N
Shrub (SG)	*Platysace ericoides*	0.1	1		N
Grass & grasslike (GG)	*Lomandra cylindrica*	0.4	80		N
Grass & grasslike (GG)	*Empodisma minus*	0.1	3		N
Shrub (SG)	*Acacia spp. (Wattle)*	0.1	1		N
Shrub (SG)	*Melichrus procumbens (Jam Tarts)*	0.1	1		N

BAM Site – Field Survey Form

Plot ID:	P6	Date:	22/12/21	Project number:	E210893	Plot dimensions:	50 x 20
Datum:	GDA94	Easting:	286,213	Recorders:	PAR		
Zone:	56	Northing:	6,328,526	IBRA region:		Midline bearing:	340
Plant Community Type:				Condition class:		PCT confidence:	
Vegetation Class:				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	4
	Shrubs:	7
	Grasses etc.:	11
	Forbs:	11
	Ferns:	2
	Other:	5
Sum of Cover of native vascular plants by growth form group	Trees:	22
	Shrubs:	7.6
	Grasses etc.:	69.2
	Forbs:	11.1
	Ferns:	3.1
	Other:	0.7
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	74
80 + cm:	1		
50 – 79 cm:	1		
30 – 49 cm:	0		
20 – 29 cm:	1	Tree hollow count	0
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	80	95	80	70	85
Average litter cover (%):	82				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E210893				
Recorders:	PAR	**Plot ID:**	P6	**Date:**	22/12/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus crebra (Narrow-leaved Ironbark)*	2	3		N
Tree (TG)	*Eucalyptus fibrosa (Red Ironbark)*	15	5		N
Tree (TG)	*Angophora floribunda (Rough-barked Apple)*	3	2		N
Shrub (SG)	*Acacia mearnsii (Black Wattle)*	6	12		N
Tree (TG)	*Allocasuarina torulosa (Forest Oak)*	2	7		N
Shrub (SG)	*Polyscias sambucifolia (Elderberry Panax)*	0.2	5		N
Shrub (SG)	*Bursaria spinosa (Native Blackthorn)*	1	6		N
Other (OG)	*Clematis aristata (Old Man's Beard)*	0.1	1		N
Fern (EG)	*Pteridium esculentum (Bracken)*	3	50		N
Grass & grasslike (GG)	*Imperata cylindrica (Blady Grass)*	8	200		N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	60	5000		N
Forb (FG)	*Hydrocotyle laxiflora (Stinking Pennywort)*	10	500		N
Fern (EG)	*Cheilanthes spp. (Cloak Fern, Mulga Fern, Rock Fern)*	0.1	20		N
Grass & grasslike (GG)	*Echinopogon caespitosus (Bushy Hedgehog-grass)*	0.1	9		N
Forb (FG)	*Dianella spp.*	0.1	1		N
Forb (FG)	*Wahlenbergia gracilis (Sprawling Bluebell)*	0.1	5		N
Grass & grasslike (GG)	*Oplismenus imbecillis*	0.1	1		N
Grass & grasslike (GG)	*Entolasia marginata (Bordered Panic)*	0.1	2		N
Other (OG)	*Glycine clandestina (Twining glycine)*	0.1	3		N
Grass & grasslike (GG)	*Cyperus gracilis (Slender Flat-sedge)*	0.4	80		N
Other (OG)	*Glycine microphylla (Small-leaf Glycine)*	0.2	20		N
Other (OG)	*Macrozamia communis (Burrawang)*	0.2	1		N
Shrub (SG)	*Persoonia linearis (Narrow-leaved Geebung)*	0.1	1		N
Grass & grasslike (GG)	*Entolasia spp.*	0.1	1		N
Forb (FG)	*Sigesbeckia orientalis subsp. orientalis (Indian Weed)*	0.2	8		N
	Cirsium vulgare (Spear Thistle)	0.1	1		E
Forb (FG)	*Oxalis perennans*	0.1	1		N
Grass & grasslike (GG)	*Rytidosperma spp.*	0.1	3		N
Forb (FG)	*Galium spp.*	0.1	1		N
Forb (FG)	*Veronica plebeia (Trailing Speedwell)*	0.1	2		N
Grass & grasslike (GG)	*Austrostipa spp. (A Speargrass)*	0.1	4		N
Forb (FG)	*Dichondra repens (Kidney Weed)*	0.1	10		N
Grass & grasslike (GG)	*Carex inversa (Knob Sedge)*	0.1	2		N
	Conyza sumatrensis (Tall fleabane)	0.1	2		E
Other (OG)	*Hardenbergia violacea (False Sarsaparilla)*	0.1	1		N
Shrub (SG)	*Acacia implexa (Hickory Wattle)*	0.1	2		N
Forb (FG)	*Dianella revoluta (Blueberry Lily)*	0.1	3		N
Forb (FG)	*Solanum pungetium (Eastern Nightshade)*	0.1	1		N
Forb (FG)	*Lobelia purpurascens (whiteroot)*	0.1	6	no	N
Grass & grasslike (GG)	*Lomandra multiflora subsp. multiflora (Many-flowered Mat-rush)*	0.1	1		N
Shrub (SG)	*Pultenaea retusa*	0.1	1		N
Shrub (SG)	*Acacia falcata*	0.1	1		N

BAM Site – Field Survey Form

Plot ID:	P7	Date:	22/12/21	Project number:	E210893	Plot dimensions:	50 x 20
Datum:	GDA94	Easting:	286,688	Recorders:	PAR		
Zone:	56	Northing:	6,328,330	IBRA region:		Midline bearing:	0
Plant Community Type:				Condition class:		PCT confidence:	
Vegetation Class:				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	3
	Shrubs:	17
	Grasses etc.:	9
	Forbs:	8
	Ferns:	1
	Other:	0
Sum of Cover of native vascular plants by growth form group	Trees:	23
	Shrubs:	12.5
	Grasses etc.:	11.3
	Forbs:	1.2
	Ferns:	15
	Other:	0
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	3
80 + cm:	1		
50 – 79 cm:	2		
30 – 49 cm:	1		
20 – 29 cm:	1	Tree hollow count	3
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	85	95	90	75	70
Average litter cover (%):	83				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E210893				
Recorders:	PAR	**Plot ID:**	P7	**Date:**	22/12/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Eucalyptus haemastoma (Broad-leaved Scribbly Gum)*	10	3		N
Tree (TG)	*Angophora bakeri (Narrow-leaved Apple)*	7	8		N
Tree (TG)	*Banksia serrata (Old-man Banksia)*	6	50		N
Shrub (SG)	*Melaleuca thymifolia (Thyme Honey-myrtle)*	8	300		N
Shrub (SG)	*Dillwynia spp.*	0.2	7		N
Grass & grasslike (GG)	*Lomandra cylindrica*	0.2	50		N
Shrub (SG)	*Platysace ericoides*	0.4	150		N
Shrub (SG)	*Melichrus procumbens (Jam Tarts)*	0.3	4		N
Shrub (SG)	*Persoonia linearis (Narrow-leaved Geebung)*	0.2	6		N
Shrub (SG)	*Leptospermum trinervium (Slender Tea-tree)*	1	20		N
Fern (EG)	*Pteridium esculentum (Bracken)*	15	300		N
Grass & grasslike (GG)	*Cyathochaeta diandra*	4	100		N
Grass & grasslike (GG)	*Themeda triandra*	2	200		N
Grass & grasslike (GG)	*Entolasia marginata (Bordered Panic)*	0.1	8		N
Shrub (SG)	*Banksia marginata (Silver Banksia)*	0.6	5		N
Forb (FG)	*Dampiera stricta*	0.1	7		N
Shrub (SG)	*Acacia ulicifolia (Prickly Moses)*	0.2	6		N
Grass & grasslike (GG)	*Austrostipa stipoides (Coast Spear-grass)*	0.1	4		N
Forb (FG)	*Caesia parviflora var. parviflora*	0.1	3		N
Grass & grasslike (GG)	*Lepyrodia scariosa*	0.7	300		N
Forb (FG)	*Thysanotus spp.*	0.1	1		N
Shrub (SG)	*Hibbertia spp.*	0.1	8	no	N
Shrub (SG)	*Grevillea parviflora*	0.1	5		N
Shrub (SG)	*Hakea dactyloides (Finger Hakea)*	0.4	5		N
Grass & grasslike (GG)	*Lomandra longifolia (Spiny-headed Mat-rush)*	4	20		N
Shrub (SG)	*Cryptandra spinescens*	0.1	2		N
Shrub (SG)	*Isopogon anemonifolius (Broad-leaf Drumsticks)*	0.3	5		N
Grass & grasslike (GG)	*Dichelachne spp. (A Plumegrass)*	0.1	7		N
Shrub (SG)	*Persoonia lanceolata (Lance Leaf Geebung)*	0.1	1		N
Grass & grasslike (GG)	*Lomandra spp. (Mat-rush)*	0.1	4		N
Forb (FG)	*Laxmannia gracilis (Slender Wire Lily)*	0.5	80		N
Forb (FG)	*Gonocarpus teucrioides (Germander Raspwort)*	0.1	30		N
Forb (FG)	*Stylidium graminifolium (Grass Triggerplant)*	0.1	1		N
Shrub (SG)	*Leptospermum juniperinum (Prickly Tea-tree)*	0.2	4		N
Shrub (SG)	*Bossiaea heterophylla (Variable Bossiaea)*	0.1	3		N
Forb (FG)	*Burchardia umbellata (Milkmaids)*	0.1	1		N
Forb (FG)	*Wahlenbergia spp. (Bluebell)*	0.1	2		N
Shrub (SG)	*Persoonia levis (Broad-leaved Geebung)*	0.2	1		N

BAM Site – Field Survey Form

Plot ID:	P8	Date:	21/12/21	Project number:	E210893	Plot dimensions:	50 x 20
Datum:	GDA94	Easting:	286,751	Recorders:	PAR		
Zone:	56	Northing:	6,327,888	IBRA region:		Midline bearing:	0
Plant Community Type:				Condition class:		PCT confidence:	
Vegetation Class:				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	4
	Shrubs:	19
	Grasses etc.:	15
	Forbs:	11
	Ferns:	0
	Other:	2
Sum of Cover of native vascular plants by growth form group	Trees:	25.1
	Shrubs:	87.6
	Grasses etc.:	19.3
	Forbs:	1.9
	Ferns:	0
	Other:	0.4
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	48
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	1	Tree hollow count	0
10 – 19 cm:	1		
5 – 9 cm:	1		
< 5 cm:	1		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	35	40	50	45	30
Average litter cover (%):	40				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

Physiography and site features

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E210893				
Recorders:	PAR	**Plot ID:**	P8	**Date:**	21/12/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Tree (TG)	*Corymbia eximia (Yellow Bloodwood)*	5	11		N
Tree (TG)	*Eucalyptus eugenioides (Thin-leaved Stringybark)*	15	20		N
Tree (TG)	*Corymbia gummifera (Red Bloodwood)*	5	5		N
Shrub (SG)	*Acacia penninervis (Mountain Hickory)*	5	25		N
Shrub (SG)	*Grevillea mucronulata*	50	3		N
Shrub (SG)	*Leptospermum trinervium (Slender Tea-tree)*	30	2		N
Grass & grasslike (GG)	*Themeda triandra*	1	100		N
Grass & grasslike (GG)	*Eragrostis benthamii*	0.4	100		N
Grass & grasslike (GG)	*Entolasia stricta (Wiry Panic)*	1	400		N
Grass & grasslike (GG)	*Lomandra spp. (Mat-rush)*	0.1	1		N
Grass & grasslike (GG)	*Aristida vagans (Threeawn Speargrass)*	15	1000		N
Shrub (SG)	*Persoonia oblongata*	0.1	2		N
Shrub (SG)	*Persoonia spp.*	0.1	1		N
Forb (FG)	*Lagenifera stipitata (Blue Bottle-daisy)*	0.4	200		N
Shrub (SG)	*Leucopogon spp. (A Beard-heath)*	0.1	1		N
Forb (FG)	*Pomax umbellata (Pomax)*	0.2	150		N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	0.2	20		N
Grass & grasslike (GG)	*Entolasia marginata (Bordered Panic)*	0.1	5		N
Shrub (SG)	*Persoonia linearis (Narrow-leaved Geebung)*	0.2	6		N
Grass & grasslike (GG)	*Dichelachne spp. (A Plumegrass)*	0.2	10		N
Grass & grasslike (GG)	*Lomandra longifolia (Spiny-headed Mat-rush)*	0.2	5		N
Shrub (SG)	*Platysace ericoides*	0.5	50		N
Shrub (SG)	*Phyllanthus hirtellus (Thyme Spurge)*	0.2	20		N
Shrub (SG)	*Poranthera corymbosa*	0.1	3		N
Other (OG)	*Hardenbergia violacea (False Sarsaparilla)*	0.3	5		N
Shrub (SG)	*Gompholobium grandiflorum (Large Wedge Pea)*	0.1	4		N
Grass & grasslike (GG)	*Panicum simile (Two-colour Panic)*	0.4	100		N
Other (OG)	*Billardiera scandens (Hairy Apple Berry)*	0.1	3		N
Shrub (SG)	*Cryptandra spinescens*	0.4	13		N
Grass & grasslike (GG)	*Lomandra obliqua*	0.1	1		N
Forb (FG)	*Opercularia diphylla (Stinkweed)*	0.1	8		N
Shrub (SG)	*Acacia spp. (Wattle)*	0.1	3		N
Forb (FG)	*Dianella revoluta (Blueberry Lily)*	0.3	10		N
Grass & grasslike (GG)	*Cyathochaeta diandra*	0.2	20		N
Grass & grasslike (GG)	*Lepidosperma laterale (Variable Sword-sedge)*	0.2	8		N
Forb (FG)	*Scaevola ramosissima (Purple Fan-flower)*	0.1	3		N
Forb (FG)	*Goodenia heterophylla*	0.1	9		N
Tree (TG)	*Banksia serrata (Old-man Banksia)*	0.1	1		N
Forb (FG)	*Patersonia glabrata (Leafy Purple-flag)*	0.3	30		N
Forb (FG)	*Haemodorum corymbosum*	0.1	8		N
Shrub (SG)	*Podolobium ilicifolium (Prickly Shaggy Pea)*	0.2	10		N
Shrub (SG)	*Persoonia levis (Broad-leaved Geebung)*	0.1	1		N
Grass & grasslike (GG)	*Austrostipa pubescens*	0.1	7		N
Forb (FG)	*Stackhousia viminea (Slender Stackhousia)*	0.1	1		N
Shrub (SG)	*Isopogon anemonifolius (Broad-leaf Drumsticks)*	0.1	1		N
Shrub (SG)	*Hibbertia acicularis*	0.1	2	yes	N
Shrub (SG)	*Melichrus procumbens (Jam Tarts)*	0.1	1		N
Shrub (SG)	*Choretrum spp.*	0.1	1		N

Project name:	E210893				
Recorders:	PAR	Plot ID:	P8	Date:	21/12/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Forb (FG)	*Gonocarpus teucrioides (Germander Raspwort)*	0.1	5		N
Grass & grasslike (GG)	*Lomandra cylindrica*	0.1	3		N
Forb (FG)	*Patersonia sericea (Silky Purple-Flag)*	0.1	1		N

BAM Site – Field Survey Form

Plot ID:	P9	Date:	20/12/21	Project number:	E210893	Plot dimensions:	50 x 20
Datum:	GDA94	Easting:	286,677	Recorders:	PR		
Zone:	56	Northing:	6,327,395	IBRA region:		Midline bearing:	150
Plant Community Type:				Condition class:		PCT confidence:	
Vegetation Class:				EEC:		EEC confidence:	

Record easting and northing at 0 m on midline. Dimensions (Shape) of 0.04 ha base plot.

BAM Attribute (400 m2 plot)		Sum values
Count of Native Richness	Trees:	1
	Shrubs:	5
	Grasses etc.:	11
	Forbs:	7
	Ferns:	0
	Other:	1
Sum of Cover of native vascular plants by growth form group	Trees:	0.4
	Shrubs:	1.2
	Grasses etc.:	96.2
	Forbs:	2.1
	Ferns:	0
	Other:	3
High Threat Weed cover:		0

BAM Attribute (1000 m2 plot) DBH			
DBH	Tree stem count	Length of logs (m) (≥10 cm diameter, >50 cm in length)	0
80 + cm:	0		
50 – 79 cm:	0		
30 – 49 cm:	0		
20 – 29 cm:	0	Tree hollow count	0
10 – 19 cm:	0		
5 – 9 cm:	0		
< 5 cm:	5		

Counts apply when no. of tree stems within a size class is ≤ 10. Estimates can be used when > 10 (eg. 10, 20, 30..., 100, 200, 300...). For multi-stemmed tree, only largest living stem is included in the count. Tree stems must be living.
For hollows, count only the presence of a stem containing hollows. For a multi-stemmed tree, only the largest stem is included in the count/estimate. Stems may be dead and may be shrubs.

BAM Attribute (1 x 1 m plots)	Litter cover (%)				
Subplot:	1	2	3	4	5
Subplot score (%):	20	45	20	15	15
Average litter cover (%):	23				

Litter cover is assessed as the average percentage ground cover of litter recorded from five 1 m x 1 m plots centred at 5, 15, 25, 35, 45 m along the plot midline. Litter cover includes leaves, seeds, twigs, branchlets and branches (less than 10 cm in diameter). Assessors may also record the cover of rock, bare ground and cryptogams.

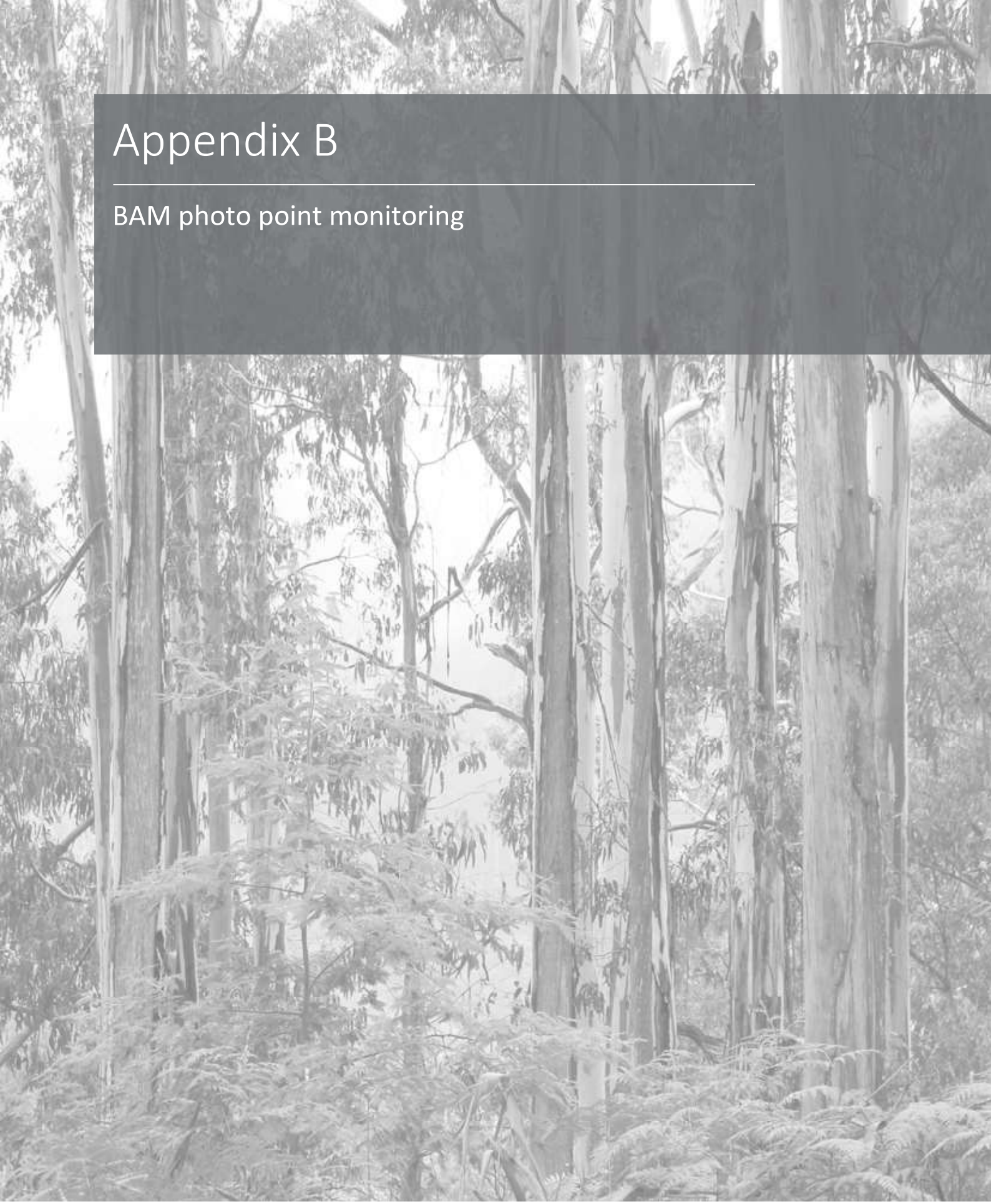
Physiography and site features

Plot Disturbance

GF Code: see Growth Form definitions in Appendix 1; N: native, E: exotic, HTE: high threat exotic; GF – circle code if 'top 3'; Cover: 0.1, 0.2, 0.3, ..., 1, 2, 3, ..., 10, 15, 20, 25, ...100% (foliage cover)
Note: 0.1% cover represents an area of approximately 63 x 63 cm or a circle about 71 cm across, 0.5% cover represents an area of approximately 1.4 x 1.4 m, and 1% = 2.0 x 2.0 m, 5% = 4 x 5 m, 25% = 10 x 10 m
Abundance: 1, 2, 3, ..., 10, 20, 30, ... 100, 200, ..., 1000, ...

Project name:	E210893				
Recorders:	PR	**Plot ID:**	P9	**Date:**	20/12/21

GF Code	Scientific name	Cover	Abundance	Voucher	N, E or HTE
Grass & grasslike (GG)	*Chorizandra cymbaria*	5	800	no	N
Grass & grasslike (GG)	*Entolasia stricta (Wiry Panic)*	5	500		N
Grass & grasslike (GG)	*Lepyrodia spp.*	0.3	50	yes	N
Grass & grasslike (GG)	*Hemarthria uncinata (Matgrass)*	10	400		N
Grass & grasslike (GG)	*Microlaena stipoides (Weeping Grass)*	0.1	1		N
Grass & grasslike (GG)	*Deyeuxia spp. (A Bent Grass)*	0.1	20	yes	N
Grass & grasslike (GG)	*Schoenus brevifolius*	50	3000	no	N
Grass & grasslike (GG)	*Schoenus spp.*	25	500		N
Grass & grasslike (GG)	*Lepidosperma spp.*	0.5	10	yes	N
Forb (FG)	*Gonocarpus micranthus*	1	200		N
Shrub (SG)	*Melaleuca thymifolia (Thyme Honey-myrtle)*	0.5	9		N
Other (OG)	*Xanthorrhoea media*	3	20		N
Forb (FG)	*Goodenia paniculata*	0.6	250		N
Forb (FG)	*Hypericum gramineum (Small St John's Wort)*	0.1	100		N
Tree (TG)	*Eucalyptus spp.*	0.4	5		N
Forb (FG)	*Hydrocotyle spp.*	0.1	40		N
Forb (FG)	*Hypoxis hygrometrica (Golden Weather-grass)*	0.1	20		N
Shrub (SG)	*Hibbertia spp.*	0.1	1	yes	N
	Conyza sumatrensis (Tall fleabane)	0.1	1		E
Shrub (SG)	*Callistemon spp.*	0.4	5	yes	N
Forb (FG)	*Viola betonicifolia (Native Violet)*	0.1	2		N
Grass & grasslike (GG)	*Lachnagrostis spp.*	0.1	3		N
Shrub (SG)	*Leptospermum juniperinum (Prickly Tea-tree)*	0.1	1		N
Forb (FG)	*Euchiton spp. (A Cudweed)*	0.1	1		N
Shrub (SG)	*Persoonia oblongata*	0.1	1		N
Grass & grasslike (GG)	*Juncus spp. (A Rush)*	0.1	2		N



Appendix B

BAM photo point monitoring

B1

B2

BAM B3

BAM B4

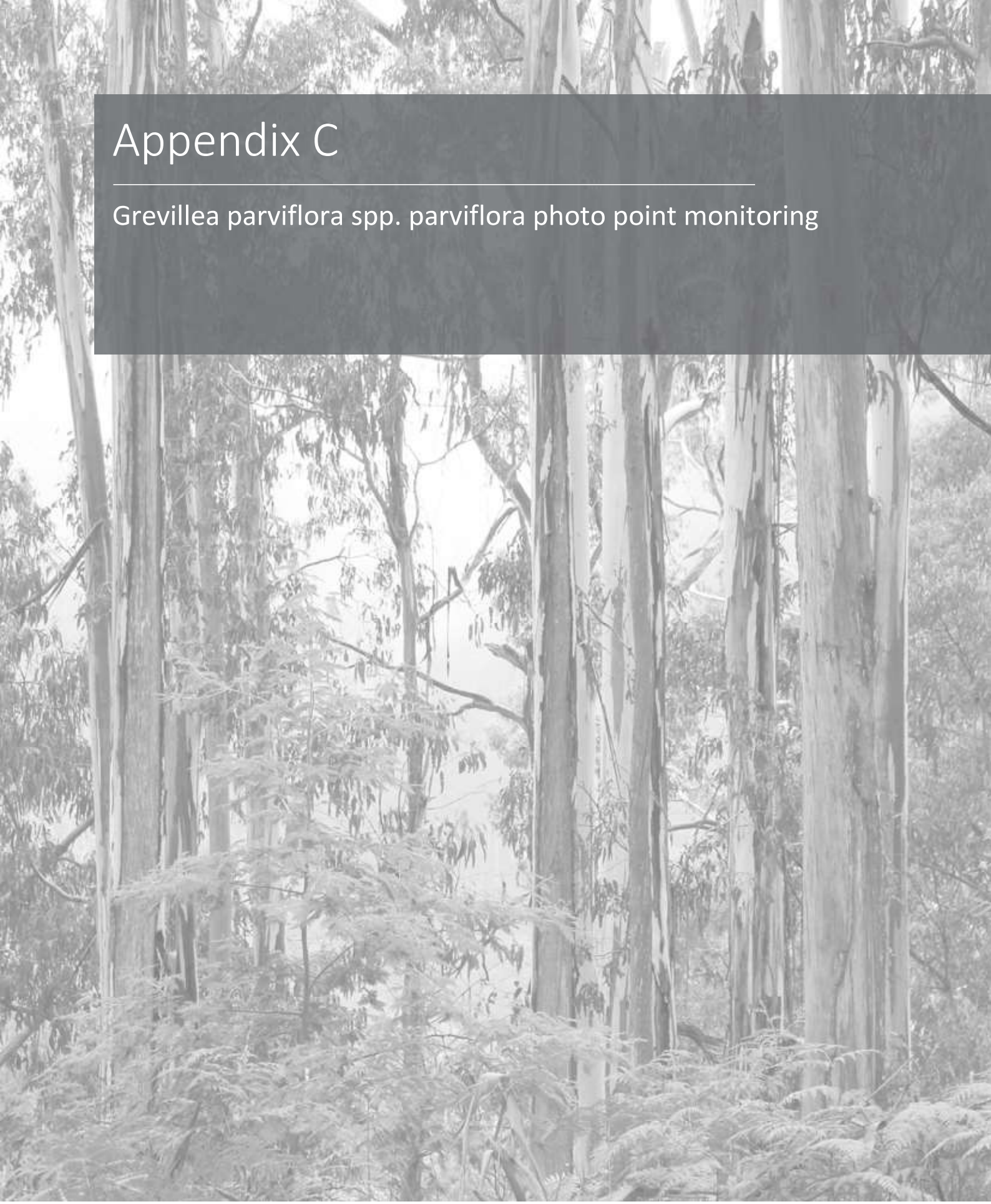
BAM B5

BAM B6

BAM B7

BAM B8

BAM B9



Appendix C

Grevillea parviflora spp. parviflora photo point monitoring

Grevillea Plot 1

Grevillea Plot 2

Grevillea Plot 3

Grevillea Plot 4

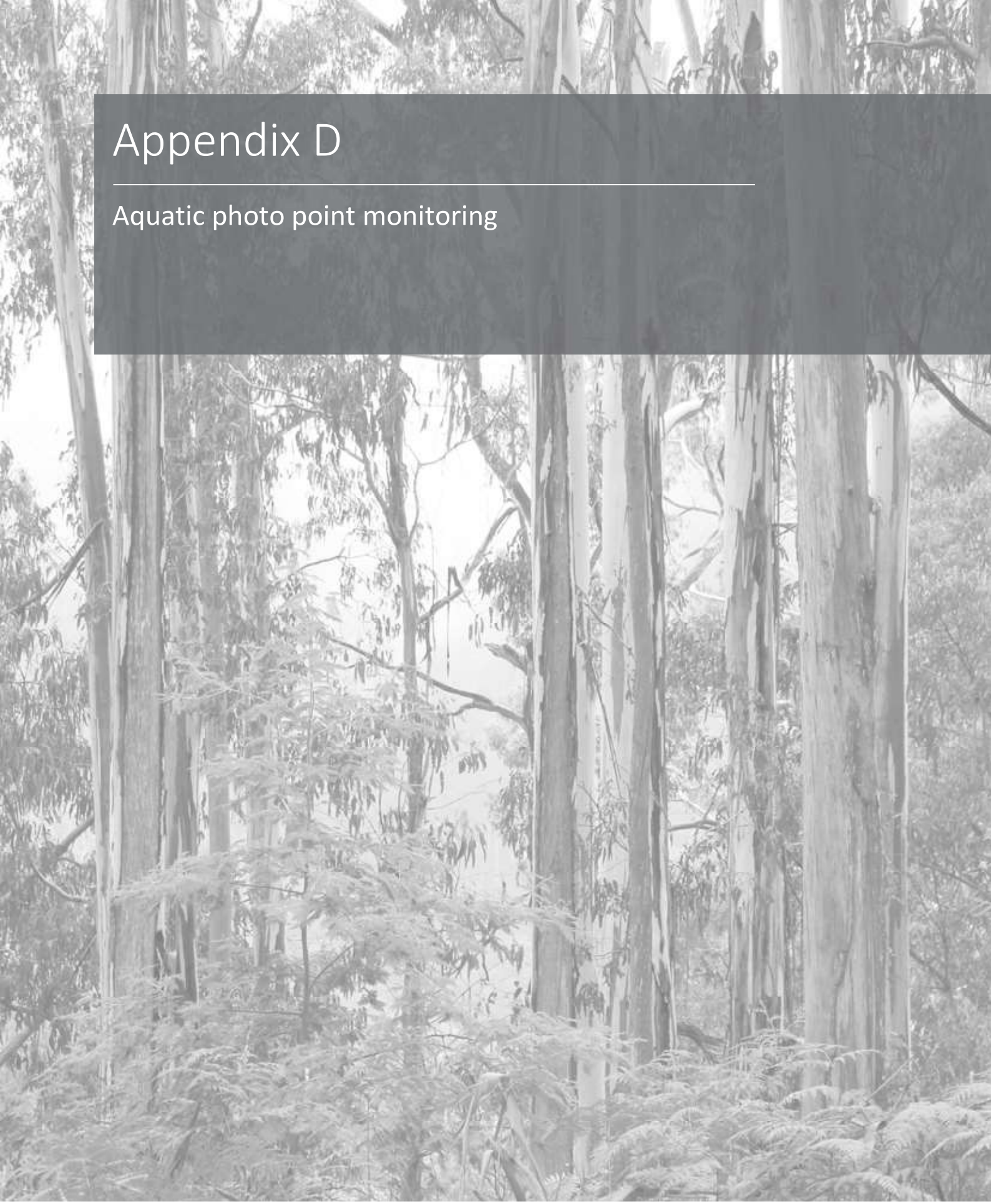
Grevillea Plot 5

Grevillea Plot 6

Grevillea Plot 7

Grevillea Plot 8

Grevillea Plot 9



Appendix D

Aquatic photo point monitoring

Tinda Creek aquatic site 1

Tinda Creek aquatic site 2

Tinda Creek aquatic site 3

Tinda Creek aquatic site 4

Tinda Creek aquatic site 5

Tinda Creek aquatic site 6

Tinda Creek aquatic site 7

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Appendix 5

Aquatic Monitoring Report Spring 2021

Prepared by Niche Environment and Heritage Pty Ltd

(Total No. of pages including blank pages = 36)

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Excellence in your environment

niche Environment and Heritage

Aquatic Monitoring Report

Spring 2021

Prepared for Tinda Creek Quarry Pty Ltd | 3 February 2022

niche-eh.com

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Document control

Project number	Client	Project manager	LGA
6939	Hy-Tech	Matthew Russell	Lithgow

Version	Author	Review	Status	Date
D1	Luke Stone	Matt Russell	Draft	17/12/2021
Rev1	Luke Stone	Darryl Thiedeke	Draft	01/02/2022
Rev 2	Luke Stone	Matt Russell	Final	01/02/2022

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Executive summary

An aquatic monitoring program was established as a requirement of the Landscape Management Plan (LMP) for the Tinda Creek Quarry. The program involves survey and analytical methods for measuring macroinvertebrates, stream health, water quality and catchment-riparian conditions.

The aim of the monitoring program is to monitor the river health of Tinda Creek and its tributaries. The monitoring includes:

- Assessment of stream condition using Riparian and Channel and Environment inventory assessment (RCE)
- Assessment of habitat condition using AUSRIVAS proforma
- Assessment of water quality against default ANZECC trigger values
- Assessment of the macroinvertebrate community condition using Stream Invertebrate Grade Number Average Level (SIGNAL2) and AUSRIVAS.

In comparison to the comparatively wet sampling season of 2020, fewer sites held water in spring 2021. Aquatic environments downstream of Tinda Creek Quarry infrastructure were found to have a continued good level of riparian regrowth after the 2019-2020 bushfire events, as well as stable channel morphology. The macroinvertebrate communities had recorded generally poor SIGNAL2 and AUSRIVAS results, however these results were comparable between the test site and reference sites, and equivalent or improved when compared to previous results. As such, the streams are likely being influenced by natural stress associated with intermittent/ephemeral streams and reflect conditions experienced within the locality, not impacts associated with the operation of the Tinda Creek Quarry.

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Glossary and abbreviations

ANZECC	Australian and New Zealand Environment and Conservation Council.
ANZG	Australian and New Zealand Guidelines (ANZG) for Fresh and Marine Water Quality.
Anthropogenic	Caused or produced by humans.
Aquatic macroinvertebrates	Animals that have no backbone, are visible with the naked eye and spend all or part of their life in water.
AUSRIVAS	Australian Rivers Assessment System.
Drainage	Natural or artificial means for the interception and removal of surface or subsurface water.
DTVs	Default Trigger Values.
Ecology	The study of the relationship between living things and the environment.
Ephemeral	Existing for a short amount of time.
Habitat	The place where a species, population or ecological community lives (whether permanently, periodically or occasionally).
LMP	Landscape Management Plan.
RCE inventory	Riparian and Channel and Environment inventory assessment.
Riparian	Relating to the banks of a natural waterway.
SIGNAL2	Stream Invertebrate Grade Number Average Level. SIGNAL2 scores are indicative only and pollution does not refer to just anthropogenic sources. Environmental stress may result in poor water quality occurring naturally in waterways such as those conditions found in ephemeral streams. Low family richness and the occurrence of pollution tolerant invertebrates can give a low SIGNAL score even though they are a natural condition.
Stress	Response to a stressor such as an environmental condition or a stimulus.

1. Introduction

1.1 Background

As part of the Tinda Creek Quarry Landscape Management Plan (LMP), a macroinvertebrate monitoring program within the Tinda Creek system and its tributaries was established to monitor changes to the system over time and assess possible influence from Quarry operations. The program includes methods for assessing stream health through the monitoring of macroinvertebrates, water quality and catchment-riparian conditions.

A baseline survey and assessment of eight sites was conducted in August 2007 shorty after a period of heavy rainfall and runoff. Following the 2015 approval for expansion of the Quarry, another survey was conducted in November 2015 to update the baseline records. Hy-Tec has committed to annual monitoring under the approved Landscape Management Plan. Niche were engaged to conduct aquatic monitoring in spring 2018, 2019 and 2020.

1.2 Catchment characteristics

The aquatic habitats surrounding the Tinda Creek Quarry include:

- Tinda Creek, a tributary of Wollemi Creek which joins the Colo River approximately 16 km to the west of the project area
- Ephemeral drainage lines that flow to Tinda Creek
- Artificially created diversion channels
- Farm dam sites.

Tinda Creek is an ephemeral/intermittent stream which flows to the west away from the Quarry grounds. It has been diverted around the eastern and northern boundaries of the current operation zone via small earth drainage channels.

Tinda Creek is met by ephemeral second order drainage lines on the northern boundary of the Quarry. These lines do not hold water due to the substrate having a high concentration of sand and silt, and as such, are usually dry due to the sandy substrate having such a high permeability.

Two small former farm dams are located within the property to the north of the Quarry. These dams have been overgrown with vegetation in recent monitoring periods, however, have been cleared to some extent due to the recent bushfires and are currently regenerating.

1.3 Aim

The aim of the aquatic monitoring program is to assess the health of Tinda Creek and its tributaries to ensure that the expanded quarry operations do not result in adverse impacts to the health of the downstream creek system. Specifically, in regard to aquatic environment and aquatic habitat health of the Greater Blue Mountains World Heritage Area. The monitoring includes:

- Assessment of stream condition using RCE
- Assessment of habitat condition using AUSRIVAS
- Assessment of water quality against default ANZECC trigger values
- Assessment of the macroinvertebrate community condition using SIGNAL and AUSRIVAS.

2. Methods

2.1 Location of monitoring sites

A total of eight sites were surveyed along the Tinda Creek system and its tributaries (Figure 1, Table 1) consistent with the baseline monitoring conducted in 2015 and monitoring in 2018/2019. This included sites upstream and sites downstream of operations of the Quarry and therefore provides both reference and test sites for monitoring.

Table 1: Location of monitoring sites

Site	Stream	Location	Easting	Northing
Reference sites				
Site 1	Tinda Creek	Tinda Creek Upstream of Quarry	286599	6327354
Site 2	Tinda Creek	Tinda Creek Upstream of Quarry	286400	6328390
Site 5	Tributary of Tinda Creek	Tinda Creek Tributary	284913	6328247
Site 8	Tributary of Tinda Creek	Tinda Creek tributary (outside of Quarry influence)	284476	6329656
Test sites				
Site 3	Tinda Creek Diversion Channel	Tinda Creek Diversion channel within Quarry	286405	6327957
Site 4	Tinda Creek	Tinda Creek Downstream of Quarry	285711	6328427
Site 6	Tinda Creek	Tinda Creek downstream of Quarry	284048	6328633
Site 7	Tinda Creek	Tinda Creek downstream of Quarry	282998	6328847

2.1.1 Site 1 – Tinda Creek, Upstream of Quarry

Site 1 is situated on the upper reaches of Tinda Creek, upstream and to the southeast of Quarry activities. In this location, Tinda Creek lacks a defined drainage channel, being characterised by an open, sandy floodplain. As Site 1 is located upstream of the quarry, it will be monitored as a reference site.

2.1.2 Site 2 – Tinda Creek, Upstream of Quarry

Site 2 is located upstream and to the north of the Quarry and is downstream of a former farm dam. Site 2 is located on a section of an upper tributary of Tinda Creek formed as a constructed drainage channel with an open floodplain. As Site 2 is located upstream of the Quarry, it will be monitored as a reference site.

2.1.3 Site 3 – Tinda Creek Quarry – Clean Water Diversion

Site 3 is situated along a clean water diversion channel that was constructed to divert overland flows around the eastern edge of the Quarry and to the north towards Tinda Creek. The diversion channel is generally less than 2 m in width. As a constructed diversion channel, Site 3 is included in the program as a test site.

2.1.4 Site 4 – Downstream of the Quarry

Site 4 is located downstream of the Quarry along a section of Tinda Creek that occurs just upstream of a small former farm dam. Tinda Creek at Site 4 comprises a defined drainage channel which supports a number of small, isolated pools. As Site 4 is situated downstream of the Quarry, it will be monitored as a test site.

2.1.5 Site 5 – Tinda Creek Tributary

Site 5 comprises a tributary of Tinda Creek that runs generally parallel to the eastern side of Putty Road and joins Tinda Creek just upstream of the road culvert. The tributary at this site comprises a series of wide pools interspersed with narrower sections. Site 5 will be monitored as a reference site.

2.1.6 Site 6 – Tinda Creek, West of Putty Road

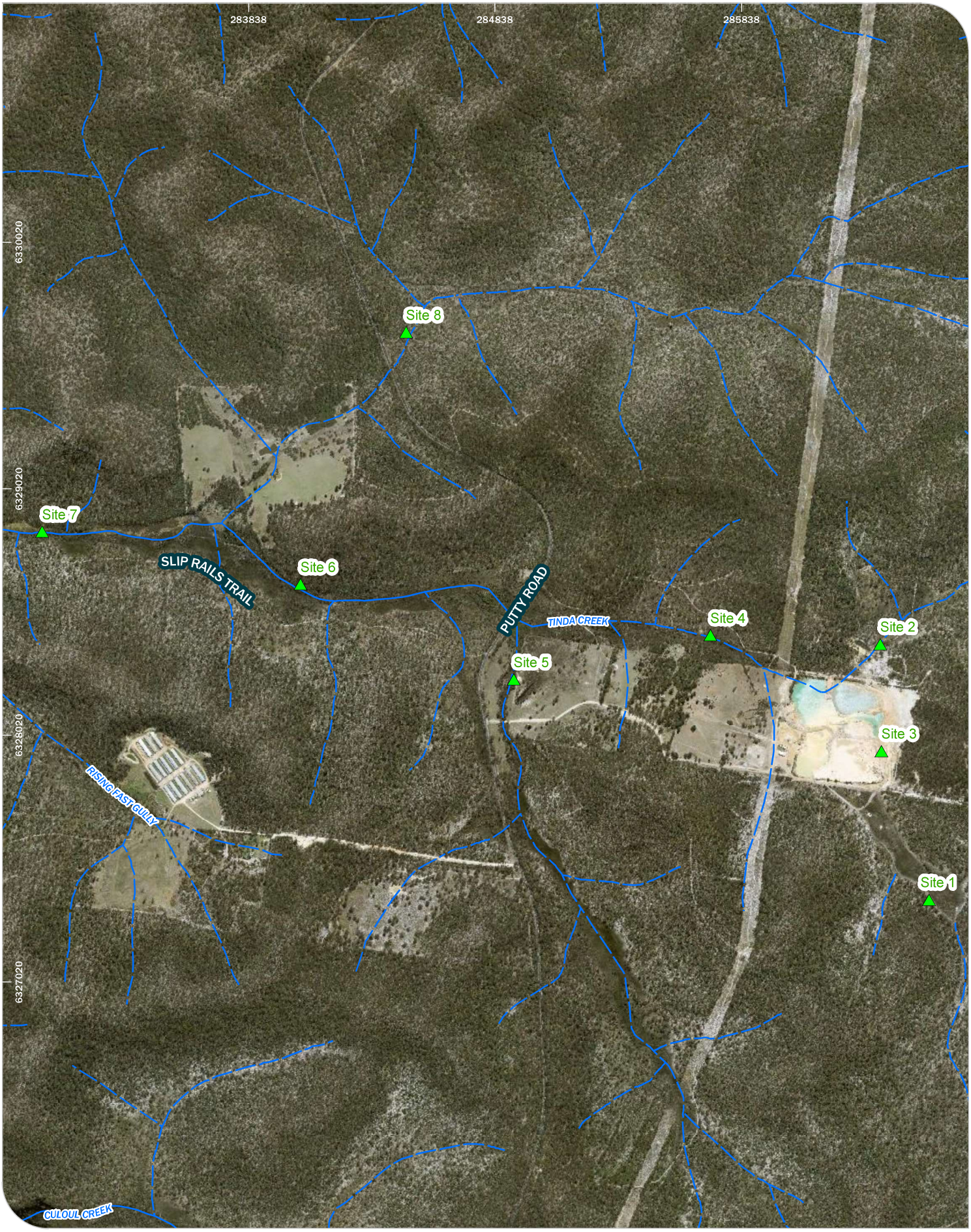
Site 6 is situated on Tinda Creek, approximately 0.75 km downstream of Putty Road. Site 6 comprises a shallow channel with broad floodplain. As Site 6 is downstream of the quarry, it will be monitored as a test site.

2.1.7 Site 7 – Tinda Creek, Far West of Putty Road

Site 7 is positioned along Tinda Creek, approximately 2 km downstream of Putty Road. Site 7 comprises a broad, open channel. As Site 7 is downstream of the Quarry, it will be monitored as a test site.

2.1.8 Site 8 – Tinda Creek Tributary, North West of the Quarry

Site 8 is located upstream of Putty Road within a tributary of Tinda Creek to the north of the Quarry that is not influenced by Quarry operations. The site is directly above the culvert under Putty Road and comprises a broad open channel. Given that Site 8 occurs in a tributary that could not be affected by the quarry operations it is monitored as a reference site.



Drawn by: Phillip Rofe File: T:\spatial\projects\ia4200\ia4216_TindaCreek_VegKoala_NSWMapsIreport4216_Figure_1_Aquatic.mxd Last updated: 3/1/2019 3:38:34 PM

niche Environment and Heritage

0 400
m
GDA 1994 MGA Zone 56

Niche PM: Matthew Russell
Niche Proj. #: 6939
Client: Hy-Tech

Subject Area
Tinda Creek Aquatic Monitoring

Figure 1

public/NSW_Imagery:

v2.0

2.2 Field methods

The field survey was undertaken on the 3 November 2021. Field methods were consistent with standardised techniques for field sampling as prescribed by AUSRIVAS (Turak *et al*. 2004). The AUSRIVAS methods of sampling both pools and riffles has been modified for this program, as no suitable in-stream riffle features were present.

A summary of the survey methods used at each of the eight sites is provided in Table 2. The application of some methods were limited at some of the sites as the sites were dry at the time of the survey and these are identified below.

Table 2: Summary of methods at each site

Site	Macroinvertebrate sampling	AUSRIVAS habitat assessment	RCE assessment	Photo monitoring
Reference site				
Site 1			X	X
Site 2			X	X
Site 5	X	X	X	X
Site 8	X	X	X	X
Test site				
Site 3			X	X
Site 4	X (dry)	X	X	X
Site 6	X	X	X	X
Site 7		X	X	X

2.2.1 Aquatic habitat and stream condition

Riparian, Channel and Environment inventory assessment (RCE)

The RCE Inventory (Chessman *et al*. 1997) provides a comparative measure of stream condition by assessing both the stream and its riparian environment in terms of habitat diversity, habitat condition and the degree of human-induced disturbance. Thirteen categories each receive a score between one and four based on their condition, resulting in an accumulated score of between 13 and 52. The maximum score (52) indicates a stream with little or no obvious physical disruption and the lowest score (13) indicates a heavily channelled stream without any riparian vegetation. This assessment provided an assessment of the general condition of the stream and must be interpreted accordingly.

Habitat description

A description of aquatic habitat was also produced using the AUSRIVAS proforma. The survey is a rapid visual assessment used to describe the habitat based on the following parameters:

- Geomorphology
- Channel diversity
- Bank stability
- Riparian vegetation and adjacent land use
- Water quality
- Macrophytes
- Local impacts and land use practices.

Macro-invertebrate sampling

Macro-invertebrate sampling was to be undertaken at sites 4-8 in accordance with AUSRIVAS protocol (Turak et al., 2004), where possible. This is due to the fact that sites 1-3 do not typically hold sufficient water to allow for sampling. The lack of sufficient water in these sites is a result of the ephemeral nature of the streams in the project area and the sandy substrate.

2.2.2 Water quality

Surface water quality was measured *in situ* using a Yeokal 611 water quality probe at each site. The following variables were recorded:

- Temperature (°C)
- Conductivity (µS/cm)
- pH
- Dissolved oxygen (DO)(% saturation and mg/L)
- Turbidity (NTU).

Alkalinity (mg $CaCO_3$/L) was measured with a standard titration kit. Water quality data were compared with the Australian and New Zealand Guidelines (ANZG) for Fresh and Marine Water Quality Default Trigger Values (DTVs) for the region as a benchmark for comparison for the program. Currently, no updated ANZG DTVs for the region have been provided. As such the DTVs applied in this report are the ANZECC (2000) physical and chemical stressors for protection of slightly upland aquatic ecosystems in South-Eastern Australia default guideline values. This is consistent with previous iterations of the monitoring program.

2.2.3 Macroinvertebrates

Samples of macroinvertebrates were collected from pool edges for a length of 10 metres, either as a continuous line or in disconnected segments. Sampling in segments was often undertaken to ensure the sampling of sub-habitats such as macrophyte beds, bank overhangs, submerged branches and root mats. Segmented sampling was also employed where pool length was short and it was logistically difficult to sample in a continuous line (e.g. in-stream logs). A 250 µm dip net was drawn through the water with short sweeps towards the bank to dislodge benthic fauna while scraping submerged rocks and debris, sides of the stream bank and the bed substrate (Plate 1). Further sweeps in the water column targeted the suspended fauna.

Plate 1: Sampling method

Each sample was rinsed from the net onto a white sorting tray from which animals were picked using forceps, pipettes and or paint brushes. Each tray was picked for a minimum period of 40 minutes, after which they were picked at 10 minute intervals for either a total of one hour or until no new specimens had been found. Care was taken to collect cryptic and fast moving animals, in addition to those that were conspicuous or slow. The animals collected at each site were placed into a labelled jar containing 70% ethanol.

Laboratory methods-invertebrate identification

Macroinvertebrate samples were identified to family level with the exception of Oligochaeta (to class), Polychaeta (to class), Ostracoda (to subclass), Nematoda (to phylum), Nemertea (to phylum), Acarina (to order) and Chironomidae (to subfamily). Keys used to identify taxa included:

- Centre for Freshwater Ecosystems (n.d.) – Identification Key and Ecology of Australian Freshwater Invertebrates. http://www.mdfrc.org.au/bugguide/.
- Dean, J., Rosalind, M., St Clair, M., and Cartwright, D. (2004) Identification keys to Australian families and genera of caddis-fly larvae (Trichoptera) Cooperative Research Centre for Freshwater Ecology.
- Gooderham, J. and Tsyrlin, E. (2002) The Waterbug Book: A guide to the Freshwater Macroinvertebrates of Temperate Australia, CSIRO Publishing.
- Hawking and Theischinger (1999) A guide to the identification of larvae of Australian families and to the identification of ecology of larvae from NSW.
- Madden, C. (2010) Key to genera of Australian Chironomidae. Museum Victoria Science Reports 12, 1-31.
- Madden, C. (2011) Draft identification key to families of Diptera larvae of Australian inland waters La Trobe University.
- Smith, B. (1996) Identification keys to the families and genera of bivalve and gastropod molluscs found in Australian inland waters Murray Darling Freshwater Research Centre.

2.3 Data analysis

2.3.1 SIGNAL: (Stream Invertebrate Grade Number Average Level) scores

The revised SIGNAL2 biotic index developed by Chessman (2003a and 2003b) was used to determine the "environmental quality" of sites. This method assigns grade numbers to each macroinvertebrate family or taxa found, based largely on their response to a range of environmental conditions (Table 3). The sum of all grade numbers for that habitat is then divided by the total number of families recorded in each habitat to calculate the SIGNAL2 index.

Table 4 provides a broad guide for interpreting the health of the site according to the SIGNAL2 score of the site.

A weighted SIGNAL2 score was also calculated (see Chessman 2003b). The SIGNAL2 index therefore uses the average sensitivity of macroinvertebrate families to present a snapshot of biotic integrity at a site. The number of taxa and weighted SIGNAL scores were used to create a bi plot using categories provided in Table 5.

Table 3: SIGNAL grade and the level of pollution tolerance for individual taxa

SIGNAL grade	Pollution tolerance
10-8	Indicates a greater sensitivity to pollution
7-5	Indicates a sensitivity to pollution
4-3	Indicates a tolerance to pollution
2-1	Indicates a greater tolerance to pollution

Table 4: Guide to interpreting the SIGNAL2 scores

SIGNAL2 score	Habitat quality
Greater than 6	Healthy habitat
Between 5 and 6	Mild pollution
Between 4 and 5	Moderate pollution
Less than 4	Severe pollution

(Source: Gooderham and Tsyrlin 2002)

*Note that SIGNAL2 scores are indicative only and that pollution does not refer to just anthropogenic pollution. Environmental stress may result in poor water quality occurring naturally in waterways. Low family richness and the occurrence of pollution tolerant invertebrates can give a low SIGNAL score even when they are in natural condition.

Table 5: Bi-plot interpretation

Bi plot category	SIGNAL2	Number of taxa
Toxic pollution, harsh physical conditions	>5	<17
Urban Industrial or agricultural pollution	<5	<17
High salinity or nutrients	<5	>17
Favourable habitat	>5	>17

2.3.2 Opportunistic observations

Opportunistic visual observations of aquatic fauna were recorded during the surveys at each site.

3. Results

3.1 Weather conditions

The survey was conducted on 3 November 2021, with a low level of rainfall leading up to the survey date (Figure 2). In the 10 days preceding the survey, a total of 1.6 mm of rain was recorded, falling on a single day. The total rainfall recorded in October was 41.6 mm, which is below the median for the Colo Heights (Mountain Pines) station of 41.6 mm (1962 – 2021). These drier than average conditions were reflected in the levels of water present within the study area, with only three sites holding water during the spring 2021 sampling survey. Despite the prevailing dry conditions at the time of spring sampling, the total rainfall recorded in 2021 (January to November) was 1100.9 mm. That is above the 980.6 mm total median total annual rainfall for the station (1962 – 2021), indicating wetter than average conditions over the course of the year. The total rainfall recorded for 2020 was also above average (1341.1 mm), while 2019 was below average (605.1), with rainfall data for 2015 and 2018 unavailable.

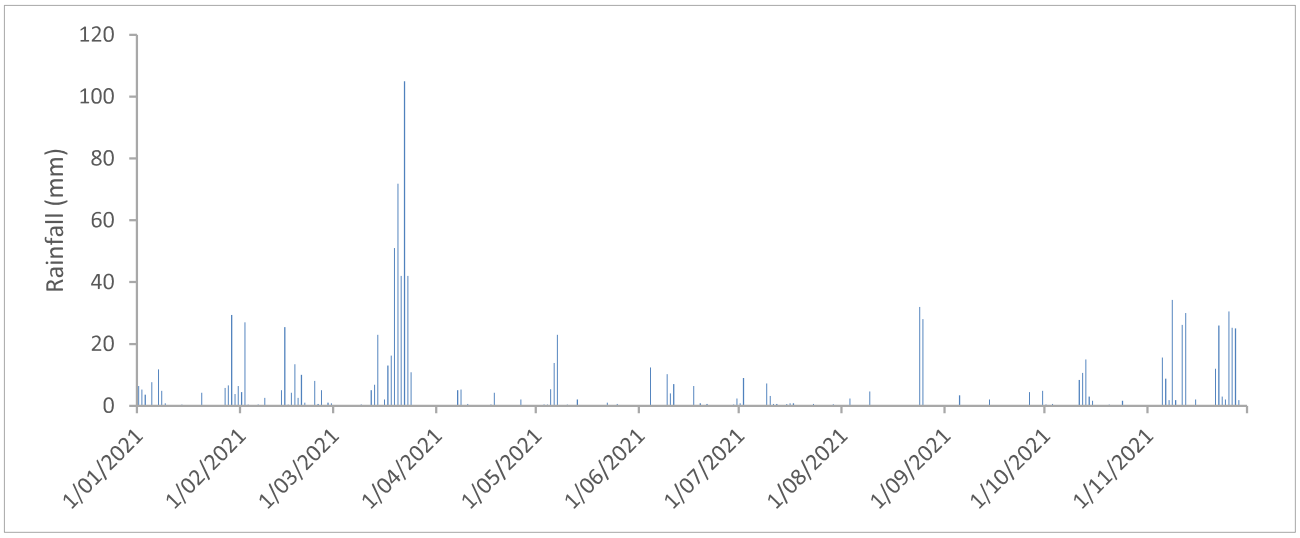


Figure 2: Rainfall data for January-November 2021 (station no. 61211)

3.2 Aquatic habitat/condition

The aquatic habitat of the study area comprised of pools habitat only with no active riffles. All except two sites had good riparian and channel health (RCE score 40 or above) (Table 6). Most sites exhibited stable banks and regenerating native riparian cover. Site 6 and Site 7 are continuing to recover from bushfires, with regrowth of ground cover vegetation observed.

Table 6: RCE inventory scores (2021)

Site	Spring 2021
Reference site	
Site 1	40
Site 2 (Constructed diversion channel)	32
Site 5	43
Site 8	45
Test site	
Site 3 (Constructed diversion channel)	27
Site 4	42
Site 6	46

Site	Spring 2021
Site 7	46

An RCE score greater than 40 indicates a stream considered to be in good condition with potential for higher biodiversity values. RCE Scores of 20-40 indicate a stream is in moderate condition and below 20 indicates that the stream is in very poor condition

3.2.1 Site 1 Tinda Creek upstream of the Quarry (reference)

The key aquatic habitat features at Site 1 (Plate 2) at the time of the spring 2021 monitoring surveys are described in Table 7.

Table 7: Site 1 habitat results

Criteria	Attribute	Site 1
Riparian	RCE score	40.
	Vegetation	Canopy absent. Scattered Parramatta Red Gum (*Eucalyptus parramattensis)* regenerating within this location. Mid-story absent. Groundcover dominated by sedge, low shrub, herb and grasses including *Leptocarpus tenax; Juncus* sp.*; Lepyrodia scariosa; Schoenus brevifolius; Entolasia stricta; Gonocarpus micranthus; Melaleuca thymifolia; Micromyrtus ciliata* and *Dampiera stricta.*
	Stream shading	Low <5%.
	Exotic vegetation	-
Stream characteristics	Modal width (m)	<1 m.
	Substrate	Majority sand and silt.
	Flow/depth	No flow.
	Macrophytes/algae	Absent.
	Water quality observations	Dry.
Comments		Very shallow and generally narrow channel form (<1 m). Open sandy floodplain with the flow channel identified by the change in vegetation, indicating the more permanent presence of surface water or subsurface flow.
Plate 2: Site 1	**Downstream**	

Criteria	Attribute	Site 1
	Upstream	

3.2.2 Site 2 Tinda Creek upstream of the Quarry (reference site)

The aquatic habitat at Site 2 (Plate 3) at the time of the spring 2021 monitoring surveys is detailed in Table 8.

Table 8: Site 2 habitat results

Criteria	Attribute	Site 2
Riparian	RCE score	32 (Constructed drainage channel).
	Vegetation	Canopy consisted of sparse Scribbly Gums (*Eucalyptus haemastoma*), with a scattered grass/shrub land dominated by *Chorizandra spaerocephala.*
	Stream shading	Low/moderate.
	Exotic vegetation	-
Stream characteristics	Modal width (m)	<1 m.
	Substrate	Sand 80%, Silt 20%.
	Flow/depth	No flow.
	Macrophytes/algae	Absent.
	Water quality	Dry.
Comments		Constructed channel to drain farm dam.
Plate 3: Site 2	Downstream	

Criteria	Attribute	Site 2
	Upstream	

3.2.3 Site 3 Tinda Creek diversion channel within Quarry (test site)

The aquatic habitat at Site 3 (Plate 4) at the time of the spring 2021 monitoring surveys is detailed in Table 9.

Table 9: Site 3 habitat results

Criteria	Attribute	Site 3
Riparian	RCE score	27 (Constructed channel).
	Vegetation	Canopy and mid-story absent. Groundcover dominated by *Chorizandra spaerocephala*.
	Stream shading	Low/none.
	Exotic vegetation	-
Stream characteristics	Modal width (m)	<2 m.
	Substrate	Sand 70%, silt 30%.
	Flow/depth	No flow.
	Macrophytes/algae	Absent.
	Water quality observations	Dry.
Comments		Dry. Very loose and unstable banks.
Plate 4: Site 3	Downstream	
	Upstream	

3.2.4 Site 4 Tinda Creek downstream of Quarry (test site)

The aquatic habitat at Site 4 (Plate 5) at the time of the spring 2021 monitoring surveys is detailed in Table 10.

Table 10: Site 4 habitat results

Criteria	Attribute	Site 4
Riparian	RCE score	42
	Vegetation	Canopy composed of *Eucalyptus haemastoma (<5%).* Mid-story dominated by small trees and tall shrubs. Ground cover was sparse with signs of slight post fire regrowth and dominated by *Chorizandra spaerocephala.*
	Stream shading	Low.
	Exotic vegetation	-
Stream characteristics	Modal width (m)	2 m.
	Substrate	80% silt, 20% sand.
	Flow/depth	No flow.
	Macrophytes/algae	Absent.
	Water quality observations	Dry.
Comments		None.
Plate 5: Site 4	Downstream	
	Upstream	

3.2.5 Site 5 Tinda Creek Tributary (reference site)

The aquatic habitat at Site 5 (Plate 6) at the time of the spring 2021 monitoring surveys is detailed in Table 11.

Table 11: Site 5 habitat results

Criteria	Attribute	Site 5
Riparian	RCE score	43.
	Vegetation	Canopy present and comprised of *Eucalyptus haemastoma*, Mid-story supporting dense cover of small trees and tall shrubs (*Acacia spp* and *Cassurina spp*).There were signs of regrowth of ground covering including regenerative Cat-tailed bulrush (Typha) and Round headed bristle sedge (*Chorizandra spaerocephala*).
	Stream shading	Low-moderate.
	Exotic vegetation	-
Stream characteristics	Modal width (m)	6 m.
	Substrate	Silt 90%, sand 10%.
	Flow/depth	No flow/deep >1 m.
	Macrophytes/algae	Cat tail Bulrush (*Typha* sp.) and floating macrophyte *Potamogetan sulcus*
	Water quality observations	Water availability was relatively high; conditions were highly turbid.
Comments		Riparian and macrophyte vegetation present, European carp (*Cyprinus carpio*) was present in dam
Plate 6: Site 5	Downstream	
	Upstream	

3.2.6 Site 6 Tinda Creek downstream of Quarry (test site)

The aquatic habitat at Site 6 (Plate 7) at the time of the spring 2021 monitoring surveys is detailed in Table 12.

Table 12: Site 6 habitat results

Criteria	Attribute	Site 6
Riparian characteristics	RCE score	46.
	Vegetation	Forest Red Gum (*Eucalyptus tereticornis*), White Stringybark (*E. globoidea)* dominated the canopy vegetation. The mid-storey was dominated by small trees and tall shrubs. The ground cover consisted of regenerating native grasses, herbs and ferns.
	Stream shading	Low/moderate.
	Exotic vegetation	-
Stream characteristics	Modal width (m)	4 m.
	Substrate	Sand 20%, silt 80%.
	Flow/depth	No flow/ >1 m deep.
	Macrophytes/algae	Green algae present.
	Water quality observations	Water availability was relatively high; conditions were highly turbid.
Comments		Good level of post bushfire regrowth.
Plate 7: Site 6	Downstream	
	Upstream	

3.2.7 Site 7 Tinda Creek downstream of Quarry (test site)

The aquatic habitat at Site 7 (Plate 8) at the time of the spring 2021 monitoring surveys is detailed in Table 13.

Table 13: Site 7 habitat results

Criteria	Attribute	Site 7
Riparian characteristics	RCE score	46.
	Vegetation	Canopy vegetation included Grey Gums (*Eucalyptus punctata*) and Scribbly Gums (*Eucalyptus haemastoma*). The ground cover consisted of by native grasses, herbs and ferns, as well as macrophytes.
	Stream shading	Low/moderate.
	Exotic vegetation	-
Stream characteristics	Modal width (m)	<5 m.
	Substrate	Silt 100%.
	Flow/depth	No flow/primarily dry.
	Macrophytes/algae	Cat tail Bulrush (*Typha* sp.), Saw sedge (*Gahnia* sp.).
	Water quality observations	Primarily dry.
Comments		Very shallow surface water in isolated small pools. Overgrown creek bed.
Plate 8: Site 7	Downstream	
	Upstream	

3.2.8 Site 8 Tinda Creek tributary (reference site, outside of Quarry influence)

The aquatic habitat at Site 8 (Plate 9) at the time of the spring 2021 monitoring surveys is detailed in Table 14.

Table 14: Site 8 habitat results

Criteria	Attribute	Site 8
Riparian characteristics	RCE score	45.
	Vegetation	Canopy vegetation included Grey Gums (*Eucalyptus punctata*) and Scribbly Gums (*Eucalyptus haemastoma*). The mid-storey was heavily damaged due to bushfires. The ground cover consisted of by native grasses, herbs and ferns along with Eucalyptus and Casuarina regeneration post fires.
	Stream shading	Low/moderate.
	Exotic vegetation	-
Stream characteristics	Modal width (m)	3 m.
	Substrate	Pebble 30%, sand 20%, silt 50%.
	Flow/depth	Low flow/<1 m.
	Macrophytes/algae	A green macro algae was present
	Water quality observations	Turbid, low flow conditions.
Comments		Leaf litter and organic matter present within the stream.
Plate 9:Site 8	Downstream	
	Upstream	

3.3 Water quality

Water samples were only possible at four of the eight sites. The results show that temperature ranged between 15.06 – 20.6 °C; the highest being Site 5 (Table 15). Conductivity ranged between 32-80 µs/cm; the highest recorded in Site 5. All sites were within the ANZG DTVs for conductivity (30-350 µS/cm). Turbidity ranged between 36.0-100.8 NTU all exceeding the adopted DTVs, with the highest reading recorded at Site 5. Dissolved Oxygen (DO) values were high at all sites holding water (between 91.8 and 93.5 % sat), with all sites within the DTVs (80-110%). All reference sites holding water had pH levels within DTVs (6.5 – 8), however test Site 6 recorded a high pH value (9.32), which is above the DTVs upper limit of 8. Alkalinity was low, recording 20 $CaCO_3$/L for all sites.

Table 15: Water quality results

Site acronym	Temp (C°)	Conductivity (µS/cm)	Turbidity (NTU)	Dissolved Oxygen (% sat)	pH*	Alkalinity (mg $CaCO_3$/L)
Reference site						
Site 1	-	-	-	-	-	-
Site 2	-	-	-	-	-	-
Site 5	20.6	80	**100.8**	93.5	7.71	20
Site 8	18.2	32	**45.6**	93.0	7.98	20
Test site						
Site 3	-	-	-	-	-	-
Site 4	-	-	-	-	-	-
Site 6	15.06	54	**36.0**	91.8	**9.32**	20
Site 7	-	-	-	-	-	-

ANZG DTVs for upland streams: Electrical conductivity (30-350 µS/cm), Turbidity (2-25 NTU), pH (6.5-8), Dissolved Oxygen (80-110%). Text in bold indicate those variables that exceed the DTVs.

Note: For some waterways, DTVs do not reflect typical background water quality and chemistry. Therefore an assessment of water quality monitoring data against default values can suggest the condition of the waterway is outside the normal range, or polluted, when in fact it is 'clean', or vice versa.

3.4 Macroinvertebrates

AUSRIVAS results and SIGNAL2 scores for the three sampled sites are provided in Table 16. Raw data is provided in Annex 1.

Table 16: Macroinvertebrate results

Site acronym	Number of Taxa	SIGNAL2 weighted score	AUSRIVAS Band
Reference site			
Site 1	-	-	-
Site 2	-	-	-
Site 5	17	3.34	B
Site 8	16	4.11	B
Test site			
Site 3	-	-	-
Site 4	-	-	-
Site 6	13	3.71	B
Site 7	-	-	-

The number of taxa at the three sites ranged from 13 to 17, with the fewest taxa observed at test Site 6. AUSRIVAS scores for all sites recorded Band B (significantly impaired) results. These results indicate levels of stream impairment at all sites holding water, as they recorded fewer families than expected based upon the modelled macroinvertebrate communities using the reference site in the AUSRIVAS model.

The low weighted scores SIGNAL2 scores recorded at all sites in spring 2021 indicate that the macroinvertebrate assemblage present in the streams is dominated by predominantly pollution-tolerant taxa (Figure 3). The Biplot, indicates that no sites have favourable aquatic habitat and all locations are exhibiting some form of pollution or natural stress. However, this appears typical for streams in the area as two references sites also cluster together in this quadrant. Pollution-sensitive taxa recorded include dragonfly Telephlebiidae (SIGNAL 9) observed at Site 5, mayfly Leptophlebiidae (Signal 8) observed at sites 6 and 8, flies Dixidae (SIGNAL 7) at Site 6 and caddisfly Odontoceridae (SIGNAL 7) at site 8.

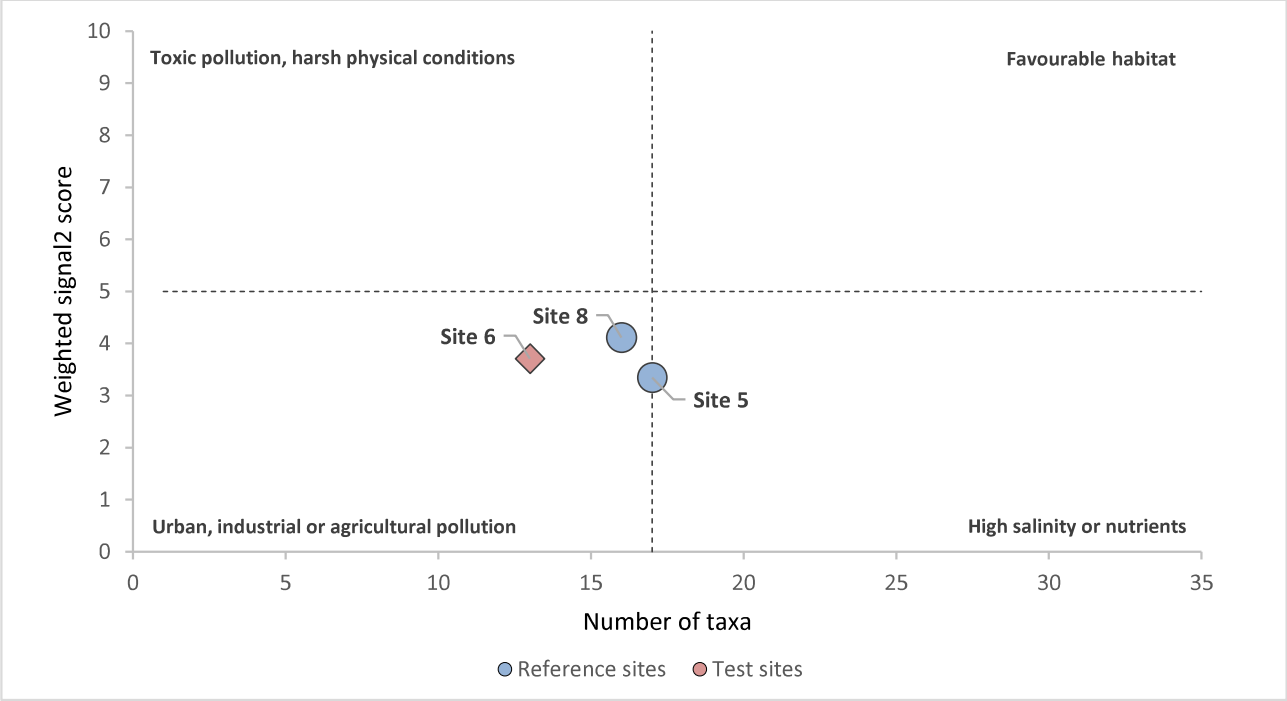


Figure 3: SIGNAL2 Bi-plot

There appears to be no general trend over time in SIGNAL2 scores when the spring 2021 results for all sites are considered in the context of previous results. The SIGNAL2 results for Site 8 have steadily increased over five surveys (Table 17). A return to drier conditions in spring 2021 has meant that fewer test sites could be sampled when compared to the wetter spring in 2020. The other reference Site 5 continues to fluctuate between SIGNAL2 scores of 2.00 and 3.54. Test Site 6 recorded an increased SIGNAL2 score when compared to the previous spring 2020, recording the highest score at this site to date. Other test sites, Site 4 and Site 7, were both dry during spring 2021.

Table 17: Weighted SIGNAL2 scores (2015, 2018, 2019, 2020 and 2021)

Site	SIGNAL2 weighted Spring 2015	SIGNAL2 weighted Spring 2018	SIGNAL2 weighted Spring 2019	SIGNAL2 weighted Spring 2020	SIGNAL2 weighted Spring 2021
Reference site					
Site 5	2.00	3.54	3.35	2.86	3.34
Site 8	2.50	3.00	3.19	3.71	4.11
Test site					
Site 4	2.25	DRY	DRY	2.83	DRY

Site	SIGNAL2 weighted Spring 2015	SIGNAL2 weighted Spring 2018	SIGNAL2 weighted Spring 2019	SIGNAL2 weighted Spring 2020	SIGNAL2 weighted Spring 2021
Site 6	3.50	2.6	DRY	2.73	3.71
Site 7	4.66	DRY	DRY	Low water level – not sampled.	DRY

AUSRIVAS scores (Table 18) in general have been observed to improve over time, with this trend continuing in spring 2021. In fact test Site 6 has recorded an improved AUSRIVAS Band score in 2021 when compared to the Band C results previously recorded during the program.

Table 18: AUSRIVAS (2018 - 2021)

Site	AUSRIVAS 2018	AUSRIVAS 2019	AUSRIVAS 2020	AUSRIVAS 2021
Reference site				
Site 5	D	B	B	B
Site 8	C	B	B	B
Test site				
Site 4	DRY	DRY	B	DRY
Site 6	C	DRY	C	B
Site 7	DRY	DRY	Low water level – not sampled.	DRY

3.5 Other fauna

European Carp (*Cyprinus carpio*) was present at Site 5 in the dam.

4. Discussion

4.1 RCE scores

RCE scores were approximately 40 or above indicating good or near good condition, with the exception of two sites (Sites 2 and 3). The low scores are due to the nature of these sites as they have been modified by human activity. Most sites have moderately increased vegetation cover. Downstream sites affected by bushfire (Site 6 and Site 7) showed considerable regrowth since 2019-20 bushfires including ground cover vegetation that were not yet re-established in spring 2020.

4.2 SIGNAL2 scores and macroinvertebrate communities

Three sites were sampled during this monitoring period. These included Site 6 (test site), along with reference sites, Site 5 and Site 8. Despite poor AUSRIVAS and low-moderate SIGNAL2 scores, the streams appear to be in reasonable health particularly considering the 2019-2020 bushfire event. The results are indicative of macroinvertebrate assemblages and stream condition that are typical of intermittent streams which are under natural ephemeral stress. The results are considered to be representative of similar streams in the locality, with the results for the reference sites clustering together with those of the test site. As such, there appears to be no obvious disturbance resulting from the Tinda Creek Quarry operations at downstream sites.

The results in general are consistent with macroinvertebrate community's representative of low flows and intermittent streams, the fauna of which consist of generally pollution-tolerant organisms resulting in the streams having low SIGNAL2 and AUSRIVAS scores. Low SIGNAL2 scores were similarly observed in previous years and the results are comparable, or better, than the results previously recorded as part of the program. In fact, test Site 6 recorded the highest score at this site to date. In addition to this, the AUSRIVAS scores recorded at all sites in spring 2021 were similar or higher than previous surveys. This improvement in scores is attributed to an increase in rainfall over the recent survey period (2018 – 2021), which has functioned to improve the condition and extent of habitat available for aquatic biota. While conditions were dry at the time of sampling in 2021, above average rainfall across the year has likely led to more permanent water levels sustaining habitats within the study area throughout the year.

4.3 Water quality

Field parameters measured during this monitoring period were within the expected range of typical disturbances found within intermittent streams. All sites had elevated turbidity levels, with reference sites recording higher levels than the test sites. Reference Site 5 recorded the highest turbidity level, substantially above that of test Site 6 and reference Site 8. Other sites also had elevated turbidity, which may be the results of continued inputs of suspended sediment that were exacerbated by 2020 bushfires.

High pH levels were recorded at test Site 6, above the ANZECC guidelines and results recorded in recent seasons. However, these elevated pH levels do not appear to have resulted in impairment to the macroinvertebrate communities present. Future monitoring events should consider pH values at this site to ascertain whether this reading is indicative of an emerging trend.

5. Conclusion and recommendations

5.1 Conclusions

The general health of the vegetation and waterways of the eight sites was found to be in moderate to good health, with a continued good level of post bushfire recovery of native vegetation. All sites but two had RCE scores above 40. Three out of the 8 total sites (test Site 6 and reference Sites 5 and 8) were sampled using AUSRIVAS method, including water quality sampling, due to the limited extent of water present across the sampling sites.

Sites downstream of Tinda Creek Quarry operations continue to exhibit good riparian and channel morphology with the native riparian vegetation showing regeneration, including reestablishment of native groundcovers that were absent in spring 2020 monitoring. The macroinvertebrate community at test and reference sites is in reasonable health despite some poor AUSRIVAS and low to moderate SIGNAL2 scores. The water quality results were consistent with what would be expected for ephemeral/intermittent streams in the locality. The high pH reading recorded at test Site 6 does not appear to have impaired biological conditions but should be re-examined in future monitoring surveys to ensure it is not part of an emerging trend.

Importantly, the stream health results recorded at test Site 6 were equivalent or improved when compared to recent surveys and clustered together with those recorded at the reference sites. This indicates comparable conditions to the references sites and as such no impacts to aquatic systems associated with the operation of the Tinda Creek Quarry are identified in the spring 2021 data.

6. References

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Websites

http://ausrivas.ewater.com.au/

http://www.mdfrc.org.au/bugguide/

Annex 1. Macroinvertebrate survey results

Table 19: Macroinvertebrate survey results in spring 2021

Taxa	SIGNAL2	Site 5	Site 6	Site 8
Acarina	6	6	6	6
Aeshnidae	4	4	4	4
Ancylidae	4	0	0	4
Atyidae	3	3	0	0
Baetidae	5	0	5	5
Ceinidae	2	0	0	3
Chironominae	3	3	3	3
Coenagrionidae	2	2	2	2
Cordulephyidae	5	5	0	0
Corixidae	2	2	2	2
Dixidae	7	0	7	0
Dytiscidae	2	2	2	2
Gerridae	4	0	4	0
Haliplidae	2	0	2	2
Hemicorduliidae	5	5	5	5
Hydraenidae	3	0	3	0
Hydrometridae	3	0	0	3
Hydrophilidae	2	0	0	0
Hydroptilidae	4	4	0	0
Leptoceridae	6	0	7	7
Leptophlebiidae	8	0	8	8
Lestidae	1	1	0	0
Libellulidae	4	4	0	0
Megapodagrionidae	5	0	5	0
Mesoveliidae	2	2	0	0
Notonectidae	1	1	1	1
Odontoceridae	7	0	0	7
Oligochaeta	2	0	2	0
Orthocladiinae	4	0	0	0
Physidae	1	0	1	0
Tanypodinae	4	4	4	4
Telephlebiidae	9	9	0	0
Turbellaria	2	0	2	0

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Cairns

Our services

Ecology and biodiversity
Terrestrial
Freshwater
Marine and coastal
Research and monitoring
Wildlife Schools and training

Heritage management
Aboriginal heritage
Historical heritage
Conservation management
Community consultation
Archaeological, built and landscape values

Environmental management and approvals
Impact assessments
Development and activity approvals
Rehabilitation
Stakeholder consultation and facilitation
Project management

Environmental offsetting
Offset strategy and assessment (NSW, QLD, Commonwealth)
Accredited BAM assessors (NSW)
Biodiversity Stewardship Site Agreements (NSW)
Offset site establishment and management
Offset brokerage
Advanced Offset establishment (QLD)

Appendix 6

Complaints Register 2021

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Month /Year	Complaints Registered	Details of Complaint
2021		
Jan-21	0	
Feb-21	0	
Mar-21	0	
Apr-21	1	Community member rang re truck being driven poorly on Putty Rd. At the time of the call, the community member was advised that the trucking business as named, does not do any business with the Quarry.
May-21	0	
Jun-21	1	Community member rang re Hy-Tec truck going quickly on Putty Rd 2 weeks previous. Investigated and found no Hy-Tec truck was on the road during the time period alluded to by the community member.
Jul-21	0	
Aug-21	0	
Sep-21	0	
Oct-21	0	
Nov-21	0	
Dec-21	0	

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Appendix 7

Minutes of Tinda Creek Quarry Community Consultative Committee Meetings

(Total No. of pages including blank pages = 12)

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TINDA CREEK SAND PROJECT
COMMUNITY CONSULTATIVE COMMITTEE
MINUTES OF MEETING HELD "VIRTUALLY" VIA EMAIL
TUESDAY 13 MAY 2021

	NAME	ORGANISATION
PRESENT	Lisa Andrews (LA)	Independent Chairperson
	Darryl Thiedeke (DT)	Hy-Tec – National Planning & Development Manager
	Michael Walton (MW)	Hy-Tec – Quarry Manager
	Jane Robinson (JR)	Putty Community Association delegate
	Brigitte Lewis (BL)	Community Representative
	Ray Campbell (RC)	Community Representative
	David Cilento (DC)	Hy-Tec – NSW General Manager
	Bruce Mansell (BM)	Community Representative
APOLOGIES	Nil	

**Due to a lack of numbers in being able to attend the meeting on site, the CCC was conducted remotely via email. The presentation was emailed to all CCC members who were requested to review the document and provide any questions/comments for incorporation into the minutes.*

The subject presentation forms as an attachment to these minutes.

<table>
<tr><td>WELCOME & INTRODUCTIONS</td><td>The chair opened the meeting when the presentation was sent on Tuesday 13th May 2021 at 2.50pm.</td><td></td></tr>
<tr><td>APOLOGIES</td><td>As above.</td><td></td></tr>
<tr><td>DECLARATION OF INTEREST</td><td>LA advised that she is an approved Independent Chairperson with the Department of Planning and Environment, appointed by the Secretary to chair this CCC and engaged by Hy-Tec.</td><td>No changes to members' previous declarations</td></tr>
<tr><td>BUSINESS ARISING</td><td>In accordance with the guidelines, the minutes from the previous meeting held on 12th October 2020 were finalised on 9th November 2020 and emailed to members.
Action Items:
<table>
<tr><th></th><th>ISSUE</th><th>RESPONSIBILITY</th></tr>
<tr><td>1</td><td>Summary of groundwater monitoring data presentation to be provided at the next CCC.</td><td>MW (Heldover to next meeting to enable maps to be shown to members)</td></tr>
</table></td><td></td></tr>
<tr><td>CORRESPONDENCE</td><td>• 28/10/20 – Email to CCC members with the draft minutes for review
• 7/11/20 - Email to CCC members with the finalised minutes
• 9/11/20 – Letter to Ray Campbell with the same information
• 22/4/21 – Email to members with the Meeting Notice, Agenda & Correspondence Report for this meeting.
• 22/4/21 – Letter to Ray Campbell with the same information.
• 2/5/21 - Email to members cancelling the onsite meeting due to lack of numbers and advising that that the CCC will be held remotely.</td><td></td></tr>
</table>

	• 13/5/21 - Email to members with the presentation, inviting members to review and provide and questions for response by the proponent. • 19/5/21 – Email to DPIE with chair's CCC annual report for 2020-21.	
REPORT/PROJECT UPDATE ***(See attached presentation)***	**Sand Project Operations – October 2020 to May 2021** • The Summer of 2020 through to Autumn 2021 was a busier period with return to normal sales and production. Year to date budgeted sales volumes of sand production increasing across site. • The site was closed to sales for a period of 7 business days in March 2021 due to flooding across the Hawkesbury River and associated regions. • During this reporting period two complaints were received and investigated regarding truck movements on Putty Road – one truck was not quarry related. **Review of Sand Project Operations** • Above average rainfall was experienced in 2020 and year to date in 2021. • This has led to normal flows of process water to wash sand and recycle water in our closed water circuit. Test bore holes level have risen in line with the rising water table after recent rains. • 2019: 315mm rainfall • 2020: 985.8mm • 2021: YTD 379mm • Average of past 15 years: 738mm per year **<u>Gospers Mountain Bushfire & the Environment</u>** • The site has recovered well following the devastating 2019 bushfires. • Infrastructure damaged or lost in the fires has now largely been replaced. The site has replaced approximately 2km of boundary fencing and gates, with work carried out by a local fencing contractor. • The surrounding native bushland has regenerated well. **Native Wildlife Project** • In order to protect its vulnerable wildlife Hy-Tec continue to work with the NSW Local Land Services and National Parks & Wildlife to manage the surrounding bushland and to control introduced species to the area. • Successful pest animal control programs have been put in place by both the Local Land Services NSW and the National Parks and Wildlife service throughout October 2020 to April 2021. **Corona/COVID 19 Impacts** • Stringent controls were put in place onsite for employees, contractors and visitors.	**Slide 1** **Slide 2 (included rainfall graph)** **Slide 3** **Slide 4** **Slide 5**

	• Government initiatives to boost recovery in the construction industry have been welcomed and are starting to flow through to the business.
	
	Site Health & Safety
	Throughout the October 2020 to April 2021 period there was one Lost Time Injury sustained onsite at the Tinda Creek Quarry. The injured employee lost 1 day off work due to a muscle injury to his knee.
	
	Wellbeing
	Adbri continue to look for ways to improve the health and wellbeing of its people. Investing in employee assistance programs that support staff in areas such as mental and physical health, financial planning, relationship support and parenting.
	
	Ongoing Investment
	• Hy-Tec have continued to invest in the business even though the 2019/2020/2021 period has been a challenging period. The new investment at Tinda Creek included:
	  ○ Komatsu 40t capacity haul truck in 2020
	  ○ Komatsu WA480 Wheel Loader in 2020
	  ○ Komatsu Hybrid HB365 Excavator in 2021
	  ○ Local employment
	  ○ Ongoing training for employees
	  ○ 1 x new employee in 2020
	  ○ Continue to purchase from local suppliers and utilise local contractors
	• New Hybrid Excavator Reduces CO2 Emissions & Diesel usage at Tinda Creek Quarry
	• In March 2021 Hy-Tec invested in a new, state-of-the-art Komatsu BH365LC-3 hybrid excavator to replace an older diesel fossil fuelled machine. The new 38 tonne Komatsu excavator was commissioned at the quarry and uses an innovative electrical energy storing technology to supplement traditional diesel fuel use.
	• The technology stores electrical energy created during the slew-braking process which is then stored in an on-board battery. The hybrid machines stores the energy created in the slewing motion which can be used to reduce fuel consumption resulting in a saving of up to 20%. Data gathered in March 2021 shows that the Hybrid excavator uses considerably less than the older diesel fossil fuel equivalent and over the course of a year, may deliver a reduction in fuel use of over 10,000 litres, which in turn reduces the emissions foot-print and fuel costs.
	• This investment in machinery that will reduce fossil fuel consumption is another example of how Hy-Tec contribute to a sustainable future while working together with our suppliers and customers to build a better Australia.
		Slide 6
		
		Slide 7
		
		Slide 8

	Correction Hawkesbury Post *"Thin end of the wedge" – if Freemans Reach sand quarry goes ahead, fears sand mining could spread"* • Hy-Tec corrected the story released May 8th, 2021 in the Hawkesbury Post and online at its Facebook page. • Hy-Tec Tinda Creek Quarry is regularly audited for compliance to its approved Development Consent conditions. • The Tinda Creek Quarry Sales and dispatch is approved between the hours : 5 am to 10 pm, Monday to Friday 6 am to 3 pm, Saturday • However Hy-Tec chooses to operate sales and dispatch between 5:00am and 4:00pm Monday to Friday and the occasional Saturday between 6am and midday dependent upon demand. The weighbridge computers are locked out for dispatch outside of approved hours. • Trucks utilised at the Quarry for sand delivery travel daily between Sydney and the Tinda Creek Quarry, rarely via Putty, if at all. • Putty Road continues to be a general access route for heavy haulage available to all the Sydney and Lower Hunter. As such, other trucks not related to the quarry utilise the road 24/7. • Link to story: **https://www.hawkesburypost.com.au/post/thin-end-of-the-wedge-if-freemans-reach-sand-quarry-goes-ahead-fears-sand-mining-could-spread**	**Slide 9**
GENERAL BUSINESS	Questions received from stakeholder group representative (Putty Community Association – Jane Robinson) **Q:** *Does the Tinda creek site have access to bore water? If so how much water has been taken from the bores on a year by year basis over the period 2015 – 2021 and in 2021 YTD?* **A:** Tinda Creek Quarry holds three Water Access Licences with Water NSW, largely only utilised in times of low rainfall as recently experienced. The table below shows the volume of water extracted per financial year reporting period. ML=Megalitres TINDA CREEK BORE WATER READING. Reporting Period – ML 2015/2016 – 0.55 2016/2017 – 0.75 2017/2018 – 12.29	

	2018/2019 14.99 2019/2020 16.44 2020/2021 YTD 5.48 **Q:** *Given that there has been significant rainfall in 2021, and we are no longer in drought as well as no need for water for firefighting purposes in the 2020/ 2021 YTD; can Tinda creek please provide an explanation why the FY YTD usage is sitting at 5.48 mega litres and has not dropped back to the pre drought levels.* **A:** With the higher rainfall YTD, between January and April 2021, the site has only used 0.16ML in total, largely for dust suppression on roads. The remaining volume was used in the dryer rainfall months of 2020 (August to November), not only for dust suppression but also to maintain adequate water supplies to maintain sand production. In 2015 the Development Consent was approved for sand volume production to be increased from 125,000t per year to 300,000t per year. This is and has been a slow and steady ramp up over the previous years with drought, bushfires, floods and COVID-19 impacting on site. For this reason it is not expected that the water extracted will go back to 2015 levels, but will fluctuate within Water NSW approved limits depending upon demands of production and climatic conditions. In addition there was some 6ML + of water pumped and captured within the water meter count during October and November 2019 for use by the RFS along with the additional water taken by the RFS & NPWS helicopters and tankers from the dredge production pond and dam at the front of the property.	
NEXT MEETING	The next meeting will be held on site on **Monday 11th October 2021 commencing at 9am.**	

The meeting was technically closed by the chair on 31 May 2021 when the draft minutes were emailed to CCC members.

ACTION ITEMS

ITEM	ISSUE	RESPONSIBILITY
1	Summary of groundwater monitoring data presentation to be provided in person at the next CCC. Held over.	MW – next CCC

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TINDA CREEK SAND PROJECT
COMMUNITY CONSULTATIVE COMMITTEE
MINUTES OF MEETING HELD "VIRTUALLY" VIA EMAIL
MONDAY 11 OCTOBER 2021

	NAME	ORGANISATION
PRESENT	Lisa Andrews (LA)	Independent Chairperson
	Darryl Thiedeke (DT)	Hy-Tec – National Planning & Development Manager
	Michael Walton (MW)	Hy-Tec – Quarry Manager
	Ethan Pettiford (EP)	Hy-Tec – Quarries Operations Manager NSW
	Jane Robinson (JR)	Putty Community Association delegate
	Brigitte Lewis (BL)	Community Representative
	Ray Campbell (RC)	Community Representative
	David Cilento (DC)	Hy-Tec – NSW General Manager
	Bruce Mansell (BM)	Community Representative
APOLOGIES	Nil	

**Due to COVID directives and site restrictions, the CCC was conducted remotely via email. The presentation was emailed to all CCC members who were requested to review the document and provide any questions/comments for incorporation into the minutes.*

The subject presentation forms as an attachment to these minutes.

<table>
<tr><td>WELCOME & INTRODUCTIONS</td><td>The chair opened the meeting when the presentation was sent on Monday 11 October 2021 at 1.24pm.</td><td></td></tr>
<tr><td>APOLOGIES</td><td>As above.</td><td></td></tr>
<tr><td>DECLARATION OF INTEREST</td><td>LA advised that she is an approved Independent Chairperson with the Department of Planning and Environment, appointed by the Secretary to chair this CCC and engaged by Hy-Tec.</td><td>No changes to members' previous declarations</td></tr>
<tr><td>BUSINESS ARISING</td><td>In accordance with the guidelines, the minutes from the previous meeting held on 3 May 2021 were finalised on 4 June 2021 and emailed to members.
Action Item:
<table>
<tr><th></th><th>ISSUE</th><th>RESPONSIBILITY</th></tr>
<tr><td>1</td><td>Summary of groundwater monitoring data presentation to be provided at the next CCC.</td><td>MW</td></tr>
</table>
Response: Ground water monitoring bores have their water column heights taken monthly by both manual and electronic down the hole data collection, with the data recorded on site. While most monitoring bores across the site have gone down in column heights in recent years, as would be expected with the prolonged dry spell and drought conditions experienced, the water in the subterranean aquafers is now recharging and increasing in height, in line with the higher rainfall across the first part of 2020 (455.8mm YTD in 2020). These results are sent to an independent Hydrogeologist</td><td></td></tr>
</table>

	for analysis and reporting by Hy-Tec, who in turn report to Water NSW or other Government Departments as required.	
CORRESPONDENCE	• 13/5/21 – Email to CCC members with the presentation for the May CCC. Comments/questions received. • 31/5/21 – Email to CCC members with the draft minutes for review • 4/6/21 - Email to CCC members with the finalised minutes • 4/6/21 – Letter to Ray Campbell with the same information • 27/9/21 – Email to members advising that this meeting will be held virtually via email. • 11/10/21 – Email to members with the presentation, inviting members to review and provide and questions for response by the proponent. Responses received and incorporated into the draft minutes.	
REPORT/PROJECT UPDATE ***(See attached presentation)***	**Sand Project Operations April to October 2021** • Production and Sales has improved throughout 2021 despite a few set-backs along the way due to Covid-19 interruptions on building sites across Metro Sydney. Year to date budgeted sales volumes of sand production increasing across site. • Between April & October 2021 the Quarry site has received 2 complaints that were investigated regarding truck movements on Putty Road, after investigation both trucks identified as non-quarry related vehicles. **Review of Sand Project Operations** • Above average rainfall early in 2021 caused some site closure, however since April the weather patterns are returning to normal. • Monitoring borehole levels have risen in line with the rising water table early in the year. • Normal flows of process water experienced to wash sand & for all the recycled water returning in the closed water circuit. • 2019 :315mm rainfall • 2020 : 985.8mm • 2021: YTD 542.2mm • Average of past 15 years : 738mm year **<u>Gospers Mountain Bushfire & the Environment</u>** • The surrounding native bushland has regenerated well with native animals returning to normal levels. • NPWS and Local Land Services have continued with pest animal control in the surrounding areas. **Native Wildlife Project** • Successful pest animal control programs have been put in place by both the Local Land Services NSW and the National Parks and Wildlife Service from April through to November 2021.	**Slide 1** **Slide 2 (included rainfall graph)** **Slide 3** **Slide 4**

	• In order to protect its vulnerable wildlife, Hy-Tec continue to work with the NSW Local Land Services and National Parks and Wildlife to manage the surrounding bushland and to control introduced species to the area (ie wild dogs, cats, deer etc).
	
	Corona (Covid 19) impact 2020/2021
	• Stringent controls put in place onsite for employees, contractors and visitors.
	• Nil Covid 19 cases recorded onsite.
	• Government initiatives to boost recovery in the construction industry have been welcomed and are starting to flow through to business.
	
	Site Health & Safety
	• Throughout the April to October 2021 period, Nil Lost Time injuries were recorded or sustained onsite at the Tinda Creek Quarry.
	• ADBRI (Hy-Tec's parent company) has put in place 10 simple life saving rules for all sites to adhere and follow to return home safe each day.
	
	Wellbeing
	• Adbri are continually looking for ways to improve the health and wellbeing of its people. We invest in employee assistance programs that support our people in areas such as mental and physical health, financial planning, relationship support and parenting.
	
	Ongoing Investment
	• Hy-Tec continue to invest in the local community and the business throughout 2019/2020/2021 period following Drought, Bushfires, Hawkesbury Floods and Covid-19 creating a challenging period.
	• Tinda Creek Quarry's investment included:
	  • Komatsu 40t capacity haul truck in 2020
	  • Komatsu WA480 Wheel Loader in 2020
	  • Komatsu Hybrid HB365 Excavator in 2021 (20% more fuel efficient and less carbon emissions)
	  • Local employment
	  • 1 x new employee in September 2021
	  • Ongoing training for employees
	  • Continue to purchase or hire equipment from local suppliers and utilise local contractors.
		Slide 5
		
		Slide 6
		
		Slide 7

GENERAL BUSINESS	• RC commented on the rehabilitation of the site and is keen to see the final results at the end of mining life. • JR, DT, EP acknowledged the presentation & minutes with nothing further to ad.	

MEETING SCHEDULE FOR 2022	It is proposed to keep the same schedule as previous years: • Monday 2nd May 2022 at 9am. • Monday 10th October 2022 at 9am.	**On site.**

The meeting was technically closed by the chair on 20 October 2021 when the draft minutes were emailed to CCC members.