APPENDIX E

TRAFFIC IMPACT ASSESSMENT

TRAFFICWORKS™

Traffic Impact Assessment Report

3 Turton Place Murrumbateman NSW

Project Number 230350
Final Report 6/05/2024

Client ACEnergy Pty Ltd

TRAFFICWORKS™

Document control record

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Executive summary

ACEnergy Pty Ltd engaged Trafficworks to undertake a traffic impact assessment (TIA) for the proposed development of a Battery Energy Storage System (BESS) at **3 Turton Place Murrumbateman NSW**.

The table below summarises the subject site's proposed development and our conclusions and recommendations.

Address	3 Turton Place Murrumbateman NSW
Zoning	RU4: Primary Production Small Lots
Proposed development	Battery Energy Storage System (BESS)
Road network	— Barton Highway (A25 - State Road) — Murrumbateman Road (Regional Road) — Patemans Lane (Local Road) — Turton Place (Local Road)
Traffic generation	Construction phase (per day): — 3 light vehicles — 2 heavy vehicles Operation phase (per fortnight): — 2 light vehicles
Car parking	Construction phase: 3 spaces Operation phase: 2 spaces

Conclusion	We conclude that subject to the implementation of our recommendations, no traffic engineering reasons would prevent the development from proceeding.
	— the peak hour traffic generation is likely to occur during the construction phase of the development, where the peak hour volumes are expected to be:
	  — 3 light vehicles
	  — 1 heavy vehicle
	— the construction phase is expected to take 4 weeks
	— the subject site will generate a peak car parking demand of 3 spaces during the construction period and 2 spaces post-opening
	— the development plan includes a designated parking area that will satisfy the parking demand

	— adequate sight distance is available at the intersection of Patemans Lane and Murrumbateman Road; no further treatment is required — the proposed site access driveway along Turton Place satisfies the minimum entering sight distance, as specified in AS/NZS 2890.1 — the setback of the proposed security gate from the edge of Turton Place will accommodate the storage of a 19 m semi-trailer clear of the traffic lane — no additional turn lane treatments are required due to the traffic generated by the proposed development.
Recommendations	It is recommended that: — **Recommendation 1:** trim or remove the tree restricting sightlines to the north (as shown in Figure 17) — **Recommendation 2:** the subject site access driveway should be constructed according to Figure 7.4 in Austroads Guide to Road Design Part 4 requirements and to the council's satisfaction.

Referenced documents

References used in the preparation of this report include the following:

- Austroads Guide to Road Design
  - Part 4: Intersections and Crossings, for details of the access driveway
  - Part 4A – Unsignalised and Signalised Intersections, for sight distance criteria and provision for turning vehicles at intersections (AGRD4)
- Austroads Guide to Traffic Management
  - Part 6 – Intersections, Interchanges and Crossings Management**,** for sight distance criteria and provision for turning vehicles at intersections (AGTM6)
- Australian Standards:
  - AS 2890.1-2004 Parking facilities - Off-street car parking
- RTA Guide to Traffic Generating Developments, Version 2.2, October 2002.
- Yass Valley Council
  - Yass Valley Local Environmental Plan (LEP) 2013
  - Yass Valley Development Control Plan (DCP) 2013*

    *2024 version currently on exhibition

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Table of Contents

1 Introduction

ACEnergy Pty Ltd engaged Trafficworks to undertake a traffic impact assessment (TIA) for the proposed development of a Battery Energy Storage System (BESS) at **3 Turton Place Murrumbateman NSW**.

For the details about:

- existing site conditions – see section 2
- description of the proposed development – see section 3.1
- traffic impact of the proposed development – see section 3
- car parking assessment of the proposed development – see section 4
- assessment of the access to the proposed development – see section 5
- our conclusions and recommendations – see section 5.3.

2 Existing conditions

2.1 Subject site

The subject site is:

- located about 3 km southeast of Murrumbateman and comprises a small area contained within Lot 23 of DP248413
- currently occupied by farmland with a residential dwelling and outbuildings.

Vehicular access to the subject site is available from Murrumbateman Road (Regional Road) via Patemans Lane and Turton Place.

Figure 1 shows the subject site's location, which is surrounded by farmland and rural properties.

Figure 1: Location plan (reproduced with permission from Nearmap)

The subject site is located within a wider area of the RU4: Primary Production Small Lots zone on the south side of the regional road and east of the Barton Highway (a state road located within SP2: Classified Road zone), as per the Yass Valley Council's (council) Local Environmental Plan (LEP).

Figure 2 shows the zoning for the subject site and surrounding area.

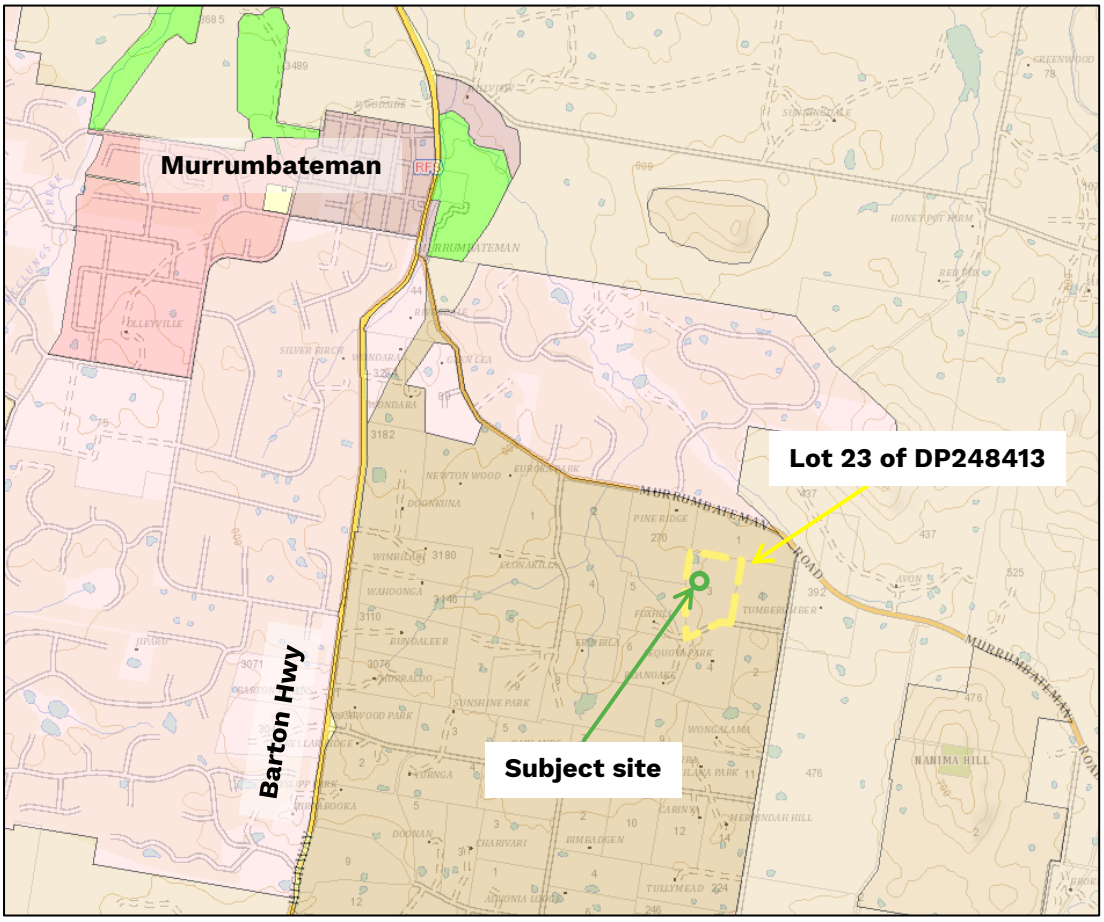


Figure 2: Zoning plan (reproduced from NSW ePlanning Spatial Viewer)

2.2 Road network

The road network includes:

- Barton Highway (A25 - State Road)
- Murrumbateman Road (Regional Road)
- Patemans Lane (Local Road)
- Turton Place (Local Road)

2.2.1 Barton Highway (A25)

Table 1 describes the features of this road.

Table 1: Barton Highway features

Feature	Description
Road type	Classified state arterial road managed by Transport for New South Wales (TfNSW) and part of the National Auslink network.
Access	Connects Hume Highway at Yass to Federal Highway in Canberra
Carriageway	Two-lane, two-way sealed road consisting of 2x 3.5 m traffic lanes with sealed shoulders ranging from 2.0 m to 3.5 m wide. A channelised right turn lane is provided for northbound vehicles turning right at the T-intersection with Murrumbateman Road.
Road reservation	30 - 40 m wide
Speed limit	50 km/h through Murrumbateman 70 km/h about 200 m south of the intersection with Murrumbateman Road 100 km/h about 800 m south of the intersection with Murrumbateman Road

Figure 3 and Figure 4 provides further information about the road.

Figure 3: Barton Highway, looking north towards the intersection with Murrumbateman Road (Source: Google)

Figure 4: Barton Highway, looking south towards the intersection with Murrumbateman Road (Source: Google)

2.2.2 Murrumbateman Road

Table 1 describes the features of this road.

Table 2: Murrumbateman Road features

Feature	Description
Road type	Classified regional road managed by the Council and funded by TfNSW.
Access	Connects Barton Highway (to the west) with Sutton Road (to the east)
Carriageway	Two-lane, two-way sealed road consisting of 2 x 3.2 m traffic lanes with 0.6 m wide sealed shoulders. An auxiliary right turn lane is provided for eastbound vehicles turning right at the intersection with Patemans Lane. An offroad shared use path (SUP) is within the road reserve. It crosses the road (north to south) about 80 m west of the Patemans Lane intersection.
Road reservation	20 m wide
Speed limit	70 km/h (subject length between Barton Highway and 100 m east of the intersection with Patemans Lane)

Figure 5 and Figure 6 provides further information about the road.

Figure 5: Murrumbateman Road, looking southeast from the intersection with Patemans Lane

Figure 6: Murrumbateman Road, looking northwest from the intersection with Patemans Lane towards the SUP crossing

2.2.3 Patemans Lane

Table 3 describes the features of this road.

Table 3: Patemans Lane features

Feature	Description
Road type	Local road managed by council
Access	Provides access to a few residential properties and farmland to Murrumbateman Road. The road is a no-through road south of the intersection with Euroka Avenue.
Carriageway	Two-way sealed road with a 6.0 m wide formation
Road reservation	20 m wide
Speed limit	70 km/h (subject length between Murrumbateman Road and 90 m south of the intersection with Turton Place)

Figure 7 and Figure 8 provide further information about the road.

Figure 7: Patemans Lane, looking north from the intersection with Turton Place

Figure 8: Patemans Lane, looking north towards the intersection with Murrumbateman Road, the SUP to the left of the road formation.

2.2.4 Turton Place

Table 3 describes the features of this road.

Table 4: Turton Place features

Feature	Description
Road type	Local road managed by council
Access	Provides access to a few residential properties and farmland to Patemans Lane. The road is a no-through road.
Carriageway	Two-way sealed road with a 6.0 m wide formation
Road reservation	20 m wide
Speed limit	no posted speed limit signs exist Due to short length, no-through access and horizontal/vertical alignment, the assumed operating speed is in the order of 50 km/h to 60 km/h

Figure 9 and Figure 10 provide further information about the road.

Figure 9: Turton Place, looking southwest towards the end of the road, near the proposed subject site driveway

Figure 10: Turton Place, looking northeast towards the bend in the road, near the proposed subject site driveway

2.3 Traffic volumes

2.3.1 Barton Highway

TfNSW Traffic Volume Viewer details traffic volumes for many of the arterial roads in New South Wales. Scrutiny of the records indicates that in 2012, during a typical midweek period, for Station Id: 94445:

- northbound volume of 4,354 vehicles per day (vpd) and southbound volume of 4,929 vpd
- AM commuter peak (7:00 to 8:00 am) northbound volume of 158 vehicles per hour (vph) and southbound volume of 687 vph
- PM commuter peak (5:00 pm – 6:00 pm) northbound volume of 559 vph and southbound volume of 290 vph.

Projecting the traffic volumes to 2024 by adopting an annual compound growth rate of 3 %[1] per annum, Barton Highway is currently estimated to carry:

- northbound volume of 6,208 vpd and southbound volume of 7,028 vpd
- AM commuter peak (7:00 to 8:00 am) northbound volume of 225 vph and southbound volume of 979 vph
- PM commuter peak (5:00 pm – 6:00 pm) northbound volume of 797 vph and southbound volume of 413 vph.

2.3.2 Regional / Local Roads

The council has no recent traffic volume data for any of the local roads (including Murrumbateman Road) mentioned in Section 2.2. The local roads are not expected to carry more traffic than the Barton Highway. As a result, the average daily traffic volume has been estimated for each of the roads as follows:

- Murrumbateman Road acts as a regional link road / collector road
    - about 5,000 vpd
    - peak-hour two-way volume of 500 vph
- Patemans Lane services some residential and rural farmland properties
    - less than 1,000 vpd
    - peak-hour two-way volume of 100 vph

[1] Investigation of traffic volumes within the region indicates a less than 3 % growth rate within the last 10 years. Therefore, the assumption of applying a 3 % growth rate is conservative for projecting the traffic volumes to 2024.

- Turton Place services rural residential properties
    - less than 100 vpd
    - peak-hour two-way volume of 10 vph

2.4 Crash history

The TfNSW Centre for Road Safety website details all injury crashes throughout New South Wales and reports that a single casualty crash occurred on the roads near the subject site in the last 5 years (2018 – 2022).In 2020, a minor injury rear-end (RUM code 30) crash occurred in daylight conditions on Murrumbateman Road southeast of the intersection with Patemans Lane.

Based on this, we conclude that no trend requires immediate investigation.

3 Traffic assessment of the proposed development

3.1 The proposal

The proposed development involves constructing a BESS with batteries and a medium voltage power station (MVPS) housed in 40ft containers. The proposed facility will be unstaffed, and the period that will generate the most traffic will be the construction phase.

Vehicular access to the site is proposed directly from Turton Place via an existing farm gate access approximately 100 m southwest of the bend in the road (Figure 11). An extract of the proposed development plan is shown in Figure 12, and the full plan is provided in Appendix 1.

Figure 11: The location of the proposed driveway access to the subject site to / from Turton Place

Figure 12: Extract of the development plan

3.1.1 Construction

On-site construction for the proposed BESS is limited mainly to assembly and connecting components with the typical battery energy storage system shipping containers. Most of the equipment will be transported to the subject site via rigid trucks, with only the batteries and MVPS required to be delivered by a 19 m semi-trailer (B-doubles will not be used for transportation).

The typical construction delivery schedule for this BESS is shown in Table 5.

Table 5: Construction delivery schedule

Time period	Site Works
Week 1	drainage, road and fencing works installation of concrete footings
Week 2	cable installation delivery of battery shipping containers and MVPS installation of battery shipping containers and inverter station
Week 3	electrical installation and cable termination electrical testing
Week 4	commissioning / demobilisation

There is a 4-week construction phase before the full operation of the BESS.

3.1.2 Heavy vehicle access to the subject site

All heavy vehicle traffic from Barton Highway will arrive/depart the subject site via Murrumbateman Road, Patemans Lane and Turton Place. Heavy vehicles will enter the subject site by turning left from Barton Highway to Murrumbateman Road, making 3 right turns at the intersections with Patemans Lane and Turton Place, and then entering the subject site about 500 m along Turton Place.

Heavy vehicles will exit the subject site in the reverse direction, making 3 left turns from Turton Place, Patemans Lane and Murrumbateman Road, and a right turn onto Barton Highway to head north towards Hume Highway.

Figure 13 indicates the route for all heavy vehicles arriving and departing the subject site.

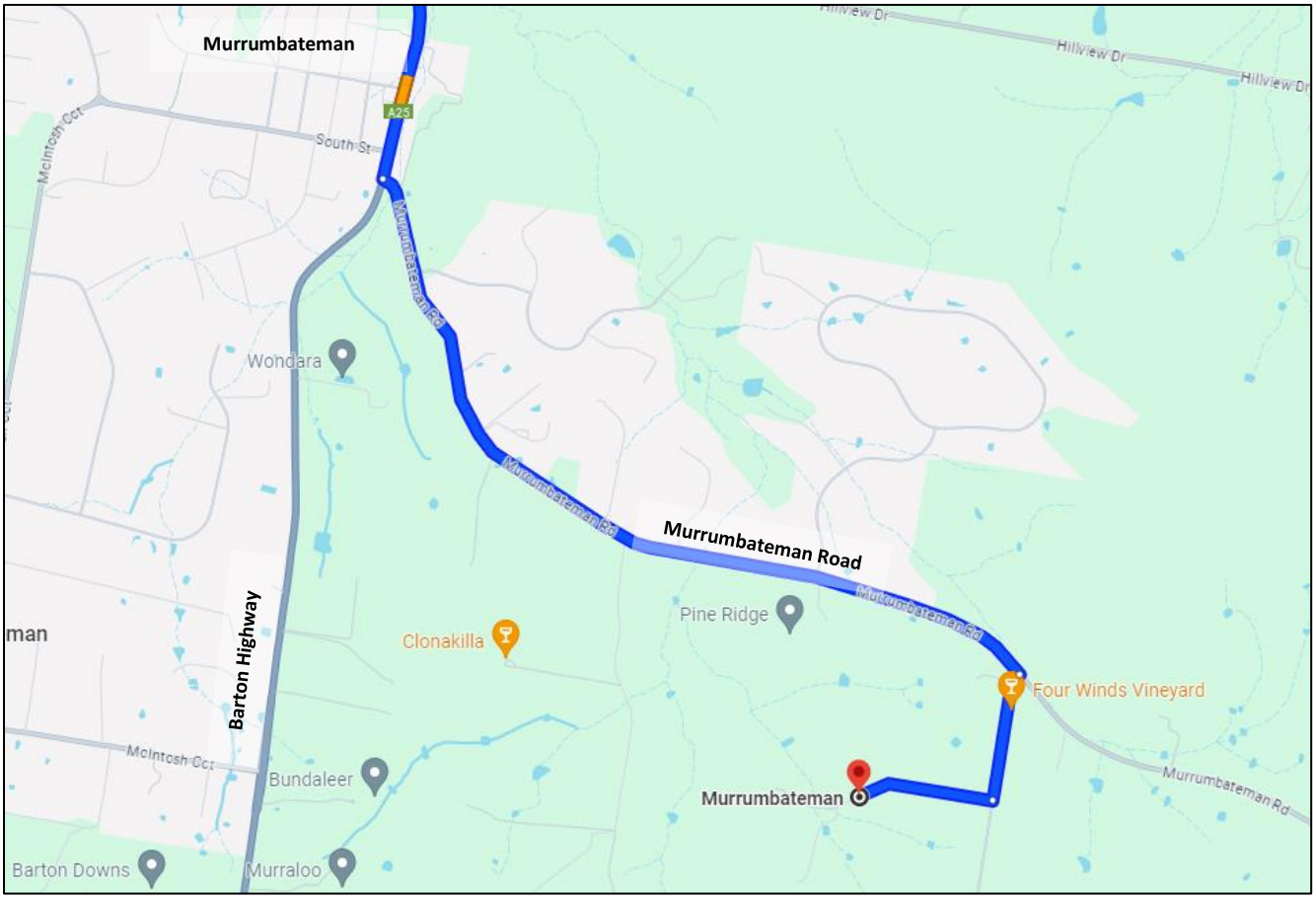


Figure 13: Indicative route for heavy vehicle arrivals (source: Google Maps)

The light vehicles are expected to arrive from Yass and Murrumbateman (from the north) or the more significant population centre of Canberra to the south.

3.1.3 Operation / decommissioning

The proposed use is based on a 40-year lease. If the lease is not renewed after this period, the facility's operator must decommission it, remove all installations, and restore the subject site to its pre-existing state.

Upon approval of this application, the responsible authority may require a decommissioning and rehabilitation plan to be submitted for endorsement.

3.2 Traffic generation

Typically, the traffic generation for new developments is estimated using the traffic generation rates provided in the RTA Guide to Traffic Generating Developments – Version 2.2A 2002 (the RTA Guide). However, the RTA Guide does not include traffic generation rates for BESS facilities.

Therefore, the traffic generation to/from the proposed development was estimated empirically. Traffic generation analysis was undertaken for the development's construction and operational phases to establish the likely peak traffic generation.

3.2.1 Construction phase traffic volumes

Based on the information provided, the peak light vehicle traffic generation is likely to occur from the start of the construction phase to the completion of this phase, with a maximum traffic generation likely to occur during weeks 1 to 3. This is when 3 construction staff vpd will access the subject site, resulting in a total daily traffic generation of 6 vpd (3 vpd arriving at the start of the shift and 3 vpd departing at the end of the shift).

Assuming the construction work will be undertaken during regular working hours, it is anticipated that 3 vehicles will access the subject site during a given peak hour (at the start of the morning shift).

Assessment of the heavy vehicles accessing the subject site during the construction phase revealed that peak traffic generation is likely to occur from the start, with a maximum number of heavy vehicles accessing the subject site during week 2. This period includes delivery of battery shipping containers when up to 10 heavy vehicles will access the subject site weekly and up to 2 vpd. Therefore, this would result in a total daily traffic generation of 4 vpd (2 vpd arriving and 2 vpd departing). It is unlikely that heavy vehicles will arrive within the same hour as deliveries will be managed by the project team (i.e. delivery schedule).

The vehicles are anticipated to access the subject site outside the commuter peak hours for the surrounding road network.

The impact of heavy vehicles is considered negligible; however, conservatively, for this assessment, it has been assumed that a single heavy vehicle will access the subject site during the AM (arriving) and PM (departing) peak hours.

3.2.2 Operational phase traffic volumes

The proposed BESS will have remote monitoring in real-time, allowing for constant surveillance and monitoring of the facility without the requirement for staffing on-site.

The compound contains critical infrastructure that requires a high degree of security. Upon identification of potential issues, action can be taken indirectly from the control centre or directly by chosen contractors who would travel to the subject site if required. During the operational phase, 2 light vehicles will attend the subject site fortnightly for general maintenance.

3.2.3 Peak traffic generation

Assessment of the likely traffic generation volumes during the construction and operational phases of the development revealed that the peak traffic generation for the subject site would occur during the construction phase. Therefore, the assessment was undertaken to determine the traffic implications during this phase.

Conclusion 1: the peak hour traffic generation is likely to occur during the construction phase of the development, where the peak hour volumes are expected to be:

- 3 light vehicles
- 1 heavy vehicle

Conclusion 2: the construction phase is expected to take 4 weeks.

3.3 Traffic distribution assumptions

Based on the surrounding road network, it has been assumed that light vehicle traffic will access the site as follows:

- 30% to/from the south (Canberra)
- 70% to/from the north (Murrumbateman / Yass)
- 100% of the heavy vehicles will arrive from the north to the subject site.

It has been assumed that all vehicles will enter the site in the AM peak and depart during the PM peak.

3.4 Anticipated traffic volumes

Given that the proposed BESS will have peak traffic generation during the construction phase, the anticipated development traffic volumes for 2024 (when the facility is under construction) are summarised in Table 6. This table reflects the turning movements at the Barton Highway / Murrumbateman Road intersection.

Table 6: Directional split of peak traffic flow at the intersection of the Barton Highway and Murrumbateman Road

Period	Type	Left In	Right In	Left Out	Right Out	Total
AM Peak	Light	2	1	0	0	3
	Heavy	1	0	0	0	1
	TOTAL	**3**	**1**	**0**	**0**	**4**
PM Peak	Light	0	0	1	2	3
	Heavy	0	0	0	1	1
	TOTAL	**0**	**0**	**1**	**3**	**4**

4 Car parking assessment of the proposed development

4.1 Planning scheme car parking assessment

The RTA Guide provides car parking rates for new developments. However, the parking requirement for BESS facilities is currently unavailable. Therefore, an empirical assessment was undertaken to estimate the demand for car parking for the proposed development.

Section 3.2.1 outlined that:

- up to 3 light vehicles are anticipated to access the subject site per day during the construction phase of the development

Section 3.2.2 outlined that:

- up to 2 light vehicles are anticipated to access the subject site every fortnight after the facility opens for periodic maintenance.

The proposed site plan indicates a formal on-site car parking area, providing sufficient space to accommodate the required on-site parking.

Conclusion 3: the subject site will generate a peak car parking demand of 3 spaces during construction and 2 spaces after opening.

Conclusion 4: the development plan includes a designated parking area to satisfy the parking demand.

5 Access to the subject site

5.1 Site access – intersection SISD requirement

The visibility criterion typically applied to intersections is Safe Intersection Sight Distance (SISD). Figure 14 shows the SISD, which:

- is nominated in the Austroads Guide to Road Design, Part 4A (AGRD4) as the minimum distance that should be provided on a major road at any intersection (refer to Section 3.2.2 in AGRD4A)
- provides sufficient distance for the driver of a vehicle on the major road:
    - to observe a vehicle from the minor access approach moving into a collision situation, e.g., in the worst case, stalling across the traffic lanes
    - to decelerate to a stop before reaching the collision point.

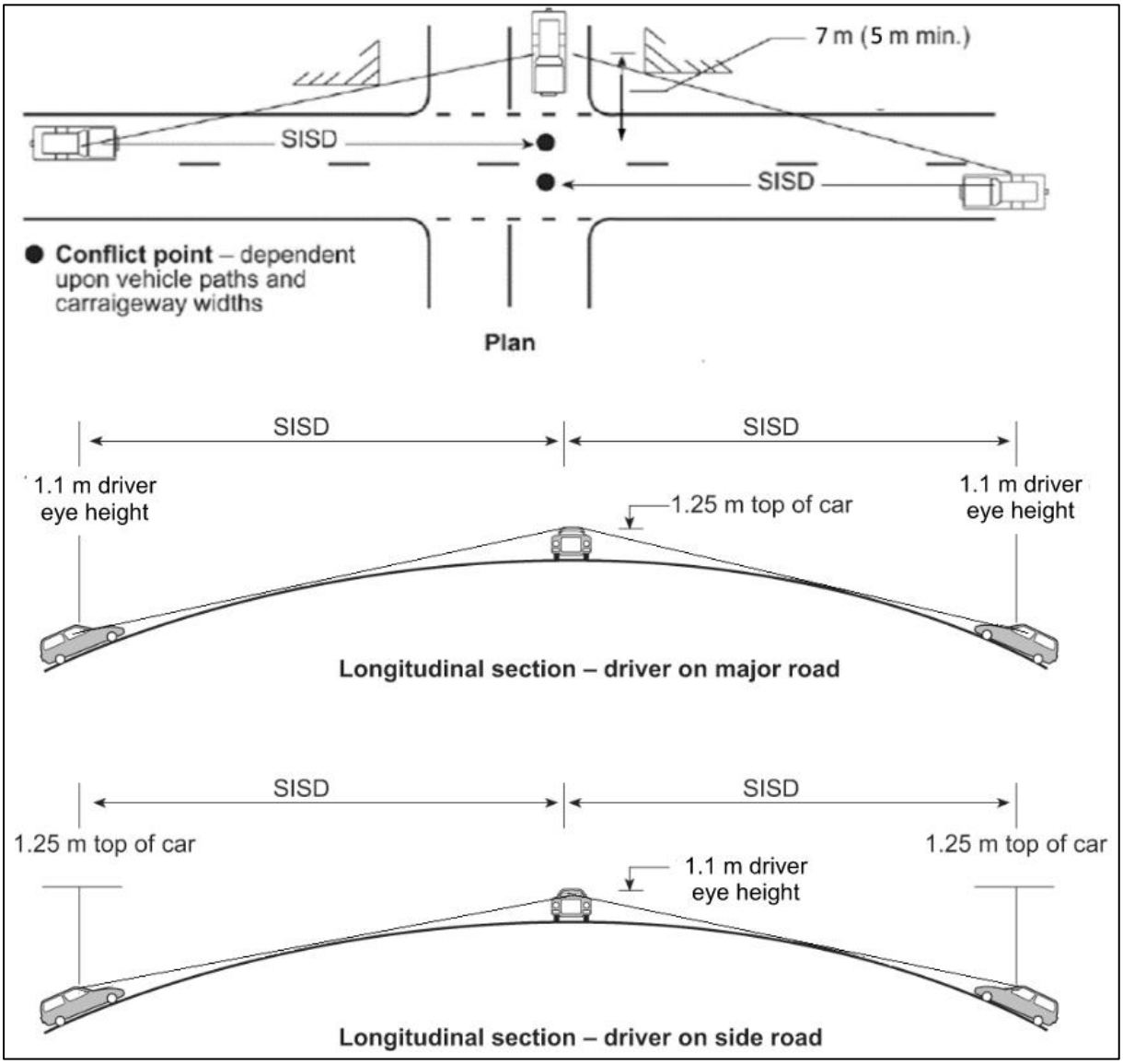


Figure 14: Safe Intersection Sight Distance (SISD) (Source: Figure 3.2 from AGRD4)

5.1.1 Murrumbateman Road

The minimum SISD criterion, specified in Table 3.2 of AGRD4A, requires clear visibility for a desirable minimum distance of **181 m**, relating to the general reaction time RT of 2 seconds and a design speed of 80 km/h (posted speed + 10 km/h).

SISD for heavy vehicles is calculated with reduced deceleration coefficients and increased observation heights to incorporate the different vehicle characteristics. With a 70 km/h design speed, the SISD for a heavy vehicle at this location is **178 m**.

The available sight distance at the intersection of Patemans Lane and Murrumbateman Road is demonstrated in Figure 15 and Figure 16.

Figure 15: Patemans Lane at the Murrumbateman Road intersection – view northwest (about 200 m)

Figure 16: Patemans Lane at the Murrumbateman Road intersection – view southeast (> 300 m)

The site assessment concluded that the visibility requirements at the Patemans Lane and Murrumbateman Road intersection are satisfied; no further treatment is required.

Conclusion 5: adequate sight distance is available at the intersection of Patemans Lane and Murrumbateman Road; no further treatment is required.

5.1.2 Patemans Lane

The minimum SISD criterion, specified in Table 3.2 of AGRD4A, requires clear visibility for a desirable minimum distance of **181 m**, relating to the general reaction time RT of 2 seconds and a design speed of 80 km/h (posted speed + 10 km/h).

SISD for heavy vehicles is calculated with reduced deceleration coefficients and increased observation heights to incorporate the different vehicle characteristics. With a 70 km/h design speed, the SISD for a heavy vehicle at this location is **178 m**.

The available sight distance at the intersection of Patemans Lane and Turton Place is demonstrated in Figure 17 and Figure 18.

Figure 17: Turton Place and Patemans Lane intersection – view north, the sightlines are restricted to 120 m due to a tree in the road reserve

Figure 18: Turton Place and Patemans Lane intersection — view south. Sightlines are about 180 m, with a slight downhill grade towards the intersection from the road's crest. A tree to the right of the road within the reserve reduces sightlines.

The site assessment concluded that the visibility requirements at the intersection of Turton Place and Patemans Lane to the:

- north is **not** satisfied
- south is satisfied.

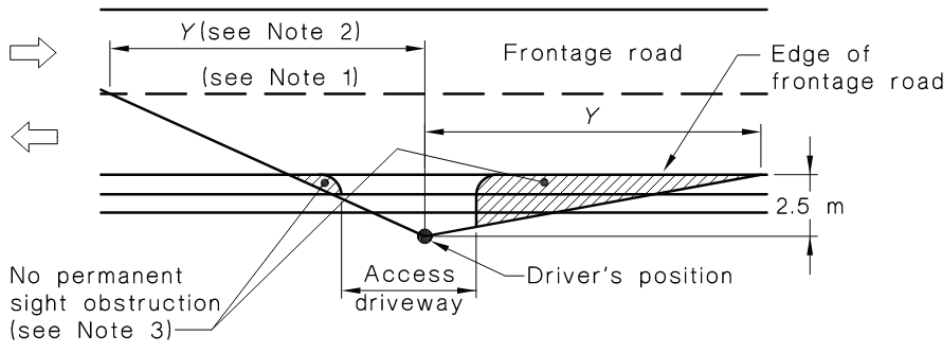
The sight constraints are existing issues, particularly the mature roadside vegetation

Recommendation 1: trim or remove the tree restricting sightlines to the north (as shown in Figure 17).

5.2 Site access – Access driveway ESD requirement

Section 3.2.4 in AS/NZS 2980.1 Parking Facilities – Part 1: Off-street car parking sets out the entering sight distance (ESD) criteria for a driver exiting an access driveway to traffic on the frontage road.

Un-signalised access driveways shall be located so the intersection sight distance available to drivers leaving the driveway along the frontage road is at least that shown in Figure 3.2 of AS/NZS 2890.1 (reproduced in Figure 19).



Frontage road speed (Note 4) km/h	Distance (*Y*) along frontage road m		
	Access driveways other than domestic (Note 5)		Domestic property access (Note 6)
	Desirable 5 s gap	Minimum SSD	
40	55	35	30
50	69	45	40
60	83	65	55
70	97	85	70
80	111	105	95
90	125	130	Use values from 2nd and 3rd columns
100	139	160	
110	153	190	

Figure 19: Sight distance requirements at driveways (Source: Figure 3.2 from AS/NZS 2890.1)

The proposed site access to the development along Turton Place is subject to an expected 60 km/h operating speed. The corresponding minimum Stopping Sight Distance (SSD) is 65 m. This can be achieved east and west of the proposed site access driveway. Figure 20 and Figure 21 show there is no vegetation restricting the sight distance to the northeast and southwest of the site access.

Figure 20: At the intersection of the site access driveway and Turton Place facing northeast

Figure 21: At the intersection of the site access driveway and Turton Place facing southwest

Conclusion 6: the proposed site access driveway to Turton Place satisfies the minimum entering sight distance specified in AS/NZS 2890.1.

5.3 Access location and operation

The subject site access driveway is recommended to be constructed per Figure 7.4 in Austroads Guide to Road Design Part 4: Intersections and Crossings requirements and to the council's satisfaction (refer to Figure 22). It should provide sufficient width to facilitate the movements of a 19 m semi-trailer accessing the subject site.

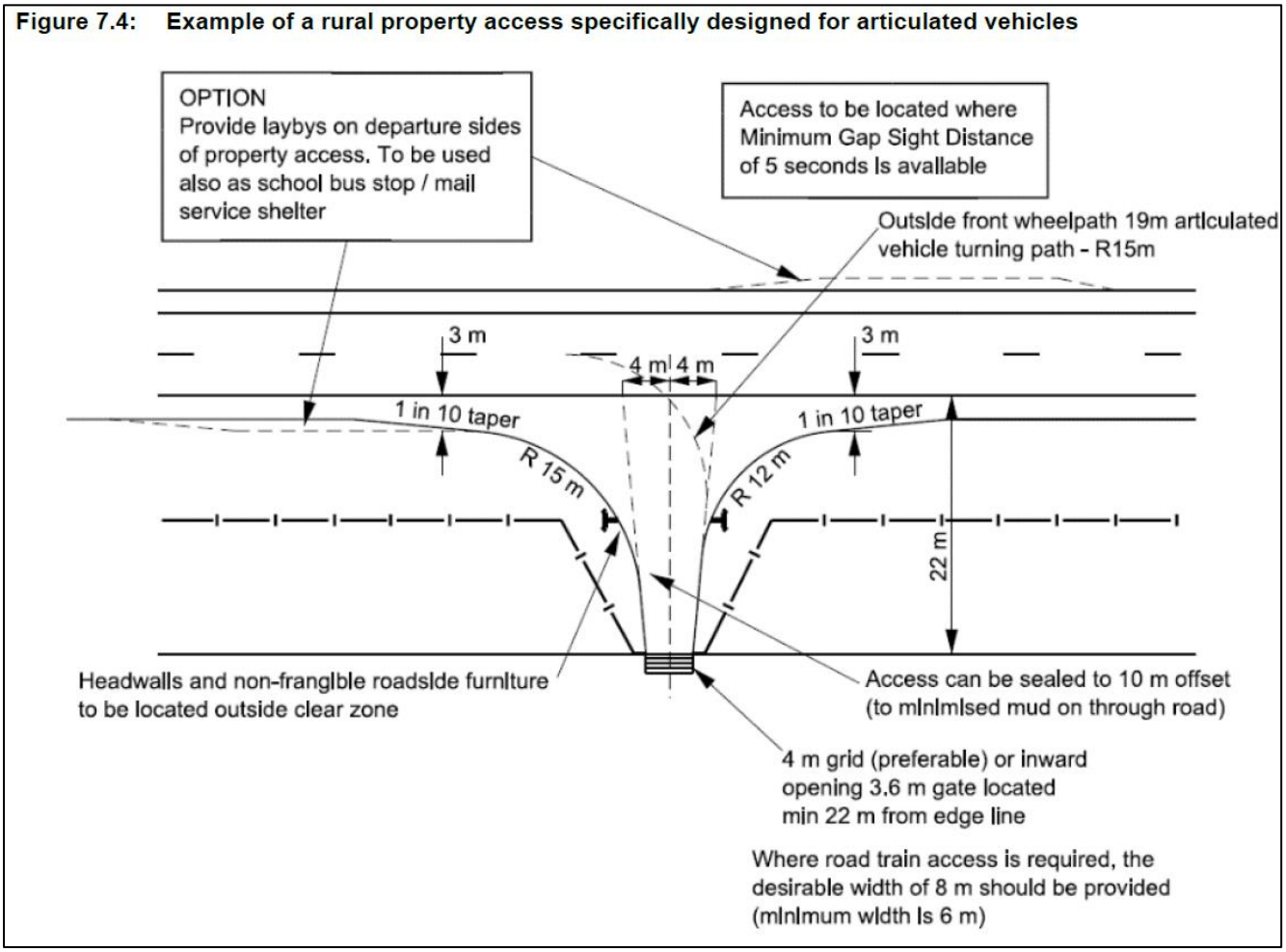


Figure 22: rural property access designed for an articulated vehicle

Recommendation 2: the subject site access driveway should be constructed according to Figure 7.4 in Austroads Guide to Road Design Part 4 requirements and to the council's satisfaction.

5.4 Site security

The proposed development will include installing site security and restricting access to authorised vehicles only. This will involve the provision of security fencing and gates at the development's entrance. The proposed security gate is >300 m from the edge of the formation on Turton Place, located at the end of the driveway.

It is indicated that only 1 truck is expected to arrive and queue at any time, with a 19 m semi-trailer being the largest vehicle accessing the subject site. Hence, the access gate is setback a sufficient distance from the edge of Turton Place to allow a 19 m semi-trailer to wait clear of the carriageway.

Conclusion 7: the setback of the proposed security gate from the edge of Turton Place will accommodate the storage of a 19 m semi-trailer clear of the traffic lane.

5.5 Local network impacts

The traffic turning from major roads into minor roads should not delay through traffic. Generally, turn treatments from major roads into minor roads at sign-controlled intersections are provided for safe and efficient intersection operation.

Due to the low turning volumes during construction (3 light vehicles and 1 heavy vehicle) and operation (2 light vehicles) and the short-term duration of the construction period, the safety and operation of the intersections between the subject site, Turton Place, Patemans Lane, Murrumbateman Road and Barton Highway can be maintained with no additional turn lane treatments.

Conclusion 8: no additional turn lane treatments are required due to the traffic generated by the proposed development.

6 Conclusions and recommendations

We conclude there are no traffic engineering reasons that would prevent the development from proceeding, as outlined below:

- the peak hour traffic generation is likely to occur during the construction phase of the development, where the peak hour volumes are expected to be:
    - 3 light vehicles
    - 1 heavy vehicle
- the construction phase is expected to take 4 weeks
- the subject site will generate a peak car parking demand of 3 spaces during the construction period and 2 spaces post-opening
- the development plan includes a designated parking area that will satisfy the parking demand
- adequate sight distance is available at the intersection of Patemans Lane and Murrumbateman Road; no further treatment is required
- the proposed site access driveway along Turton Place satisfies the minimum entering sight distance, as specified in AS/NZS 2890.1
- the setback of the proposed security gate from the edge of Turton Place will accommodate the storage of a 19 m semi-trailer clear of the traffic lane
- no additional turn lane treatments are required due to the traffic generated by the proposed development.

However, this TIA has identified a recommendation that needs to be addressed:

- **Recommendation 1:** trim or remove the tree restricting sightlines to the north (as shown in Figure 17)
- **Recommendation 2:** the subject site access driveway should be constructed according to Figure 7.4 in Austroads Guide to Road Design Part 4 requirements and to the council's satisfaction.

Appendix 1 – Development Plans

North

R01
(NEAREST DWELLING)

R02

R03

DISTANCE FROM RESIDENTIAL AREA TO BESS AREA

R01 (NEAREST DWELLING)	APPROX. 236m
R02	APPROX. 569m
R03	APPROX. 354m

LEGEND

	SITE ACCESS GATE AND ROAD		NEW ACCESS TRACK TO BE UPGRADED
	BATTERY		ROAD/HIGHWAY/RAILWAY
	MVPS		EXISTING ACCESS TRACK
	HV SWITCHGEAR		BESS SECURITY FENCE 1.8 METER HIGH CHAIN MESH SECURITY FENCE GALVANISED STEEL
	EXISTING O/H LINE		TITLE BOUNDARY
	EXISTING LINE EASEMENT		NEIGHBORING BOUNDARIES
	EXISTING HV POLE/TOWER		ONE ROW LANDSCAPE
	NEW O/H LINE		TWO ROWS LANDSCAPE
	NEW LINE EASEMENT		RESIDENTIAL PROPERTY
	NEW HV POLE/TOWER		CAR PARK AREA
	INFRASTUCTURE AND EASEMENT EXCLUSION ZONE		TREES TO BE REMOVED (ALL TREES IN THE MARKED AREA)
	EXISTING TREES		EXISTING DAM
	TREE TO BE REMOVED (MARKED)		EXISTING DRAINAGE
	EXISTING FENCE		STANDARD FARM FENCE

REVISIONS

REV	STATUS	DESCRIPTION	DATE	D.B.	C.B.
A	CP	INITIAL ISSUE	07/06/23	XT	RZ
B	CP	ADDED INFRASTRUCTURE AND EASEMENT EXCLUSION ZONE	20/11/23	XZ	AJ

PROJECT DETAILS:
MURRUMBATEMAN DISTRIBUTION BESS
3 TURTON PLACE MURRUMBATEMAN, NEW SOUTH WALES 2582
-34.9920, 149.04964

CLIENT DETAILS:
ACENERGY PTY LTD

DRAWING TITLE:
AERIAL LAYOUT 1 OF 2

DRAWING NR: CP-1.0_023118

DRAWN BY :	APPROVED BY :	PROJECT MGR :
XZ	AJ	LZ
SCALE : AS INDICATED	ISSUE : CONCEPT PLAN	ISSUE DATE : 20/11/2023
SHEET SIZE: A3	PROJECT NO: 23118	REV. NO: B

ACENERGY

Appendix 2 – Acronyms and terms

Acronyms / terms	Definition
AGRD4	Austroads Guide to Road Design Part 4 – Intersections and crossings
AGRD4A	Austroads Guide to Road Design Part 4A – Unsignalised and signalised intersections
AGTM6	Austroads Guide to Traffic Management Part 6 – Intersections, interchanges and crossings management
AGTM8	Austroads Guide to Traffic Management Part 8 – Local street management
AS/NZS2890.1	Australian Standard / New Zealand Standard 2890.1 Parking facilities Part 1: Off-street car parking
DPE	Department of Planning and Environment
ESD	Entering site distance
PSP	Precinct structure plan
SIDRA	SIDRA intersection – micro analytical traffic engineering software to model the performance of intersections
SISD	safe intersection sight distance
TIA	traffic impact assessment
TfNSW	Transport for New Soth Wales (NSW)
vpd	vehicles per day
vph	vehicles per hour

APPENDIX F

LANDSCAPING PLAN

Aerial imagery © Nearmap

REVISED APPROVAL ISSUE - 22 November 2024

Notes

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Rev	Date	Revision Note	By
B	20/11/2024	Detail drawing reference rectangle removed	CW
A	8/5/2024	Fully revised to amended D-BESS site layout; Plant specings revised, plant schedule updated.	CW

Issue	Date	Issue Note	By
5	22/11/2024	REVISED APPROVAL ISSUE	CW
4	20/11/2024	REVISED APPROVAL ISSUE	CW
3	3/6/2024	REVISED APPROVAL ISSUE	CW
2	8/5/2024	REVISED APPROVAL ISSUE	CW
1	26/11/2023	APPROVAL ISSUE	CW

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Project

MURRUMBATEMAN Distribution BESS

3 Turton Place Murrumbateman NSW

Drawing

Overview/Context Plan

Sheet 1 of 4

Local Authority: Yass Valley Council, NSW

0 100 150 200 m

Scale: 1:3,000 @ A1; 1:6,000 @ A3

Drawn: CW Date: 26 Nov 2023

North

Project #	Drawing #	Rev
23646	01	B

groundcontrol

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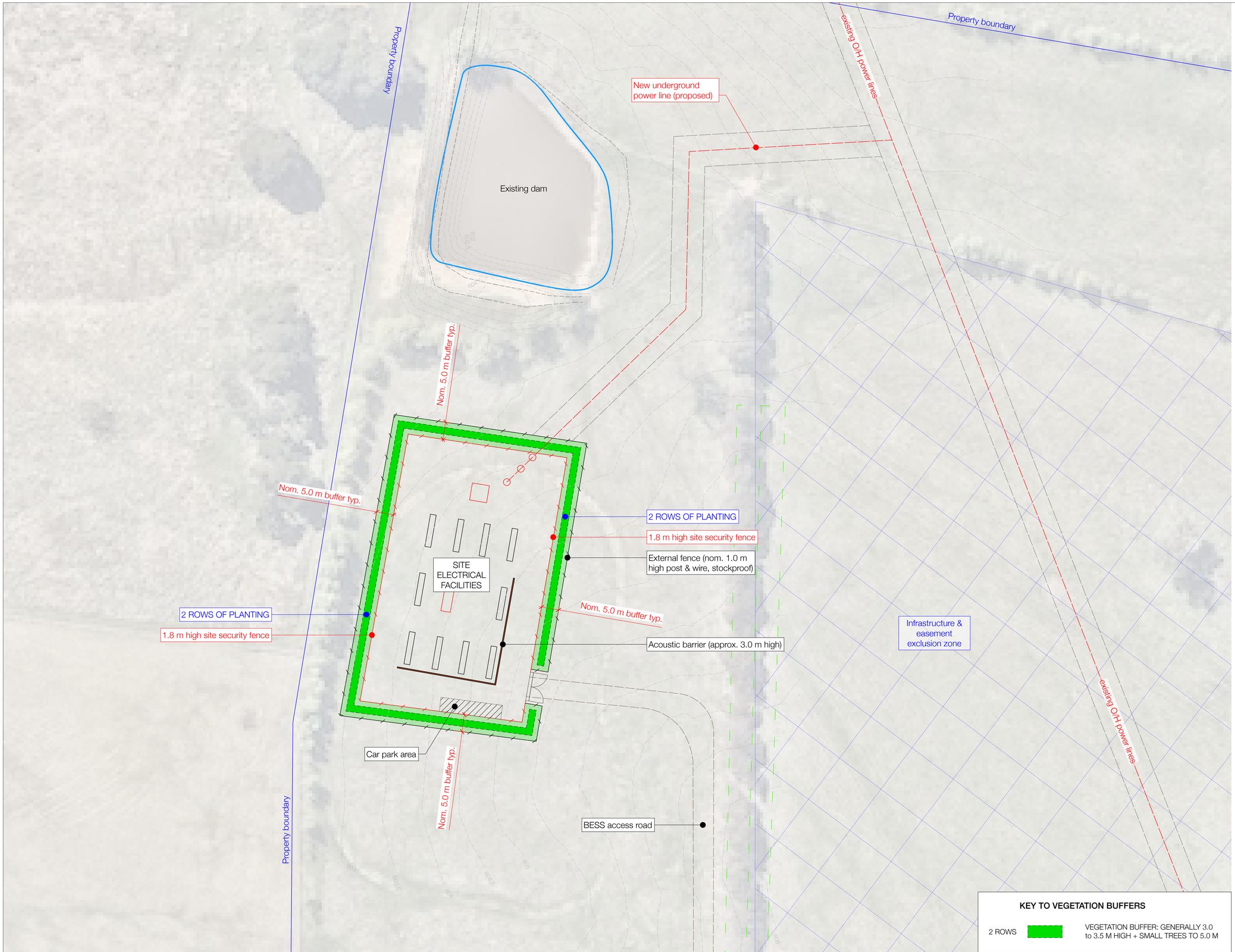

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Rev	Date	Revision Note	By
C	20/11/2024	Acoustic barrier & car park area added	CW
B	3/6/2024	New connecting power line corrected from overhead to underground installation	CW
A	8/5/2024	Fully revised to amended D-BESS site layout; Plant specings revised, plant schedule updated.	CW

Issue	Date	Issue Note	By
5	22/11/2024	REVISED APPROVAL ISSUE	CW
4	20/11/2024	REVISED APPROVAL ISSUE	CW
3	3/6/2024	REVISED APPROVAL ISSUE	CW
2	8/5/2024	REVISED APPROVAL ISSUE	CW
1	26/11/2023	APPROVAL ISSUE	CW

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Project

MURRUMBATEMAN Distribution BESS

3 Turton Place Murrumbateman NSW

Drawing

Landscape Screening Plan

Sheet 2 of 4

Local Authority Yass Valley Council, NSW

0 10 20 30 40 m

Scale 1:500 @ A1; 1:1,000 @ A3

Drawn CW Date 26 Nov 2023

North

Project #	Drawing #	Rev
23646	02	C

groundcontrol

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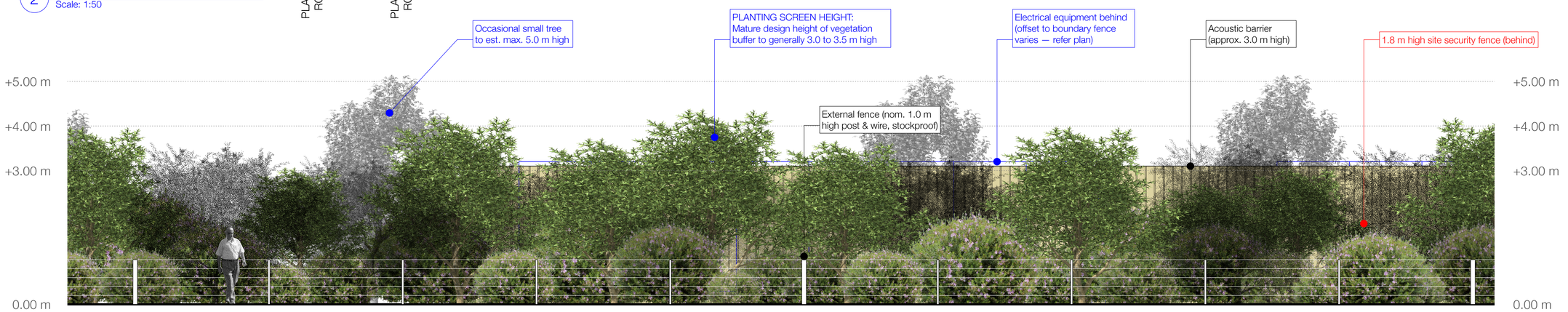
LIFE FORM	INDIGENOUS	SPECIES NAME	COMMON NAME	EST. MATURE HEIGHT	EST. MATURE SPREAD	POT SIZE	QUANTITY
		SMALL TREES					
ST	●	*Acacia dorytoxylon*	Spearwood	5.0	4.0	Hiko	10
ST	●	*Acacia pravissima*	Tumut Wattle	5.0	4.0	Hiko	10
ST	●	*Hakea decurrens*	Bushy Needlewood	5.0	4.0	Hiko	5
		LARGE SHRUBS					
L	●	*Acacia decora*	Western Silver Wattle	2.5	3.0	Hiko	30
L	●	*Acacia paradoxa*	Kangaroo Thorn	3.0	3.0	Hiko	16
L	●	*Acacia verniciflua*	Varnish Wattle	3.5	3.0	Hiko	30
L		*Callistemon citrinus 'Kings Park Special'*	Kings Park Bottlebrush	3.5	3.0	Hiko	30
L	●	*Kunzea ericoides*	Burgan	3.0	3.0	Hiko	16
L	●	*Leptospermum lanigerum*	Woolly Tea-tree	3.5	3.0	Hiko	30
		MEDIUM SHRUBS					
M	●	*Acacia buxifolia*	Box-leaf Wattle	2.5	2.0	Hiko	25
M	●	*Acacia siculiformis*	Dagger Wattle	2.0	2.0	Hiko	20
M	●	*Bursaria spinosa*	Sweet Bursaria	2.5	2.0	Hiko	20
M	●	*Callistemon sieberi*	River Bottlebrush	3.0	2.0	Hiko	20
M	●	*Indigofera australis*	Australian Indigo	2.0	2.0	Hiko	20
M	●	*Leptospermum continentale*	Prickly Tea-tree	2.5	2.0	Hiko	23
		SMALL SHRUBS					
S	●	*Acacia genistifolia*	Early Wattle	1.5	2.0	Hiko	20
S	●	*Grevillea lanigera (shrub form)*	Woolly Grevillea	1.5	2.0	Hiko	20
S	●	*Kunzea parvifolia*	Violet Kunzea	1.0	2.0	Hiko	11

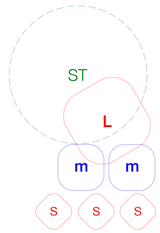
TOTAL PLANTS QUANTITY 356

2 TYPICAL VEGETATION BUFFER (SECTION)
Scale: 1:50



3 TYPICAL VEGETATION BUFFER (EXTERNAL ELEVATION)
Scale: 1:50

KEY TO PLANT LIFE FORMS



SMALL TREES
LARGE SHRUBS
MEDIUM SHRUBS
SMALL SHRUBS

Unless otherwise noted, all plants to be planted with Arborgreen 'Greenguard POP' or similar approved tree guards and biodegradable jute weed mats

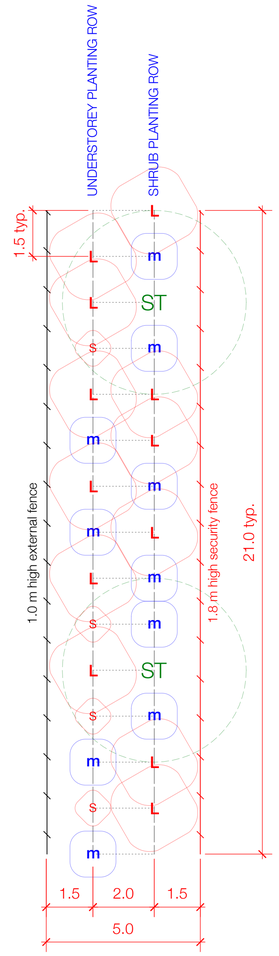
PLANT SET-OUT

Plant species shall be distributed in natural groupings to all planting areas, generally in accordance with plant life-form planting layouts as described in the Vegetation Buffer Detail Sheets as part of this drawing set.

Avoid concentrations of one species in any one area.

Avoid planting more than 5 no. of the same species in any one 21 m long typical planting row.

Maximise plant diversity at plant set-out.



2 ROWS

1 TYP. VEGETATION BUFFER
Scale: 1:100

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Rev	Date	Revision Note	By
C	22/11/2024	Acoustic barrier height adjusted	CW
B	20/11/2024	Acoustic barrier added to typical section & elevation	CW
A	8/5/2024	Fully revised to amended D-BESS site layout; Plant specings revised, plant schedule updated.	CW

Issue	Date	Issue Note	By
5	22/11/2024	REVISED APPROVAL ISSUE	CW
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Project

MURRUMBATEMAN Distribution BESS

3 Turton Place Murrumbateman NSW

Drawing

Landscape Screening

Sheet 3 of 4

Local Authority Yass Valley Council, NSW

Scale As shown @ A1
Drawn CW Date 26 Nov 2023
Project # 23646 Drawing # 03 Rev C

North

groundcontrol
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LANDSCAPE WORKS CONSTRUCTION NOTES:

1 WORKS BY CIVIL/OTHERS
All construction & civil works incl. demolition, building works, bulk earthworks, drainage infrastructure, road pavements, site electrical & battery facilities & associated infrastructure, fencing and other related works.

The civil contractor will ensure the following minimum depths of site topsoil are provided for the landscape works:

- Planting areas -- min. 150 mm depth site topsoil.
- Finished level of topsoil to be generally 100-150 mm above surrounding existing ground surface levels to ensure topsoil/planting areas are free from waterlogging during wet periods.

2 INSURANCES
Provide certificates of currency for Public Liability Insurance (min. $20M) and Workcover insurance (min. $20M) to the Superintendent prior to commencing works. Each certificate of currency shall note the Proprietor as an interested party.

3 ROAD OPENING PERMIT
Apply to the responsible authority for a road opening permit (if required), incl. the payment of all fees and charges re same. An approved copy of the approved road opening permit shall also be provided to the Superintendent prior to works commencing on site.

4 LANDSCAPE PRE-COMMENCEMENT MEETING
The Contractor shall Initiate, coordinate and attend a pre-commencement meeting with Council, Proprietor & Superintendent, incl. achieving compliance with all Council & specified requirements, checklists, insurances, approvals, etc.

5 TRAFFIC MANAGEMENT
If required, prepare and submit to the responsible authority a traffic management plan to their satisfaction, incl. the payment of all fees and charges re same. An approved copy of this plan shall also be provided to the Superintendent prior to works commencing on site. Implement approved traffic management plan during the duration of the Works on site.

6 LOCATE EXISTING SERVICES
Locate all existing services prior to commencing works, contacting Dial Before You Dig, the project civil engineers/contractor and/or the relevant authorities re same as required. Identify all overhead services prior to commencing works.

7 SET OUT THE WORKS
Accurately set the works out as per the documentation set.

8 SOIL TESTING
Undertake soil sampling & testing from an approved ag. soil testing laboratory, incl. seeking recommendations for fertilising planting zone to improve soil NPK balance, trace elements, etc. Any recommended adjustments must be made to improve the soil conditions for native tree & shrub planting.

9 PLANTING AREAS PREPARATION -- INITIAL
These works to be done ideally in LATE FEBRUARY/MARCH of the planting year:

- Eradicate broadleaf, woody and noxious weeds from all planting areas using selective, non-residual herbicides. Manual removal of larger woody weeds may be required -- inspect site to confirm extent.
- Rip along planting line to 2.0 m wide to min. 300 mm depth with a Yeomans/Keyline plough with tynes at max. 750 mm centres to break up/aerate natural subgrade and to relieve compaction, grade & level.
- Apply fertilisers and additives at rates recommended by soil test results.
- Cultivate planting lines to break up soil clods and provide an appropriate planting medium.
- DO NOT WORK WET SOIL. Remove any deleterious material brought to the surface, consolidate soil and grade surface to even grades, free of any depressions or undulations.

10 PLANTING AREAS PREPARATION -- SECONDARY
These works to be done ideally in APRIL/MAY of the planting year:

- Eradicate broadleaf, woody and noxious weeds from all planting areas using selective, non-residual herbicides. Manual removal of larger woody weeds may be required.
- Re-cultivate planting lines to break up soil clods and provide an appropriate planting medium.
- DO NOT WORK WET SOIL. Remove any deleterious material brought to the surface, consolidate soil and grade surface to even grades, free of any depressions or undulations.

11 PLANT SUPPLY
All plants shall be healthy, free from any pests or diseases, be attractive, well grown and well formed plant specimens and shall have a healthy, well formed root system commensurate in size with the foliage mass (root systems must not be pot bound). Plant container sizes shall be as listed in the detail planting schedule, but shall be min. hiko, ViroTube or 50 mm round/square pot size.

The planting contractor shall inspect all plants on delivery to site and shall certify in writing to the Superintendent that all plants supplied are as described above and are accepted by the planting contractor for planting in this project.

12 PLANTING
Set out plants as documented. Individual holes are to be dug (tree planter, mini-auger, etc.) in the prepared planting areas of sufficient size to easily accommodate the plant's root system and relieve any polishing. Create broad, shallow watering bowl to ALL plants to facilitate effective watering (min. 5 litre capacity). All plants shall be watered-in immediately after planting and at such times during the Contract period as is required to maintain growth free of water stress. Planting medium must be moist - do not plant into dry soil. Handle and plant all plants at all times in accordance with best horticultural practice.

13 FERTILISING
Refer maintenance section.

14 WEED MATS
Supply & install to each plant a 600 x 600 mm TreeMax or similar approved jute weed mat. Installation strictly to manufacturer's recommendations.

15 TREE/PLANT GUARDS
Supply & install to each plant Arborgreen 'Greenguard POP' 450 x 200 mm (sides): Code: 'GRGRDPOP-TRI' or similar approved 100% biodegradable tree guard, incl. 1 no. x 25 x 25 x 750 mm HWD stake per guard to all plants. Ensure stake extends min. 300 mm into ground. Installation strictly to manufacturer's recommendations.

16 GRASSING (IF REQUIRED)
Some areas of grass seeding may be required and will be directed and quantified by the Superintendent.

Do not sow seed in periods of extreme heat, cold or wet, or where wind velocities are excessive unless otherwise approved. Seed mix shall be as follows:

- TURF-TYPE REGENERATING PERENNIAL RYEGRASS 95% by count
- TURF-TYPE TALL FESCUE 3% by count
- SUB CLOVER 1% by count
- WHITE CLOVER 1% by count

Seeding rate shall be min. 30 gms per m2. Apply seed evenly – seed application shall be via direct drilling or by other approved methods. Seeding shall be programmed when there is a period of anticipated weather conditions (i.e. rain) that will provide the best chance for germination of grass seed. Any areas affected by heavy rain, wind removing seed or other cause shall be re-seeded as specified to achieve an even cover of grass.

Slash grass when growth height has reached 100 mm or otherwise as directed by Superintendent. Should all the areas not require cutting at one time, complete all further cuts as necessary until 100% of the area has achieved successful coverage and all areas have received at least first cut.

17 PRACTICAL COMPLETION COORDINATION
The Contractor shall Initiate, coordinate and attend a Practical Completion meeting with Council, Proprietor & Superintendent, incl. achieving compliance with all Council & specified requirements, checklists, insurances, approvals, etc.
NOTE: Min. 3 no. working days notice is required for a Practical Completion meeting.

18 LANDSCAPE ESTABLISHMENT MAINTENANCE PERIOD
Maintain the contract works from the Date of Practical Completion to the Date of Final Completion/hand-over.

Maintenance shall include care of the contract area by accepted horticultural practices, and rectification of any defects that become apparent during this period. Maintenance tasks to be carried out during the maintenance period shall include, but shall not be limited to, slashing, watering as required, weed control, pest & disease control & management, tree/plant guard adjustment/replacement as required, rubbish removal.

WEED CONTROL – PLANTED AREAS:
In planted areas, poison all broadleaf, noxious & woody weeds as they appear. Slashable grasses are to be retained generally between planting rows. Selective herbicides shall be nominated by the Contractor and approved by the Superintendent prior to use. Non-selective herbicide shall be Monsanto 'Roundup BIACTIVE' glyphosate-based herbicide -- standard 'Roundup' is NOT to be used. NO OTHER HERBICIDE SHALL BE USED WITHOUT PRIOR APPROVAL. All herbicide applications shall use NuFarm 'Spraymate or similar approved marker dye admixture and shall be handled and applied strictly according to manufacturer's recommendations, recommended rates and directions.

GRASS MANAGEMENT – PLANTED AREAS:
Slash all areas between plants in rows and min. 1.5 m along all outside edges of all planting zones on a regular basis to maintain grass height to max. 100 mm. Slashing shall comply with all local Council and RFS guidelines re grass heights.

JUTE MAT & TREE/PLANT GUARDS:
Maintain jute mat and tree/plant tree guards for first two summers minimum, repair and replace as required during this period.

PLANT REPLACEMENT:
Replace any failing, failed or dead plants during the maintenance period. The Superintendent and the Contractor will inspect the full planting areas at the end of each summer and will identify the number and species of plants that are failing, have failed/died. The Contractor shall replace all such plants identified.

WATERING:
The Contractor shall ensure all plants planted/maintained under this contract receive adequate (but not excessive) watering to maintain optimum growth and health. Watering shall be localised to each plant, not broad spraying across the entire planting area, to limit weed/grass growth between planting rows.

Watering shall be either manually via watercart/hose as required OR via a drip irrigation system, using Netafim 'UniRAM AS' inline dripline @ 1.6 LPH with emitter spacing of 400 mm -- one surface dripline per planting row. Drip irrigation system to be designed by an accredited irrigation designer and connect to an available clean water source, incl. filtration at source.

All plants shall be watered as required for at least the FIRST TWO SUMMERS to aid in establishment of healthy root systems and foliage growth, with further waterings if required during late spring and/or early autumn or at any other time of the year based on prevailing climatic conditions. Further waterings may be needed beyond this minimum establishment watering should prevailing climatic conditions deteriorate with potential to lead to deterioration of plant growth, health or plant deaths (e.g. severe drought, El Niño conditions, etc.).

FERTILISING:
All plants (excluding Proteacea family) shall be fertilised with Scotts 'Osmocote® Plus Trace Elements: Native Gardens' (NPK 21.8 : 0.7 : 7.2) or similar approved at the manufacturer's recommended rates. Fertiliser shall be locally spread on soil surface around plants during planting operations. If unsure which plants are in the Proteacea family – ASK.

Allow for one fertiliser application in Year 1 and second application in Year 2.

PESTS & DISEASES:
Regularly monitor all plants grasses planted/maintained under this contract for evidence of pest and/or disease attack -- identify and treat any/all problems arising.

RABBITS, HARES, KANGAROOS, ETC.:
Identify any predation by rabbits, hares and other pests with potential to damage or destroy the landscape works under this contract. Take all necessary steps, within local authority regulations and/or guidelines, to limit or eradicate predation. Maintain all tree guards in good condition to limit rabbit/hare/kangaroo/other damage to plants with installed guards.

REVISED APPROVAL ISSUE - 22 November 2024

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A	8/5/2024	Fully revised to amended D-BESS site layout; Plant specings revised, plant schedule updated.	CW

Issue	Date	Issue Note	By
5	22/11/2024	REVISED APPROVAL ISSUE	CW
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ACENERGY

Project

MURRUMBATEMAN Distribution BESS

3 Turton Place Murrumbateman NSW

Drawing

Landscape Specification Notes

Sheet 4 of 4

Local Authority Yass Valley Council, NSW

Scale N.T.S.

Drawn CW Date 26 Nov 2023

Project #	Drawing #	Rev
23646	04	A

North

groundcontrol

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APPENDIX G

FLOOD AND GROUNDWATER ASSESSMENT

Flood and Groundwater Assessment Report

ACEnergy BESS – 3 Turton Place, Murrumbateman, NSW

ACEnergy Pty Ltd

26 April 2024

Document Status

Version	Doc type	Reviewed by	Approved by	Date issued
V01	Final	Lachlan Inglis	Lachlan Inglis	26/04/2024

Project Details

Project Name	ACEnergy BESS – 3 Turton Place, Murrumbateman, NSW
Client	ACEnergy Pty Ltd
Client Project Manager	Ahmed Adel
Water Technology Project Manager	Jorja Strack
Water Technology Project Director	Ben Hughes
Authors	Jorja Strack, Daniel Wohling
Document Number	23010129_Murrumbateman_R01V01

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LIST OF FIGURES

LIST OF TABLES

1 INTRODUCTION

1.1 Overview

ACEnergy Pty Ltd are proposing to construct a Battery Energy Storage System (BESS) at 3 Turton Place, Murrumbateman, NSW (the Subject Site). The study objective is to better understand the flooding mechanisms, groundwater conditions and potential development risks within and surrounding the proposed BESS, particularly across the location where the BESS infrastructure is proposed to be constructed. This site is referred to as 'the Subject Site' within this report. The report presents the flood modelling assumptions and results together with a groundwater investigation of the Subject Site.

1.2 Objectives

To provide ACEnergy Pty Ltd with a better understanding of the Subject Site's inundation risk and the developments potential to impact groundwater availability and quality, the following tasks were completed:

- Review of existing flood and groundwater information.
- Development of a 2D (Two-Dimensional) hydraulic flood model (using TUFLOW) Rain-on-Grid (RoG) methodology to assess flood risk from stormwater runoff.
- Preliminary hydrogeological assessment to determine groundwater level and any potential groundwater and surface water interactions at the Subject Site.
- Provision of high-level recommendations for any mitigation or design alterations which may be required to reduce potential risks associated with flooding, drainage and groundwater.

Existing groundwater studies applied to the broader region and specific no studies were available for the Subject Site. An existing flood study is available for the study area and is discussed in Section 2.1.

1.3 Site

The Subject Site is located approximately 3 km east of the Murrumbateman Township in Eastern NSW, located at 3 Turton Place, Murrumbateman, NSW (Figure 1-1).

The site facility is proposed to be installed on gradually sloping terrain. The topography varies from 605.2 m AHD in the southeast to 602.1 m AHD in the northwest of the Subject Site (Figure 1-3). The terrain slopes towards the northwest with a slope of approximately 1.5%. The site is bounded by surrounding farmland and agricultural properties.

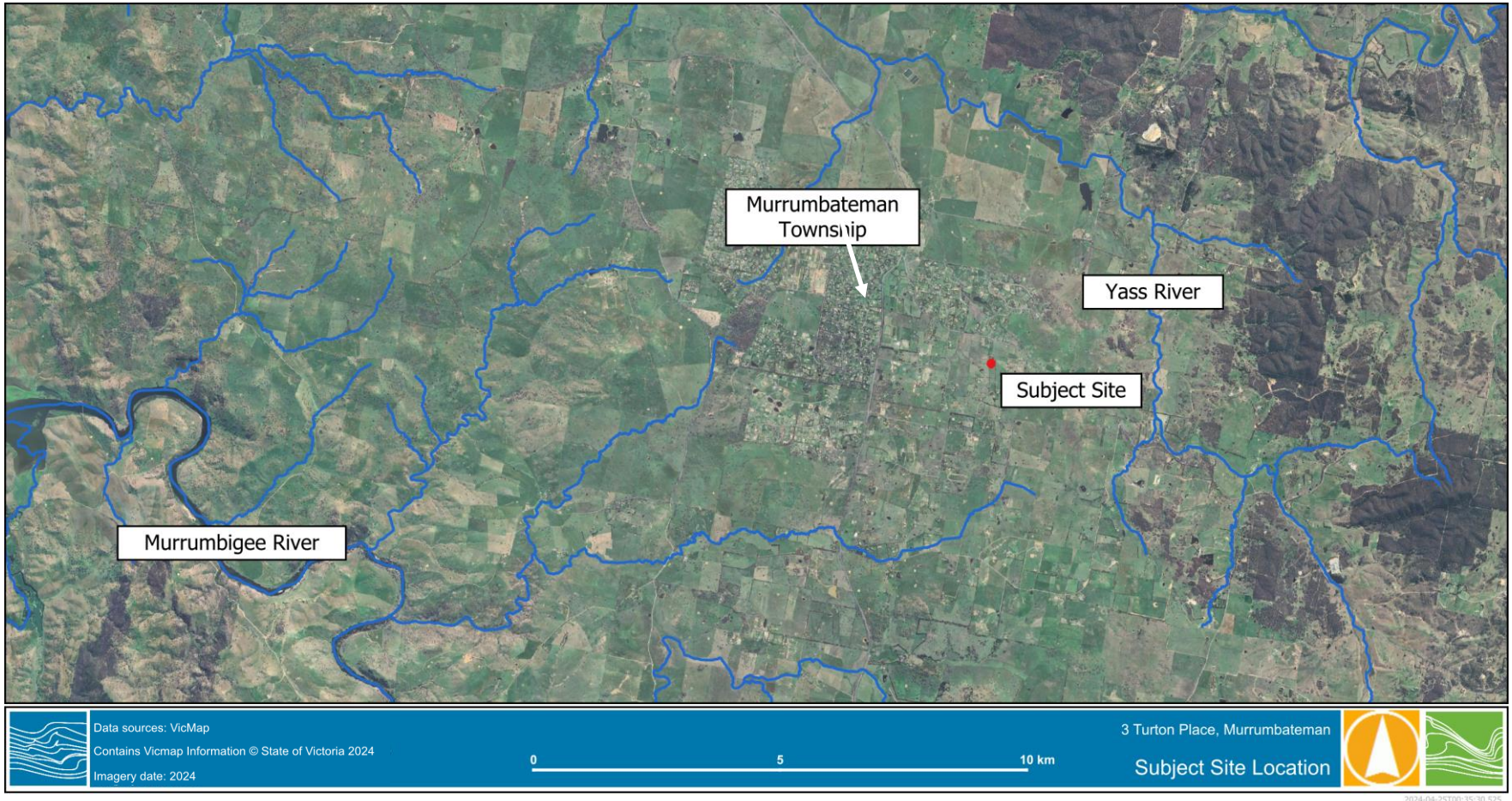

FIGURE 1-1 SUBJECT SITE LOCATION

FIGURE 1-2 SUBJECT SITE – ZOOMED IN

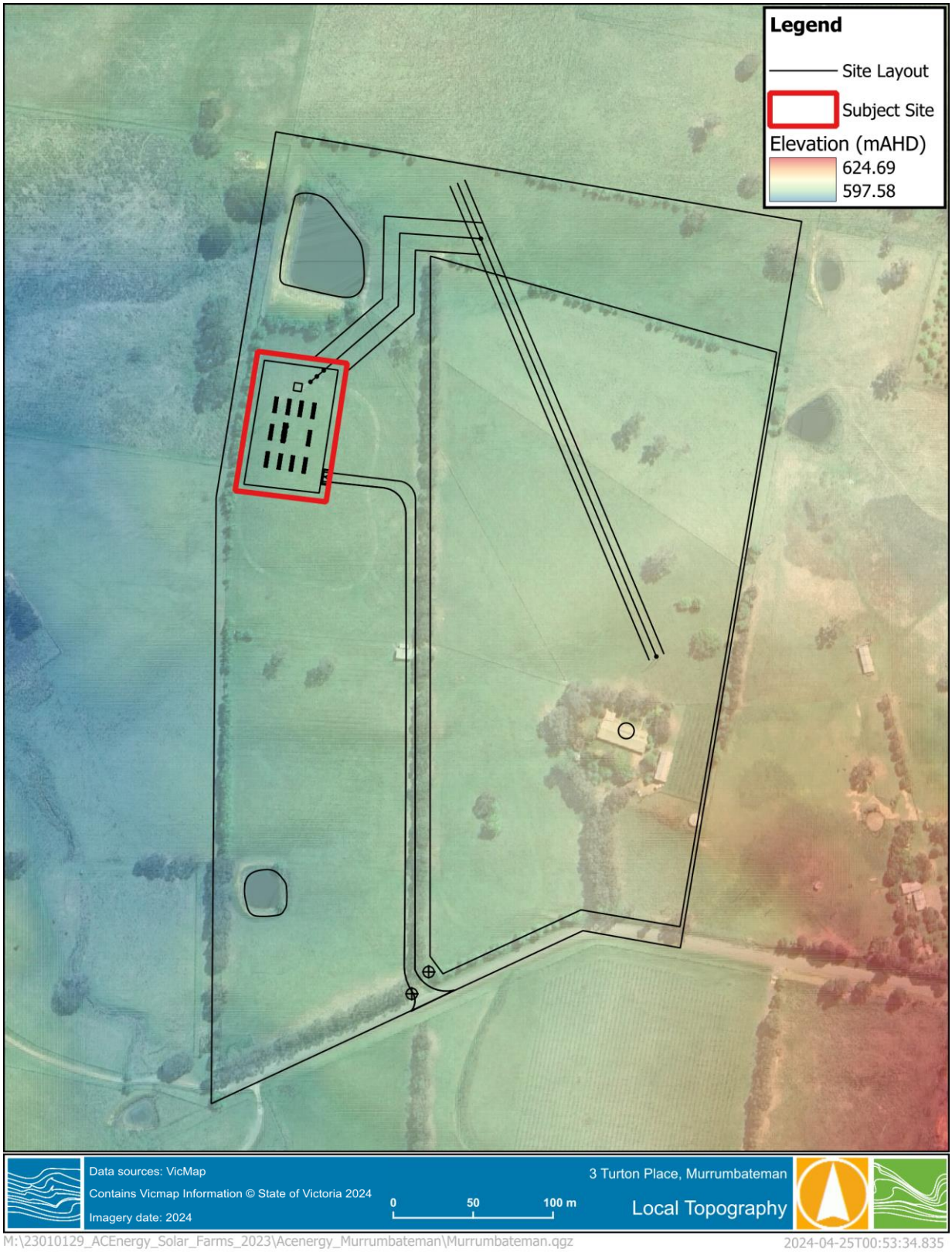

FIGURE 1-3 SUBJECT SITE TOPOGRAPHY

2 FLOODING

2.1 Previous Flood Study

The Murrumbateman, Bowning, Bookham and Binalong Flood Study – Addendum Report[1] was conducted for Yass Valley Council in 2020. The 1% AEP flood depth mapping which covers the Subject Site is presented in Figure 2-1. Based on the Addendum Report, the site is located adjacent to overland flow during a 1% AEP event from the Unnamed Tributary catchment which flows through the existing dam in the north of the site. This flow path is consistent with the flood mapping discussed in Section 2.

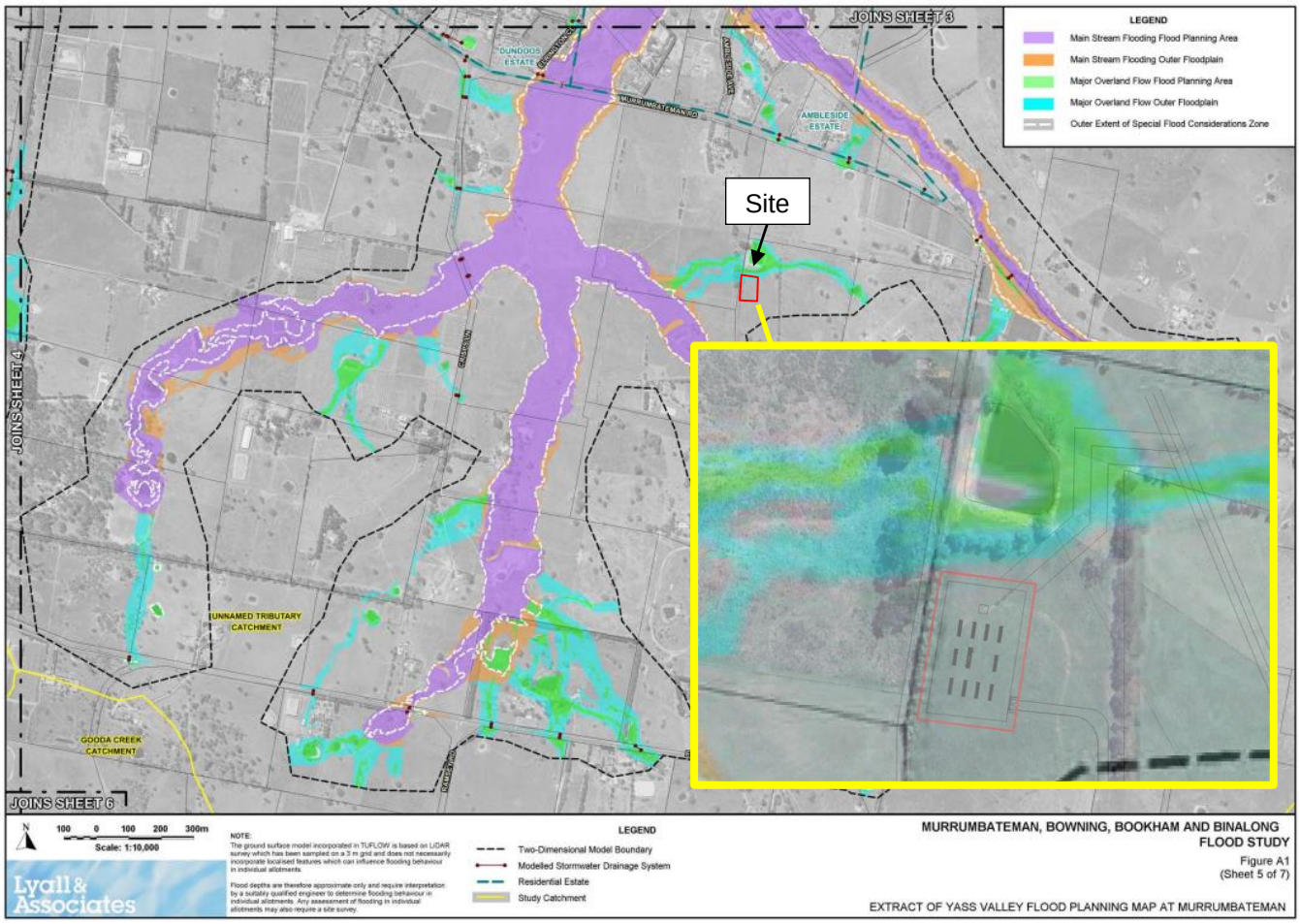

FIGURE 2-1 MURRUMBATEMAN, BOWNING, BOOKHAM AND BINALONG FLOOD STUDY 1% DEPTH (SOURCE: YASS VALLEY COUNCIL)

[1] Retrieved from https://flooddata.ses.nsw.gov.au/flood-projects/murrumbateman-bowning-bookham-and-binalong-flood-study-addendum-report

2.2 Methodology

A two-dimensional Rain on Grid (RoG) hydraulic modelling approach was employed for the hydraulic modelling component of this investigation. The model has generally been developed inline with Australian Rainfall and Runoff (ARR) 2019 guidelines[2] and simulated using TUFLOW hydraulic flood modelling software. Simulations were completed using TUFLOW Build 2023-03-AB Single Precision with HPC (Highly Parallelised Computations) solution scheme on a GPU solver.

The RoG methodology is extensively used for flood mapping of urban and rural areas. It allows for a comprehensive flood risk assessment by identifying overland flow paths based on the topography dataset as illustrated in the flow chart in Figure 2-2.

- The rainfall layer, which consists of one single rainfall polygon over the model extent was produced in a GIS package.
- Hyetographs (rainfall depth timeseries) were created for a range of design rainfall AEP (Annual Exceedance Probability) events and durations using QGIS TUFLOW plugin and the 2016 Bureau of Meteorology Intensity Frequency Duration (IFD) at the centroid of the catchment. These were applied to the TUFLOW model to represent catchment rainfall under various durations for the 1% AEP design storm.

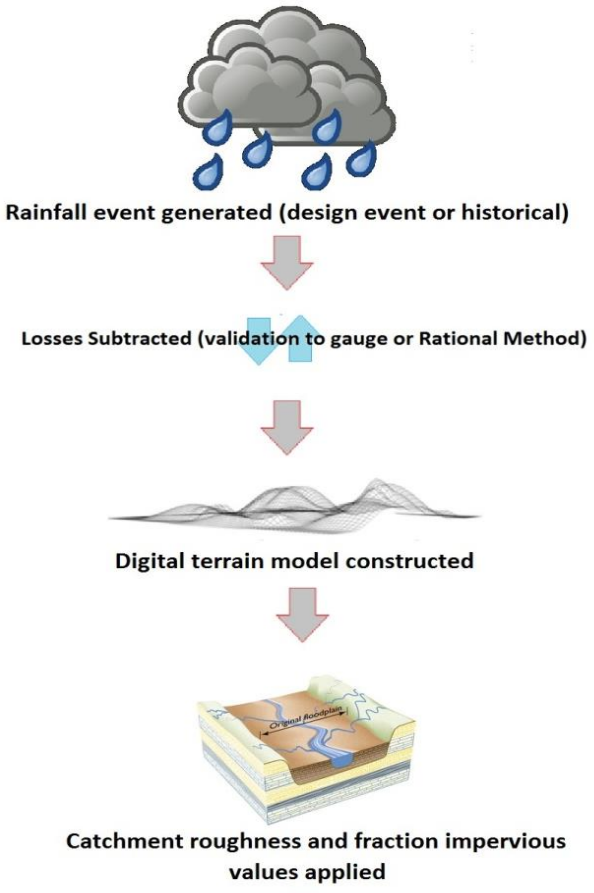

FIGURE 2-2 RAINFALL ON GRID MODELLING APPROACH

[2] Retrieved from http://book.arr.org.au.s3-website-ap-southeast-2.amazonaws.com/

A new hydraulic model was constructed using land use, cadastral, topography and aerial photography datasets to identify different land uses which are represented from a hydrologic and hydraulic perspective as surface roughness and initial and continuing loss values.

The upstream catchment and wider area were modelled to ensure all runoff from the upstream catchment was captured. The TUFLOW model set-up and model extent is presented in Figure 2-3.

FIGURE 2-3 TUFLOW MODEL SETUP

2.2.1 Rainfall

Understanding historical rainfall seasonality and long-term trends is critical to surface water and groundwater investigations. Historical rainfall data was taken from the SILO database[4] for the grid point nearest to the study area (latitude -35.00 and longitude 149.05). The dataset covers a 67-year period from 1957 to 2024, which is adequate to identify longer-term rainfall trends.

The mean annual rainfall is 702.1 mm/yr, with monthly average rainfall ranging between 47.0 mm in April and 71.3 mm in October (Figure 2-4). Annual rainfall is highly variable and Figure 2-5 shows periods of both above and below-average rainfall over the nearly 67-year period. The above-average rainfall is interpreted from the cumulative deviation from the mean monthly rainfall (CDMMR) (Figure 2-3), which identifies when rainfall has trended above average (inclining line) or below average (declining line). Above-average rainfall periods were noted between approximately 1958-1965, 1970-1980, 1985-2000 and from 2020-2024. Several below-average rainfall periods are noted between approximately 1965-1970, 1980-1985 and 2000-2010.

[4] https://www.longpaddock.qld.gov.au/silo/

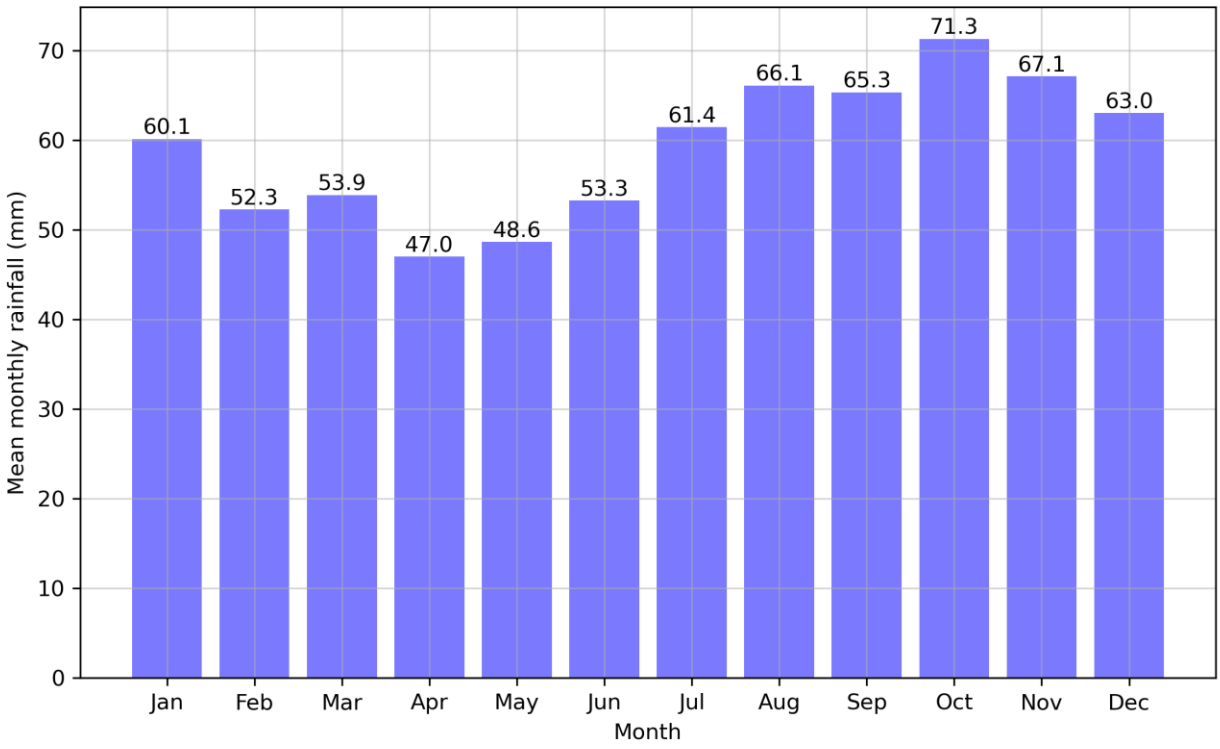

FIGURE 2-4 MONTHLY AVERAGE RAINFALL FROM 1957-2024

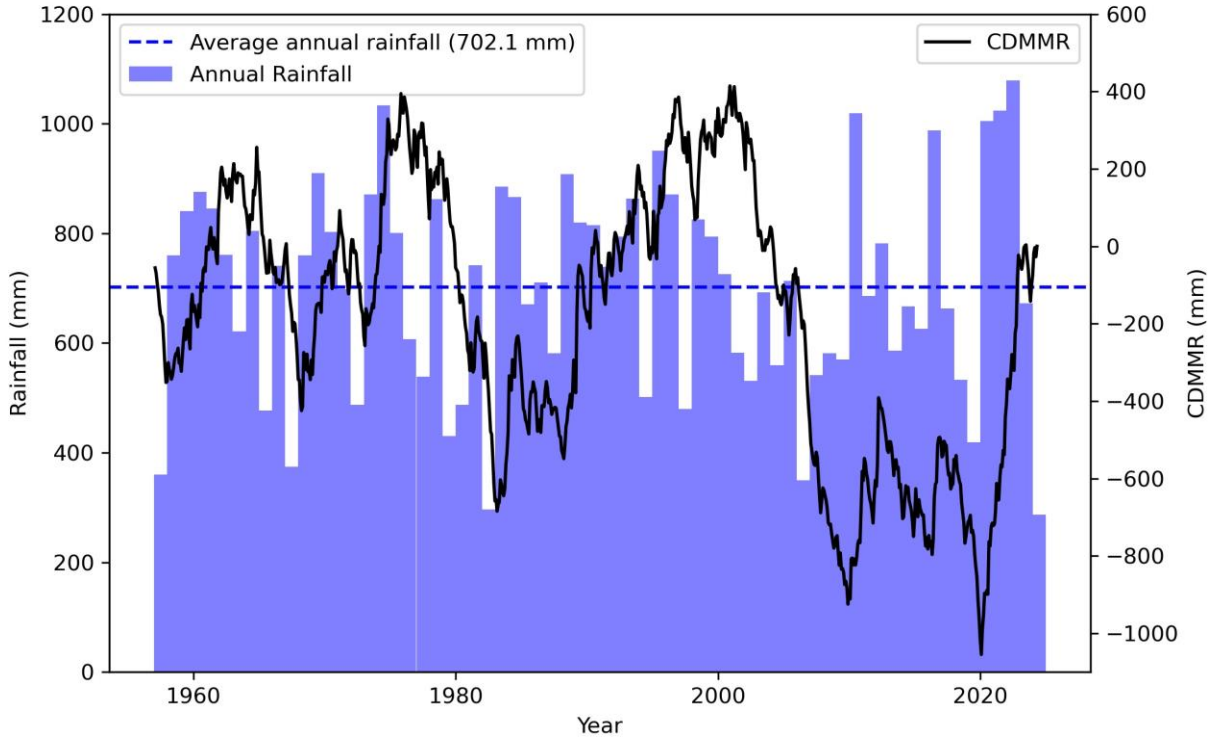

FIGURE 2-5 AVERAGE ANNUAL RAINFALL AND THE CUMULATIVE DEVIATION FROM MEAN MONTHLY RAINFALL (CDMMR) BASED ON DATA AVAILABLE FROM 1957-2024

2.2.2 Digital Elevation Model, Losses and Hydraulic Roughness

A Digital Elevation Model (DEM) was generated from 1 m resolution LiDAR, supplied by NSW Spatial Services via Geoscience Australia's Elevation Information System (ELVIS)[5].

Table 2-1 summarises the rainfall losses and hydraulic roughness used for the hydraulic modelling as per the land use types within the model. These values were adopted based on Water Technology's experience with RoG models in the surrounding area. Figure 2-6 shows the TUFLOW materials layer.

A check was also undertaken to test the sensitivity of continuing loss values adopted. It was found that reducing the losses by 50% for the critical duration (1% AEP, 360 minutes, TP06) had negligible impacts on the flood extent and maximum flood depths (<2cm) around the Subject Site.

TABLE 2-1 MODEL PARAMETERS

Land use types	Material Code	Manning's 'n' (roughness)	Initial loss (mm)	Continuing loss (mm/hr)
Residential – Rural	102	0.150	14	2
Open Pervious Area	108	0.040	14	2
Paved Roads/Carparks	114	0.025	1	0.5

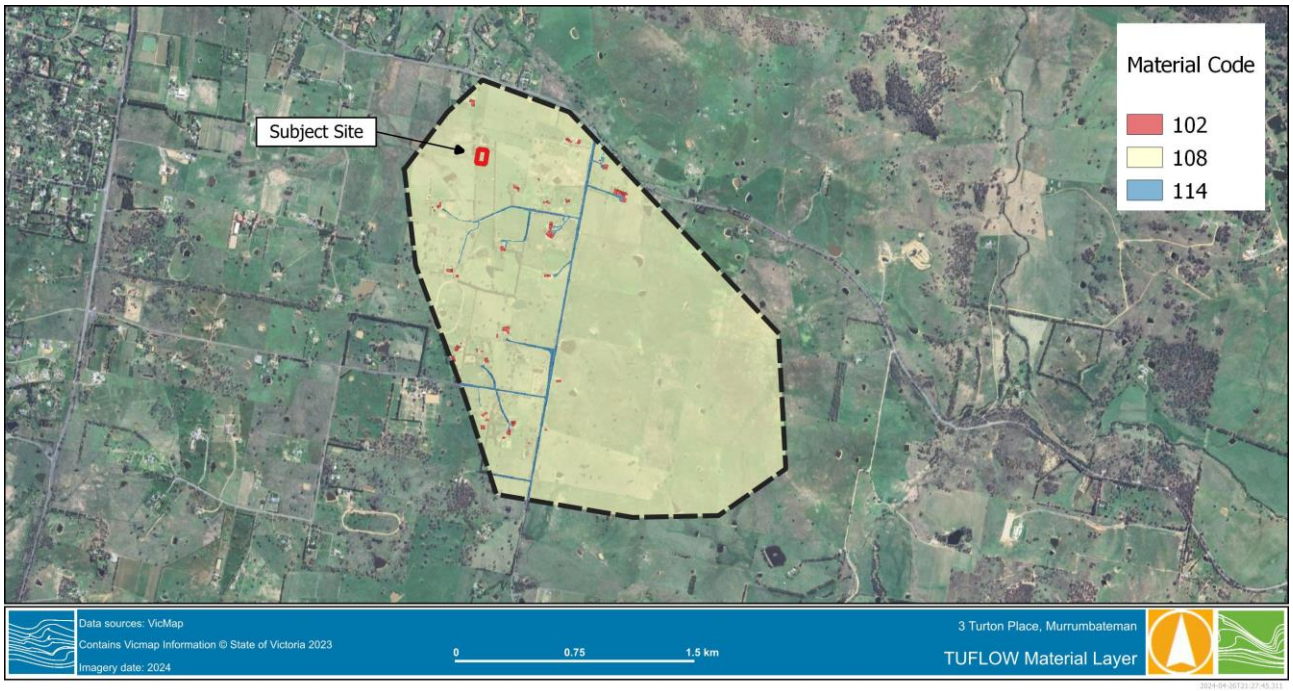

FIGURE 2-6 TUFLOW MODEL MATERIALS LAYER

2.2.3 Boundaries

A tailwater (2D TUFLOW 'HQ') boundary was set and extended around the downstream model extent to allow overland flow to freely drain out of the model, with a constant slope of 0.5%.

[5] https://elevation.fsdf.org.au/

2.2.4 TUFLOW Model Checks

- The following checks were undertaken on the TUFLOW model parameters and outputs:
  - 2D timestep: The adaptive 2D timestep drops to a minimum of 0.5 seconds. A 'Classic' TUFLOW model would be expected to have a timestep no less than ¼ of the grid size (3 m), i.e. 1.25 seconds, with a healthy HPC model no lower than a tenth of this figure. Hence, the adopted timestep is within the recommended range.
  - Model mass errors: The mass errors for all models were less than 1% and within the recommended range.
  - Errors and warning messages: No errors were found within the model and all warnings were reviewed and either acceptable or fixed, if required.

2.2.5 Critical Duration and Temporal Pattern Assessment

The model was simulated for the following 1% AEP design storm durations; 3, 6, 12, & 24 hours, using three ARR 2019 temporal patterns representative of front, mid and back loaded storm events.

Results were processed to select the combination of durations and temporal patterns resulting in the maximum flood depths throughout the catchment and covering the site. This is a conservative method of identifying areas prone to flooding in a 1% AEP event. The modelled durations and temporal patterns are shown in Table 2-2.

TABLE 2-2 MODELLED DURATION AND TEMPORAL PATTERN

AEP Event	1%
Durations	3, 6, 12, & 24 hours
Temporal Pattern	TP02, TP04, TP06

2.3 Flood Hazard Classification

Floods can be hazardous, producing harm to people, damage to infrastructure and potentially loss of life. In examining potential flood hazard there are several factors to be considered, as outlined in ARR 2019 (Book 6 Chapter 7)[6]. An assessment of flood hazard should consider:

- Velocity of floodwater.
- Depth of floodwater.
- Combination of velocity and depth of floodwater.
- Isolation during a flood.
- Effective warning time.
- Rate of rise of floodwater.

The flood hazard at the site was assessed in accordance with ARR2019, which defines six hazard categories. The combined flood hazard curves are presented in and vulnerability thresholds classifications are tabulated in Table 2-3.

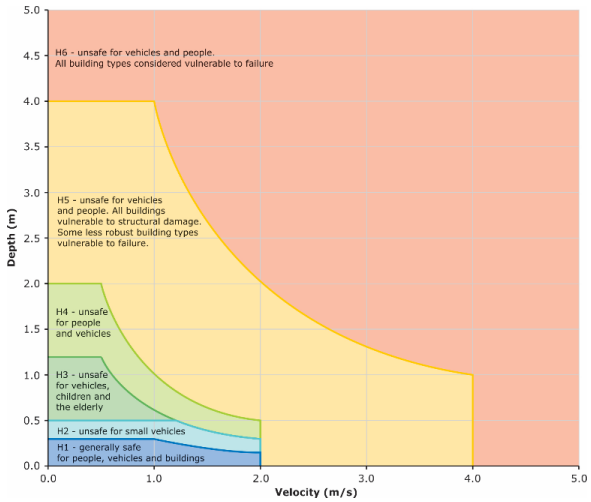

FIGURE 2-7 FLOOD HAZARD CURVES

[6] http://book.arr.org.au.s3-website-ap-southeast-2.amazonaws.com/

TABLE 2-3 HAZARD CLASSIFICATION (ARR, 2016)

Hazard Vulnerability Classification	Classification Limit (D and V in combination)	Limiting Still Water Depth (D)	Limiting Velocity (V)	Description
H1	D*V ≤ 0.3	0.3	2.0	Generally safe for vehicles, people and buildings.
H2	D*V ≤ 0.6	0.5	2.0	Unsafe for small vehicles.
H3	D*V ≤ 0.6	1.2	2.0	Unsafe for vehicles. Children and the elderly.
H4	D*V ≤ 1.0	2.0	2.0	Unsafe for vehicles and people.
H5	D*V ≤ 4.0	4.0	4.0	Unsafe for vehicles and people. All buildings vulnerable to structural damage. Some less robust buildings subject to failure.
H6	D*V > 4.0	-	-	Unsafe for vehicles and people. All building types considered vulnerable to failure.

2.4 Results

The existing conditions 1% AEP depth, velocity and flood hazard results are shown from Figure 2-8 to Figure 2-10. The flood depth map was filtered for small depths (below 0.02 m) and puddles less than 100m^2 removed.

The following observations can be made for the 1% AEP storm event:

- The maximum depth within the Subject site is approximately 80 mm. The main flow path is shallow sheet flow, from the east of the site. Water ponds around the dam to the north of the Subject Site with a small flow path through the northeast corner of the site.
- Modelled peak velocities within the proposed facilities extent are generally less than 0.2 m/s with some small areas between 0.50 – 0.55 m/s in the northeast corner of the site.
- A flood hazard map was created from the product of both depth and velocity as described in the previous section. The Subject Site and proposed location of the facilities is all classified as H1 ‘Generally safe for vehicles, people, and buildings’. This is to be expected of shallow water, ponding across the site rather than traversing it. To the north of the site, the dam has flood hazard up to H3 due to the greater depths within the dam.

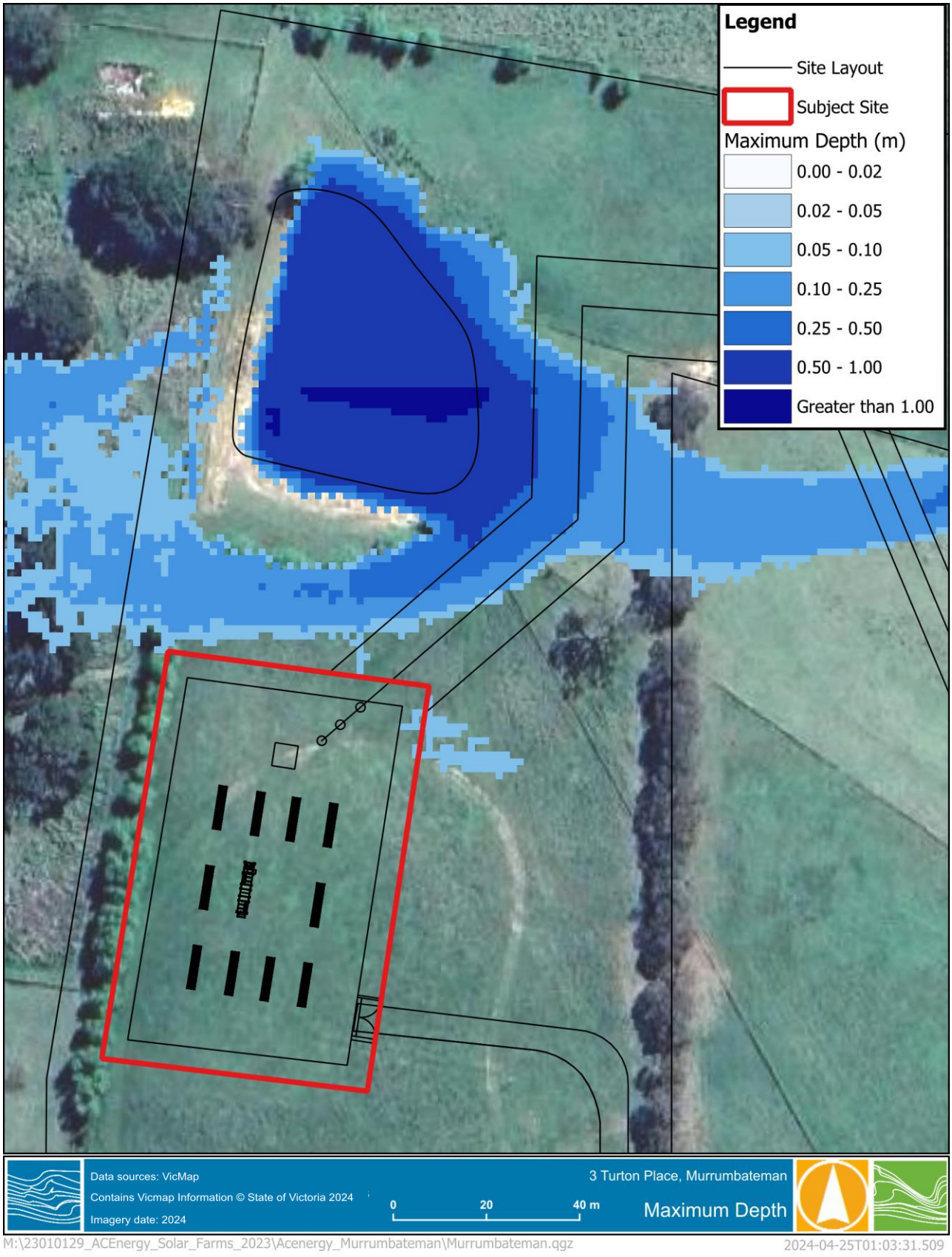

FIGURE 2-8 1% AEP MAXIMUM FLOOD DEPTH (DEPTHS BELOW 0.02M NOT SHOWN)

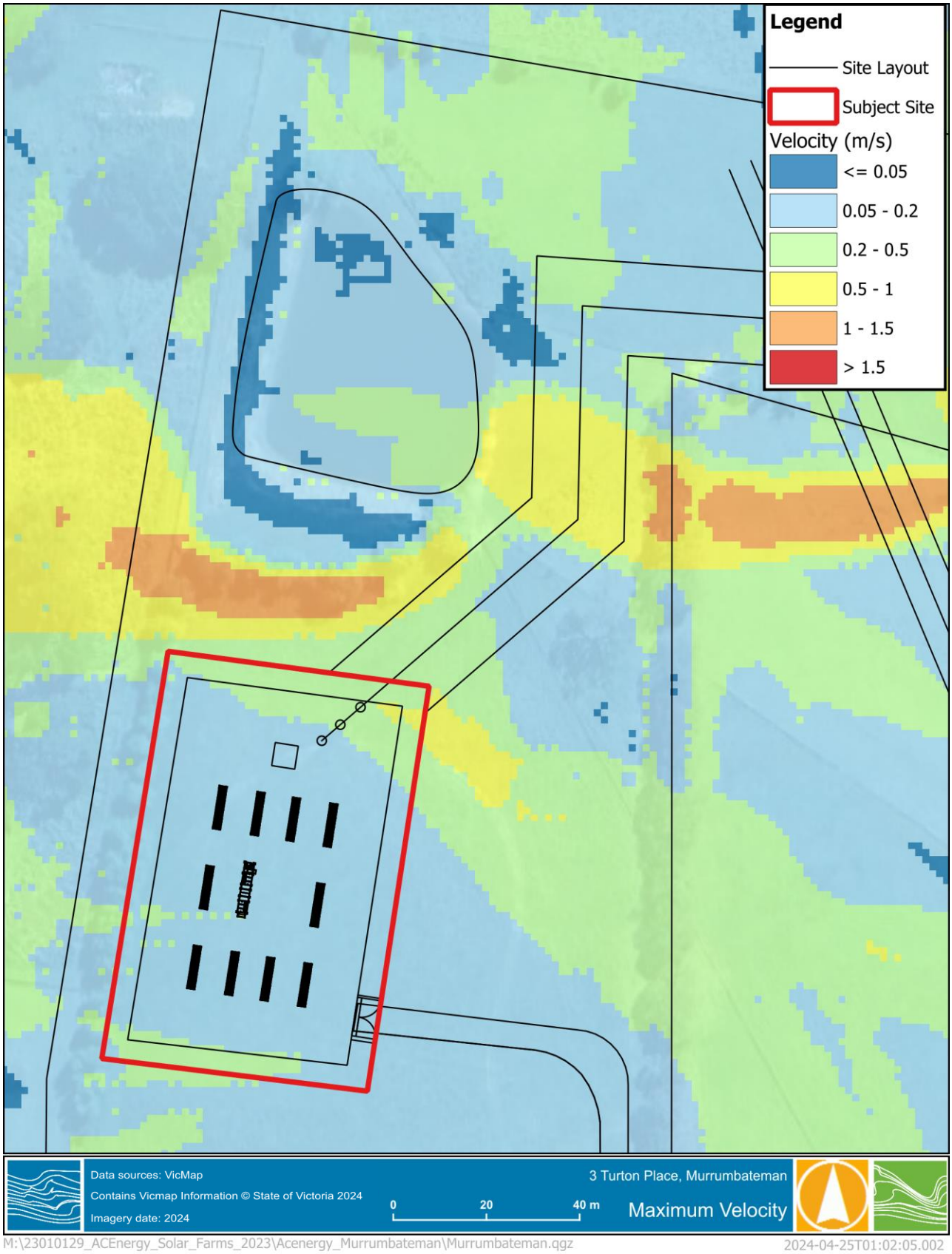

FIGURE 2-9 1% AEP MAXIMUM FLOOD VELOCITY

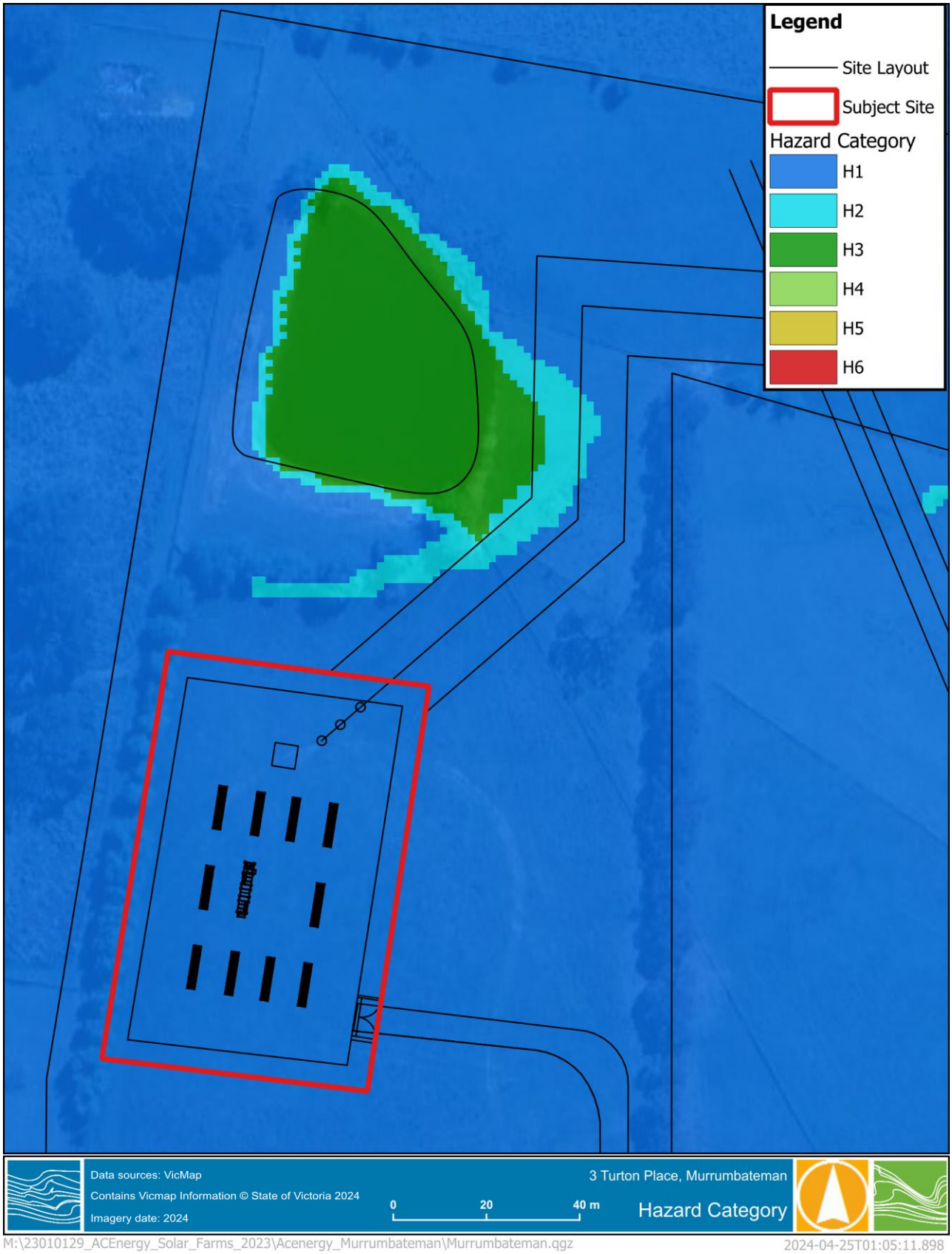

FIGURE 2-10 1% AEP MAXIMUM FLOOD HAZARD

3 GROUNDWATER

The Subject Site is not located within a “groundwater vulnerable” area according to the NSW Department of Planning and Environment’s (DPEs) Groundwater Vulnerability mapping[7]. The Yass Valley Local Environmental Plan 2013 requires an assessment of groundwater vulnerability to maintain hydrological function of key groundwater systems and protect vulnerable resources from depletion and/or contamination due to the proposed development. Although the Subject Site is not located within a groundwater vulnerable area, a groundwater vulnerable area is mapped approximately 2 km south of the Subject Site, and therefore this assessment will assess potential impacts to that identified area. This preliminary hydrogeological assessment considers key components of the groundwater system to develop a hydrogeological conceptual model (Section 3.1) that was used to inform a groundwater vulnerability assessment (Section 3.2).

The following factors were considered as part of this groundwater vulnerability assessment:

- The likelihood of groundwater contamination.
- Impacts on groundwater-dependent ecosystems.
- The cumulative impact on the groundwater system (including impacts on nearby groundwater extraction for a potable water supply or stock water supply.
- Any appropriate measures proposed to avoid, minimise or mitigate the impacts of the development.
- Groundwater abstraction

3.1 Hydrogeological Conceptualisation

Geology of the Subject Site was determined from the NSW Geoscience website MinView[8], with the whole site underlain by quaternary age alluvial and residual deposits, including saprolite, developed by the weathering of older underlying formations. The deeper geology of the area is associated with the Douro Group within the Lachlan Fold Belt. Immediately underlying the Subject Site are the Hawkins Volcanics, which may comprise porphyritic, limestone, mudstone and breccia units[6]. While to the east and north of the Subject Site are Mount Ainslie Volcanics, which comprise porphyry and shale units.

Groundwater information (i.e. bore information, geology, water levels, yields and salinity) were collated from the Bureau of Meteorology (BoM) Groundwater Explorer[9] and from the WaterNSW Realtime Data web portal[10] within a 1 km radius of the Subject Site (Table 3-1 and Figure 3-2). The geological log from the bore GW047516, which is the closest bore to the Subject Site at approximately 200 m west-southwest (Figure 3-2), indicates a thin (0.3 m) layer of topsoil over 6.4 m of clay, over 31.4 m of granite to the termination depth of 38.1 m below ground level (mbgl). Bores GW047293 (300m south) and GW417023 (350m north) also reported over 6m of clay at the surface, suggesting that the Subject Site is underlain by a thick layer of clay.

The remainder of the identified bores within 1 km of the Subject Site all indicate a similar geology of a thin topsoil over several metres of clay over bedrock. The local geological descriptions conform with the broader geological descriptions of superficial deposits and clay derived from weathering over granites of the Douro Group.

[7] https://datasets.seed.nsw.gov.au/dataset/epi-groundwater-vulnerability
[8] MinView | Regional NSW | Mining, Exploration and Geoscience
[9] http://www.bom.gov.au/water/groundwater/explorer/map.shtml
[10] https://realtimedata.waternsw.com.au/water.stm

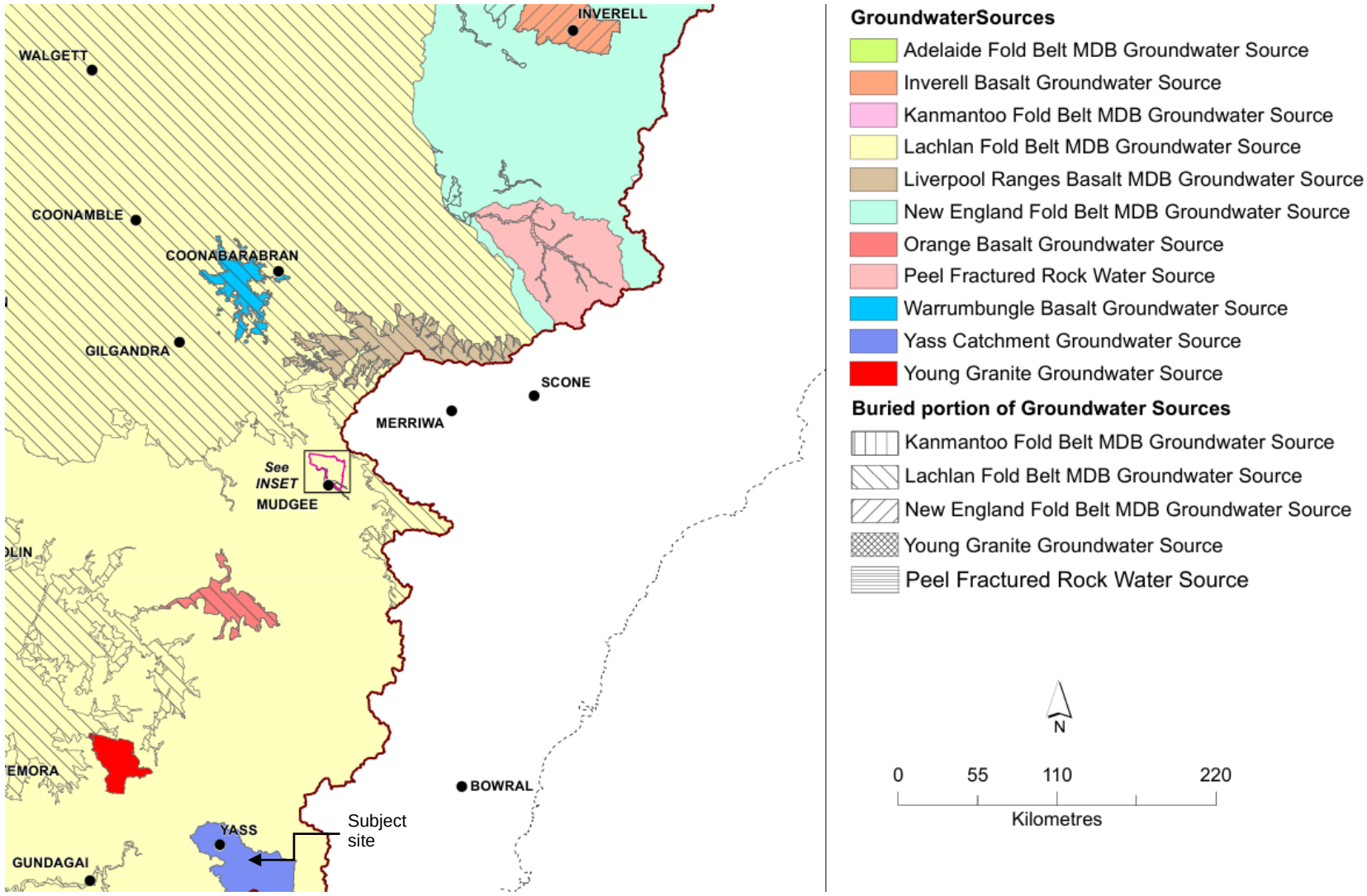

FIGURE 3-1 MURRAY-DARLING BASIN FRACTURED ROCK WATER RESOURCE PLAN GROUNDWATER RESOURCE UNITS (2022)

TABLE 3-1 COLLATED BORE INFORMATION FOR BORES IN CLOSE PROXIMITY (APPROXIMATELY 1 KM) OF THE SUBJECT SITE.

Bore ID Use Location (Purpose)	Total depth (m)	Screen interval(s) (m)	Lithology description	Standing water level (mBGL)	Yield (L/s)	TDS (mg/L)
GW047516 Irrigation 200m west	38.1	NA	0.0-0.3m Topsoil 0.3-6.7m Clay 6.7-38.1m Granite	NA	NA	NA
GW047293 Irrigation 300m south	45.7	9.1-19.8 26.8-28.9	0.0-0.3m Topsoil 0.6-6.9m Clay 6.9-19.8m Granite decomposed water supply 19.8-45.7m Granite porphyry water supply	3.0	0.91 3.64	Good
GW046695 Domestic/stock 600m east	79.90	36.6-37.2 68.0-69.2	0.0-1.5m Topsoil/subsoil 1.5-7.9m Clay sandy 7.9-10.3m Porphyry decomposed 19.8-45.7m Porphyry water supply	36.6 13.7	0.01 0.05	1,001-3,000
GW020873 Stock 800m northwest	28.7	9.4-9.4 23.8-23.8 28.7-28.7	0..0-7.92m Clay some sand 7.92-28.65m Granite water supply	NA NA 7.9	NA 0.42 0.48	
GW417023 Domestic/stock 350m north	120	90.0-91.0	0.0-9.0m Clay 9.0-120.0m Shale	24.0	0.44	NA
GW400709 Domestic/stock 750m northwest	36.0	18.00-2.0 32.0-34.0	0.0-3.0m Topsoil, clay 3.0-1.0m Soft decomposed granite 10.0-36.0m Granite, highly fractured	6.0	0.51 7.6	NA
GW401759 Test bore 750m northwest	60.0	14.0-18.0 20.0-24.0 24.0-30.0 46.0-48.0 56.0-59.0	0.0-3.0m Clay 3.0-60.0m Weathered dense, volcanic	0.85	0.5 1.6 0.7 1.5 2.5	1,000

Bore ID Use Location (Purpose)	Total depth (m)	Screen interval(s) (m)	Lithology description	Standing water level (mBGL)	Yield (L/s)	TDS (mg/L)
GW058339 Test bore 750m northwest	61.0	19.8-25.9	NA	NA	NA	NA
GW400773 Domestic/stock 900m northwest	30.0	17.0-19.0 23.0-23.2	0.0-1.0m Topsoil 1.0-6.0m Clay 6.0-19.0m Decomposed granite 19.0-30.0m Granite	1.0	1.01 0.25	NA
GW009136 NA 750m west	39.0	NA	0.0-4.88m Clay 4.88-39.0m Porphyry	NA	NA	NA
GW416988 Domestic/stock 650m west	25.0	NA	NA	20.0	20.0	NA
GW417529 400m east	No records					
GW401258 400m east	No records					
GW402406 Domestic/stock 400m east	NA	NA	NA	NA	2.1	NA
GW067430 Domestic/stock /irrigation 650m east	No records					
GW056823 Domestic/stock /irrigation 750m east	23.0	20.0-23.0	0.0-23.0m Granite decomposed water supply	1.0	1.0	NA
GW400739 Domestic/stock /irrigation 800m east	76.0	14.0-14.5 59.0-59.3 67.0-67.2	0.0-3.0m Clay 3.0-16.0m Sandy clay 16.0-23.0m decomposed basalt 23.0-76.0m Hard basalt	3.0	0.44 2.27 0.07	Good

Bore ID Use Location (Purpose)	Total depth (m)	Screen interval(s) (m)	Lithology description	Standing water level (mBGL)	Yield (L/s)	TDS (mg/L)
GW064561 Domestic/stock 900m east	24.0	18.0-18.5	0.0-1.0m Topsoil 1.0-3.0m Decomposed granite 3.0-24.0m Granite	NA	4.4	NA

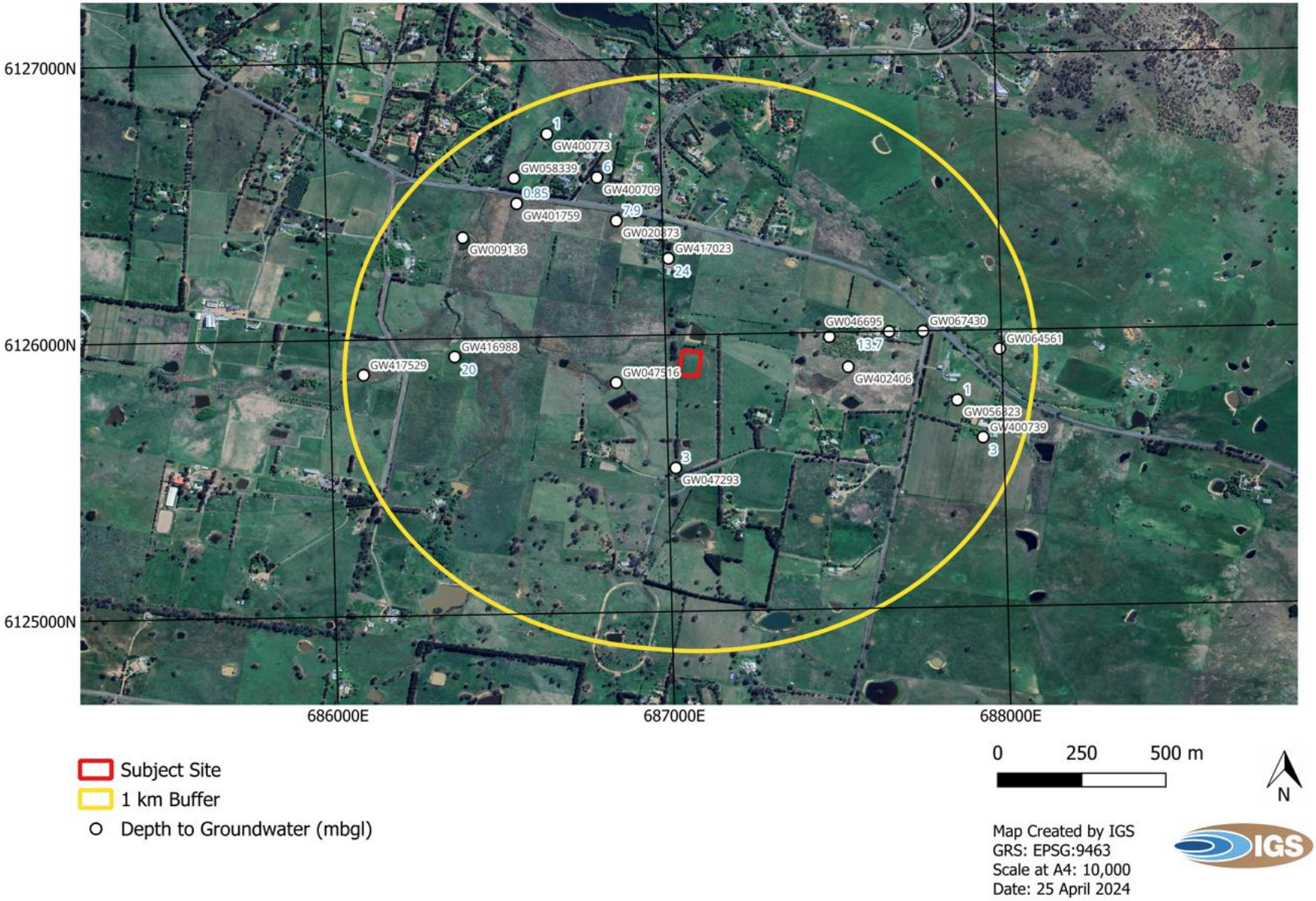

FIGURE 3-2 AVAILABLE GROUNDWATER BORES WITH GROUNDWATER LEVELS IN BLUE

3.1.1 Groundwater Quality and Use

There are limited water quality datasets available in the area around the Subject Site with only two reported qualitative salinity results and two quantitative salinity results. Bores GW046695 and GW401759 reported salinities of 1,000 mg/L to 3,000 mg/L, indicating water is suitable for stock and irrigation uses. Bores GW047293 and GW400739 reported salinity of 'good'; however, it was not reported if the 'good' definition related to stock water use or potable water use.

Based on the available data it is considered that the local groundwater quality at the site is brackish and only suitable for irrigation or stock water uses.

3.1.2 Groundwater levels

As shown in Table 3-1, water levels have been recorded from <1.0-36.0 mBGL within 1 km of the Subject Site, however, the closest (300m south) bore location generally reported water levels of 3 mbgl. The shallowest water levels were reported in bores a minimum of 750m from the Subject Site. Most of the bores identified within 1 km of the Subject Site have screened sections at depths greater than 9 mbgl, indicating that groundwater generally occurs in the Douro Group volcanics beneath the shallow clay layers that are present. There are no telemetered monitoring bores within 10 km of the site which does not allow for any groundwater levels timeseries to be investigated. However, it is expected that groundwater levels will fluctuate over the course of a year with the highest groundwater levels expected in late spring and the lowest in late autumn.

3.1.3 Acid Sulfate Soils

The Subject Site is not located in an area identified as having acid sulfate soils according to the NSW Planning, Industry and Environment (DPIE) webapp, eSpade[11].

3.1.4 Groundwater Management

Groundwater use at the Subject Site is managed under the Water Sharing Plan for the NSW Murray Darling Basin (MDB) Fractured Rock Groundwater Sources 2020 (reference)[12], and specifically provisions for Yass Catchment Groundwater Source (Figure 3-1). It is understood that there will be no groundwater abstraction or dewatering occurring at the Subject Site during any phase and therefore no groundwater licence will be required.

3.1.5 Groundwater-Surface water interactions and Groundwater Dependent Ecosystems

Groundwater-surface water interactions are expected to be limited, given that few natural surface water bodies are near the Subject Site and reported water levels close to the site i.e. within 750m, were reported at a minimum depth of 3 mbgl and are beneath a thick layer of clay. It is noted, however, that tree's may have root systems that would extend deeper than 3 mbgl and draw water from beneath the clay layer. The GDE atlas[13] was queried to locate terrestrial, aquatic or subterranean GDEs near the Subject Site (Figure 3-3). The closest terrestrial GDEs are located 2 km to the west and 3 km to the east with both described as having a 'Low potential for groundwater interaction' and therefore due to the distance and low interaction potential they are not considered a risk.The GDE Atlas identified that the closest aquatic GDEs are located approximately between 2.5 km south and 3.5 km eastand are associated with Gooda Creek,Murrumbateman Creek and Broken Dam. The aquatic GDEs are reported as having a "High or moderate potential for groundwater interaction", with Broken Dam identified as the GDE with the Moderate ranking.

[11] eSPADE v2.2 (nsw.gov.au)
[12] sl-2020-0348 (nsw.gov.au)
[13] http://www.bom.gov.au/water/groundwater/gde/

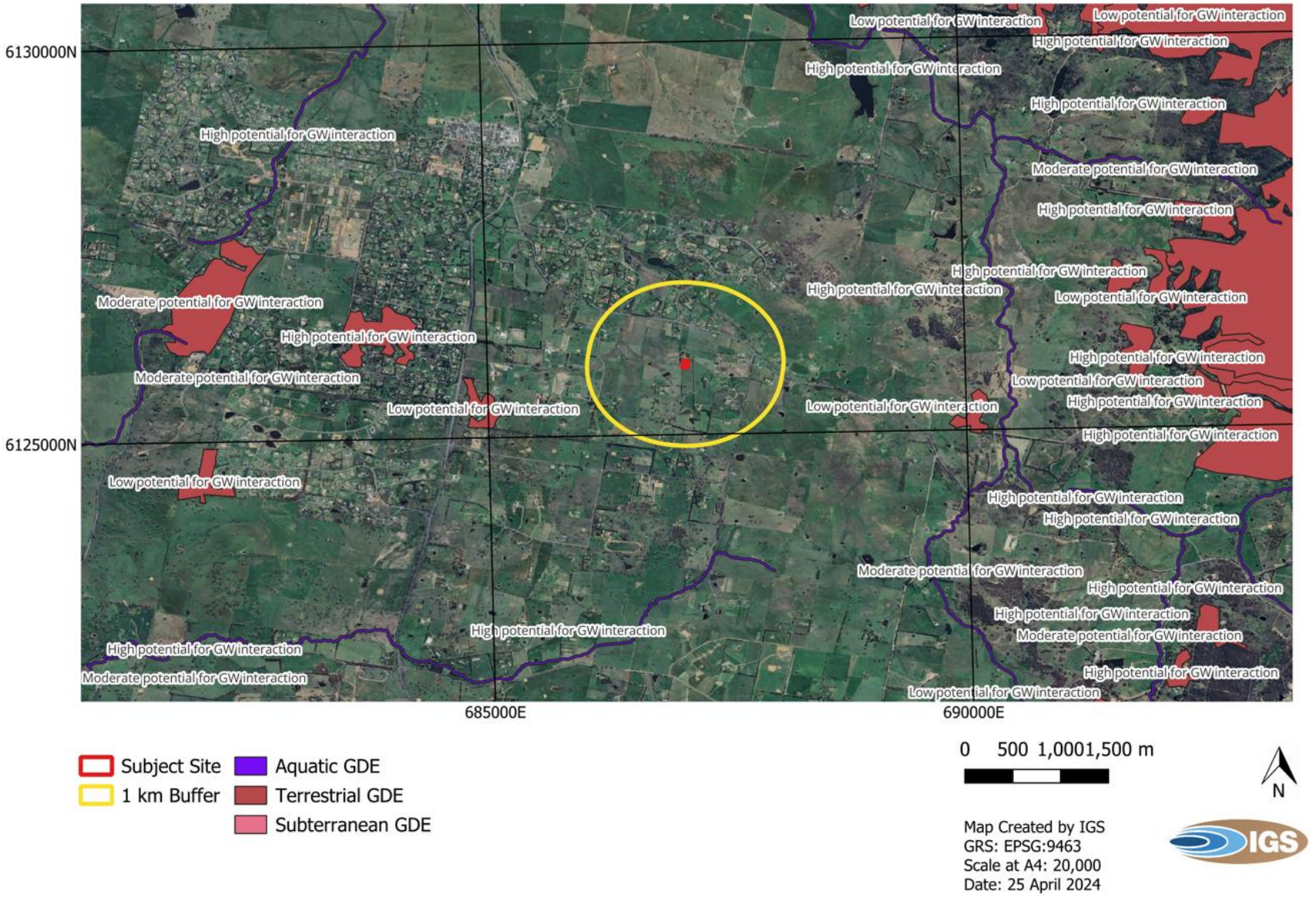

FIGURE 3-3 GROUNDWATER-DEPENDENT ECOSYSTEMS NEAR THE SUBJECT SITE FROM THE GDE ATLAS LABELLED WITH THE POTENTIAL FOR GROUNDWATER INTERACTION

3.2 Groundwater Vulnerability Assessment

3.2.1 Likelihood of contamination

It is understood that during construction, there will be no significant stored volumes of chemicals or fuels and no refuelling or washing of vehicles. Therefore, the potential risks of contamination would be from minor fuel or hydraulic hose leaks, which are expected to be less than 100 L. These leaks would be managed via spill kits and mechanical removal of impacted soils until clean/non-odorous soils are observed. Therefore, due to the small volumes of potential sources and the reported thickness (>5 m) of clay in the bores logs located within 300 m of the Subject Site which is assumed to be consistent with the Subject Site, acting as a barrier to vertical migration of contaminants, the Subject Site is considered to have a negligible risk of contaminating and reducing groundwater quality for any local users or GDEs associated with the local groundwater.

Once operational, potential contaminant sources include leakage of chemicals from batteries; however, the batteries will be lithium-ion phosphate, which does not contain heavy metals and is considered to be the safest batteries in the industry. In the unlikely event of battery failure, the units are self-contained, with anti-leak connections, limiting any potential for contamination release. Further, as the batteries are in IP54 rated self-contained units, the opportunity for external water to interact with the internal battery and therefore the batteries are not considered a significant source of contamination. This is also demonstrated in Section 2.4, with limited surface water flow paths determined by the surface water modelling.

Potential battery fires are expected to be contained within the individual units, as each unit has internal fire-suppression systems, including flammable gas, smoke and thermal sensors, pressure release systems and aerosol fire extinguishing systems. Therefore, the risk from small individual fires is not considered significant. However, should a larger fire occur necessitating the use of large volumes of external water and fire-fighting chemicals, then there would be a low risk to groundwater from the infiltration of fire-fighting liquids to the shallow aquifer. However, as discussed, the thick clay layer beneath the Subject Site would reduce any downward migration to the underlying groundwater system and therefore, even in this scenario, the risk of contamination to groundwater is considered minimal.

Up to 100 L of fuel will be stored onsite, which is a potential source of contamination. However, standard management practices are in place to ensure that the fuel is stored in a bunded enclosure with a minimum of 110% of the stored volume to ensure the bund can contain the entire volume of the stored fuel. Therefore, it is expected that the risk of fuel leak will be minimal.

A 900 mm deep oil bund will be constructed, which could be a source of contamination. However, with the bund constructed to the current standards with regular inspection and maintenance, it is not considered to be a significant source of contamination.

IGS have been informed that no chemicals, other than what has been discussed above, will be stored on the Subject Site that would be considered a source of contamination. No dangerous goods will be stored onsite.

The risk of aquifer contamination associated with the proposed development during construction and operation is considered low due to the Subject Site only storing a small volume of bunded fuel and no other sources of contamination during operation and no stored materials or refuelling/maintenance or washdowns etc. occurring during construction and therefore having no sources onsite. Further, the locally thick clay layer will retard vertical migration through the unsaturated zone allowing time for removal of any spills to occur and be made good before contact with the groundwater at approximately 3 mbgl.

The water table/aquifer is unlikely to be encountered, based on the water levels from the closest bores to the Subject Site. Shallow groundwater < 1mbgl has been reported in bore over 700 m from the site, and therefore, there is a potential for groundwater in the local area to be shallower. It is anticipated that during construction, due to the thick clay layer and shallow trench depths of <1 m, groundwater is unlikely to be

encountered, eliminating the potential for the creation of a pathway for contamination through the thick clay layer.

It is recommended, however, that a shallow bore be sunk on the Subject Site to approximately 5 mbgl to determine the exact geology and water level at the site and water level measurements be taken at the end of winter to determine the highest water levels likely to be encountered.

3.2.2 Potential adverse impacts on groundwater dependent ecosystems and groundwater abstraction

The development is not expected to have any adverse impacts on GDEs. No mapped GDEs are within the Subject Site, therefore no GDEs will be directly damaged during construction. Terrestrial GDEs are located 2 km west and 3 km east of the development and are described as having “Low potential for groundwater interaction”. Therefore, due to the distance from Subject Site and low potential for groundwater interaction the terrestrial GDEs are not considered to be at risk from the development, as there is negligible risk to groundwater quality and no risk to groundwater levels, due to no groundwater abstraction, from the development.

The identified aquatic GDEs are located between 2.5 km south and 3.5 km east from the Subject Site and are described as having either “high or moderate potential for groundwater interaction”. However, The GDE Atlas describes aquatic GDEs as “ecosystems that rely on surface expression of groundwater”. As there will be no groundwater abstraction at the Subject Site during any phase, there will be no change to groundwater levels related to the Subject Site. Therefore, groundwater-surface expression will not be impacted and therefore no risk is expected to the aquatic GDEs.

As discussed, the local trees, which are not explicitly identified as GDEs may have root systems that will penetrate the thick clays to the water table. Therefore, there is a potential for local tress to be impacted should groundwater contamination occur. However, as discussed it is considered unlikely that groundwater contamination would occur due to the low volumes of source chemicals and the expected thick layer of clay at the Subject Site.

There are no subterranean GDEs reported within 10 km of the Subject Site and, therefore, no risk.

Locations of groundwater abstraction points are not released for public access in NSW, and therefore, no comment can be made on potential impacts to groundwater quality in local abstraction bores. However, as there is considered negligible risk of contamination to groundwater during construction and general operation of the BESS, and there will be no groundwater abstraction during any point of construction or operation, the risk to groundwater abstraction bores near the Subject Site is considered negligible.

3.2.3 Cumulative impact on the development on groundwater

The development is not extracting water from groundwater systems during operations and is therefore will not impact the quantity of water in the local groundwater system.

3.2.4 Mitigation measures

Mitigation measures are focused primarily on preventing chemical spills from reaching the groundwater system in the unlikely event of leakage. Mitigation measures include:

- Drilling of a soil bore to 5 mbgl on the Subject Site to understand the exact geology and water levels during winter at the.
- Self-bunded battery storage units.
- Self-bunded fuel storage areas.

- Regular maintenance and inspection of fuel bund, oil bund and battery storage units.
- Development of site management plans detail responses to leaks such as spill kits, removal and appropriate testing and disposal of impacted soils and options for installing groundwater monitoring bores in the case of a significant fire or unexpected leak.
- If possible, excavating during summer or autumn will further reduce the already low likelihood of intersecting groundwater during the shallow excavations.

An onsite soil bore should be drilled to ensure that the information available during this desktop study is accurate and to confirm or otherwise that the site is underlain by thick clays and to further understand the local water table and if there is any fluctuation of the water table after winter rains.

Currently, based on the understanding that groundwater near the site is at least 3 mbgl and the clays extend over the site, then groundwater monitoring is not required during the construction and operation of the facility as groundwater is unlikely to be encountered; however, should the onsite soil bore identify shallow groundwater or an absence of clay at the Subject Site then groundwater monitoring bores may be required.

In the future if a significant release or major fire occurred, then bores should be installed to determine the local groundwater flow direction and then up- and downgradient bores of the Subject Site should be constructed to determine if any impacts have migrated to the locally groundwater.

4 CONCLUSIONS AND RECOMMENDATIONS

4.1 Surface Water

The flood investigation provided within this report provides flood mapping for the proposed BESS facility at 3 Turton Place, Murrumbateman, NSW. A 2D hydraulic flood model was developed in line with the latest flood modelling software; industry standards (i.e. BoM IFD and ARR 2019 guidelines) and the latest available 1 metre LiDAR dataset (NSW Spatial Services) for the 1% AEP design storm event.

The flood modelling and mapping undertaken as part of this investigation confirmed that there are no significant overland flow paths across the site with peak flood depths below 80 mm across the area of interest. Maximum flood velocities are all low, between 0.05 – 0.55 m/s, resulting in the site being classified as flood hazard H1 (generally safe for people, vehicles and buildings).

The Murrumbateman, Bowning, Bookham and Binalong Flood Study – Addendum Report was conducted for Yass Valley Council in 2020. The 1% AEP flood depth mapping covers the Subject Site. Based on the Addendum Report, the site is located adjacent to overland flow during a 1% AEP event from the Unnamed Tributary catchment which flows through the existing dam in the north of the site. This flow path is consistent with the flood mapping discussed in Section 2.

Based on the findings of the flood modelling it is recommended to set critical infrastructure to be a minimum of 150 mm above the existing ground level to reduce the risk associated with stormwater runoff impacting infrastructure. Importing fill to raise the areas where infrastructure is to be located is not likely to increase flood levels on neighbouring properties, however, should be tested within the hydraulic model at a further design stage once the final layout is available.

4.2 Groundwater

Based on the understanding of the local hydrogeological regime and site operations during construction and operation, it is considered that there is negligible risk to groundwater or GDEs. This conclusion is derived from:

- No significant volumes of potential contaminants will be stored on the Subject Site during construction and operation phases and the small volumes that will be stored shall be appropriately bunded and infrastructure maintained.
- The battery units are self-contained and will control any potential leaks. There is no opportunity for leaching of metals due to the containment and lack of water in the battery units.
- Excavations will be shallow, <1 m deep and groundwater is unlikely to be encountered and no dewatering or abstraction will occur. Summer or autumn excavations will further reduce the potential for intersecting groundwater during excavations.
- Depth to groundwater, based on available data, is generally >3 m (at bores located within 400 m of the Subject Site) and is beneath a thick clay layer, reducing the risk of infiltration to groundwater. However, recent water level data is not available and may change the risk assessment if it were found to be shallower on the Subject Site or the expected clay layer was not present.
- Mapped GDEs are all >2 km or more away and are unlikely to be impacted in the unlikely occurrence of groundwater contamination. As there will be no groundwater abstraction at the Subject Site the GDEs will not be impacted by changes in groundwater levels due to onsite activities.
- Site management plans will provide details on the clean-up of small spills via spill kits and soil removal.
- A shallow bore on the Subject Site to confirm site conditions is recommended.

Therefore, groundwater monitoring is not considered necessary at the Subject Site unless there is a major fire where fire-fighting water or chemicals are used, or another unforeseen leak occurs outside the expected small volumes of stored fuel. Should a major fire or other event occur, then groundwater monitoring wells should be located up and down-gradient of the site and down-gradient to determine any impacts to groundwater.

REFERENCES

New South Wales Department of Planning and Environment (2020). Water Sharing Plan for the NSW Murray-Darling Basin Fractured Rock Groundwater Sources (report sl-2020-0348)

New South Wales Government (2013). Yass Valley Local Environmental Plan.

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APPENDIX H

BUSH FIRE MANAGEMENT AND EMERGENCY RESPONSE PLAN

REF: 6559BF

Date: 16/5/24

BUSH FIRE MANAGEMENT & EMERGENCY RESPONSE PLAN

BATTERY ENERGY STORAGE SYSTEM

LOT 23 DP 248413

3 TURTON PLACE

MURRUMBATEMAN

LGA: Yass Valley

Client: ACEnergy Pty Ltd

HARRIS ENVIRONMENTAL CONSULTING
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Version Control

Date Created				
Version Number	Name	Issue Detail	Date Modified	Status
1.0	LJ & KH	DRAFT BFMERP	9/4/24	LJ & KH
1.0	LJ & KH	FINAL BFMERP	16/5/24	LJ & KH
1.1	LJ & KH	FINAL BFMERP	16/5/24	LJ & KH

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DISCLAIMER

The recommendations provided in the summary of this report are a result of the analysis of the proposal in relation to the requirements of Planning for Bushfire Protection 2019. Utmost care has been taken in the preparation of this report; however, there is no guarantee of human error. The intention of this report is to address the submission requirements for Development Applications on bushfire prone land. There is no implied assurance or guarantee the summary conditions will be accepted in the final consent, and there is no way Harris Environmental Consulting is liable for any financial losses incurred should the recommendations in this report not be accepted in the final conditions of consent. This bushfire assessment provides a risk assessment of the bushfire hazard as outlined in the PBP 2019 and AS3959 2018. It does not provide protection against any damages or losses resulting from a bushfire event.

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FIGURES

TABLES

1 INTRODUCTION

ACEnergy Pty Ltd engaged Harris Environmental Consulting to prepare a Desktop Bush Fire Management and Emergency Response Plan (the plan) for the proposed Battery Energy Storage System (BESS) development at 3 Turton Place, Murrumbateman.

The subject site is classified Bush Fire Prone Land (BFPL) under the Yass Valley BFPL Map.

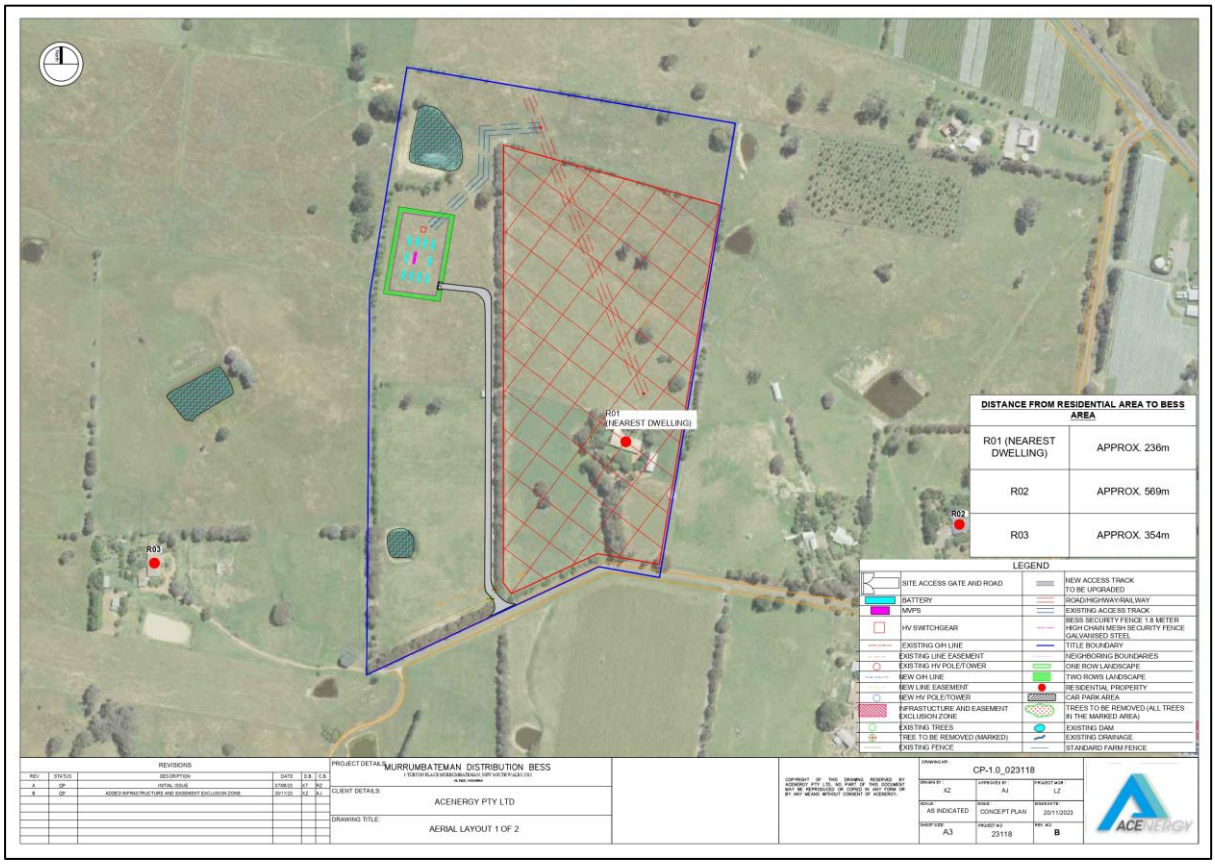
The plan has been prepared per the requirements of *Planning for Bush Fire Protection 2019* (PBP), the NSW Rural Fire Service (RFS) document: *A guide to developing a bush fire emergency management and evacuation plan,* and Australian Standard AS 3745:2010 *Planning for emergencies in facilities.*

The purpose of the plan is to evaluate the bushfire risk profile of the site and identify a package of bushfire management measures and emergency response actions that can be taken to protect human life and minimise impacts on assets from the threat of a bush fire.

2 FACILITY DETAILS

The proposed development will involve the construction and operation of a Battery Energy Storage System on the northwestern corner of the subject site. The proposed development includes 10 batteries, one MVPS and associated facilities within a 0.5 ha fenaced site with proposed internal property access from Turton Place on the south.

Figure 1 - Proposed Development



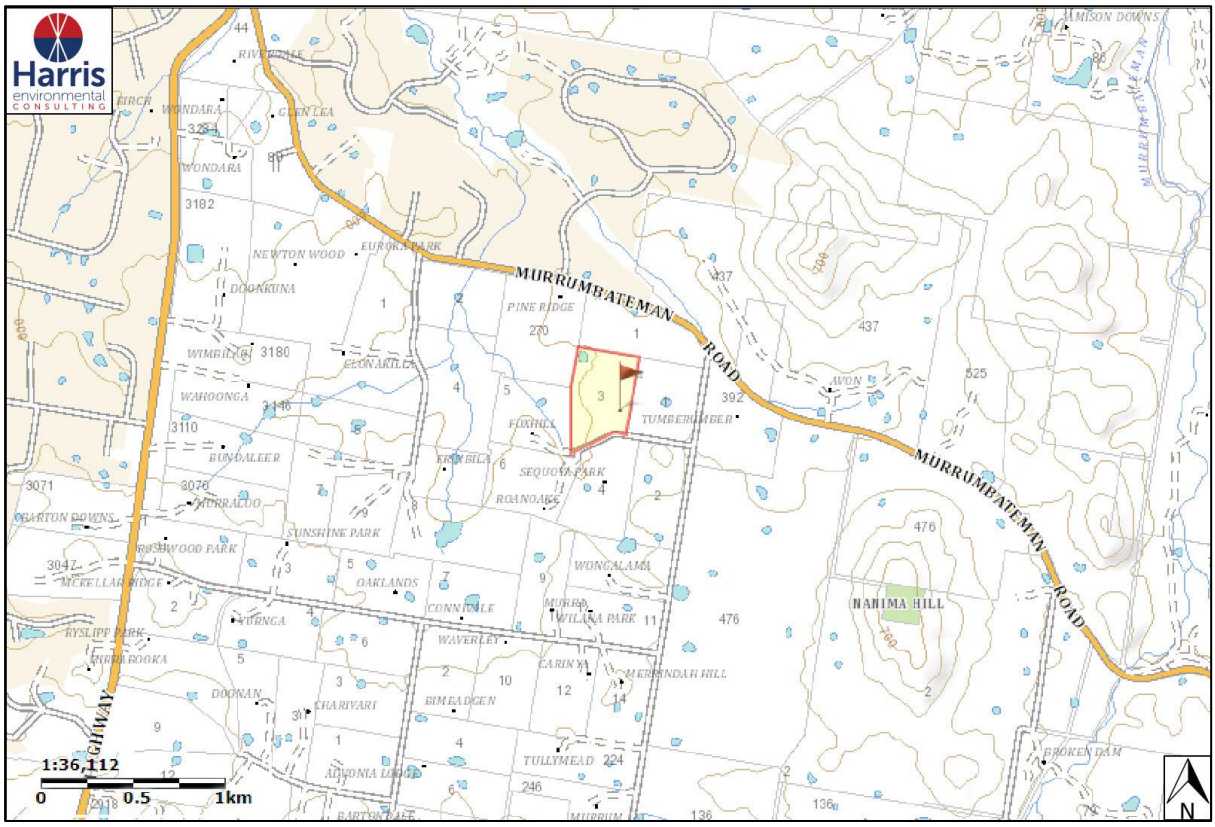
3 SITE DESCRIPTION

The site is located 7km east of the main township of Murrumbateman in the Southern Tablelands of NSW and 40 km north of Canberra (ACT).

The legal title of the property is Lot 23 in DP 248413, 3 Turton Place, Murrumbateman NSW 2582.

The site is located within the Yass Valley Local Government Area (LGA) and is zoned RU4 - Primary Production Small Lots under the *Yass Valley Local Environmental Plan 2013.*

Figure 2 - Site Location



4 LANDSCAPE BUSHFIRE RISK PROFILE

4.1 Southern Tablelands

The site is located in the Southern Tablelands of NSW. The Southern Tablelands Bush Fire Management Committee (BFMC) coordinates all bushfire risk management.

The BFMC area covers roughly 1,455,100ha of land from the lower Blue Mountains and Wyangla Dam in the north, Burrinjuck Dam in the south-west to the Shoalhaven River in the east and borders onto the north east of the Australian Capital Territory.

The BFMC area generally experiences temperate to cool climate with warm to hot summers and cool winters. The average annual rainfall across the region is 800-1000mm which occurs during winter and spring, with minimal rainfall in the summer months. The fire season typically commences in October and continues in late March/April.

The BFMC area has an average of 265 bushfires per year, 5 of which are considered major fires. Yass Valley has a history of major fires occurring in a cycle of 2.5 years.

The majority of bushfires in the BFMC area are from lightning strikes associated with spring and summer storm activity as well as burns escaping from legal and illegal burns and use of farm machinery.

4.2 Bushfire Hazard Assessment

The site contains and is surrounded by rural residential land, vineyards and agricultural farming.

Yass Valley Council maps the BFPL within and surrounding the subject site as Category 3 bushfire-prone vegetation.

Vegetation Category 3 is considered to be medium bushfire-risk vegetation. It is higher in bushfire risk than Category 2 (and the excluded areas) but lower than Category 1. It is represented as dark orange on a BFPL map and consists of Grasslands, freshwater wetlands, semi-arid woodlands, alpine complexes, and arid shrublands.

Figure 3 – Bushfire Prone Land Map

4.2.1 Classified Vegetation

The majority of the land surrounding the development is not classified on the State Vegetation Type Map, with only minimal remnant trees mapped as 'Southern Tableland Grassy Woodland' (NSW DPIE, 2022). This vegetation has <5% tree cover and has been classified as Grassland in accordance with PBP 2019.

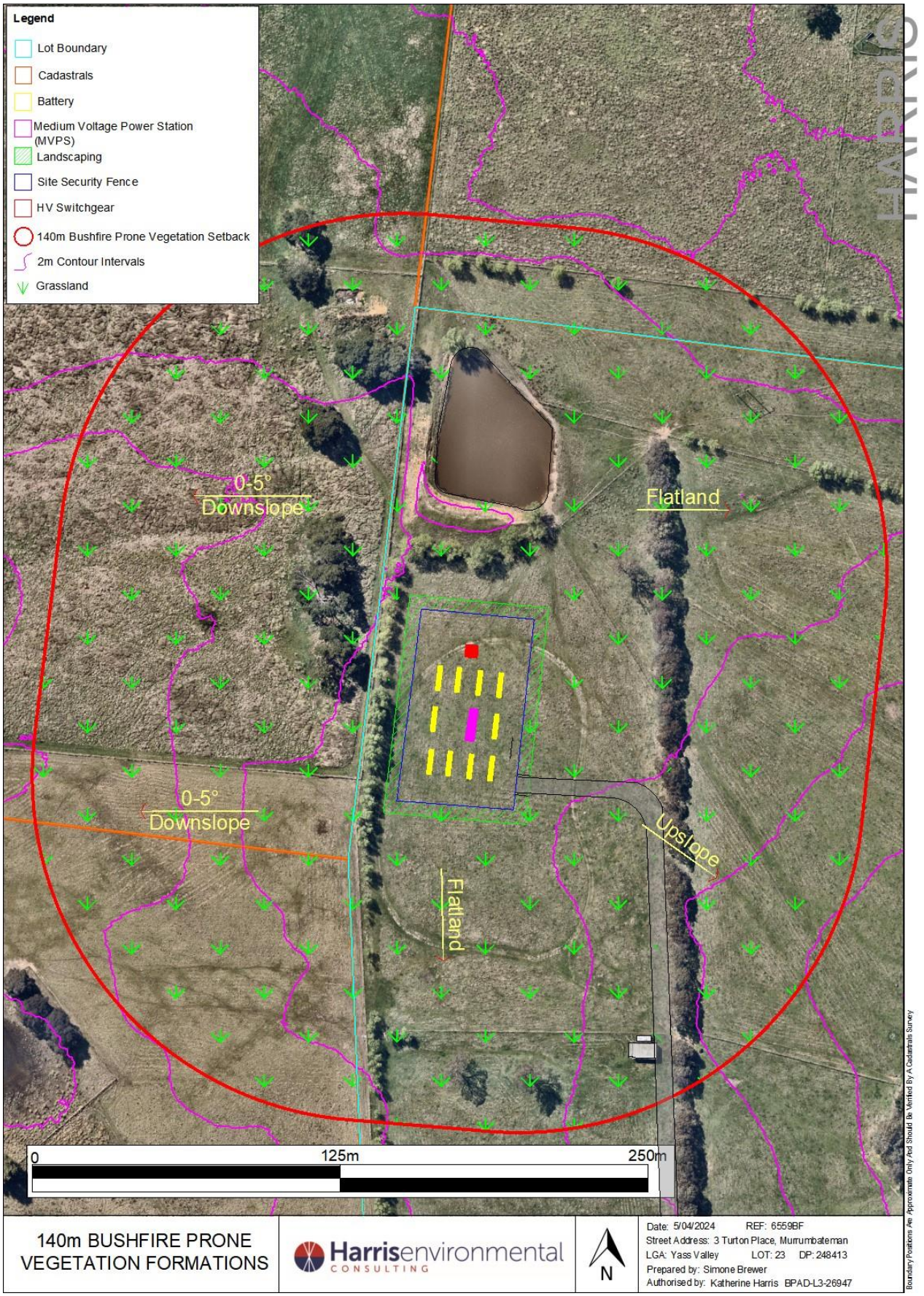
4.2.2 Effective Slope

Australian Standard AS3959-2018 *Construction of buildings in bushfire-prone areas* and PBP 2019 identify that the slope of the land under the classified vegetation is much more important than the slope between the proposed development and the edge of the classified vegetation.

The effective slopes influencing bushfire behaviour towards the proposed development were assessed using elevation data from Spatial Services NSW, April 2023.

The development area is located on a gentle slope that falls west. Slopes to the west are considered 0-5 degrees downslope, with land in all other directions considered flatland/upslope.

Figure 4 – Classified vegetation and effective slopes influencing bushfire behaviour



4.2.3 Potential Bush Fire Behaviour

Based on the desktop assessment of land use, classified vegetation and effective slopes within 140 metres of the subject site, the predominate risk to the proposed development is likely to be from grassland fires impacting the site or spreading from the site.

The bushfire risk posed by a grassland hazard differs from fires in other vegetation communities. Fires burning through a grassland hazard generally spread rapidly at higher intensities and have shorter residence time. Ember production is limited, smaller and fewer in number than those produced from forest fires but can still propagate spot fires ahead of the main fire front.

5 BUSHFIRE RISK ANALYSIS

The bushfire risk to people, property, and the environment has been assessed in relation to the likelihood and consequence per the Australian Standard AS ISO 310000 *Risk Management Guidelines*.

The plan identifies assets within the site, protection measures and management zones.

5.1 Asset Identification

Assets are defined as anything valued by the community, which includes agricultural land, forests, livestock, heritage buildings and places, infrastructure, the environment, commercial and industrial buildings and equipment that may be at risk from bushfires.

Assets within the site have been divided into four asset types.

5.1.1 Human Settlements:

- Residential areas, including urban bushland interface areas and rural properties, and
- Other human settlement areas, including commercial and industrial areas.

5.1.2 Economic:

- Built assets within the subject site, e.g. the battery energy storage systems, MVPS, compound, access roads, landscaping and all associated facilities
- Commercial operation of the facility.

5.1.3 Environmental:

- Threatened species, populations and ecological communities within the site; and
- Locally important species and ecological communities that are susceptible to fire.

5.2 Risk Register and Risk Management Matrix

Refer to Appendix I.

6 BUSHFIRE MANAGEMENT AND PROTECTION MEASURES

The Bushfire Management Plan has been prepared in accordance with the NSW Rural Fire Service *Model Bushfire Risk Management Plan*. The plan identifies a package of bushfire management and protection measures that can be taken to protect life and minimise impacts on assets from bushfires.

6.1 Asset Protection Zones

The intent of an Asset Protection Zone (APZ) is to minimise the risk of bushfire attacks and maintain reduced fuel loads to ensure radiant heat levels at buildings and assets are below critical limits. The APZ provides a safe operational environment for emergency service personnel undertaking operations.

Assets are defined as anything valued by the community, which includes agricultural land, forests, livestock, heritage buildings and places, infrastructure, the environment, commercial and industrial buildings and equipment that may be at risk from bushfires.

The APZ is located wholly in grassland, with no trees within the development footprint. This grass that should be kept mown (<100mm in height). A 10-13-metre-wide APZ around the electrical facilities provides a defendable space and safe operational access to all assets and infrastructure. This APZ is located within surrounding security fence.

6.2 Bushfire Management Zones

Bushfire Management Zones have been assessed in consideration of the Southern Tablelands BFRMP. Management zones are based on the overall and long term management of the site in consideration of bushfire impacting the site as well as protection of the surrounding landscape from a fire escaping the site.

The Precinct map for west of Murrumbateman is shown in Appendix II and shows no Strategic Fire Advantage Zone or Land Management Zones within the surrounding area. An APZ has been identified within the site based on the bushfire risk profile and risk analysis detailed in section 4.3. The APZ is illustrated in Figure 5 and detailed in Table 1.

Based on the layout of the facility this assessment also recommends a fuel free zone directly surrounding the MVPS, batteries and HV switchgear for the purposes of minimising the likelihood of fires within the site and reducing their potential severity or extent.

Figure 5 - Land Management Zones

Table 1: Bushfire management zones.

Fuel Free Zone	
Description	A fuel-free area under and surrounding critical assets.
Purpose	The primary purpose of a fuel-free area is to prevent the spread of fire and inhibit fire propagation from spot fires.
Location	Immediately adjacent critical assets at risk of bushfire. 1-5m
Tactics	• Gravel or concrete. • Herbicide application.
Management Intensity	Managed at a high intensity to minimise available fuel loads.
Asset Protection Zones(APZ):	
Description	A fuel-reduced area surrounding an asset that creates a buffer from the bushfire-prone vegetation and provides a defendable space for firefighting operations.
Physical Description	**Trees:** • tree canopy cover should be less than 15% at maturity; • trees at maturity should not touch or overhang the building; • lower limbs should be removed up to a height of 2m above the ground; tree canopies should be separated by 2 to 5m; and • preference should be given to smooth barked and evergreen trees. **Shrubs:** • shrubs create large discontinuities or gaps in the vegetation to slow down or break the progress of fire towards buildings should be provided; • shrubs should not be located under trees; • shrubs should not form more than 10% ground cover; and • clumps of shrubs should be separated from exposed windows and doors by a distance of at least twice the height of the vegetation. **Grass:** • grass should be kept mown (as a guide grass should be kept to no more than 100mm in height); and • leaves and vegetation debris should be removed.
Purpose	The primary purpose of an APZ is to protect human life (including residents, community members and firefighters), property and highly valued public assets (such as human settlement, economic, environmental and cultural items) from the direct impacts of bushfires.
Location	APZs are generally implemented within the development site and immediately adjacent assets at risk of bushfire to provide separation from bushfire-prone vegetation.
Tactics	• Slashing and mowing. • Herbicide application. • Grazing. • Implement frequent prescribed burning. • Carry out selective hand clearing.

	• Grassland within the APZ should be kept mown (as a guide, grass should be kept to no more than 100mm in height). • The APZ should be established before the commencement of works and maintained for the life of the development.
Management Intensity	Vegetation within the APZ is managed at a high intensity to minimise available fuel loads. As a minimum, APZs are to be treated as required to maintain the specifications of the APZ. APZs should be audited bi-annually

6.3 Construction Standards

To ensure the proposed development is afforded a suitable package of bushfire protection measures, all critical assets should be constructed from non-combustible materials designed to mitigate the risk of flame damage, ember attack and radiant heat. The APZ within the fenced site can achieve a BAL 40 setback, based on the remoteness of the development, the external services should be shielded or designed to withstand 40kWm2 of radiant heat (BAL 40). Where applicable, all critical assets should include ember protection.

Ember protection can be achieved by enclosing all openings or covering openings with a non-corrosive metal screen mesh with a maximum aperture of 2mm. This includes subfloor areas, open windows, vents, weep holes and eaves. External doors should be fitted with draft excluders.

6.4 Safe Operational Access

The subject site has direct access to Turton Place to the south. The site access gate is located on Turton Place. The access is approximately 390 m in length to the 8 m wide access gate.

Based on the length of the internal access road within the property it is recommended the access comply with the PBP- Property Access Table 7.4a. This includes:

- A minimum carriageway width of four metres;
- provide enough turning room for a fire tanker that requires an inner minimum turning radius of 6 m and outer minimum radius of 12 m;
- Curves a minimum inner radius of six metres;
- The minimum distance between inner and outer curves is six metres;
- The cross fall is not more than 10 degrees;
- Maximum grades for sealed roads do not exceed 15 degrees (28 per cent) and not more than 10 degrees (18 percent) for unsealed roads; and
- There is suitable access for a Category 1 fire appliance to within 4m of the static water supply.

6.5 Provision of Services

The proposed development will not be connected to reticulated water. A minimum of 20,000L of static water should be located within the development site to ensure adequate water is provided to protect assets during and after the passage of a bushfire.

Above-ground tanks must be manufactured of concrete or metal and raised tanks have protected stands. A suitable connection for firefighting purposes, such as a 65mm Storz outlet and a gate or ball valve, should be provided where required.

All above-ground electrical transmission lines should be managed under specifications issued by the managing authority.

6.6 Site Management

All land management must be undertaken according to license conditions and legislation, whether inside or outside the site.

Under the *Rural Fires Act 1997*, the RFS can direct landholders to undertake hazard reduction activities on their property.

6.7 Total Fire Bans

During the construction and operation phase of the facility, the safe work procedures and restrictions associated with a total fire ban, as outlined by the NSW RFS, should be followed. A total fire ban means no fires out in the open. A total fire ban helps limit the potential for fires to develop.

During a total fire ban, you cannot light, maintain or use a fire in the open or carry out any activity in the open that causes or is likely to cause a fire.

Call the local NSW RFS Fire Control Centre or local Council for further advice.

6.8 Fire Safety

Based on the nature of the development, there is potential for fires to initiate from the components within the site.

The proposed development includes hardware for the purposes of fire safety. Each battery container is built with fire suppression system and have multiple built-in fire protection devices that work collaboratively, including flammable gas, smoke and thermal sensors, pressure relief system and aerosol fire extinguishing system. Therefore, a container will automatically suppress an internal fire in the first instance.

The battery type is a lithium-Ion phosphate (LFB) which are considered to be one of the safest battery chemistries within the industry. LFP does not contain heavy metals. Battery cell and BESS containers provide double layers. LFP does not include any oil colling but has anti-leaking connectors within the self-contained design. The development includes a surrounding fence, gate and landscaped area for security purposes limiting trespassing.

7. EMERGENCY RESPONSE

7.1 Emergency Planning Committee

This section outlines standard requirements and protocols developed based on similar projects. Detailed protocol and measures are subject to reasonable changes and confirmed by the appointed EPC contractor.

The persons responsible for managing the site should form an Emergency Planning Committee (EPC). The EPC shall consist of at least two people.

The EPC is responsible for implementing and maintaining the emergency plan, emergency response procedures, and related training. The duties of the EPC include the following:

- Ensuring that resources are provided to enable the development and implementation of the emergency plan;
- Ensuring that the emergency plan is readily identifiable and available to the appropriate persons;
- Ensuring those with control of emergencies operate per the emergency plan, that this person/persons are current and readily available, and continue to operate at all times;
- Authorise and implement the emergency plan. The following shall apply to the implementation:
    - awareness of the emergency response procedures,
    - training,
    - testing emergency procedures, and
    - reviewing emergency procedures;
- Ensuring the emergency procedures remain viable and effective by testing and reviewing policies as required;
- Establishing strategies to ensure all onsite personnel are made aware of emergency response procedures;
- Ensuring a permanent record of events for emergencies is compiled and retained;
- Identifying opportunities for improvement in the emergency plan;
- Obtain professional advice on the level of indemnity provided to EPC members and be aware of the level of the indemnity supplied; and
- Shall meet before the inception of the Plan and as required to ensure the Plan is relevant and up to date.

7.2 Emergency Control Organisation

The Emergency Control Organisation (ECO) is responsible for organising and supervising the safe movement of onsite personnel in an emergency. During emergencies, instructions given by the ECO personnel shall take precedence over the normal management structure.

This Plan documents the pre-emergency, emergency and post-emergency duties and responsibilities during a bushfire emergency.

The following roles are recommended to the appropriate staff: Chief Warden, Deputy Chief Warden, Communications Officer, Building Wardens, Safety Officers, and First Aid Officers. A Chief Warden is required as a minimum.

Selection criteria for ECO personnel:

- Be capable of performing their duties;
- Have leadership qualities and the ability to command authority;
- Display practical decision-making skills;
- Demonstrate the capability to remain calm under pressure;
- Be available onsite to undertake their appointed duties
- Possess practical communication skills; and
- Be able to undertake relevant training.

7.3 Roles and Responsibilities

Construction Stage

Chief Warden	
Position:	
Contact Details:	
The Chief Fire Warden shall be identifiable by wearing white (white helmet, cap, hat or vest) with the words "Chief Fire Warden" prominently displayed.	

Deputy Warden	
Position:	
Contact Details:	
The Deputy Warden shall be identifiable by wearing white (white helmet, cap, hat or vest) with the words "Deputy Warden" prominently displayed.	

Operational & Maintenance Stage

For the Operational Stage, emergency personnel's roles and responsibilities and fire emergency protocol are to be in accordance with Appendix I.

Chief Warden/ HSE Manager	
Position:	
Contact Details:	
The Chief Fire Warden shall be identifiable and if applicable, by wearing white (white helmet, cap, hat or vest) with the words "Chief Fire Warden" prominently displayed.	

Deputy Warden/ O&M Manager	
Position:	
Contact Details:	
The Deputy Warden shall be identifiable and if applicable, by wearing white (white helmet, cap, hat or vest) with the words "Deputy Warden" prominently displayed.	

7.3.1 Pre-emergency Task

Chief Warden

- Maintain a current register of ECO members;
- Replace ECO members when a position becomes vacant;
- Conduct regular exercises;
- Ensure the emergency response procedures are kept up to date;
- Attend meetings of the EPC as appropriate;
- Attend training and emergency exercises as required by EPC; and
- Ensure personal ECO identification is available.

Deputy Warden

- Ensure personal proficiency in the operation of communication equipment;
- Maintained records and logbooks and make them available for emergency response;
- Ensure that ECO members are proficient in the use of the communication equipment;
- Ensure that emergency communication contact details are up to date;
- Attend training and emergency exercises as required by EPC;
- Confirm sufficient wardens for the area of responsibility;
- Coordinate the completion of Personal Emergency Evacuation Plans (PEEP) documentation;
- Report on the deficiencies of the emergency equipment;
- Ensure that wardens have communicated the emergency response procedures to all occupants within their nominated areas;
- Ensure that occupants are aware of the identity of their wardens;
- Coordinate safety practices by wardens throughout their area of responsibility;
- Ensure that all occupants are aware of the emergency response procedures; and
- Carry our safety practices (e.g. Clear access to emergency equipment).

7.3.2 Emergency Task

Refer to the Bushfire Emergency Response Plan for actions.

7.3.3 Post-Emergency Task

Chief Warden:

- When the emergency incident is rendered safe, or the Emergency Service returns control, notify the ECO members to have occupants return to the site, as appropriate;
- Organise a debrief with ECO members and, where applicable, with any attending Emergency Service; and
- Compile a report for the EPC and management.

Deputy Warden:

- Records events and actions during the emergency for debriefing;
- Clean and service used specialised equipment; and
- Replace specialised equipment when necessary.

7.4 Evacuation Considerations

To the north a Neighbourhood Safer Place have been identified if the site is occupied during a bushfire event and local emergency services have issued evacuation orders.

- North West (5.4 kms) – Open Space –- Murrumbateman Recreation Grounds– 19 East Street, Murrumbateman NSW.

No Neighbour Safer Places exist south towards the Australian Capital Territory, however this assessment has identified an area to the south to evacuate towards. It should be noted emergency services are likely to provide an area to the south if evacuation is to occur in this direction.

- South (29 kms) – Playing Fields –- Perce Douglas Memorial Playing Fields, Nicholls ACT 2913.

As illustrated in Figure 6, the entire road network associated with access and egress from the site traverses agricultural and rural land.

During an emergency, the anticipated times have been calculated for evacuation to the designated safer places north and south, as shown below in Table 2.

Table 2: Travel times rounded up to the nearest minute.

Average Speed Km/h	Travel time to Murrumbateman Recreation Grounds – 5.4 km North West	Travel time to Perce Douglas Memorial Playing Fields – 29 km South
50 km/h	7 minutes	35 minutes
40 km/h	9 minutes	44 minutes
30 km/h	11 minutes	58 minutes
25 km/h	13 minutes	1 hour 10 minutes
10 km/h	33 minutes	2 hour 54 minutes

7.4.1 Evacuation Centres

In a major bushfire event, evacuation centres will likely be established to meet the needs of those affected by the bushfires. Evacuation centres are generally existing facilities that can often open with little notice to provide immediate assistance. It is advised that the Site Manager monitors evacuation centres established in the area and follows the advice of the emergency service when directed to evacuate. The location of evacuation centres is likely to impact on-road use and expected travel times in the event of an evacuation.

Figure 6 - Evacuation routes to safer places: North

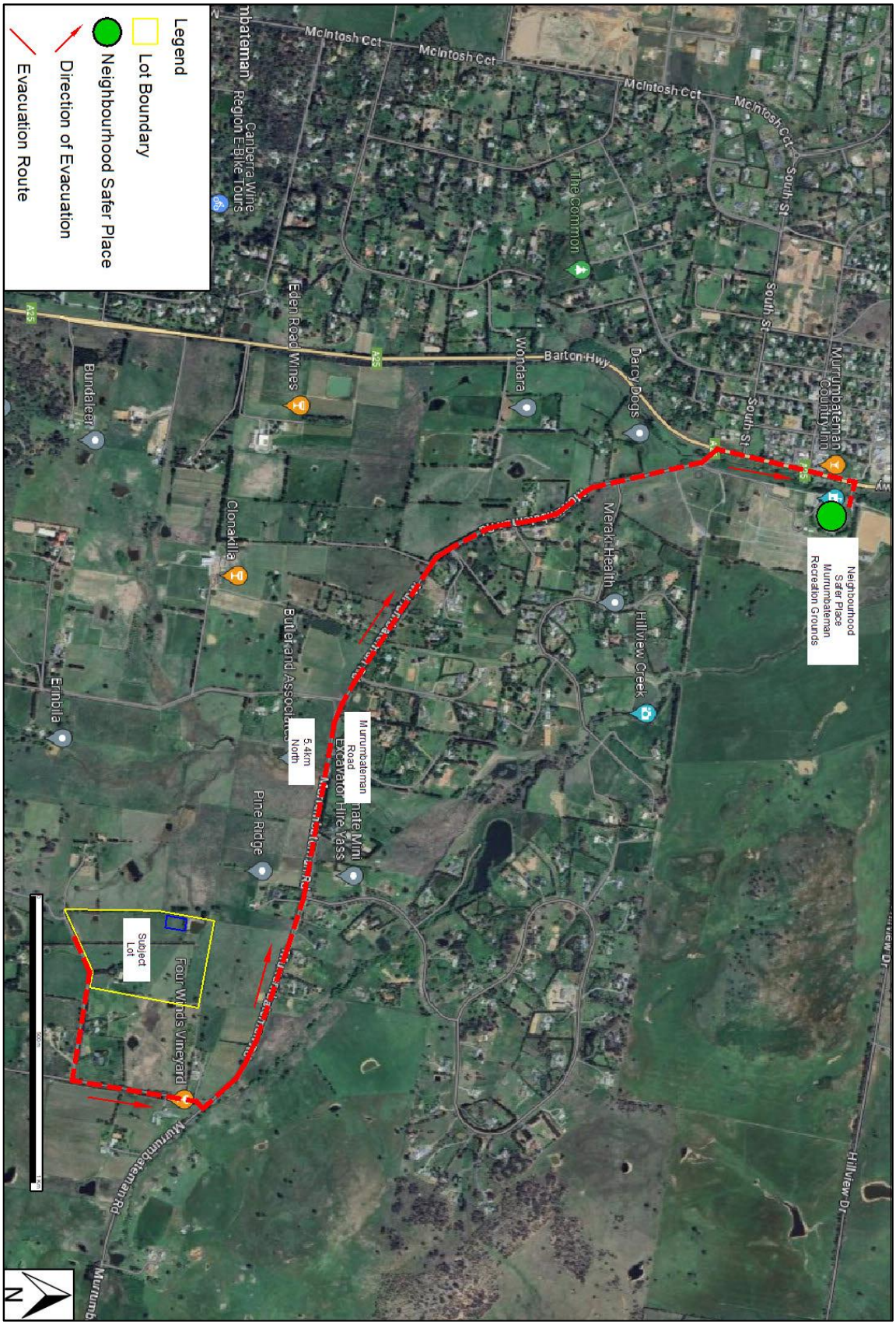
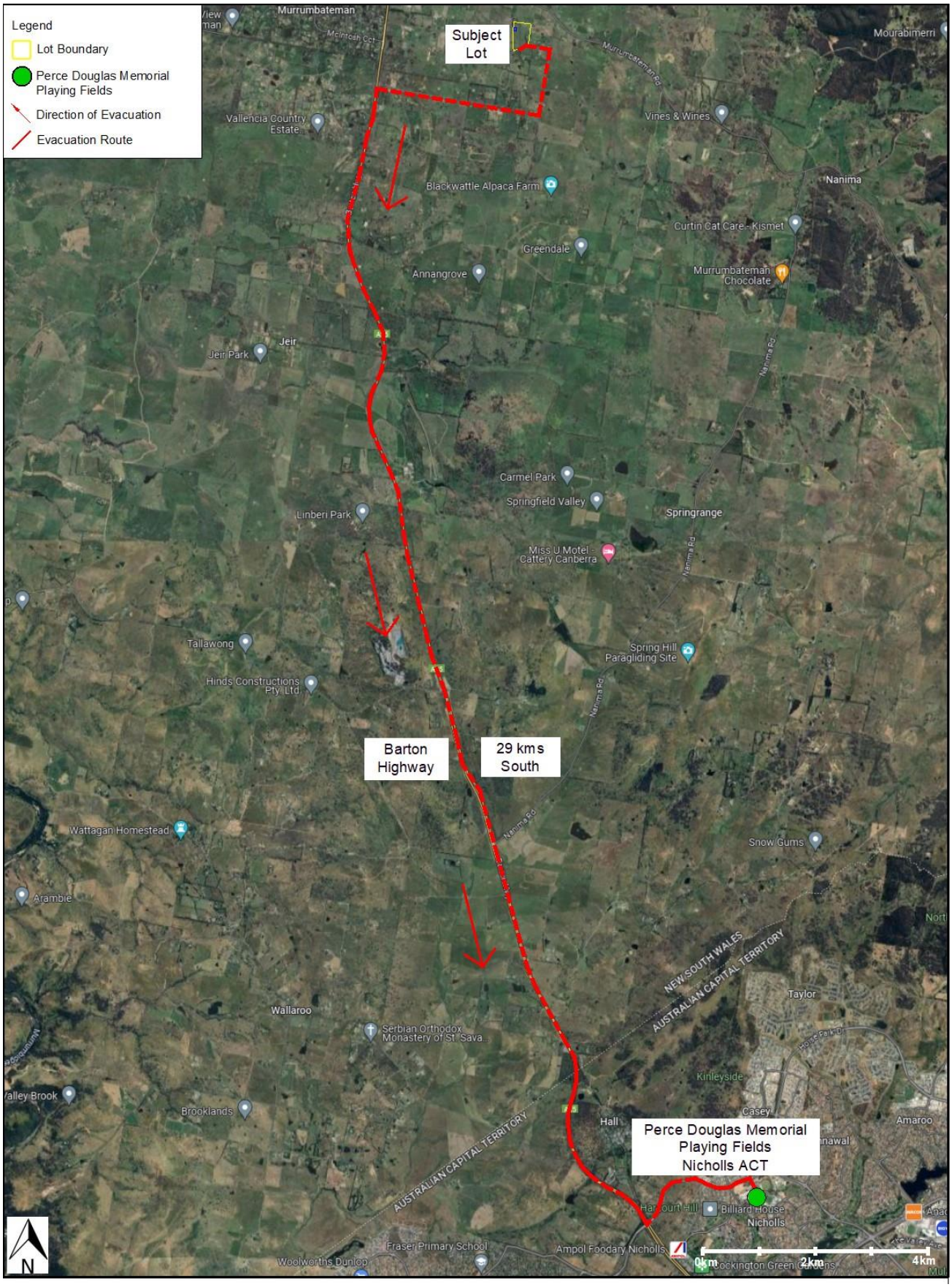


Figure 7 - Evacuation routes to ACT: North



7.5 Preparation

The Chief Warden is to prepare ahead of the start of the fire season and potential bushfire events by undertaking the following steps.

Site:

- Ensure the Plan is up to date;
- Ensure the system regularly checked and maintained by an authorised technician;
- Ensure any firefighting equipment is serviceable and available. e.g. Ladders, spades, shovels, mops, buckets, and hoses;
- Keep the important contact details such as the contractor installer, system manufacturer somewhere safe and easily accessible in case of an emergency. Labelling and signage to inform emergency responders in accordance with the Australian Standard AS/NZS 5139 Electrical installations - Safety of battery systems for use with power conversion equipment may also be required;
- Ensure areas around the assets are prepared and maintained;
- Keep the area where the system is installed clear of all materials (especially those that are combustible) and other equipment;
- Ensure all landscaping within the site is maintained to an APZ standard;
- Ensure onsite powerlines are maintained, liaise with relevant providers;
- Check and update external emergency contact numbers; and
- Monitoring risks from adjoining private and public land, maintaining communication with adjoining landowners and land managers for any changes in management or increased risks to the site.

Onsite personnel:

- Have all onsite personnel details easily identifiable to account for all persons on site;
- Have informative signage in key locations in the site (front gate) outlining the emergency management procedures and bushfire protection measures;
- Have a site layout plan that shows the designated assembly areas and evacuation details available for all onsite personnel; and
- Have emergency kits available: e.g. Whistle, portable battery radio, waterproof torch, spare batteries, first aid kit and manual, waterproof bag for valuables, emergency contact details, duct and masking tape, non-perishable food and water, and pocket knife.

Planning:

- Evacuation safety is dependent on several factors, such as fire danger rating, temperature, wind strength and direction. The time to evacuate may take more than expected during weekends or school holidays when traffic is heavy;
- When advised to evacuate, the early departure of all onsite personnel before emergency services arrive is recommended.
- Similarly, when advised to evacuate, early evacuation is recommended as it is not appropriate to move people through areas with heaving smoke or where a bushfire may be burning or is predicted to burn through;
- The Chief Warden is to check with emergency services and the Live Traffic NSW website: https://www.livetraffic.com/;

Maintenance and Training:

- Ensure up to date training for all onsite personnel. Safe work practices, including observance of standards, codes and regulations, provision of material data including safety data sheets and company policies and procedures, all have important bearing on fire safety and should be explicitly addressed;
- Ensure site is maintained including removal of trade wastes; regular maintenance of installed facilities and equipment; as well as clearance and checking of drains and collection pits.

7.6 Monitoring Bush Fire Threats

7.6.1 Information

For information on bushfires, call the **Bush Fire Information Line:**

- 1800 NSW RFS (**1800 679 737**).

The two systems used by the Rural Fire Service which provide triggers for evacuation are:

- **The Fire Danger Ratings**- used **before** a fire has started; and
- **The Bush Fire Alerts**- are used **once** a fire has started.

Both of these warning systems are described below.

7.6.2 Fire Danger Rating

Before a fire starts, monitor the **Fire Danger Ratings** daily at www.rfs.nsw.gov.au/fdr. The higher the fire danger rating, the more dangerous a fire is likely to be.

These ratings are based on predicted conditions such as the temperature, humidity, wind and dryness of the landscape. It indicates how a bushfire may act, what impacts could occur and the consequences of a bushfire in the identified conditions. The table below and the graph are taken from the RFS Bushfire Survival Plan and show how the fire danger gets higher, so does the potential loss of life and property.

FIRE DANGER RATING	WHAT YOU SHOULD DO
CATASTROPHIC	**For your survival, leave bush fire risk areas.** › These are the most dangerous conditions for a fire. › Your life may depend on the decisions you make, even before there is a fire. › Stay safe by going to a safer location early in the morning or the night before. › Homes cannot withstand fires in these conditions. › You may not be able to leave and help may not be available.
EXTREME	**Take action now to protect your life and property.** › These are dangerous fire conditions. › Check your bush fire plan and ensure that your property is fire ready. › If a fire starts, take immediate action. › If you and your property are not prepared to the highest level, go to a safer location well before the fire impacts. › Reconsider travel through bush fire risk areas.
HIGH	**Be ready to act.** › There's a heightened risk. Be alert for fires in your area. › Decide what you will do if a fire starts. › If a fire starts, your life and property may be at risk. The safest option is to avoid bush fire risk areas.
MODERATE	**Plan and prepare.** › Stay up to date and be ready to act if there is a fire.
NO RATING	› Fire danger ratings are used on days when you need to take action. On days of minimal risk, 'No Rating' will be issued.

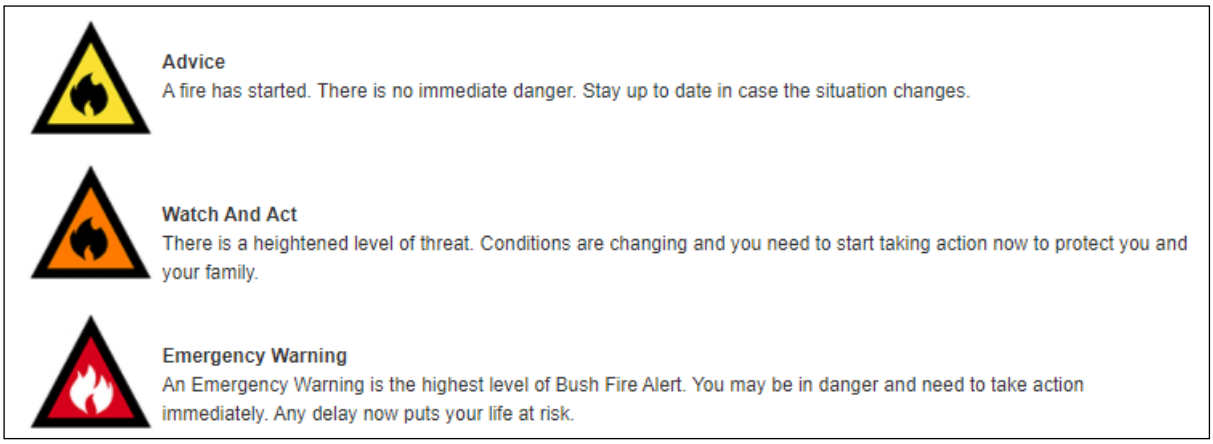
7.6.3 Fires Near Me

After a fire has started, the 'Fires Near Me' website and mobile application provide information and warnings about bushfires and other incidents attended by the NSW RFS.

Website: https://www.rfs.nsw.gov.au/fire-information/fires-near-me

Use the FIRES NEAR ME mobile application to help you stay up to date on bushfires in your area

The following alert levels are provided to give you an indication of the level of threat from a fire:



7.6.4 Radio Updates

In an emergency, ABC Radio can provide up-to-date information. The local stations for Griffith LGA include:

- ABC Radio – **666 AM** Canberra and Digital radio ;
- ABC Radio Central West – **549 AM** Cumnock
- ABC RN – **856 AM** Canberra and Digital radio; and
- ABC NEWS on the radio – **103.9 AM** Canberra and Digital radio ;

7.6.5 Road Closures

The unpredictable nature of bushfires may result in roads being closed without warning. Where emergency services have issued evacuation orders, leaving early is always the safest option. Information on road closures can be obtained from emergency services and found on the Live Traffic NSW website: https://www.livetraffic.com/

7.6.6 Early Evacuation

In a bushfire emergency, emergency services may issue evacuation orders. If off-site evacuation is required, Evacuation Centres will often be set up to accommodate those evacuating. The evacuation direction will depend highly on the existing fire conditions, and advice should be sought from emergency services concerning suitable evacuation routes to the designated Evacuation Centres.

7.7 Emergency

Refer to the Bushfire Emergency Response Plan for actions.

7.8 Post-Emergency Task

- The Chief Warden should seek advice from emergency services before returning to the site;
- A record of the emergency response and evacuation should be taken, and the Emergency Plan updated were applicable.

3 Turton Place, Murrumbateman

BUSHFIRE EMERGENCY AND EVACUATION PLAN

This plan has been designed to assist management in protecting life.
This plan outlines evacuation and site closure procedures to protect occupants from a bushfire threat.

The primary actions to follow are:

Evacuate and close on forecasted Extreme and Catastrophic Fire Danger Rating days

Facility	Battery Energy Storage System
Facility type	Commercial - Utilities
Location	Lot 23 in DP 248413, 3 Turton Place, Murrumbateman NSW 2582.
Estimated occupancy	During Construction: During Operation:
Travel arrangements from the site	Private vehicles.
Chief Warden	
Deputy Warden	

EMERGENCY CONTACTS

In an emergency, call

000

Organisation	Location	Contact
Murrumbateman Rural Fire Brigade	39 Rose St, Murrumbateman NSW	0419 899 979
Springfield NSWRFS	Patemans Ln, Murrumbateman NSW	0418 444 325
Fire and Rescue NSW	90 Meehan St, Yass NSW	02 6229 6711
NSW Police	47 Rossi St, Yass NSW & 31 Anthony Rolfe Ave, Gungahlin ACT	02 6226 9399 000
NSW Ambulance	Charnwood ACT	000
Yass Valley Council	209 Comur St, Yass NSW 2582	02 6226 1477

SITE CLOSURES AND EARLY EVACUATION PROCEDURES – This plan recommends non-occupation on extreme or catastrophic fire weather days and leaving early in all circumstances.

Early evacuation procedure: Non-operational on days of forecasted extreme or catastrophic fire weather

If the site is operational in a bushfire event, relocate all site occupants to the emergency assembly areas and follow the advice of local emergency services.

If evacuation orders are issued, evacuate to the local safer places, evacuation centres or emergency care facilities as directed.

Emergency Assembly Area: Property Access Gate – south onto Turton Place

Trigger to evacuate	Actions
An extreme or catastrophic fire danger rating is forecast for the next day. OR	• The Chief Warden should consult the NSW RFS, check the NSW RFS website, call 1800 NSW RFS, or use smartphone applications and local firefighting resources for fire situations and updates;

<table>
<tr>
<td rowspan="2">Fire 'Advice' Warning is likely to impact the site.

OR

Fire' Watch and Act' Warning is likely to impact the site.

OR

When directed to do so by NSW Police or the NSW Rural Fire Service (RFS)</td>
<td>The Chief Warden is to take control of the bushfire situation: Remain calm and explain to onsite personnel what is happening and the fire situation;
The Chief Warden is to advise the local emergency service that the site is being evacuated as directed by the emergency services (including how many people and where they are going).
Ensure the Wardens and Site Manager have mobiles and are contactable.
Make arrangements for private transportation for evacuation.</td>
</tr>
<tr>
<td>Off-site Evacuation
Arrange for onsite personnel to make their way to the designated Emergency Assembly Area;
Confirm all onsite personnel have been notified;
Make sure all onsite personnel have transportation for evacuation;
Arrange for suitable transportation to meet at the emergency assembly point for persons without transport, persons with compromised mobility and persons that require medical assistance;
Advise all onsite personnel with access to private transportation and do not require medical assistance to make their way to the designated Safer Place or Evacuation Centre as directed by the local emergency services.
Monitor the progress of the evacuation;
The Chief Warden is to advise the relevant emergency service that provided the evacuation orders when all persons have been evacuated;</td>
</tr>
</table>

	• Should the fire services arrive, the Chief Warden will hand control over to the officer in charge and provide an operational brief listing injured or vulnerable persons needing assistance. • Maintain situational awareness through radio, the NSW RFS website, 1800 NSW RFS, smartphone applications and local firefighting resources.

THIS PLAN DOES NOT SUPPORT SHELTERING ONSITE
Site closure on days of forecasted extreme or catastrophic fire weather and leaving early in all circumstances.

DAILY ACTIONS					
ACTIONS	**Bush Fire Danger Ratings**				
	NO RATINGS	**MODERATE**	**HIGH**	**EXTREME**	**CATASTROPHIC**
Chief Warden should Monitor the ACT ESA website and check the 'Fires Near Me' site or app.		By 1 pm	Minimum 1 pm and 3 pm	Monitor conditions every hour. The site should be closed and non-operational on forecasted extreme fire weather days. The site is closed.	Monitor conditions every hour. The site should be closed and non-operational on forecasted catastrophic fire weather days. The site is closed.
Fire is predicted to impact the site.	Monitor conditions every hour. Relocate all site occupants to the **Emergency Assembly Area.** Prepare for off-site evacuation. The site is closed.	Monitor conditions every hour. Relocate all site occupants to the **Emergency Assembly Area.** Prepare for off-site evacuation. The site is closed.	Monitor conditions every hour. Relocate all site occupants to the **Emergency Assembly Area.** Prepare for off-site evacuation. The site is closed.	Monitor conditions every hour. The site should be closed and non-operational on forecasted extreme fire weather days. The site is closed.	Monitor conditions every hour. The site should be closed and non-operational on forecasted catastrophic fire weather days. The site is closed.

The time to fire impact is less than the time required to evacuate.	Relocate all site occupants to the **Emergency Assembly Area.** Prepare for off-site evacuation. The site is closed.	Relocate all site occupants to the **Emergency Assembly Area.** Prepare for off-site evacuation. The site is closed.	Relocate all site occupants to the **Emergency Assembly Area.** Prepare for off-site evacuation. The site is closed.	The site should be closed and non-operational on forecasted extreme fire weather days.	The site should be closed and non-operational on forecasted catastrophic fire weather days.
After the bush fire event: The Chief Warden is to confirm with emergency services that the site is safe (utilities and buildings) and coordinate all clean-up, repair and maintenance as required to allow the site to return to normality. Where applicable, occupants affected by the event should be identified and provided with appropriate counselling and support.					

Figure 8 – Bush Management and Emergency Response Plan

Appendix I: Hazard Matrix and Risk Register

The bushfire risk to people, property (assets), and the environment has been assessed in relation to the likelihood and consequence per the Australian Standard AS ISO 310000 *Risk Management Guidelines*. Table 3 describes the likelihood and the consequence on a scale of 1 to 5, increasing with severity.

Table 3: Likelihood & Consequence Description

Likelihood		Consequence	
Almost Certain (5)	Expected to occur in most circumstances	Catastrophic (5)	Death or permanent injury, considerable economic and irreversible environmental damage
Likely (4)	Will probably occur in most circumstances.	Major (4)	Serious injury, hospital treatment, major economic and irreversible local environmental damage
Possible (3)	May occur occasionally	High (3)	Injury requiring medical treatment, long-term economic and environmental damage
Unlikely (2)	Could happen sometime	Medium (2)	Minor injury, first aid required, minor short-term economic and environmental damage
Rare (1)	May happen only in exceptional circumstances	Low (1)	No injuries, low financial loss, minor environmental impact

Likelihood	**Consequence**				
	Insignificant	**Minor**	**Moderate**	**Major**	**Catastrophic**
Almost Certain	High	High	Extreme	Extreme	Extreme
Likely	Medium	High	High	Extreme	Extreme
Possible	Low	Medium	High	Extreme	Extreme
Unlikely	Low	Low	Medium	High	Extreme
Rare	Low	Low	Medium	High	High

Risk Level	Risk Response
Extreme	**High priority - unacceptable risk – Immediate action required** Urgent site-specific mitigation and comprehensive management measures are required to reduce risk levels.
High	**High priority - unacceptable risk – Immediate action required** site-specific mitigation and comprehensive management measures are required to reduce risk levels.
Medium	**Medium priority - Potentially unacceptable risk** Site-specific mitigation and comprehensive management measures are required to reduce risk levels.
Low	**Low priority - Acceptable risk** Ongoing mitigation and management measures will ensure risk level remains low and risk is eliminated over time.

Risk Register – Construction and operation of the Murrumbateman Battery Energy Storage System					
Risk No#	**Description**	**Risk Rating**	**Treatment**	**Residual Risk Rating**	**Responsible**
1	Physical impact on persons or loss of life.	High	• Implementation of the bushfire management and protection measures detailed in section 6 & 7. • Daily actions outlined in the Bushfire Emergency And Evacuation Plan	Medium	Site management EPC Fire Wardens Site Occupants
2	Fire impacting the subject site and assets.	High	• Implementation of the bushfire management and protection measures detailed in section 6 & 7.	Medium	Site management EPC Fire Wardens
2	Fire propagation within the site and spreading from the site.	High	• Implementation of the bushfire management and protection measures detailed in section 6 & 7. • Follow advice from emergency services.	Medium	Site management EPC Fire Wardens

Appendix II: EPC Contractor

Table 1 outlines the roles and responsibilities of key personnel involved in a fire emergency during the operation of the BESS.

All personnel shall follow the corresponding Fire Emergency Protocols in **Table 2** below during or after a bushfire incident.

Table 1 – Roles and Responsibilities

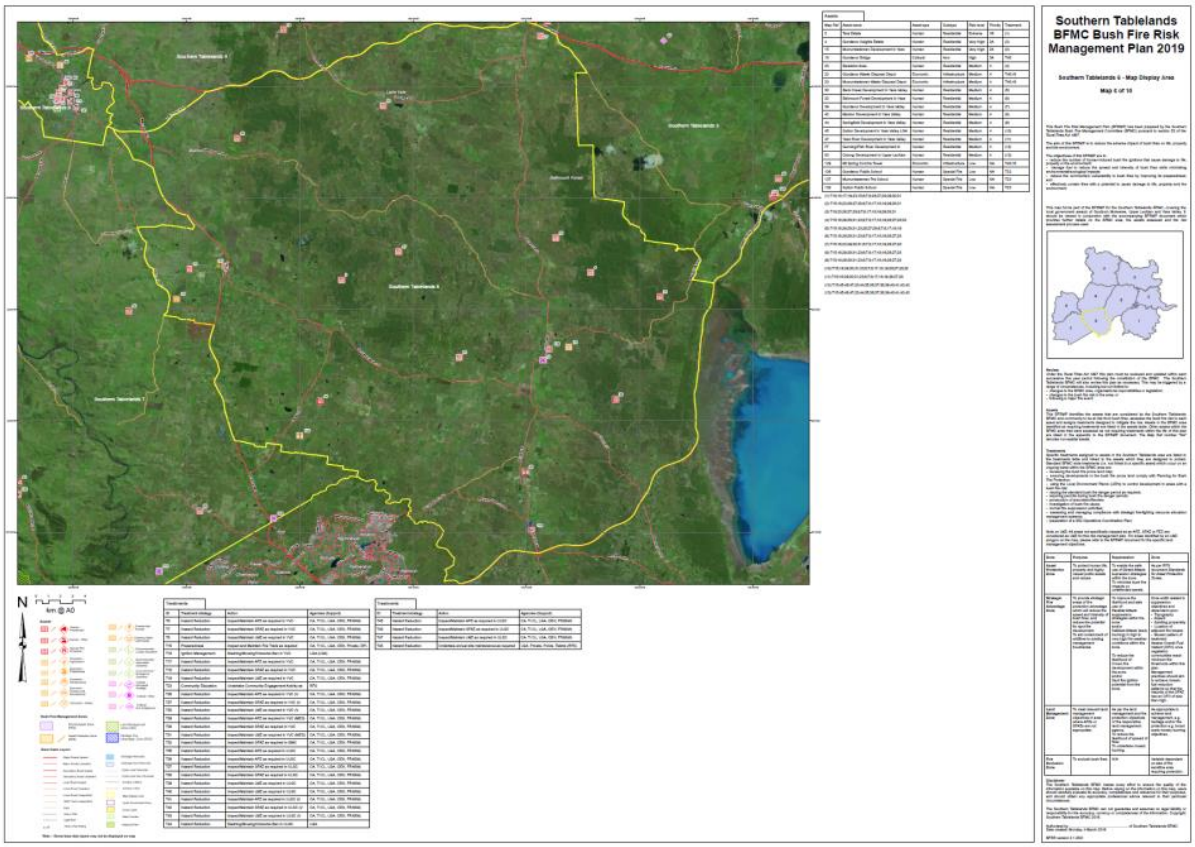
Role	Responsibility
O&M Manager (Office based)	• Respond to emergency calls • Respond to HSE Officer's request for any required assistance • Report incident to Asset Owner • Review and update relevant emergency procedures
HSE Officer (Site based)	• Respond to emergency calls • Ascertain the nature of the emergency • Initiate the corresponding emergency protocol • Arrange first responders to attend to the fire • Notify Emergency Services and First Responders • Notify the O&M Manager of any required assistance • Control and guide the emergency response process
Trained First Aiders (Site based)	• Treat injured individuals in coordination with the HSE Officer
First Responders	• Assist in the emergency response process and provide adequate resources to the HSE Officer
Employees (Site based)	• Raise the alarm • Notify HSE Officer • Follow the emergency procedure with instructions from O&M Manager and HSE Officer

Table 2 – Fire Emergency Protocol

Fire	
Project # and Title	
O&M Manager	During the incident: ▪ Respond to HSE Officer's request for any required assistance ▪ Respond to emergency calls After the incident: ▪ Notify the Asset Owner of the incident. ▪ Submit incident report to Asset Owner. ▪ Review and update all applicable procedures.
HSE Officer	During the incident: ▪ Evaluate the event. ▪ Send first responders to work crew location/s. ▪ Arrange evacuation if required.

	▪ Notify the O&M Manager about the incident ▪ Notify the O&M Manager of any required assistance ▪ Keep the O&M Manager up to date on the incident. ▪ Dial 000 for emergency services, if required. ▪ Terminate incident. After the incident: ▪ Confirm it is safe to return to work. ▪ Complete debrief. ▪ Complete an incident report for O&M Manager. ▪ Provide counselling as required. ▪ Return to work if deemed safe to do so.
Employees	During the incident: ▪ Raise the alarm. ▪ Contact the HSE Officer. ▪ Provide details on the emergency. ▪ Follow the emergency procedure with instructions from O&M Manager and HSE Officer After the incident: ▪ Return to work after receiving confirmation from HSE Officer.
First Responders	During the incident: ▪ Attempt first attack extinguishing and containment, if safe to do so. ▪ Keep the HSE Officer up to date on the incident. ▪ Rescue any injured personnel, if safe to do so. ▪ Extinguish the fire, if possible and be safe to do so. After the incident: ▪ Return to work after receiving confirmation from HSE Officer.
Trained First Aiders	During the incident: ▪ Provide first aid, if required. After the incident: ▪ Return to work after receiving confirmation from HSE Officer.

Appendix III: Southern Tablelands BFRMP Precinct Map



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APPENDIX I

ACOUSTIC REPORT

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Murrumbateman Distribution BESS

3 Turton Place, Murrumbateman, NSW

Acoustic Report – Environmental Noise Emission Assessment

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MEMBER FIRM OF THE ASSOCIATION OF AUSTRALASIAN ACOUSTICAL CONSULTANTS

Project	Proposed Distribution BESS – 3 Turton Place, Murrumbateman, NSW
Project No.	13137
Document Reference	13137-1.3jg
Document Status	Revision 3
Date	Monday, November 18, 2024
Author	Jordan Growcott
Client Details	**ACENERGY Pty Ltd** 502, 689 Burke Road Camberwell, VIC 3124

Disclaimer

Watson Moss Growcott Acoustics Pty Ltd has prepared this document for the sole use of the Client and based on a specific scope of works and relevant limitations as agreed between Watson Moss Growcott Acoustics Pty Ltd and the Client.

The information contained within this report and adopted as the basis for any assessment has been provided by the Client.

The findings of any assessment and/or recommendations provided within this document are based on noise and vibration factors only. Any proposal/recommendation nominated within this document must be reviewed and approved by Relevant Authorities, and third-party consultants, as necessary. This may include but is not limited to structural engineers, mechanical services engineers etc.

The information contained within the report should not be used by or relied upon by any other parties other than the Client without the written approval of Watson Moss Growcott Acoustics Pty Ltd.

Table of Contents

1. Introduction

The proposal includes the construction and operation of a new 4.95MW battery energy storage system (BESS) facility at the site described as 3 Turton Place, Murrumbateman, New South Wales.

The subject site is currently occupied by farmland, a residential dwelling and rural infrastructure including fencing, roadways and outbuildings. The area designated for the proposed BESS is currently used for agricultural activities.

The new facility will include electrical infrastructure which will generate noise emissions with the potential to impact on the acoustic amenity of the surrounding environment including at residential receptors.

In consideration of the above, Watson Moss Growcott Acoustics (WMG) has been engaged to undertake an assessment of noise emissions from the proposal to consider the following:

- Noise and vibration associated with electrical infrastructure and vehicle activity at the subject site during general operations associated with the proposed facility.
- Noise and vibration emissions associated with the construction phase of the proposal.

This report presents the findings of the assessment, and where appropriate, includes indicative noise mitigation strategies to minimise the potential for adverse impacts at nearby noise sensitive receptor locations.

2. Noise Assessment Terminology

Noise assessment terminology used within this report is defined within Table 1 below.

Table 1: Noise Assessment Terminology

Terminology	Definition
dB(A)	Decibels recorded on a sound level meter, which has had its frequency response modified electronically to an international standard, to quantify the average human loudness response to sounds of different character
L_{eq} / L_{Aeq}	The equivalent continuous level that would have the same total acoustic energy over the measurement period as the actual varying noise level under consideration. It is the noise measure defined by the EPA as the measure of the noise to use in assessing compliance with noise limits.
L_{90} / L_{A90}	The level exceeded for 90% of the measurement period, which is representative of the typical lower levels in a varying noise environment. It is the noise measure defined by the EPA as the measure of the background noise level to use in determining noise limits.
Sound Power Level (Lw)	The sound power level of a source is a measure of the amount of energy in the form of sound emitted from the source. The sound power level of a source is an inherent characteristic of that source and does not vary with distance from the source or with a different acoustic environment. The sound power level equals the sound pressure level at a distance from the source plus 10 times the logarithm (to base 10) of the measurement surface area (m^2), and is relative to a reference sound power of 1pW, (10-12 Watts).
Sound Pressure Level (Lp)	Sound that we can hear with our ears or measure with a sound level meter is actually small variations in the pressure of the air around us. The magnitude of the pressure fluctuations vary over a very wide range from the very lowest levels we can just hear to the very high levels we need to be protected from, and for that reason sound is measured on a logarithmic scale. The sound pressure level equals 10 times the logarithm (to base 10) of the sound pressure divided by a reference pressure, which is 20 µPa. The sound pressure level reduces with increasing distance from a source and is influenced by the surroundings.

3. Site and Surrounding Environment

The land under consideration is located at 3 Turton Place, Murrumbateman, New South Wales.

The subject site boundary adjoins Turton Place to the south and is adjacent to RU4 zoned land to the east, west and north. The area of land under consideration is located in the northwest corner of the subject site and is rectangular in shape.

The land in immediate proximity of the proposal is generally vacant and would not be expected to be noise sensitive in accordance with legislative or guideline criteria.

The closest and therefore most critical sensitive uses located within proximity of the site will include:

- **R01** – 3 Turton Place, Murrumbateman.
- **R02** – 4 Turton Place, Murrumbateman.
- **R03** – 5 Turton Place, Murrumbateman.
- **R04** – 270 Murrumbateman Road, Murrumbateman.
- **R05** – 1A Turton Place, Murrumbateman.
- **R06** – 1 Turton Place, Murrumbateman.

Information regarding the location and the use at the sensitive receptors has been provided by the client.

It is noted that the site is also in proximity to the 'Dionysus Winery and Woo Chocolate' premises which is located at 1 Patemans Lane to the northeast of the site. This site is identified as **R07** below.

Figure 1 below provides an aerial photo of the site and surrounds including the sensitive receptors which have been considered as part of the noise emission assessment.

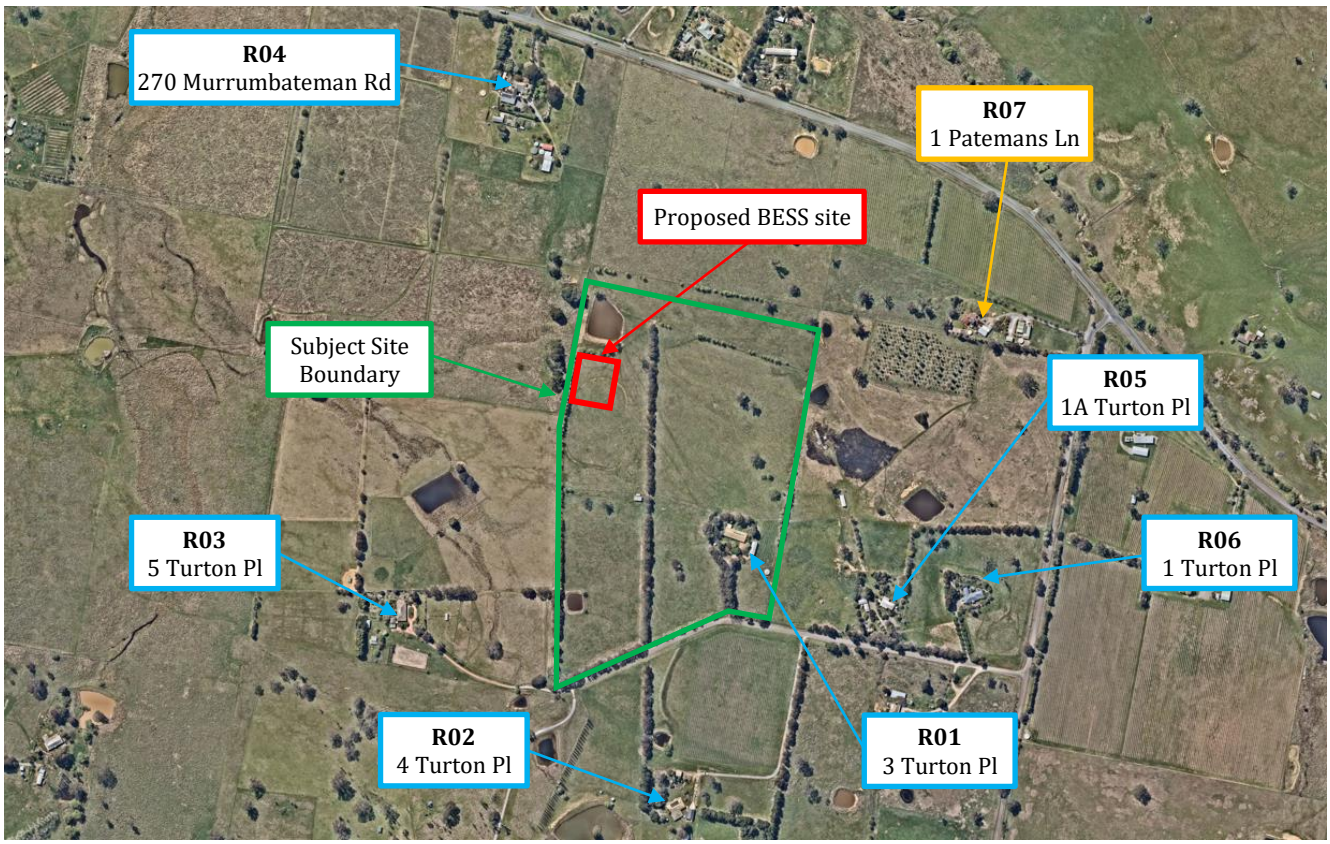


Figure 1: Proposed subject site and surrounding environment

4. Operational Phase Noise Assessment

4.1. Operational Noise Criteria

4.1.1. Overview

The NSW Environment Protection Authority (EPA) Noise Policy for Industry (NPfI) provides criterion for addressing operational noise emissions associated with the proposed use at sensitive receptors. The Policy was released in 2017 and includes relevant methodologies for assessment and management of typical operational noise emissions from industrial premises within NSW.

Within the NPfI, commercial noise emissions are considered during various assessment periods defined as the day, evening, and night to reflect the sensitivity associated within the impacts of noise. The assessment periods defined by the EPA are included within Table 2 below.

Table 2: EPA Defined Assessment Periods

EPA Assessment Period	Relevant Days	Relevant Time Periods
Day	Monday to Saturday	7:00am to 6:00pm
	Sunday	8:00am to 6:00pm
Evening	All Days	6:00pm to 10:00pm
Night	Monday to Saturday	10:00pm to 7:00am
	Sunday	10:00pm to 8:00am

When addressing noise emissions associated with commercial/industrial uses, the NPfi defines project trigger levels which are used to consider potential impacts at sensitive receptors. The levels are determined based on consideration of what the NPfI refers to as the 'Project Intrusiveness Noise Level', and the 'Project Amenity Noise Levels'.

In accordance with the NPfI methodologies, project trigger levels are adopted based on the lower and more stringent of the determined intrusiveness and amenity noise levels.

4.1.2. Project Intrusiveness Noise Criteria

The intent of the project intrusiveness noise level is to minimise the potential for change in the acoustic environment at relevant sensitive receptors by ensuring that impacts associated with a new source are controlled to values 5 dB above a minimum threshold noise level.

The attributable noise levels are defined as L_{Aeq} values assessed over a 15 minute period.

WMG has not undertaken any measurement of the ambient noise environment at or within the vicinity of the site for the preparation of this report.

The proposed development is situated in a rural residential environment characterised by RU4 zoned land consisting of agricultural production with scattered dwellings. The site is additionally located in proximity to two major arterial roadways, Murrumbateman Road and the Barton Highway. Given the surrounding land uses there is the potential that the subject site and adjacent land is already subjected to elevated noise levels, including those associated with vehicle movements and agricultural production.

Whilst no direct measurement of existing ambient noise levels has been completed, it is anticipated that, if necessary, further investigations could be conducted at a later stage of the project to determine the existing ambient noise levels at the surrounding sensitive receptors and the influence of existing traffic movements.

In consideration of the above and in the absence of site measured data, WMG has adopted a conservative approach to the assessment by adopting the minimum 'rating background levels' (RBLs) as the basis for determining the project intrusiveness noise levels.

The minimum RBLs adopted are nominated within the NPFI and are reproduced in Table 3.

Table 3: Minimum RBLs

Descriptor	NPfi Defined Assessment Period		
	Day	Evening	Night
Minimum RBLs	35 L_{A90}	30 L_{A90}	30 L_{A90}

The project intrusiveness noise levels have been determined based on the minimum RBLs in accordance with the methods provided in the NPFI. The adopted project intrusiveness noise levels are detailed in Table 4 and reflect the adopted minimum RBLs plus 5 dB.

Table 4: Project Intrusiveness Noise Levels

Descriptor	NPfi Defined Assessment Period		
	Day	Evening	Night
Project Intrusiveness Noise Levels	40 $L_{Aeq\ 15min}$	35 $L_{Aeq\ 15min}$	35 $L_{Aeq\ 15min}$

4.1.3. Project Amenity Noise Criteria

Project Amenity Noise levels, as detailed by the NPfI, are provided to address the ambient noise levels within an area from all industrial noise sources combined.

The intent of amenity noise levels is to allow for a consideration of noise impacts accumulated from the addition of surrounding commercial/industrial operations. Project amenity noise levels therefore limit the sole independent consideration of intrusiveness levels and the potential for continual increases to noise levels through the addition of separate commercial/industrial operations.

Derivation of the project amenity noise levels is based on the 'recommended amenity noise levels' contained within **Table 2.2: Amenity noise levels** of the NPfI. The values presented in the Table represent the total industrial noise which may impact on a receptor location over an assessment period.

In order to compare the amenity values with the **project intrusiveness level**, the values are adjusted from a $L_{Aeq\ period}$ to $L_{Aeq\ 15min}$, by adding a 3dB correction to the amenity noise level.

When determining the relevant amenity noise levels, WMG has considered the site as 'rural' as the surrounding land is generally comprised of agricultural land uses on RU4 land with scattered residential receptors. The amenity noise levels for 'rural' areas are summarised below.

Table 5: NPfI Amenity Noise Levels

Receiver	Noise Amenity Area	Time of Day	Recommended Amenity Noise Level	
			Raw NPfI Values	Adjusted for 15min
Residential	Rural	Day	50 $L_{Aeq\ period}$	53 $L_{Aeq\ 15min}$
		Evening	45 $L_{Aeq\ period}$	48 $L_{Aeq\ 15min}$
		Night	40 $L_{Aeq\ period}$	43 $L_{Aeq\ 15min}$

New industrial noise sources are then subject to the **project amenity noise level** which is determined to represent an objective for any single commercial/industrial noise source at a receptor location.

Where the surrounds include other commercial/industrial uses which may impact on receptors, the project amenity noise level implements a negative adjustment to account for cumulative contributions.

It is noted that there are two existing wineries located to the northeast of the site identified as 'Dionysus Winery & Woo Chocolate', and 'Found Winds Vineyard'. Based on a review of each of the venue websites, the premises are open 11:00am-4:00pm which will align with the NPfI 'day' period and will avoid the night period which is critical for the proposed BESS site operations.

In consideration of the above, WMG has allowed for potential cumulative contributions due to the wineries during the day period, but not during the more critical evening and night periods at the sensitive receptor locations. The adopted values are therefore as shown below in Table 6.

Table 6: Project Amenity Noise Levels

Descriptor	NPfi Defined Assessment Period		
	Day	Evening	Night
Recommended Amenity Noise Level	50 $L_{Aeq\ period}$	45 $L_{Aeq\ period}$	40 $L_{Aeq\ period}$
Adjustment to allow for additional contributions	minus 5 dB	-	-
Adjustment to reflect 15min assessment period	plus 3 dB	plus 3 dB	plus 3 dB
Project Amenity Noise Levels	48 $L_{Aeq\ 15min}$	48 $L_{Aeq\ 15min}$	43 $L_{Aeq\ 15min}$

4.1.4. Adopted Project Trigger Noise Criteria

4.1.4.1. Residential Receptors

In accordance with the assessment methodologies contained within the NPfI, the project noise trigger levels will be determined based on whichever of the project intrusiveness level and the project amenity level is the lower or more stringent. In consideration of the above, the project trigger noise levels will be as shown in Table 7.

Table 7: Project Trigger Noise Levels

Descriptor	NPfi Defined Assessment Period		
	Day	Evening	Night
Project Intrusiveness Noise Levels	40 $L_{Aeq\ 15min}$	35 $L_{Aeq\ 15min}$	35 $L_{Aeq\ 15min}$
Project Amenity Noise Levels	48 $L_{Aeq\ 15min}$	48 $L_{Aeq\ 15min}$	43 $L_{Aeq\ 15min}$
Project Trigger Noise Levels	**40 $L_{Aeq\ 15min}$**	**35 $L_{Aeq\ 15min}$**	**35 $L_{Aeq\ 15min}$**

For sensitive residential receptors, and in accordance with the NPfI, the project noise trigger levels are to be assessed at the reasonably most-affected point on or within the residential property boundary or, if that is more than 30 metres from the residence, at the reasonably most affected point within 30 metres of the residence, but not closer than 3 metres to a reflective surface and at a height of between 1.2–1.5 metres above ground level.

For multi-storey residential buildings (greater than two storeys) where a ground floor assessment location is deemed to be unrepresentative of the exposure of upper stories, the assessment may be undertaken at a representative elevation and closer than 3 metres to a reflective surface, as agreed with the regulator.

However, the assessed/measured noise level is to be suitably adjusted to reflect a 'free field' (that is, nominally no reflective signals) assessment/measurement location.

Due to the continuous operation of the subject site and new equipment, the critical criteria will be based on the night period when the lowest criteria will be applicable.

4.1.4.2. Commercial Premises

Due to the proximity of the 'Dionysus Winery & Woo Chocolate' commercial premises to the subject site, it would also be considered reasonable to assess potential noise impacts at this receptor.

When considering potential noise impacts on independent commercial premises, the NPfI nominates amenity levels of 65 $L_{Aeq\ period}$ during times when the premises are in use.

When converted to a 15-minute assessment period, this objective will be 68 $L_{Aeq\ 15min}$.

4.1.5. Modifying Factor Corrections

When considering noise impacts on sensitive receptors, NPfI methodology includes relevant adjustment factors which account for the potential for the noise source under consideration to impact on the acoustic amenity of the noise sensitive receptor.

The relevant factors are included within Fact Sheet C of the NPfI and include:

- Tonal noise.
- Low frequency noise.
- Intermittent noise.

Clarification regarding each of the adjustments is shown below in Table 8.

Table 8: NPfI Modifying Factor Corrections

Relevant Factor	Assessment / Measurement	When to Apply	Correction
Tonal Noise	One-third octave band analysis.	Level of one-third octave band exceeds the level of the adjacent bands level on both sides by in the order of 5dB – 15dB as defined in the NPfI.	5 dB
Low-Frequency Noise	Measurement of source contribution C-weighted and A-weighted level and one third octave measurements.	Measure / assess source contribution C and A weighted Leq,t levels over same time period. Correction to be applied where the C minus A level is 15 dB or more and the level defined in Table C2 of the NPfI is exceeded.	2 or 5 dB
Intermittent Noise	Subjectively assessed but should be assisted with measurement to gauge the extent of change in noise level.	The source noise heard at the receiver varies by more than 5 dB(A) and the intermittent nature of the noise is clearly audible.	5 dB

The adjustments are applied to the measured/predicted values at sensitive receptors for consideration relative to the project noise trigger levels. A maximum of 10dB correction will be applied to the measured/predicted noise levels at the sensitive receptor, with a maximum of 5dB applicable when the tonal character is in the low frequency range below 160Hz.

4.2. Noise Modelling Results

4.2.1. Noise Prediction Methodology

Modelling of operational noise emissions from the site has been conducted using DataKustik CadnaA environmental noise modelling software.

Relevant information regarding site elevations, site buildings and the surrounding environment has been provided by the client and sourced from online databases including Nearmaps, NSW Planning Portal, and topography from the ANZLIC Committee on Surveying and Mapping.

With the utilisation of the above, the model has been developed and configured with sufficient detail for appropriate noise emission calculations to be undertaken.

For this assessment, the modelling software has implemented the calculation procedures defined within International Standard ISO 9613-2: 1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation (ISO 9613).

The described standard has been considered and approved as part of many previous projects requiring noise emission assessment works. Through implementation of the Standard using CadnaA, the noise emission modelling considers the following attenuation measures:

- Geometrical spreading.
- Atmospheric absorption.
- Ground attenuation.
- Meteorological effects.
- Source / Receiver height effects.
- Attenuation due to the surrounding environment including existing buildings / structures.

In addition to the above, and in accordance with the methodologies contained within the NPfI, noise predictions must account for noise enhancing weather conditions in the direction of sensitive receptors.

This can be addressed via two options:

- **Option 1**
  Adopt the **noise-enhancing meteorological conditions** for all assessment periods for noise impact assessment purposes without an assessment of how often these conditions occur – a conservative approach that considers source-to-receiver wind vectors for all receivers and F class temperature inversions with wind speeds up to 2 m/s at night.

- **Option 2**
  Determine the **significance** of noise-enhancing conditions.

Option 1 has been adopted as the basis for predicting noise emissions from the proposed use and is often considered conservative as it represents a worst case operation scenario.

The critical receptors located in proximity of the subject site are understood to be single level dwellings, therefore an assessment height of 1.5m has been adopted as the basis for the noise model.

Predicted values at receptor locations have been calculated in the 'free-field', which do not include reflections from localised surfaces other than the ground.

4.2.2. Source Sound Power Levels

When considering noise emissions associated with the proposal, the client has advised that the relevant noise sources will include the following:

- 1no. MVPS including 2no. inverters and 1no. 5MVA transformer.
- 10no. liquid cooling battery containers.

Figure 2 below provides a site plan for the proposal including the relevant equipment locations.

Figure 2: Site plan including relevant noise sources

For the purposes of this assessment, WMG has considered source noise data provided by the inverter and battery unit manufacturers in combination with input from the client. A summary of the sound power/pressure levels adopted for each item of equipment is included within Table 9.

Table 9: Adopted source sound power levels

Noise Source	Adopted Noise Level
MVPS inverter – per unit	88 dB(A) – sound power
MVPS Transformer – 5MVA unit	65 dB(A) – sound power
Battery cabinet liquid cooling – per unit	81 dB(A) – sound power

Once commissioned, the electrical infrastructure which forms part of the facility will operate continuously 24 hours per day, 7 days per week. The assessment will therefore consider potential noise emissions during the day, evening, and night assessment periods.

4.2.3. Predicted Noise Levels

The noise sources forming part of the proposal have been modelled based on the following assumptions:

- The MVPS unit inverters and transformers have been assessed as omnidirectional noise sources. There may be the potential for the MVPS to include directivity which may reduce noise emissions in some directions pending their orientation.
- The battery units have been assessed with their noise source directivity facing north away from the nearest noise sensitive residential receptors.

The results of the noise model are presented below in Table 10.

Table 10: Noise modelling results compared with Project Trigger Noise Levels

Assessment Location	Predicted Noise Level (15_{min})	Project Trigger Noise Levels L_{Aeq}		
		Day	Evening	Night
R01	36 dB(A) L_{eq}	40	35	35
R02	26 dB(A) L_{eq}	40	35	35
R03	32 dB(A) L_{eq}	40	35	35
R04	30 dB(A) L_{eq}	40	35	35
R05	23 dB(A) L_{eq}	40	35	35
R06	<20 dB(A) L_{eq}	40	35	35
R07	22 dB(A) L_{eq}	68		

The outcomes of the noise model indicate that in the absence of noise control, and without consideration of any NPfI modifying factors, predicted noise levels at the R02-R07 receptors are compliant with the project trigger noise levels.

When considered at R01 however, the predicted values indicate the potential for marginal exceedances of the project trigger levels by 1 dB(A) during the evening and night periods.

As part of previous assessments, WMG has identified that electrical infrastructure has the potential to include a tonal character which may be audible at nearby receptors and warrant an adjustment in accordance with the NPfI.

Due to the distance separation between the electrical infrastructure and nearby sensitive receptors however, WMG would expect that residual tonal noise may not be present and therefore not require an adjustment for this project.

The noise modelling software utilised as part of the assessment includes the capability to predict the one-third octave band noise levels at the sensitive receptors. The predicted one-third octave band noise levels are summarised below.

Table 11: Predicted one-third octave band noise levels - dB

Rec	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz
R01	24	21	25	23	23	23	29	33	26	25	32	25	22	25	24	26	25	26	25	22	23	29	14	<10	<10	<10	<10
R02	19	17	21	19	18	19	21	24	20	16	22	15	15	17	16	18	16	17	16	12	11	16	<10	<10	<10	<10	<10
R03	23	21	25	23	23	23	27	31	24	22	29	21	20	22	21	22	22	22	21	18	18	24	<10	<10	<10	<10	<10

Rec	25Hz	31.5Hz	40Hz	50Hz	63Hz	80Hz	100Hz	125Hz	160Hz	200Hz	250Hz	315Hz	400Hz	500Hz	630Hz	800Hz	1kHz	1.25kHz	1.6kHz	2kHz	2.5kHz	3.15kHz	4kHz	5kHz	6.3kHz	8kHz	10kHz
R04	18	16	20	18	17	19	20	24	21	16	22	15	14	16	17	19	17	17	16	13	11	16	<10	<10	<10	<10	<10
R05	17	15	19	17	16	17	19	23	17	14	20	13	12	14	13	14	13	14	12	<10	<10	14	<10	<10	<10	<10	<10
R06	16	13	17	15	14	15	16	20	15	11	17	10	9	11	10	11	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
R07	17	15	18	17	16	18	18	21	19	14	19	12	12	13	14	15	13	12	11	<10	<10	<10	<10	<10	<10	<10	<10

To provide a basis for understanding the presence of any modifying factors, WMG has compared the predicted values with the criteria nominated in the NPfI which relates to tonal noise and low frequency noise.

Tonal noise
When considered at R02, R04, R06 and R07, the predicted values do not exceed the level of the adjacent one-third octave bands on both sides by the 5dB, 8dB and 15dB thresholds nominated in the NPfI. A tonal adjustment will not be applicable for the assessment at these receptors. For the R01, R03 and R05 receptors, the acoustic energy at 3150Hz is sufficiently elevated that a tonal adjustment of +5dB(A) will be applicable.

Low frequency noise
The predicted values do not exceed the low-frequency noise threshold values, and hence an adjustment will not be applicable for the assessment.

The results of the updated assessment including the +5dB(A) tonal adjustment at the R01, R03 and R05 receptors is summarised below.

Table 12: Noise modelling results compared with Project Trigger Noise Levels (including tonal adjustment)

Assessment Location	Predicted Noise Level (15_{min})	Project Trigger Noise Levels L_{Aeq}		
		Day	Evening	Night
R01	41 dB(A) L_{eq}	40	35	35
R02	26 dB(A) L_{eq}	40	35	35
R03	37 dB(A) L_{eq}	40	35	35
R04	30 dB(A) L_{eq}	40	35	35
R05	28 dB(A) L_{eq}	40	35	35
R06	<20 dB(A) L_{eq}	40	35	35
R07	22 dB(A) L_{eq}	68		

As shown above, with the inclusion of the +5dB(A) tonal adjustment, WMG has determined that residual noise impacts at the R01 and R03 receptors have the potential to exceed the project trigger levels, and hence additional noise control should be considered at the subject site.

4.2.4. Noise Control Discussion

The findings of the assessment identify potential exceedances of the project trigger levels by up to 6 dB(A) at the R01 receptor and 2 dB(A) at the R02 receptor.

Due to the predicted non-compliances, WMG has amended the noise model to include a 3.0m high acoustic barrier to the east and south of the electrical infrastructure which will provide noise shielding in the direction of these receptors.

The barrier will effectively block line of sight between the receptors and the electrical infrastructure forming part of the site operations, and hence will reduce the noise impacts. The barrier construction requirements are discussed in Section 4.2.5.

The proposed barrier alignment is included below.

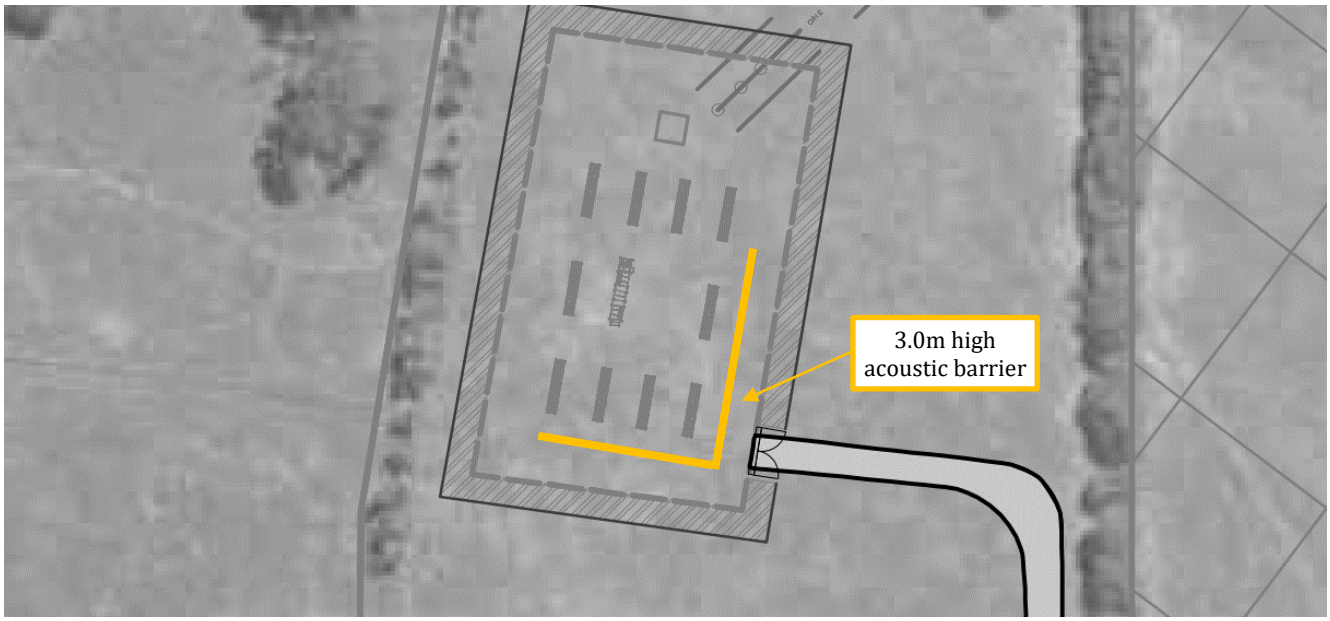


Figure 3: Proposed acoustic barrier arrangement

With the inclusion of the acoustic barrier, and the relevant tonal adjustment, WMG has determined that the predicted noise levels at each of the surrounding sensitive receptors will be compliant with the project trigger levels.

The results of the updated noise model are summarised below.

Table 13: Noise modelling results compared with Project Trigger Noise Levels (including tonal adjustment)

Assessment Location	Predicted Noise Level (15_{min})	Project Trigger Noise Levels L_{Aeq}		
		Day	Evening	Night
R01	35 dB(A) L_{eq}	40	35	35
R02	20 dB(A) L_{eq}	40	35	35
R03	34 dB(A) L_{eq}	40	35	35
R04	30 dB(A) L_{eq}	40	35	35
R05	28 dB(A) L_{eq}	40	35	35
R06	<20 dB(A) L_{eq}	40	35	35
R07	22 dB(A) L_{eq}	68		

The assessment outcomes indicate that there will be a practical solution available to reduce noise impacts at the R01 and R03 receptors so that they comply with the project trigger levels.

However, in the absence of the adopted tonal adjustment which may not be applicable in 'real world' conditions, the acoustic barrier may not be necessary to comply with the project trigger levels at the R03 receptor. This would result in only the R01 receptor being exposed to noise levels marginally higher than the project trigger levels.

It is understood that the R01 receptor is associated with the proposal, and hence is aware of the potential noise level impacts which may arise at their property. It is therefore expected that this receptor may be more tolerant of noise impacts from the subject site operations.

In consideration of the above, and with the understanding that there is a practical solution available for the project, it would be reasonable that the client makes provisions for the acoustic barriers within the subject site design, but only introduces the barriers if it was determined to be necessary after commissioning of the electrical infrastructure.

4.2.5. Acoustic Barrier Construction

Based on the results of the noise model the acoustic barrier will need to be constructed to be 3000mm high and located to the south and east of the equipment to provide sufficient noise shielding in the direction of the nearby receptors.

To provide noise reduction qualities, the barrier must be constructed of materials with a surface minimum weight of 12 kg/m^2 and be constructed with no gaps between panels and between the panels and the ground below.

Where practical, the acoustic barrier location should be selected to maximise its height on the land topography, hence maximising the noise shielding in the direction of the sensitive receptors.

In addition to the above, the acoustic barrier must be lined on the electrical infrastructure side of the barrier using 100mm thick sound absorbing materials which achieve a Noise Reduction Coefficient (NRC) of not less than 0.9.

Suitability of the materials for external applications, and for installation within proximity of the proposed equipment must be considered and approved by others. Suppliers of the materials can include Megasorber or an equivalent alternative. Fibrous insulation faced with perforated metal may also be a suitable alternative, however, would require a specific detail to ensure it was suitable for outdoor applications and could prevent rain ingress.

5. Construction Noise Assessment

5.1. Duration of Construction Works and Construction Program

The construction program for the proposed BESS facility is expected to have a duration of four weeks, during which various activities will be undertaken at the subject site.

The client has advised that the construction hours will be limited in accordance with the 'recommended standard hours' nominated by the EPA which include:

- Monday to Friday, 7:00am to 6:00pm.
- Saturday, 8:00am to 1:00pm.
- Sunday and Public Holidays, no construction works.

In consideration of the above, assessment of noise emissions due to construction activities at the site has been limited to the above 'recommended standard hours', as the client has advised that there is no need for works to be completed during other times.

For the purposes of this assessment, the client has provided a breakdown of the proposed construction program to assist with calculating residual noise levels at the critical sensitive receptors within proximity of the subject site.

The construction program is included below in Table 14 and indicates that the potentially 'noisy' activities including excavation, crane usage and heavy delivery vehicles will generally be limited to week 1 and week 2 of the program.

Table 14: Proposed construction program

Period	Site Works	No. of Vehicle Access per week
Week 1	• Drainage, road, and fencing works • Installation of concrete footings	Light – 10 (2 per day) Heavy – 2
Week 2	• Cable installation • Delivery of battery shipping containers and inverter station • Installation of battery shipping containers and inverter station	Light – 15 (3 per day) Heavy – 12
Week 3	• Electrical installation and cable termination • Electrical testing	Light – 15 (3 per day)
Week 4	• commissioning / demobilisation	Light – 10 (2 per day) Heavy – 1

5.2. Interim Construction Noise Guideline

5.2.1. General Assessment Methodologies

Construction noise and vibration associated with demolition, remediation, renewal, maintenance, and general building works has been identified as a major environmental issue within NSW. Construction activities can generate high levels of noise which can adversely impact on the surrounding acoustic environment including affecting sleep, concentration, mental and physical health.

In consideration of the above, several agencies including the Department of Environment and Climate Change (DECC), NSW Department of Planning, Roads and Traffic Authority (RTA), WorkCover NSW, NSW Health together with the Local Government and Shires Association of NSW prepared the *Interim Construction Noise Guideline* (INCG) to assist with addressing construction noise and vibration impacts.

The guideline was released in 2009 and provides methodologies for assessing and managing the potential impacts of construction noise on residences and other sensitive land uses.

The INCG document is currently under review by the EPA with a new draft guideline having been issued for *public consultation purposes only*, however had not been superseded at this stage.

In consideration of the above, WMG has adopted the currently applicable INCG document as the basis for providing an assessment of construction noise and vibration emissions associated with the project.

The main objectives of the ICNG are to:

- Promote a clear understanding of ways to identify and minimise noise from construction works.
- Focus on applying all 'feasible' and 'reasonable' work practices to minimise construction noise.
- Encourage construction activities to be undertaken only during the 'recommended standard hours' unless approval is given for works that cannot be undertaken during these hours.
- Streamline the assessment and approval stages and reduce time spent dealing with complaints at the project implementation stage.
- Provide flexibility in selecting site-specific feasible and reasonable work practices to minimise noise impacts.

When addressing construction noise and vibration, the guideline presents two alternative assessment methodologies expressed as either quantitative or qualitative and which vary based on the proposed construction project duration.

For shorter duration projects which are nominally defined as less than three weeks in total, the qualitative assessment procedures are commonly adopted which require the proponent to consider the guideline's checklist of work practices to minimise noise and implement appropriate strategies.

Where projects have a duration of greater than three weeks, the quantitative assessment procedure is recommended which includes derivation of 'noise management levels' (NML) and noise predictions to consider the potential noise impacts at sensitive receptor locations.

This BESS project will be undertaken for a period of four weeks and will therefore marginally exceed the timeframe which is nominated for a qualitative assessment. Furthermore, due to the proximity of the site to the nearest sensitive receptors, it is considered appropriate that a detailed investigation consistent with the quantitative assessment approach is undertaken for the proposal.

5.2.2. Determination of Project Noise Management Levels

The NMLs are determined based on an emergence of the construction noise impacts above the RBLs defined within the NPfI for the 'recommended standard hours' as shown within Table 15.

Table 15: Hours Nominated within ICNG

Period Designation	Relevant Hours
Recommended Standard Hours	Monday to Friday – 7:00am to 6:00pm Saturday – 8:00am to 1:00pm
Outside Recommended Standard Hours	All Days – 6:00pm to 7:00am Saturday – 1:00pm to 6:00pm Sunday / Public Holidays – All Day

A summary of the methodologies associated with determining the NMLs and the methods of application are included within Table 16 below.

Table 16: Noise impacts at residences using quantitative assessment procedure.

Time of Day	NML L_{Aeq} (15 min)	How to Apply
Recommended standard hours.	Noise affected RBL + 10 dB	The noise affected level represents the point above which there may be some community reaction to noise. ▪ Where the predicted or measured LAeq (15 min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. ▪ The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected 75 dB(A)	The highly noise affected level represents the point above which there may be strong community reaction to noise. ▪ Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: 1. Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools, or mid-morning or mid-afternoon for works near residences. 2. If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected RBL + 5 dB	▪ A strong justification would typically be required for works outside the recommended standard hours. ▪ The proponent should apply all feasible and reasonable work practices to meet the noise affected level. ▪ Where all feasible and reasonable practices have been applied and noise is more than 5 dB(A) above the noise affected level, the proponent should negotiate with the community.

The NMLs are not mandatory limits, however where construction noise levels are predicted to exceed the NMLs, it is considered appropriate that the proponent implement feasible and reasonable work practices to minimise the potential impacts on noise sensitive receptors.

Guidance in relation to what is considered feasible and reasonable is included in the ICNG and generally relates to practical implementation and ongoing maintenance associated with the proposed treatment.

It also considers whether the overall noise benefits associated with the noise control approach outweigh the overall adverse social, economic, and environmental effects, including the cost of the measure.

When determining the noise management levels for the construction phase of the project, and in the absence of site measured data, WMG has adopted the minimum RBLs which form part of the NPfI.

The adopted NMLs for the project are therefore as shown below in Table 17.

Table 17: Residential Receptor Noise Management Levels for Construction

Descriptor	NPfi Defined Assessment Period		
	Day	Evening	Night
Recommended Standard Hours – Noise Affected	45 L_{Aeq}	N/A	N/A
Recommended Standard Hours – Highly Affected	75 L_{Aeq}	N/A	N/A

Where appropriate, the ICNG also requires consideration of ground borne noise impacts at residential receptors as well as the potential for noise emissions to cause sleep disturbance at residential receptors during the night periods.

Given the distance setback of the closest sensitive receptor to the site and the proposed construction hours which are limited to the day period, potential ground borne noise emissions, and the potential for sleep disturbance has not been considered further.

5.3. Proposed Construction Activities and Noise Assessment

Based on information provided by the client, equipment which will form part of the construction works associated with preparation and commissioning of the subject site will include:

- Excavator.
- Grader.
- Drum roller.
- Water dust suppression truck.
- Truck mounted crane (60 tonne) – lifting and positioning works expected to be completed in 1 day.
- Concrete truck and associated agitator.
- Power hand tools.

In addition to the above, a total of fifteen (15) heavy vehicles will attend the subject site throughout the four week construction program, with fourteen (14) expected within the first two weeks. The heavy vehicles will deliver the battery containers and inverter station. The final truck will likely be for waste collection.

An indicative breakdown of the construction stages during which each type of equipment will be utilised is included below within Table 18.

Table 18: Summary of Construction Activities.

Construction Stage	Equipment and Activity
Access road construction.	▪ Excavator. ▪ 10t smooth drum roller. ▪ Grader for gravel road construction. ▪ Water trucks for dust suppression.
Drainage and fencing works.	▪ Excavator for landscaping. ▪ Water trucks for dust suppression. ▪ Concrete truck and associated agitator for fence construction. ▪ Private vehicles.
Installation of concrete footings	▪ Concrete truck and associated agitator. ▪ Private vehicles.
Delivery of battery shipping containers and inverter station unit.	▪ Semi-trucks for good deliveries. ▪ Crane truck to move containers and place in position. ▪ Private vehicles.
Cable installation	▪ Excavator for cable trenching. ▪ Water trucks for dust suppression. ▪ Powered hand tools for connection. ▪ Private vehicles.
Electrical installation, cable termination and electrical testing.	▪ Powered hand tools for connection. ▪ Private vehicles.
Commissioning and demobilisation	▪ Private vehicles. ▪ Waste truck.

Private vehicles, although relevant, will have source sound power levels significantly lower than other potential noise sources forming part of the proposed construction activities and will not contribute to the calculated value at the sensitive receptors. In consideration of the above, WMG has not considered noise associated with private vehicles further within the construction noise assessment.

Transient sources such as trucks may travel within the site boundaries, however, for the purposes of this assessment, WMG has considered that the construction activities will generally occur where the electrical infrastructure will be located.

The exception to this will be that trucks will need to travel along the access road to enter the site, and hence will be in closer proximity to R01 at various times throughout the construction period. Furthermore, specific road preparation and construction works will also need to occur in proximity to R01, and hence have been considered at this location as part of the assessment.

When addressing source noise levels associated with the construction activities, WMG has considered the following:

- Maximum noise levels from plant and equipment nominated within Appendix C of the Construction Noise and Vibration Strategy document issued by Transport for NSW 2019.
- Noise level data provided by the manufacturer/equipment suppliers.
- Noise level data obtained by WMG as part of previous independent investigations.

Based on the above, and with input from the client, the equipment types and adopted sound power levels are included within Table 19 below.

Table 19: Summary of Equipment and Associated Sound Power Levels

Construction Stage	Equipment Type	No. of Units	Adopted Sound Power Level	Operating Time in 15min period	Adopted L_{WA} per Stage
Access road construction.	Excavator	1	95 dB(A)	100 %	111 dB(A)
	Roller	1	107 dB(A)	50 %	
	Grader	1	113 dB(A)	50 %	
	Water Cart	1	102 dB(A)	50 %	
Drainage and fencing works.	Excavator	1	95 dB(A)	100 %	111 dB(A)
	Water Cart	1	102 dB(A)	50 %	
	Concrete Truck	1	104 dB(A)	25 %	
	Concrete pouring	1	110 dB(A)	100 %	
Concrete footings install	Concrete Truck	1	104 dB(A)	25 %	110 dB(A)
	Concrete pouring	1	110 dB(A)	100 %	
Delivery of battery shipping containers and inverter station unit	Truck movements	1	101 dB(A)	25 %	102 dB(A)
	Crane truck	1	104 dB(A)	50 %	
Cable installation.	Excavator	1	95 dB(A)	100 %	102 dB(A)
	Water Cart	1	102 dB(A)	50 %	
	Hand Tools	3	96 dB(A)	50 %	
Electrical installation, cable termination and electrical testing	Hand Tools	3	96 dB(A)	50 %	98 dB(A)
Commissioning and demobilisation.	Waste Truck	1	101 dB(A)	50 %	98 dB(A)

The client has advised that each phase of the construction program will be undertaken progressively which will result in cumulative noise levels during each stage rather than due to multiple construction stages.

Using the adopted sound power levels and usage rates described in Table 19, the calculated resultant noise levels at the critical receptors are summarised within Table 20 below.

Table 20: Predicted Construction Noise Levels

Construction Phase	Predicted Noise Levels $L_{Aeq\ (15\ minute)}$						Predicted Noise Levels relative to Derived NMLs $L_{Aeq\ (15\ minute)}$					
	R01	R02	R03	R04	R05	R06	R01	R02	R03	R04	R05	R06
Access road construction.	59	49	49	42	45	42	45	45	45	45	45	45
Drainage and fencing works.	53	44	49	48	46	39	45	45	45	45	45	45
Concrete footings install	52	44	48	47	45	38	45	45	45	45	45	45
Battery containers and inverter station unit delivery and placement	45	37	40	39	37	30	45	45	45	45	45	45
Cable installation.	45	37	40	39	37	30	45	45	45	45	45	45
Electrical installation, cable termination and electrical testing	40	31	36	35	33	26	45	45	45	45	45	45
Commissioning and demobilisation.	40	31	36	35	33	26	45	45	45	45	45	45

The results of the noise model indicate that during the initial stages of the construction program, noise emissions associated with the construction of the access road, concrete truck use, and more particularly, the concrete pouring process have the potential to be higher than the 'Noise Affected' NMLs during the recommended standard hours.

The calculated values will continue to be well below the 'highly affected' NML of 75 dB(A).

Given the calculated NML exceedances, construction noise mitigation strategies have been included in Section 5.4.

It must be noted that the R01 receptor who is predicted to receive exposure to the higher levels of construction noise, is associated with the proposal, and hence has open communication with the client regarding the proposed works and construction methodology.

In consideration of the above, it is expected that this receptor will be more tolerant of the potential construction noise impacts that other nearby receptors.

5.4. Construction Noise Mitigation and Management

The NSW ICNG requires that noise emissions associated with construction are assessed against NMLs.

The NMLs are not mandatory noise limits, however where construction activity noise levels are predicted to exceed the NMLs, it is considered appropriate that the proponent implement feasible and reasonable work practices to minimise the potential impacts on noise sensitive receptors.

Guidance regarding minimisation of disturbance due to construction is included within *AS2436-2010 Guide to noise and vibration control on construction, demolition and maintenance sites'* as well as the ICNG and includes the reference to the following:

- Implementation of universal work practices relating to minimising noise.
- Selection of low noise plant and equipment.
- Consultation and transparency with the surrounding community.

In addition, due to the calculated exceedances of NMLs at the R01, R03 and R04 receptors, specific noise control for some activities should be considered by the client.

5.4.1. General Work Practices

Universal work practices which should form part of a construction management plan will include:

- Regular enforcement (ie toolbox talks) of the need to minimise noise and vibration. This will include educating heavy vehicle drivers regarding expectations of their vehicle use (eg. avoid engine brakes, sudden acceleration, minimising reversing etc).
- Regular identification of noisy activities and adoption of improvement techniques.
- Avoiding the use of portable radios, public address systems or other methods of site communication that may unnecessarily impact upon nearby residents.
- Developing routes for the delivery of materials and parking of vehicles to minimise noise.
- Where possible avoiding the use of equipment that generates impulsive noise.
- Minimising the need for vehicles reversing at the site and within proximity of receptors.
- Use of broadband audible alarms on vehicles and elevating work platforms used on site.
- Minimising the movement of materials and plant and unnecessary metal-on-metal contact.
- Minimising truck movements.
- Scheduling respite periods (eg. noisy periods limited to 3 hours).
- Prioritise ensuring that construction works, and heavy vehicle movements occur during standard work hours between 7am and 6pm Monday to Friday, and 7am to 1pm Saturday.

5.4.2. Plant and Equipment

General work practices which will minimise the potential for noise emissions to cause disturbance at sensitive receptors will include:

- Where possible, implementing quieter techniques for high noise activities.
- Choosing quieter mobile and fixed equipment based on the site requirements.
- Operating equipment in the quietest and most efficient manner.
- Regular inspection and maintenance of equipment to ensure it is in good working order.

5.4.3. Community Relations

Communication and transparency with the surrounding community will be critical in minimising the potential for adverse impacts on the acoustic amenity at sensitive receptors. In order to orchestrate the above, it is advised that the client implement the following:

- Appoint a relevant community relations manager prior to project commencement.
- The manager must approach and communicate with sensitive receptors information regarding the project timeline, construction methodologies, potentially noisy periods.
- Maintain contact with receptors throughout duration of project to ensure that they are up to date on when certain events will commence and finish.
- Provide a construction noise management plan to the sensitive receptors which includes site contact information for residents to call regarding complaints and other queries.

Where complaints are received, they must be recorded on a centralised system and handled in a prompt and responsive manner. This may involve noise monitoring or a review or processes.

5.4.4. Specific Construction Activity Noise Control

5.4.4.1. Concrete Truck Pouring

The noise emission assessment has identified the potential for exceedances of NMLs at the critical R01, R03 and R04 receptors due to the concrete pouring works which will occur during fencing and concrete footing installation.

Predicted values at all other identified receptor locations will be < 45 L_{Aeq} during the described works which is below the NML for the recommended standard hours at these locations.

Due to the calculated exceedances, it would be recommended that the client engage in consultation with the receptors and ensure that they are aware of the works proposed and the duration of the works.

It would be expected that the main source of noise associated with the pouring activity will be the truck engine revs, therefore the contractor should minimise this where possible to minimise noise emissions.

Furthermore, in accordance with information provided in AS2436-2010, where feasible, the contractor should:

- Locate static mixing activities as far as possible from sensitive receptors.
- Ensure that workers do not hammer the drum as part of cleaning.
- Fit more efficient silencers to diesel or petrol engines.

5.4.4.2. Reversing and Warning Alarms

Community concerns in relation to construction noise have often resulted from the use of tonal reversing beepers associated with mobile equipment at construction sites. In consideration of the above, WMG provide the following recommendations:

- Equipment which is based at site should be fitted with ‘new generation’ broadband reverse alarms which vary their noise output according to the ambient noise level in the surrounding environment.
- Encourage operators of commercial vehicles making deliveries / collection at site to replace any tonal revering beepers with the described ‘new generation’ broadband reverse alarms.
- Configure the site to minimise the requirement for non-site based vehicles to reverse.

Where possible, non-audible warning systems (eg. flashing lights, reversing cameras) should be used to reduce noise and must be approved by relevant safety authorities.

6. Vibration Assessment

The project construction and operational phase will not include any vibration intense activities such as piling and ramming and hence, have not been considered further.

7. Road Traffic Noise Assessment

During the operational phase of the BESS project, it is understood that there will be no permanent staff based at the site, and therefore no regular traffic movements.

Site inspections and maintenance works will be undertaken intermittently as required.

Given the infrequency of the operational vehicle movements, noise impacts during these times will be negligible and are not expected to impact adversely on the acoustic environment at sensitive receptors.

The focus of any vehicle movements will therefore be based on the project construction phase during which there will be weekly vehicle movements. It is understood that during this phase, vehicles will access the site via the internal access road from Turton Place.

When addressing the potential noise impacts associated with vehicle movements along public roads, commonly adopted criterion is provided within the NSW Department of Environment Climate Change and Water (DECCW) Road Noise Policy, March 2011.

The Policy includes assessment criteria to consider the potential noise impacts at residences affected by traffic on existing roadways generated by land use developments as shown in Table 21.

Table 21: Road Traffic Noise Assessment Criteria for Residential Land Uses

Road Category	Type of Project / Land Use	Assessment Criteria L_{Aeq}	
		Day (7am to 10pm)	Night (10pm to 7am)
Freeway	Existing residences affected by additional traffic on described roadway generated by land use developments	60 (15 HOUR)	55 (9 HOUR)
Local Roads	Existing residences affected by additional traffic on described roadway generated by land use developments	55 (1 HOUR)	50 (1 HOUR)

Based on guidance provided by the client, it is understood that the following light and heavy vehicle movements will form part of the four week project construction program:

- **Week 1** – two light vehicles accessing the site per day, and a total of two heavy vehicles accessing the site across the week period. No more than one heavy vehicle in a one hour period.
- **Week 2** – three light vehicles accessing the site per day, and a total of twelve heavy vehicles accessing the site across the week period. No more than one heavy vehicle in a one hour period.
- **Week 3** – three light vehicles accessing the site per day, and no heavy vehicles.
- **Week 4** – two light vehicles accessing the site per day, and a total of one heavy vehicle accessing the site across the week period.

The heavy vehicles will be delivering materials to the site including the new battery storage containers and the MVPS containers. Light vehicles will be associated with construction staff and their personal vehicles.

Based on a review of aerial photography of the surrounding area, it is understood that dwellings will be setback from access roads which may carry site vehicles by 40-50m.

Based on calculations, the proposed construction program traffic movements will be below the assessment criteria values nominated in Table 20 above.

8. Conclusion

WMG has undertaken an acoustic assessment to address potential operational and construction noise and vibration impacts associated with the BESS facility proposed at the site described as 3 Turton Place, Murrumbateman, New South Wales.

Assessment of noise emissions from the proposed site operations, and construction activities have been based on the methodologies described within the following documentation:

- NSW EPA Noise Policy for Industry.
- NSW Interim Construction Noise Guideline 2009.
- Department of Environment and Conservation's 'Assessing Vibration: a technical guideline'.
- NSW Department of Environment Climate Change and Water Road Noise Policy 2011.

The findings of the assessment have concluded that there is potential for residual operational noise levels at the R01 and R03 receptors to be higher than the project trigger levels.

The predicted exceedances at the R03 receptor are primarily due to the inclusion of a 5 dB(A) tonal adjustment at the receptor which has been adopted within the assessment based on source data provided by the equipment supplier.

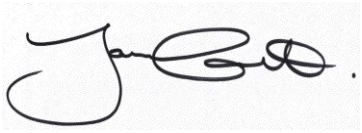
Without the adjustment the predicted noise levels would comply with the project trigger levels at R03 and would only marginally exceed the levels by 1 dB(A) at R01.

WMG has provided a practical solution to control noise emissions from the site if the 5dB(A) tonal adjustment is found to be applicable in 'real world' conditions. This would include a 3.0m high acoustic barrier installed to the south and east of the new electrical infrastructure.

Given that the R01 receptor is associated with the project, and with the understanding that there is a practical solution to reduce potential noise impacts at the critical receptors, it would be reasonable that the client makes provisions for the acoustic barriers within the site design, but only introduces the barriers if it was determined to be necessary after commissioning of the electrical infrastructure.

When addressing general construction noise and vibration as well as road traffic noise, the findings of the assessment concluded the following:

- Noise due to construction vehicle movements is predicted to be below noise level criteria nominated within the Road Noise Policy.
- Noise emissions due to some construction activities have been predicted to exceed NMLs at receptors. In these instances, WMG has provided suitable noise mitigation strategies to minimise the potential for adverse impacts on the relevant sensitive receptors.
- The project construction and operational phase will not include any vibration intense activities such as piling and ramming and hence, have not been considered further.



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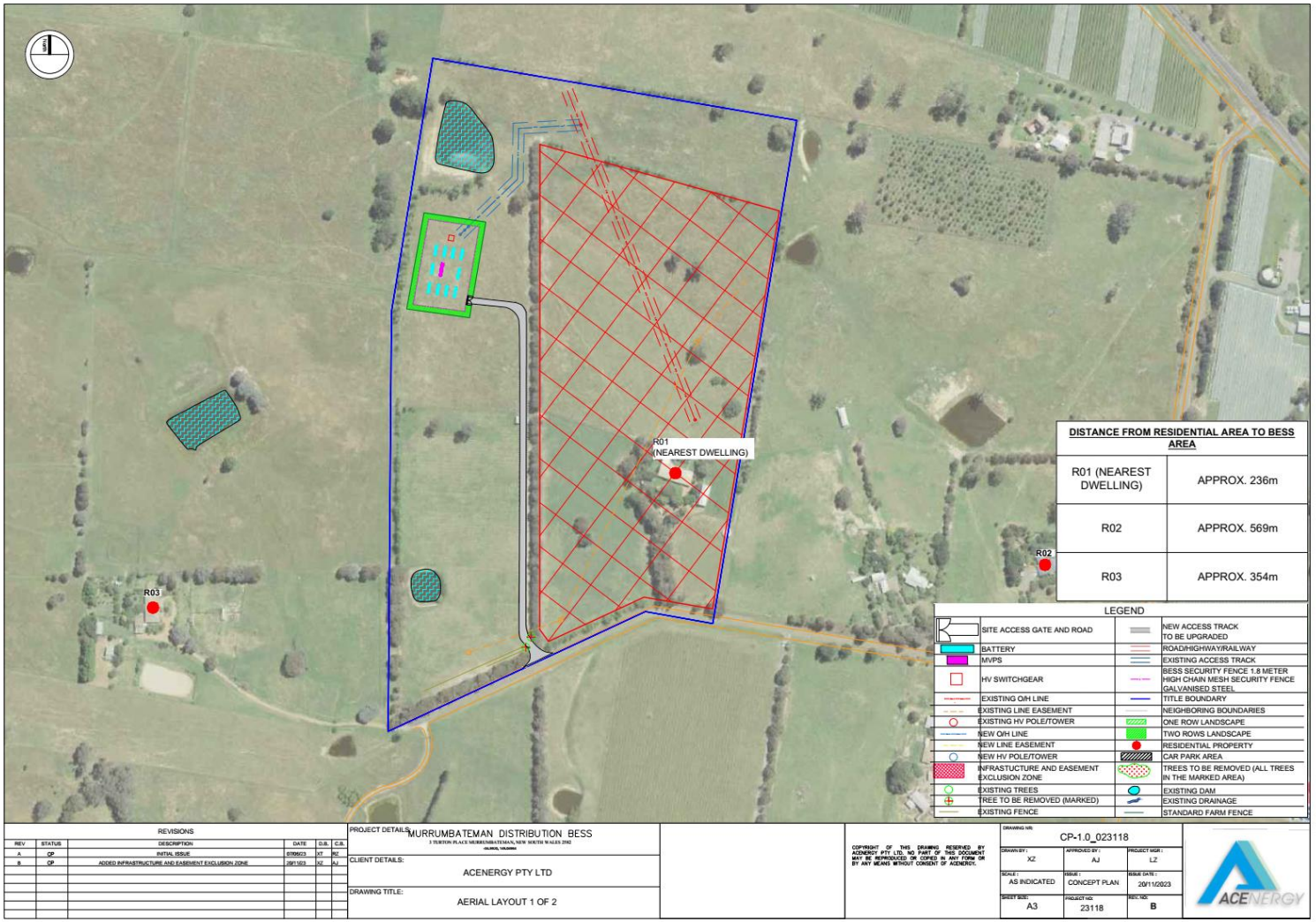
Appendix 1 – Aerial Site Plan Layout



APPENDIX J

PANORAMIC PHOTOGRAPHS

Southeast Corner of Project Site facing Northwest (Indicative view from R05 and R06)

1 Patemans Lane facing Southwest (Indicative view from R07)

4 Turton Place facing North (Indicative view from R02)

5 Turton Place facing Northeast (Indicative view for R03)

Murrumbateman Road facing South

Northwestern Corner of Project Site facing South (Indicative view from R04)

Patemans Lane facing West