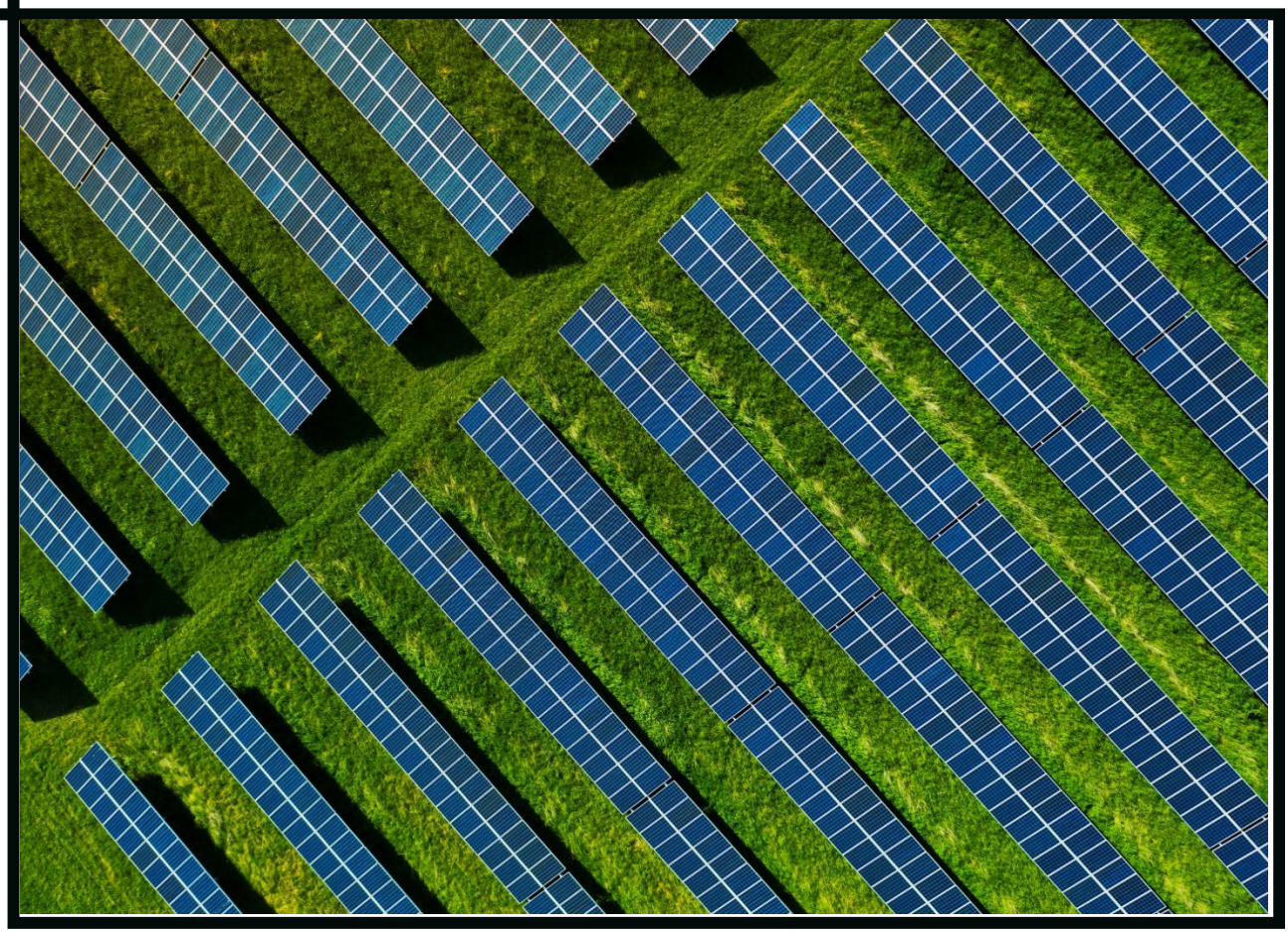

TRANSPORT IMPACT ASSESSMENT- MORTLAKE ENERGY HUB

Prepared for
BRIGHTNIGHT POWER
May 2024

URBIS

URBIS STAFF RESPONSIBLE FOR THIS REPORT WERE:

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Report Number	Final

Urbis acknowledges the important contribution that Aboriginal and Torres Strait Islander people make in creating a strong and vibrant Australian society.

We acknowledge, in each of our offices, the Traditional Owners on whose land we stand.

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1. INTRODUCTION

1.1. OVERVIEW

Urbis has been engaged by Bright Night Power to prepare a Transport Impact Assessment (TIA) for the Solar Energy Facility and Battery Energy Storage System (BESS) development located in Mortlake, Victoria. This TIA accompanies the Planning Permit application for the development of land for a solar farm and ancillary services.

Urbis has assessed the proposed development, provided input to the design, and confirmed that the proposal will achieve satisfactory traffic and transport outcomes and is designed in accordance with the relevant Australian Standard, Moyne Shire Council and Department of Transport and Planning (DTP) requirements.

1.2. REPORT STRUCTURE

This report outlines an assessment of the existing transport conditions and the potential transport impacts of the proposed development, and includes

- A review of the existing transport and traffic networks serving the site.
- An outline of the proposed development.
- An outline of the construction traffic management requirements of the development.
- An assessment of the transport and traffic implications of the proposed development.

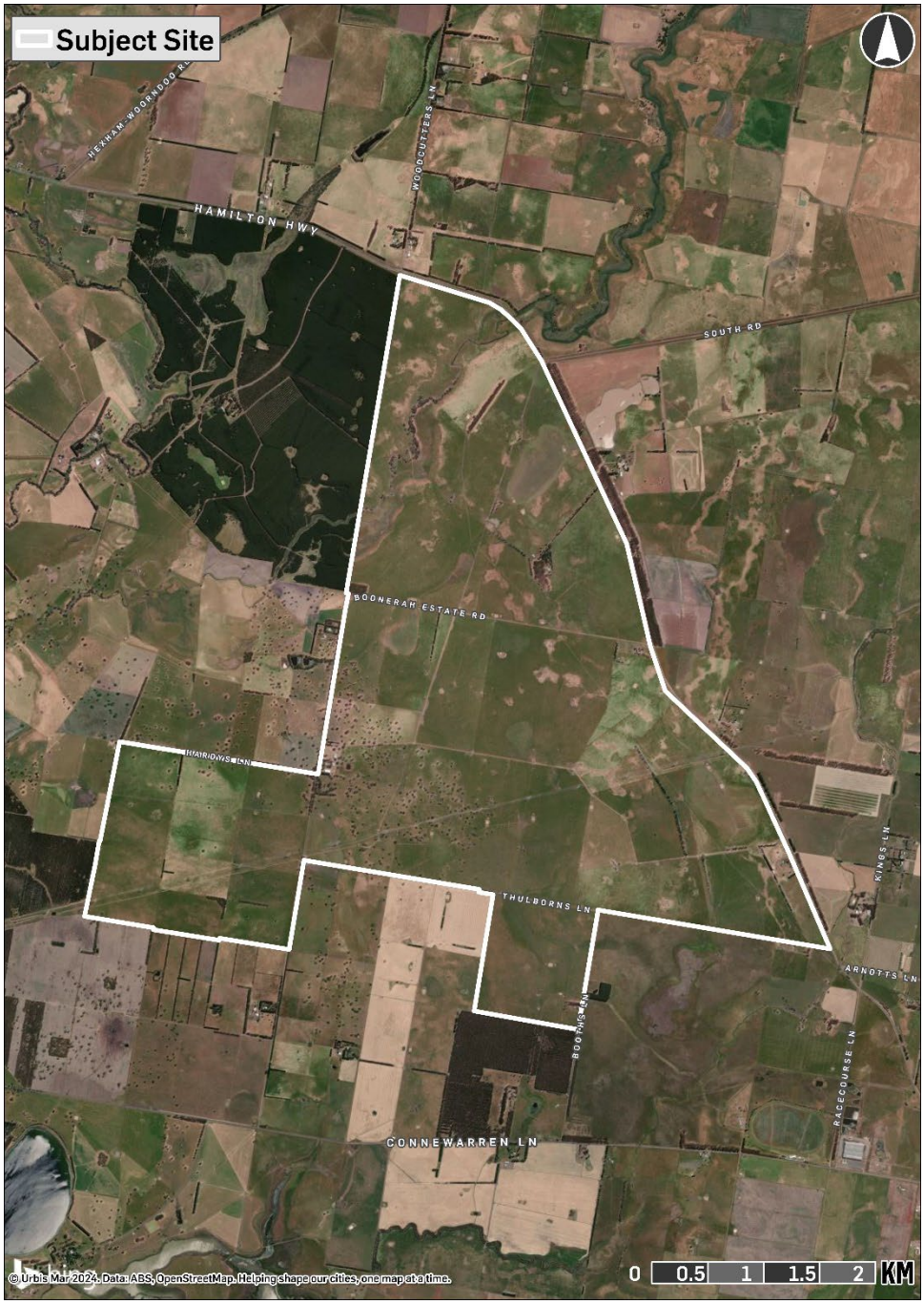
2. EXISTING CONDITIONS

2.1. THE SITE

The subject site is a 1,883 hectare site that includes land parcels along Connewarren Lane and Boonerah Estate Road adjacent to Hamilton Highway, accessed off Hamilton Highway in Mortlake, Victoria. The site is surrounded by other rural and agricultural land uses. The subject site is within the Moyne Shire Council Local Government Area (LGA) and is subject to the Moyne Planning Scheme.

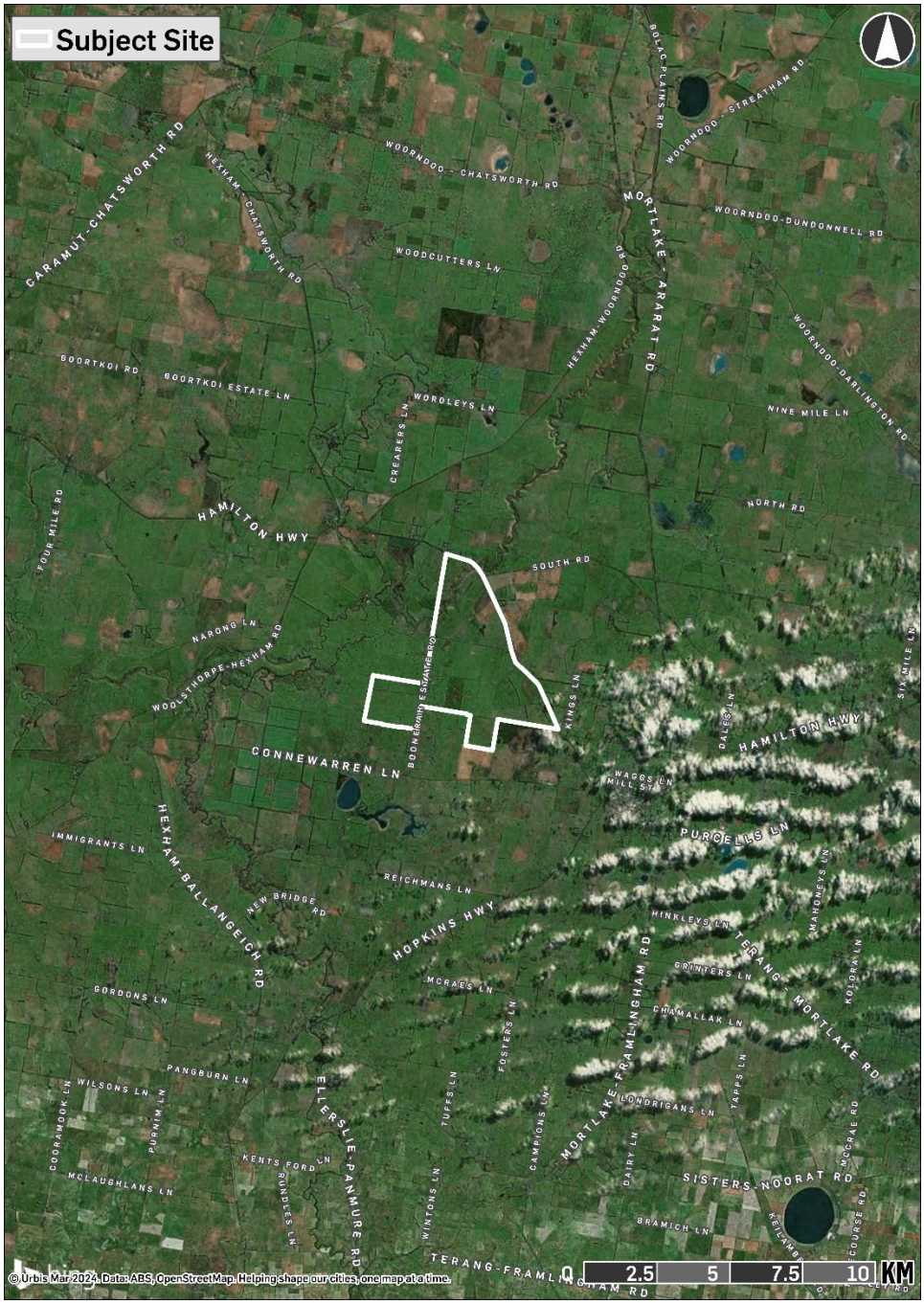
Figure 1 shows the site location, and **Figure 2** shows the site's context within the broader area.

Figure 1 Site location



Source – Nearmap modified by Urbis

Figure 2 Site context



Source - Nearmap modified by Urbis

2.2. EXISTING TRANSPORT NETWORK

2.2.1. Road Hierarchy

Roads within Victoria are categorised by classification (ownership) and function (use).

Road Classification

Roads are classified (as defined by the Road Management Act 2004) based on their importance to the movement of people and goods within Victoria (as a primary means of communication).

The classification of a road allows DTP to exercise authority on all or part of the road. Classified roads include Freeways, Arterial Roads, Municipal Roads, and Non-Arterial State Roads.

- **Freeways** – Major links through Victoria and between and within major urban areas. They are the principal traffic-carrying roads controlled and maintained by either DTP or a private operator. Privately operated Freeways include Eastlink and Peninsula Link.
- **Arterial Roads –** Roads of secondary importance between Freeways and Municipal Road which provide the primary connections to and between urban centres. Arterial roads are the responsibility of DTP for maintenance funding, though councils fund and maintain service roads, pathways, and the roadside.
- **Municipal Roads –** Municipal Roads are the responsibility of councils for maintenance funding. These roads provide connections within local centres and form part of the respective municipalities' local road network. DTP may fund some maintenance and improvements based on specific programs (e.g., urban bus routes and road safety programs). Traffic management on Local Roads is controlled under the delegations to local government from DTP.
- **Non-Arterial State Road** – A State Road which is not an arterial road. These roads provide access to key services such as dams as well as access to national parks. These roads are the authority of the Department of Environment Land Water and Planning or Parks Victoria.

Road Function

The DTP considers two essential needs which must be met when considering the functionality of a road.

- The traffic movement, or mobility, function – providing the means by which people and goods can move from one place to another.
- The access function – providing access to properties and land uses adjacent to the road.

In Victoria, road function is classified as follows

- **Arterial Roads** – The primary function is to provide for the safe and efficient movement of people and freight.
- **Local Roads** – Provide direct access to abutting land uses and contribute to the overall functioning of areas bounded by arterial roads or other barriers. The basic function of a local road is to provide a good environment in which to live or conduct a business and to enable vehicular access to abutting land.

2.2.2. Surrounding Roads

The characteristics of the surrounding road network are detailed in **Table 1**. The surrounding road network is shown in **Figure 3**.

Table 1 Characteristics of surrounding roads

Road	**Hamilton Highway**	**Connewarren Lane**	**Boonerah Estate Road**	**Thulborns Lane**	**Kings Lane**	**Arnotts Lane**
Classification / Function	Arterial	Municipal	Municipal	Municipal	Municipal	Municipal

Road	Hamilton Highway	Connewarren Lane	Boonerah Estate Road	Thulborns Lane	Kings Lane	Arnotts Lane
Sealed (yes/no)	Yes	Yes	No	No	Yes	No
Movement lanes	One lane in each direction	One lane in each direction	One lane bi-directional	One lane bi-directional	One lane in each direction	One lane bi-directional
Parking lanes	No	No	No	No	No	No
Carriageway width (approx.) (m)	Eight	Seven	Four	Four	Four	Four
Signposted speed (km / h)	100	100	No sign	No sign	No sign	No sign
Line marking / divided lanes	Yes	Yes	No	No	No	No
Pedestrian pathways	No	No	No	No	No	No
Bus stops	No	No	No	No	No	No

Source: Nearmap, Google Street View

Figure 3 Surrounding intersections

Source - Nearmap modified by Urbis

2.2.3. Nearby Intersections

The following intersections are proximate to the subject site

Table 2 Surrounding Intersections

Intersection	Control Method
Hamilton Highway / Connewarren Lane.	Priority Controlled Intersection
Connewarren Lane / Boonerah Estate Road.	Priority Controlled Intersection
Hamilton Highway / Boonerah Estate Road.	Priority Controlled Intersection
Connewarren Lane / Booths Lane.	Priority Controlled Intersection
Hamilton Highway / Kings Lane / Racecourse Lane.	Priority Controlled Intersection
Hamilton Highway / Arnotts Lane.	Priority Controlled Intersection
Hamilton Highway / Holdsworths Lane.	Priority Controlled Intersection

Source: Urbis

2.2.4. Existing Road Traffic Volumes

Traffic volumes for Hamilton Highway are provided in the DTP's Open Data Platform, which provides bi-directional Annual Average Daily Traffic (AADT) for 2020. The AADT for Hamilton Highway between William Street and Connewarren Lane is as follows

- 485 vehicles in the eastbound direction, with 20 per cent of AADT being heavy vehicles.
- 443 vehicles in the westbound direction, with 19 per cent of AADT being heavy vehicles.

2.2.5. Crash History

Crash data can provide valuable information about a road network's road safety performance. Existing road safety deficiencies can be highlighted by examining crash data, which can aid in determining whether the proposed development's traffic generation will exacerbate any identified issues.

Open Data Platform from the DTP allows users to analyse Victorian fatal and injury crash data based on time, location, conditions, crash type, road user type and object hit. This data was analysed for the surrounding road network for the five years between 2018 and 2023.

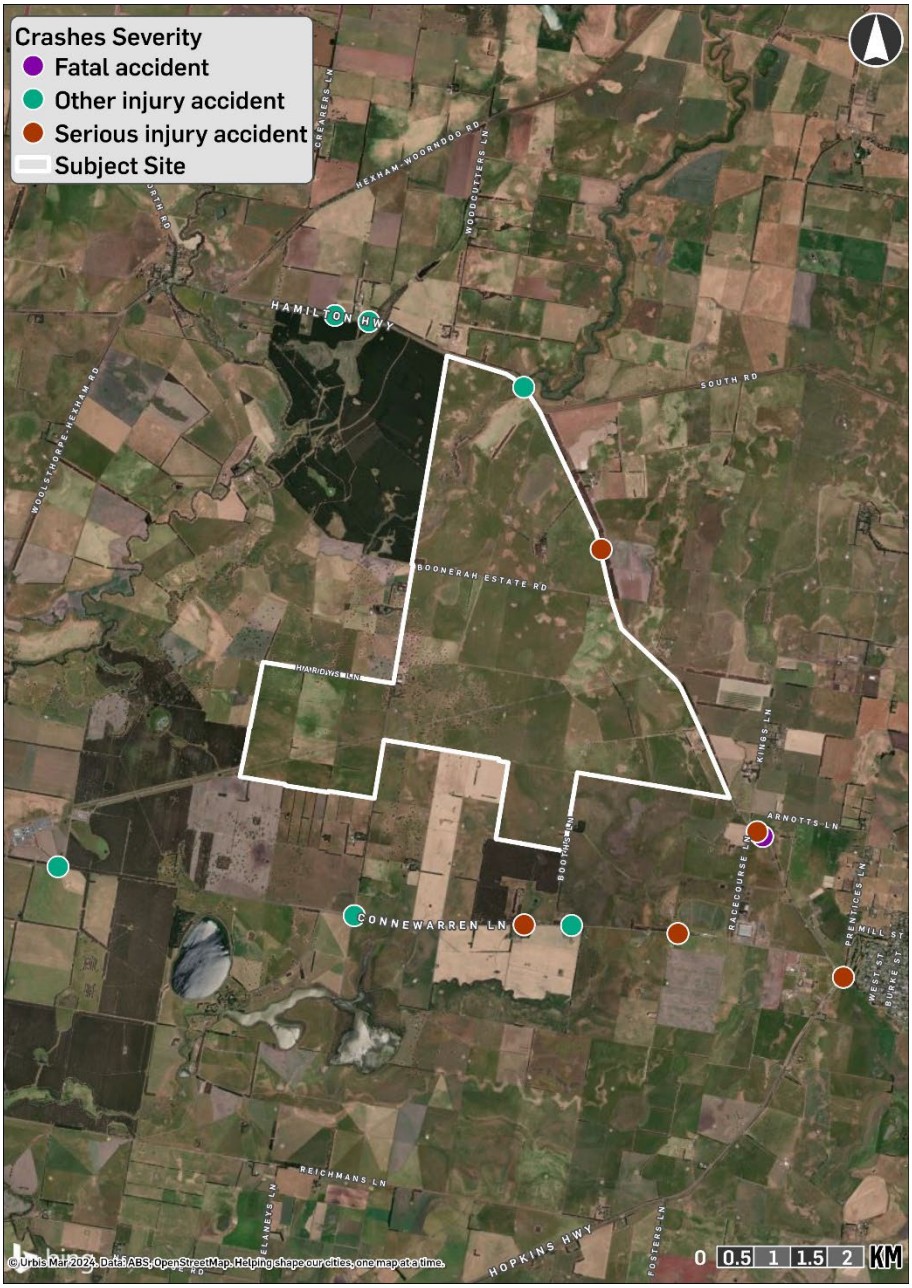
Table 3 Crash history

Crash ID	Degree of Crash	Description	Type of intersection	Lighting Conditions
1	Other Injury	Struck Animal	T Intersection	Day
2	Other Injury	Off carriageway to right	Not at intersection	Day
3	Serious Injury	Right off carriageway into object / parked vehicle	Not at intersection	Darkness

Crash ID	Degree of Crash	Description	Type of intersection	Lighting Conditions
4	Serious Injury	Right off carriageway into object / parked vehicle	Not at intersection	Darkness
5	Fatal accident	Head on (not overtaking)	Not at intersection	Darkness
6	Serious Injury	Off carriageway to left	Not at intersection	Dusk / Dawn
7	Serious Injury	Right near (intersection only)	T intersection	Day
8	Other Injury	Left Off Carriageway into the object	Not at intersection	Day
9	Other Injury	Struck Animal	Not at intersection	Day
10	Other Injury	Rear End (Vehicles in same lane)	Not at intersection	Day

Source – DTP Open Data Platform

Figure 4 Crash history as described in **Table 3**



Source – Open Data Platform, DTP, Victoria

The summary of this analysis is as follows

- **Number of crashes**: There are no crashes on Boonerah Estate Road within the immediate vicinity of the site. There were a total of five crashes reported along Hamilton Highway and Connewarren Lane near the site during the five years (2018-2023) considered.
- **Severity:** Hamilton Highway – Two crashes involved serious injuries, and one involved a fatal accident; Connewarren Lane – Two crashes involved serious injuries.
- **Crash types:** No crash trend was observed. One fatal accident involved a head-on Hamilton Highway, two were right off the carriageway into an object / parked vehicle and one was at a T intersection.
- **Time:** Most of the crashes were in darkness with no street lights.
- **Vulnerable Road Users:** No crashes involved pedestrians.

In conclusion, this level of crashes observed on these rural curved roads is not unusual for such environments, and there is no evidence to suggest any significant systemic road safety issues in the vicinity of the development.

2.2.6. Public Transport Network

There is no public transport infrastructure or services that connect directly to the site. The closest public transport stop is Webster Street / Dunlop Street in the town of Mortlake approximately eight kilometres from the site, which connects to Melbourne, Ballarat, Warrnambool and Casterton with coach services (via Skipton and Hamilton).

2.2.7. Walking and Cycling Network

There is no dedicated active transport infrastructure surrounding the site, with no footpaths on the roads immediately surrounding the site to enable walking. Cycling is permitted on the shoulder of roads; however, the nature of these roads (often being unsealed or having an unsealed shoulder) makes cycling on these roads challenging even for experienced riders.

3. DEVELOPMENT PROPOSAL

The proposed development is for a Battery Energy Storage System (BESS) co-located with a Solar energy facility. The development is anticipated to have a generation capacity of approximately 360MW and a storage capacity 300MW. It will be located across a number of land parcels with access from the Hamilton Highway, Connewarren Lane, Boonerah Estate Road and Thulborns Lane. **Appendix A** shows the proposed development.

3.1. DEVELOPMENT OVERVIEW

The development seeks to

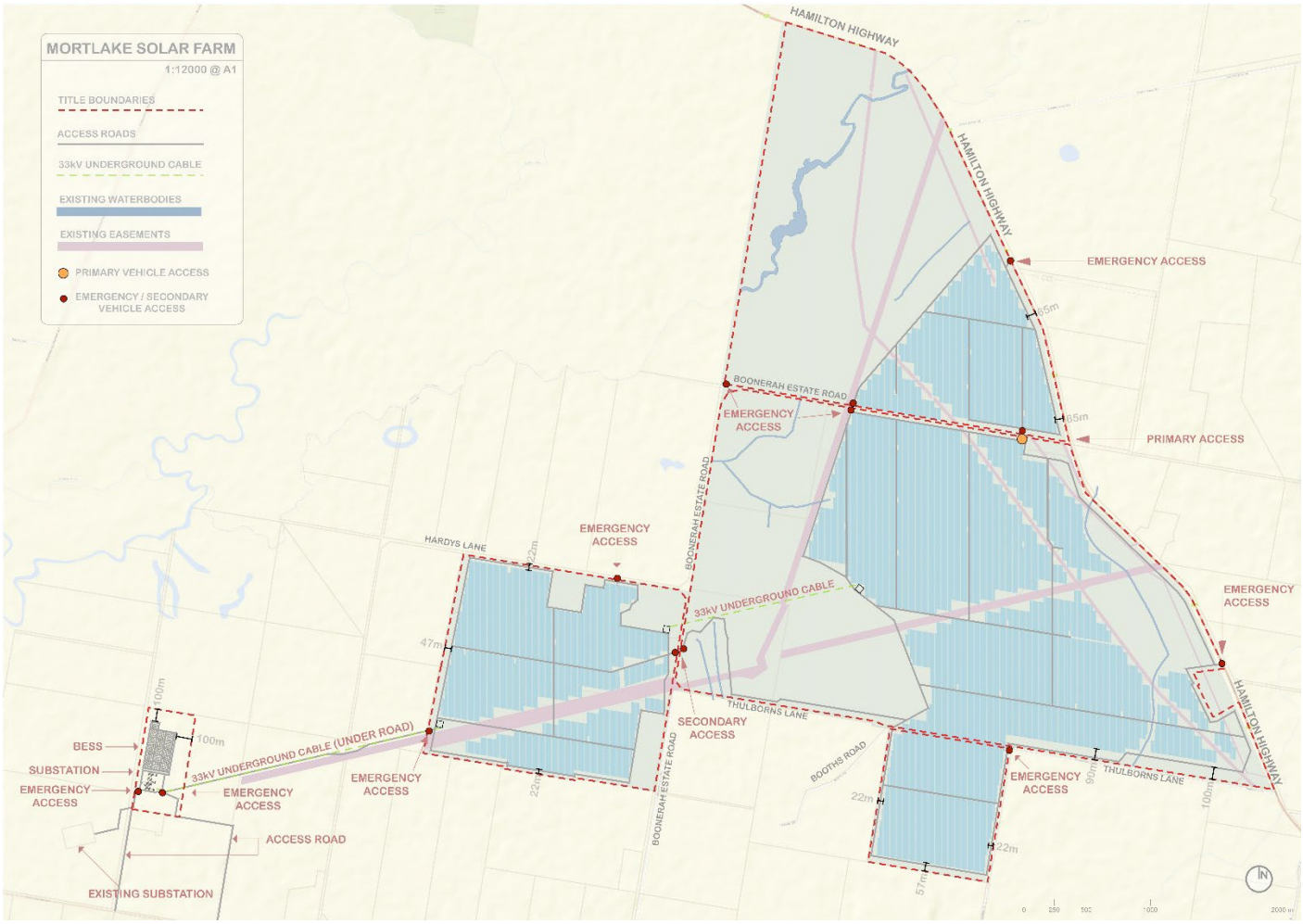
- Remediate existing land to support the development of a energy hub.
- Protect key biodiversity and cultural heritage within the site.
- Preparation of construction, compound, laydown and parking area.
- Bulk earthworks include topsoil stripping, cut-to-fill, import-to-fill, capping and surfacing layers.
- Road works include internal roads, access roads, and interfacing with Hamilton Highway to transport equipment to the site via oversized vehicle deliveries.
- Delivery and installation of security fencing, including post and sill foundation and perimeter chain mesh fencing.
- Landscaping and rehabilitation inclusive of trimming batters, table drainage, earth shaping and seeding.
- Earth grid installation.
- Stormwater drainage system including pits, pipes, headwalls, table drains, electrical pit and conduit system.
- Equipment, structure, and building foundations inclusive of major and minor foundations for the BESS and associated substation.
- Delivery and landing of equipment including transformers, batteries, control and switchgear buildings.
- Mechanical and electrical equipment installation includes structural erection, landing of equipment, cable reticulation works, cabling and terminations.
- Testing and commissioning of the works.

3.2. VEHICLE ACCESS

Vehicle access to the site will be from several access points. The primary access points to the site will be via Boonerah Estate Road via an upgraded road and intersection treatment at the Hamilton Highway / Boonerah Estate Road intersection. Secondary /emergency access to the site will be via Thulborns Lane, Hamilton Highway and Hardys Lane. Access to the proposed BESS will be via Connewarren Lane.

The aforementioned vehicle access points are shown in **Figure 5**.

Figure 5 Vehicle access point design



Source – Urbis

3.3. INTERNAL ROAD NETWORK

There are several roads located within the site. They are typically broken down by their function as follows

- Site ring road (enabling access to all parts of the site).
- Internal access way (the primary function of servicing the panels).

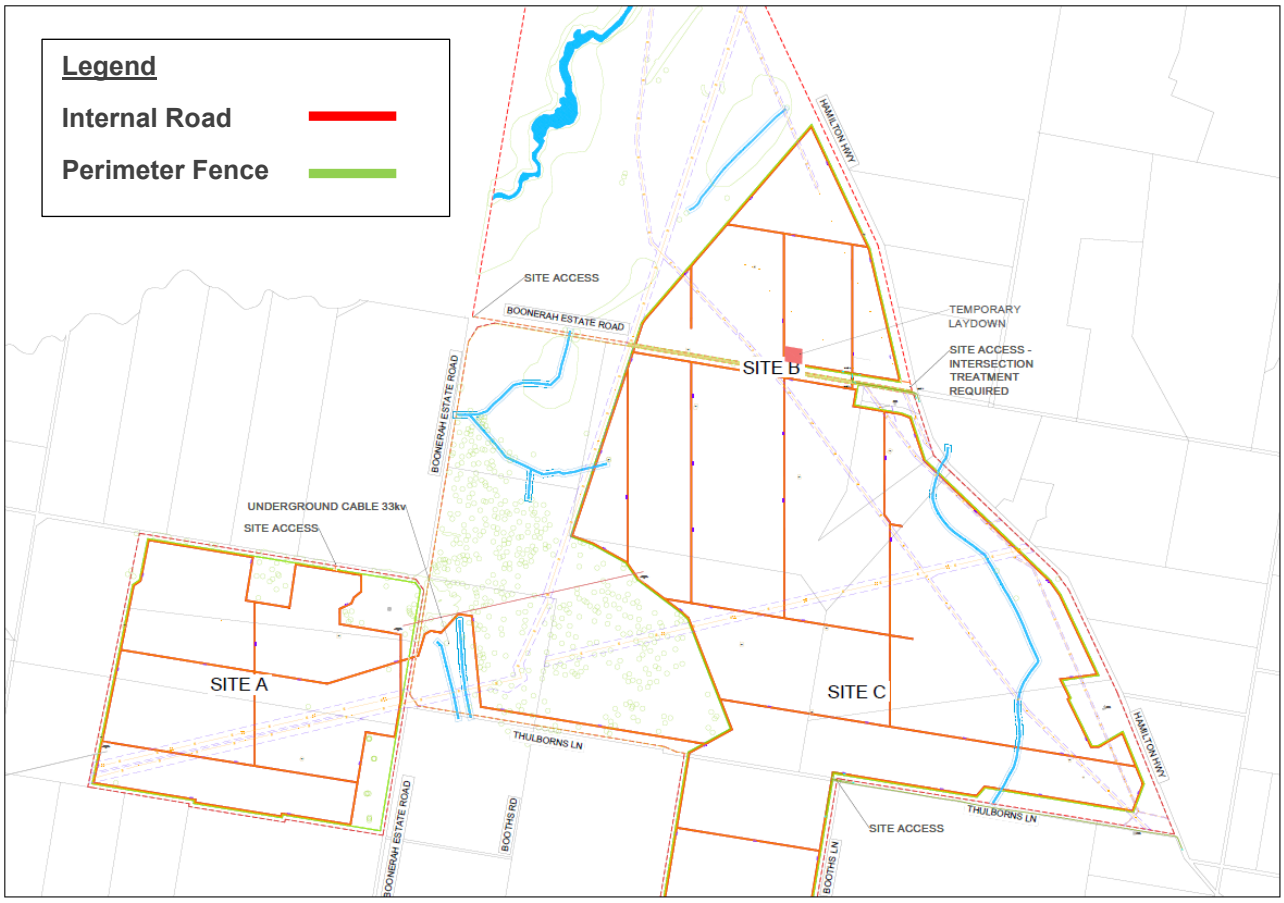
Table 4 details the internal road network

Table 4 Internal Road Network

Name	Width at widest point	Function
Ring Road	six metres	Brings vehicles in and out of the site and serves as the primary means of travelling around the site. Must comply with CFA guidelines of being an all-weather seal, must be four metres wide and must have a passing bay every 600 metres with a length of 20 metres and a carriageway width of 6 metres.
Internal Access Ways	six metres	Connects the ring road to the panels themselves, the primary function of these roads is to service and clean the panels. These roads are not subject to the same CFA requirements as the ring road.

Source: Urbis

Figure 6 Internal road layout within the solar energy facility



Source – Urbis

3.4. STAFFING LEVELS

During the operational phase, the site will have a staffing requirement of 10 to 20 individuals working permanently during business days in addition to the local contractors. These staff members will commute to the site using regular light vehicles. Their primary responsibilities will involve conducting maintenance inspections and performing repairs as needed.

3.5. VEHICLE PARKING ARRANGEMENTS

Staff will be parking informally throughout the site based on the activities that need to be undertaken on a day-to-day basis. There is sufficient width on the internal roads to pull over and still allow for two-way vehicle movements.

4. CONSTRUCTION REQUIREMENTS

4.1. CONSTRUCTION VEHICLES

A large number of construction vehicles will be required to transport the solar panels, batteries, inverters and bulkier items, including the substation components and step-up transformers. Several construction vehicles will also be required for general on-site activities other than the deliveries.

Four categories of vehicles will be used for the construction project

- **Construction Vehicles**: These vehicles will transport solar panels, batteries, inverters, substation components, step-up transformers, steel, road construction materials, concreting supplies, and water. They will be larger than personnel vehicles and include oversized vehicles. These vehicles will serve both to deliver materials and for general construction activities on-site.
- **Medium and Heavy Rigid Trucks**: These will be utilised for delivering raw materials and smaller plant materials, waste collection and foundation laying.
- **Oversized vehicles and B-doubles**: These will transport large plant materials such as battery packs and transformers.
- **Light Vehicles**: This category includes cars and light commercial vehicles. These vehicles will be used for personnel movement, including construction personnel, subcontractors, and escort vehicles.

The largest vehicle to be utilised in the construction process will be a 24-metre-long 16-axle platform trailer and dolly**.** Details of all the vehicles used in the construction of BESS are listed in **Table 5**.

Table 5 Details of construction vehicles

Construction Activity	Vehicle to be used	Oversize and Overmass (OSOM) vehicle*
Building Transport	26 m long, CPP trailer with 5 rear axles (19 m)	No
Concrete Truck	7.6 m long, FTR 6m^3 Concrete Mixer truck	No
Earthwork	9.5 m long, MT 31Moxy	No
Mobile Crane	19.2 m long, Demag AC 500-1	No
Step Up Transformer	25 m long B-Double Vehicle	No
Batteries	24 m long Truck and 16 axle Low Loader combination	Yes
Transformer Transport*	24 m long Truck and 16 axle Low Loader combination	Yes

**OSOM vehicle is a heavy vehicle that is carrying, or specially designed to carry, a large indivisible item*

4.2. CONSTRUCTION VEHICLE GENERATION

Based on information provided by the developer, an estimated 300 workers and 167 daily vehicle movements are expected during the peak construction period. During the peak hour, 53 vehicle movements are expected. The following assumptions have been developed to split out trip generation by vehicle types.

- It is assumed that all construction workers will access the site via minibus and that the minibuses have a capacity of transporting 20 workers per vehicle. It is further assumed that the minibuses will stay on-site in a staging area during the working day.
- It has been assumed that the difference in peak hour vehicle movements and the determined minibus movements will be heavy vehicles associated with construction.

- The provided vehicle movements are assumed to be one-way. To determine traffic generation, vehicle movements have been divided by two to determine the total traffic generated by the construction.

For example total daily trucks generated is the total number of daily truck movements divided by two and then subtracting the minibuses from this figure.

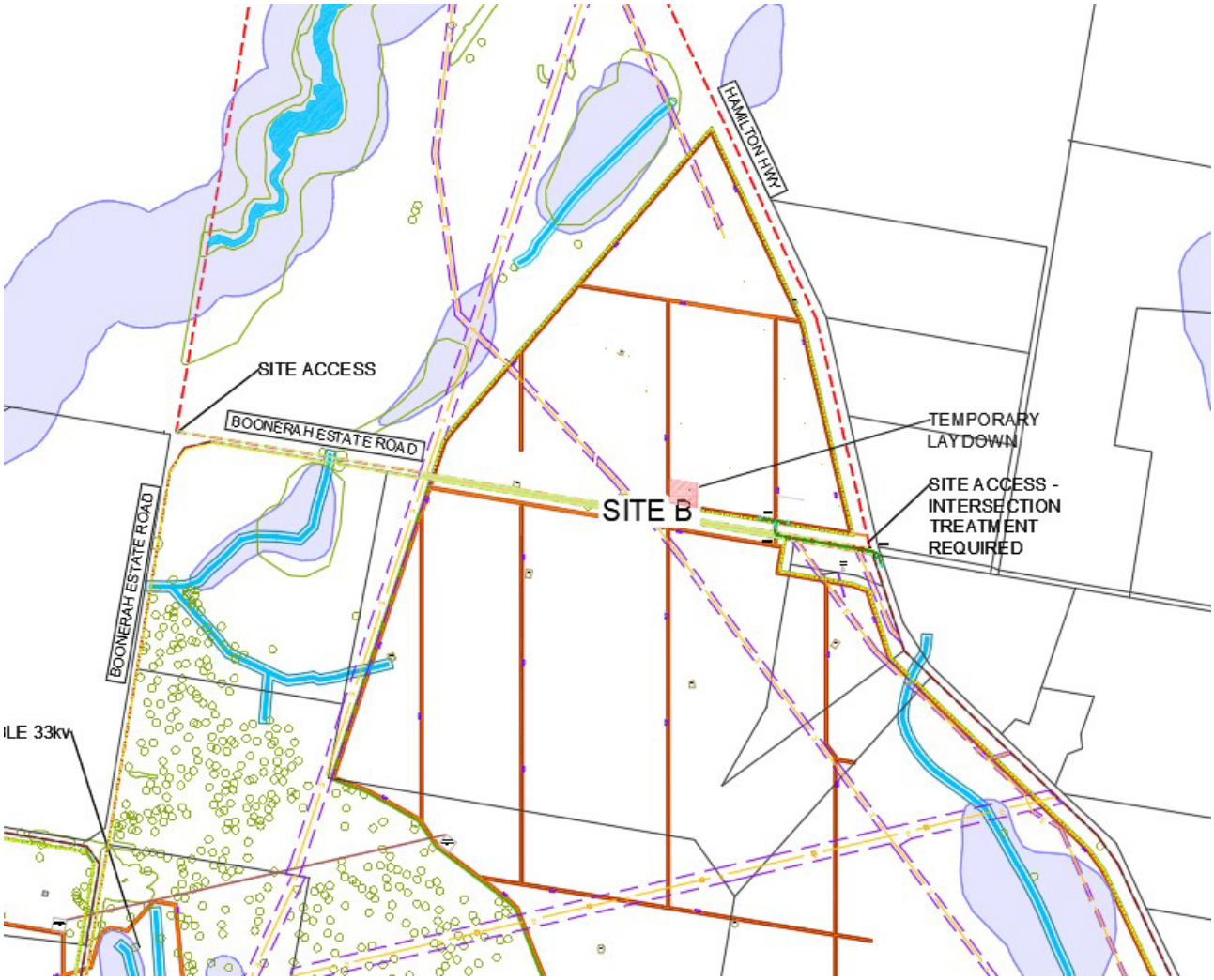
Based on these assumptions, the following trip generation has been determined

- Total daily trucks generated – 54.
- Total daily minibuses generated – 15.
- Peak hour trucks generated – 19.
- Peak hour minibuses generated – 15.

4.3. CONSTRUCTION LAYDOWN AREA AND PARKING

Vehicles associated with the construction of the solar farm will park their vehicles in a nominated staging area during construction. These will primarily be the minibuses, utility vehicles and other construction-related vehicles being stored on the site. Deliveries of materials will also be set down in this location. The set-down area for the BESS will be directly inside the BESS site as it is relatively small. **Figure 7** shows the location of the set down and parking area associated with the solar farm.

Figure 7 Set down and vehicle parking area



Source: Urbis

4.4. CONSTRUCTION VEHICLE ROUTE

Most construction material delivery vehicles will access the site from the Port of Melbourne. The vehicle haulage route (within the local context) is specified in **Figure 8**. Construction vehicles are anticipated to follow the same route as shown in these figures.

Deliveries from Port of Melbourne will access the site from the Westgate Bridge, join Princess Highway (M1) and exit to Hamilton Highway and then continue on Hamilton Highway through Inverleigh, Cressy and Lismore. The vehicle will then exit Hamilton Highway and turn left onto Connewarren Lane (BESS-associated) or Boonerah Estate Road (solar-associated).

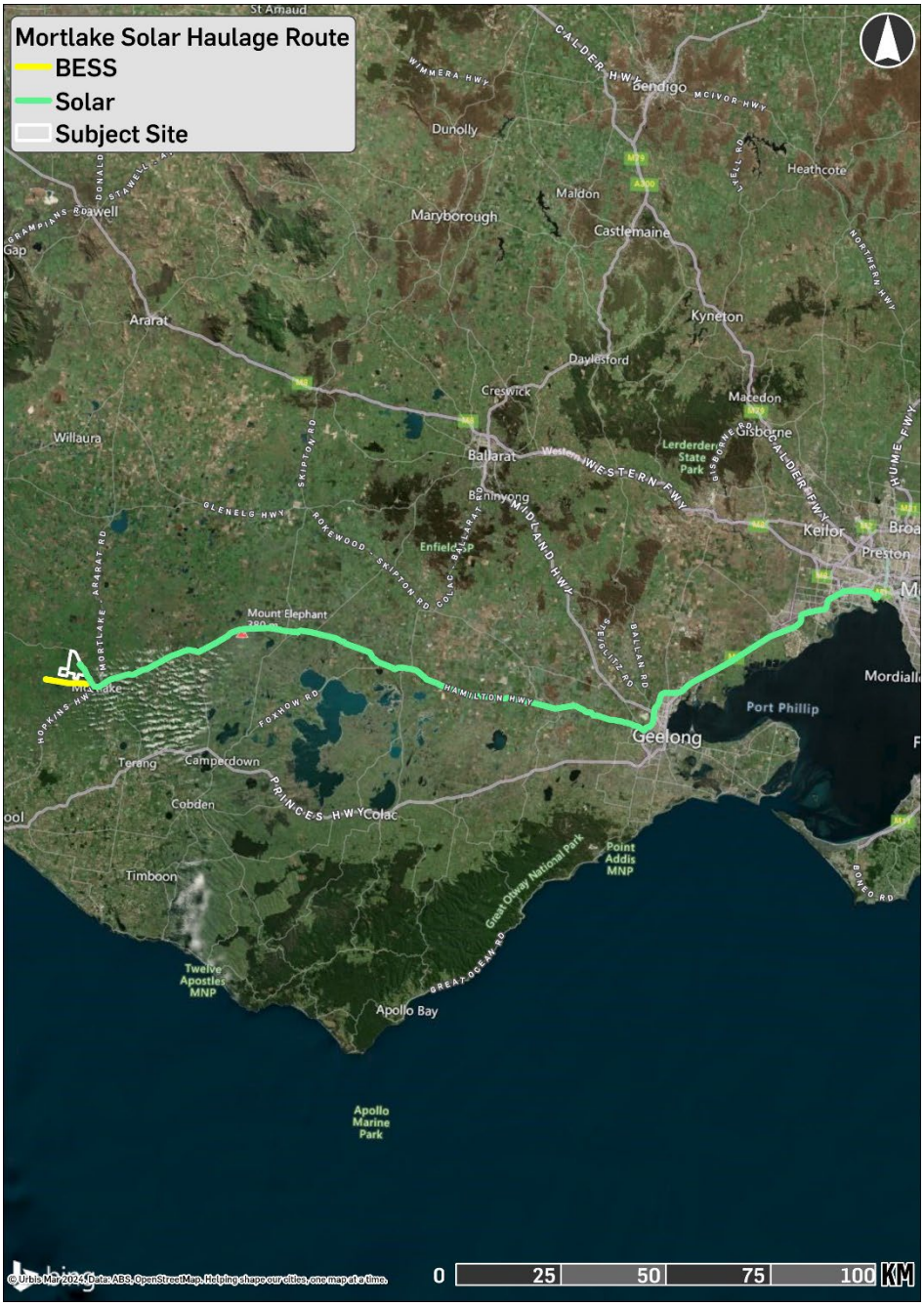
With the exception of Connewarren Lane (a Council-controlled road), all other roads on the above route are governed by DTP. In addition, it is noted that all these roads are pre-approved Over-Dimensional (OD) routes. However, some roads and crossings on the haulage route have conditional approvals, requiring permissions from the over-dimension loads team and alterations in the haulage routes might be required. All permits for transporting all OD vehicles must be applied through the National Heavy Vehicle Regulator(NHVR).

OSOM vehicles used for transformer delivery will require suitable traffic management (including support vehicles) to the satisfaction of the relevant authority. It is anticipated that some oversized vehicle movements will be required during construction to deliver solar farm and substation infrastructure. In addition, the

construction of demountable buildings, which have a width of approximately five metres, may require additional OSOM movements.

Due to the oversized vehicles' size and the road network's nature, some modifications may be required to support vehicle manoeuvrability. This will be managed by the construction contractor and all required temporary network modifications will be outlined prior to the issue of a Construction Certificate.

Figure 8 Haulage routes



Source: Urbis

4.5. INTERNAL CONSTRUCTION VEHICLE CIRCULATION

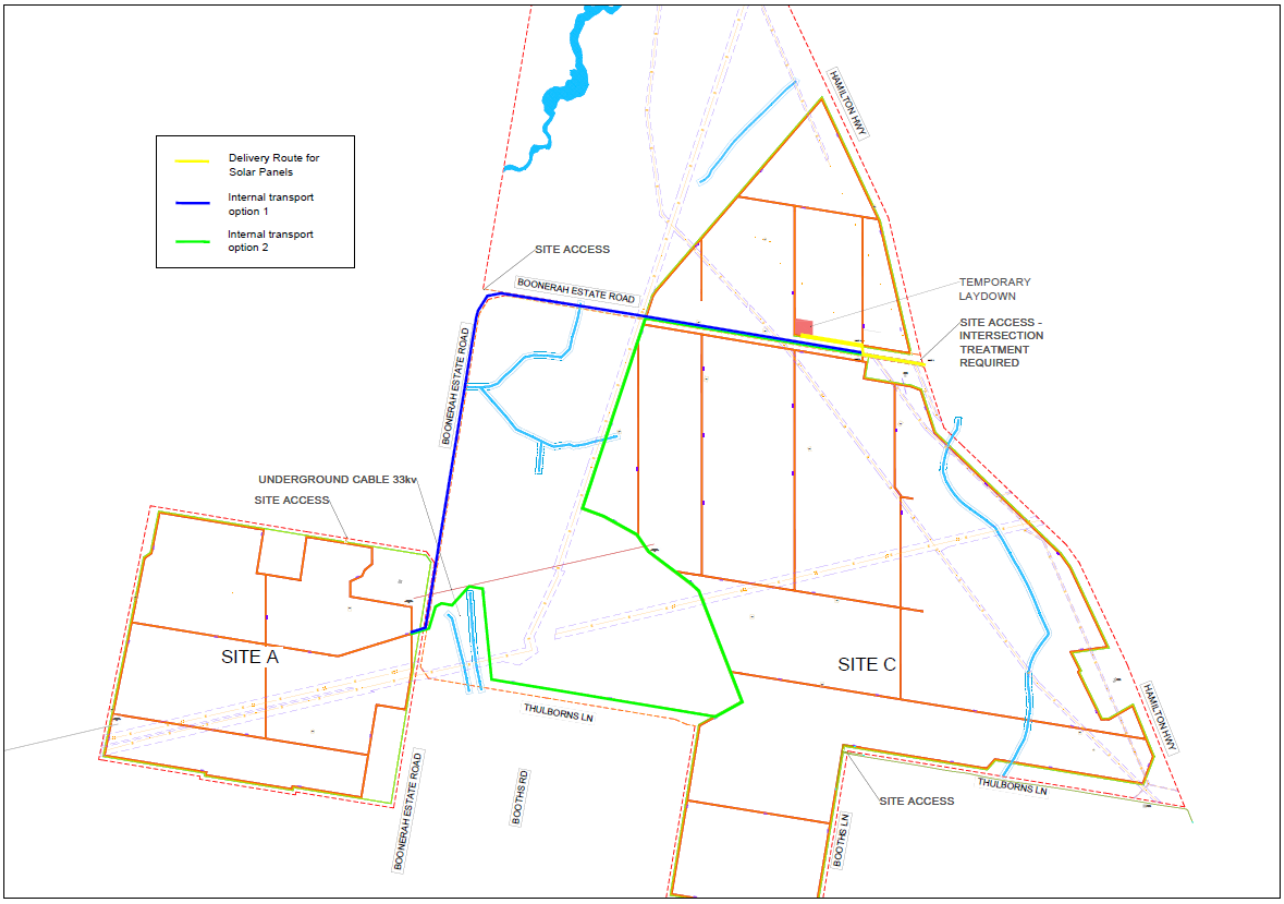
All solar associated deliveries to the site will be delivered from Boonerah Estate Road via the Hamilton Highway. Vehicles will then access the laydown area as discussed in Section 4.3 of this report. These larger delivery vehicles will then return to the Hamilton Highway. To move panels and construction equipment from

this laydown area to other parts of the site, vehicles to the nature of a 10 metre long flatbed truck will be used. In particular, access between the laydown area and Site A (western portion of the site) will need to travel approximately six kilometres on either an internal road network to be constructed or utilising the existing road network. Two options are presented to achieve this

- Option 1, involves vehicle picking up panels from the laydown area and travelling west along Boonerah Estate Road before accessing Site A.
- Option 2, involves constructing one of the internal roads early on in construction to provide a connection between the laydown area and Site A.

Figure 9 shows the route options

Figure 9 Internal panel delivery route options



Source: Urbis

4.6. MITIGATION MEASURES

4.6.1. Dilapidation Survey

Before starting the construction, the contractor will conduct a dilapidation survey of the nearby roads within a two-kilometre radius of the site. This survey will involve creating a written report and taking photos of any existing damage to public infrastructure. The report will cover the condition of table drains, gravel road surfaces, seals, signs, and other public infrastructure in front of the property, neighbouring properties, and along the designated haulage route as well as the potential panel movement route Option 1 along Boonerah Estate Road.

During and immediately after construction, continued monitoring of the road conditions shall be made by the site management team and a nominated representative. If any significant damage is caused by the developer or its subcontractors, the site manager shall engage a contractor to repair the roads.

The log of photographic evidence shall be used as a reference in determining the extent of road dilapidation. Unless identified in the written report, any damage to infrastructure identified post-construction will be attributed to the development.

It should be noted that the ultimate nature of the dilapidation surveys will be subject to agreement with DTP and Council. A copy of the road dilapidation report shall be submitted to DTP / Council prior to the commencement of works and once construction works are completed.

4.6.2. Construction Vehicle Movements

During construction, all vehicles and machinery associated with the construction of the site will be contained within the site. All vehicles associated with construction works, including the delivery and removal of materials and debris, will use the haulage route identified in **Section 4.4**. Appropriate traffic control measures will be taken to notify other road users of large vehicles entering and exiting the site. All appropriate mitigation measures will be taken to support the use of oversized vehicles including the use of support cars and pilots. An oversized / over-mass vehicle permit may need to be obtained from the National Heavy Vehicle Regulator.

The use of mobile cranes will be required during the unloading of batteries associated with the BESS, which will take place only within the site. The contractor will further outline the nature and method of unloading the batteries.

To minimise disruptions and congestion, the project will schedule the movement of oversized vehicles outside of peak traffic periods, plan routes that avoid built-up areas during daytime peak traffic, and ensure convoy length or platoons are effectively minimised.

4.6.3. Construction Worker Trips

In order to minimise the impact of construction worker trips on the surrounding road network, all construction workers are to travel to and from the site via a shuttle bus. An estimated 15 shuttle buses will be required to transport construction workers to and from the site. It is likely that these staff members will be based in Mortlake during the construction phase of the project. Site managers may occasionally travel to the site using a utility vehicle.

4.6.4. Nature of Loads and Monitoring

Traffic monitoring during the construction phase will include daily pre-start visual inspections of vehicles to ensure that the vehicles are in good working order and follow manufacturer specifications. Noise controls (efficient silencers, low-noise mufflers, etc.) must be installed and maintained (where reasonable and practicable).

Deliveries to the site will be tracked in a register to ensure that allowable limits outlined in the conditions are maintained.

Civil works vehicles, including standard construction materials, concrete, prefabricated components, and steel reinforcement, shall cover their loads.

Street sweeping shall be undertaken following sediment tracking from the site if required. Soil is loaded onto trucks using machinery such as diggers, loaders and excavators. All trucks used to transport contaminated soil are licenced by the Environmental Projection Authority (EPA). All trucks removing soil and material from the construction work site are covered to prevent dirt and dust from escaping. The project also aims to minimise the length of time that spoil is stockpiled on site.

No building materials, waste, machinery, or related matter shall be stored on the road. All loading and unloading of vehicles shall occur within the boundaries of the site. Truck tyres will need to be washed prior to entering the public roadway from the site.

The construction contractor is obligated to manage any debris or damage to roads in which vehicles associated with construction travel along. Mitigation measures such as sediment tracking, dust suppression and wheel cleaning will be implemented to ensure debris from the site is managed. Remediation to public

roads if required due to damage caused by vehicles associated with the site will be undertaken by the proponent.

4.6.5. Community Consultation

The Project Manager will consult with and notify the surrounding property owners and any affected businesses of the proposed works and the proposed traffic management strategy.

A project-specific communication strategy will be developed by the Contractor to determine the most effective way of notifying all affected parties. Where required, consultation will also be undertaken with the responsible road authority to determine suitable communication methods.

Possible communication methods that could be utilised are as follows

- Mail drop to local residents.
- Email lists.
- Variable Message Signage.
- Noticeboard/Poster signage.
- Media advertisement (radio/newspaper).
- Website.

5. TRANSPORT IMPACT ASSESSMENT

5.1. ACCESS AND SERVICING

There is an access driveway to the internal road easement from Boonerah Estate Road and Thulborns Lane, as shown in **Figure 6**. Boonerah Estate Road will be the primary access point for the solar farm component of the development, with secondary access if required from Thulborns Lane. The BESS component of the development will be accessed from Connewarren Lane via a driveway. The BESS site and solar site do not have any internal road connection to each other and vehicular access between the two is via the surrounding public road network.

5.2. VEHICLE MANOEUVRABILITY

A swept path test of the CFA fire truck accessing the site has been undertaken. This swept path test shows the vehicle accessing the solar farm from the Boonerah Estate Road and Thulborns Lane as well as the vehicle accessing the BESS from Connewarren Lane. The vehicle manoeuvrability swept paths are included in **Appendix B**.

5.3. SIGHT DISTANCE

The safe intersection sight distance (SISD) is defined in Section 3.2.2 of the Austroads Guide to Road Design, Part 4A, Signalised and Un-signalised intersections, as the minimum standard to be provided at an intersection with a major road. SISD assessment was undertaken at the following intersections

- Boonerah Estate Road / Hamilton Highway.
- Thulborns Lane / Hamilton Highway.
- Connewarren Lane / Hamilton Highway.

Figure 10 Safe intersection sight distance (SISD) formula

$$SISD = \frac{D_T \times V}{3.6} + \frac{V^2}{254 \times (d + 0.01 \times a)}$$

where

SISD	=	safe intersection sight distance (m)
D_T	=	decision time (sec) = observation time (3 sec) + reaction time (sec) – refer to *AGRD Part 3* (Austroads 2016b) for a guide to values
V	=	operating (85th percentile) speed (km/h)
d	=	coefficient of deceleration – refer to Table 3.3 and *AGRD Part 3* for a guide to values
a	=	longitudinal grade in % (in direction of travel: positive for uphill grade, negative for downhill grade)

Source – Guide to Road Design Part 4A: Unsignalized and Signalised Intersections

The SISD is assessed based on the following parameters

- An observation time of 3 seconds.
- A reaction time of 2.5 seconds.
- Deceleration coefficients for the purpose of SISD calculations are 0.46 for light vehicles and 0.24 for heavy vehicles.
- Driver eye height is 2.4m for trucks and 1.1m for cars.
- Speed zone of 100 km / h on Hamilton Highway North of Connewarren Lane along the subject section being assessed.

- Speed zone of 80 km / h from approximately 300 metres north of Connewarren Lane to the intersection of the Hamilton Highway and Hopkins Highway along the subject section being assessed.

The results are summarised in **Table 6**.

Table 6 Safe intersection sight distance requirements

Location	Vehicle Type	Design Speed	Decision time	Grade	Required SISD
Boonerah Estate Road / Hamilton Highway	Truck	100 km / h	3.0 + 2.5 s	0 %	316 m
	Car	100 km /h	3.0 + 2.5 s	0 %	238 m
Thulborns Lane / Hamilton Highway	Truck	100 km / h	3.0 + 2.5 s	0 %	316 m
	Car	100 km /h	3.0 + 2.5 s	0 %	238 m
Connewarren Lane / Hamilton Highway	Truck	80 km / h	3.0 + 2.5 s	0 %	227 m
	Car	80 km /h	3.0 + 2.5 s	0 %	176 m

Source – Urbis

All of these critical intersections have satisfactory sight distance requirements for vehicles turning out of the minor roads and onto the Highway. This is demonstrated in **Figure 11**, **Figure 12** and **Figure 13**.

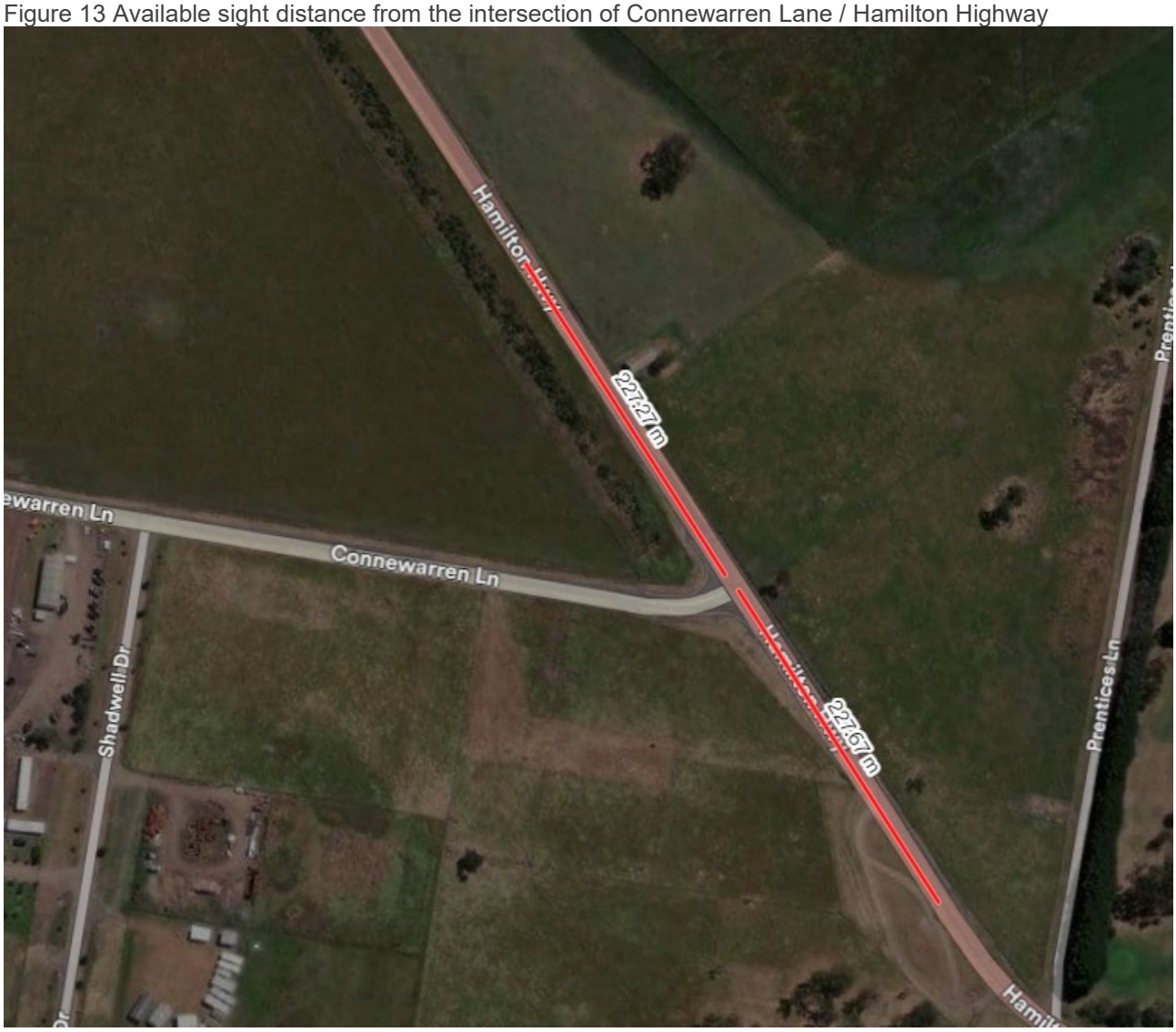
Figure 11 Available sight distance from the intersection of Boonerah Estate Road / Hamilton Highway

Source: Urbis

Figure 12 Available sight distance from the intersection of Thulborns Lane / Hamilton Highway

Source: Urbis

Figure 13 Available sight distance from the intersection of Connewarren Lane / Hamilton Highway



Source: Urbis

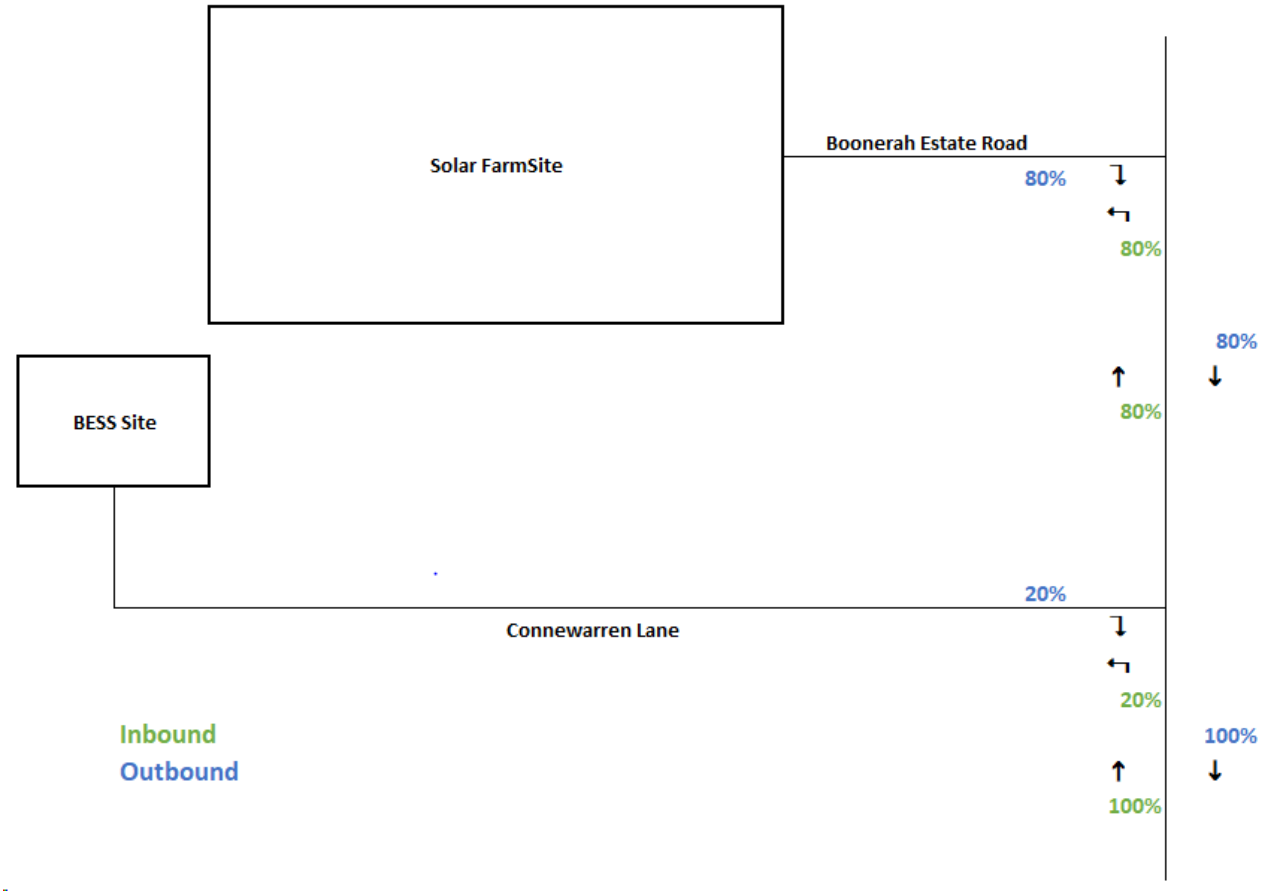
5.4. TRIP GENERATION

During the operational phase of the development, a maximum of 20 staff will be on-site at one time. While it is unknown at this stage how many of these staff would drive to the site individually, a conservative car occupancy ratio of two persons per vehicle has been adopted. Based on this assumption a maximum of 10 vehicles will be accessing the site across the day, resulting in 20 vehicle movements. These vehicles will be accessing the site from both the Hamilton Highway and Connewarren Lane.

5.5. TRIP DISTRIBUTION

During the operational phase of the development, trips accessing and egressing the site will be split 20 per cent accessing the BESS site via Connewarren Lane and 80 per cent accessing the solar farm via the Hamilton Highway. **Figure 14** shows the trip distribution for vehicles accessing the site. Note that green text represents inbound trips while blue text represents outbound trips.

Figure 14 Trip distribution



Source: Urbis

5.6. EMERGENCY VEHICLE ACCESS

The CFA *Design Guidelines and Model Requirements for Renewable Energy Facilities (2022)* outlines design requirements for solar farms regarding access for emergency vehicles. *Section 6.2.1 Emergency Vehicle Access* of the CFA design guidelines outlines the following requirements for emergency vehicle access at a Solar Farm

a) Construction of a four (4) metre perimeter road within the perimeter fire break.

b) Roads must be of all-weather construction and capable of accommodating a vehicle of fifteen (15) tonnes.

c) Constructed roads should be a minimum of four (4) metres in trafficable width with a four (4) metre vertical clearance for the width of the formed road surface.

d) The average grade should be no more than 1 in 7 (14.4% or 8.1°) with a maximum of no more than 1 in 5 (20% or 11.3°) for no more than fifty (50) metres.

e) Dips in the road should have no more than a 1 in 8 (12.5% or 7.1°) entry and exit angle.

f) Roads must incorporate passing bays at least every 600 metres, which must be at least twenty (20) metres long and have a minimum trafficable width of six (6) metres. Where roads are less than 600 metres long, at least one passing bay must be incorporated.

g) Road networks must enable responding emergency services to access all areas of the facility, including fire service infrastructure, buildings, and battery energy storage systems and related infrastructure.

h) The provision of at least two (2) but preferably more access points to the facility, to ensure safe and efficient access to and egress from areas that may be impacted or involved in fire. The number of access points must be informed through a risk management process.

The design of the solar farm incorporates the following items to support the compliance of the proposed development with the CFA guidelines

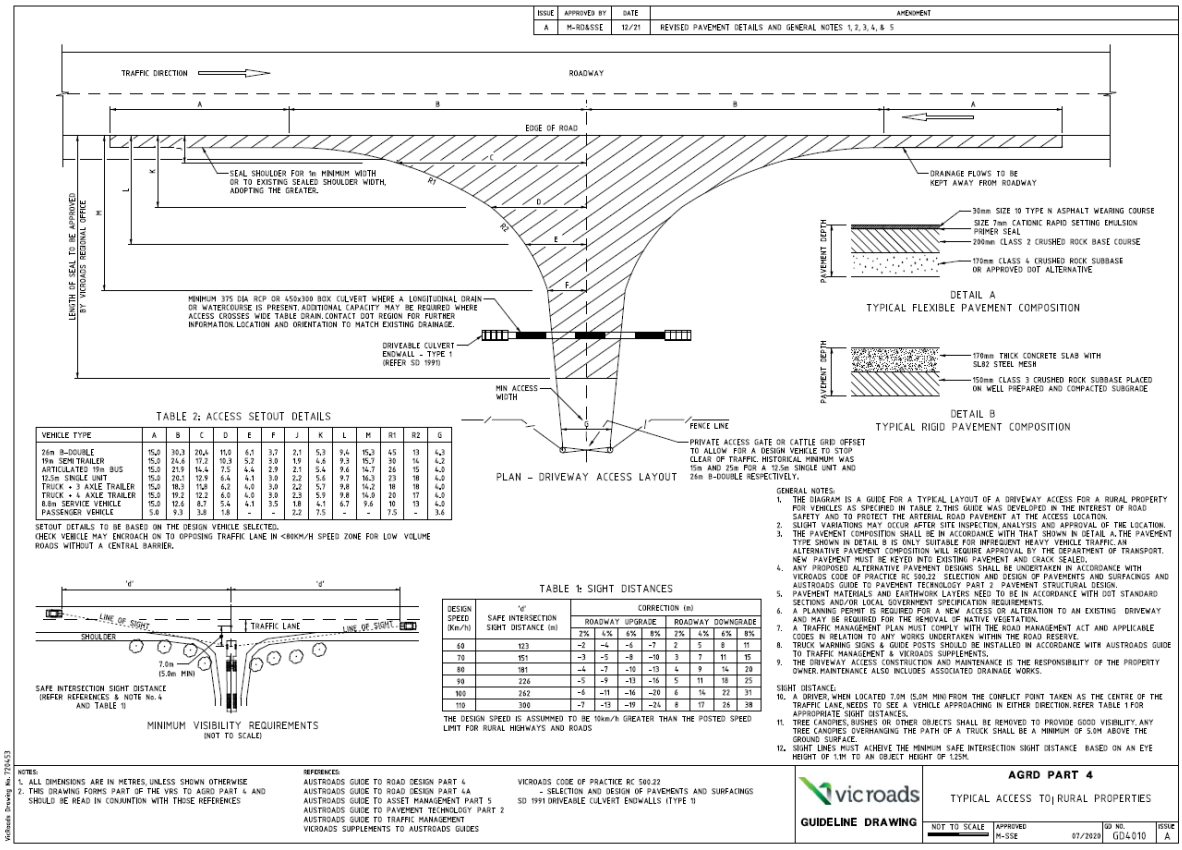
- A perimeter road that is at least four metres wide with a passing bay of six metres wide and 20 metres long at least every 600 metres.
- Gravel perimeter roads will be constructed to accommodate a 15-tonne vehicle during all weather conditions.
- The maximum grade does not exceed one in five and the average grade does not exceed one in seven.
- The internal road network and perimeter roads are accessible from access points off the Hamilton Highway, Boonerah Estate Road, Thulborns Lane, Hardys Lane and Connewarren Lane. Given the size of the site, 12 access points from the surrounding road network are provided.
- The internal road network allows for access to all areas of the site.
- The manoeuvrability of the CFA fire truck has been tested in **Section 5.2** of this report, showing the vehicle can successfully access and egress the site effectively.

5.7. ACCESS VIA BOONERAH ESTATE ROAD

Boonerah Estate Road currently classified as a Local Access Road providing access to a small number of rural properties. Boonerah Estate Road therefore functions more like a private access road rather than a Local Access Road.

To facilitate access via Boonerah Estate Road and the Hamilton Highway / Boonerah Estate Road intersection, it is proposed to adopt the VicRoads Typical Access to Rural Properties Guideline drawing for improvements to the Hamilton Highway / Boonerah Estate Road intersection as shown in **Figure 15**.

Figure 15 Hamilton Highway / Boonerah Estate Road intersection proposal - VicRoads guideline drawing for typical access to rural properties



Source: VicRoads Access Management Policies

The above intersection design is considered appropriate given the good available SISD at the intersection, the travel routes associated with the development of the subject site, and the negligible traffic volumes currently turning in/out of Boonerah Estate Road at the intersection.

6. CONCLUSION

Based on the assessment presented in this report, the key findings are summerised as follows

- Access to the solar energy facility will be from via Boonerah Estate Road, Hardys Lane and Thulborns Lane, with access to the BESS via Connewarren Lane. Boonerah Estate Road currently operates more like a driveway than a road due to the low number of vehicles using it. To support the development, the intersection of Boonerah Estate Road and Hamilton Highway will be upgraded to support the traffic generated by the proposed development during the operational phase.
- During the peak construction phase, it is estimated that around 300 construction workers will be actively working on-site each day, resulting in approximately 167 vehicle movements daily. During the peak construction phase, it is anticipated that there will be a maximum of 53 vehicle movements in the peak hour.
- All construction deliveries will be via the Hamilton Highway with deliveries arriving in the Port of Melbourne. All construction workers will be based in Mortlake for the duration of the construction and will be driven to the site via shuttle bus.
- During the operational phase, it is anticipated that 10 vehicles will be generated in a worst case scenario (resulting in 20 vehicle movements total), with 80 per cent of these accessing the site via Boonerah Estate Road. The low number of vehicles will have a negligible impact on the surrounding road network once the upgrade to Boonerah Estate Road and Hamilton Highway intersection is completed.

Based on the above, the proposed development can be supported and will have a negligible impact on the surrounding road networking during the operation phase. Impacts on the surrounding road network can be effectively managed based on the construction mitigation measures outlined in this report.

DISCLAIMER

This report is dated 3 May 2024 and incorporates information and events up to that date only and excludes any information arising, or event occurring, after that date that may affect the validity of Urbis Ltd **(Urbis)** opinion in this report. Urbis prepared this report on the instructions, and for the benefit only, of BrightNight Power Pty Ltd **(Instructing Party)** for the Purpose of Mortlake Energy Hub Transport Impact Assessment **(Purpose)** and not for any other purpose or use. To the extent permitted by applicable law, Urbis expressly disclaims all liability, whether direct or indirect, to the Instructing Party which relies or purports to rely on this report for any purpose other than the Purpose, and to any other person which relies or purports to rely on this report for any purpose whatsoever (including the Purpose).

In preparing this report, Urbis was required to make judgements that may be affected by unforeseen future events, the likelihood and effects of which are not capable of precise assessment.

All surveys, forecasts, projections and recommendations contained in or associated with this report are made in good faith and on the basis of information supplied to Urbis at the date of this report, and upon which Urbis relied. Achievement of the projections and budgets set out in this report will depend, among other things, on the actions of others over which Urbis has no control.

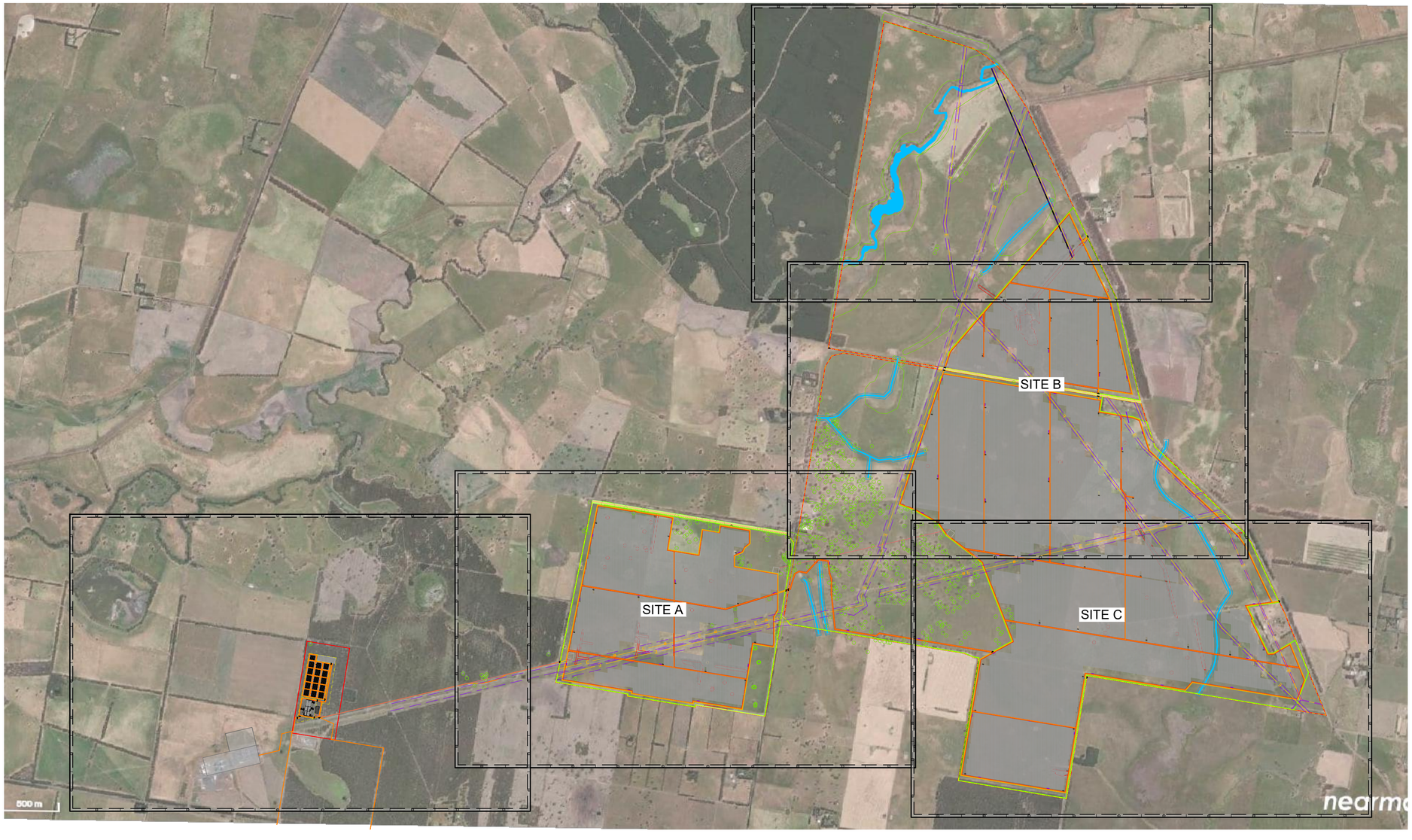
In preparing this report, Urbis may rely on or refer to documents in a language other than English, which Urbis may arrange to be translated. Urbis is not responsible for the accuracy or completeness of such translations and disclaims any liability for any statement or opinion made in this report being inaccurate or incomplete arising from such translations.

Whilst Urbis has made all reasonable inquiries it believes necessary in preparing this report, it is not responsible for determining the completeness or accuracy of information provided to it. Urbis (including its officers and personnel) is not liable for any errors or omissions, including in information provided by the Instructing Party or another person or upon which Urbis relies, provided that such errors or omissions are not made by Urbis recklessly or in bad faith.

This report has been prepared with due care and diligence by Urbis and the statements and opinions given by Urbis in this report are given in good faith and in the reasonable belief that they are correct and not misleading, subject to the limitations above.

APPENDIX A – PROPOSED DEVELOPMENT

MORTLAKE ENERGY HUB
SITE PLAN



PROJECT DETAILS	
BOUNDARY AREA	1900 Ha
PANEL AREA	1060 Ha (56% of site)
GATES	19
DC CAPACITY	360MWp
AC CAPACITY	300MW
PV MODULES	795,762
STRING TRACKERS	8455
SOLAR INVERTER SKID	44
BESS INVERTER SKID	78
ROW DISTANCE	7.25m
SECURITY FENCE LENGTH	28.8km

GENERAL LEGEND

- DEVELOPMENT BOUNDARY
- PERIMETER FENCE
- SECURITY FENCE
- UNDERGROUND CABLE 33kV
- ACCESS ROADS
- PUBLIC ROADS IN RESERVE
- EXTERNAL VEGETATION BUFFER (5m)
- INTERNAL FIRE SAFETY BUFFER (10m)
- EXISTING EASEMENT POWERLINES SET WITHIN
- OVERLAND FLOW PATH
- PASSING BAYS
- GATES
- 45,000L WATER TANK (11) (W.T)
- 288,00L WATER TANK (1) (W.T)
- SOLAR INVERTER (44) (INV. SKID)
- EXISTING VEGETATION - REMOVED
- EXISTING VEGETATION - RETAINED

2-STRING TRACKER (1251)
- 66 PANELS

3-STRING TRACKER (7204)
- 99 PANELS

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URBIS

PROJECT
MORTLAKE ENERGY HUB
SITE PLAN
HAMILTON HIGHWAY, MORTLAKE 3272
VICTORIA, AUSTRALIA

Level 10, 477 Collins Street | Melbourne VIC 3000 AUSTRALIA | +61 3 8663 4888 | URBIS Pty Ltd | ABN 50 105 256 228

KEY PLAN

REV	DESCRIPTION	DWN	CHK	DATE
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D	FOR REVIEW	AF	BB	11.04.2024
C	FOR REVIEW	OS	BB	18.03.2024
B	FOR REVIEW	AF	BB	28.02.2024
A	INTERNAL DRAFT FOR REVIEW	AF	BB	13.12.2023

PROJECT DIRECTOR: BRENTON BEGGS

CLIENT
MORTLAKE ENERGY HUB

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ISSUE
FOR APPROVAL

PROJECT NO.
P0040707

SCALE

NORTH

DRAWING TITLE
000-CS COVERSHEET 00
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DRAWING NO.
000-CS

REVISION
E

PROJECT DETAILS	
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PANEL AREA	1060 Ha (56% of site)
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BESS INVERTER SKID	78
ROW DISTANCE	7.25m
SECURITY FENCE LENGTH	28.8km

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- SECURITY FENCE
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- EXISTING VEGETATION - RETAINED
- 2-STRING TRACKER (1251) - 66 PANELS
- 3-STRING TRACKER (7204) - 99 PANELS

TEMPORARY LAYDOWN

PROPOSED BESS

PROPOSED SUBSTATION

SITE ACCESS

PROPOSED EXTENSION

EXISTING SUBSTATION

UNDERGROUND CABLE 33kv

288,000L WATER TANK

SITE ACCESS

SITE ACCESS

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MORTLAKE ENERGY HUB

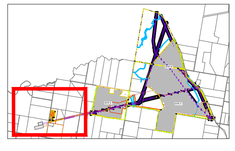
SITE PLAN

HAMILTON HIGHWAY, MORTLAKE 3272

VICTORIA, AUSTRALIA

Level 10, 477 Collins Street | Melbourne VIC 3000 AUSTRALIA | +61 3 8663 4888 | URBIS Pty Ltd | ABN 50 105 256 228

KEY PLAN



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B	FOR REVIEW	AF	BB	28.02.2024
A	INTERNAL DRAFT FOR REVIEW	AF	BB	13.12.2023

PROJECT DIRECTOR: BRENTON BEGGS

CLIENT

MORTLAKE ENERGY HUB

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DRAWING TITLE

001-CS DETAIL PLAN 01

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ISSUE

FOR APPROVAL

PROJECT NO.

P0040707

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NORTH

DRAWING NO.

001-CS

REVISION

E

PROJECT DETAILS	
BOUNDARY AREA	1900 Ha
PANEL AREA	1060 Ha (56% of site)
GATES	19
DC CAPACITY	360MWp
AC CAPACITY	300MW
PV MODULES	795,762
STRING TRACKERS	8455
SOLAR INVERTER SKID	44
BESS INVERTER SKID	78
ROW DISTANCE	7.25m
SECURITY FENCE LENGTH	28.8km

GENERAL LEGEND

- DEVELOPMENT BOUNDARY
- PERIMETER FENCE
- SECURITY FENCE
- UNDERGROUND CABLE 33kV
- ACCESS ROADS
- PUBLIC ROADS IN RESERVE
- EXTERNAL VEGETATION BUFFER (5m)
- INTERNAL FIRE SAFETY BUFFER (10m)
- EXISTING EASEMENT - POWERLINES SET WITHIN
- OVERLAND FLOW PATH
- PASSING BAYS
- GATES
- 45,000L WATER TANK (11)
- 288,00L WATER TANK (1)
- SOLAR INVERTER (44)
- EXISTING VEGETATION - REMOVED
- EXISTING VEGETATION - RETAINED

2-STRING TRACKER (1251) - 66 PANELS

3-STRING TRACKER (7204) - 99 PANELS

UNDERGROUND CABLE 33kv

SITE ACCESS

HARDYS LN

THULBORNS LN

SITE ACCESS

SITE ACCESS

BOONERAH ESTATE ROAD

BOOTHS RD

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PROJECT

MORTLAKE ENERGY HUB

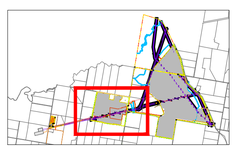
SITE PLAN

HAMILTON HIGHWAY, MORTLAKE 3272

VICTORIA, AUSTRALIA

Level 10, 477 Collins Street | Melbourne VIC 3000 AUSTRALIA | +61 3 8663 4888 | URBIS Pty Ltd | ABN 50 105 256 228

KEY PLAN



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B	FOR REVIEW	AF	BB	28.02.2024
A	INTERNAL DRAFT FOR REVIEW	AF	BB	13.12.2023

PROJECT DIRECTOR: BRENTON BEGGS

CLIENT

MORTLAKE ENERGY HUB

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DRAWING TITLE

002-CS DETAIL PLAN 02

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PROJECT NO.

P0040707

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DRAWING NO.

002-CS

REVISION

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PROJECT DETAILS	
BOUNDARY AREA	1900 Ha
PANEL AREA	1060 Ha (56% of site)
GATES	19
DC CAPACITY	360MWp
AC CAPACITY	300MW
PV MODULES	795,762
STRING TRACKERS	8455
SOLAR INVERTER SKID	44
BESS INVERTER SKID	78
ROW DISTANCE	7.25m
SECURITY FENCE LENGTH	28.8km

GENERAL LEGEND

- DEVELOPMENT BOUNDARY
- PERIMETER FENCE
- SECURITY FENCE
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- ACCESS ROADS
- PUBLIC ROADS IN RESERVE
- EXTERNAL VEGETATION BUFFER (5m)
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- PASSING BAYS
- GATES
- 45,000L WATER TANK (11)
- 288,00L WATER TANK (1)
- SOLAR INVERTER (44)
- EXISTING VEGETATION - REMOVED
- EXISTING VEGETATION - RETAINED

2-STRING TRACKER (1251) - 66 PANELS

3-STRING TRACKER (7204) - 99 PANELS

HAMILTON HWY

EMERGENCY ACCESS

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URBIS

PROJECT

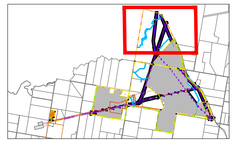
MORTLAKE ENERGY HUB

SITE PLAN

HAMILTON HIGHWAY, MORTLAKE 3272

VICTORIA, AUSTRALIA

Olderfleet, Level 10, 477 Collins Street | Melbourne VIC 3000 AUSTRALIA | +61 3 8663 4888 | URBIS Pty Ltd | ABN 50 105 256 228



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B	FOR REVIEW	AF	BB	28.02.2024
A	INTERNAL DRAFT FOR REVIEW	AF	BB	13.12.2023

PROJECT DIRECTOR: BRENTON BEGGS

CLIENT

MORTLAKE ENERGY HUB

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003-CS DETAIL PLAN 03

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ISSUE

FOR APPROVAL

PROJECT NO.

P0040707

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DRAWING NO.

003-CS

REVISION

E

PROJECT DETAILS	
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PANEL AREA	1060 Ha (56% of site)
GATES	19
DC CAPACITY	360MWp
AC CAPACITY	300MW
PV MODULES	795,762
STRING TRACKERS	8455
SOLAR INVERTER SKID	44
BESS INVERTER SKID	78
ROW DISTANCE	7.25m
SECURITY FENCE LENGTH	28.8km

GENERAL LEGEND

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- SECURITY FENCE
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- ACCESS ROADS
- PUBLIC ROADS IN RESERVE
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- GATES
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- SOLAR INVERTER (44)
- EXISTING VEGETATION - REMOVED
- EXISTING VEGETATION - RETAINED
- 2-STRING TRACKER (1251) - 66 PANELS
- 3-STRING TRACKER (7204) - 99 PANELS

SITE ACCESS

SITE ACCESS

BOONERAH ESTATE ROAD

TEMPORARY LAYDOWN AREA

BUSINESS SIGNAGE

PRIMARY SITE ACCESS - INTERSECTION TREATMENT REQUIRED

SITE ACCESS

BOONERAH ESTATE ROAD

1006274

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MORTLAKE ENERGY HUB

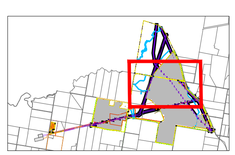
SITE PLAN

HAMILTON HIGHWAY, MORTLAKE 3272

VICTORIA, AUSTRALIA

Level 10, 477 Collins Street | Melbourne VIC 3000 AUSTRALIA | +61 3 8663 4888 | URBIS Pty Ltd | ABN 50 105 256 228

KEY PLAN



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A	INTERNAL DRAFT FOR REVIEW	AF	BB	13.12.2023

PROJECT DIRECTOR: BRENTON BEGGS

CLIENT

MORTLAKE ENERGY HUB

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DRAWING TITLE

004-CS DETAIL PLAN 04

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ISSUE

FOR APPROVAL

PROJECT NO.

P0040707

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REVISION

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PROJECT DETAILS	
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PANEL AREA	1060 Ha (56% of site)
GATES	19
DC CAPACITY	360MWp
AC CAPACITY	300MW
PV MODULES	795,762
STRING TRACKERS	8455
SOLAR INVERTER SKID	44
BESS INVERTER SKID	78
ROW DISTANCE	7.25m
SECURITY FENCE LENGTH	28.8km

URBIS

PROJECT

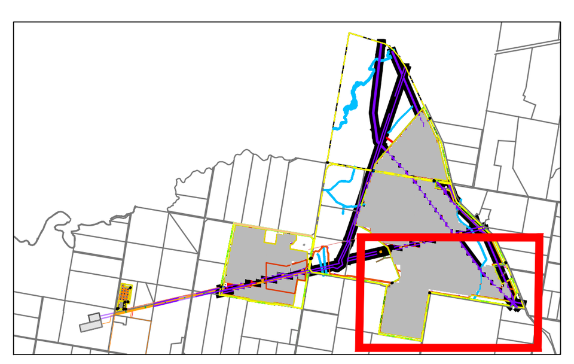
MORTLAKE ENERGY HUB

SITE PLAN

HAMILTON HIGHWAY, MORTLAKE 3272
VICTORIA, AUSTRALIA

Level 10, 477 Collins Street | Melbourne VIC 3000 AUSTRALIA | +61 3 8663 4888 | URBIS Pty Ltd | ABN 50 105 256 228

KEY PLAN



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B	FOR REVIEW	AF	BB	28.02.2024
A	INTERNAL DRAFT FOR REVIEW	AF	BB	13.12.2023

DISCLAIMER

PROJECT DIRECTOR: BRENTON BEGGS

CLIENT
MORTLAKE ENERGY HUB

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DRAWING TITLE
005-CS DETAIL PLAN 05
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ISSUE
FOR APPROVAL

PROJECT NO.
P0040707

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005-CS

REVISION
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APPENDIX B – SWEPT PATHS

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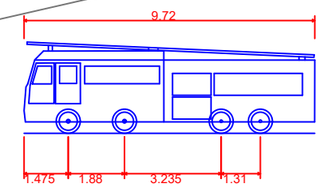
INSET A



Copy of Isuzu FYH300-350 8X4 Walk-In Rescue

Overall Length	9.720m
Overall Width	2.445m
Overall Body Height	3.048m
Min Body Ground Clearance	0.383m
Track Width	2.300m
Lock-to-lock time	4.00s
Curb to Curb Turning Radius	10.200m

INSET B

ALL DRAWINGS ARE DESIGNED TO BE PRINTED AND READ IN COLOUR

IT IS THE CONTRACTORS' RESPONSIBILITY TO PRINT DRAWINGS IN COLOUR TO AVOID ANY POTENTIAL DISCREPANCIES IF DRAWINGS ARE PRINTED IN BLACK AND WHITE

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MORTLAKE ENERGY HUB

Swept Paths for Isuzu FYH300-350 8 X 4 Walk-In Rescue

Angel Place, Level 8, 123 Pitt Street | Sydney NSW 2000 Australia | +61 2 8233 9900 | URBIS Pty Ltd | ABN 50 105 256 228

- Vehicle Body
- Line for vehicle Body
- 300mm Clearance line for vehicle Body

REV	DESCRIPTION	DWN	CHK	DATE
A	For client review			

BRIGHTNIGHT POWER

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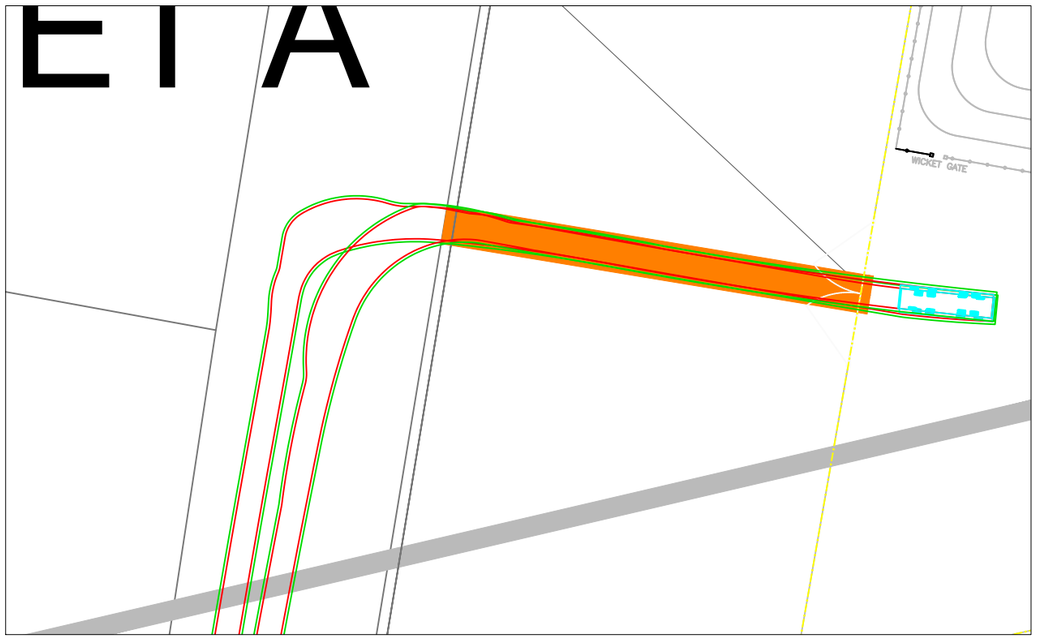
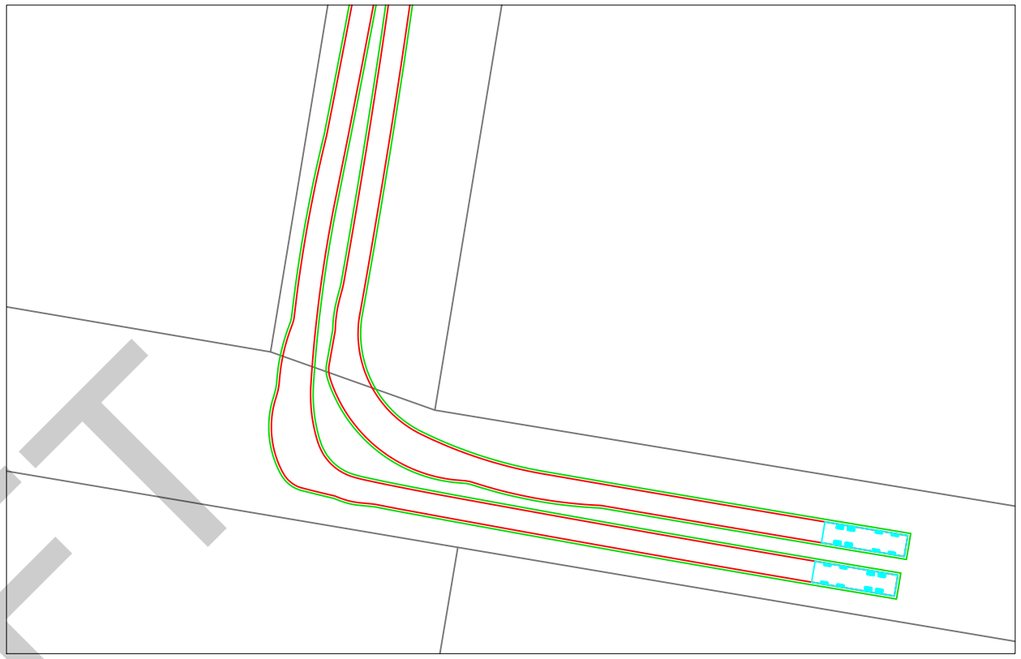


INSET B



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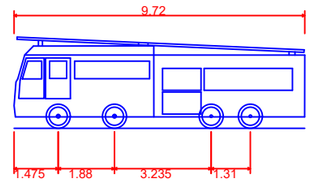
INSET A

INSET B

INSET C

EXISTING DWELLING



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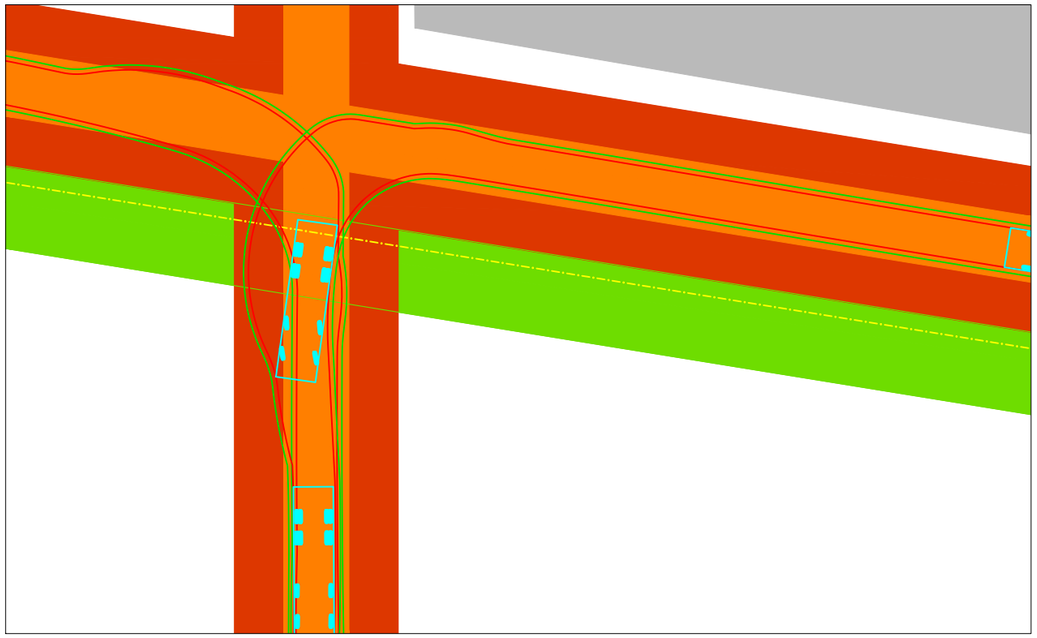
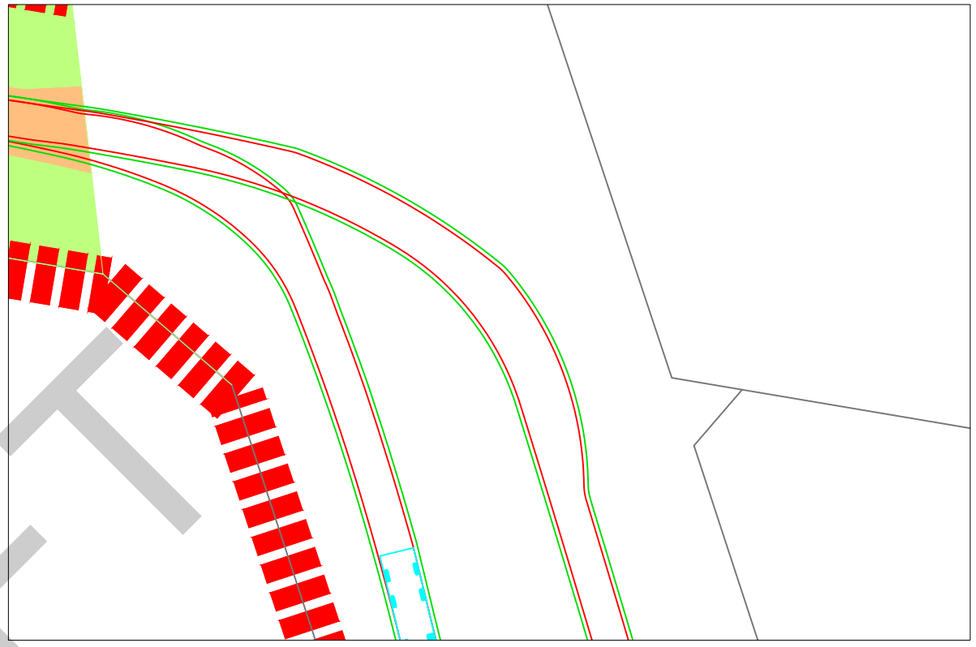
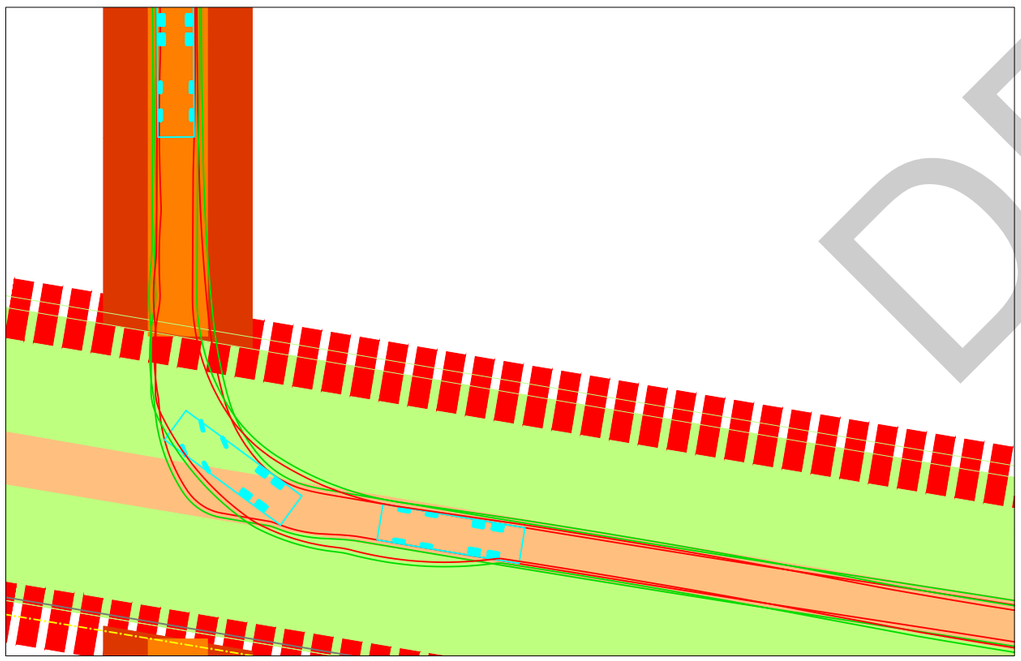


INSET C



INSET B



Vehicle Body

Line for vehicle Body

300mm Clearance line for vehicle Body

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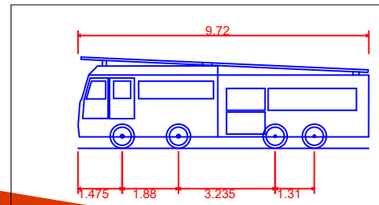

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