APPENDIX A UPDATED PROJECT DESCRIPTION

3. UPDATED PROJECT DESCRIPTION

3.1 Overview

The Project involves the construction, operation and commissioning of a wind farm with up to 64 wind turbine generators (WTG), together with associated and ancillary infrastructure, as detailed in Figure 3-1 to Figure 3-5.

The Project has been revised following exhibition of the EIS, in response to the outcomes of community consultation, regulatory and community submissions, engagement and ongoing design, and constructability assessments.

The Project consists of the following key components:

- up to 64 WTGs, each with:
  - a generating capacity of approximately 6 MW;
  - three blades mounted to a rotor hub on a tubular steel tower, with a combined height of blade and tower limited to a maximum tip height of 230 m AGL;
  - a gearbox and generator assembly housed in a nacelle; and
  - adjacent hardstands for use as crane pads and assembly and laydown areas.
- decommissioning of three current monitoring masts and installation of up to 10 new monitoring masts for power testing (the up to five previously proposed in the EIS and an additional five now proposed). Five of the new monitoring masts would be located close to a WTG location and five would be placed on the same location as a WTG prior to its installation and removed shortly before WTG installation. They would have a maximum height of approximately 150 m AGL, equivalent to the hub height of the installed WTGs. The exact number and locations of the monitoring masts would be defined at the detailed design stage. These masts assist in verifying the performance of the WTGs during operation of the Project;
- a 330 kV electrical substation, including transformers, insulators, switchyard and other ancillary equipment located between WTGs 20 and 26 or with an option north west of WTG 5 and 6;
- an operations and maintenance facility located either adjacent to the BESS / substation, or within the compound area between WTGs 55 and 56;
- a battery energy storage system (BESS) of approximately 100 MW/400 MWh (4 hours of storage of 100 MW of power) adjacent to the substation;
- aboveground and underground 33 kV electrical reticulation and fibre optic cabling connecting the WTGs to the onsite substation (following site access tracks where practicable) (connection lines);
- a 330 kV single circuit twin conductor overhead transmission line (transmission line) to connect the onsite substation to the existing 330 kV TransGrid Liddell to Tamworth overhead transmission line network, located approximately 24 km west of the substation (based on existing substation location). The eastern section of the transmission line may include multiple 33 kV overhead circuits subject to the final internal substation location that is selected;
- a switching station to connect the Project to the 330 kV TransGrid Liddell to Tamworth line and enable the Project to connect to the gird. The switching station would also be located approximately 24 km west of the substation, or approximately 13.5 km from the WTG Project Area (based on existing substation location);
- an internal private access road network (combined total length of approximately 40 km) connecting the WTGs and other Project infrastructure to the public road network; and
- upgrades to local roads and crossings required for the delivery, installation and maintenance of WTG components and associated materials and structures.

The following temporary elements would be required during construction of the Project:

- temporary site buildings and facilities for construction contractors / equipment, including two construction compounds, site offices, car parking and amenities for the construction workforce;
- two temporary concrete batching plants to supply concrete for WTG footings and substation construction works, with the option to use any construction laydown area with the exception of the laydown areas along transport route proposed;
- optional expansion of an existing Forestry Corporation of New South Wales (FCNSW) quarry within the Hanging Rock State Forest;
- earthworks for access roads, WTG platforms and foundations, potentially including controlled blasting in certain areas;
- potentially rock crushing facilities on-site for the generation of suitable aggregates for concrete batching and/or sized rock for access road and hardstand construction;
- up to seven laydown areas for the temporary storage of construction materials, plant, and equipment construction;
- external water supply for concrete batching and construction activities;
- the transport, storage and handling of fuels, oils and other hazardous materials for construction and operation of wind farm infrastructure; and
- beneficial reuse of materials won from the development footprint during cut and fill and WTG foundation excavation for use in roads, hardstands and foundation material.

The Project also includes the subdivision of land to create two new lots for:

- the substation, Operations & Maintenance (O&M) facility and battery storage; and
- the switchyard.

Please refer to the indicative plans contained in Figure 3-6 and Figure 3-7 showing the currently proposed lots the subject of the subdivision. These remain subject to further detailed design and discussions with the relevant landholder and TransGrid. The Project also includes any deemed subdivision, including subdivision for lease purposes, arising from the grant of leases for any other Project infrastructure components including turbines and the substation.

The key Project components are discussed in further detail below.

3.2 Project Components and Layout

3.2.1 Overview

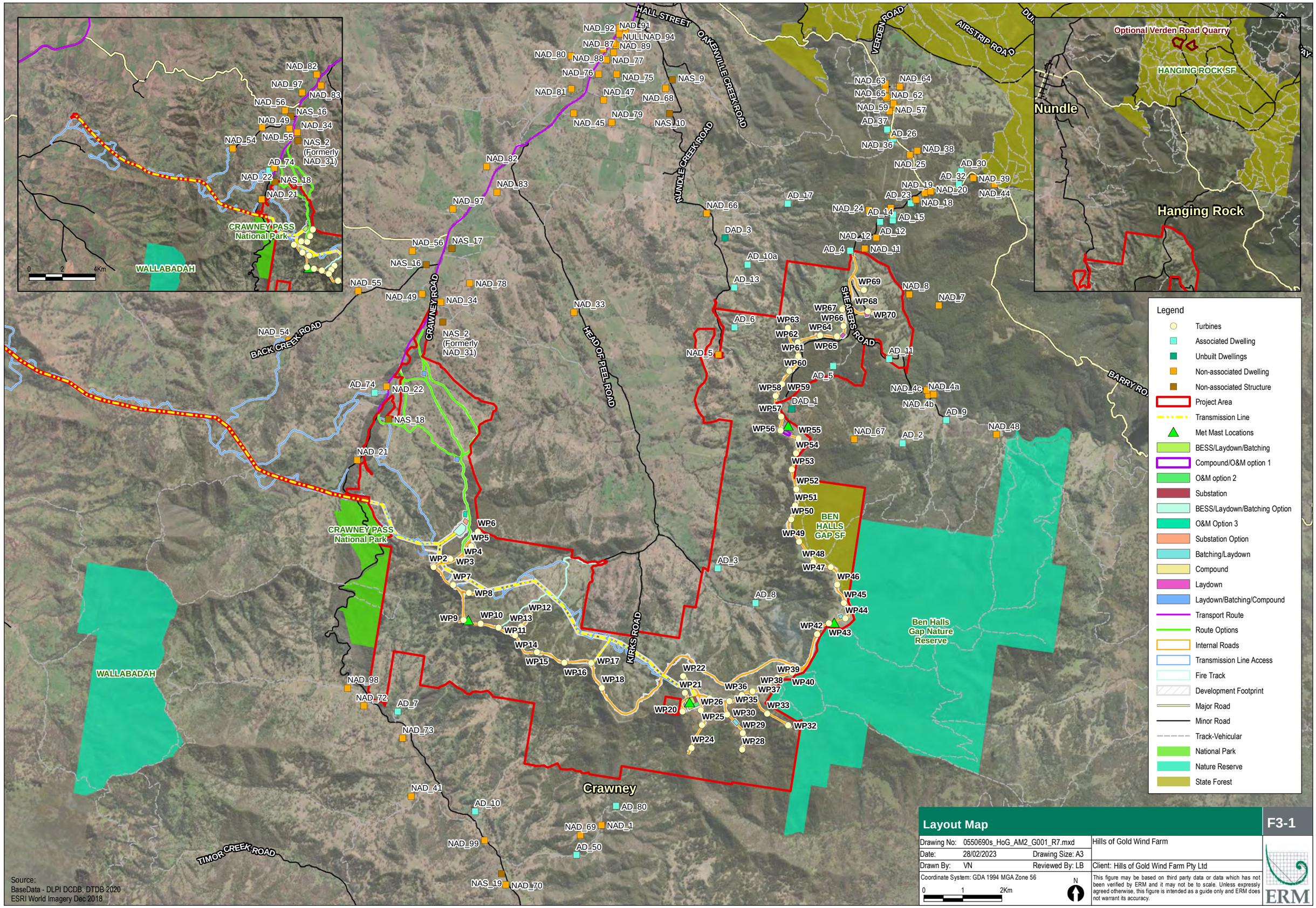
The proposed Project layout including the WTGs, access roads and supporting infrastructure is shown in Figure 3-1 to Figure 3-5. This layout remains subject to ongoing detailed design and relocation allowance subject to the restrictions outlined below.

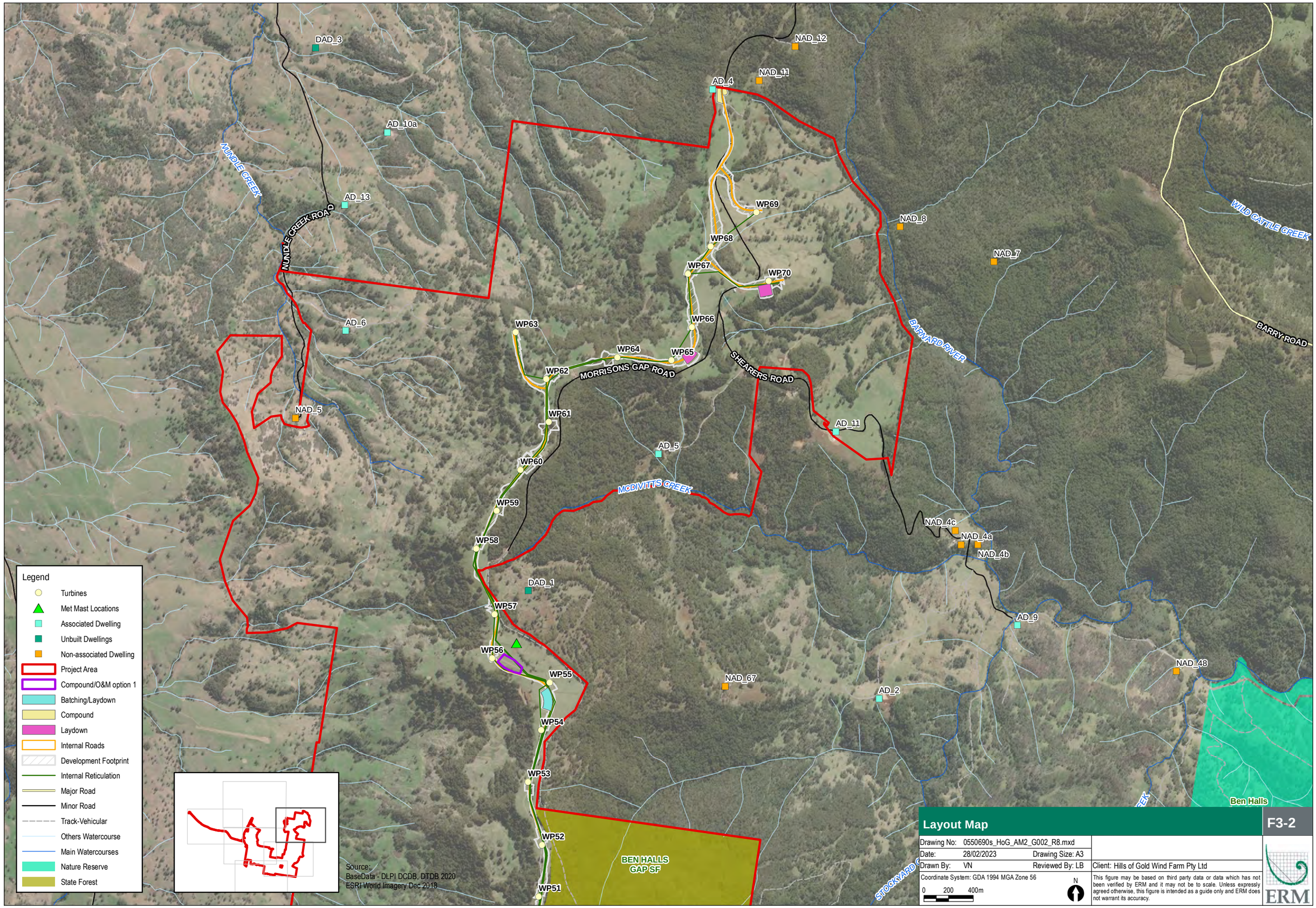
The proposed layout of Project infrastructure was developed based on consultation with the community and relevant land owners. The proposed layout is intended to:

- maximise exposure to the wind resource through suitable positioning of WTGs onsite including elevated locations along the ridgeline and suitable spacing between WTGs to account for wind sector management; and
- minimise environmental impacts and protect sensitive areas identified through specialists assessments undertaken for the EIS, and subsequent Amendment Reports.

3.2.2 Iterative Design Process

The layout of the Project and siting of WTGs and other key infrastructure components has been subject to an ongoing iterative design and siting process, taking into account issues raised during ongoing community engagement and in response to regulatory and community submissions as well as the findings of the further environmental assessments completed and considerations of civil engineering and wind generation constraints and opportunities. These findings are discussed in the EIS, Submissions Report, and subsequent Amendment Reports.


Optional Verden Road Quarry
HANGING ROCK SF
Nundle
Hanging Rock
HALL STREET
OAKENVILLE CREEK ROAD
NUNDLE CREEK ROAD
VERDEN ROAD
AIRSTRIP ROAD
CRAWNEY PASS National Park
WALLABADAH
BACK CREEK ROAD
CRAWNEY ROAD
HEAD OF PEEL ROAD
SHEARERS ROAD
KIRKS ROAD
TIMOR CREEK ROAD
BARRY RO
BEN HALLS GAP SF
Ben Halls Gap Nature Reserve
Crawney
0 2 4Km
Legend
Turbines
Associated Dwelling
Unbuilt Dwellings
Non-associated Dwelling
Non-associated Structure
Project Area
Transmission Line
Met Mast Locations
BESS/Laydown/Batching
Compound/O&M option 1
O&M option 2
Substation
BESS/Laydown/Batching Option
O&M Option 3
Substation Option
Batching/Laydown
Compound
Laydown
Laydown/Batching/Compound
Transport Route
Route Options
Internal Roads
Transmission Line Access
Fire Track
Development Footprint
Major Road
Minor Road
Track-Vehicular
National Park
Nature Reserve
State Forest
Source:
BaseData - DLPI DCDB, DTDB 2020
ESRI World Imagery Dec 2018
Layout Map
F3-1
Drawing No: 0550690s_HoG_AM2_G001_R7.mxd
Hills of Gold Wind Farm
Date: 28/02/2023
Drawing Size: A3
Drawn By: VN
Reviewed By: LB
Client: Hills of Gold Wind Farm Pty Ltd
Coordinate System: GDA 1994 MGA Zone 56
0 1 2Km
N
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM



Layout Map

F3-2

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Drawn By:	VN	Reviewed By: LB	Client: Hills of Gold Wind Farm Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

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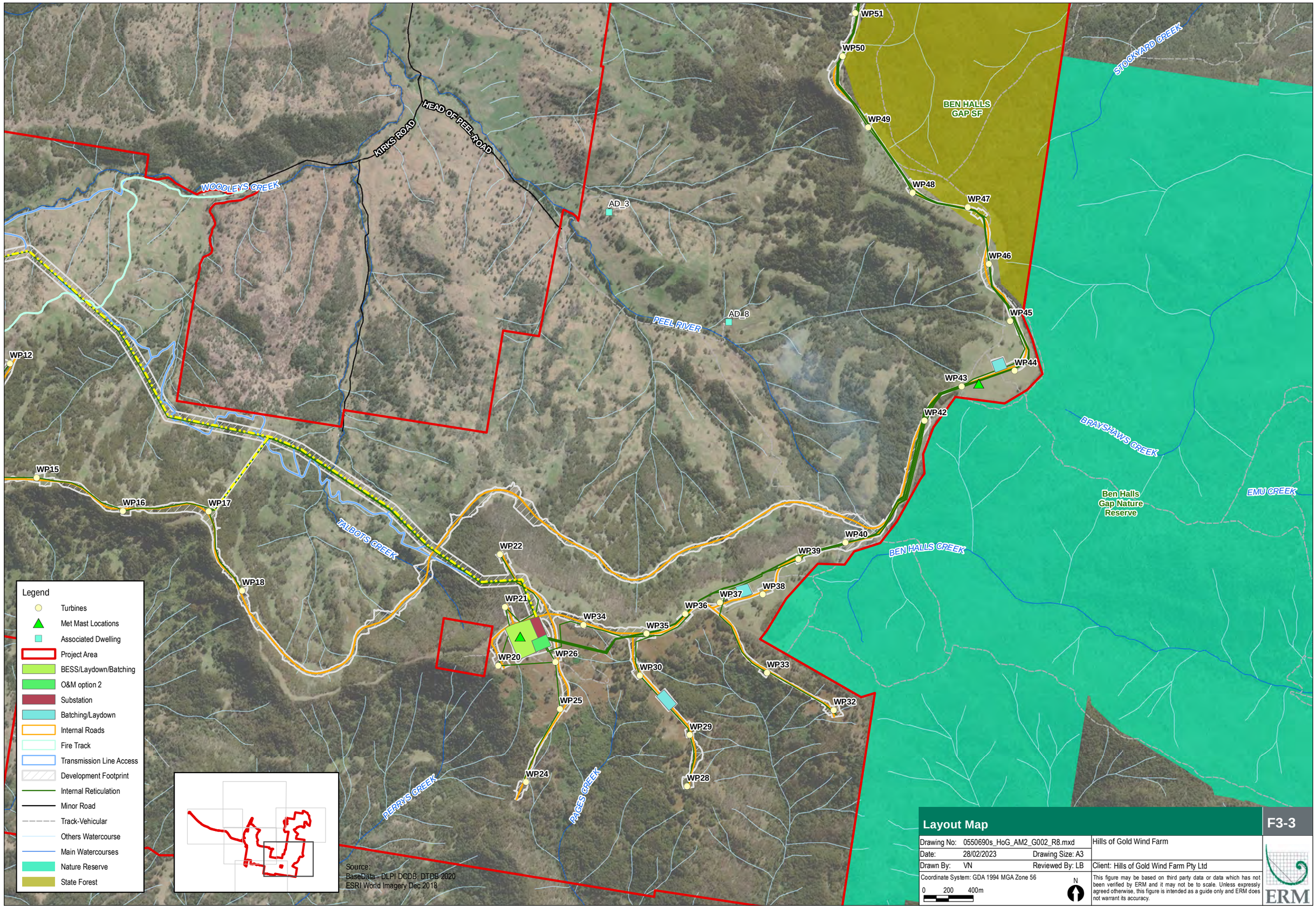
ERM



Layout Map

F3-3

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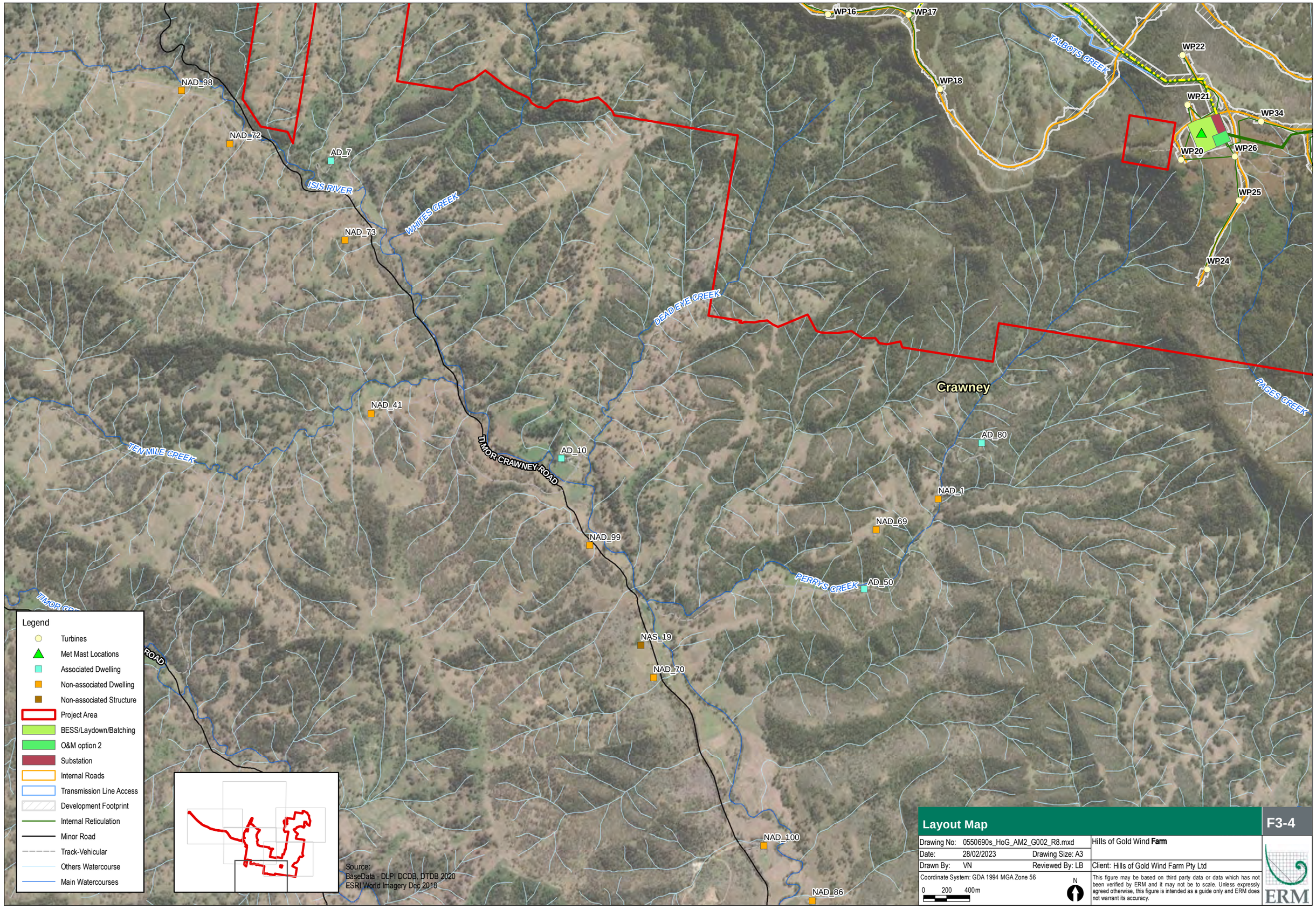
Date:	28/02/2023	Drawing Size: A3	
Drawn By:	VN	Reviewed By: LB	Client: Hills of Gold Wind Farm Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 200 400m

N

ERM



Layout Map

F3-4

Drawing No:	0550690s_HoG_AM2_G002_R8.mxd		Hills of Gold Wind **Farm**
Date:	28/02/2023	Drawing Size: A3	
Drawn By:	VN	Reviewed By: LB	Client: Hills of Gold Wind Farm Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 200 400m

N

ERM

NAD_22
AD_74
NAS_18
NAD_21
BACK CREEK
HEAD OF PEEL ROAD
PEEL RIVER
LIMESTONE OAKY CREEK
RYANS OAKY CREEK
OAKY CREEK
WOMBRAMURRA CREEK
CRAWNEY PASS
National Park
CRAWNEY ROAD
KIMOR CRAWNEY ROAD
WP6
WP5
WP3
WP4
WP2
WOODLEYS CREEK
WP7
WP8
WP9
WP10
WP11
WP12
WP13
WP14
WP15
TALBOTS CREEK
WHITES CREEK

Legend

- Turbines
- Met Mast Locations
- Associated Dwelling
- Non-associated Dwelling
- Non-associated Structure
- Transmission Line
- Project Area
- BESS/Laydown/Batching Option
- O&M Option 3
- Substation Option
- Laydown/Batching/Compound
- Transport Route
- Route Options
- Internal Roads
- Fire Track
- Transmission Line Access
- Development Footprint
- Internal Reticulation
- Minor Road
- Track-Vehicular
- Others Watercourse
- Main Watercourses
- National Park

Source:
BaseData - DLPI DCDB, DTDB 2020
ESRI World Imagery Dec 2018

Layout Map

F3-5

Drawing No:	0550690s_HoG_AM2_G002_R8.mxd		Hills of Gold Wind Farm
Date:	28/02/2023	Drawing Size: A3	
Drawn By:	VN	Reviewed By: LB	Client: Hills of Gold Wind Farm Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 200 400m

N

ERM

RANGERS VALLEY CREEK
COONOO COONOO CREEK
MIDDLEBROOK CREEK
BASIN CREEK ROAD
BACK CREEK ROAD
NAD_54
BASIN CREEK
BACK CREEK
CRAWNEY ROAD
GRAMURRA CREEK

Legend
- Non-associated Dwelling
- Transmission Line
- Project Area
- Switching Station
- Transmission Line Access
- Development Footprint
- Major Road
- Minor Road
- Track-Vehicular
- Others Watercourse
- Main Watercourses
- National Park

Source:
BaseData - DLPI DCDB, DTDB 2020
ESRI World Imagery Dec 2018

Layout Map

F3-6

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Coordinate System: GDA 1994 MGA Zone 56

0 200 400m

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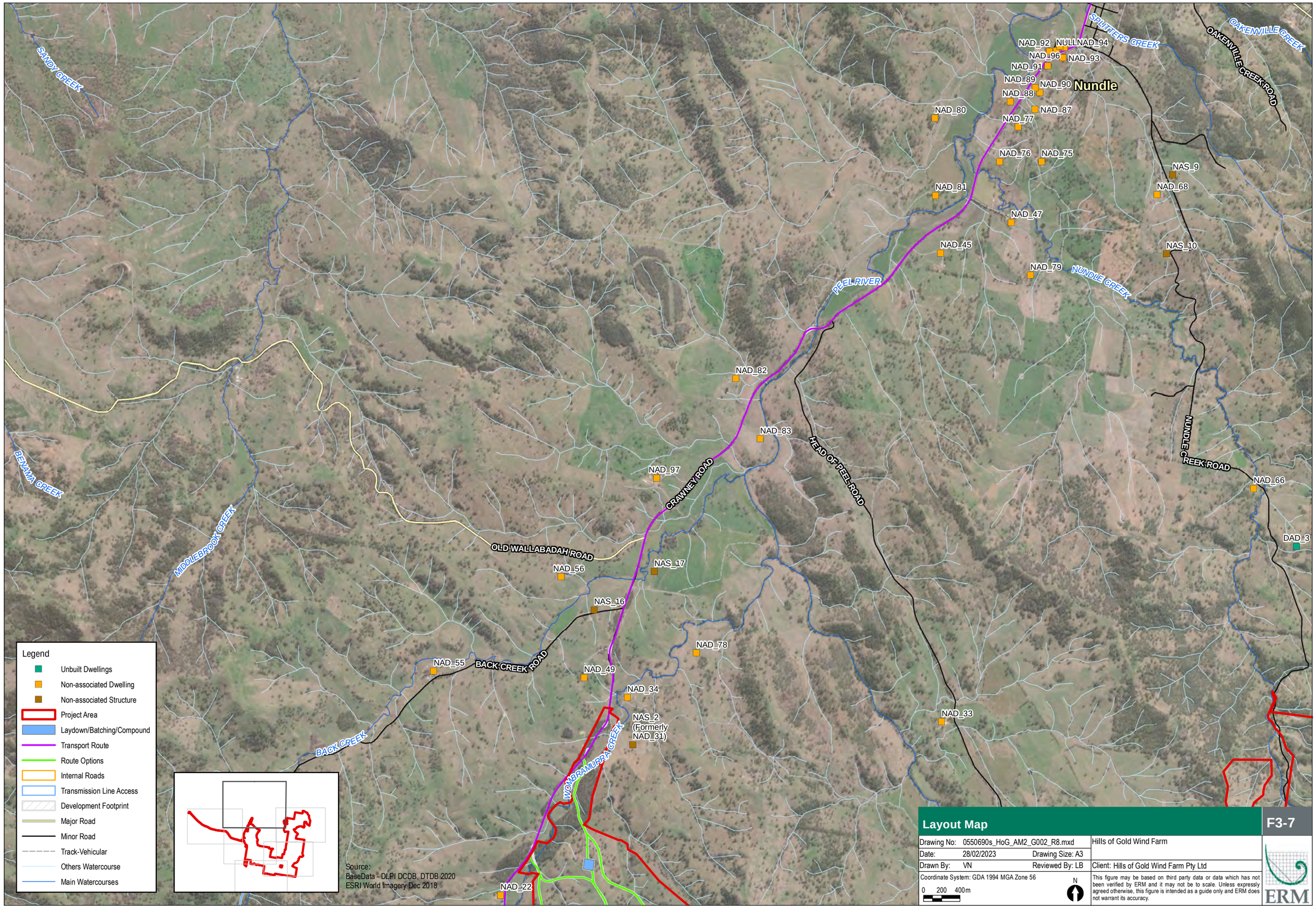
ERM


SANDY CREEK
SPLITTERS CREEK
OAKENVILLE CREEK
OAKENVILLE CREEK ROAD
NAD_92
NULL
NAD_94
NAD_96
NAD_93
NAD_91
NAD_89
NAD_90
Nundle
NAD_88
NAD_87
NAD_80
NAD_77
NAD_76
NAD_75
NAS_9
NAD_68
NAD_81
NAD_47
NAD_45
NAS_10
NAD_79
NUNDLE CREEK
PEEL RIVER
NAD_82
NAD_83
HEAD OF PEEL ROAD
NUNDLE CREEK ROAD
NAD_66
NAD_97
CRAWNEY ROAD
DAD_3
BENMA CREEK
MIDDLEBROOK CREEK
OLD WALLABADAH ROAD
NAD_56
NAS_17
NAS_16
NAD_78
NAD_55
BACK CREEK ROAD
NAD_49
NAD_34
NAS_2
(Formerly
NAD_31)
NAD_33
BACK CREEK
WOMBRAMURRA CREEK
NAD_22
Legend
Unbuilt Dwellings
Non-associated Dwelling
Non-associated Structure
Project Area
Laydown/Batching/Compound
Transport Route
Route Options
Internal Roads
Transmission Line Access
Development Footprint
Major Road
Minor Road
Track-Vehicular
Others Watercourse
Main Watercourses
Source:
BaseData - DLPI DCDB, DTDB 2020
ESRI World Imagery Dec 2018
Layout Map
F3-7
Drawing No: 0550690s_HoG_AM2_G002_R8.mxd
Hills of Gold Wind Farm
Date: 28/02/2023
Drawing Size: A3
Drawn By: VN
Reviewed By: LB
Client: Hills of Gold Wind Farm Pty Ltd
Coordinate System: GDA 1994 MGA Zone 56
N
0 200 400m
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
ERM

Legend

- Project Area
- Transmission Line
- BESS/Laydown/Batching
- O&M Option 3
- Substation
- Temporary Footprint
- Cadastre

Source:
BaseData - DLPI DCDB, DTDB 2020
ESRI World Imagery Dec 2018

Indicative Subdivision Plan
Substation, BESS and O&M Facility

F3-8

Drawing No:	0550690s_HoG_AM2_G003_R1.mxd		Hills of Gold Wind Farm
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Drawn By:	VN	Reviewed By: LB	Client: Hills of Gold Wind Farm Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 20 40m

N

ERM

Legend

- Project Area
- Switching Station
- Cadastre
- Transmission Line
- Existing Transmission Line

Source:
BaseData - DLPI DCDB, DTDB 2020
ESRI World Imagery Dec 2018

Indicative Subdivision Plan - Switching Station

F3-9

Drawing No:	0550690s_HoG_AM2_G009_R2.mxd		Hills of Gold Wind Farm
Date:	27/10/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: LB	Client: Hills of Gold Wind Farm Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 20 40m

N

ERM

3.2.3 Wind Turbine Generators

The Project would involve the construction and operation of up to 64 WTGs within the Project Area. The WTG model for the Project is yet to be selected, with a range of models currently under consideration. Based on current technology, the selected model is expected to have a generation capacity of approximately 6.0-7 MW. The selected WTG model would be in compliance with the relevant building standards and codes, including:

- IEC WT 01:2001 System for Conformity Testing and Certification of Wind Turbines — Rules and procedures;
- IEC 61400-1:2005 Wind turbines Part 1: Design requirements;
- IEC 61400-12-1:2005 Wind turbines Part 12-1;
- IEC 61400-23 Wind turbine generator systems – Part 23;
- IEC 62305-1/3/4 Protection against lightning; and
- IEC 61400-4:2012 Wind turbines — Part 4: Design requirements for wind turbine gearboxes.

The dimensions of the WTG components including blade length, and hub and blade tip heights would vary depending on the final model selected. In order to provide flexibility in selecting the WTG model, the WTG dimensions adopted for assessment for the Project are the largest of the model options being considered for the Project. The assessed dimensions are as follows:

- a WTG with a rotor diameter of up to 170 m (blade length of up to 83.5 m); and
- an overall tip height of 230 m.

Each WTG consists of a tower, nacelle, rotor hub, and blades. The WTGs would have a matt white or light grey finish. To achieve visual consistency through the landscape, the Project would include:

- uniformity in the colour, design, height and rotor diameter;
- use simple muted colours and non-reflective materials to reduce visibility and avoid drawing the eye;
- blades, nacelle and towers are to appear as the same colour; and
- avoidance of unnecessary lighting, signage, logos etc.

Typical components of a turbine are detailed in Figure 3-8.

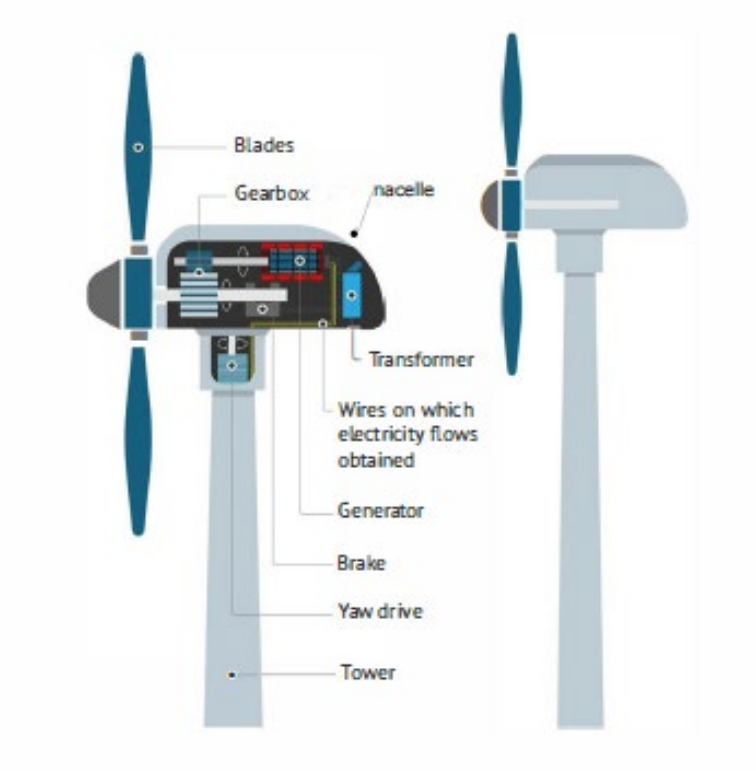


Figure 3-10 Wind Turbine Components

The process of installing the WTGs is outlined in Section 3.3.6. The central coordinates, maximum elevation and siting of the WTG locations are provided in Table 3-1.

Table 3-1 WTG Coordinates

WTG No.	New Easting (m)*	New Northing (m)*	New Elevation (m AHD)
WP2	316,684.50	6,502,788.66	1,263.18
WP3	317,114.92	6,502,995.81	1,262.88
WP4	317,469.36	6,502,963.71	1,198.99
WP5	317,646.98	6,503,321.05	1,134.41
WP6	317,818.00	6,503,696.01	1,185.63
WP7	317,183.98	6,502,322.03	1,184.45
WP8	317,588.46	6,502,126.50	1,178.77
WP9	317,452.93	6,501,426.14	1,154.00
WP10	317,887.87	6,501,330.80	1,161.00
WP11	318,351.00	6,501,230.88	1,120.41
WP12	319,126.03	6,501,524.02	1,139.38
WP13	318,924.01	6,501,258.58	1,173.96
WP14	318,777.97	6,501,031.99	1,171.18
WP15	319,340.99	6,500,599.00	1,117.44
WP16	320,041.96	6,500,328.97	1,080.70
WP17	320,735.99	6,500,326.03	1,187.67
WP18	321,006.98	6,499,684.96	1,134.41
WP20	323,082.43	6,499,076.63	1,408.99
WP21	323,137.92	6,499,550.86	1,407.97

WTG No.	New Easting (m)*	New Northing (m)*	New Elevation (m AHD)
WP22	323,095.55	6,499,977.22	1,371.28
WP24	323,307.94	6,498,134.05	1,256.89
WP25	323,580.67	6,498,725.83	1,365.33
WP26	323,546.01	6,499,106.95	1,392.62
WP28	324,613.04	6,498,099.97	1,354.64
WP29	324,632.01	6,498,515.04	1,336.71
WP30	324,229.02	6,498,998.02	1,345.66
WP32	325,798.17	6,498,717.02	1,323.41
WP33	325,258.04	6,499,018.98	1,333.53
WP34	323,773.06	6,499,406.00	1,403.67
WP35	324,282.23	6,499,334.71	1,354.27
WP36	324,596.53	6,499,496.90	1,365.28
WP37	324,878.10	6,499,587.77	1,358.03
WP38	325,225.13	6,499,653.52	1,341.59
WP39	325,513.04	6,499,939.82	1,336.68
WP40	325,893.75	6,500,074.08	1,293.30
WP42	326,534.09	6,501,059.68	1,358.60
WP43	326,836.91	6,501,337.76	1,379.99
WP44	327,265.10	6,501,463.66	1,387.07
WP45	327,228.78	6,501,866.26	1,366.83
WP46	327,057.45	6,502,328.60	1,329.94
WP47	326,887.11	6,502,787.84	1,374.55
WP48	326,439.98	6,502,906.01	1,373.53
WP49	326,078.99	6,503,434.02	1,373.55
WP50	325,871.96	6,504,010.96	1,325.95
WP51	325,974.99	6,504,360.00	1,321.36
WP52	326,001.97	6,504,777.96	1,331.99
WP53	325,888.02	6,505,289.04	1,312.45
WP54	325,995.03	6,505,707.01	1,317.46
WP55	326,063.97	6,506,091.96	1,320.59
WP56	325,597.02	6,506,290.06	1,297.00
WP57	325,618.03	6,506,645.04	1,290.65
WP58	325,469.04	6,507,177.04	1,293.71
WP59	325,633.03	6,507,481.97	1,284.92
WP60	325,826.97	6,507,814.02	1,243.43
WP61	326,055.98	6,508,201.98	1,217.99
WP62	326,036.01	6,508,549.96	1,241.51
WP63	325,787.98	6,508,928.05	1,194.11
WP64	326,612.34	6,508,724.20	1,245.67
WP65	327,050.01	6,508,701.95	1,269.81
WP66	327,214.99	6,508,968.95	1,266.23

WTG No.	New Easting (m)*	New Northing (m)*	New Elevation (m AHD)
WP67	327,184.98	6,509,403.03	1,260.06
WP68	327,367.01	6,509,622.95	1,248.38
WP69	327,736.99	6,509,900.99	1,187.83
WP70	327,837.39	6,509,343.16	1,223.68

Towers and Foundations

The wind turbine tower is constructed of composite metals and consists of 4 to 7 segments supporting the wind turbine nacelle, rotor hub and blades. Each tower would be mounted on a concrete foundation approximately 25 m in diameter located adjacent to a constructed all weather hardstand area. The exact type of foundation to be utilised would be based on the results of geotechnical surveys undertaken during the detailed design phase and prior to commencement of construction at each WTG site.

General interest has been received regarding the typical types of turbine foundations used for wind turbines. The three common types of foundations used for wind turbines are Gravity Foundations, Rock Anchors and Pile Foundations or a combination of these three depending on geotechnical conditions.

The most common type of foundation is the Gravity Foundation in which an area is excavated suitable to support the burying of a “pedestal” design of concrete and reinforced steel sufficient to create a gravity foundation. These are typically 3-5 m deep and 25 m in diameter. The volume can be between 500-900 m^3 depending on the turbine, geotechnical conditions and other environmental factors. A cross section of a typical gravity foundation is shown in Figure 3-9.

Figure 3-11 Typical Gravity Foundation for a Wind Farm (ENGIE Willogoleche Wind Farm in construction)

A gravity foundation is then covered so that only the tower section is visible above ground as shown in Figure 3-10:

Figure 3-12 Typical Wind Farm Tower Foundation

Nacelle

The nacelle is the housing that sits on the top of the turbine tower and accommodates the generator, control systems, pitch and yaw drives. The nacelle may also include the transformer and gearbox (if used) and is typically constructed of fibreglass. Oil containment and sound insulation are provided for within each nacelle.

Wind Turbine Rotor

The rotor, which includes the hub that connects the blades to the gearbox, is the portion of the WTG that captures the energy from the wind. The energy captured by the rotating blades is transferred to a generator housed within the nacelle. Blades are generally made of fibreglass reinforced with epoxy and carbon fibre. The rotor is controlled by a central wind turbine control unit (microprocessor). The microprocessor controls the rotational speed of the rotor and the pitch of the blades, therefore enabling the rotor to maximise energy production from the wind resource and ensure the safe and reliable operation of the WTG. When wind speeds get too high the microprocessor controls the pitch of the blades to stop the WTG rotating, which minimises wear on the components from operating at too high wind speeds.

Each WTG would have a transformer located in either within the nacelle or mounted external to the WTG on the hardstand area. The transformer is required to ‘step-up’ the voltage of the electricity produced by each WTG to the onsite distribution voltage of 33 kV. Each WTG would be connected to the onsite substation via a network of aboveground and underground electricity and communication cables.

Obstacle Lighting

The Project may require obstacle lighting at night time or during periods of reduced visibility. Whilst the Aviation Impact Assessment (Aviation Projects, 2020) (provided in Appendix H of the EIS) and the Aviation Impact Assessment Addendum (Aviation Projects, 2022) (provided as an appendix to the Amendment Report No. 2) concluded that the Project would not require obstacle lighting to maintain an acceptable level of aviation safety, the Civil Aviation Safety Authority (CASA) may potentially require lighting where turbines exceed 150 m in tip height, as has been the case for other wind farm developments in NSW.

Ongoing consultation with CASA has confirmed the use of steady low intensity lighting (200 candela) night lighting rather than medium intensity and confirmation of acceptance of an Obstacle Lighting Plan, provided in Appendix J of the Amendment Report No. 1. Based on this consultation, the potential night lighting requirements for the Project may include:

- two steady red low intensity obstacle lights on WTGs, with a minimum intensity of 200 candela, in accordance with the CASA endorsed Obstacle Lighting Plan;
- mounting of the light fixtures sufficiently above the surface of the nacelle so that the lights are not obscured by the rotor hub, and are at a horizontal separation to ensure an unobstructed view of at least one of the lights by a pilot approaching from any direction; and
- individual wind turbines to be lit in accordance with the obstacle lighting plan.

Night lighting would be operated in accordance with CASA requirements.

The Landscape and Visual Impact Assessment (refer Chapter 11 and Appendix F of the EIS) and the Addendum Landscape and Visual Assessment Report (Appendix G of the Amendment Report No. 1) assesses the impact of night lighting.

3.2.4 Electrical Reticulation

Transmission Line

A 330 kV single circuit twin conductor overhead transmission line connection is proposed to connect the onsite substation to the existing 330 kV overhead transmission line network. The length of the 330kV transmission line will depend on the location of the substation built. If the substation is built near WTG 20 it will be a 24.2 km overhead 330kV transmission line with a parallel 33kV easement of approximately 30 m in the eastern section of the transmission line.

An option to locate the substation near WTG 5 would require internal overhead 33 kV powerlines to be strung in parallel in the eastern section of the transmission line, replacing approximately 9 km of existing proposed 330kV overhead line which. This would reduce the 330kV route to 15 km. This has been considered in the development footprint impact assessment for the transmission line.

The proposed 330 kV transmission line is anticipated to comprise a steel pole structure or lattice tower structure up to 50 m high and spaced between 150 m - 1,000 m apart depending on the structure and terrain. The conductors (wires) would be aluminium and would be designed to be a minimum of 9 m above the ground at their lowest point.

The poles or lattice towers would generally require a concrete pier for the foundation (at each corner for lattice towers) and it would be necessary to establish ‘construction pads’ adjacent to the towers. A crane pad of approximately 10 m x 10 m would be established for the crane assembly and a second steel lay down area for the steel assembly prior to erection. The laydown area would typically be around 20 m x 10 m.

Each circuit would include three pairs of conductors, orange balls for visual identification (where necessary) and an earth shield wire, protecting the line from lighting strikes.

Vehicle access to the transmission line would be via Basin Creek Road to the switching station site, with access to the construction sites along the transmission line proposed to be predominantly from Crawney Road via local access roads, as shown in Figure 3-4 and Figure 3-5.

Examples of the typical steel pole structures (Figure 3-13) and lattice tower structures (Figure 3-14) proposed for the transmission line are shown below.

Figure 3-13 Typical Steel Pole Structures, Transmission Line

Figure 3-14 Typical 330 kV Lattice Tower

Easements

The 330 kV transmission line would be designed and constructed to meet relevant Australian standards.

The 330kV transmission line would be centred on a 60 m wide easement. An overhead 33kV would run in parallel with the 330kV easement for 9 km increasing the width to 90 m in the eastern section of the existing 330kV transmission corridor.

For the safe operation of the transmission line, certain activities would be restricted where necessary within the easement area such as planting and growing trees, construction of buildings, or erection of antennae or masts. The ongoing use of the land for agricultural purposes such as grazing would not be affected by the transmission line.

The option to locate the substation near WTG 5 would require internal overhead 33kV powerlines to be strung an additional 9 km, reducing the 330kV transmission line and easement by 9 km to a total of 15 km. The 33kV easement could be up to 90 m wide to account for multiple circuits to the alternate optional substation location. This has been assessed in the updated development footprint.

Onsite Substation

It is proposed that a new 33 kV/330 kV substation compound would be constructed onsite with approximate dimensions of 100 m by 136 m. The primary purpose of the substation would be the reception, transformation and transmission of electrical power and energy. The electrical substation would house a series of transformers, switch gear, and ancillary equipment for the transformation and distribution of energy. The transformers and radiators in the electrical substation would be located on foundations and would be surrounded by concrete bunds and/or collection sumps designed with sufficient capacity to retain 110% of the oil contained within each transformer.

The indicative location, including an alternative location option for the substation is identified in the wind farm layout plan provided in Figure 3-1. An image of a typical wind farm substation is provided at Figure 3-15.

Figure 3-15 Typical Substation - Gullen Range Wind Farm 33/330kV Substation

(Photo courtesy of Gullen Range Wind Farm)

Battery Energy Storage System (BESS)

The Project includes the installation of a lithium-ion battery energy storage system (BESS). A 5.64 ha footprint area has been set aside for the installation of the BESS. Given the substantive advances in battery storage technologies over time, the exact storage capacity cannot be confirmed at this time, however, it is anticipated that the BESS would have a capacity of approximately 100 MW/400 MWh. This would allow the optimisation of the Hills of Gold Wind Farm in the NEM.

The major components of the BESS would be batteries, inverters, transformers, heating ventilation air conditioning and fire protection. The specific design details for the BESS would not be finalised until the completion of the detailed design stage of the Project but would not exceed the specifications provided in the SEPP 33 screening assessment discussed in Chapter 13 and Appendix L of the EIS and the Preliminary Hazard Analysis in Appendix L of the Amendment Report No. 1. An image of a typical BESS is provided in Figure 3-16.

Figure 3-16 Typical Battery Energy Storage System

33 kV Cable and Fibre Optic Network

Each of the 64 WTGs would be connected to the onsite substation via a 33 kV electrical cable and fibre optic network. Whilst the electrical reticulation network would be finalised during the detailed design phase, it is anticipated that the aboveground and underground cabling would generally be located adjacent to the footprint of the internal access roads. However, some deviations away from the access roads may be required given potential topographical or other constraints. The currently identified extent of deviations proposed is included in Figure 3-1 and Figure 3-3. Any deviations would avoid areas of heritage and ecological significance and would remain within the study area of the Project. The trenching for underground electrical cabling would be approximately 2 m wide per circuit by 1.5 m deep, located within a works area of approximately 10 m to accommodate the excavator and stockpiling of spoil and bedding sand. Trenches would be progressively backfilled during the course of the construction works. The aboveground cabling would have orange balls for visual identification if necessary.

Switching Station

A switching station with approximate dimensions of 190 m by 215 m for physical electrical components would be constructed to connect the Project transmission line to the existing 330 kV TransGrid Liddell to Tamworth overhead transmission line network. The switching station would have a permanent footprint of approximately 4 ha including estimated temporary impact. The location of the switching station is identified in the wind farm layout plan provided at Figure 3-1 and Figure 3-5. An image of a typical wind farm switching station is provided in Figure 3-17.

Figure 3-17 Typical Switching Station – Gullen Range Wind Farm 330 kV Switching Station

(Photo courtesy of Gullen Range Wind Farm)

3.2.5 Crane Pads and Assembly Areas

A hardstand would be constructed adjacent to the base of each WTG to enable the assembly and erection of the tower, nacelle and blade components. The final design would depend on the topography of the surrounding land. Each crane pad would consist of crushed rock hardstand of an area between 0.38 ha and 0.53 ha depending on pad design (Figure 3-18).

Approximately sixteen (16) out of the up to 64 WTG's pad areas are expected to be designed based on a 'Just in time' (JIT) delivery concept. The JIT pad does not require a blade laydown area reducing the area of disturbance per pad by approximately 0.15 ha. Various centralised laydown areas have been considered across the Project Area to allow for nacelle-blade assembly and temporary storage. Once nacelle-blade assembly has occurred at the centralised area, units are transported to the hardstand at each WTG location for erection.

This JIT concept has been adopted to further reduce the biodiversity impacts of the Project.

Figure 3-18 details (A) preliminary design of a simplified hardstand layout including blade pad and access road, and (B) simplified laydown layout without blade laydown area (JIT pad).

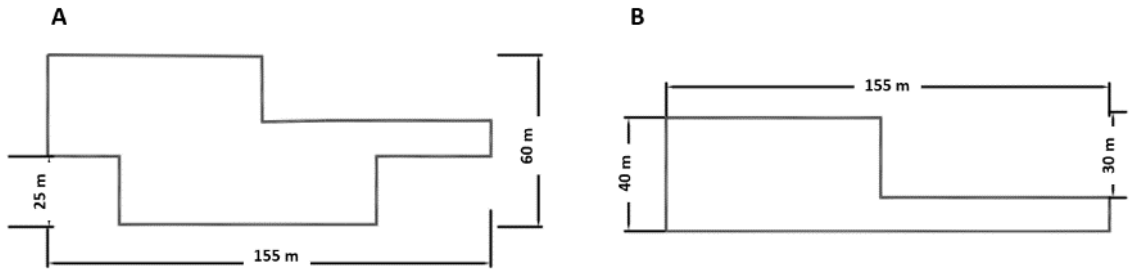


Figure 3-18 Typical Laydowns

Whilst it is anticipated that the majority of crane pads would remain in situ to allow for future maintenance or removal of the WTGs, there may be the opportunity to apply a top soil layer to the laydown portions to allow grazing activities to resume while the turbines are not in use.

3.2.6 Site Access from Nundle

Site access would be split according to types of vehicles and the area of the site required to be accessed. The majority of general construction traffic is expected to access the site via Barry Road and Morrisons Gap Road, located to the north east of the Project Area. No upgrade to the Devils Elbow is proposed to support Oversize Overmass, but upgrades are proposed to widen and improve safety. Morrisons Gap Road is unsealed for approximately 3 km prior to the Project Area and is proposed to be sealed following construction.

Oversize Overmass vehicles are proposed to access the site via Nundle and Crawney Road with a portion of general construction traffic expected to use this route when work is required in the western portion of the Project Area. An option for blades to loop around Nundle utilising Happy Valley Road is also proposed. There are 3 options proposed to enter the Project Area off Crawney Road of which one will be selected and upgraded.

Emergency access/egress would also be provided via Head of Peel Road.

The location of the Project access point and transport routes of infrastructure are shown in Figure 3-22.

Transport of wind farm components to the Project Area is discussed in Section 3.3.4

3.2.7 Internal Access Roads

The construction and maintenance of the Project would require construction of up to approximately 40 km of private access roads within the Project Area. The roads would provide ongoing access to the WTGs and other Project infrastructure including the transmission line. Where practicable, the internal road network would be aligned on the route of existing farm or other access roads. The internal roads would be up to 5.5 m wide (with approximately 1.5 m shoulders on either side), with localised widening where required to support transportation of the WTG components.

The Development Footprint (area of disturbance) has been based on preliminary concept civil design for roads and hardstands, including likely cut and fill requirements, batters, cable runs and drainage which is subject to the abovementioned specifications.

Included within the internal road network proposed for both construction and ongoing use is the 'Transverse Track', which provides internal road access between WTG 18 to WTG 40 to overcome topography challenges for road construction between WTG 18 and WTG 20.

The proposed internal road network is shown in Figure 3-1 to Figure 3-5.

3.2.8 Permanent Operations and Maintenance Facility

A permanent site operations and maintenance facility (O&M), approximately 93 m by 166 m would be constructed to provide for all operations and maintenance activities associated with the Project. Three optional locations for the siting of the facility are proposed, being adjacent to the substation / BESS (at either proposed location), or being at the compound between WTG 55 and WTG 56. An example O&M facility is provided in Figure 3-19. Car parking facilities would also be provided for employee and service vehicles.

During operations, approximately 16 permanent staff would occupy these premises. Whilst most activity is anticipated to occur during business hours Monday to Friday, access to the Project Area would be required on a 24 hour basis, seven days a week.

Figure 3-19 Example O&M Facility – Willogoleche Wind Farm

(Photo courtesy of ENGIE)

3.2.9 Meteorological Monitoring Masts

The Project includes the decommissioning of the three current monitoring masts and installation of up to 10 new monitoring masts for power testing. Five of the new monitoring masts would be located close to a WTG location and five would be placed on the same location as a WTG prior to its installation and removed shortly before WTG installation. They would have a maximum height of approximately 150 m AGL, equivalent to the hub height of the installed WTGs. The exact number and locations of the monitoring masts would be defined at the detailed design stage. These masts assist in verifying the performance of the WTGs during operation of the Project.

The monitoring masts consist of a buried concrete base foundation and guy wires which are attached to buried anchor points. In accordance with the recommendations of the Aviation Impact Assessment (Aviation Projects, 2020) (provided in Appendix H of the EIS) and the Aviation Impact Assessment Addendum (Aviation Projects, 2022) (provided as an appendix to the Amendment Report No. 1), these would be marked using three dimensional coloured objects attached to the wire or cables (for example spheres or pyramids) if necessary.

3.2.10 Turbine Relocation

The proposed layout remains indicative and subject to ongoing detailed design, which would incorporate detailed geotechnical investigations and selection of the final wind turbine model.

In order to facilitate refinement of the layout during the detailed design process, an allowance for relocating WTGs by up to 100 m radius from the locations identified in this Amendment Report is sought. Other Project infrastructure components, including cabling and access tracks, may also be relocated within the Project Area subject to ensuring that this does not result in any greater impacts than assessed and complies with all conditions imposed on any development consent granted for the Project. The BESS, substation, switching station and O&M facility would not be relocated within an identified flame zone.

Final layout documentation would be prepared and submitted to DPE prior to commencement of construction.

3.2.11 Temporary Facilities

Construction of the Project would require a range of temporary buildings and facilities for construction personnel and equipment, including a construction compound (including site offices, car parking, and amenities for the construction work force), mobile concrete batching plants, laydown and storage areas for the temporary storage of construction materials, plant, equipment and wind turbine components, and temporary power supply for construction. An example concrete batching plant is provided in Figure 3-20.

Figure 3-20 Example Concrete Batching Plant – Willogoleche Wind Farm

(Photo courtesy of ENGIE)

The indicative location of temporary facilities and activities associated with the construction of the Project are outlined in Figure 3-1 to Figure 3-5.

3.3 Project Construction

3.3.1 Duration and Staging

Construction activities would be progressive across the Project Area over a period of approximately 18 – 24 months. Subject to confirming of any staging requirements, the anticipated timing of key Project milestones is presented in Figure 3-21.

Construction, operation and decommissioning of the Project may be staged and early works entered into in response to market drivers and specific construction work packages. Where staging is required:

- each of the strategies, plans and programs required by the conditions of consent would be submitted on a progressive basis for each stage of the Project, where appropriate;
- DPE and Councils would be notified in accordance with any relevant conditions of the development consent; and
- details of final staging and early works timing would be confirmed prior to the construction of each stage.

The Proponent has advised that the construction is likely to be staged with early works awarded shortly after any development approval to commence design, council approvals and road upgrades and associated works.

In addition, construction of the BESS may be included as a subsequent stage to the Project construction timeline based on market demand and the fast-changing economics of battery storage. If so, allowances would be made during the construction of the main wind farm Substation and O&M Facility such that the BESS can be added at a future point in time. The assessments consider a worst case assumption that the BESS is constructed within the Project schedule.

3.3.2 Construction Hours

Construction of the Project would generally be undertaken in accordance with the DECC (2009) *Interim Noise Construction Noise Guideline*, with the hours of work being:

- Monday to Friday: 7.00am-6.00pm;
- Saturday: 8.00am-1.00pm; and
- no works on Sunday or public holidays.

Some out of hours work may be required, including for:

- logistics and safety requirements imposed by relevant regulatory authorities (e.g. NSW Police);
- weather conditions such as high winds during the day necessitating WTG crane lifts at night;
- temperature conditions requiring concrete pours during the early morning; and
- extended concrete pours into the evening to complete a foundation.

If a need to work outside the recommended standard hours of construction is identified, these would carried out in accordance with the Noise Management Plan to be prepared for the Project.

3.3.3 Construction Workforce

It is anticipated that during construction up to 211 full time equivalent (FTE) direct construction jobs would be generated based on modelled estimates outlined in the Socio-Economic Assessment in Appendix R of the Amendment Report No. 1.

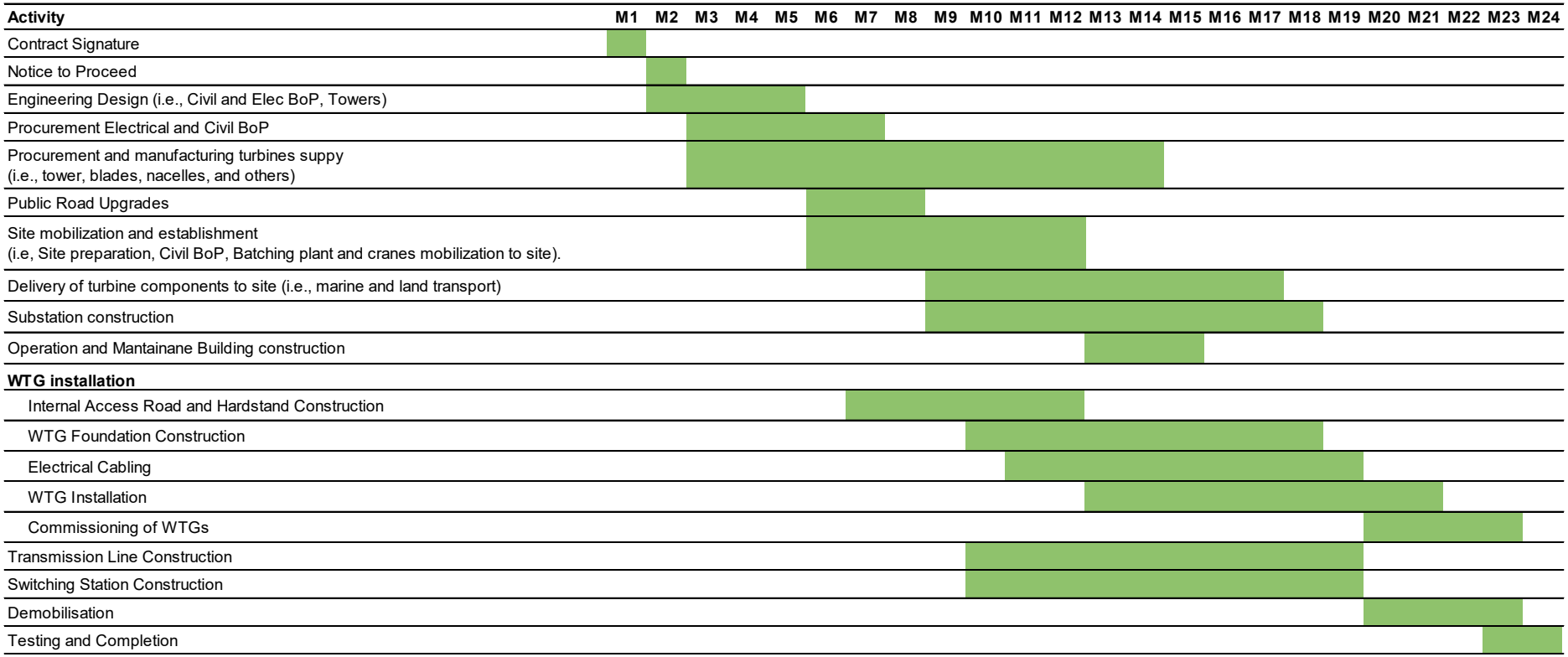


Figure 3-21 Anticipated Approximate Timeline for Construction Phase of the Project

3.3.4 Transportation

3.3.4.1 Oversized Overmass Load Transportation

The Project would include the delivery to the Project Area of the components of the wind turbines and electrical equipment including among other things:

- blades;
- tower sections;
- nacelles;
- substation and switching station components; and
- cabling.

To facilitate transportation and ease of installation, the WTG tower would be manufactured in up to seven sections. Due to the size of the WTG components, the truck and trailer configurations to transport the components are classified as Restricted Access Vehicles (RAVs). RAVs require permits that specify the designated route for travel, the number of escorts required and the time in which the RAVs can travel through certain road zones.

It is proposed that oversized and over mass loads would be transported from the Port of Newcastle to the Project Area. Transportation of the components is forecast to be undertaken over a period of approximately nine months. A detailed Traffic Management Plan would be implemented for the transportation of individual items.

The proposed transport routes are detailed in Figure 3-22. The proposed routes are:

- Route 1a (blade and loads over 5.2 m) – via Selwyn Street, George Street, Industrial Drive, Maitland Road, New England Highway, John Renshaw Drive, Hunter Expressway, New England Highway, Golden Highway, Denman Road, Bengalla Road, Wybong Road, Kayuga Road, Invermein Street, Stair Street, Dartbrook Road, New England Highway, Lindsays Gap Road, Nundle Road, Herring Street, Innes Street, Jenkins Street, Crawney Road;
- Route 1b (blade option only) – via Selwyn Street, George Street, Industrial Drive, Maitland Road, New England Highway, John Renshaw Drive, Hunter Expressway, New England Highway, Golden Highway, Denman Road, Bengalla Road, Wybong Road, Kayuga Road, Invermein Street, Stair Street, Dartbrook Road, New England Highway, Lindsays Gap Road, Nundle Road, Oakenville Street, Old Hanging Rock Road,,Happy Valley Road, Jenkins St, Crawney Road;
- Route 2 (loads up to 5.2 m) – via Selwyn Street, George Street, Industrial Drive, Maitland Road, New England Highway, John Renshaw Drive, Hunter Expressway, New England Highway, Bell Street, Victoria Street, Market Street, New England Highway, Lindsays Gap Road, Nundle Road, Herring Street, Innes Street, Jenkins Street, Crawney Road;
- Route 3 (loads over 5.2 m) – via Selwyn Street, George Street, Industrial Drive, Maitland Road, New England Highway, John Renshaw Drive, Hunter Expressway, New England Highway, Golden Highway, Denman Road, Thomas Mitchell Drive, New England Highway, Bell Street, Victoria Street, Market Street, New England Highway, Lindsays Gap Road, Nundle Road, Herring Street, Innes Street, Jenkins Street, Crawney Road; and
- Route 4 (standard loads) – via Selwyn Street, George Street, Industrial Drive, Maitland Road, New England Highway, John Renshaw Drive, Hunter Expressway, New England Highway, Lindsays Gap Road, Nundle Road, then either:
  - Crosby Street, Oakenville Street, Old Hanging Rock Road, Barry Road, Morrisons Gap Road or:
  - Herring Street, Innes Street, Jenkins Street, Crawney Road.

The Project component transport routes are detailed in Table 3-2.

Table 3-2 Project Component Transport Routes

Blades	Heavy - Over 5.2 m Height	Heavy - Under 5.2 m Height		Standard
100% Route 1a and Route 1b	**100% Route 3**	**Option 1 100% Route 2**	**Option 2 50% Route 2 and 50% 3**	**100% Route 4**
■ Blades (root section); ■ Blades (tip section)	■ Hubs; ■ Tower Sections; ■ Transformers; and ■ Nacelles with Drivetrain in	■ Nacelle with Drivetrain Out; ■ Drivetrain	■ Nacelle with Drivetrain Out; ■ Drivetrain	■ Other (2 x 40ft Shipping Container per WTG); ■ Sub station; ■ Switching Station; ■ Overhead cabling; ■ Underground cabling; ■ Battery System; ■ Mobile concrete Batch Plant

This is further detailed in in the Route Survey (2022) and Traffic and Transport Assessment (2022) which are attached as an appendix to the Amendment Report No. 2.

In summary, the RAV route from the Port of Newcastle to the Project Area would involve accessing the New England Highway, via Industrial Drive with bypasses of the Singleton and Muswellbrook townships before departing the New England Highway at Lindsay Gap Road near Wallabadah. This general route was used to provide access for RAVs for the Sapphire Wind Farm located further north and has therefore already been subject to a number of modifications to accommodate the RAV movements associated with other wind farm developments.

At Lindsay Gap Road the RAV transport continues through to Nundle Road and the village of Nundle, with most RAVs using Crawney road to access to the Project Area, with those RAVs able to use the existing “Devils Elbow” on Barry Road to take this route.

3.3.4.2 Other Vehicles

Heavy vehicles would be required to transport materials and equipment associated with the Project construction. It is anticipated that heavy vehicles would consist of vehicles up to and including 19.0 m long semi-trailers and B-Doubles (standard vehicles) and ‘truck and dogs’, concrete trucks and water tankers. The presence of the temporary concrete batching plant would reduce the number of external concrete truck movements to and from the Project Area.

Light vehicles comprising light trucks for smaller deliveries and cars, four-wheel drives and utility vehicles attributed to Project personnel would also access the Project Area during construction and operation of the Project.

A majority of these vehicles are expected to use Barry Road and Morrisons Gap Road with a portion using Crawney Road to access the Project Area from the west.

3.3.5 Road Upgrades

A Route Survey was undertaken by Rex J Andrews Engineered Transportation (2022). It is provided as Appendix I to the Amendment Report No. 2. The survey reviewed several route options to transport WTG components from the Port of Newcastle to the Project site:

- Route 1: Suitable for all loads if modifications are undertaken;
- Route 1a: Suitable for blades only if modifications are undertaken;
- Route 1b: Suitable for blades only if modifications are undertaken;

- Route 2: Suitable for Loads up to 5.2 metres in height, but not blades;
- Route 3: Suitable for Loads over 5.2 metres in height, but not blades; and
- Route 4: Suitable for standard loads up to 3.5 metres wide, and no higher than 5.2 metres in overall height.

A map of each route is provided in the survey. Each route would require road upgrades to be able to transport the components listed above. The required road upgrades are summarised within Appendix I to the Amendment Report No. 2.

The Submissions Report No. 2 proposes optionality for east bound heavy vehicles travelling to the western Project entrance off Crawney Road to use Route 2 to avoid the centre of the Nundle township (refer Figure 3-22).

Detailed engineering plans are annexed to Appendix C 'Traffic and Transport Assessment Addendum 3' of the Submissions Report No. 2 regarding the proposed intersection upgrade and required widening of the corner of Oakenville and Herron Street and Innes and Jenkins Street.

An additional hardstand area is also being proposed on the western side of Herron Street to provide a waiting bay when OSOM vehicles are using Route 2 (see indicative location in Figure 1-4 of the Submissions Report No. 2).

Legend

- Project Area
- Layby
- Internal Roads
- All Components
- Route 1 - Blades and loads over 5.2m
- Route 2 - Loads up to 5.2m
- Route 3 - Loads over 5.2m
- Route 4 - Standard Loads

Source:
BaseData - DLPI DCDB, DTDB 2020
ESRI World Street Map

Transport Route, Internal Roads and Site Access

F3-22

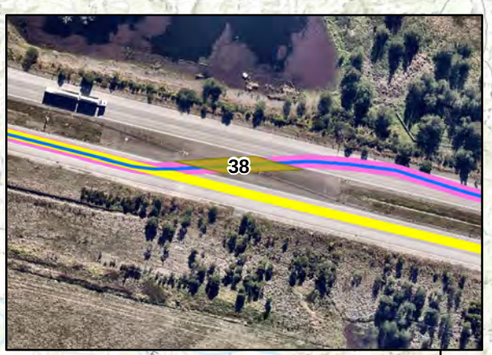
Drawing No:	0550690s_HoG_AM2_G004_R3.mxd		Hills of Gold Wind Farm **Submissions** Report **No. 2**
Date:	13/02/2023	Drawing Size: A3	
Drawn By:	VN	Reviewed By: LB	Client: Hills of Gold Wind Farm Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 10 20Km

N

ERM



Legend

Upgraded Road Footprint

- Permanent Footprint
- Temporary Footprint

Transport Route

- Route 1 - Blades and loads over 5.2m
- Route 2 - Loads up to 5.2m
- Route 3 - Loads over 5.2m
- Route 4 - Standard Loads

Source:
BaseData - DLPI DCDB, DTDB 2020
ESRI World Imagery Dec 2018
Nearmap Imagery 2021

Road Modifications and Upgrades

F3-23a

Drawing No:	0550690s_HoG_AM2_G005_R1.mxd		Hills of Gold Wind Farm
Date:	27/10/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: LB	Client: Hills of Gold Wind Farm Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 5 10Km

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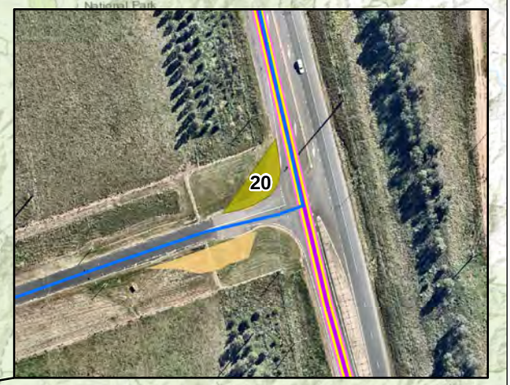
ERM



Legend

Upgraded Road Footprint

- Permanent Footprint
- Temporary Footprint

Transport Route

- Route 1 - Blades and loads over 5.2m
- Route 2 - Loads up to 5.2m
- Route 3 - Loads over 5.2m
- Route 4 - Standard Loads

Source:
BaseData - DLPI DCDB, DTDB 2020
ESRI World Imagery Dec 2018
Nearmap Imagery 2021

Road Modifications and Upgrades

F3-23b

Drawing No:	0550690s_HoG_AM2_G006_R1.mxd		Hills of Gold Wind Farm
Date:	27/10/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: LB	Client: Hills of Gold Wind Farm Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 5 10Km

N

ERM

Legend

Project Boundary	Transport Route
Upgraded Road Footprint	All Components
Permanent Footprint	Route 1 - Blades and loads over 5.2m
Layby	Route 2 - Loads up to 5.2m
Bridge	Route 3 - Loads over 5.2m
Temporary Footprint	Route 4 - Standard Loads

Source:
BaseData - DLPI DCDB, DTDB 2020
ESRI World Imagery Dec 2018

Road Modifications and Upgrades

F3-23c

Drawing No:	0550690s_HoG_AM2_G007_R4.mxd		Hills of Gold Wind Farm
Date:	27/10/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: LB	Client: Hills of Gold Wind Farm Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 5 10Km

N

ERM

Site Access Option A

Site Access Option B

Site Access Option C

Legend

Project Boundary

Upgraded Road Footprint

Permanent Footprint

Layby

Bridge

Temporary Footprint

Transport Route

All Components

Route 1 - Blades and loads over 5.2m

Route 2 - Loads up to 5.2m

Route 3 - Loads over 5.2m

Route 4 - Standard Loads

Source:
BaseData - DLPI DCDB, DTDB 2020
ESRI World Imagery Dec 2018

Road Modifications and Upgrades

F3-23d

Drawing No:	0550690s_HoG_AM2_G010_R2.mxd		Hills of Gold Wind Farm
Date:	27/10/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: LB	Client: Hills of Gold Wind Farm Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 5 10Km

N

ERM

3.3.6 WTG installation

Excavation will be carried out with mechanical equipment for the WTG foundations. The exact design of the WTG foundations would depend on localised geotechnical conditions and the final type of foundation adopted, however would likely consist of concrete gravity foundation based footings. Topsoil and spoil from excavation would be stockpiled for reuse to backfill over the foundation and for vegetation rehabilitation of the Project Area. Excess materials would be utilised at other parts of the Project Area or exported offsite for beneficial reuse at an approved location.

The towers, nacelles and blades would be lifted off delivery trucks using mobile cranes. Cranes would then assist in the assembly of the rotor and the installation of the towers, nacelles and rotors and blades.

3.3.7 Temporary Mobile Concrete Batch Plant

Two temporary mobile concrete batch plants are proposed for the WTG foundations and also potentially for other structures including buildings, the substation switching station foundations, bunding and culverts. The two batch plants would be located at any of the temporary construction laydown areas, with the exception of laydowns on the transport route, and would be utilised at various periods during construction works as required. Each concrete batch plant is likely to include a slump stand, water tanks and stockpiles of gravel and sand, and may also include rock crushing facilities depending on the source materials used for construction. Whilst the exact details of the facilities would be determined during the detailed design phase, typically the area required for the plant and storage of materials would be approximately 100 m by 100 m at each of the two proposed locations. The batching plant would be bunded to contain runoff and potential contaminants.

Materials for the plant would be primarily sourced from an external supplier to be determined during the procurement phase of the Project. It is anticipated the cement would be stored in a silo adjacent to the batching process machinery. Concrete agitators would transfer the concrete from the batch plant to the WTG foundation locations.

3.3.8 Resource Requirements

Construction materials including gravel, aggregate and sand would be required for the concrete batch plant and construction of hardstands to support Project infrastructure, including internal access roads and installation of electrical cabling. It is anticipated that the road formation would be constructed using a cut and fill balance with excavated materials used for the final hardstand surfaces of the roads, crane pads and laydown areas. However, this would need to be confirmed upon geotechnical testing of the excavated material prior to works commencing. Otherwise, gravel, along with aggregate and sand for concrete batching would be sourced externally from existing operating quarries. The Project would undertake ‘crushing, grinding or separating’ works at an estimated annual capacity of up to 500,000 tonnes per annum during construction.

There are a number of existing quarries located within approximately 80 km of the Project Area, including quarries located at Tamworth, Willow Tree, Currabubula, Ardglen and Crawney Road. A Traffic and Transport Assessment was prepared in 2020 to accompany the EIS, and an addendum was prepared in 2021 to accompany the Submissions Report. These reports considered vehicle transport of aggregates from roads in these localities for the purposes of the traffic assessment.

The Amendment Report No. 2 includes the option to expand Verden Road Quarry to supply materials for the Project. Verden Road Quarry is the closest quarry to the Project and is the preferred option subject to viability to be determined during detailed design. A second addendum to the Traffic and Transport Assessment was prepared in 2022, which considered the impacts of the proposed expansion and use of Verden Road Quarry. It is attached as an appendix to the Amendment Report No. 2.

Construction materials would be transported to the Project Area by trucks and stockpiled within the laydown areas and at the concrete batch plants.

Water supply for the concrete batch plants, dust suppression and other construction activities would also be required onsite. It is anticipated that water required for construction would be supplied from existing onsite dams or bores (subject to seasonal availability, harvestable rights and water licencing requirements) or alternatively from other licenced water sources (subject to approval). Water would only be obtained from sources licenced under the Water Management Act and / or under harvestable rights.

3.3.9 Optional Verden Road Quarry Expansion

One of the proposed amendments to the Project is the optional expansion of a quarry 9 km north of WTG 69 within the Nundle State Forest.

Verden Road Quarry is located at Lot 254 DP755324 and Lot 6711 of DP1204174, which is Crown land managed by the Forestry Corporation of NSW (FCNSW).

The quarry site currently supports an existing, small (< 30,000 tonnes per annum) FCNSW quarry operation, which utilises the material for upgrade and maintenance of roads and tracks within the Hanging Rock State Forest.

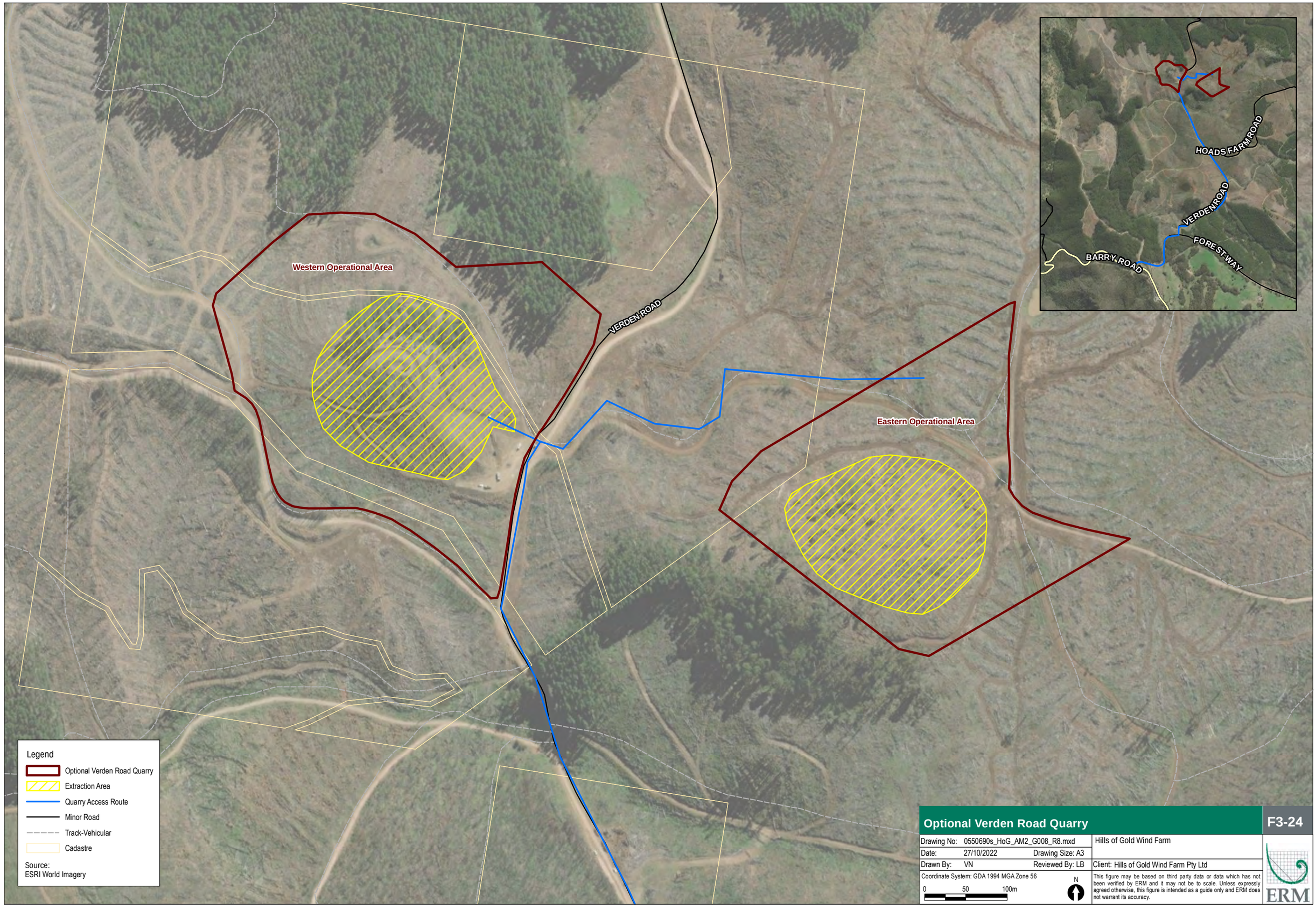
It is proposed to expand the quarry to supply materials to the Project. The proposed quarry would extract up to 500,000 tonnes per annum.

It is estimated that the Project may need approximately 700,000 – 800,000 tonnes of quarry materials in total. Key features of the proposed expansion are summarised as follows:

- Quarry operations would be confined to Lot 131 DP754099 and Lot 132 DP754099;
- Two areas for quarrying activities are identified as follows:
  - The ‘western operations area’, which is focussed on the existing FCNSW quarry operations area. This site has an area of approximately 13.2 ha, which includes the extraction pit, processing and stockpiling areas, overburden /topsoil emplacement areas and surface water management structures. This would be the primary area for the production of quarry materials; and
  - The ‘eastern operations area’, located on the hill immediately to the east of the ‘western quarry’. This site has an area of approximately 9.9 ha, which includes the extraction pit, processing and stockpiling areas, overburden /topsoil emplacement areas and surface water management structures. This area would only be used should the quarry materials demand from the Project exceed anticipated extraction from the western extraction area (either in total demand quantity and/or rate of demand). To summarise, it would provide a back-up option for the production of quarry materials if required.
- Development of a processing and stockpiling area adjacent to each extraction pit (as required);
- Development of a main extraction pit in the western operations area with extraction to approximately 1,100m AHD, during the construction period of the Project (assumed to be two years). Development of a satellite extraction pit (the ‘eastern operations area’) if / as required to meet construction tonnage demands;
- Development of an extraction pit in the eastern operations area with extraction to approximately 1,175m AHD, during the construction period of the Project (assumed to be two years);
- Crushing and processing of extracted rock using mobile equipment;
- Extraction, processing, stockpiling and transport of up to 500,000 tonnes of material per annum from the Project area;

- Construction and operation would be undertaken during daytime hours, being Monday to Saturday 7am to 6pm, with minor non-audible works to be undertaken outside of these hours (e.g. maintenance activities);
- Erection of temporary administration (mobile crib room/toilet facilities) and construction of surface water management infrastructure;
- Transport of processed quarry material would be managed by the appointed civil contractor for the Project on an 'as needs' basis during quarry operations;
- At the completion of extraction works, , handing the site back to FCNSW in a safe, clean, and stable condition and in accordance with Section 3.3.9.8;
- Stabilisation of the processing and stockpiling area. Relevant portions of these areas to be returned to pre-disturbance existing condition in consultation with FCNSW (e.g. plantation ready); and
- Operation of the Quarry would be with ARDG, or their preferred quarry operator and separate Environment Protection Licence is proposed for this specific project activity.

It is not proposed to construct a weighbridge, as extraction quantities would be calculated by certified and calibrated loader scales and cross referenced with topographic survey taking account of rock density. All materials produced by the quarry would supply the Project only.



Optional Verden Road Quarry

F3-24

Drawing No:	0550690s_HoG_AM2_G008_R8.mxd		Hills of Gold Wind Farm
Date:	27/10/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: LB	Client: Hills of Gold Wind Farm Pty Ltd

Coordinate System: GDA 1994 MGA Zone 56

0 50 100m

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3.3.9.1 Site Establishment

At the commencement of the quarry expansion the following site establishment works would occur:

- Establishment of disturbance boundaries from GPS survey control;
- Establishment of erosion and sediment control structures prior to initial site stripping/earthworks and construction of the processing and stockpiling areas;
- Ground disturbance activities including: initial site stripping/earthworks; blast hole drilling; initial quarry blast; and establishment of quarry pit and processing area and site access track (Figure 3-24); and
- Transport of mobile equipment (quarrying and crushing / infrastructure) to the Project area via Forest Way and Verden Road.

3.3.9.2 Timeframes

It is envisaged that initial site disturbance at the existing quarry site may commence in late 2023approval of the Project). Approval is being sought for operations to occur for the duration of the construction of the project, and up to six months after, completion of the construction of Project, to allow for contingency should materials be required for post-construction rectification works to the public/internal road network and hardstand areas. It is noted that, subject to obtaining all necessary authorisations, construction of Project is scheduled to be completed in 2025.

3.3.9.3 Operations

The material in the quarry would be extracted through an excavator and truck operation. Based on the existing status of FCNSW quarry operations on the site of the west quarry area, extraction operations would be initiated via a blast to loosen up the material prior to loading of material by excavator into dump trucks for transport to the processing area. Additional blasts would be required periodically to enable access to blasted rock in approximately 75,000 tonne quantities. Assuming a total materials demand of 0.75M tonnes over an 18-month production period, this would equate to a blast frequency of approximately one every two months.

The blasting would be completed by an appropriately licensed and experienced contractor, with no requirement to store explosives and blast-related materials on site. Processing of raw feed at the quarry site would be undertaken progressively, following the completion of each blast, with material to be processed and stockpiled prior to load out. Material would be transported by the Project civil contractor directly to the Project area in accordance with demand.

The approximate number of staff/workers expected to present on site at any one time are as follows:

- Prior to Commencement:
  - Drill and blast crew (x 2 – 3) (prior to initial blast and commencement of operations for a period of 7 – 10 days weather dependent); and
  - Mobile plant and equipment operators for site preparation / earthworks (x 3 – 4).
- During Operations:
  - Excavator operator;
  - Loader operator;
  - Production manager;
  - Quarry supervisor; and
  - General hand.

3.3.9.4 Ancillary Facilities

The proposed works include stockpiling, processing and overburden /topsoil storage areas. Mobile equipment would be used to crush and process extracted rock. Temporary administration and facilities (mobile self-contained units), and surface water management infrastructure would be located within the Project area.

3.3.9.5 Hours of Operation

Construction and operation would be undertaken during daytime hours, being Monday to Saturday 7am to 6pm. It is anticipated that some activities may require works outside of these hours (e.g. maintenance). These works would be restricted to relatively non-audible activities to limit the potential impacts on surrounding areas.

3.3.9.6 Access and Transport Routes

Transport of all material from the quarry site would be directly to the entrance of the Project via Verden Road and Forest Way (FCNSW controlled roads), then with the majority of materials via the proposed construction transport route for the Project of Barry Road and Morrisons Gap Road and a portion via Barry Road, the township of Nundle and Crawney Road.

3.3.9.7 Operational Water Requirements

The quarry would require the use of water for dust suppression on the processing plant and across all disturbed areas of the site as required. Operational water requirements for the quarry would be supplied by a combination of the following:

- Runoff from within the quarry pit and processing area captured in the sediment basin; and/or and/or
- Water sourced externally from existing nearby dams located within Hanging Rock State Forest under an agreement with FCNSW from which water would be pumped and / or carted to the site.

3.3.9.8 Proposed Rehabilitation and Key Mitigation Measures

During consultation with ARDG FCNSW has requested that at the completion of quarry operations that the site be handed back to it such that it can continue to operate the quarry site for its own benefit. Any rehabilitation of disturbed land within the project area would be undertaken in close consultation with FCNSW, who have indicated that such areas of the site be rehabilitated (where possible) and prepared for its previous land use as a pine plantation.

All surface water management structures would be left in place for continued use as part of future FCNSW quarry operations. Sediment fencing and controlled site access would be provided. All erosion and sediment control measures would be designed in accordance with relevant guidelines and would be inspected, maintained and cleaned during construction and operation. Erosion and sediment controls would be established in accordance with an erosion and sedimentation plan to be produced for the proposed works as part of the Environmental Management Plan (EMP) for the Project.

3.3.10 Temporary Site Office, Car Parking and Storage

A temporary construction site office would be erected and maintained for the duration of the construction phase. In addition, temporary contractor parking and facilities and equipment laydown and storage areas are proposed with the indicative locations shown in Figure 3-2, 3-3 and 3-4.

3.3.11 Temporary Construction Car Park and Pedestrian Crossing

A pedestrian crossing and temporary construction car park would be established in Nundle subject to further consultation with Tamworth Regional Council.

3.3.12 Post Construction Site Rehabilitation

The Project Area would be progressively rehabilitated throughout the course of construction. When construction is completed, all temporary plant and equipment would be removed, and disturbed areas would be revegetated and rehabilitated in consultation with involved landholders hosting infrastructure. Adequate sediment, soil and erosion controls would be put in place during ground disturbing works and rehabilitation activities in accordance with the *Managing Urban Stormwater: Soils and Construction- Volume 1* (The 'Blue Book') (Landcom, 2004).

Post construction rehabilitation requirements and processes would be detailed in the Environmental Management Strategy (EMS) to be prepared prior to commencement of construction of the Project, and undertaken in accordance with any relevant conditions of the development consent for the Project. Figure 3-25 provides examples of rehabilitation following underground cable installation at the Biala Wind Farm. Figure 3-26 provides examples of rehabilitation of road batters and verges at the Biala Wind Farm.

Figure 3-25 Examples of Rehabilitation following Underground Cable Installation – Biala Wind Farm

(Photos courtesy of BJCE (Australia) Pty Ltd)

Figure 3-26 Examples of Rehabilitation of Road Batters and Verges – Biala Wind Farm

(Photos courtesy of BJCE (Australia) Pty Ltd)

3.4 Development Footprint

The Development Footprint for the Project is approximately 447 ha, which includes the Permanent and Temporary Development Footprints:

- The Permanent Development Footprint is the area of land that would be subject to permanent alteration as a result of installation and operation of Project infrastructure until the Project is decommissioned at its end of life. The Permanent Development Footprint is approximately 145 ha (of the 447 ha total footprint) and is comprised of:
  - WTG foundations;
  - crane pads;
  - permanent access roads, including the transverse track;
  - transmission line and transmission line access roads;
  - substation, switching station and other facilities; and
  - road upgrades required for the transport haul route.
- Temporary Development Footprint (the area of land that would be temporarily disturbed during construction of the Project and rehabilitated following construction) covers approximately 302 ha (of the 447 ha total Development Footprint) and is comprised of:
  - access road and hardstand construction batters;
  - underground electrical cable footprint;
  - concrete batching plants;
  - transmission line temporary access roads; and
  - laydown and assembly areas adjacent to the crane hardstand and WTG foundation.

It should be noted that the impact assessment has been undertaken based an estimated total worst case Development Footprint which combines the Temporary Development Footprint and the Permanent Development Footprint, notwithstanding that temporary impacted areas would be rehabilitated at completion of construction. The Development Footprint includes cumulative impact where multiple options have been considered of which not all will be built, such as multiple access options off Crawney Road and optional substation, BESS and O&M facility footprints. The estimated total development footprint for the key Project components is outlined in Table 3-3.

Table 3-3 Estimated Development Footprint of Key Project Components

Project Component		Permanent Footprint (ha)	Temporary Footprint (ha)[2]	Estimated Total Footprint (ha)[1]
Wind Farm (WF)	WTGs including crane pad assembly areas and asset protection zones	27.88	17.81	45.69
	Internal access roads [3,4,5]	23.91	29.25	53.16
	Operations and maintenance building[5]	17.67	14.66	32.34
	Substation			
	BESS			
	Temporary facilities: parking, storage / laydown areas and batching plants	0	92.23	92.23
Total WF		69.46	153.95	152.58
Transmission Line (TL)	Transmission line [7]	0.15	120.90	121.05
	Switching station	4.08	0	4.08
	Transmission line access roads	24.28	6.05	30.33
Total TL		28.51	126.95	155.46
Transport route (TR)	Transport route upgrades[6]	25.26	21.56	46.83
Total TR		25.26	21.56	46.83
Quarry (Q)	Quarry area	21.39	0	21.39
Total Q		21.39	0	21.38
Total WF + TL + TR		144.62	302.46	447.11

Notes:

1. *Estimated total footprint includes temporary footprint areas.*
2. *Temporary footprint areas are areas that would be rehabilitated after completion of construction.*
3. *Internal access road calculation includes internal roads between hardstands and transverse track.*
4. *Calculation of 41 km with assumption the road would accommodate drainage, internal 33 kV underground cable runs, and cut & fill batters*
5. *Underground 33 kV electrical reticulation network would generally be located within the disturbance footprint of the access road network.*
6. *Temporary areas to be rehabilitated include cut and fill, roads Asset Protection Zones (APZ) and buffer for underground cabling.*
7. *330 kV transmission line is 24 km of 60 m easement and 33 kV aboveground power line is 2.46 km of 15 m easement.*
8. *It has been estimated that 90% of the 330kV easement can be rehabilitated using native grasses.*
9. *It is estimated that 50% of the transport route upgrades would be rehabilitated with native grass.*

3.5 Project Operation

Upon commissioning, the Project would be operational 24 hours per day, seven days per week. The Project would be controlled by a remote supervisory control and data acquisition (SCADA) from a control room located within the permanent site operations and maintenance facility. Where required, assistance from an offsite SCADA engineering team may be sought. The SCADA system would allow remote operation of all WTGs with the ability to shutdown individual or all WTGs if required. The SCADA system also allows the Project to operate at optimal capacity by synchronising with the internal WTG control systems to alter rotor speed and blade pitch to depending on wind conditions.

3.5.1 Operational and Maintenance Workforce

Regular maintenance would be undertaken on WTGs and other plant and equipment by internal and specialised contractors throughout the operation of the Project. It is anticipated that up to 28 FTE technical personnel and maintenance staff would be employed during operation.

Circumstances may arise where unplanned equipment failure occurs due to environmental events or other factors. The majority of repairs can be undertaken during routine maintenance; however, WTG components requiring replacement would need to be undertaken using a crane in a similar manner to their installation. In addition, replacement of WTGs may occur throughout the operational life of the Project as improved technologies become available.

3.6 Decommissioning and Rehabilitation

The WTGs have an expected operating life between 25-35 years, at the end of which there are three main options for consideration:

- continue the use of the site as a wind farm using the existing WTGs (subject to condition of equipment);
- replace the WTGs with technology current at that time and continue the use of the site as a wind farm for a further term (subject to agreement with landowners); or
- decommission the Project and remove the WTGs and associated infrastructure in accordance with the Environmental Management Strategy.

When decommissioning is required:

- key stakeholders including landholders would be consulted;
- all above ground structures not required for the ongoing agricultural use of the land (some access tracks, for example, may be required to be retained by the landholder to enable ongoing access), including the WTGs and substation would be removed and the land rehabilitated to ensure it can be returned to agricultural use; and
- below ground infrastructure, including the WTG foundations and hardstands to a depth less than 500 mm would be removed. All other infrastructure below 500 mm would be left in situ and covered in clean fill material, with the area adequately graded to reflect the slope of the surrounding area and to mitigate the risk of soil erosion.

It is anticipated that the decommissioning and rehabilitation phase would take up to 18 months to complete, with the Project Area being returned, as far as practicable, to its condition prior to the commencement of construction.

The Environmental Management Strategy would include measures for Decommissioning and Rehabilitation in accordance with any project approval requirements.

The Proponent has entered long-term lease agreements with the associated landholders for the construction and operation of the Project. The terms of these agreements make express provision for the Proponent's decommissioning obligations. Until decommissioning is complete, licence fees are also payable to the associated landholders. Therefore, there is a strong incentive for the wind farm owner to properly complete decommissioning when required.

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