Table 2-3 Intersections potentially requiring traffic control and measures involving minor works – Route 2

Intersection	Potential measures/works that may be require implementation
Dutton St / Kenny St	• Traffic Control • Remove and re-erect signage • Check clearance to railway crossing signals • Check clearance to overhead power lines
Kenny St / Port Connection Road (Bunda Street)	• Traffic Control • Remove and re-erect signage • Check clearance to overhead power lines
Port Connection Road (Bunda Street) / Martyn Street	• Traffic Control • Remove and re-erect signage • Check clearance to overhead power lines
Martyn Street / Mulgrave Road	• Traffic Control • Remove and re-erect signage • Check clearance to overhead power lines
Mulgrave Road / Captain Cook Highway (Sheridan Street)	• Traffic Control • Remove and re-erect signage
Captain Cook Highway (Cairns - Mossman) / Kennedy Highway (Cairns - Mareeba) (Roundabout)	• Traffic Control
Kennedy Highway (Mareeba - Ravenshoe) / Hanson Road	• Traffic Control

Any areas requiring a temporary lane closure must comply with the *Far North Queensland – Table of Allowable Lane Closures (TALC)* and will require an approved Traffic Guidance Scheme and Traffic Management Plan prior to implementation. It is also suggested that a Community Liaison Officer is utilised to communicate lane closures with the relevant Local Authorities; local business or organisations which may be affected; and the general public. It should be noted that these issues are not restricted to the locations noted above and the following issues may be experienced along the entire route:

- Vertical clearance of vehicle envelope to overhead power lines, gantry signs, signal mast arms, street lights and overhead fauna crossings (rope bridge, Palmerston Highway and Kennedy Highway (Cairns – Mareeba)) should be assessed to determine if there is a requirement to consult/engage the Department of Transport and Main Roads (TMR), Cairns Regional Council, Tablelands Regional Council or Ergon Energy as applicable for any adjustments that may be required to their assets.
- Structural integrity of culvert and bridge crossings should be determined by consulting TMR, Cairns Regional Council or Tablelands Regional Council as applicable to request recent inspections including details of type of inspection carried out. Further assessments may be required depending on the completeness of previous inspections.
- Requirement for permits and escorts to traverse the detailed routes should be identified and obtained as required.

It is recommended that a visual inspection is completed to identify areas of potential conflict along the entirety of the route prior to the commencement of any localised detailed investigations (if required).

3. Response to Question 24

3.1 Query

An assessment of the access to site (along Hansen Road and Springmount Road) for vertical geometry which utilises recent survey data.

3.2 Response

To the best of our knowledge, recent survey or adequate topographical data does not exist at this time to allow a more detailed assessment of the access to site via Hansen Road and Springmount Road. Several sources were investigated, including the Queensland Government's Physical Road Network, and Geoscience Australia's Digital Topographic Data. However, at the time of this report, the Digital Elevation Model (DEM) has insufficient detail to perform such an investigation, and the Physical Road Network currently provides horizontal geometry only. In addition, survey from remote-sensing methods, such as Light Detection and Ranging (LiDAR), does not currently exist.

The Technical Note: Mount Emerald Wind Farm Traffic Impact Assessment Engineering Responses, undertaken by SKM 2012, provides a response to a query from the TRC, "Demonstrating the capability of the vertical profiles of Hansen and Springmount Roads accommodating any proposed drop deck or low loader transport of turbine components." This assessment of vertical geometry was based on a best fit to the GPS data recorded during a vehicle drive-through of the route as no detailed survey existed. The response to TRC 51 is included for information in Appendix B and the longitudinal sections, issued as Appendix C of the SKM 2012 technical report, are included in Appendix C of this report.

4. Response to Question 25

4.1 Query

Provide further information on how staff travel to site can be managed in a way that will allow the maximum number of staff vehicles to remain below 30 vehicles per day as indicated in the Traffic Impact Assessment.

4.2 Response

To respond to the Question 25 of the ministerial call (dated 11 June 2014), the following reports were reviewed:

- Technical Note: Mount Emerald Wind Farm Traffic Impact Assessment Engineering Responses - 19 December 2012 undertaken by SKM. The report will be referred to as SKM 2012
- Mount Emerald Wind Farm Traffic Impact Assessment (TIA) – 8 August 2011 undertaken by SKM. This report will be referred to as SKM 2011

Based on the information reviewed, the SKM 2011 TIA report assumes a maximum of 30 vehicles per day for workers during the construction stage of the project. Appendix B of the SKM 2012 technical report outlines in detail the estimated number of workers per month for the two year construction phase. Figure 4-1 summarises the estimated total number of workers during the construction phase (based on the information provided within Appendix D (From SKM 2012 Appendix B)).

Figure 4-1 outlines the total estimated workers for the project during the construction phase (blue line) which includes the estimated construction-related workers (green line) and the estimated skilled/unskilled contract labourers (red line).

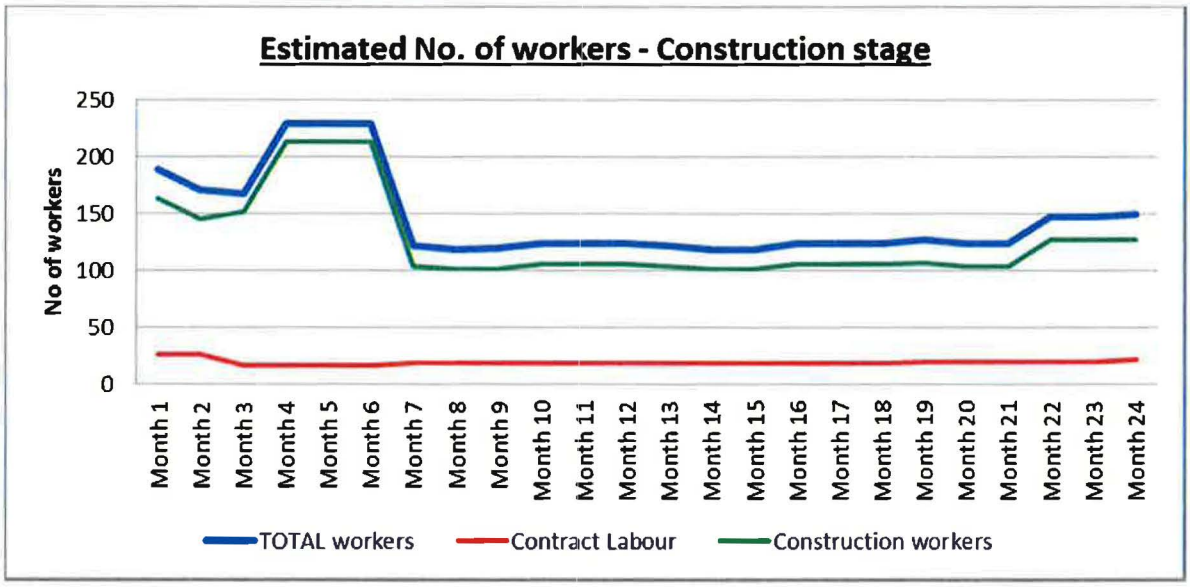


Figure 4-1 Estimated total number of workers during construction stage (24 months)

The estimated maximum numbers of workers expected to be on site during month 4 to month 6 of the construction phase is approximately 229. Of these 229 workers, 16 workers will be contract skilled and unskilled labourers and are expected to arrive and depart the site via individual or shared private vehicles.

The following assumptions (which are consistent with the previous traffic reports) have been adopted for the assessment:

- All construction workers are expected to arrive and depart the project site via dedicated 30 seater worker buses. These buses will have several pick up and drop off points at key townships
- All skilled and unskilled contract labourers are expected to arrive and depart the project site via their own vehicles. It is expected that some skilled and unskilled labourers arriving and departing the project site will carpool. Given the remote location of the project site to key townships, a conservative carpooling ratio of two people per car for the skilled and unskilled contract labours was adopted for this assessment

Based on the assumptions above, the maximum number of trips generated by the estimated number of workers during the construction is expected to be 16 vehicles per day, which comprise eight 30-seater buses and eight light vehicles. To provide a robust assessment, a nominal 10 additional vehicles per day has been added to allow for unscheduled visits, deliveries, private vehicles, miscellaneous tasks, and for construction workers who need to bring their own vehicles with trade specific tools. This makes an estimated total of 26 vehicle movements at the site per day.

Therefore, the estimated number of worker-related vehicles travelling to/from the project site is expected to be 26 vehicles per day which is expected to occur for only 3 of 24 months during the construction phase. The worker-related vehicles generated per day for the remaining 21 months will be less than the anticipated 26 vehicles per day experienced during the peak construction phase.

The estimated number of worker-related vehicles to /from the project site is less than the assumed 30 vehicles per day outlined within the SKM 2011 TIA report and SKM 2012 technical note. However, to maintain the number of worker-related vehicles arriving/departing the project site at or below the expected 30 vehicles per day, the following recommendations should be adopted by the client and the nominated construction contractor during the construction phase:

- The nominated construction contractor will provide a 30-seater shuttle bus services for construction workers arriving and departing the project site.
- The 30-seater shuttle bus will service the key townships where the construction workers live.
- Provide minimal or restricted on-site parking to discourage workers arriving to and departing from the project site via private vehicles.

These measures should be outlined in detail within the construction management plan to be developed in close consultation with the relevant Local Authorities and stakeholders.

Note that the estimated work-related vehicles per day outlined within this assessment are for a pre-feasibility design level. The construction schedule and estimated number of workers for each task may vary depending on the construction methods adopted by the nominated contractor for this project. Detailed worker numbers and construction schedules would become available once the project execution contracts have been awarded, which can only occur once this project is approved. Any changes to the construction worker numbers and schedules would be captured within a detailed construction traffic management plan which should be undertaken during the post approval stage in close consultation with the relevant Local Authorities and stakeholders.

5. Response to Question 26

5.1 Query

Should sufficient measures to restrict staff traffic to 30 vehicles per day not be provided, a new assessment identifying the worst case traffic impact on the road network should be provided.

5.2 Response

It should be noted that the estimated work-related vehicles per day outlined within this assessment is for a pre-feasibility design level. The construction schedule and estimated number of workers for each task may vary depending on the construction methods adopted by the nominated contractor for this project. Detailed worker numbers and construction schedules would become available once the project execution contracts have been awarded, which can only occur once this project is approved. Any changes to the construction worker numbers and schedules would be captured within a detailed construction traffic management plan which should be undertaken during the post approval stage in close consultation with the relevant Local Authorities and stakeholders.

6. Conclusion

This technical note has addressed the queries from the State Government, Questions 23 to 26, regarding the potential traffic impact of the proposed MEWF project.

In response to Question 23, two possible access routes for oversized vehicles were described: the first via Palmerston Highway, and the second via Kennedy Highway. A high-level investigation of constraints detected oversized vehicle restrictions; possible horizontal and vertical geometry and clearance limitations; and potential structural integrity issues for culvert and bridge crossings. Checks should be conducted for the full length of each route to determine geometry, clearance, and culvert/bridge restrictions to the vehicle and its envelope. Appropriate permits and escorts will need to be obtained for the passage of oversized vehicles, and control measures will need to be implemented to accommodate the substantial turn paths and envelope of larger vehicles.

As noted in the response to Question 24, more recent survey data does not exist to provide a more detailed vertical geometry assessment of Hansen Road and Springmount Road. Points of possible vertical geometry conflict were provided from the SKM 2012 technical note.

The response to Question 25 confirms that travel to site could be managed so that the number of staff vehicles remains below 30 vehicles per day during the busiest construction stage. This is based on a pre-feasibility estimate of eight 30-seater busses, eight light vehicles, and a nominal 10 additional vehicles for various purposes. Detailed worker numbers and construction schedules would need to be confirmed by the nominated contractor for the project prior to submission of a construction traffic management plan developed in consultation with the relevant Local Authorities and stakeholders.

As noted in the response to Question 25, it is possible to restrict staff traffic to 30 vehicles per day. Therefore, a new assessment identifying the worst case traffic impact on the road network is not required for Question 26.

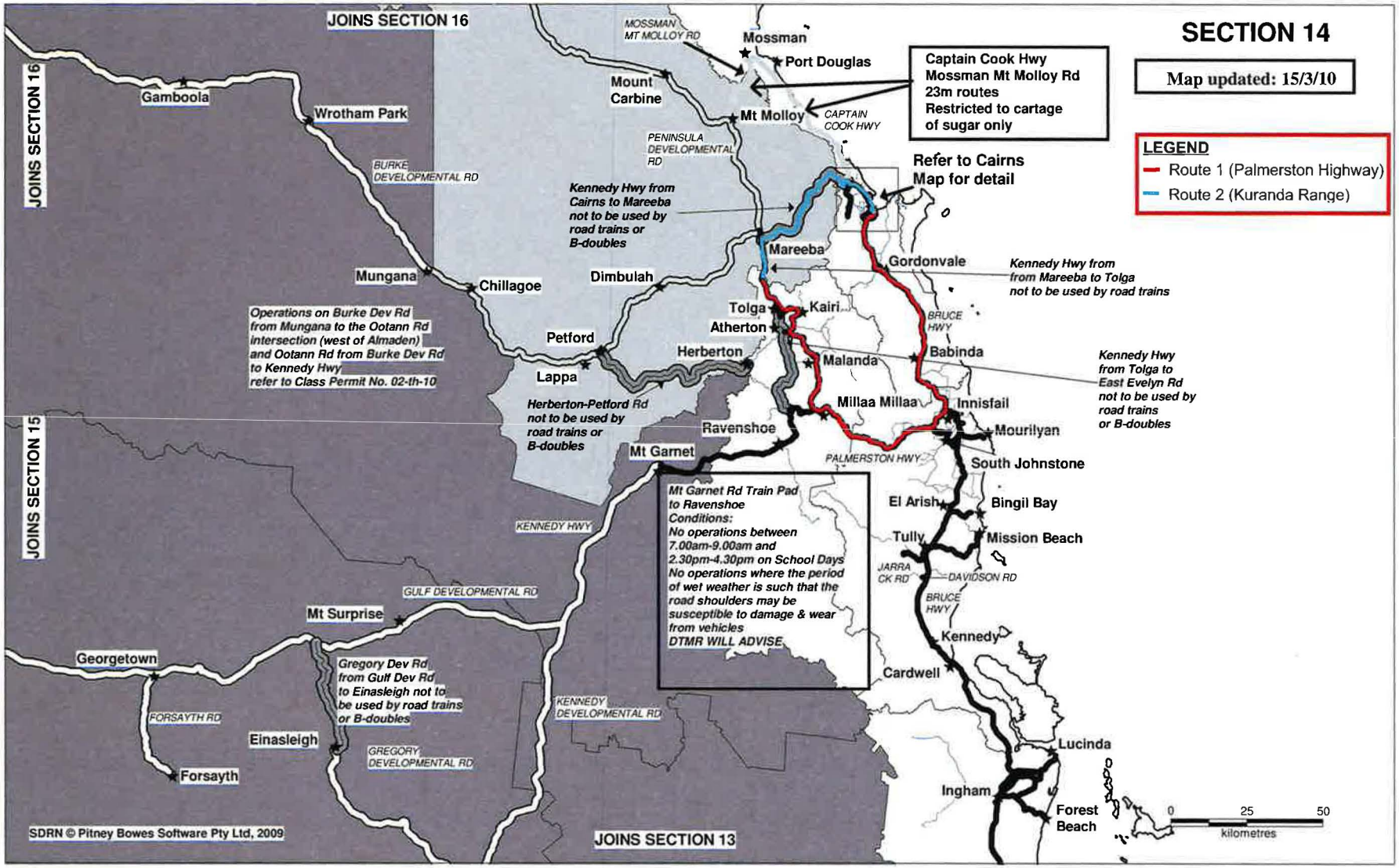
As stated previously, this report should be read in full and in conjunction with the following reports:

- Mount Emerald Wind Farm Traffic Impact Assessment (TIA) – 8 August 2011 undertaken by SKM.This report will be referred to as SKM 2011
- Technical Note: Mount Emerald Wind Farm Traffic Impact Assessment Engineering Responses - 19 December 2012 undertaken by SKM. The report will be referred to as SKM 2012

Appendix A. Multi-Combination Routes in Queensland: selection of maps with proposed routes

MULTI-COMBINATION ROUTES IN QUEENSLAND

Queensland Government

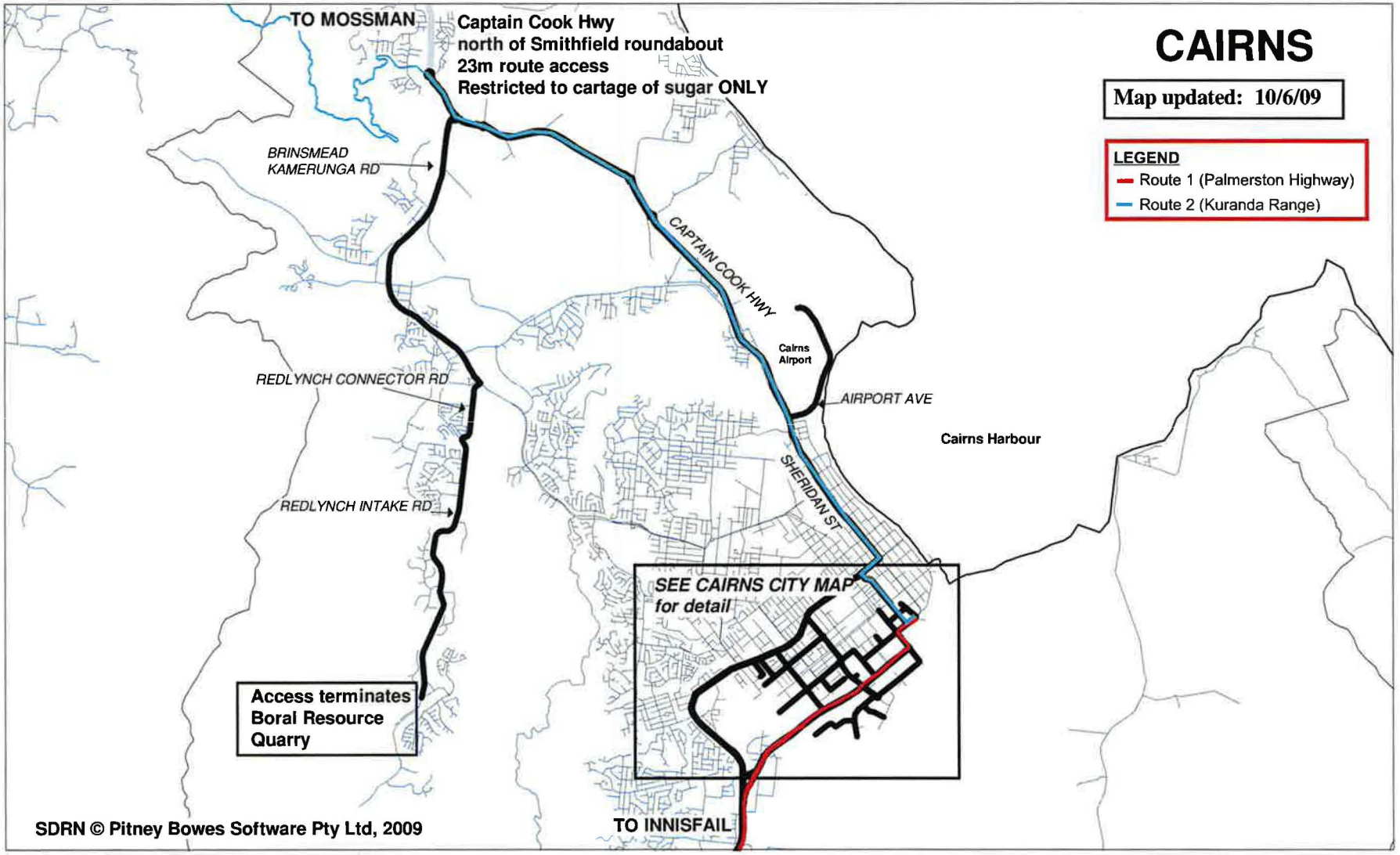


B-DOUBLES	ROAD TRAINS	NO ROAD TRAINS or B-DOUBLES
23 metre routes	Type 1 routes	
23 & 25 metre routes	Type 1 & 2 routes	

REFER TO LEGEND FOR DETAILS OF OPERATIONS IN THE SHADED AREAS

MULTI-COMBINATION ROUTES IN QUEENSLAND

Queensland Government

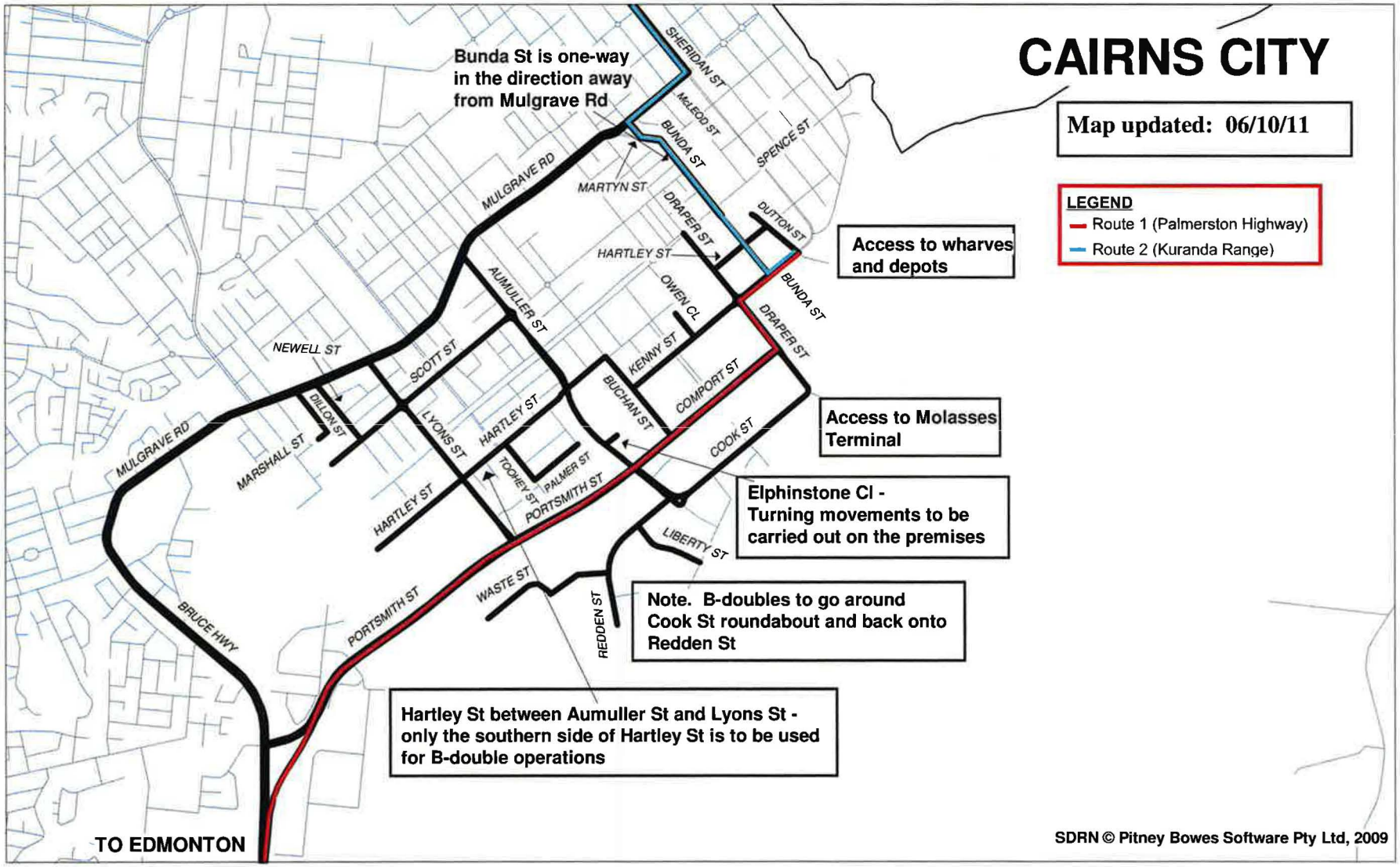


B-DOUBLES	ROAD TRAINS	NO ROAD TRAINS or B-DOUBLES
23 metre routes	Type 1 routes	
23 & 25 metre routes	Type 1 & 2 routes	

REFER TO LEGEND FOR DETAILS OF OPERATIONS IN THE SHADED AREAS
Note: 23 & 25 metre B-doubles can access Type 1 & 2 road train routes

MULTI-COMBINATION ROUTES IN QUEENSLAND

Queensland Government

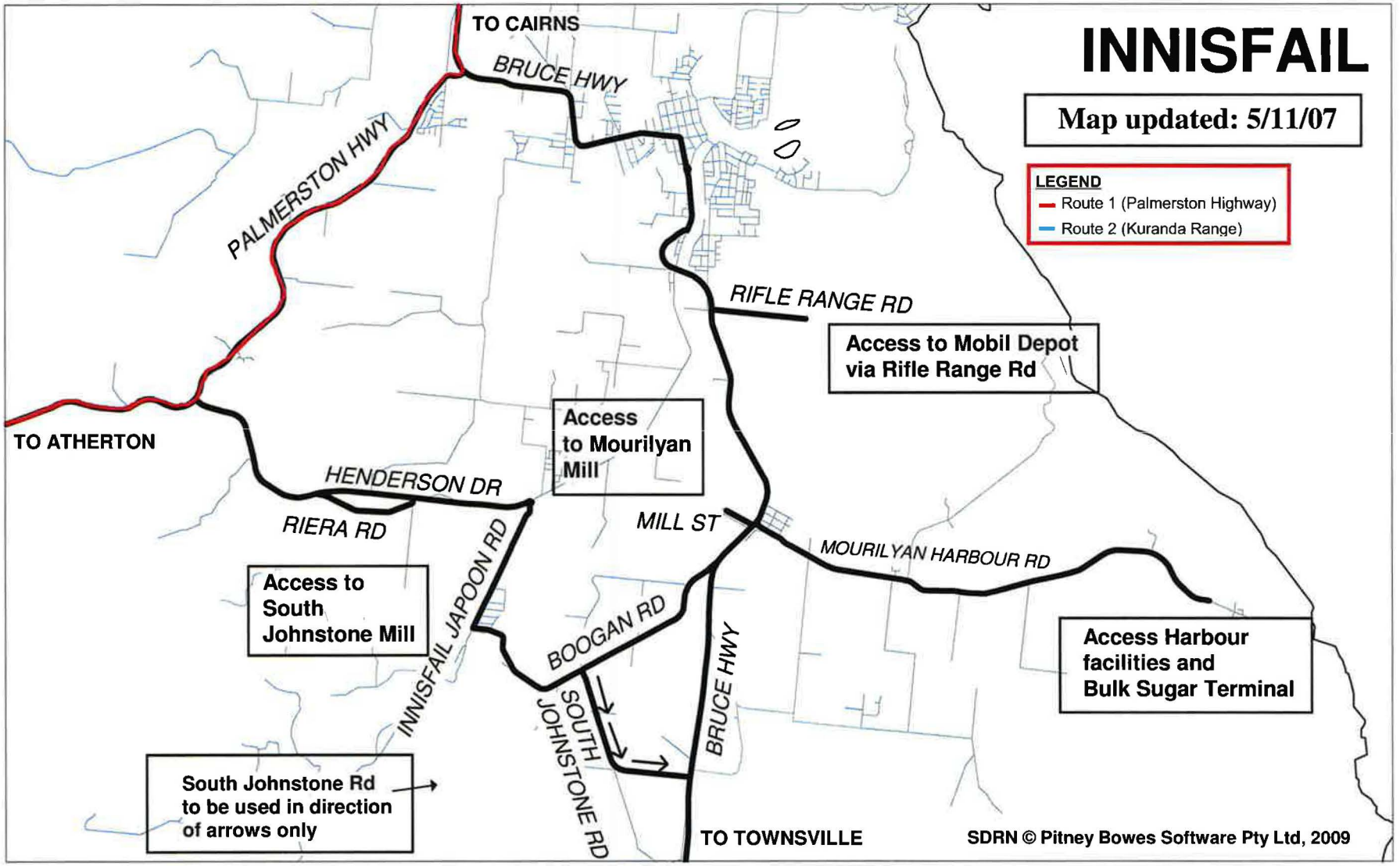


B-DOUBLES	ROAD TRAINS	NO ROAD TRAINS or B-DOUBLES
23 metre routes	Type 1 routes	
23 & 25 metre routes	Type 1 & 2 routes	

REFER TO LEGEND FOR DETAILS OF OPERATIONS IN THE SHADED AREAS
Note: 23 & 25 metre B-doubles can access Type 1 & 2 road train routes

MULTI-COMBINATION ROUTES IN QUEENSLAND

Queensland Government



B-DOUBLES
23 metre routes
23 & 25 metre routes

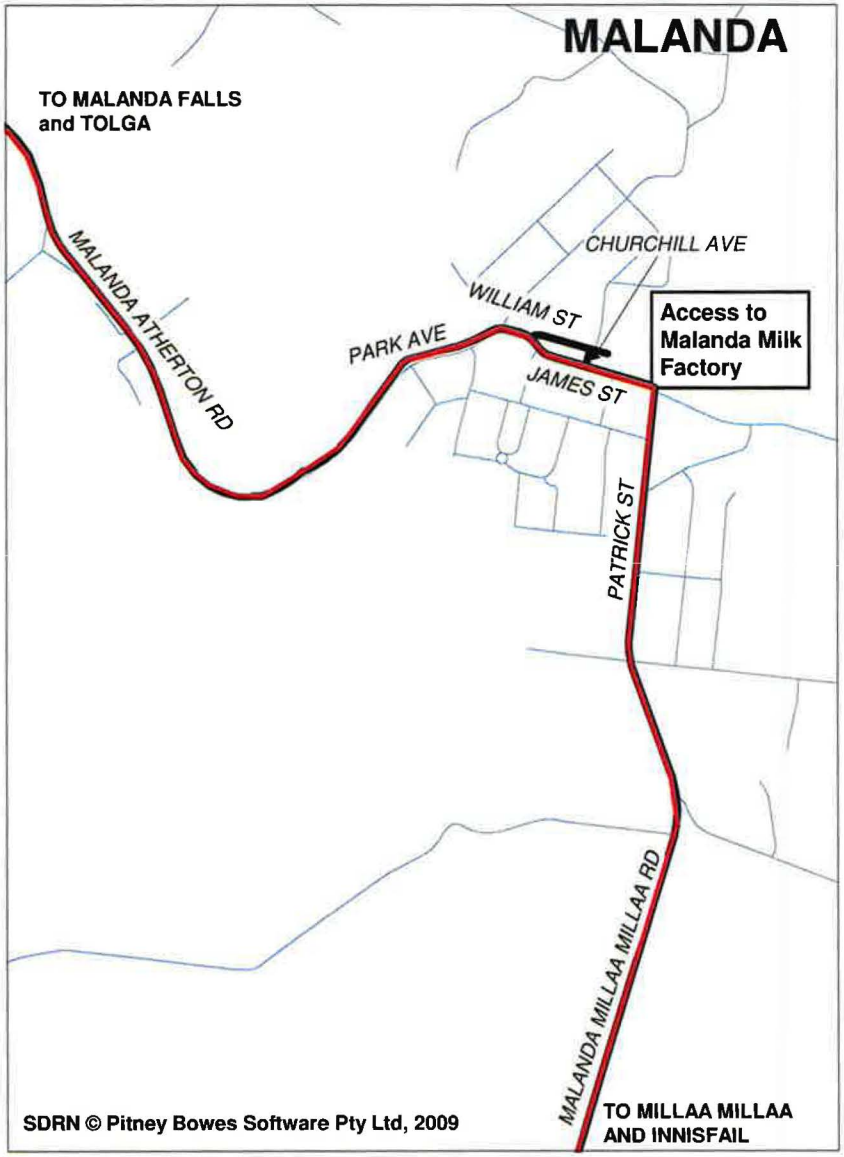
ROAD TRAINS
Type 1 routes
Type 1 & 2 routes

NO ROAD TRAINS or B-DOUBLES

REFER TO LEGEND FOR DETAILS OF OPERATIONS IN THE SHADED AREAS

MULTI-COMBINATION ROUTES IN QUEENSLAND

Queensland Government



LEGEND
- Route 1 (Palmerston Highway)
- Route 2 (Kuranda Range)

B-DOUBLES
- 23 metre routes
- 23 & 25 metre routes

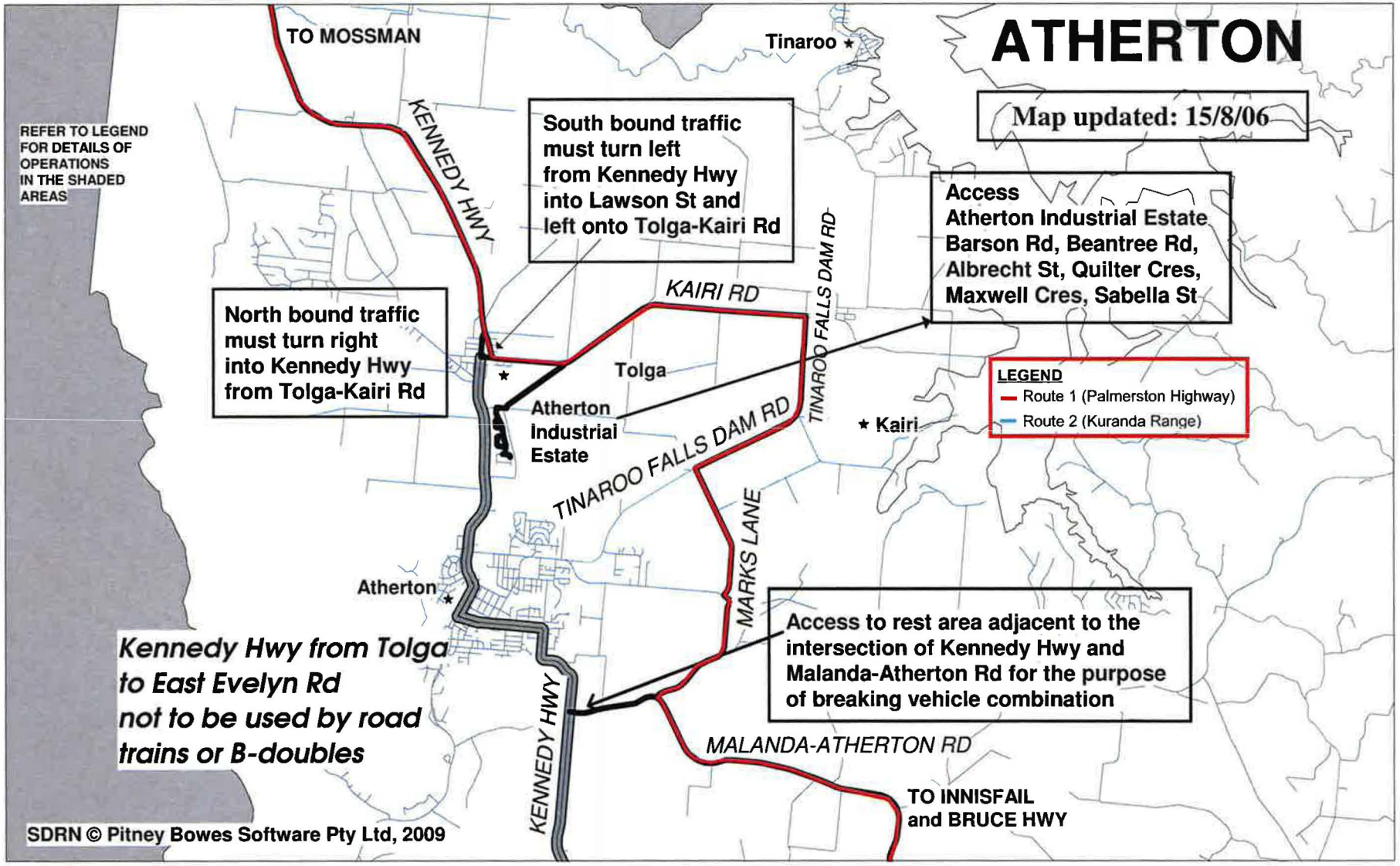
ROAD TRAINS
- Type 1 routes
- Type 1 & 2 routes

NO ROAD TRAINS or B-DOUBLES

REFER TO LEGEND FOR DETAILS OF OPERATIONS IN THE SHADED AREAS

MULTI-COMBINATION ROUTES IN QUEENSLAND

Queensland Government



B-DOUBLES
23 metre routes
23 & 25 metre routes

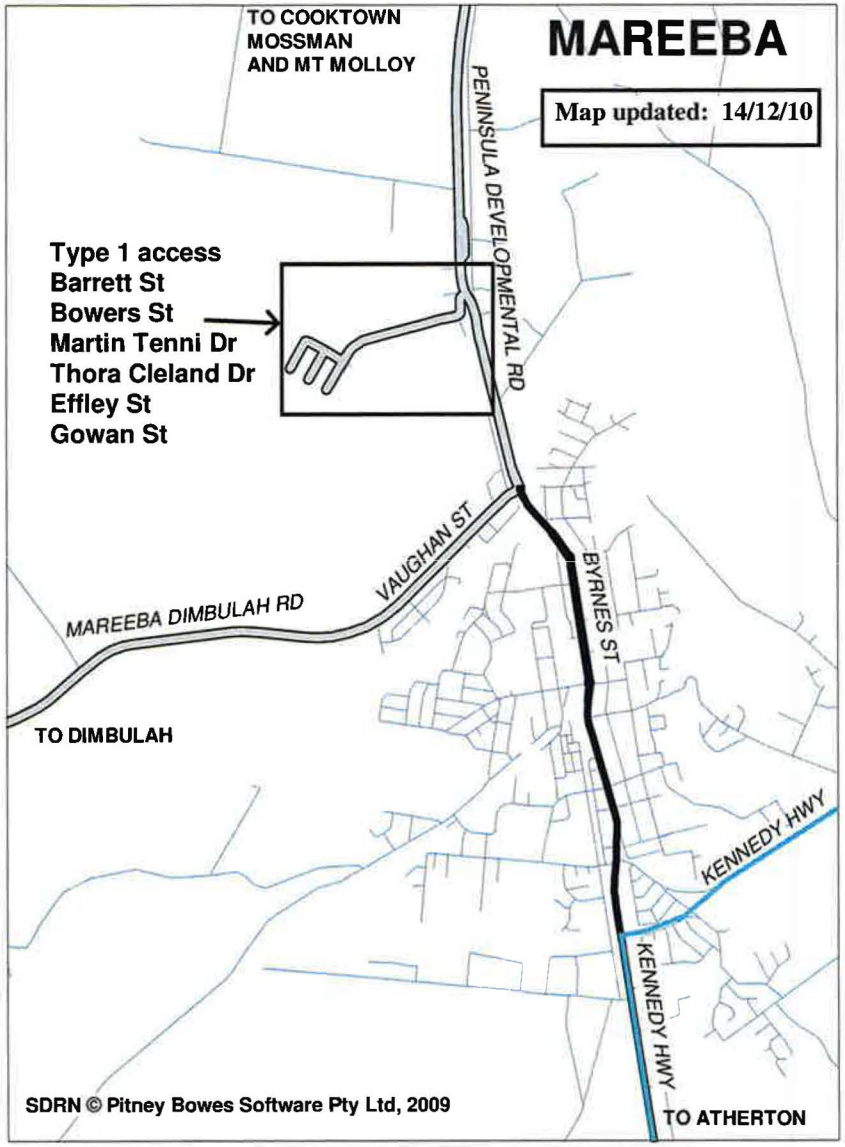
ROAD TRAINS
Type 1 routes
Type 1 & 2 routes

NO ROAD TRAINS or B-DOUBLES

REFER TO LEGEND FOR DETAILS OF OPERATIONS IN THE SHADED AREAS

MULTI-COMBINATION ROUTES IN QUEENSLAND

Queensland Government



LEGEND
- Route 1 (Palmerston Highway)
- Route 2 (Kuranda Range)

B-DOUBLES
- 23 metre routes
- 23 & 25 metre routes

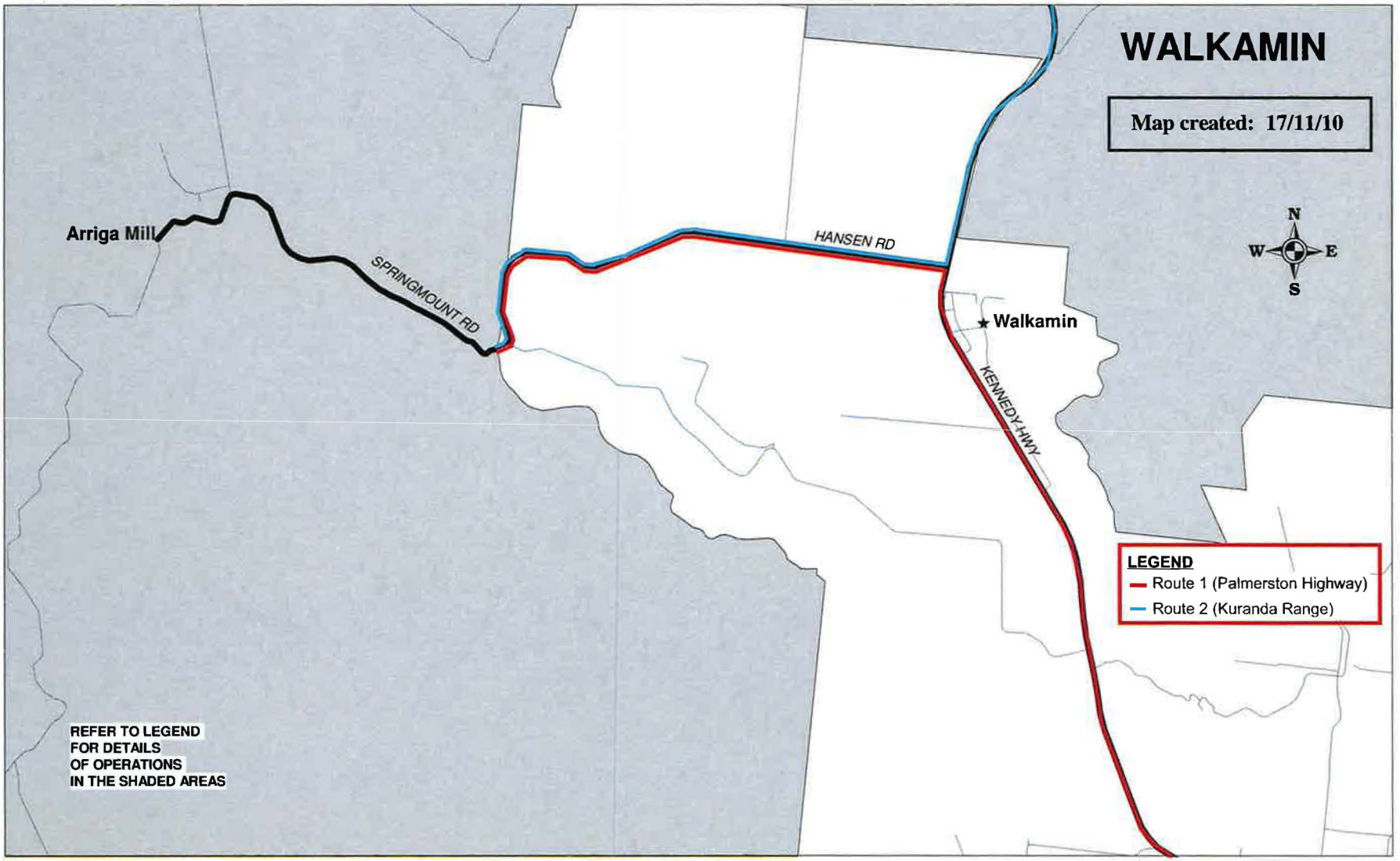
ROAD TRAINS
- Type 1 routes
- Type 1 & 2 routes

NO ROAD TRAINS or B-DOUBLES

REFER TO LEGEND FOR DETAILS OF OPERATIONS IN THE SHADED AREAS
Note: 23 & 25 metre B-doubles can access Type 1 & 2 road train routes

MULTI-COMBINATION ROUTES IN QUEENSLAND

Queensland Government



B-DOUBLES
23 metre routes
23 & 25 metre routes

ROAD TRAINS
Type 1 routes
Type 1 & 2 routes

NO ROAD TRAINS
or B-DOUBLES

REFER TO LEGEND FOR DETAILS OF OPERATIONS IN THE SHADED AREAS

Appendix B. Engineering Reponse to TRC 51 (From SKM 2012)

2. Engineering Response to TRC 51

- TRC 51 Demonstrating the capability of the vertical profiles of Hansen and Springmount Roads accommodating any proposed drop deck or low loader transport of turbine components

The assessment of the route to transport the turbine components along Hansen Road and Springmount Road to the site access at Kippen Drive has been carried out based on the following critical dimensions from "Acciona Windpower's Transportation Manual" and "REPOWER Systems Manual for Transportation, access tracks and Crane Pads".

2.1. Assumptions

- It is assumed that RATCH Australia will undertake a separate route assessment for this project
- Horizontal layout check was not undertaken as part of this report as it is included in the previous report.
- Blades are transported on a truck and rear steerable dolly/trailer, thus making the horizontal geometry not being a constraint on this route.
- The blades and tower components are mounted high above the ground so it is deemed that the transport of blades will not have vertical conflicts. (This is based on the REPOWER Systems document which details vertical crest clearances to be no greater than 1.75m over 50m lengths).
- Rotor/hub/nacelle are transported on low loaders and vertical crest curves were assessed based on the following requirements.

2.2. Vertical profile requirements

As per "Acciona Windpower's Transportation Manual – AW3000", short crest curves (less than 26m long) must not have the crest higher than 300mm or low loader transport vehicles will not be able to traverse the crest curve.

- The requirement for gradients has been checked against the requirements mentioned in section 2.4 RE Power Systems' 'Wind Power - MM82/MM92/3.2M114/3.4M104 Specification for transportation, transport roads, access tracks and crane pads'. The sections of the road which does not meet the criteria are shown in Table 1 and highlighted in the attached drawings included in **Appendix C**.
- The minimum vertical clearance height is 5 metres. Vertical clearance to overhead services and structures is not undertaken as part of this report. The report focuses on the vertical profile of the Hansen road.
- No detailed survey was available.
- Vertical geometry was developed as a best fit to the GPS data recorded during a vehicle drive through of the route.

Crests curve vertical geometry checked and shown in Table 1. Long sections and plans have been produced for two roads of approximately 10.9km in length. Refer to the drawings in **Appendix C** of this report.

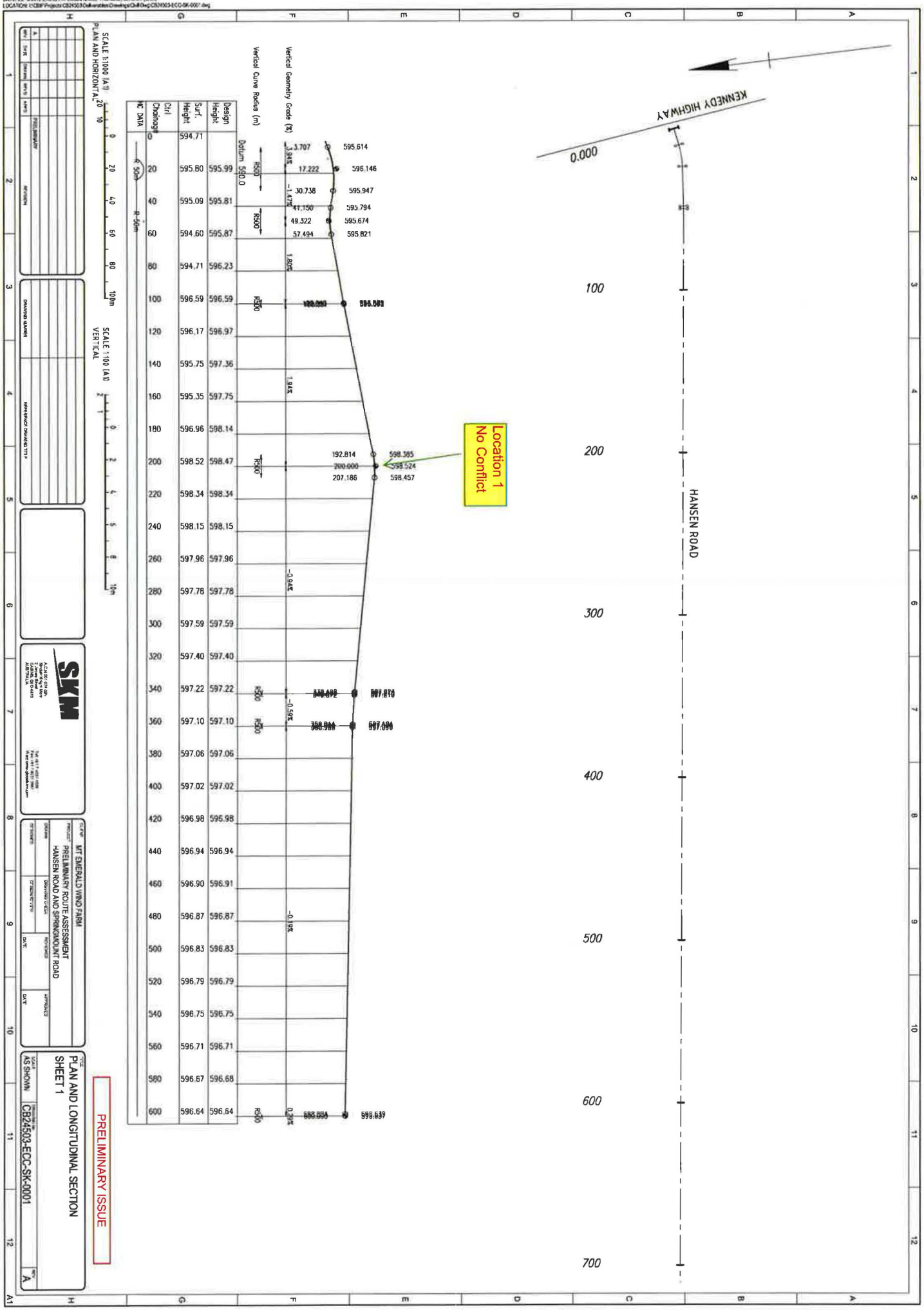
Table 1: Review of vertical profiles of Hansen and Springmount Road

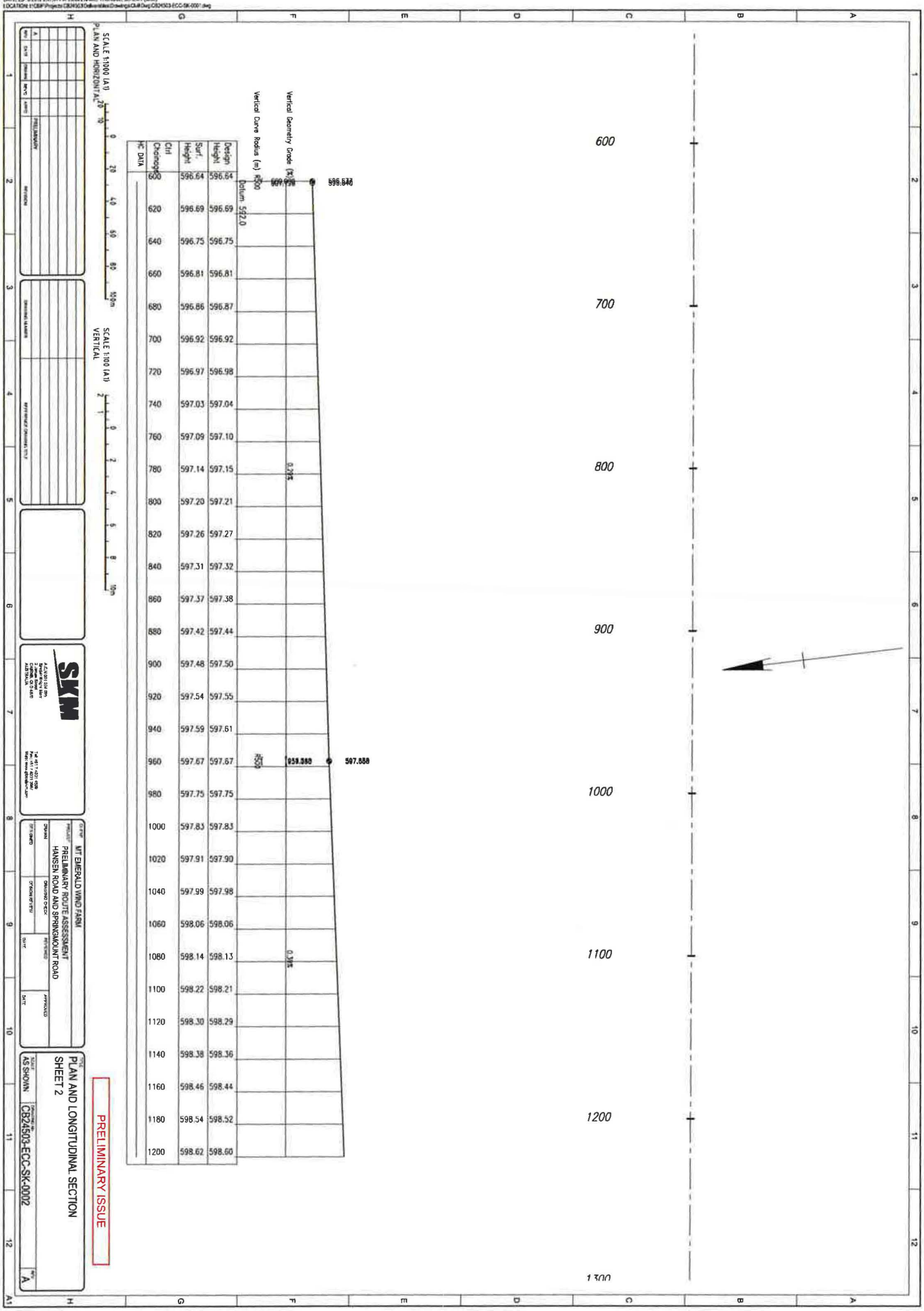
Review of Vertical profiles along Hansen and Springmount Road			
Location	Chainage	Possible conflict with vertical profile	Comments
1	200	Checked - no conflict	Refer Drawings in Appendix B
2	1620	Checked - no conflict	Refer Drawings in Appendix B
3	1920	Checked - no conflict	Refer Drawings in Appendix B
4	2900	Checked - no conflict	Refer Drawings in Appendix B
5	3440	Checked - no conflict	Refer Drawings in Appendix B
6	4170	Checked - no conflict	Refer Drawings in Appendix B
7	4420	Checked - no conflict	Refer Drawings in Appendix B
8	5320	Checked - no conflict	Refer Drawings in Appendix B
9	5775	Checked - possible conflict	* Eastern approach to Granite Creek causeway. As per Acciona Windpower AW3000 specification for low loaders, there is possible conflict. However, acceptable per REPower Systems Specification for blade transportation. It should be noted that this assessment was done purely from GPS survey coordinates and the road may have flatter surface profiles in reality. Recommend detail survey or refer to as constructed drawings to confirm crest details from ch 5740 to 5820

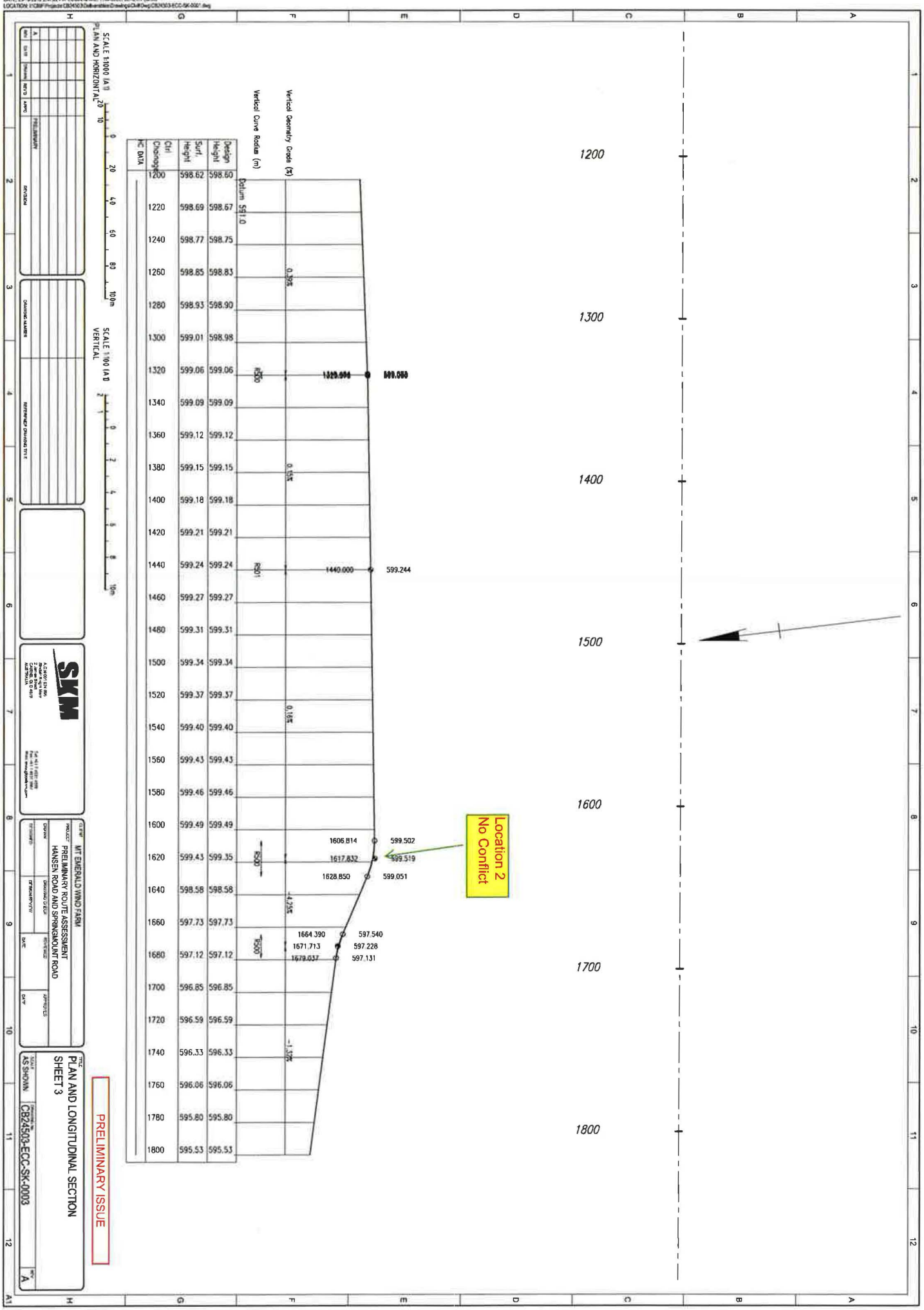
Mitigation for Location 9

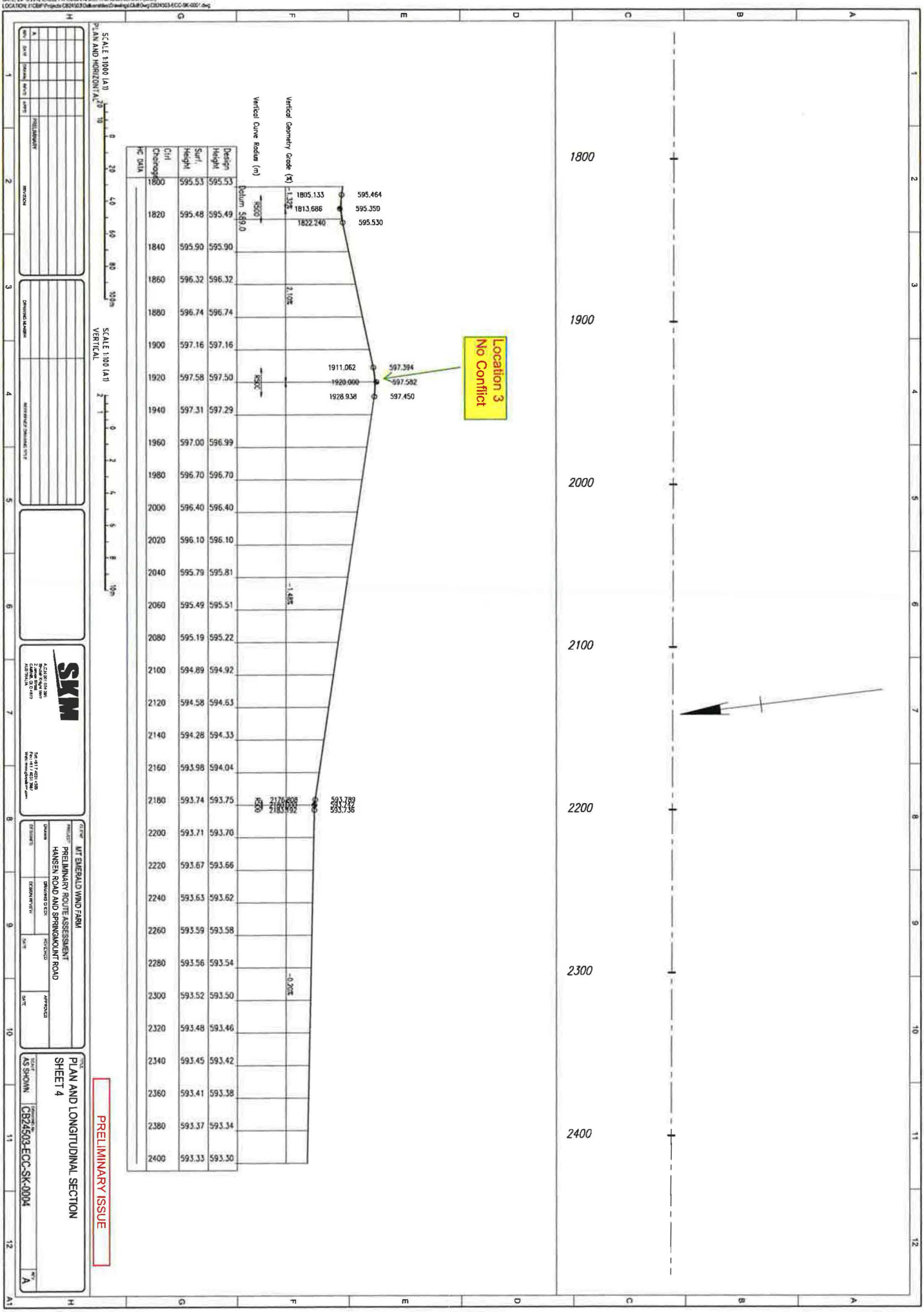
- Detail survey for the section of the road should be undertaken.
- After review of the survey and detailed reassessment of the conflict section, if the conflict remains, improvement to the vertical curve is recommended.

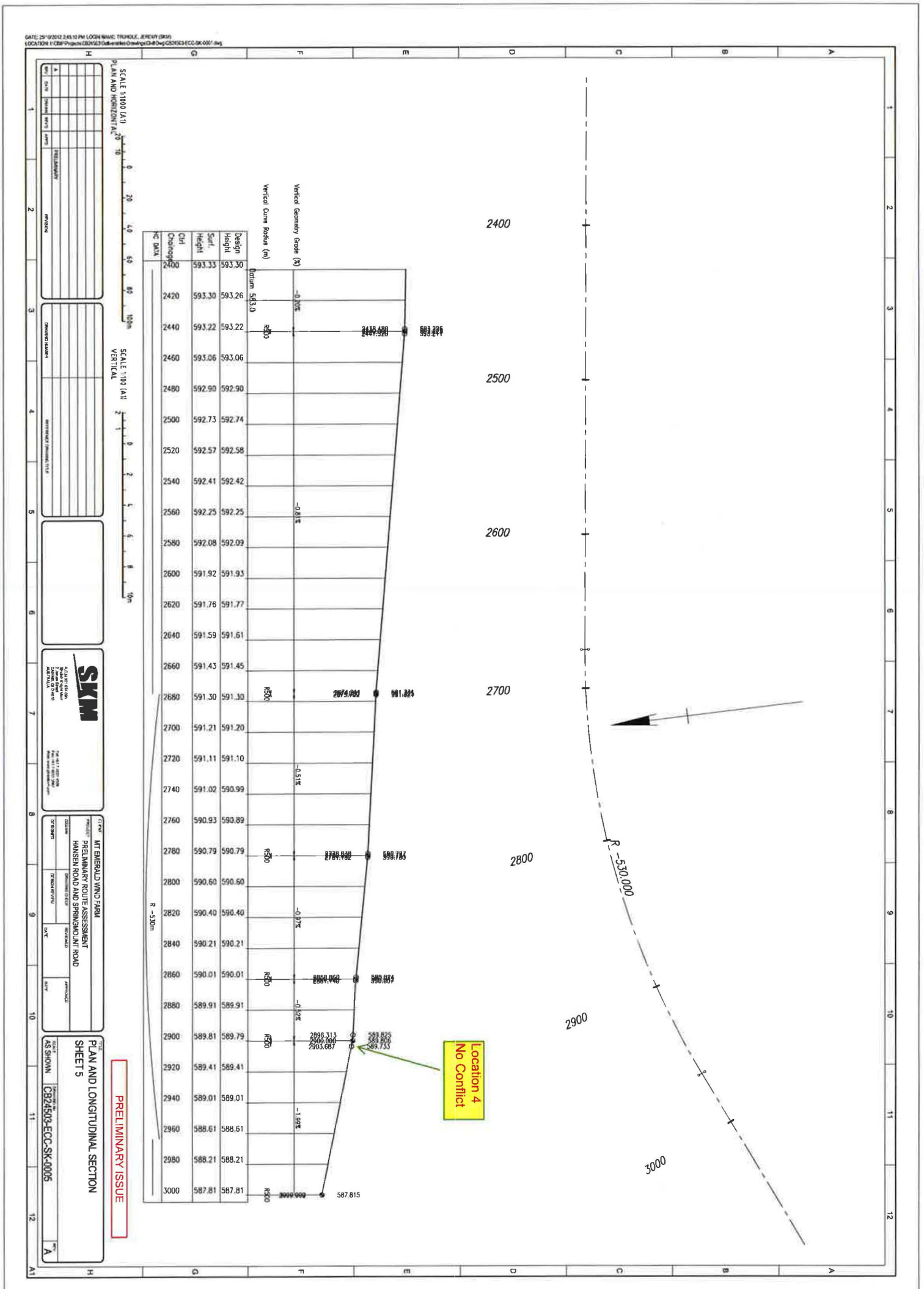
Appendix C. Vertical Geometry Drawings (From SKM 2012, Appendix C)

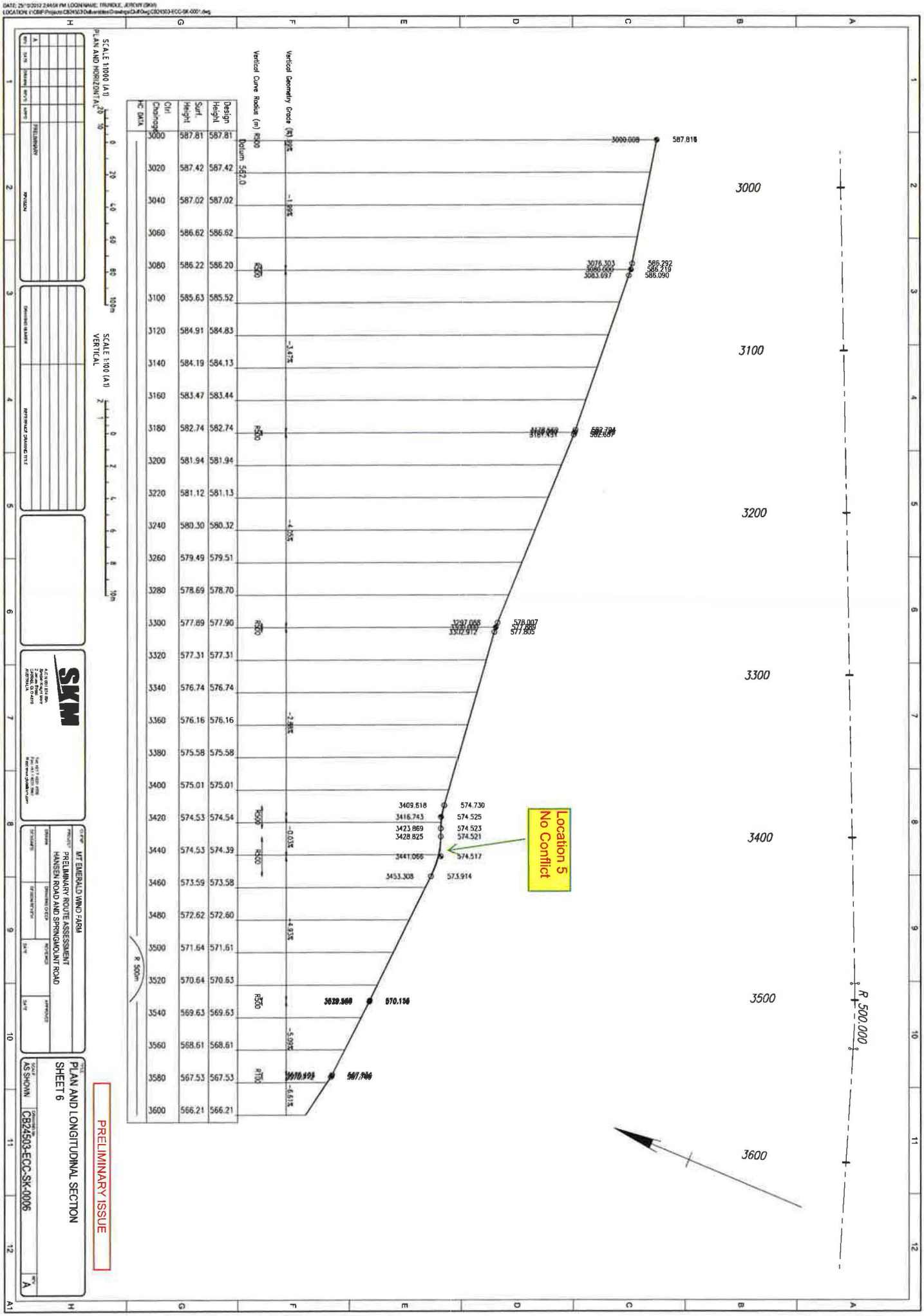





SCALE 1:1000 (A1)
PLAN AND HORIZONTAL
SCALE 1:100 (A1)
VERTICAL
Vertical Geometry Grade (%)
Vertical Curve Radius (m)
Datum 591.0
Design Height
Surf. Height
Ch'nage
HC DATA
1200 598.62 598.60
1220 598.69 598.67
1240 598.77 598.75
1260 598.85 598.83
1280 598.93 598.90
1300 599.01 598.98
1320 599.06 599.06
1340 599.09 599.09
1360 599.12 599.12
1380 599.15 599.15
1400 599.18 599.18
1420 599.21 599.21
1440 599.24 599.24
1460 599.27 599.27
1480 599.31 599.31
1500 599.34 599.34
1520 599.37 599.37
1540 599.40 599.40
1560 599.43 599.43
1580 599.46 599.46
1600 599.49 599.49
1620 599.43 599.35
1640 598.58 598.58
1660 597.73 597.73
1680 597.12 597.12
1700 596.85 596.85
1720 596.59 596.59
1740 596.33 596.33
1760 596.06 596.06
1780 595.80 595.80
1800 595.53 595.53
0.32%
0.55%
0.16%
-4.25%
-1.32%
R500
R501
R500
R500
1440.000
599.244
1606.814
599.502
1617.832
599.519
1628.850
599.051
1664.390
597.540
1671.713
597.228
1679.037
597.131
Location 2
No Conflict
1200
1300
1400
1500
1600
1700
1800
PRELIMINARY ISSUE
SKM
MT EMERALD WIND FARM
PRELIMINARY ROUTE ASSESSMENT
HANSEN ROAD AND SPRINGMOUNT ROAD
PLAN AND LONGITUDINAL SECTION
SHEET 3
AS SHOWN
CB24503-ECC-SK-0003
A


SCALE 1:1000 (A1)
PLAN AND HORIZONTAL
SCALE 1:100 (A1)
VERTICAL
Vertical Curve Radius (m)
Vertical Geometry Grade (%)
Datum 589.0
HC DATA
Ch'l Chainage
Surf. Height
Design Height
1805.133 595.464
1813.686 595.350
1822.240 595.530
1911.062 597.394
1920.000 597.582
1928.938 597.450
2176.608 593.789
2184.792 593.736
Location 3
No Conflict
1800
1900
2000
2100
2200
2300
2400
PRELIMINARY ISSUE
MT EMERALD WIND FARM
PRELIMINARY ROUTE ASSESSMENT
HANSEN ROAD AND SPRINGMOUNT ROAD
PLAN AND LONGITUDINAL SECTION
SHEET 4
AS SHOWN
CB24503-ECC-SK-0004
A




Vertical Geometry Grade (%)
Vertical Curve Radius (m)
Datum 542.0
Design Height
Surf. Height
Ctrl Chainage
HC DATA
3000 587.81 587.81
3020 587.42 587.42
3040 587.02 587.02
3060 586.62 586.62
3080 586.22 586.20
3100 585.63 585.52
3120 584.91 584.83
3140 584.19 584.13
3160 583.47 583.44
3180 582.74 582.74
3200 581.94 581.94
3220 581.12 581.13
3240 580.30 580.32
3260 579.49 579.51
3280 578.69 578.70
3300 577.89 577.90
3320 577.31 577.31
3340 576.74 576.74
3360 576.16 576.16
3380 575.58 575.58
3400 575.01 575.01
3420 574.53 574.54
3440 574.53 574.39
3460 573.59 573.58
3480 572.62 572.60
3500 571.64 571.61
3520 570.64 570.63
3540 569.63 569.63
3560 568.61 568.61
3580 567.53 567.53
3600 566.21 566.21
R500
R 500m
3000.000 587.818
3076.303 586.292
3080.000 586.219
3083.697 586.090
3409.518 574.730
3416.743 574.525
3423.869 574.523
3428.825 574.521
3441.066 574.517
3453.308 573.914
Location 5
No Conflict
3000
3100
3200
3300
3400
3500
3600
R 500.000
SCALE 1:1000 (A1)
PLAN AND HORIZONTAL
SCALE 1:100 (A1)
VERTICAL
PRELIMINARY ISSUE
MT EMERALD WIND FARM
PRELIMINARY ROUTE ASSESSMENT
HANSEN ROAD AND SPRINGMOUNT ROAD
PLAN AND LONGITUDINAL SECTION
SHEET 6
AS SHOWN
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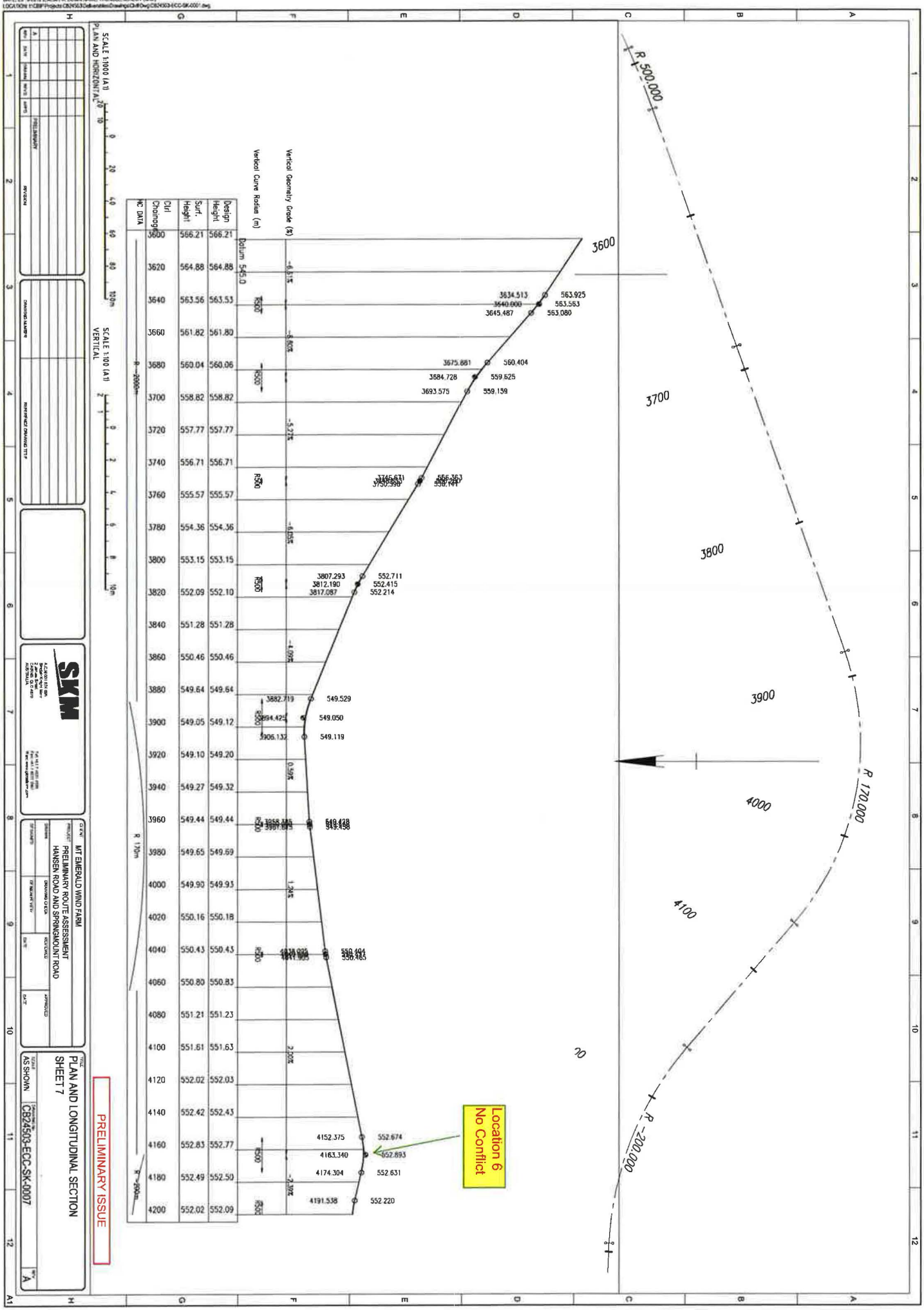
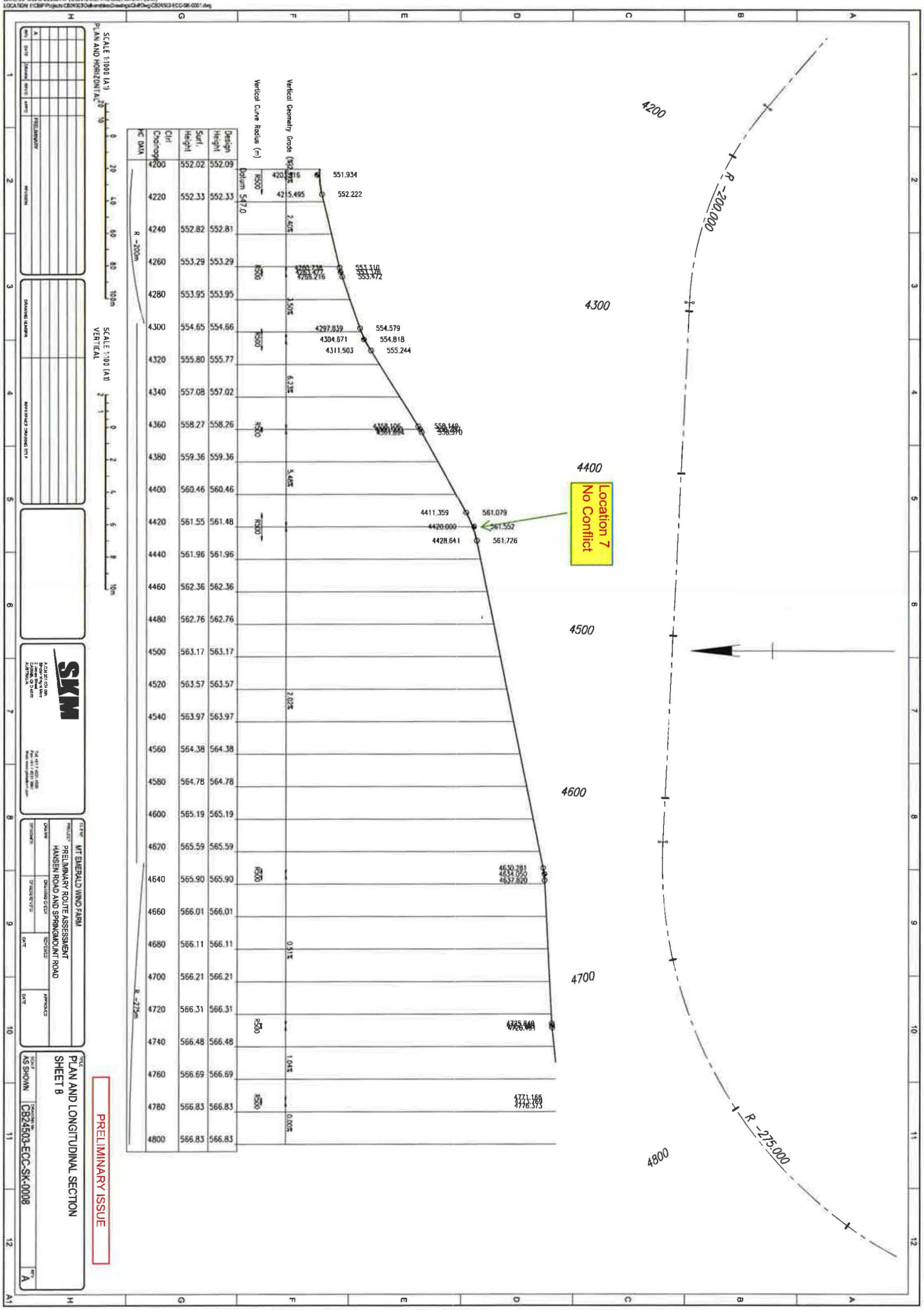
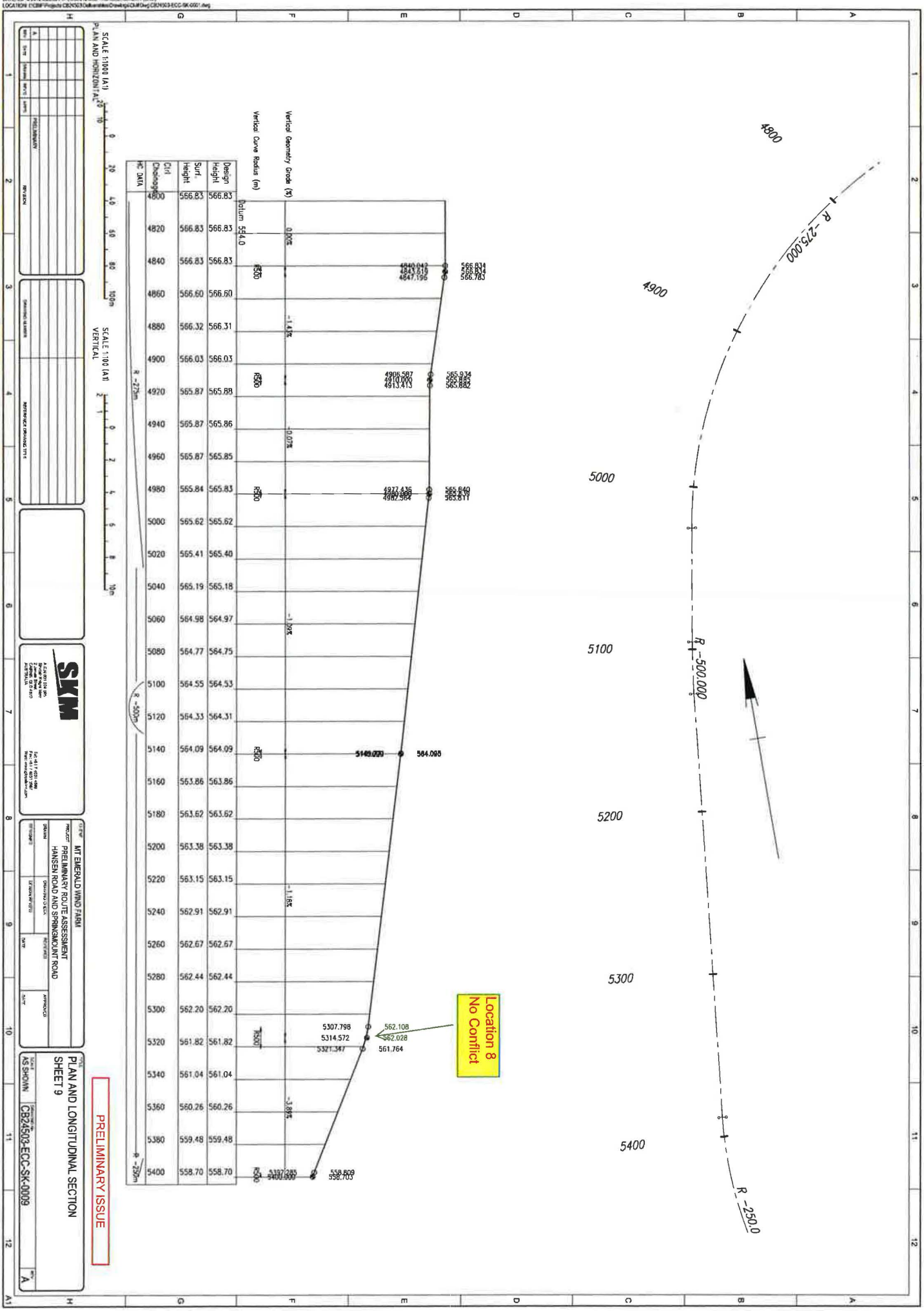
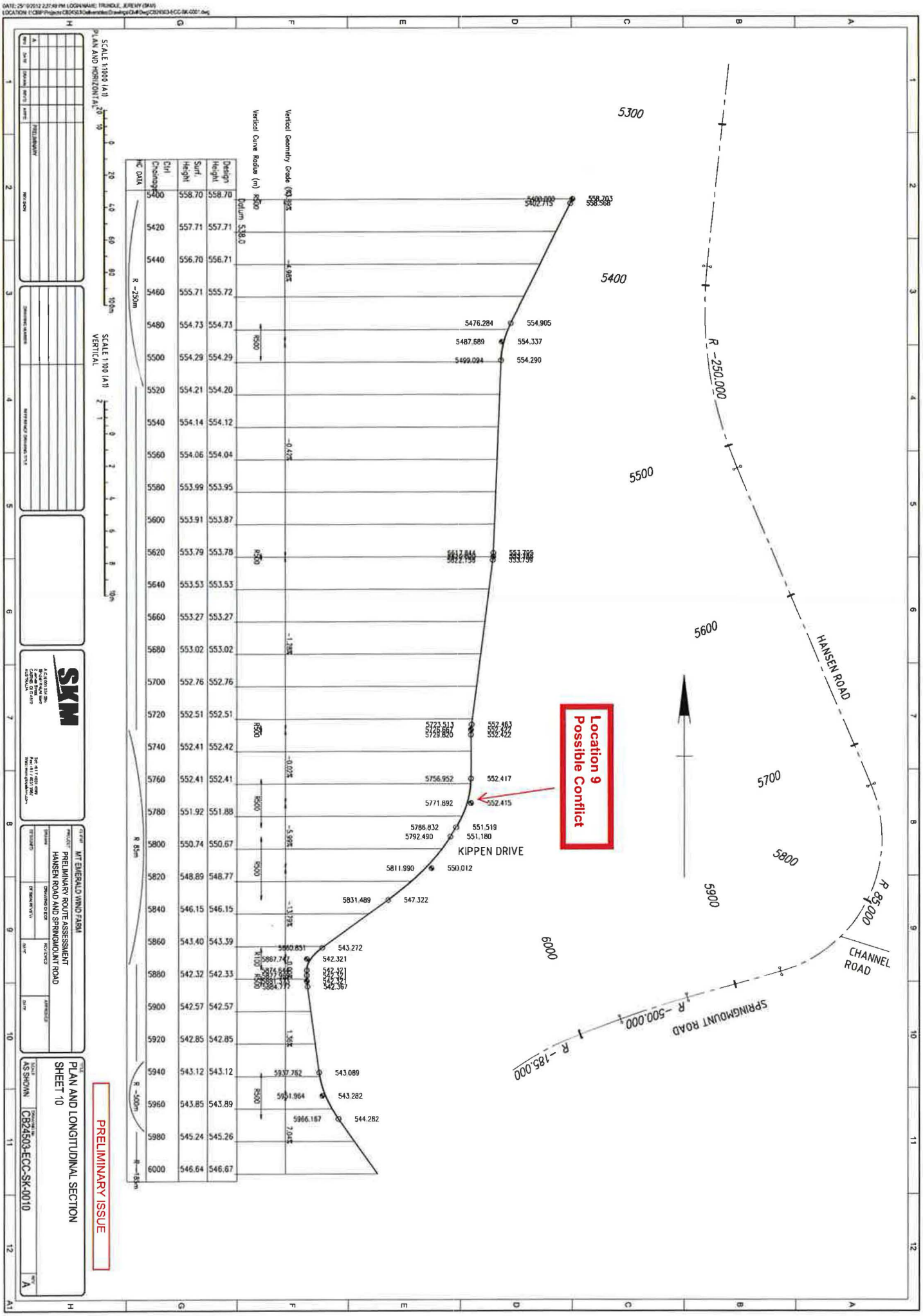
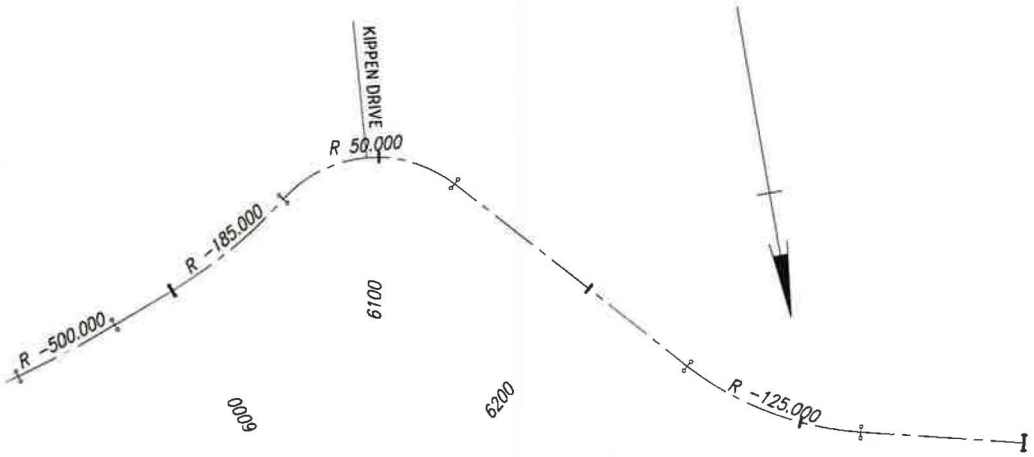
A

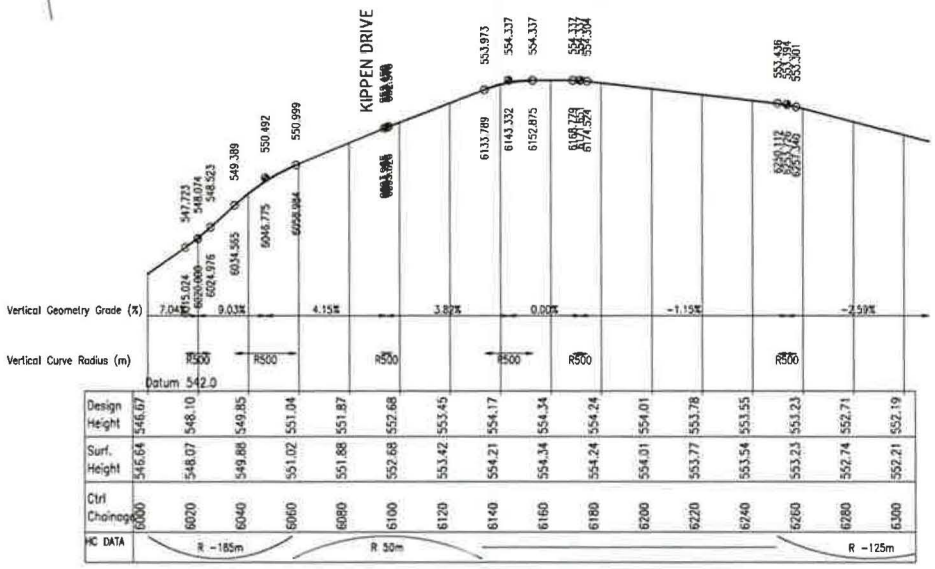












Design Height	546.67	548.10	549.85	551.04	551.87	552.68	553.45	554.17	554.34	554.24	554.01	553.78	553.55	553.23	552.71	552.19
Surf. Height	546.84	548.07	549.88	551.02	551.88	552.68	553.42	554.21	554.34	554.24	554.01	553.77	553.54	553.23	552.74	552.21
Ctrl Chainage	6000	6020	6040	6060	6080	6100	6120	6140	6160	6180	6200	6220	6240	6260	6280	6300
HC DATA		R -185m				R 50m								R -125m		

SCALE 1:1000 (A1)
PLAN AND HORIZONTAL
0 20 40 60 80 100m
20 10

SCALE 1:100 (A1)
VERTICAL
0 2 4 6 8 10m
2 1

PRELIMINARY ISSUE

REV	DATE	DRAWN	REVIEW	APPD	REVISION
A					PRELIMINARY

DRAWING NUMBER | REFERENCE DRAWING TITLE

SKM

CLIENT: MT EMERALD WIND FARM
PROJECT: PRELIMINARY ROUTE ASSESSMENT
HANSEN ROAD AND SPRINGMOUNT ROAD

DRAWN | DRAWING CHECK | REVIEWED | APPROVED
DESIGNED | DESIGN REVIEW | DATE | DATE

TITLE: PLAN AND LONGITUDINAL SECTION
SHEET 11

SCALE: AS SHOWN
DRAWING No: CB24503-ECC-SK-0011
REV: A

DATE: 29/10/2012 2:51:51 PM | LOGIN NAME: TRENDLE, JEREMY (SKM)
LOCATION: P:\Projects\CB24503\Drawings\CB24503-ECC-SK-0007.dwg

Appendix D. Calculation for Vechicle Movements & Worker Numbers (From SKM 2012, Appendix B)

Mt. Emerald Wind Farm - Worker Numbers Estimate

PRELIMINARY INFORMATION

Location	Mount Emerald, Walkamin
Tower Model	Siemens SWT-2.3-101 WTG
No. of Towers	75
No. Of working days	300
Total Output	225 MW

	Year 1: Workers per day												Year 2: Workers per day											
	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12
Kippan Drive Road Construction	42	36	38	58	58	58	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Surveying	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clearing & grubbing	2	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Earth moving/ Excavation	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hauling/ Dumping	4	4	4	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine grading	3	3	3	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Levelling	3	3	3	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Drainage	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Granular base	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electrical conduits	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Watering	2	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paving base	0	0	0	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Compaction	0	0	2	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paving wearing course	0	0	0	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shoulder granulars	0	0	0	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
guardrail installation	0	0	0	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Noise barriers	2	2	2	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Signage	2	2	2	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landscaping	0	0	0	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pavement marking	0	0	0	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Checkout and acceptance	2	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Internal access road construction within wind farm site	82	70	74	94	94	94	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Surveying	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clearing & grubbing	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Earth moving/ Excavation	8	8	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hauling/ Dumping	8	8	8	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine grading	6	6	6	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Levelling	6	6	6	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Drainage	6	6	6	6	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Granular base	8	8	8	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Electrical conduits	8	8	8	8	8	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Watering	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paving base	0	0	0	8	8	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Compaction	0	0	4	6	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Paving wearing course	0	0	0	8	8	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Shoulder granulars	0	0	0	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
guardrail installation	0	0	0	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Noise barriers	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Signage	4	4	4	6	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Landscaping	0	0	0	6	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pavement marking	0	0	0	6	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Checkout and acceptance	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hansen road maintenance and rehabilitation works	2	2	2	24	24	24	14	11	12	16	16	16	14	11	11	16	16	16	5	2	2	26	26	26
Surveying	0	0	0	0	0	0	3	0	0	0	0	0	3	0	0	0	0	0	3	0	0	0	0	0
Clearing & grubbing	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Earth moving/ Excavation	0	0	0	2	2	2	2	2	2	0	0	0	2	2	2	0	0	0	0	0	0	2	2	2
Hauling/ Dumping	0	0	0	1	1	1	1	1	1	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1
Fine grading	0	0	0	1	1	1	1	1	1	0	0	0	1	1	1	0	0	0	0	0	0	2	2	2
Levelling	0	0	0	1	1	1	1	1	1	0	0	0	1	1	1	0	0	0	0	0	0	1	1	1
Drainage	0	0	0	2	2	2	2	2	2	0	0	0	2	2	2	0	0	0	0	0	0	2	2	2
Granular base	0	0	0	2	2	2	2	2	2	0	0	0	2	2	2	0	0	0	0	0	0	2	2	2
Electrical conduits	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Watering	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Paving base	0	0	0	2	2	2	0	0	0	4	4	4	0	0	0	4	4	4	0	0	0	4	4	4
Compaction	0	0	0	1	1	1	0	0	1	1	1	1	0	0	0	1	1	1	0	0	0	1	1	1
Paving wearing course	0	0	0	3	3	3	0	0	0	2	2	2	0	0	0	2	2	2	0	0	0	2	2	2
Shoulder granulars	0	0	0	1	1	1	0	0	0	1	1	1	0	0	0	1	1	1	0	0	0	1	1	1
guardrail installation	0	0	0	2	2	2	0	0	0	2	2	2	0	0	0	2	2	2	0	0	0	2	2	2
Noise barriers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Signage	0	0	0	2	2	2	0	0	0	2	2	2	0	0	0	2	2	2	0	0	0	2	2	2
Landscaping	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pavement marking	0	0	0	1	1	1	0	0	0	1	1	1	0	0	0	1	1	1	0	0	0	1	1	1
Checkout and acceptance	0	0	0	1	1	1	0	0	0	1	1	1	0	0	0	1	1	1	0	0	0	1	1	1
Concrete Foundation Construction	37	37	37	37	37	37	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Surveying	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clearing & grubbing	2	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Earth moving/ Excavation	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hauling/ Dumping	2	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Levelling	2	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Temporary formwork	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reinforcement bars shaping	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reinforcement bars installing	4	4	4	4	4	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Install footing rings	2	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pouring concrete	2	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Watering	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vibration	2	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Trimming off finished surface	2	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Checkout and acceptance	2	2	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardstands	0	0	0	0	0	0	10	10	10	10	10	10	10	10	10	10	10	10	0	0	0	0	0	0
Construct WTG hardstand areas	0	0	0	0	0	0	4	4	4	4	4	4	4	4	4	4	4	4	0	0	0	0	0	0
Disperse gravel base	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	0	0	0	0	0	0
Roll gravel base	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	0	0	0	0	0	0
Grade hardstand area	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	0	0	0	0	0	0
Cabling	0	0	0	0	0	0	8	8	8	8	8	8	8	8	8	8	8	8	0	0	0	0	0	0
Trenching	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	0	0	0	0	0	0
Laying	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	0	0	0	0	0	0
Covering	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	0	0	0	0	0	0
Cable and Earthing in Wind Farm	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	0	0	0	0	0	0
Delivery of Tower Components	0	0	0	0	0	0	20	20	20	20	20	20	20	20	20	20	20	20	0	0	0	0	0	0
Loading/ Unloading	0	0	0	0	0	0	10	10	10	10	10	10	10	10	10	10	10	10	0	0	0	0	0	0
Storing	0	0	0	0	0	0	10	10	10	10	10	10	10	10	10	10	10	10	0	0	0	0	0	0
Wind Turbine Generator Construction	0	0	0	0	0	0	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20
Main crane assembly	0	0	0	0	0	0	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Construction of main WTG sections	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Nacelle section	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Tower upper section	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Tower mid section	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Tower lower section	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Tower hub section	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Tower blade section	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Transmission Lines	0	0	0	0	0	0	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32	32
Nitrogen Conductor	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
OPGW	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Suspension Poles	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Strain Poles	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Termination Poles	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Insulators	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Line Fittings	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
OPGW Splice Enclosures	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Earthing and Labels	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Container Demurrage	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Electrical Installation	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Construction and assembly of transmission poles	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Installation of transmission lines	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Installation of transmission lines	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Installation of transmission lines	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Concrete footings for transmission poles	0	0	0	0	0	0	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Control Building and Switchyard	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	50	50	50	50	50	50
110kV Circuit Breaker	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2
110kV Disconnector AUD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2
110kV Earth Switch	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2
110kV VT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2
110kV Post Insulators	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2
110kV Surge Arrestors	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2
110/22kV, 80MVA Transformer	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2
22kV Main Switchboard	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2
22kV WTG Switchgear	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2
22kV WTG Transformers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2
Protection	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2
SCADA and Telecommunications	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2
AC/DC Aux	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2
Steel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3	3
Busbars	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3	3
Cable and Earthing in Sub-station	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3	3
Ancillary Equipment incl. Installation (AC/DC Aux)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3	3
Electrical Installation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3	3
Installation of Switchyard Equipment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2
Installation of Switchyard Equipment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2
Installation of Switchyard Equipment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	2	2
Concrete foundation for switchyard	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	3	3	3
Miscellaneous	26	26	16	16	16	16	18	18	18	18	18	18	18	18	18	18	18	18	20	20	20	20	21	22
Experts	2	2	2	2	2	2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
Site Managers	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
E-suppliers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2	3	4
Contractors	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Site Camp and Temporary Office installation	10	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Staff Amenities	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Waste Transfer/Storage Facilities	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Total no of workers per day	189	171	167	229	229	229	122	119	120	124	124	124	122	119	119	124	124	124	127	124	124	148	148	150
Average (daily) per 3 different phases of wind tower construction			202									122									137			
Average number of workers per day												154												

Mt. Emerald Wind Farm - Quantities Estimate

PRELIMINARY INFORMATION	
Location	Mount Emerald, Walkamin
Tower Model	Siemens SWT-2.3-101 WTG
No. of Towers	75
No. Of working days	300
Total Output	225 MW

ITEM	DESCRIPTION	QUANTITY	UNIT	VEHICLE MOVEMENTS	TYPE OF PLANT	COMMENTS / ASSUMPTIONS
1.0	**Roads**					Kippen Drive, Internal access roads within Wind Farm Site & Hansen Road (if required)
	Length of access road	44.6	km			Total length of unsealed access road within wind farm site 33.2km, Kippen Drive 5.3km & Hansen Rd 6.1km.
	Carriageway width	5.0	m			Minimum required for transport of turbine components
	Total pavement width	7.0	m			1.0 m shoulder either side of carriageway
	Strip existing surface	100	mm	5	EME - Excavator	Remove top-soil along proposed access roads
	Volume of top-soil	31,220	m^3			
	Tonnage of top-soil	62,440	tonnes	2,313	Trucks - 10 yd with trailers	Assuming no cut to fill, CCM of top-soil is 2.0 tons/m^3, each truck/trailer carries 27 tonnes
	Pavement thickness	300	mm			Gravel compacted to minimum 300 mm thickness, axle loading of 15 tonnes
	Volume of gravel	93,660	m^3			
	Tonnage of gravel	224,784	tonnes	8,325	Trucks - 10 yd with trailers	Assuming CCM of gravel is 2.4 tons/m^3, each truck/trailer carries 27 tonnes
	Spread gravel road base evenly			4	EME - Bulldozer	
	Roll gravel			4	EME - Vibrating Roller	
	Grade road surface	312,200	m^2	2	EME - Grader	
2.0	**Foundations**					
	Construct WTG foundations	75	no.			
	Foundation plan area	289	m^2			17 x 17 m square pad footing
	Slab thickness	1.4	m			
	Volume of concrete per footing	405	m^3			32 MPa concrete (if a rock anchor type is used (as is highly likely for MEWF) then this reduces to 100m^3)
	Total volume of concrete	30,345	m^3			75 WTG footings in total, sand & gravel aggregates
	Tonnage of concrete	72,828	tonnes	2,023	Trucks - 10 yd with Trailers	Assuming MDD of concrete is 2.4 tons/m^3, concrete mix is 25% water
	Water trucks for concrete mix			90	Trucks - Water Tanker	Supply by water tanker (20,000L)
	Mix concrete			4	Trucks - Agitator	Assuming batching plant on site
	Deliver WTG footing rings	75	no.	75	Trucks - Flat Tray	
	Install WTG footing rings	75	no.	2	Crane - 50t plus capacity	Steel flange connection ring for lower WTG section. (2 trips to site and 2 trips from site)
	Install WTG footing steel reo	40	tonnes			40 tonne steel per footing
	Total volume of steel reo	3,000	tonnes	300	Trucks - Flat Tray	75 WTG footings in total
3.0	**Hardstands**					
	Construct WTG hardstand areas	75	no.			Construction area for assembling WTG by crane
	Hardstand plan area	800	m^2			40 x 20 m, max. gradient of 1%, bearing capacity > 200 kN/m^2
	Base thickness	300	mm			Gravel compacted to 300 mm thickness
	Volume of gravel per hardstand	240	m^3			
	Total volume of gravel	18,000	m^3			
	Tonnage of gravel	43,200	tonnes	1,600	Trucks - 10 yd with Trailers	Assuming CCM of gravel is 2.4 tons/m^3, each truck/trailer carries 27 tonnes
	Disperse gravel base			2	EME - Bulldozer	
	Roll gravel base			1	EME - Vibrating Roller	
	Grade hardstand area	800	m^2	1	EME - Grader	
4.0	**Cabling**					
	Trenching, laying and covering	44.6	km	2	EME - Excavator	Excavation of cable trench
	Cable and Earthing in Wind Farm	44.6	km	8	Semi/Low Loader	Approximately 40 drums of cabling, 8 tonnes each
5.0	**WTG Construction**					
	Main crane assembly	1	no.	2	Crane - 50t plus capacity	2 trips to site and 2 trips from site
	Construction of main WTG sections	75	no.	20	Crane - 400t plus capacity	75 WTG in total, assembly by using main crane (400 tonne plus capacity) (10 trucks to bring the crane and its components to site and 10 to remove it
	Nacelle section	75	no.	75	Semi/Low Loader	
	Tower upper section	75	no.	75	Semi/Low Loader	
	Tower mid section	75	no.	75	Semi/Low Loader	
	Tower lower section	75	no.	75	Semi/Low Loader	
	Tower hub section	75	no.	25	Semi/Low Loader	1 truck for every 3 hubs
	Tower blade section	225	no.	225	Semi/Low Loader	3x blades per WTG, single blade transport
6.0	**Transmission Lines**					
	Nitrogen Conductor	150	km	15	Trucks - Flat Tray	3 x 50 km transmission lines, 5 km per drum, 5-6 tonnes each
	OPGW	55	km	6	Trucks - Flat Tray	Optical ground wire cable, 5 km per drum
	Suspension Poles	102	no.	17	Semi/Low Loader	Disassembled in 40 ft containers, assumed 6 per container
	Strain Poles	24	no.	6	Semi/Low Loader	Disassembled in 40 ft containers, assumed 4 per container
	Termination Poles	23	no.	6	Semi/Low Loader	Disassembled in 40 ft containers, assumed 4 per container
	Insulators	1	lot	1	Trucks - Flat Tray	Delivered in boxes, on pallette
	Line Fittings	1	lot	1	Trucks - Flat Tray	
	OPGW Splice Enclosures	14	no.	1	Trucks - Flat Tray	
	Earthing and Labels	1	lot	1	Trucks - Flat Tray	
	Container Demurrage	1	lot	1	Trucks - Flat Tray	
	Elecinical Installation	1	lot	3	Trucks - Flat Tray	Installation of electrical items such as lighting, A/C, telecomms, etc.
	Construction and assembly of transmission poles			1	Crane - 20t plus capacity	Pole components lifted into position by crane
	Installation of transmission lines			1	Trucks - EPV	
	Installation of transmission lines			2	Light Vehicles - 4WD	
	Installation of transmission lines			1	Light Vehicles - Winch Trailer	
	Concrete footings for transmission poles			1	Trucks - Agitator	
7.0	**Control Building and Switchyard**					
	110kV Circuit Breaker	2	no.	1	Semi/Low Loader	
	110kV Disconnector AUD	3	no.	1	Trucks - Flat Tray	1 pallette
	110kV Earth Switch	1	no.	1	Trucks - Flat Tray	1 pallette
	110kV VT	3	no.	1	Trucks - Flat Tray	1 pallette
	110kV Post Insulators	40	no.	4	Trucks - Flat Tray	4 palletes
	110kV Surge Arrestors	6	no.	1	Trucks - Flat Tray	1 pallette
	110/22kV, 80MVA Transformer	2	no.	3	Semi/Low Loader	75 tonne for transformer, 25 tonne for oil container
	22kV Main Switchboard	1	no.	1	Trucks - Flat Tray	7-8 panels, 1 tonne each
	22kV WTG Switchgear	75	no.	75	Trucks - Flat Tray	
	22kV WTG Transformers	75	no.	75	Trucks - Flat Tray	8 tonne per transformer
	Protection	1	lot	1	Trucks - Flat Tray	< 1 tonne
	SCADA and Telecommunications	1	lot	1	Trucks - Flat Tray	
	AC/DC Aux	1	lot	1	Trucks - Flat Tray	
	Steel	1	lot	1	Trucks - Flat Tray	
	Bushers	1	lot	1	Trucks - Flat Tray	
	Cable and Earthing in Sub-station	1	lot	1	Trucks - Flat Tray	
	Ancillary Equipment incl. Installation (AC/DC Aux)	1	lot	1	Trucks - Flat Tray	
	Electrical Installation	1	lot	1	Trucks - Flat Tray	
	Installation of Switchyard Equipment			0	Crane - 50t plus capacity	50t crane already on site
	Installation of Switchyard Equipment			4	Light Vehicles - 4WD	
	Installation of Switchyard Equipment			1	Trucks - EPV	
	Concrete foundation for switchyard			2	Trucks - Agitators	
8.0	**Miscellaneous**					
	Labour Transport	229	no.	4,580	Light Vehicles - 30 seater Bus	Transport workers to site by coach/bus (max 229 on site during peak construction)
	Contractor Vehicle Access	6	no.	3,600	Light Vehicles - 4WD	
	Site Camp and Temporary Offices			3	Trucks - Flat Tray	
	Staff Amenities			1	Trucks - Flat Tray	
	Waste Transfer/Storage Facilities			2	Trucks - Flat Tray	

Mareeba SHIRE COUNCIL

65 Rankin Street
PO Box 154 MAREEBA QLD 4880
[redacted]
W: www.msc.qld.gov.au
E: info@msc.qld.gov.au

12 February 2018

Council Ref: MCU/11/0024
Our Ref: BM:nj
Your Ref: MBN14/753 & MC16/5324

The Hon Cameron Dick MP
Minister for State Development, Manufacturing,
Infrastructure and Planning
PO Box 15009
CITY EAST QLD 4002

Dear Minister

NOTICE ABOUT REQUEST TO CHANGE DEVELOPMENT APPROVAL - AFFECTED ENTITY
DEVELOPMENT PERMIT FOR MATERIAL CHANGE OF USE - MOUNT EMERALD WIND FARM, ARRIGA

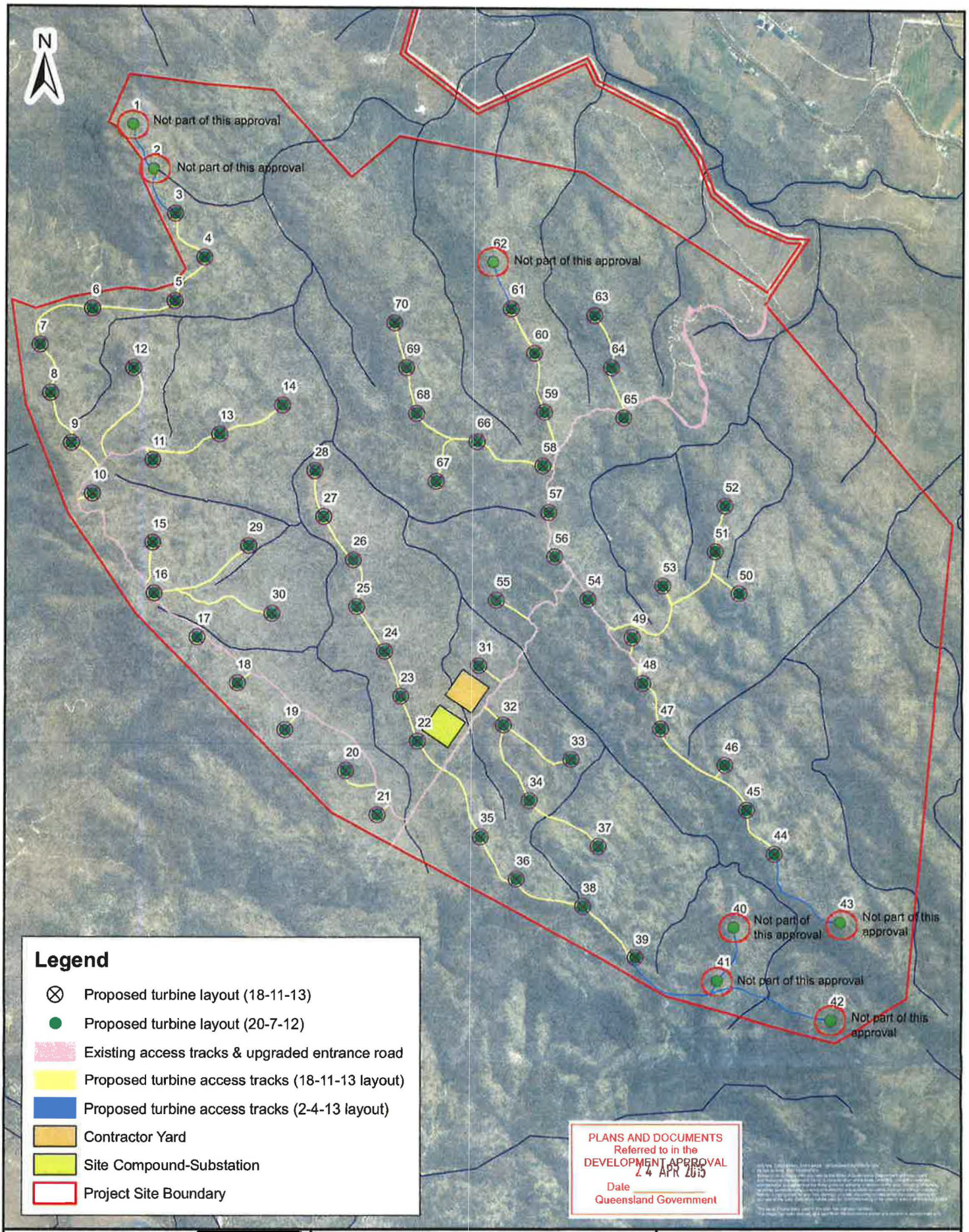
In accordance with Section 80 (1) of the Planning Act 2016, on 7 February 2018, Mount Emerald Wind Farm Pty Ltd gave Mareeba Shire Council notice of a minor change application for the Mount Emerald Wind Farm project.

Council understands that the proposed change relates to Condition 2, in particular the definition of micro-siting. Council has considered the proposed change and advises that it has no objection to the change being made.

Should you require any further information, please contact Council's Senior Planner, [redacted] on the above telephone number.

Yours faithfully

[redacted]



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Meters (A3)

Maps Projection: MGAz55
Maps Datum: GDA94
File Reference: PR100246-170a.mxd
Sheet Number: 1 of 1

Client: RACL

Title: Mount Emerald Wind Farm
Turbine locations and development footprint

RPS

RPS Australia East Pty Ltd
ACN 140 292 762

135 Abbott St
PO Box 1949
CAIRNS QLD 4870

T +61 7 4031 1336
F +61 7 4031 2942
W rpsgroup.com.au

SCALE (A3)	DATE	DRAWING NO	ISSUE
1:22,000	18-11-2013	PR100246-170	A

Appendix A

Statement of Commitments

1 Statement of Commitments

The following statements form commitments of Mt Emerald Wind Farm Pty Ltd in terms of environmental management and monitoring to mitigate the potential adverse environmental impacts and to gain a net environmental benefit from the establishment of Mt Emerald Wind Farm. The draft Statement of Commitments (SoC) is a compilation of the various mitigation measures developed after the detailed impact assessment of the Proposal on identified key environmental issues. It is presented as a set of measures arranged according to environmental issues by project phases, with the desired environmental outcomes, and responsibilities for implementation clearly identified.

This SoC will inform the preparation of a Project Environmental Management Plan (PEMP); the Construction Environmental Management Plan (CEMP); and Operational Environmental Management Plan (OEMP); and associated sub-plans that provide more site and project phase-specific details regarding the environmental management and monitoring measures to be implemented.

1.1 Project Environmental Management Plan:

The PEMP is a management document prepared by the Proponent that expands on the final SoC and other project approval conditions into more detailed outcomes. The PEMP will provide the basis for:

- meeting all environmental requirements;
- assignment of environmental management responsibilities between the Proponent and contractors;
- inclusion of environmental requirements into tender documents; and
- continuing management and evaluation of the environmental performance of the project.

The PEMP will be an integral element of the detailed design phase and will form part of any contractual requirements. The PEMP will identify or describe:

- processes for the environmental evaluation of the Proposal;
- environmental risks which may be managed respectively by the Proponent and the contractor;
- the promotion of environmental awareness among employees, contractors and the community;
- the requirements for review and/or audit of environmental documents such as contractors' Environmental Management Plans.

1.2 Construction Environmental Management Plan

The CEMP will be prepared by the primary contractor, in consultation with the Proponent, based on the former's proposed work methods and the environmental outcomes required for the Proposal.

The main aim of the CEMP will be to avoid, minimise and manage any potential environmental impacts arising from construction activities for the Proposal. It will describe in a more detailed and site-specific manner the management measures to be carried out for the activities at various stages of construction. This will include the definition and allotment of responsibilities among the Proponent, the primary contractor and its sub-contractors. It will also cover the conduct of ongoing stakeholder engagement, system of notification and complaints management during construction.

The CEMP will contain a suite of sub-plans to describe detailed management procedures for key environmental issues. Among the sub-plans projected for development for the construction phase are the following:

- **Threatened Species Management Plan (TSMP)** – this plan will describe measures to minimise the impacts on threatened species of flora and fauna, including identification and marking of exclusion zones on site;
- **Weed and Pest Management Plan (WPMP)** – This plan will detail the protocols for the management of noxious and environmental weed species on the site, with the objective of minimising the potential of risk of introducing such weeds and pests into the site or spreading them across and/or beyond the development footprint;
- **Rehabilitation Plan** – this plan will provide guidelines to integrate appropriate landscape rehabilitation strategies and methods into the management of disturbed land. The Rehabilitation Plan will complement the WPMP (above), and outline recommendations for incorporating rare and threatened plants and the reinstatement of groundlayer and other fauna habitats;
- **Habitat Clearing and Management Plan** – this plan will provide management strategies involved in mitigating the impacts of habitat clearing on susceptible fauna, including the induction of all workers and for wildlife spotters and catchers in involved in habitat clearing;
- **Cultural Heritage Management Plan –** this plan documents the procedures to be followed for impact avoidance or mitigation, and will be developed in consultation with an archaeologist, and the traditional owners of the land, being the Bar Barrum People and Muluridji People;
- **Traffic Management Plan (TMP)** – the TMP, to be prepared in consultation with Department of Transport and Main Roads, will outline traffic movements to and from the site as well as within the construction zones. The TMP will describe measures that promote traffic safety for local and regional traffic, construction personnel and landowners who may need to access the project site. The TMP will also establish protocols for construction deliveries, especially of large loads (*e.g.* cranes, turbine infrastructure);
- **Bushfire Risk Management Plan** – this plan, to be prepared in consultation with the Queensland Fire and Rescue Service and will identify and manage bushfire risks which may arise due to construction activities on site, and will describe protocols for responding to a fire during the construction phase. The plan will also identify regulatory requirements relating to fire safety in accordance with relevant Workplace Health and Safety Requirements (*e.g.* relevant specifications for chemical storage and refuelling) and will be based upon the draft Fire Management Plan submitted with the Development Application;
- **Ecological Fire Management Plan** – this plan will detail the management strategies to be implemented in order to maintain an appropriate fire regime (extent, intensity, frequency) for the various faunal and flora habitats represented on the site;
- **Emergency Evacuation Plan (EEP) –** this plan will outline site protocols in the event of an emergency (*e.g.* chemical spill), including lines of communications among construction personnel and affected residents, safe evacuation routes and muster points, and coordination procedures with State Emergency Response personnel who may respond on site;
- **Erosion and Sediment Control Plan (ESCP)** – prepared in accordance with the Institute of Engineers Australia Queensland ESC Guidelines, the ESCP will describe temporary and permanent sediment control procedures and methods to minimise erosion during the construction of the project, covering discrete construction areas and which will account for the changing surface configuration at various stages of construction;
- **Construction Waste Management Plan (CWMP)** – this plan will describe measures to minimise waste generation onsite and maximising opportunities for recycling and reuse;
- **Construction Dust Management Plan** – this plan will describe measures for dust mitigation, control and monitoring using dust gauges; and
- **Stormwater Manangement Plan (SWMP) –** related to Erosion and Sediment Control Plan, the SWMP will prepared in accordance with Queensland Urban Drainage Manual, with specific reference to waterway crossings and stormwater outlets for all turbine pads and access tracks (where applicable) to ensure water quality is maintained.

1.3 Operation Environmental Management Plan

An Operational Environmental Management Plan (OEMP) will be prepared by the Proponent to describe the environmental management measures to be implemented during the operational phase of the project. This plan will cover not only the operational and maintenance requirements of the wind farm but will also address ongoing monitoring and maintenance of the project site to minimise ecological impacts and to promptly respond to potential community amenity issues.

The OEMP will include the following:

- key operational and maintenance activities;
- identification of statutory obligations and planning approval commitments;
- description of the roles and responsibility of site personnel and visiting contractors;
- monitoring of the following key environmental issues:
  - noise;
  - fauna impacts;
  - flora and vegetation impacts;
  - dust emissions (from bare ground within the development footprint);
  - stormwater quality and sedimentation
  - fire risks; and
  - operational traffic impacts.

The OEMP will be prepared and submitted for approval to the Council no later than one month prior to the commencement of operation of the wind farm.

1.4 Statement of Commitments

The Proponent has voluntarily prepared a draft Statement of Commitments (SoC) outlining the suite of mitigation measures to avoid, minimise and manage potential environmental impacts resulting from the construction (C), operation (O) and decommissioning (D) of the Proposal.

The elements of the Proponent's draft SoC which have been described throughout the Development Application, after the detailed assessment of the key issues are compiled in **Table 1**.

Table 1 Draft Statement of Commitments

Item	Impact	Objectives	Mitigation Task	Responsibility	Project Phase		
					C	O	D
1.0	**Visual & Landscape**						
1.01	**Visual impact from contrast between turbines and rural landscape**	Reduce visual contrast	An off-white or grey colour for the structures will be considered to reduce visual contrast between turbines and the viewing background (this is subject to final turbine selection).	Proponent		✓	
1.02	**Visual impact**	Provide screening through landscape planting	The Proponent will undertake landscape planting where screening is deemed appropriate and in accordance with the outcomes of the assessment process and in consultation with landowners, taking into consideration that the location and design of screen planting used as a mitigation measure is very site specific and requires detailed analysis of potential views.	Proponent		✓	
1.03	**Visual impact from scarring of landscape**	Reduce occurrences and extent of landscape scarring	• Disturbed soil areas will be reinstated immediately after completion of construction, including re-contouring and re-seeding with appropriate plant species. • Tracks have been designed to follow contour lines and existing roads will be used as much as possible, which will minimise cut-and-fill and the potential landscape scarring. • Revegetation and offset planting will be undertaken on site in consultation and agreement with landholders.	Contractor and Proponent	✓	✓	
1.04	**Visual impact from construction activities**	Reduce visibility of construction activities from outside the site.	• Safeguards will be enforced to minimise dust emissions during construction. • Height of stockpiles will be restricted.	Contractor	✓		
1.05	**Visual impact from night-time lighting**	Minimise light spill from project site	Activities (such as aviation lighting) that may require night-time lighting will be minimised and, if necessary, low lux (intensity) lighting designed to be mounted with the light inwards to the site will be used to minimise glare.	Proponent	✓	✓	
1.06	**Visual impact from contrast between site infrastructure and the rural landscape**	Site infrastructure sympathetically with the nature of the locality	• Substation and other ancillary infrastructure will be sited sympathetically with the nature of the locality and away from major roads and residences where possible to mitigate visual impact. • The majority of electrical connections within the site (i.e. cables between the turbines) have been designed to be located underground (where possible), in order to further reduce potential visual impacts.	Proponent	✓	✓	

Item	Impact	Objectives	Mitigation Task	Responsibility	Project Phase		
					C	O	D
1.07	**Visual impact from contrast between site infrastructure and the rural landscape**	Select appropriate materials and colours	Appropriate materials and colours, together with consideration of their reflective properties, will be selected for ancillary structures and built elements associated with the Proposal.	Proponent	✓		
2.0	**Noise**						
2.01	**Construction Noise**	Minimise noise impact on receivers	Construction and decommissioning activities will be carried out within the following periods only: • Monday – Saturday– 6am to 6pm, Work or deliveries will be carried out on Sundays and public holidays, except for the following activities, associated with the construction and decommissioning, which may need to occur outside standard working hours such as: • delivery of oversize loads or materials as requested by Police or other authorities for safety reasons; • completion of concrete pouring past the standard hours of work due to climatic considerations; • Any works that do not cause a noise nuisance at nearby dwellings; • Emergency work to avoid injury, property damage and/or to prevent environmental harm.	Contractor	✓		✓
2.02	**Construction Noise**	Minimise noise impact on receivers	In accordance with the, *Environmental Protection Policy (Noise) 2009* and relevant Local Laws; all the feasible and reasonable standard work practices will be employed to minimise construction noise impacts.	Contractor	✓		✓
2.03	**Construction Noise**	Minimise noise impact on receivers	Notification and ongoing consultation with potentially affected receivers will be carried out, especially where potentially noisy works are anticipated.	Proponent and Contractor	✓		✓
2.04	**Noise from Construction Traffic**	Minimise noise impact on receivers	The timing of deliveries will be regulated and notification to residents carried out when deliveries of large loads are scheduled.	Proponent and Contractor	✓		✓
2.05	**Construction Noise**	Minimise risk	Construction plant will be selected on the basis of low inherent potential to generate noise and vibration. Regular and ongoing maintenance of plant equipment and machinery will be undertaken to ensure operational noise do not exceed typical levels.	Contractor	✓		✓

Item	Impact	Objectives	Mitigation Task	Responsibility	Project Phase		
					C	O	D
2.06	**Construction Noise**	Minimise noise emission from construction plant	Construction vehicles will be fitted with mufflers and low noise emission reversing alarms.	Contractor	✓		✓
2.07	**Construction and Operational Noise**	Management of Noise Impacts	Establishment of Complaints Hotline to allow affected residents to register noise complaints and response within reasonable timeframe.	Proponent	✓	✓	✓
2.08	**Construction Noise**	Monitoring of noise levels at affected receivers	When noise complaints are received, the affected resident will be contacted to identify the source of noise and any remedial measures that may be required.	Proponent and Contractor	✓		✓
2.09	**Operational Noise**	Manage noise impact on specific Receiver/s	The Proponent proposes to acquire this property or alternatively to negotiate relocation arrangements with the owner to mitigate this noise exceedence. Augment existing buildings to alleviate noise and ensure compliance with relevant noise policy base criterion (if required)	Proponent		✓	
2.10	**Operational Noise**	Reduction of turbine numbers as required to ensure compliance with noise criteria	The wind farm layout will be determined by the chosen turbine model. Turbine locations will be removed from the layout in the vicinity of any residence where necessary to achieve compliance with the relevant noise policy base criterion if required.	Proponent	✓	✓	
2.11	**Operational Noise**	Monitor compliance with noise criteria	Within the first twelve months of operation, monitoring of wind farm noise emissions will be undertaken at representative residences including the closest non-involved residences to assess compliance with noise criteria. The monitoring will cover all prevailing wind conditions.	Proponent		✓	
2.12	**Operational Noise**	Address any non-compliance with noise criteria	Where operational noise monitoring indicates the Proposal exceeds noise limits set in the development approval conditions, the following noise mitigation measures shall be implemented: • using active noise control functions of turbines; • rectify any manufacturing defects or control settings so that noise can be reduced to the in accordance with the contracted specifications; or • if excesses still occur, acoustic treatment of non-involved receiver dwellings.	Proponent		✓	

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2.13	**Operational Noise**	Monitoring the effectiveness of operational noise mitigation measures	Should any of the measures in item 2.12 be adopted, their effectiveness will be verified through noise monitoring during the first 12 months of operation.			✓	
3.0	**Flora and Fauna**						
3.01	**Reduction in local biodiversity**	Protect and conserve areas of high conservation value	At the design stage: • Infrastructure will be micro-sited in areas of least ecological significance with site-specific input from fauna and vegetation ecologists; • Location of infrastructure in areas of important habitats and conservation significant flora will be avoided in the first instance; • Clearing is limited to the development footprint; • Aligning access tracks and cabling along existing tracks; • Clearing of overstorey and mature and native riparian vegetation will be minimised. Infrastructure will be preferentially sited in previously cleared and disturbed areas; • Access track widths will be kept to a minimum wherever practicable, and when in areas containing rare and threatened plants; • Detailed hollow-bearing tree surveys will be undertaken in areas of woodland where hollow-bearing trees may be removed, with the results used in micro-siting infrastructure to avoid trees where possible and provide buffers around trees identified as having significance; • A detailed management plan for the removal of hollow-bearing trees will be prepared by an ecologist to minimise impacts to resident fauna; • Threatened Plant Management Plan to be developed including strategies for translocation or propagation and planting where removal can not be avoided; • Identification of rare and threatened plants in areas to be cleared prior to vegetation removal.	Proponent	✓		

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3.02	**Reduction in local biodiversity from the construction footprint**	Minimise extent of construction impact and ensure vegetation integrity and connectivity	The total area of the construction footprint will be minimised through the following measures: • where possible, cabling will be laid underground, within or adjacent to the road corridor to minimise additional impacts; • where required, cabling in drainage lines will be under-bored. If under-boring is not feasible, rehabilitation and stabilisation works will be undertaken immediately following works within drainage lines; • trenches will be filled as soon as possible; • any trench left open overnight will be adequately covered or inspected at first light for any trapped fauna which should be released in an appropriate location nearby; • disturbance will be kept to a minimum at creek crossings; • appropriate erosion and sedimentation controls will be put in place prior to works, particularly when working in or near drainage lines; • creek works will not be undertaken when rain is forecast and will be avoided where possible when there is flow; • materials laydown and stockpiling will make use of existing areas of disturbance or other areas of low biodiversity value, where possible; • all construction vehicles necessary for physical construction will be restricted to within designated tracks, within the construction zones; • care will be taken when working within drip lines and within proximity to tree roots in order to prevent damage; • all onsite staff are to undergo a site induction to ensure understanding of on-site flora and fauna issues; • areas proposed for construction will be inspected for wildlife prior to the commencement of works. Any species found will be relocated by a trained wildlife handler; and • revegetation of areas not required for construction and operation will be undertaken to maximise seasonal growth and establishment of plantings in accordance with a site-specific Rehabilitation Plan which includes monitoring to assess the success or otherwise of such works.	Proponent and Contractor	✓		

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3.03	**Reduction in local biodiversity through loss of habitat**	Retain habitat and biodiversity elements	Impacts on critical habitat features and flora and fauna species will attempt to be be minimised through the following measures: • Wildlife spotter-catchers will be engaged to oversee construction work at each site where clearing of vegetation (such as mature trees and hollows) is required to attempt capture and relocation of any fauna where possible; • Clearing will be staged to allow fauna adequate time to relocate; • Creation of artificial habitats (e.g. nest boxes, boulder piles) adjacent to sites and identification of a appropriate release areas; • impacts to hollow-bearing trees that have not been specifically identified for removal will be avoided; • fallen timber will be left in place or moved to a nearby area to retain fauna habitat (without increasing fire hazards); • where destruction of rocky outcrops can not be avoided, a preclearance survey to find and relocate captured reptiles and other ground-dwelling fauna will be conducted; • removed rocks will be replaced in nearby areas, in consultation with an ecologist; • instream habitat along creeklines such as snags, bedrock and emergent vegetation will be retained, avoided or relocated as a last option.	Proponent and Contractor	✓	✓	✓
3.04	**Reduction in local biodiversity through introduction and spread of noxious weeds**	Control the introduction and/or spread of noxious weeds	Introduction and/or spread of noxious weeds will be controlled through the following measures: • noxious weeds within the development envelope will be controlled according to Weed and Pest Management Plan and other control plans and measures recommended by the Tablelands Regional Council; • A regulated weed washdown bay for machinery and vehicles will be constructed and maintained at the entrance to the project area; • Noxious weeds currently lining the access will be controlled and eradicated prior to construction commencing; • Pre-construction and post-construction weed survey will be conducted to to identify the location and severity of weeds infestations within development footprint;	Proponent and Contractor	✓	✓	✓

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			• where a specific weed risk has been identified, all machinery, equipment and vehicles are to be inspected and washed down as required before entering and leaving the project site; • soil from soil disturbance and vegetation clearance which may contain exotic species will be placed at least 50 m away from any water source; • weed-contaminated soil will not be allowed into the project site for fill or other purposes; • topsoil that is limited in weeds and harvested to salvage the native soil seed bank will be used to reintroduce the seed bank back into disturbed areas; • onsite staff and contractors will be educated on noxious weeds occurring at the site and ways to prevent their spread; • revegetation will be carried out using locally native endemic species characteristic of the cleared vegetation type; • control of invasive weed grasses within the disturbance zone will be conducted as soon as they are detected.				
3.05	**Reduction in local biodiversity through degradation of disturbed areas**	Progressively rehabilitate disturbed areas	• Rehabilitation will be undertaken progressively in all areas disturbed by the works; • Local native species will be sourced for all revegetation works within native vegetation. Selected species will be common to the vegetation community in which works occur and may include rare and threatened plant species; • Re-use of topsoil and matter from the upper horizon will be used, where practical, to assist the natural regeneration process; • Seed collection of plant species from localised provenance prior to vegetation clearing to accumulate suitable stock for rehabilitation work.		✓		
3.06	**Reduction in local biodiversity through impact on the aquatic environment**	Manage potential impacts on creeks	Upgrades to existing creek crossings will be designed in accordance with Queensland Urban Drainage Manual and Far North Queensland ROC Development Manual; and Disturbed bank areas will be rehabilitated using native species only as soon as practical after completion of construction.		✓		

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3.07	**Reduction in regionally and nationally significant species**	Threatened Species Management	A Threatened Species Management Plan (TSMP) will be prepared to outline measures to minimise impacts on significant species throughout the area during all project phases. The TSMP will incorporate provisions for the following: • pre-clearance surveying and monitoring; • handling and relocation of wildlife (if found); • regular site inspections for injured/damaged species; • consultation with local government, DERM, SEWPAC and other relevant stakeholders regarding the implementation of management strategies; • rehabilitation of areas of high significance; • monitoring and control programme for introduced predators species to minimise impacts of susceptible native fauna; • the abundance and distribution of threatened species will be monitored during the operation phase to ensure that populations are not being adversely impacted by the project.	Proponent and Contractor	✓	✓	✓
3.08	**Bird and Bat Mortality and Turbine Avoidance Monitoring**	Monitoring of Bird and Bat Strike	Validation of the required turbine strike/barotrauma risk modelling will require mortality monitoring to be conducted during the operation phase and observations of bird and bat avoidance behaviour. Mortality monitoring is likely to incorporate the following methods: • carcass searches utilising trained sniffer dogs and visual searches; • carcass removal studies to calibrate mortality monitoring data. Spatially and temporally replicated surveys of bat and bird flight behaviour and habitat utilisations will be conducted to validate assumed avoidance rates used in the mortality risk models. Regular reporting will be undertaken to identify any trends in the data and will recommend appropriate management actions.	Proponent in consultation with technical specialists		✓	

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3.09	**Reduction in local biodiversity**	Management of biodiversity during decommissioning	• A biodiversity assessment will be undertaken prior to decommissioning, to update the knowledge of site attributes and evaluate specific impact types (given the life span of the project is in the order of 30 years); • Relevant mitigation measures implemented during the construction phase to contain impacts will also be applied to decommissioning works; • New measures to avoid and mitigate impacts will be developed depending on the results of the assessment.	Proponent in consultation with technical specialists		✓	✓
4.0	**Indigenous Heritage**						
4.01	**Damage or disturbance to sites or items of Indigenous heritage significance**	Minimisation of potential impacts on sites or items of potential indigenous heritage significance	While no sites have been found to occur to date within the project area, the assessment of likely occurrence is moderate and as such, a strategy of avoidance of impacts will be adopted. In regard to the previously recorded Aboriginal objects identified in previous studies which are located within the study area, but outside areas of proposed impact, these areas will be avoided during construction, operation and decommissioning of the wind farm. Steps will be taken to ensure that inadvertent impacts to these locales do not occur.	Proponent and contractor in consultation with technical specialists and the local Aboriginal Community	✓		
4.02	**Damage or disturbance to sites or items of Indigenous heritage significance**	Minimisation of potential impacts on sites or items of potential indigenous heritage significance	Ground disturbance impacts associated with the Proposal will be kept to a minimum and that areas of work will be defined so as to ensure as little impact as possible to objects of Aboriginal cultural and heritage value which may occur on site.	Proponent and Contractor	✓		
4.03	**Damage or disturbance to sites or items of Indigenous heritage significance**	Assess the potential Indigenous heritage impacts in development areas which have not been previously assessed	Additional archaeological assessment will be conducted in any areas proposed to be disturbed which have not been surveyed during the assessment completed to date prior to work commencing.	Proponent in consultation with Technical Specialists	✓		

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4.04	**Damage or disturbance to sites or items of Indigenous heritage significance**	Minimisation of potential impacts on sites or items of potential indigenous heritage significance	In consultation with an archaeologist, the relevant Aboriginal communities, an Indigenous Heritage Management Plan (IHMP) will be prepared as a component of the CHMP to document the procedures to be followed for impact avoidance or mitigation to ensure that all recorded Aboriginal objects identified in previous studies, which are located in the development envelope, but outside areas of proposed impact, are avoided during construction and operation of the wind farm.	Proponent in consultation with Technical Specialists	✓	✓	
4.05	**Damage or disturb areas/items of Indigenous Heritage**	Management of undiscovered items of Aboriginal and/or archaeological significance	If during the course of the construction works any items of aboriginal cultural heritage or significance (i.e. archaeological items) are uncovered, works shall cease (within vicinity to the item) and DERM notified of the findings. An appropriate assessment and salvage strategy will be determined and implemented prior to the recommencement of construction works within the area. Should human remains be found during the proposed earthworks works will cease and the police notified immediately.	Contractor in consultation with the Proponent and DECCW	✓		✓
4.06	**Damage or disturb areas/items of Indigenous Heritage**	Management of Aboriginal Cultural Heritage	Personnel involved in the construction management phases of the project will be trained in procedures to implement recommendations relating to cultural heritage where necessary.	Proponent and Contractor	✓		
5.0	**European Heritage**						

4.07	**Damage or disturb areas/items potentially involving unexploded Ordnance**	Management of European History (specifically World War II)	• Prior to construction, undertake an investigation of presence of unexploded ordnance within the project site in accordance with Department of Defence and DERM requirements;
			• Undertake remediation measures in accordance with findings of the investigation report;
			• Personnel involved in the construction phase of the project will be trained in appropriate procedures to report findings of UXO which include:
			  • Ensuring the object is left in situ;
			  • Marking the general area to ensure no further disturbance can occur;
			  • Note appearance, dimensions and location of object;
			  • Notify the police immediately.
				Proponent and Contractor	✓		

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	Damage or disturbance to sites and areas of European Cultural Heritage	Minimisation of potential impacts on sites or items of potential european heritage significance	Ground disturbance impacts associated with the proposal will be kept to a minimum and that areas of work will be defined so as to ensure as little impact as possible to objects of European cultural and heritage value which may occur on site.	Proponent and Contractor	✓		
	Damage or disturbance to sites or items of Eurpoean heritage significance	Assess the potential Indigenous heritage impacts in development areas which have not been previously assessed	Additional archaeological assessment will be conducted in any areas proposed to be disturbed which have not been surveyed during the assessment completed to date prior to work commencing.	Proponent in consultation with Technical Specialists	✓		
	Damage or disturbance to sites or items of European heritage significance	Minimisation of potential impacts on sites or items of potential indigenous heritage significance	Prepare CHMP to document the procedures to be followed for impact avoidance or mitigation to ensure that European objects found during investigations are avoided during construction and operation of the wind farm.	Proponent in consultation with Technical Specialists	✓	✓	
	Damage or disturb areas/items of European Heritage	Management of undiscovered European Cultural Heritage	If during the course of the construction works any items of European cultural heritage or significance (i.e. archaeological items) are uncovered, works shall cease (within vicinity to the item) and DERM notified of the findings. An appropriate assessment and salvage strategy will be determined and implemented prior to the recommencement of construction works within the area.		✓		
5.0	**Traffic and Transport**						
5.01	**Adverse impact on local and regional traffic during the construction and decommissioning phases**	Minimisation of impact to local and regional traffic	• Large oversize materials will be transported overnight to reduce impacts on road network (subject to DTMR approval); • No oversize or large trucks associated with the construction will operate on the Kennedy Highway or Channel/Springmount Roads during the school bus hours of 7:30am and 8:50am, and between 3:20pm and 4:30pm on school days;	Contractor in consultation with Traffic Management Specialists, RTA and ULSC	✓		✓

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			• Once more detail is known about the exact type of transport vehicles and routing for the delivery of turbine components to site, more detailed swept path analysis will be undertaken along the truck route to identify any road widening and road furniture relocation works that may be required.				
5.02	**Traffic safety risks from construction vehicles**	Minimise traffic safety risks from movement of construction vehicles	• Upgrade Kippin Drive and Springmount Road intersection, to accommodate oversize vehicles during the construction phase; • Upgrade of Kippin Drive to a standard required to accommodate expected vehicle types; • Traffic controllers on Kippin Drive and Springmount/Channel Road intersection will be provided to help assist large trucks exiting the site and manage any safety risks. Advance warning signs will be placed on each approach, 200 metres from the access road with "Prepare to stop" warnings when traffic controllers are present; • A relatively significant increase of traffic volume on Kippin Drive, Channel and Springmount Roads could increase the risk of accidents with vehicles. Therefore, lower speed limits will be enforced on Springmount and Channel Roads and internal access roads at all times during construction.	Contractor	✓		
5.03	**Damage to existing road infrastructure**	Protect existing road infrastructure	• Road and intersection conditions will be established by the use of field surveys and regular site inspections. When required, rehabilitation of the pavement and/or edges of seal, shoulders and verges will be carried out. At the completion of the works the access roads will be in the same or superior condition than at the commencement of the works; • Regular road dilapidation surveys will be carried out during construction and decommissioning; • Internal roads and turns in the project site are required to be widened up to 10m in order to transport the construction materials and the large turbines to the desired location, and will require surfacing upgrade through grading; and • A procedure will be established to ensure the ongoing maintenance of access roads during the operation phase.	Proponent / Contractor	✓	✓	✓

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5.04	**Amenity impacts from construction and operation traffic**	Minimise potential amenity impacts from traffic from the Proposal	• Procedures will be established to monitor traffic impacts on public and internal access tracks during construction, including noise, dust and travel times, and to implement modified work methods to reduce such impacts where possible.	Proponent, Contractor and Technical Specialists	✓	✓	✓
5.05	**Loss of internal access roads**	Retain and handover internal access roads	Internal access roads will be retained and handed over to the landowners after decommissioning.				✓
6.0	**Aeronautical**						
6.01	**Disruption of flight paths and local aeronautical activities**	Minimise risk	Prior to the commencement of construction and operation the following information shall be provided to the CASA and DoD: • as constructed coordinates in latitude and longitude of each WTG (WGS84 or MGA94); • final height of each WTG in m AHD; and • elevation at the base of each WTG in m AHD.	Proponent in consultation with technical specialists	✓		
7.0	**Telecommunications**						
7.01	**Potential interference**	Minimise potential of Proposal infrastructure to interfere with existing telecommunications facilities	Once the final models and locations of wind turbines are known, the locations of communications towers and requirements of licence holders will be confirmed and input into the micro-siting of individual turbines to minimise potential for telecommunications interference.	Proponent and Contractor	✓		
7.02	**Prolonged Interference or disturbance of communication links**	Manage and minimise impacts	At the commencement of operation, the Proponent shall offer to undertake a monitoring program of houses within 5km of the wind farm to determine any loss in television signal strength. If loss of signal occurs and the source of interference can be reasonably attributed to the Proposal, the Proponent shall put in place mitigation measures at each of the affected receivers in consultation and agreement with the landowners.	Proponent		✓	
8.0	**Fire and Bushfire**						
8.01	**Bushfire risk during construction**	Manage bushfire risk	A Bushfire Risk Management Plan will be prepared in consultation with the Rural Fire Service and QLD Fire and Rescue Service. The mitigation measures will include: • Construction personnel will be inducted on bushfire risk management and other fire risks that could be present at the project site.	Contractor	✓	✓	✓

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			• On total fire ban days, restrictions will be placed on certain activities with the potential to cause fires. • Basic fire fighting equipment at each active site will be provided, including fire extinguishers, knapsacks and other equipment suitable for initial response actions with a minimum of one trained person on-site				
8.02	**Bushfire risk during construction**	Maintain coordination with RFS	The QFRS will be provided with the final wind turbine locations, ancillary infrastructure, construction work schedule and locations of additional water supplies for construction, potential landing pads for fire fighting aircrafts and helicopters and access gates for fire fighting services.	Proponent and Contractor	✓		
8.03	**Ignition of fire due to mechanical malfunction**	Minimise risk	• Dedicated monitoring systems (e.g. SCADA) enable wind turbines to be automatically shut down if ambient temperatures exceed the safe operating range, or if components overheat; • Other remote alarming and maintenance procedures are required for electrical faults, which can still occur within the tower or nacelle and create a fire; • Wind turbines will be shut down if directed by the QFRS in the event of nearby wildfire.	Turbine Manufacturer		✓	
8.04	**Spreading of fire away from wind farm infrastructure**	Minimise risk	• The substation will be surrounded by a gravel and concrete area free of vegetation to prevent the spread of fire from the substation and to reduce the impact of any bushfire on the structure; • An Asset Protection Zone (APZ) will be maintained around the control room and substation buildings, compliant with the RFS guidelines; • Areas around each WTG will be managed for fire risk (e.g. regular vegetation clearing and reduction of any fuel loads).	Proponent and Contractor		✓	
8.05	**Ignition of fire due to lightning strike on turbines**	Minimise risk	Lightening arresters will be built into each of the turbines to minimise the potential impacts of fire caused by lightening.	Turbine Manufacture		✓	
8.06	**Restricted movement of fire response vehicles and personnel**	Manage fire vehicle movement	Access roads will be constructed and maintained with suitable width and specifications for the movement of fire management vehicles.	Proponent and Contractor	✓	✓	✓

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9.0	**Health and Safety**						
9.01	**Wind farm noise**	Manage community concerns with respect to wind farm noise	The Proponent will establish a complaints management system to be implemented prior to the construction phase and maintained throughout the operation phase of the development to register noise and other health complaints and concerns about the Proposal from the community.	Proponent		✓	
10.0	**Electromagnetic Fields**						
10.01	**Exposure to EMF**	Minimise unnecessary exposure to EMF	To ensure there will be no unnecessary exposure to EMF from the Proposal, the following mitigation and management measures will be implemented: • electrical cables will be placed below ground where possible to shield electrical fields; • wires will be bundled where possible to reduce the magnetic field emissions; • appropriate security will be placed around emitting structures (e.g. substation) to restrict public access and limit potential exposure; and • non-staff that need to go near the emitting structures will be accompanied by a trained and qualified staff member.	Proponent and Contractor		✓	
11.0	**Water Quality**						
11.01	**Pollution or contamination of aquifers**	Minimisation of pollution or contamination risk to surface and ground water quality	An Erosion and Sediment Control Plan and Stormwater Management Plan will be prepared in line with the FNQROC Development Manual, Institute of Engineers Australia Queensland ESC Guidelines and Queensland Urban Drainage Manual, as part of the CEMP. Both the ESCP and SWMP will address the requirements for: • water retardation and diversion devices around construction areas, including devices to manage surface runoff from hardstand areas and surfaced access tracks; • design of appropriately sized sedimentation basins to capture and treat runoff from construction areas; and • monitoring and maintenance procedures for erosion and sediment control structures.	Proponent and Contractor	✓		

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11.02	**Pollution or contamination of local water ways and aquifers**	Minimising risk to groundwater quality and wind farm infrastructure	• Where rock anchor foundations are the first choice solution but the resulting risks posed to groundwater could be too high as may be shown in detailed geotechnical studies, alternative footings such as gravity foundations will be designed and implemented; • Suitable perimeter protection and bunding will be provided to the substation transformers to minimise the risk of transformer oil leaks or spills during operation and maintenance.	Proponent in consultation with technical specialists, Contractors and Turbine Manufacturer	✓	✓	
11.03	**Pollution of local water ways and aquifers**	Minimising risk to groundwater quality	• In the instance that belowground infrastructure intercepts the groundwater table, a suitable protective casing (for example a plastic pipe sleeve) will be used to pass through the ground water zone. This sleeve will allow the foundation/pile material to pass through and form a solid foundation without affecting the groundwater zone; • Spill kits will be provided at or near the location of oil and fuel storage to contain potential spills and leaks; • Concrete and cement carrying vehicles will only be washed out in appropriate wash down facilities; • Hazardous material, waste and sewage will be managed in accordance with regulatory requirements; • Wastewater produced from temporary on site toilets during construction will be disposed off site.	Contractor and Proponent	✓	✓	✓
11.04	**Alteration to local hydrology**	Minimising adverse impacts on local hydrology	The construction of hardstands and sealed roads may cause minor alterations to drainage patterns due to localised reduction in infiltration resulting in increased runoff. The appropriate drainage structures and erosion controls will be incorporated in hardstands, access roads and tracks to manage run-off and reduce the risk erosion and scour from concentrated flows. Outlet structures will be designed in accordance with the DERM guidelines to minimise construction and operation impacts on watercourse and riparian corridors. Considerations include, but are not limited to: • Any stormwater outlets should aim to be 'natural', yet provide a stable transition from a constructed drainage system to a natural flow regime;	Proponent, designers and Contractor	✓	✓	✓

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			• All ancillary drainage infrastructure, e.g. sediment and litter traps, should be located outside the riparian corridor. Runoff should be of an appropriate water quality and quantity before discharge into a riparian corridor or watercourse is allowed; • Discharge from an outlet should not cause bed or bank instability.				
11.05	**Pollution or contamination of local water ways**	Minimising pollution or contamination risk to surface water quality	• Except for drainage line crossings of access tracks and cable trenches, ground disturbance activities, including road construction and track upgrades and the excavation of footings for turbines, crane pads, control buildings and substation, will be located away from natural drainage features where possible; • The storage of oils, fuels and other hazardous chemicals will be appropriately bunded and located away from watercourses; • All trenching works will be rehabilitated immediately following completion and works within drainage lines will be confined to a minimal timeframe to reduce the risk of release of discharge of and accidental spills of oil or fuel from construction plant; • Any spoil stockpiles from foundation excavation and access road construction will be located away from drainage lines, natural watercourses, road surfaces and trees, Stockpiles will be protected against erosion and sedimentation until the material is carted away for reuse or offsite disposal. Stockpiles to be retained longer than four weeks on site will be stabilised; • The extra width of construction roads not required for operational phase access will be stabilised and rehabilitated to reduce the extent of bare ground; • Sediment and erosion controls during various phases of construction will be developed in accordance with the requirements of the Institute of Engineers Australia Queensland ESC Guidelines; • Water quality and erosion and sedimentation control devices will be regularly inspected and maintained to ensure functionality. If erosion is detected as a result of inadequate maintenance of drainage control devices, remedial action will be carried out immediately to avoid reoccurrence of the event.	Contractor	✓	✓	✓

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11.06	**Pollution of local water ways**	Manage the disturbance of riparian vegetation throughout the site	Any access tracks (with the exception of creek crossings) and all other works and disturbances will avoid any core riparian zone to avoid impacting on the integrity of the riparian corridors.	Proponent and Contractor	✓		✓
12.0	**Soils and Landform**						
12.01	**Ground disturbance**	Minimise alteration to soils and landform especially where beneficial land use post-decommissioning may be restricted	• Detailed geotechnical investigations will be undertaken to assess ground conditions and determine the most suitable foundation design for the turbine sites; • The foundation design will consider the volume of excavation spoil that will be generated and any opportunities for reuse of the spoil in the construction of other site infrastructure and any constraints in stockpiling the material; • Soil compaction resulting from vehicle access and laying of materials will be remediated after construction activities have been completed in the affected area; • Where possible, access routes and tracks will be confined to already disturbed areas.	Proponent and Contractor	✓		✓
12.02	**Creation of unstable landforms and loss of topsoil from construction activities and infrastructure layout**	Stabilise steep slopes	• Subsoil will be separated from topsoil for reinstatement purposes. On steep slopes, topsoil will be stabilised; • Any spoil stockpiles from foundation excavation and access road construction will be protected against erosion and sedimentation until the material is carted away for reuse or offsite disposal. Stockpiles to be retained longer than four weeks on site will be stabilised.	Contractor	✓		
12.03	**Soil Contamination**	Manage any contaminated material from past land uses	• The involved property owners will be consulted to identify any potential areas of contamination resulting from past land use; • An unexpected finds protocol will be prepared to outline the procedures to manage any contamination identified or disturbed during excavation works.	Contractor and Proponent	✓		
13.0	**Waste**						
13.01	**Inefficient resource use and waste generation**	Promote waste hierarchy	Waste will be managed according to a Waste Management Plan based on the hierarchy principles of resource management as follows: • as a priority, unnecessary resource consumption will be avoided;	Contractor and Proponent	✓	✓	

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			• avoidance will be followed by resource recovery (including reuse of materials, reprocessing, recycling, and energy recovery); and • disposal will be undertaken as a last resort.				
13.02	**Inefficient resource use**	Promote efficient use of water and energy	Energy and water conservation will be promoted through training and use of appropriate signage.	Contractor and Proponent	✓	✓	
13.03	**Missed opportunities for recycling and reuse**	Maximise opportunities for recycling and reuse	• Purchasing decisions will be made in consideration of recycled content and increased opportunities for reuse (for example, refillable printer cartridges); • Cleared vegetation will be chipped and used as mulch for revegetation works where practical; • Bins will be provided in construction and office areas for the collection and segregation at source of wastes and recyclables.	Contractor and Proponent	✓	✓	
13.04	**Potential contamination and OHS risk from improper waste disposal**	Control waste disposal procedures	• Liquid and solid waste generated from the wind farm will classified and disposed of in accordance with a construction waste management plan; • Any hazardous waste, including unwashed empty, containers will be stored in appropriate containers on site prior to collection by licensed contractors for disposal to a licensed facility; • All noxious weeds and exotic plant species removed will be disposed of at a licensed facility.	Contractor and Proponent	✓	✓	
13.05	**Loss of amenity and potential contamination from waste generation**	Minimise risks from waste generation and waste handling	• All working areas will be kept free of rubbish and cleaned up at the end of each work day; • Any contaminated waste will be contained then disposed of according to regulatory requirements; • Waste generated outside of the project site will not be stored, treated, processed or disposed in the project site.	Proponent and Contractor	✓	✓	
14.0	**Community**						
14.01	**Regional community impacts as a result of the wind farm development, operation and decommissioning.**	Community enhancement and benefit	The Proponent is proposing to establish a Community Investment Fund and contribute approximately $180,000 to the fund each year. The fund would be maintained throughout the operational life of the project for investment in community infrastructure and services, sustainability initiatives, local economic and tourist developments, community groups and events etc.	Proponent		✓	

Item	Impact	Objectives	Mitigation Task	Responsibility	Project Phase		
					C	O	D
14.02	**Community information and project knowledge**	Dissemination of project information	With the exception of confidential documents, the Proponent will make all documents under this Development Application available for public inspection on request.	Proponent	✓	✓	✓
14.03	**Community information and project knowledge**	Dissemination of project information	Regular newsletters and newspaper articles will be disseminated to all relevant parties (including those who have registered as part of our community information sessions), together with information on Ratch Australia Corporation LTD Website (windfarms.net.au) regarding the progress of the application through to construction	Proponent	✓	✓	✓
14.04	**Community information and project knowledge**	Dissemination of project information	The Proponent will issue newsletters on a quarterly basis throughout the planning approvals and design phase providing information regarding the progression of the project. Detailed newsletters will also be prepared throughout the duration of the construction period up to the operational phase.	Proponent	✓	✓	
15.0	**Land Use**						
15.03	**Risk of degradation of previously inaccessible environmentally sensitive areas**	Minimise degradation of environmentally sensitive areas	Access to previously inaccessible environmentally sensitive locations will be restricted to landowners and authorised personnel only through measures such as the installation of lockable gates on access tracks.	Proponent in coordination with landowners	✓	✓	
15.04	**Impact on amenity of residents and visitors to the area**	Minimise visual, noise and traffic impacts	The design, construction, operation and decommissioning of the Proposal will incorporate the mitigation measures recommended in the visual, noise and other technical assessments so as to minimise any potential impacts on local amenity.	Proponent and Contractor	✓	✓	✓
16.0	**Air Quality**						
	Generation of fugitive dust	Monitor and minimise the generation of dust from ground disturbance, spoil stockpiles and construction traffic	• A Construction Dust Management Plan (CDMP) will be prepared as part of the CEMP; • Dust deposition gauges will be installed to monitor dust emissions and ensure emissions do not exceed 4 grams per metre squared per month, in accordance with DERM and WPH&S guidelines; • Dust levels will be visually monitored and dust suppression (*e.g.,* water sprays) will be implemented if required; • During dry and windy conditions a water cart or alternative chemical dust suppression will be made available and applied to access tracks and ground disturbance areas; • Set appropriate speed limits for construction traffic on internal roads.	Proponent and Contractor	✓		✓

RPS

Mount Emerald Wind Farm

Preliminary Environmental Management Plan

Prepared by:

RPS AUSTRALIA EAST PTY LTD

135 Lake Street
Cairns
Queensland 4870

[redacted]

Client Manager: [redacted]
Report Number: PR100246 / R72893
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Prepared for:

RATCH AUSTRALIA CORPORATION LTD

Level 4, 231 George Street,
Brisbane,
Queensland, 4001

[redacted]

W: www.ratchaustralia.com

IMPORTANT NOTE

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In preparing this report we have made certain assumptions. We have assumed that all information and documents provided to us by the Client or as a result of a specific request or enquiry were complete, accurate and up-to-date. Where we have obtained information from a government register or database, we have assumed that the information is accurate. Where an assumption has been made, we have not made any independent investigations with respect to the matters the subject of that assumption. We are not aware of any reason why any of the assumptions are incorrect.

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Document Status

Version	Purpose of Document	Orig	Review	Review Date
A	EIS EMP	MJ/SG/JM	DF	

Approval for Issue

Name	Signature	Date
[redacted]		29.11.2013

Contents

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Figures

1.0 Introduction

This Preliminary Environmental Management Plan (EMP) has been prepared for RATCH Australia Corporation Ltd (RACL) for construction, operational and decommissioning activities proposed to be carried out on the Mount Emerald Wind Farm (MEWF), in response to the EIS Guidelines of April 2012. It should be noted the document presents a framework for further development following the outcomes of the EIS/EPBCA referral and Queensland Development Application processes. Similarly, commercial details of the construction and operation phases are yet to be finalised, therefore many system and operational details are not available. Nonetheless, the EMP aims to identify sources of actual and potential environmental harm identified through the EIS process and what actions, processes and/or strategies will be adopted to avoid, prevent or minimise the likelihood of environmental harm being caused. The EMP aims to provide for the review and 'continual improvement' in the overall environmental performance of the MEWF operations.

This EMP will form the basis from which detailed EMPs will be prepared by the construction, operational and decommissioning entities. The detailed EMPs to follow the project approval may contain project design modifications; however, basic elements will be adopted and presented in the form of the following stand alone plans:

- Construction Environmental Management Plan (CEMP);
- Operational Environmental Management Plans (OEMPs); and
- Decommissioning Management Plan (DEMP).

These plans will be subject to approval by RACL and various approval agencies, including Department of the Environment (DotE).

A plan indicating the site layout (current at November 2013) is provided in **Appendix A**. This layout may be subject to modification as a result of outcomes from the approval and detailed design process.

The EMP aims to address the following matters:

(a) Identification of environmental issues and potential impacts.

(b) Environmental commitments - a commitment by senior management to achieve specified and relevant environmental goals.

(c) Control measures for routine operations to minimise likelihood of environmental harm.

(d) Contingency plans and emergency procedures for non-routine situations.

(e) Organisational structure and responsibility.

(f) Effective communication.

(g) Monitoring of mitigation measures and residual impacts.

(h) Conducting ongoing environmental impact assessments.

(i) Staff training.

(j) Record keeping.

(k) Periodic review of environmental performance and continual improvement.

2.0 Management Systems

This section provides an outline of the proposed elements of an Environmental Management System to be adopted for the project.

2.1 Environmental Policy

As a developer of renewable energy in Australia, implementing sustainable measures and ensuring the protection of the environment are fundamental to RACL's long term objectives and philosophy. Investments in renewable energy are both environmentally and commercially sustainable and RACL currently owns three wind farms that are significantly reducing Australia's greenhouse emissions. In addition, RACL continues to improve the environmental ratings of its other power generation assets by continuously revising for economically possible ways of reducing its carbon emissions.

As RACL continues to grow, it strives to promote preservation and restoration of the environment, by managing and minimising the environmental impact of its operations and activities and fully respecting environmental laws and regulations.

RACL encourages employees to take care and demonstrate responsibility towards the environment and to report any incident that may have a hazardous effect. RACL continuously strives to ensure its employees are aware of how they can reduce the consumption of energy and resources and implement strategies focused on waste minimisation and recycling where possible. Ensuring the protection of the environment and implementing sustainable solutions are paramount to the success of RACL, its people and the communities in which it serves.

2.2 Implementation Responsibilities

A draft Site Organisation Chart outlining responsibilities for environmental design and management is presented in **Error! Reference source not found.** below.

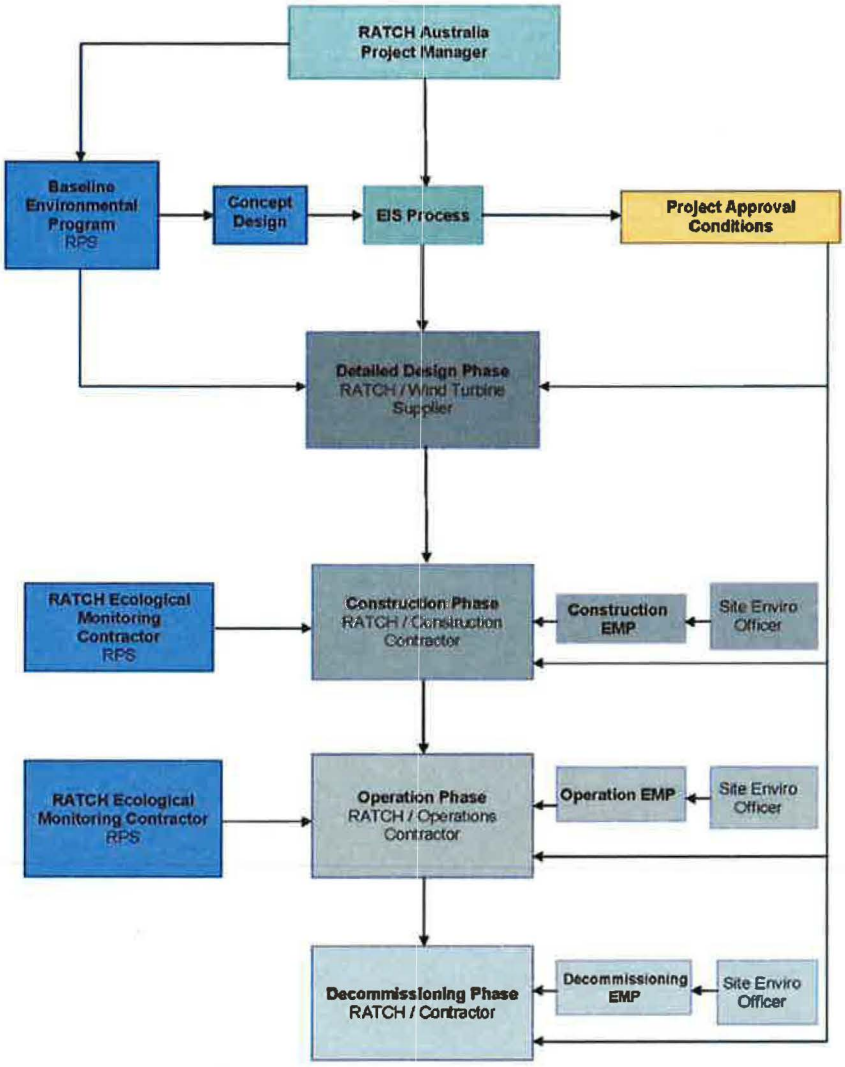

Figure 1 Draft Site Organisation Flowchart

2.2.1 RACL Australia Project Manager

RACL will provide a Project Manager to oversee compliance with EMPs covering construction, operation and decommissioning phases. The Project Manager will also be responsible for integration of outcomes of the EIS / approvals processes into final designs, operational plans and contractual documentation, including facilitating any preconstruction environmental programs, regular review of operational performance reports, facilitation of external environmental compliance audits. In addition the Project Manager will continually review environmental performance against all EIS/EMP commitments, conditions and audit outcomes and drive any necessary operational changes as required to maintain regulatory compliance via the Construction, Operations and Decommissioning Phase Managers. The Project Manager will also be responsible for commissioning any external environmental expertise, particularly in relation to ecological research and monitoring programs and incorporation of outputs into a range of environmental programs identified in the EMPs, in consultation with regulatory agencies as required.

2.2.2 Construction, Operations and Decommissioning Phase Managers

The phase managers will direct work in a manner that complies with;

- all relevant environmental procedures,
- adheres to all legislative requirements and
- ensures that the requirements of this EMP, the EIS, CEMP, OEMP and DEMP are implemented.

The phase managers will have 'stop task' and 'stop work' authority and will report to the Project Manager. They will also be responsible for initiating and managing external system audits.

2.2.3 Environmental Officers

The Environmental Officers (EO) will be responsible for monitoring and reporting the implementation of EMPs for all project phases. It is likely that Environmental Officers will be appointed by the Construction, Operation and Decommissioning phase entities and will report to the phase managers. Jurisdictional responsibilities between RACL and these entities will be incorporated in contractual documentation.

The Environmental Officers will also be responsible for implementation of environmental programs such as species management plans, Cultural Heritage Management Plan (CHMP), the Complaints Register and for setting up compliance audits and monitoring programs. Construction compliance auditing will be conducted against the requirements of this EMP, CEMP, OEMP, DEMP, Construction Safe Work Method Statements, License and Permit Conditions.

2.2.4 Ecological Monitoring Contractor

RACL will appoint an external ecological contractor to assist with all phases of the project commencing with input into the detailed design process which will be informed by a number of preconstruction ecological surveys identified below. A key function will be the preparation of detailed Significant Species Management Plans which will set out key impact management strategies including further baseline programs, design, construction and operational measures and protocols, monitoring regimes, management targets, corrective actions, timeframes and responsibilities. Elements of these plans are listed below, with details to be provided in the specific plans.

2.3 Training

The success of the EMP depends on all those responsible for implementation and review being thoroughly conversant with its contents, interpretation and performance measurements. RACL and its contractors will be responsible for ensuring that project personnel have sufficient knowledge and awareness to identify potential environmental issues, and that they are trained to take appropriate corrective action.

It is essential all personnel are familiar with the procedures for reporting on issues that may result in environmental degradation. This includes informing key personnel within RACL its contractors and relevant regulatory authorities.

2.4 Induction

All staff, including field staff, will complete a comprehensive Project induction prior to commencing work on the Project. The induction will include safety, access and a comprehensive review of environmental requirements. All Project personnel from supervisory to managerial level will have an additional detailed

training session on the use and implementation of the EMPs. It is the responsibility of the phase managers to ensure records of training are maintained.

2.5 Toolbox Meetings

The phase Manager will ensure supervisors hold at least weekly toolbox talks with staff and crews to discuss issues associated with the scheduled work.

This will include highlighting and discussing relevant environmental and safety issues as required. The sessions will include discussion of strategies to be implemented as identified in Job Hazard Analysis (JHA) of current work activities.

2.6 Job Hazard Meetings

A JHA is a simple tool that is used in helping personnel identify, analyse and manage the hazards that exist in the work they undertake. It formalises the process of hazard identification and risk management most people follow when working. The JHA requires personnel to examine the task they are about to undertake and:

- Break the job down into separate, defined steps;
- For each step identify the potential hazards (including potential environmental or cultural heritage hazards) that could occur within that job step; and
- For each potential hazard list the method to be followed to prevent the hazard causing an injury, loss, damage or environmental incident.

Weekly job hazard meetings will be held in conjunction with the Toolbox meetings.

2.7 Reporting and Auditing

During construction, operations and decommissioning phases there will be continuous review of the project area and individuals and work crews will be required to demonstrate the pertinent requirements of the EMPs are being adhered to. Each supervisor will be required to record daily activities including monitoring data, on which relevant EMP requirements will be addressed (daily, weekly, monthly check sheets to be prepared by the construction contractor).

RACL commissioned external audits will include as a minimum, two annual construction audits (the first within 2 months of commencement) and two annual operation phase audits for the first three years, reverting to an annual audit thereafter assuming high levels of compliance; frequency of auditing will be revised following receipt of approval conditions. Where compliance levels are unacceptable to the regulatory authorities auditing and reporting schedules may be reviewed.

The results of other environmental programs directly commissioned by RACL including any additional preconstruction baseline and construction / operation phase ecological impact monitoring will be provided to DEHP and DOTE as requested.

2.7.1 Incident Reporting and Non-conformance

Incident reporting will be implemented to record any safety or environmental non-conformances, incidents or complaints. These shall be recorded on an incident report form and forwarded to the relevant phase Manager for reporting within the RACL system and for a process of continuous improvement to be implemented.

All such incidents shall be investigated in a timely manner and any necessary steps implemented to minimise likelihood of recurrence. If required, the EMP shall be reviewed and updated in accordance with Section 2.9.

2.7.2 Reporting

Section 320 of the EP Act requires any person who becomes aware of an event that may or has caused environmental harm, reports the event / incident to their employer. Details of the nature and circumstances of the event must be provided.

Any such incidents must be immediately reported to the phase manager and recorded on an Incident Report Form. The phase manager will ensure the appropriate external agencies are notified within the appropriate timeframe.

All such incidents shall be investigated in a timely manner and any necessary steps implemented to minimise likelihood of recurrence. If required, the EMP shall be reviewed and updated in accordance with Section 2.9, in consultation with RACL and the relevant regulatory agencies.

The RACL Project Manager will be responsible for the preparation of project phase reporting as identified in approval conditions; this may include compliance reporting and the status of ongoing research and monitoring programs.

2.8 Complaints Procedure

All complaints about the Project will be directed to, and recorded by, the Community Liaison Officer for each phase. Contact details for the Community Liaison Officer will be provided to all affected landowners. A Register will be kept recording details of all complaints received, the action taken in response (where necessary), and any corrective actions or procedural changes implemented to prevent recurrence.

The initiator of the complaint will be advised of the results of all actions taken.

The Community Liaison Officer will review the register daily and advise the Environmental Officer of any relevant complaints. The Environmental Officer will then investigate the complaint and instigate any corrective action required.

The register will be regularly audited by the Construction Manager to ensure adequate and timely response to any verified complaint is occurring.

2.9 Review and Update

The EMPs will be reviewed as required (at least annually) to ensure they address environmental issues and changes in legislation, policies and guidelines including work practices.

As details of design, construction methodology and access needs are refined, so too will the EMP and site and phase specific plans. The 'living' nature of the document means it will progressively improve and will continue to provide appropriate direction for environmental protection. A key review milestone will be following project approvals.

As a number of adaptive management strategies and programs are proposed in the EIS and this EMP, ongoing review of EMP success (or otherwise) in consultation with various regulatory agencies will dictate the frequency of EMP review and modification.

2.10 Legislative and Other Considerations

The legislation and standards listed in Environmental legislation, policies and standards relevant to the Project has been be used to guide preparation of this EMP and will form the basis for ongoing decision-making and complaint resolution in respect of the EMP.

Table 1 Environmental legislation, policies and standards relevant to the Project

Element	Legislative and Other Requirements
Construction—General	*Environmental Protection Act 1994 (Qld)* *Environmental Protection Regulation 2008 (Qld)* *Workplace Health and Safety Act 1995 (Qld)* *Workplace Health and Safety Regulation 1997 (Qld)*
Noise and Vibration	*Environmental Protection (Noise) Policy 2008 (Qld)* *Workplace Health and Safety Act 1995 (Qld)* AS 1055.1 & .2: Acoustics—Description and measurement of environmental noise AS 2436: Guide to noise control on construction, maintenance and demolition NZS 6808:2010 Acoustics – Wind farm noise
Air Quality	*Environmental Protection (Air) Policy 2008 (Qld)* National Health and Medical Research Council Guidelines 1985(Cwth) Draft National Environmental Protection Measures and Impact Statement for Ambient Air Quality 1997(Cwth)
Water Quality	*Environmental Protection (Water) Policy 1997 (Qld)* Australian Water Quality Guidelines for Fresh and Marine Waters, ANZECC 2002 *Water Act 2000 (Qld)*
Erosion and Sedimentation Control	Soil Erosion and Sediment Control, Engineering Guidelines for Queensland Construction Sites—IEAust (Qld) 1996
Contaminated Land	*Environmental Protection Act 1994 (Qld)*
Storage and Handling of Dangerous Goods	*Environmental Protection Act 1994 (Qld)* *Environmental Protection Regulation 2008 (Qld)* *Workplace Health and Safety Act 1995 (Qld)* AS1940 – The Storage and Handling of Flammable and Combustible Liquids
Transport of Dangerous Goods	Australian Code for Transport of Dangerous Goods by Road and Rail
Waste Management	*Environmental Protection (Waste Management) Policy 2000 (Qld)* *Environmental Protection (Waste Management) Regulation 2000 (Qld)*
Flora and Fauna	*Environment Protection and Biodiversity Conservation Act 1999 (Cwth)* *Nature Conservation Act 1992 (Qld)* *Nature Conservation Regulation 1994 (Qld)* *Vegetation Management Act 1999 (Qld)* *Environmental Protection Act (Qld)* *Land Protection (Pest and Stock Route Management) Act 2002 (Qld)*

Element	Legislative and Other Requirements
Cultural Heritage	*Native Title Act 1993 (Cwlth)* *Native Title (Queensland) Act 1993* *Queensland Heritage Act 1992* *Queensland Heritage Regulation 2003* *Aboriginal Cultural Heritage Act 2003 (Qld)*
Land Use	*Integrated Planning Act 1997(Qld)* *Land Protection (Pest and Stock Route Management) Act 2002 (Qld)*

2.11 Related Documentation

The operation will be carried out generally in accordance with the following documents:

- MEWF - Environmental Impact Assessment – RPS Australia 2013 (Volumes 1-3);
- this EMP, CEMP, EOMP, DEMP documents;
- National Wind farm Guidelines
- Consolidated Conditions of Project Approval;
- Weed Management Plan
- Rehabilitation Management Plan
- Fire Management Plan
- Translocation Plans
- Significant Species Management Plans

If there is any inconsistency between the Conditions of Approval and a document listed above, the Conditions of Approval shall prevail to the extent of the inconsistency. If there is any inconsistency between documents listed above (other than the Conditions of Approval) then the most recent document shall prevail to the extent of the inconsistency.

All persons involved with the operational phase of the MEWF shall undertake their respective activities in accordance with the relevant requirements of the OEMP. The OEMP shall also be read in conjunction with the following related RACL documents which exist as separate documents:

- Site Induction Handbook (Service);
- Policies and procedures contained within RACL's Environmental Management System

3.0 Detailed Design (Pre Construction) EMP

The Pre-construction EMP contains a program of works aimed at avoiding, minimising or mitigating impacts through closing information gaps and preparation of a number of detailed management plans which will guide operations through subsequent construction, operation and decommissioning phases.

Species	Potential Impact	Impacting Phase	Proposed Mitigation Strategy	Essential Information Gaps	Management Actions Required	Monitoring, Reporting	Timing	Responsibilities	Relevant Agency
Fauna									
Bare-rumped Sheathtail Bat	Turbine Collision & Barotrauma	Operation	Turbine operation curtailment (increased cut-in speed & targeted turbine shut-down during high risk conditions or detected collision mortality	1. Relationship between environmental factors (weather, insect abundance) and call activity. 2. Utilisation of the turbine rotor sweep area (RSA) (abundance and flight height data)	1. Continue and expand ultrasonic call surveys; sample within Rotor Swept Area (RSA) (higher towers & balloons) 2. Collect weather and insect abundance/height data 3. Identify high-risk conditions/times and seasons 4. Conduct radar utilisation at call survey locations sampling at RSA; quantify abundance and flight heights 5. Conduct numerical risk modelling (for *S. saccolaimus only* or for entire microchiropteran bat community – depending on radar data quality)	Prepare Microchiropteran Bat Management Plan	Pre-construction	External Ecologist / Specialist (inc. Biostatistician)	DotE DERM
Spectacled Flying-fox / Grey-headed Flying Fox	Turbine Collision	Operational Phase	Turbine curtailment during high-risk conditions (active) or excessive mortality events (reactive)	1.Utitlisation of the RSA (abundance and flight height data) 2. Population Viability Analysis (PVA) to determine sustainable collision mortality levels	1. Conduct radar utilisation surveys 2. Support CSIRO researchers to conduct satellite telemetry of more individuals from nearest colonies to site (Mareeba and Tolga Scrub) 3. Conduct numerical collision risk modelling (using radar/telemetry data)	Prepare Flying Fox Management Plan	Pre-construction	External Ecological/Specialist	DotE DERM
Northern Quoll	Habitat Loss	Construction	Avoid clearing high-quality denning and foraging habitats	1. Denning and foraging habitat preferences especially of breeding females 2. Estimates of dispersion for PVA model	Preconstruction 1. Undertake additional telemetry studies on the project site to determine whether proposed turbine ridge habitats are used preferentially, particularly females with young; and offsite, to collect data on dispersion rates to refine the PVA (to assess the significance of potential impacts) 2. Redesign infrastructure layout to avoid high quality foraging or maternal denning habitat and/or inform Quoll Management Plan	Prepare Quoll Management Plan	Pre-construction	External Specialist	DotE DERM
	Habitat Degradation (late dry season wild fires and weed invasion)	Construction and Operation	1. Weed monitoring and control 2. Implementation of Ecological Fire Management (to avoid extensive wild fire in late dry season)	1. Long-term fine-scale fire history of site	1. Fire-scale mapping using Landsat imagery 2. Control of existing weed infestations (especially invasive grasses along Kippen Drive and access tracks)	Prepare Weed Management Plan and Fire Management Plan	Pre-construction	External Specialist	DotE DERM
Sarus Crane	Turbine Collision	Operational Phase	Turbine curtailment during high-risk conditions (active) or excessive mortality events (reactive)	1.Utitlisation of the RSA (abundance and flight height data) 2. Population Viability Analysis (PVA) to determine sustainable collision mortality levels	1. Conduct radar utilisation surveys 2. Support CSIRO researchers to conduct satellite telemetry of more individuals from nearest colonies flocks 3. Conduct numerical collision risk modelling (using radar/telemetry data) - updated	Prepare Bird Adaptive Management Plan	Pre-construction	External Ecological / Specialist	DotE DERM
Flora									
Significant Plants	Clearing of Conservation Significant Plants	Construction	Avoidance and micro-siting of turbines.	Detailed distribution of significant plants Relocation and translocation strategies.	Avoidance of disturbance to key plant habitats (see next point). Detailed plant survey of south-west montane heath habitat - GPS mapping of avoidance patches. Micro positioning of turbines to minimise clearing and disturbance to conservation significant plants and important vegetation types.	Final site-based floristic records. Records of seed collections as per Rehabilitation Plan.	Preconstruction and ongoing throughout construction phase. Seed collection every 3 months after construction	External Botanist	DotE DERM

Species	Potential Impact	Impacting Phase	Proposed Mitigation Strategy	Essential Information Gaps	Management Actions Required	Monitoring, Reporting	Timing	Responsibilities	Relevant Agency
					Presence of Botanical advisor in pre clearance team. Instigate site-based seed and propagule collection for future rehabilitation work.	Conservation Significant Plant Management Plan	for at least 5 years.		
	Clearing of Conservation Significant Plants	Operation / Decommissioning	Translocation and revegetation strategies	Propagation viability of significant plants. Plant successional traits.	Prepare Significant Plant Management Plans including : Research propagation of *Homoranthus porteri, Melaleuca uxorum, Plectranthus amoenus and Grevillea glossadenia.* Conduct Revegetation trials. Investigate plant successional traits.	Conservation Significant Plant Management Plan Annual Revegetation Trial report	Preconstruction and ongoing as required First 3 years of operation	External botanist/ Nursery External Specialist	DotE DERM
Water Quality									
Aquatic Flora and Fauna	Reduced downstream water quality	Construction / Decommissioning and Operation	Maintenance of downstream water quality through water monitoring and management in accordance with a detailed Erosion and Sediment Control Plan	Background Water Quality(pH, Electrical Conductivity, Turbidity)	Conduct preconstruction water quality monitoring to inform construction water quality targets Prepare Detailed Erosion And Sediment Control Plan (ESCP)	as per Approval Conditions and CEMP Annual Baseline Water Quality Assessment Report Monthly reporting against approval conditions	preconstruction and event based during construction and first year of operation	Pre-construction - External Specialist Construction- Environmental Officer	DEHP DotE

4.0 Construction EMP

4.1 Flora

Policy	To minimise the effect on vegetation and habitat for flora, and to promote regeneration of native vegetation on the WTG access tracks and turbine sites.
Performance Objectives	▪ Minimise impacts to native vegetation and disturbance to important plant habitats. ▪ Rehabilitation with native plants of available cleared areas ▪ Where practicable, avoid disturbance to significant species (endangered, vulnerable and rare flora species). ▪ Minimise habitat fragmentation and maintain absolute minimum width clearing along ridges. ▪ Prevent weeds and plant pest diseases spreading as a result of construction activities. ▪ Offset of any rare, endangered or vulnerable plants disturbed by construction by translocating species where practicable, and providing additional rehabilitation areas where revegetation trials can be established.
Management Strategies	▪ Conduct activities in accordance with Conservation Significant Plant Management Plan. ▪ Preconstruction survey (early works package) undertaken to identify locations of rare and threatened species and other significant plants (including habitat trees) along the preferred WTG access tracks/turbine sites will be undertaken to allow designers to avoid and minimise clearing of these species and communities during construction. Any seed or plant propagules should be collected, stored and labelled by a botanist or qualified person to accumulate a seed bank for future rehabilitation. ▪ Topsoil is a rare commodity on the site and soil and rock spoil should be stockpiled separately and adjacent to where the material was taken, or the very nearest suitable storage area. Stockpiles of material (particularly soil) will not exceed a height of 1 (one) metre. ▪ Placement of physical barriers around significant vegetation areas in order to restrict access and prevent disturbance. ▪ Transplanting trials of suitable plants to be practiced as a rehabilitation/conservation measure if feasible. Transplanting will occur when ground conditions are best suited to plant growth (i.e. some longer term moisture is available in the soil). ▪ Windrowed vegetation should not be burnt. Respreading of cleared native vegetation over areas available for rehabilitation (i.e. laydown areas, track batters, temporary crane pads) to occur following construction. ▪ Conduct rehabilitation success trials particularly in relation to significant species and trials as per Conservation Significant Plant Management Plan ▪ Preconstruction survey (early works package) to identify location of weeds along the proposed WTG access tracks and turbine sites and existing tracks. ▪ Control environmental weeds by approved methods and in accordance with the Weed Management Plan along the WTG access tracks and turbine sites prior to clearing and grading. This should be undertaken at least 2 weeks prior to construction work commencing in the respective areas. ▪ Declared weeds to be controlled by an approved method prior to clearing and grading. ▪ All soil and rock material is to be stockpiled *in situ*. All imported construction material (road base, sand, rock-fill etc.) is to be free of weed seed and propagules, and be sourced from clean suppliers in the local region. ▪ All vehicles and machinery to be washed down and certified weed free prior to entering site and in accordance with the Weed Management Plan. Vehicles and machinery is to be monitored at the site entry point (washdown bay). ▪ Vehicles, plant and equipment is to be washed down following work in areas affected by weeds. ▪ Vehicles and machinery working in internal weed infested areas are not to continue work in weed-free zones unless certified clean and weed free. Mobile washdown facilities will be established.

Performance Indicators	▪ Minimum impact to ecosystems and plant species of National Environmental Significance and species known to be of interest to conservation. ▪ Minimal disturbance of flora during construction of the WTG access tracks and turbine sites and associated camp sites. ▪ Achievement of Conservation Significant Plant Management Plan targets ▪ No damage to protected species without relevant permit and approval. ▪ No presence of environmental and declared weeds (e.g. grader grass, sicklepod, Lantana, thatch grass etc. - refer to Weed Management Plan). ▪ Survival and persistence of species planted for the offset programme and Translocation Plan.
Monitoring, Reporting and Corrective Action	▪ Photographic records are to be maintained throughout the year (monthly basis). Fixed photo monitoring points are to be established. ▪ Daily Check Sheets to include weed presence – completed and reviewed by manager/supervisor, and supervising botanist when on site ▪ Regular inspections, third party audits and reviews (non-compliance and incident reporting) undertaken in accordance with EMP and recommendations and corrective actions implemented. ▪ Prepare Annual Conservation Significant Plant Management Plan and Rehabilitation Plan reports. ▪ Additional weed control as required with supplementary weed surveys within 14 days following rainfall events. ▪ Offset rehabilitation planting to be monitored for a period of 3 years following rehabilitation to ensure survival, persistence and performance, as well as replacement of mortalities.
Responsible Person	▪ Environmental Officer and supervising botanist ▪ Annual site rehabilitation assessment by supervising botanist
Associated Documentation	▪ Conservation Significant Plant Management Plan ▪ Rehabilitation Plan ▪ Weed Management Plan ▪ Translocation Plan ▪ Offset Programme ▪ EIS technical reports

4.2 Fauna

Policy	To minimise the effect on fauna and habitat.
Performance Objectives	▪ Minimise impacts to native fauna. ▪ Where practicable, avoid disturbance to endangered, vulnerable and rare fauna species. ▪ Minimise habitat fragmentation and promote habitat regeneration where practicable. ▪ Pest animals and animal pest diseases not spread as a result of construction activities.

Management Strategies	▪ Spotter catcher present prior to and during all clearing activities.
	▪ Implementation of Quoll Management Plan Construction Phase Protocols. Key draft elements include:
	  ▪ Saturation trapping and collaring of all quolls prior to commencement of section clearing and daily radio tracking/sniffer dog surveys to confirm absence of quolls in proposed clearing area. Trapping to confirm stage of reproduction cycle as this can vary from year to year.
	  ▪ Daily clearing to commence only once all tracked animals are confirmed clear of the area.
	  ▪ Carry out primary earthworks during February to October period to avoid mortality of dependant juveniles (left in den sites). If earthworks is to occur during November to January period conduct sniffer dog searches in advance of clearing to confirm presence/ absence. If present delay clearing in that area until maternal removal. This is dependent on trapping activities.
	▪ Implementation of Bird Management Plan Construction Phase Protocols. Key draft elements to include:
	  ▪ Avoidance of clearing of any roosting trees identified during preconstruction surveys and micro siting of turbine and track location.
	  ▪ Minimizing area of cleared vegetation
	  ▪ Implementation of Micro bat Management Plan Construction Phase protocols. Key draft elements to include:
	  ▪ Avoidance of clearing of any roosting trees identified during preconstruction surveys and micro siting of turbine and track location.
	▪ Minimizing area of cleared vegetation
	▪ Avoid vehicular use of site at night where possible
	▪ Restrict speed limits at night
	▪ Weed monitoring and control
	▪ Develop and implement ecological burning regime

Performance Indicators	▪ Mortality of endangered species within approved limits; and ▪ Compliance with species management plans
Monitoring, Reporting and Corrective Action	▪ Photographic records are to be maintained throughout the year (monthly basis). Fixed photo monitoring points are to be established. ▪ Daily Spotter Catcher records including quoll tracking records – reviewed by manager / supervisor, and supervising botanist when on site ▪ Clearing scheduling to be determined by Construction Manager in consultation with Spotter Catcher and External Ecological Contractor ▪ Regular inspections, third party audits and reviews (non-compliance and incident reporting) undertaken in accordance with EMP and recommendations and corrective actions implemented. ▪ Prepare Annual Conservation Significant Plant Management Plan and Rehabilitation Plan reports. ▪ Additional weed control as required with supplementary weed surveys within 14 days following rainfall events. ▪ Offset rehabilitation planting to be monitored for a period of 3 years following rehabilitation to ensure survival, persistence and performance, as well as replacement of mortalities.
Responsible Person	▪ Environmental Officer

	▪ External Ecological Contractor / Spotter Catcher ▪ Construction Manger to authorize clearance only
Associated Documentation	▪ Species Management Plans ▪ Approval permits

4.3 Erosion and Sediment Control

Policy	To provide effective erosion and sediment practices to mitigate the potential effects of construction on watercourses, land use and the general environment.
Performance Objectives	▪ Minimise soil erosion. ▪ Minimise sedimentation of land. ▪ Minimise modification to drainage patterns. ▪ Prevent as far as practical, sediment transport to adjacent watercourses.
Management Strategies	▪ Conduct all earthworks in accordance with a detailed Erosion and Sediment Control Plan prepared by a suitably experienced professional (e.g. Certified Professional in Erosion and Sediment Control) ▪ Minimise the quantity and duration of soil exposure. ▪ Protect topsoil, root and seed stock. ▪ Protect critical areas during and after construction by reducing the velocity of stormwater flow and redirecting runoff onto undisturbed areas. ▪ Install and maintain temporary erosion and sediment control measures during construction. ▪ Replace topsoil and seed stock on turbine laydown pads and track verges to facilitate revegetation as soon as practicable following construction. ▪ Inspect disturbed areas and maintain erosion and sediment controls as necessary during and after construction until stabilisation is achieved. ▪ Should the cabling trench require dewatering in wet weather, then this is to be pumped out and disposed across grass and not directly discharged to any stormwater drain or creek. ▪ Strict implementation of permanent stormwater diversion drains on all hilly slopes (approximately 20 m intervals, depending on slope). ▪ Strict implementation of silt mesh fencing, and stormwater diversion drains on the banks of all waterways containing flowing water during construction. ▪ Highly erodible soils are identified by visual inspection of the site to identify the extent and location of existing soil erosion. ▪ Where highly erodible soils are identified, and if the area cannot be reasonably avoided, the following controls should be implemented: ▪ Keep the work area to a minimum so that the smallest possible ground area is disturbed. ▪ Place erosion control structures such as diversion drains and silt fences at key locations to capture the suspended sediment. ▪ Divert stormwater away from the exposed soil to reduce overland flow or channel flow on the vulnerable soils. ▪ Stormwater Diversion ▪ In areas which are subject to erosion potential (slopes >5%), stormwater diversion banks / drains (whoa-boys) should be placed diagonally across the tracks to divert stormwater to adjacent undisturbed grassed areas following completion of construction. Spacing of such diversion drains can be approximately 50 m to 70 m apart. Where slopes are >5%, then more frequent spacing is required. ▪ Adequate monitoring and follow-up work following construction to ensure any initiated erosion is arrested early.
Performance Indicators	▪ Achievement of downstream water quality targets (Turbidity, TSS) ▪ No large scale erosion or sedimentation caused to adjacent land uses as a result of construction activities. ▪ No evidence of additional sedimentation in watercourses as a result of erosion from construction activities. ▪ Reinstatement of watercourses to original profile. ▪ Adequate spacing of stormwater diversion drains in areas of erosion potential
Monitoring, Reporting and Corrective Action	▪ Photographic Records ▪ Daily Check Sheets – completed and reviewed by manager / supervisor. ▪ Regular inspections, audits and reviews (non-compliance and incident reporting)

	undertaken in accordance with EMP and recommendations and corrective actions implemented. ▪ Construction audits will include all watercourse crossings. ▪ A post-construction audit which will evaluate revegetation, erosion control, weed control, water course bank stability will be conducted annually for two years following completion of construction.
Responsible Person	▪ Environmental Officer ▪ Construction Superintendant ▪ Construction Manager
Associated Documentation	▪ Detailed Erosion and Sediment Control Plan

4.4 Management of Flammable and Combustible Substances

Policy	To ensure storage and handling of flammable and combustible substances onsite does not cause environmental harm or harm to persons.
Performance Objectives	▪ To minimise potential for land contamination. ▪ To ensure the on-going safety of construction personnel.
Management Strategies	▪ An Emergency Response Plan shall be in place and employees inducted in its application. ▪ Flammable and combustible substances are stored, handled, separated and signed as required by the Flammable and Combustible Liquids Regulations and AS1940. ▪ Transportation of dangerous goods will be in accordance with the Regulations and with AS 1678, AS 2809 and AS 2931. ▪ A qualified person will be appointed as Site Safety Officer. ▪ An on-site set of the relevant MSDS for all flammable and combustible substances and dangerous goods used during construction will be maintained and available. ▪ Waste flammable and combustible substances which cannot be recycled will be transported to a designated disposal site as approved by Local Government. ▪ No refuelling of plant and equipment over or within 100m of watercourses. ▪ Spill kits containing absorbent and containment material (e.g. absorbent matting) will be available where hazardous materials are used and stored and personnel trained in their correct use. ▪ Spills of flammable and combustible substances will be rendered harmless and collected for treatment and / or remediation or disposal at a designated site, including cleaning materials, absorbents and contaminated soils and reinstatement made to the affected area. ▪ Personal protective equipment (PPE) appropriate to the materials in use will be provided. ▪ Relevant Local Government permits will be held and conditions of permits met.
Performance Indicators	▪ No hazardous goods contamination of the environment.. ▪ Ensure appropriate remedial action has been implemented for any spills. ▪ Major incidents reported to relevant authorities and their directions followed. ▪ Spill kits and PPE available and used as appropriate.
Monitoring, Reporting and Corrective Action	▪ Photographic Records ▪ Regular inspection of storage facilities and work practices in the handling of flammable and combustible substances or other dangerous substances. ▪ Daily Check Sheets – completed and reviewed by manager / supervisor. ▪ Regular inspections, audits and reviews (non-compliance and incident reporting) undertaken in accordance with EMP and recommendations and corrective actions implemented.
Responsible Person	▪ Construction Manager ▪ Environmental Officer
Associated Documentation	▪ Nil