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MARALLA EAST & WEST WIND FACILITIES

TRANSPORT IMPACT ASSESSMENT

JANUARY 2017

WSP | PARSONS BRINCKERHOFF

MARALLA EAST & WEST WIND FACILITIES

TRANSPORT IMPACT ASSESSMENT

WSP Environment & Energy

Version 1.3

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PRODUCTION TEAM

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SUBCONSULTANTS

None

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1 INTRODUCTION

1.1 BACKGROUND

WSP Group Africa (Pty) Ltd (WSP) has been appointed by WSP Environment & Energy to undertake a Transport Impact Assessment (TIA) of the proposed Maralla East & West Wind Facility to be located near Sutherland in the Northern and Western Cape Provinces.

It is the intention of the developer, BioTherm Energy (Pty) Ltd (BioTherm), to apply for approval for both projects and to develop them separately or concurrently.

This report assesses the expected Transport related impacts of both facilities during the construction, operation and subsequent decommissioning phases. The purpose of this report is to consider the Transport impact that both facilities will have on the surrounding road network and environment, and to propose mitigating measures to address these impacts, where required.

1.2 SCOPE

The Scope of the TIA is as per the requirements of the South Africa Committee of Transport Officials, South African Traffic Impact and Site Traffic Assessment Manual, TMH16, Vol. 1, Version 1, August 2012. The scope covers the following:

- Previous traffic related studies, submissions and approvals (if relevant).
- Description of the extent of the development, including location and land-use/s.
- Description of the phased development of the facility (if applicable).
- Record of liaison with authorities.
- Record of site visits.
- Description of the local and potentially affected road network, including planning and comment on the road condition, where information is available.
- Description of latent development in the vicinity of the facility that may also have an impact on the local road network
- Assessment of the required site access, parking and internal circulation.
- Assessment of expected trip generation (construction & operational phases).
- Capacity analysis (construction & operational phases), including an assessment of the expected total E80's (heavy axle loading) for the life cycle of the facility.
- Assessment of public transport and Non-motorised transport.
- Recommendations and conclusions with regards to the required traffic and transport related road upgrades.

Due to the location of the facilities in the same area, and the shared access onto the surrounding road network, a single TIA was undertaken. A separate TIA for each facility will not reflect the combined Transport impact satisfactorily.

1.3 PREVIOUS SUBMISSIONS

No prior TIA's has been undertaken for the development.

1.4 PEER REVIEW

The TIA was subjected to a peer review by an independent engineer, as requested by the DEA, detailed below:

Urban EQ Consulting Engineers
Andrew Bulman Pr. Eng
Transportation Engineer
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The review is included in Appendix A. The issues raised has been addressed, where relevant, in this latest version of the TIA.

1.5 TYPE AND EXTENT OF THE DEVELOPMENTS

The Maralla East & West Wind Facility will be two 250 MW (maximum) facilities, to be located over 6 farms with a total area of a 10,106 ha.

PROJECT INFRASTRUCTURE

A summary of the details of the facilities and associated infrastructure is included in Table 1-1.

Table 1-1: Technical details of the Proposed Maralla East & West wind energy facilities & associated Infrastructure

TECHNICAL DETAILS OF THE PROPOSED FACILITY	
Generation Capacity	up to 250MW each
Number of turbines	up to 125
Area of buildable area	Approximately 200 ha
Area occupied by each turbine	0.5 ha (85m x 60m)
Turbine hub height	up to 120m
Rotor Diameter	up to 150m
Turbine Foundation	20m diameter x 3m deep – 500 to 650m^3 concrete. Excavation area approx. 1000 m^2 in sandy soils due to access requirements and safe slope stability requirements.
Electrical turbine transformers	0.5ha (85m x 60m)
Area of preferred Operations and Maintenance building assessment site	O&M buildings will be in proximity of the Substation due requirements for power, water and access.
Footprint of Operations and Maintenance Building(s)	O&M building includes operations, on site spares storage and workshop. Typical areas indicated below: à Operations = 20 x 8 = 160m^2 à Work shop = 12 x 8 = 96m^2

TECHNICAL DETAILS OF THE PROPOSED FACILITY	
	à Stores = 15 x 8 = 120m^2
Area of preferred construction laydown areas	Construction camp typical area 60m x 40m = 2 400m^2 à Laydown or staging area 150m x 75m = 11 250m^2 à Laydown for concrete towers (only if required) = 40 000m^2 "
Cement Batching Plant	Gravel and sand will be stored in separate heaps whilst the cement will be contained in a silo. The actual mixing of the concrete will take place in the concrete truck. The footprint of the plant will be in the order of 0.25ha. The maximum height of the cement silo will be 20m. This will be a temporary structure during construction.
Width of internal roads	Between 4.0m and 6.0m, however this may increase to 8m on bends
Length of internal roads	Approximately 60 km
Type and Height of fencing	Approximately 5m high palisade or mesh fencing where required
Sewage	Septic tanks (with portable toilets during the construction phase)
Footprint of internal onsite substation	150m x 150m
Onsite substation capacity	Up to 132kV
Specifications of onsite switching stations, transformers, invertors, onsite cables etc	The medium voltage collector system will comprise of cables (1kV up to and including 33kV) that will be run underground, except where a technical assessment suggests that overhead lines are applicable, in the facility connecting the turbines to the onsite substation.
Width of the powerline servitude	31m (15.5m either side)
Powerline tower types and height	Tower (suspension / strain) / Steel monopole structure, which may be self-supported or guyed suspension.
List of additional infrastructure to be built	Access roads and internal roads. Administration, control and warehouse buildings.

1.6 PHASING OF THE DEVELOPMENT

The implementation planning of the two facilities is unknown at this stage. For the purpose of the impact assessment, it was assumed that the facilities will be constructed at the same time, with an estimated construction period of 2 years.

1.7 APPROVAL OF SUBMISSIONS

This report will be subject to approval from the relevant local, provincial or national roads authorities, and will be submitted as part of the Environmental Impact Assessment.

2 LIAISON & DATA COLLECTION

2.1 LIAISON

Comments were requested from the Western Cape Provincial Government Department of Transport & Public Works (PGWC) regarding the proposed facilities and its potential impact on Provincial Road R354. The PGWC made various initial comments in a letter dated 5 October 2016, the relevant points are summarised below:

- A TIA will be required when the LUPA application is made. Amongst the usual items that the TIA addresses it should also consider the impact on road infrastructure and what maintenance measures may be required during construction and decommissioning of the facilities.

Comments have been requested from the Northern Cape Province Department of Transport & Public Works, but has not been obtained as yet.

2.2 SITE VISITS

A specific transport related site visit was not deemed necessary at this stage of the assessment.

2.3 ROAD NETWORK & MASTER PLANNING

There is no known local, provincial or national roads planned in the vicinity of the site or the greater study area.

2.4 LATENT DEVELOPMENTS

Refer to Section 8: Cumulative Transport Impact Assessment.

3 SITE LOCATION & SURROUNDING ROAD NETWORK

3.1 SITE LOCATION

The facilities will be located on the following farms located in the Karoo Hoogland Municipality, Division Sutherland, in the Northern Cape Province.

- Remaining Extent of Farm 3 Roodeheuvels 180.
- Remaining Extent of Farm Annex 3 Roodeheuvels 181.
- Portion 1 of Farm Wolven Hoek 182.
- Portion 2 of Farm Wolven Hoek 182.
- Remaining Extent of Farm Schalkwykskraal 204.
- Remaining Extent of Farm Welgemoed 268 located in the Central Karoo District Municipality, Division Laingsburg, in the Western Cape Province.

Refer to Figure 3.1 for the locality map of the farm portions and Figure 3.2 and Figure 3.3 for aerial images of the proposed wind turbine locations and access roads.

3.2 ROAD NETWORK DESCRIPTION

The site is located east of Provincial route, road R354 (TR02001). The road links National Road N1 to the south at Matjiesfontein; with Sutherland to the north. An unsurfaced local road traverses the site, and connects to the R354 to the south-west in the Western Cape, and to the north-west in the Northern Cape.

The R354 is a single carriageway 2-way surfaced road (1 lane per direction), with no surfaced shoulders. It is regarded as in “Fair” and “Good” condition on the section located in the Western Cape, as per the Provincial Government of the Western Cape (PGWC) Department of Transport’s 2015 Surfaced Road Condition Assessment.

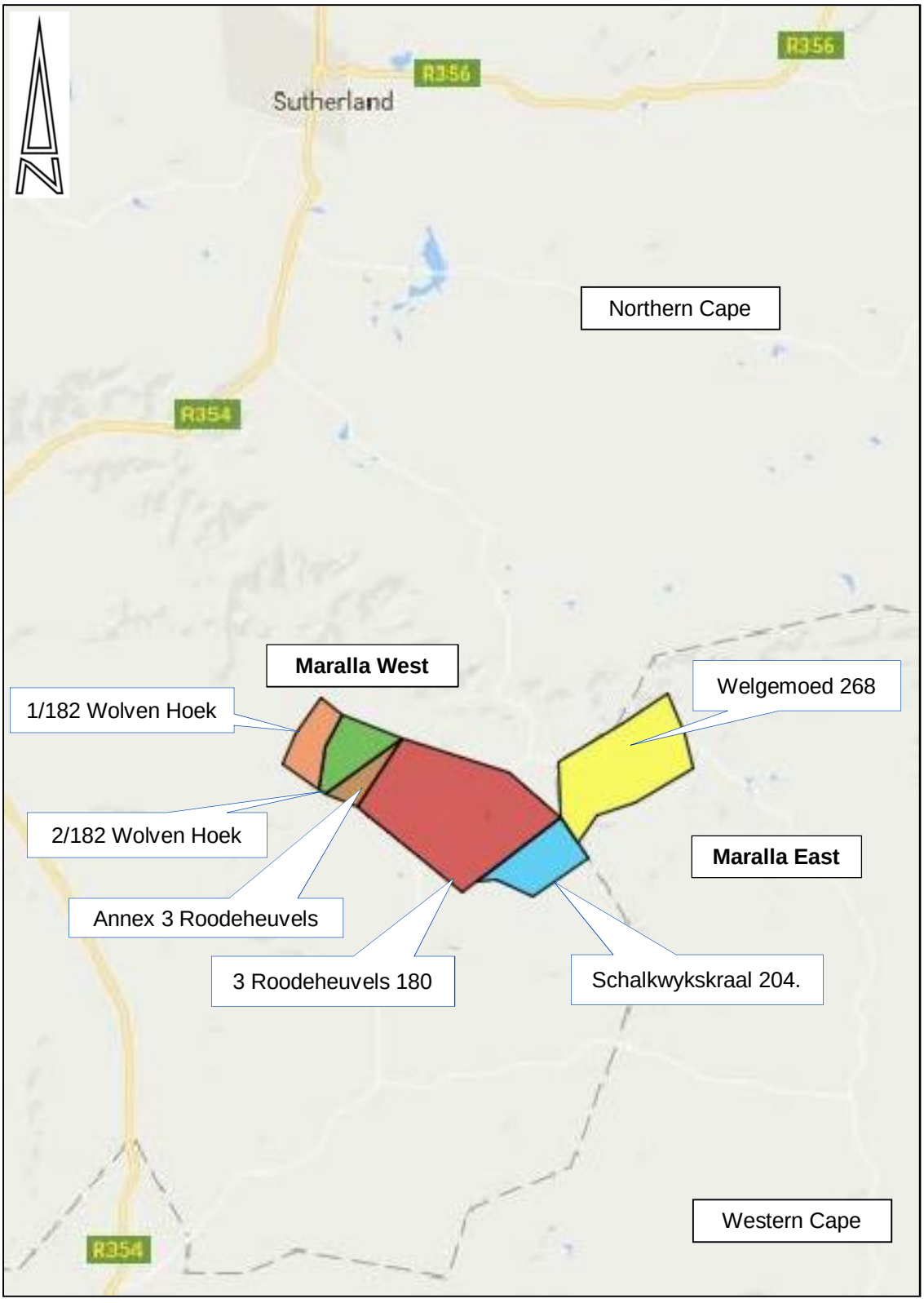

Figure 3-1 Locality map and farm portions

Source: GoogleMaps

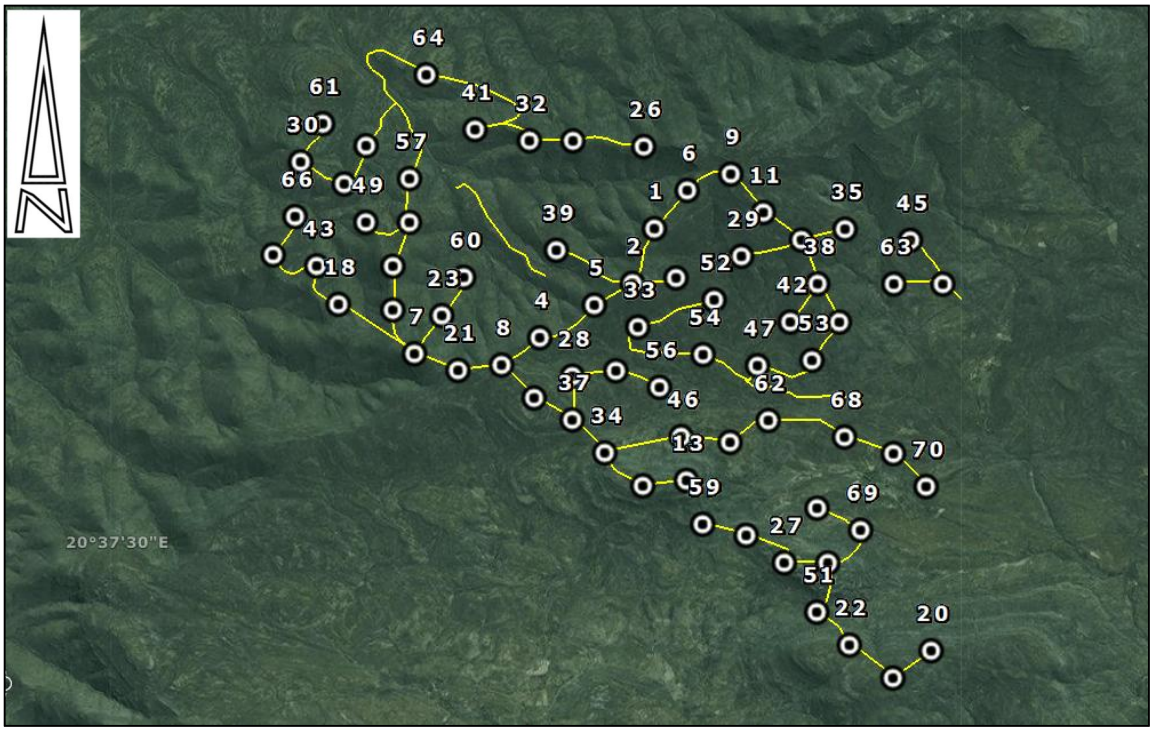

Figure 3-2 Proposed Turbine locations & access roads – Maralla West

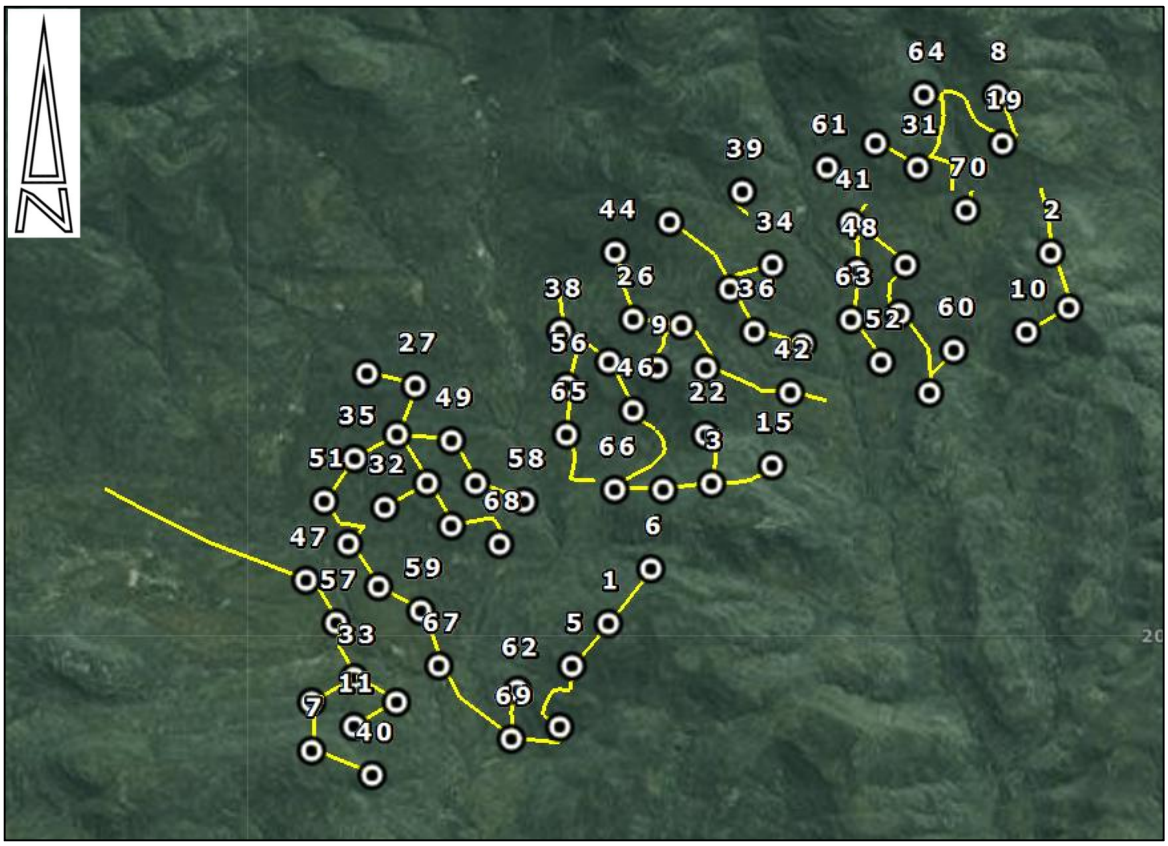

Figure 3-3 Proposed Turbine locations & access roads – Maralla East

4 SITE ACCESS & PARKING

4.1 DEVELOPMENT ACCESS

It is recommended that the local access roads to the Klein Roggeveld, Komsberg/ Kareedoringkraal off the R354 is utilised during construction and for the future operational and ultimate decommissioning phase of the facility. Refer to Figure 4.1 for the access roads.

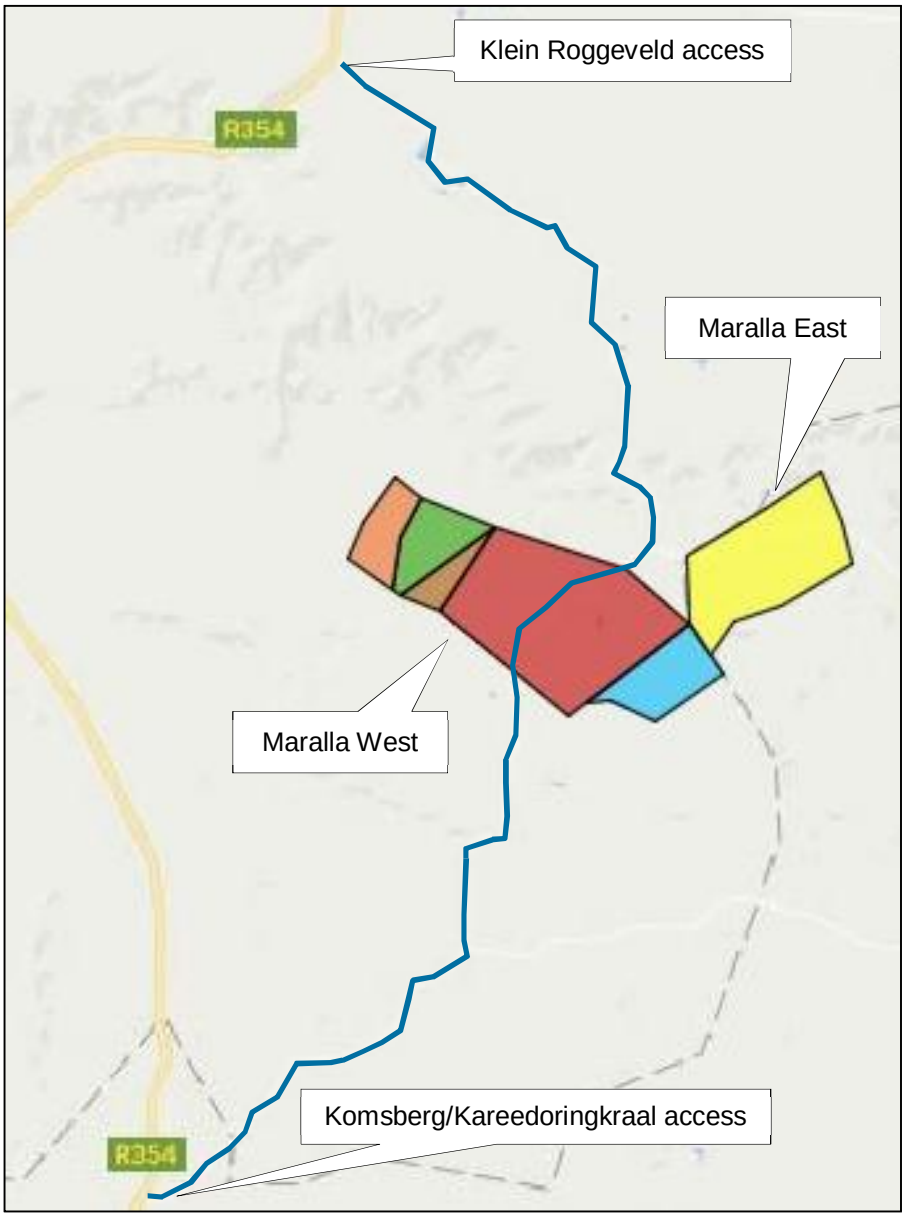

Figure 4-1 Existing accesses and access roads

Source: GoogleMaps

The expected traffic increase on this road during the construction phase may results in deterioration of the roads, as they are not designed for abnormal load or high traffic volumes. The cost of maintaining and repairing these gravel roads during the construction and decommissioning phases should be borne by the developer.

The transport route/s of the construction materials, components and any oversized/weight components may be National, Provincial or Local roads; and approval will have to be obtained from each authority for the transportation of any oversized or abnormally heavy components. Upgrades to the vertical or horizontal alignment of the local gravel access road/s may be required depending on the length and width of any abnormal vehicles. These alignment upgrades cannot be determined at this stage.

4.2 PARKING PROVISION

The proposed on-site parking provision will be limited to the following:

- Construction phase – temporary parking for construction staff and construction deliveries.
- Operational phase – parking for operational & maintenance staff vehicles.

This parking will be accommodated on-site.

5 PUBLIC & NON-MOTORISED TRANSPORT ASSESSMENT

In terms of the National Land Transport Transition Act (NLTTA) 22 of 2000, section 29, it is a requirement that an assessment of public and non-motorised transport be included in a Transport impact assessment.

Due to the remote location of the site, on private farms, public access will not be allowed or required during the construction or operational phases of the project. There is therefore no need for public transport services or non-motorised transport infrastructure, except for the transport of construction staff, refer to Section 6.3.

6 TRAFFIC FLOWS & TRIP GENERATION

6.1 EXISTING TRAFFIC FLOWS

Traffic surveys were sourced from the Western Cape Government Road Network Information System (RNIS), (https://rnis.pgwc.gov.za/rnis/rnis_web_reports).

Counts undertaken during April 2015 confirm very low traffic volumes on the R354, these were escalated to the current year and total 145 AADT (Annual Average Daily Traffic). The counts were undertaken on the section between the DR2243 Aprilkraal intersection and the Northern Cape border.

6.2 LATENT TRAFFIC

Refer to Section 8: Cumulative Transport Impact Assessment.

6.3 DEVELOPMENT TRIP GENERATION

The South African Trip Data Manual (TMH17) does not contain estimates for expected trip generation of a wind power facility. The following is however noted with regards to the expected trip generation.

Note that the estimated traffic generation detailed below represents an absolute maximum, assuming both projects are approved and constructed at the same time. It is unlikely that this maximum trip generation will be reached during any weekday peak period, therefore the analysis is conservative.

CONSTRUCTION PHASE TRAFFIC

The construction phase of the facility will generate the only notable vehicle volumes that requires assessment. Construction traffic will include vehicles for material and component deliveries, construction staff and all other associated personnel. Trips will include the delivery of over-sized components such as rotor blades, mast sections and generators. The route/s between the origin of the material and components and the facility may be National, Provincial or Local roads, and each authority will be required to provide the necessary permits for the transportation of any oversized or weight components.

The construction phase traffic was estimated based on the assumptions listed per traffic type below.

CONSTRUCTION STAFF TRIP GENERATION (PER FACILITY)

- An estimated construction period of 24 months per facility, with a variable number of staff required depending on the construction phase.

- Approximately 600 workers will be on-site every day during the peak construction period.
- Workers will not be accommodated on-site.
- 85% of the work force (unskilled and semi-skilled workers) will utilise public transport to site from neighbouring towns, most notably Laingsburg which is located approximately 90 km away.
- Skilled personnel will travel by private car with an average occupancy of 1.5 persons.
- 80% of Public Transport will be by bus, with a 65 person per bus occupancy.
- 20% of Public Transport will be by mini-bus, with a 16 person per vehicle occupancy.
- Staff will not utilise NMT to site due to the excessive distances to the closest towns.
- It is assumed that the public transport vehicles will not remain on-site during the workday, therefore all these vehicles will arrive and again depart during the AM and PM peaks.

Refer to Table 6.1 for the total trip generation for the construction staff per facility.

Table 6-1: Total peak hour trip generation – construction staff per facility

STAFF TYPE	TOTAL		
Unskilled/Semi-skilled staff (Maximum workers per day)	510		
Skilled staff (Maximum workers per day)	90		
Total (Maximum workers per day)	**600**		
TRIP TYPE	**TOTAL (VEH/HR)**	**IN (VEH/HR)**	**OUT (VEH/HR)**
AM Peak hour bus trips	14	7	7
AM Peak hour per mini-bus trips	14	7	7
AM Peak hour private vehicle trips	60	60	0
Total AM peak hour trips	**88**	**74**	**14**

CONSTRUCTION MATERIAL TRIP GENERATION (PER FACILITY)

- 70 turbines will be installed per facility.
- The turbine towers are expected to have a hub height of up to 120 m, with a rotor diameter of up to 150m.

- Each 150 m diameter turbine rotor will require 3 blades of up to 75 m long (maximum). Rotor blades will be manufactured off-site, and could also be imported from abroad via the most suitable Port. The dimensions of the blades, their point of origin and the resultant route to the facility will determine the vehicle type and special permits that may be required for the transportation of these blades.

  The route/s between the origin of the components and the facility may be National, Provincial or Local roads, and each authority will be required to provide the necessary permits for the transportation of all oversized/weight components.

  It is recommended that an abnormal vehicle route management plan be undertaken when the port/s of entry are known. This plan will cover all aspects such as horizontal and vertical requirements, bridges along the route, speed limits, etc. These plans and the application for the abnormal permits is normally the responsibility of the logistics company that will transport the components to site.

- The tower masts will be constructed of tubular steel, pre-cast or in-situ cast concrete or a steel and concrete hybrid. The material type is primarily determined by the height of the tower. Steel tower masts are constructed in sections of up to 30 m, and are lifted into place on site. Pre-cast concrete masts are usually constructed in sections off-site, and also lifted into place on-site. Concrete and steel hybrid masts are usually constructed from a concrete base section of up-to 80 m, and an upper section of steel. These components are also manufactured off site and lifted into place on site.

  The type of tower mast components (steel, concrete, hybrid) will determine their origin, port of entry (if relevant) and delivery route to site. Road based delivery of any oversized or weight components will require abnormal freight permits from the relevant road authorities and a route management plan, similar to that for the transportation of the rotor blades, will be required.

Assumptions were made to estimate the expected trip generation of the construction phase, refer to Table 6.2.

- Masts are manufactured from 4 x 30 m steel segments. One segment can be delivered per vehicle trip.
- 1 rotor blade can be transported on an abnormal size vehicle.
- The foundation quantities for a typical steel tower of 120m is approximately 600 m^3 of concrete reinforced with 60 tons of steel.
- Ready-mix concrete is transported in 6m^3 loads.
- Steel is transported in 40 ton loads on standard flatbed vehicles.
- Component and material deliveries will take place over a period of 18 months.
- A total of 15,610 delivery trips (in & out total) will be required, which is approximately 40 trips a day (In & out total).
- The delivery of materials during the AM and PM peak hours will therefore be low, as trucks will arrive and depart throughout the day. If a conservative maximum 15% of the daily trips are generated during the AM and PM peaks, a total of 6 trips per peak hour is expected.

Table 6-2 Potential construction phase trip generation per facility

	Mast components (No.)	Rotor blades (No.)	Rotor	Nacelle	Generator	Foundation material - Concrete (m^3)	Foundation material - Steel reinforce-ment (tons)
No. of turbines: 1	4 x 30 m length steel sections	3 x 75m length	1	1	1	600	60
No. of turbines: 70	280	210	70	70	70	42,000	4,200
No. of vehicle trips (in & out)	**560**	**420**	**140**	**140**	**140**	**14,000**	**210**
Total No. of trips (in & out)	**15,610**						

TRIP GENERATION SUMMARY

Refer to Table 6.3 for the expected combined trip generation for both facilities, assuming the absolute maximum with both facilities constructed during the same 2-year period. It is assumed that the peak construction activities and associated highest vehicle trips will not occur at the same time, therefore Table 6.3 shows a maximum which is highly unlikely.

Table 6-3: Total maximum peak hour trip generation

FACILITY	VEHICLE TRIPS PER PEAK HOUR		
	Staff (In : Out : Total)	**Material deliveries (In : Out : Total)**	**Total (In : Out : Total)**
Maralla East (In:Out:Total)	74 : 14 : 88	3 : 3 : 6	**77 : 17 : 94**
Maralla West (In:Out:Total)	74 : 14 : 88	3 : 3 : 6	**77 : 17 : 94**
Total	148 : 28 : 176	6 : 6: 12	**154 : 34 : 188**

The potential maximum vehicle trips per hour is moderate, however given that the peak construction activities at each of the 2 sites is highly unlikely to coincide, the total trips is expected to be lower.

Engineers opinion: The above analysis and resultant trip generation represents an unlikely worse-case scenario. The background vehicle volumes along the R354 from where all trips will distribute onto the major road network is low. In conclusion, the Transport impact of the facilities on the local major road network is expected to be low. Also refer to Section 7.

E80 SUMMARY

The total E80 loading of the construction vehicles on the local road network was estimated for the concrete and steel deliveries for both facilities. The average E80 axle loading per heavy vehicle is estimated at 3.49, refer to Table 6.4. Refer to Table 6.5 for the calculation of the total E80 loading for both facilities.

Note that these calculations assume that all delivery and return trips occur along the same route to and from the site, and is therefore a conservative maximum. The return E80 pavement loading of the empty vehicles were not calculated, as these are negligible compared to the loaded vehicles.

Table 6-4: Average E80 loading (Maralla East & West)

VEHICLE TYPE	% COMPOSITION OF TRIPS	E80/HV
Small	0.05	0.51
Medium	0.05	1.9
Large - Steel	1.0	4.7
Large - Concrete	98.0	3.5
Average number of E80 axles per heavy vehicle		**3.49**

Table 6-5: Total E80 loading (Maralla East & West)

VEHICLE TYPE	NO. OF TRIPS (IN)
Large - Steel	210
Large - Concrete	14,000
Sub-total	14,210
Average E80 loading	3.49
Total E80 loading	**49,579**

The estimated total E80 loading for the duration of the construction period is approximately 0.050 million, and no mitigating measures are deemed necessary for bulk material deliveries along major National or Provincial roads.

The expected traffic increase on the local access roads during the construction phase could result in deterioration of the access roads, as they are not designed for abnormal loads and large traffic volumes. The cost of maintaining and/or repairing the access roads during the Construction phase of the projects, should be borne by the developer.

OPERATIONAL PHASE TRAFFIC

The operational phase of the facilities will require very few permanent staff. The vehicle trips that will be generated by the personnel will be low and the associated Transport impact on the surrounding road network will therefore be negligible.

DECOMMISSIONING PHASE TRAFFIC

Following the initial 20-year operational period of the facilities, its continued economic viability will be investigated. If it is still deemed viable its life may be extended; if not, it will be decommissioned. If it is completely decommissioned, all the components will be disassembled, reused and recycled or disposed of. The site will be returned to its current use.

It is not possible to determine the volume of traffic that will be generated during the decommissioning phase. It can however be expected that the volumes will be lower than during the construction phase, and the resultant Transport impact on the local road network will be lower than during the Construction phase. Any damage to the road caused by the decommissioning phase traffic should be repaired at the cost of the developer.

6.4 CAPACITY ANALYSIS

A capacity analysis of the two access intersections off the R354 was not undertaken, and is not deemed necessary for a development with such low daily and peak hour traffic generation. However, the safety of these intersections may be compromised due to the increase in especially heavy vehicle volumes along the R354 and the access roads. The low current traffic volumes along the R354 and the expected construction traffic volumes does not justify the construction of additional turning lanes. However, the following recommendations are made to improve the safety of the intersections.

R354 / KOMSBERG / KAREEDORINGKRAAL ACCESS

Provide additional warning signs as follows:

- Side road junction warning sign (W108) on the southern approach of the R354, located approximately 100 m from the intersection.
- Provide a temporary truck crossing warning sign (TW345) on the same road sign pole as the W108 sign.
- Staggered side road junctions warning sign (W110) on the northern approach of the R354, located approximately 100 m from the intersection.
- Provide a temporary truck crossing warning sign (TW344) on the same road sign pole as the W110 sign.

R354 / KLEIN ROGGEVELD ACCESS

Provide a Stop Sign (R1.1) and solid stop line on the side road approach to the R354.

Provide additional warning signs as follows:

- Side road junction warning sign (W108) on the southern approach of the R354, located approximately 100 m from the intersection.
- Provide a temporary truck crossing warning sign (TW345) on the same road sign pole as the W108 sign.
- Side road junction warning sign (W107) on the northern approach of the R354, located approximately 100 m from the intersection.
- Provide a temporary truck crossing warning sign (TW344) on the same road sign pole as the W110 sign.

7 TRANSPORT IMPACT ASSESSMENT

7.1 IMPACT ASSESSMENT METHODOLOGY

INTRODUCTION

The EIA, of which this TIA is an informant, uses a methodological framework developed by WSP | Parsons Brinckerhoff to meet the combined requirements of international best practice and NEMA, Environmental Impact Assessment Regulations, 2014 (GN No. 982) (the "EIA Regulations").

As required by the EIA Regulations (2014), the determination and assessment of impacts will be based on the following criteria:

- Nature of the Impact
- Significance of the Impact
- Consequence of the Impact
- Extent of the impact
- Duration of the Impact
- Probability if the impact
- Degree to which the impact:
  - can be reversed;
  - may cause irreplaceable loss of resources; and
  - can be avoided, managed or mitigated.

Following international best practice, additional criteria have been included to determine the significant effects. These include the consideration of the following:

- Magnitude: to what extent environmental resources are going to be affected;
- Sensitivity of the resource or receptor (rated as high, medium and low) by considering the importance of the receiving environment (international, national, regional, district and local), rarity of the receiving environment, benefits or services provided by the environmental resources and perception of the resource or receptor); and
- Severity of the impact, measured by the importance of the consequences of change (high, medium, low, negligible) by considering inter alia magnitude, duration, intensity, likelihood, frequency and reversibility of the change.

It should be noted that the definitions given are for guidance only, and not all the definitions will apply to all of the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

METHODOLOGY

Impacts are assessed in terms of the following criteria:

- The **nature**, a description of what causes the effect, what will be affected and how it will be affected

Table 7-1: Nature of Impact

NATURE OR TYPE OF IMPACT	DEFINITION
Beneficial / Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
Adverse / Negative	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor.
Direct	Impacts that arise directly from activities that form an integral part of the Project (e.g. new infrastructure).
Indirect	Impacts that arise indirectly from activities not explicitly forming part of the Project (e.g. noise changes due to changes in road or rail traffic resulting from the operation of Project).
Secondary	Secondary or induced impacts caused by a change in the Project environment (e.g. employment opportunities created by the supply chain requirements).
Cumulative	Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.

à The physical **extent**, wherein it is indicated whether:

Table 7-2: Extent of Impact

SCORE	DESCRIPTION
1	the impact will be limited to the site;
2	the impact will be limited to the local area;
3	the impact will be limited to the region;
4	the impact will be national; or
5	the impact will be international;

à The **duration**, wherein it is indicated whether the lifetime of the impact will be:

Table 7-3: Duration of Impact

SCORE	DESCRIPTION
1	of a very short duration (0 to 1 years)
2	of a short duration (2 to 5 years)
3	medium term (5–15 years)
4	long term (> 15 years)
5	permanent

- The **magnitude of impact on ecological processes**, quantified on a scale from 0-10, where a score is assigned:

Table 7-4: Magnitude of Impact

SCORE	DESCRIPTION
0	small and will have no effect on the environment.
2	minor and will not result in an impact on processes.
4	low and will cause a slight impact on processes.
6	moderate and will result in processes continuing but in a modified way.
8	high (processes are altered to the extent that they temporarily cease).
10	very high and results in complete destruction of patterns and permanent cessation of processes.

- The **probability of occurrence**, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale where:

Table 7-5: Probability of Impact

SCORE	DESCRIPTION
1	very improbable (probably will not happen.
2	improbable (some possibility, but low likelihood).
3	probable (distinct possibility).
4	highly probable (most likely).
5	definite (impact will occur regardless of any prevention measures).

- the **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high;
- the **status**, which is described as either positive, negative or neutral;
- the degree to which the impact can be reversed;
- the degree to which the impact may cause irreplaceable loss of resources; and
- the *degree* to which the impact can be mitigated.

The **significance** is determined by combining the criteria in the following formula:

$$S = (E+D+M)*P$$

S = Significance weighting

E = Extent

D = Duration

M = Magnitude

P = Probability

The **significance weightings** for each potential impact are as follows:

Table 7-6: Significance weightings **per Impact**

OVERALL SCORE	SIGNIFICANCE RATING	DESCRIPTION
< 30 points	**Low**	where this impact would not have a direct influence on the decision to develop in the area
31-60 points	**Medium**	where the impact could influence the decision to develop in the area unless it is effectively mitigated
> 60 points	**High**	where the impact must have an influence on the decision process to develop in the area

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the Project's actual extent of impact, and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures, and is thus the final level of impact associated with the development of the Project. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this EIA Report.

7.2 TRANSPORT IMPACT ASSESSMENT PER FACILITY

Refer to a Table 7.7 for the Construction Phase impact assessments per facility. Note that the impacts are expected to be similar for each site, as the maximum vehicle trips per site will be similar. Furthermore, it is unlikely if the maximum vehicle trips for both sites will be generated at the same time, and the impact assessment per facility as noted in Table 7.7 is regarded as representative.

The Operational and Decommissioning phases were not assessed, as the trip generation during these phases will either be negligible or low.

Table 7-7: Impact assessment per facility - Construction phase

Potential Impact		Extent	Duration	Magnitude	Probability	Significance	
		(E)	(D)	(M)	(P)	(S=(E+D+M)*P)	
Noise, dust & exhaust pollution due to vehicle trips on-site	Nature of impact:	Vehicle and tyre noise, dust, exhaust pollution					
	Without Mitigation	2	2	2	4	24	Low
	degree to which impact can be reversed:	Temporary impact, no long term effect					
	degree of impact on irreplaceable resources:	N/a					
	Mitigation Measures	None					
	With Mitigation						
Noise, dust and exhaust pollution due to additional trips on the access roads	Nature of impact:	Vehicle and tyre noise, dust, exhaust pollution					
	Without Mitigation	2	2	4	4	32	Medium
	degree to which impact can be reversed:	Temporary impact, no long term effect					
	degree of impact on irreplaceable resources:	N/a					
	Mitigation Measures	None					
	With Mitigation						
Noise and exhaust pollution due to additional trips on the R354	Nature of impact:	Vehicle and tyre noise, exhaust pollution					
	Without Mitigation	2	2	2	4	24	Low
	degree to which impact can be reversed:	Temporary impact, no long term effect					
	degree of impact on irreplaceable resources:	N/a					
	Mitigation Measures	None					
	With Mitigation						

7.3 SUMMARY

The overall significance of each impact during the Construction Phase of the facilities, as detailed in Table 7.7, is Low or Medium. The impacts are limited to the peak construction period only, local in nature, and minor and will not result in an impact on processes or low and will cause a slight impact on processes.

Mitigating measures are therefore not recommended for the expected trip generation of the facilities.

8 CUMULATIVE TRANSPORT IMPACT ASSESSMENT

8.1 BACKGROUND

The DEA requested that a cumulative traffic impact assessment be undertaken of the latent power facilities in the vicinity of the Maralla East & West wind energy facilities.

8.2 LATENT DEVELOPMENTS

The known developments that may have a cumulative impact on the surrounding road network are shown Figure 8.1 and Figure 8.2 for the Maralla East & West facilities respectively.

Refer to Table 8.1 for the facilities that were assessed in terms of their potential cumulative traffic impact on the road network. This was assessed in combination with the Maralla facilities. The facilities listed below will potentially also take access off the R354 during their construction and operational phases.

Table 8-1 Latent developments in the study area

ID	DEA number	Name	Type	Access to major road network
2	12/12/20/1782	Sutherland 2 WEF*	Wind Energy	Via Klein Roggeveld access road to R354
6 & 16	12/12/20/1988/1/AM1	Roggeveld Wind Farm**	Wind	Via local access roads to R354
10 & 13	12/12/20/2370 & 12/12/20/2370/2	Hidden Valley wind energy facility***	Wind Energy	Via Klein Roggeveld access road to R354
7	?	Esiyazo Wind Facility	Wind Energy	Via Aanstoot or Aurora access roads to R354

Notes
* The Sutherland 2 WEF site is the western of the 4 sites, and is the only facility that was assessed as it will take access off the R354 via the Klein Roggeveld or Komsberg access roads.
** The eastern sites located closest to the R354 were assessed, as these will take access off the R354.
*** The development will consist of 3 phases, namely the Karusa, Soetwater and Great Karoo Wind Farms.
**** EIA currently underway by WSP.

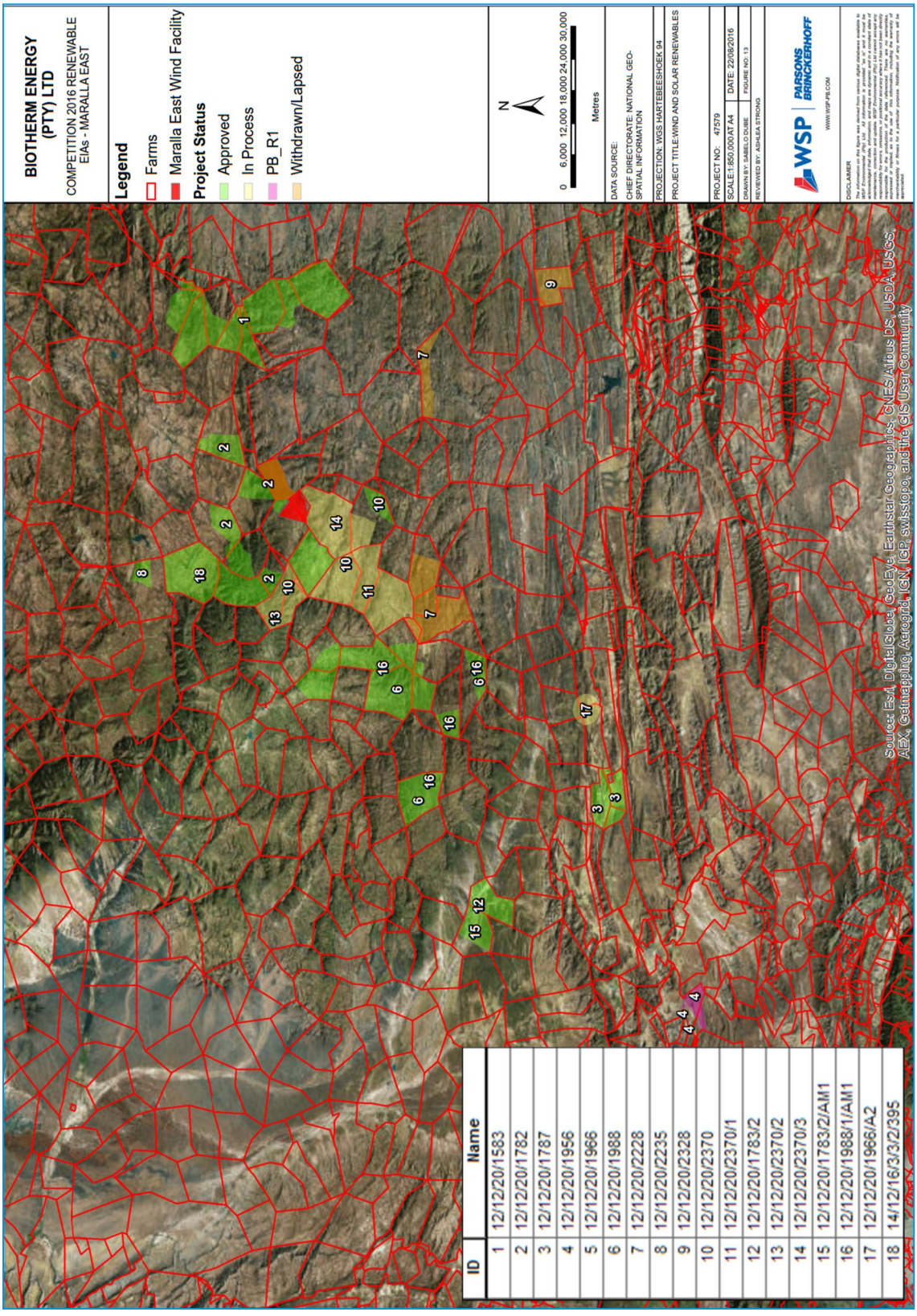

Figure 8-1 Latent Power Facilities – Maralla East

Source: WSP

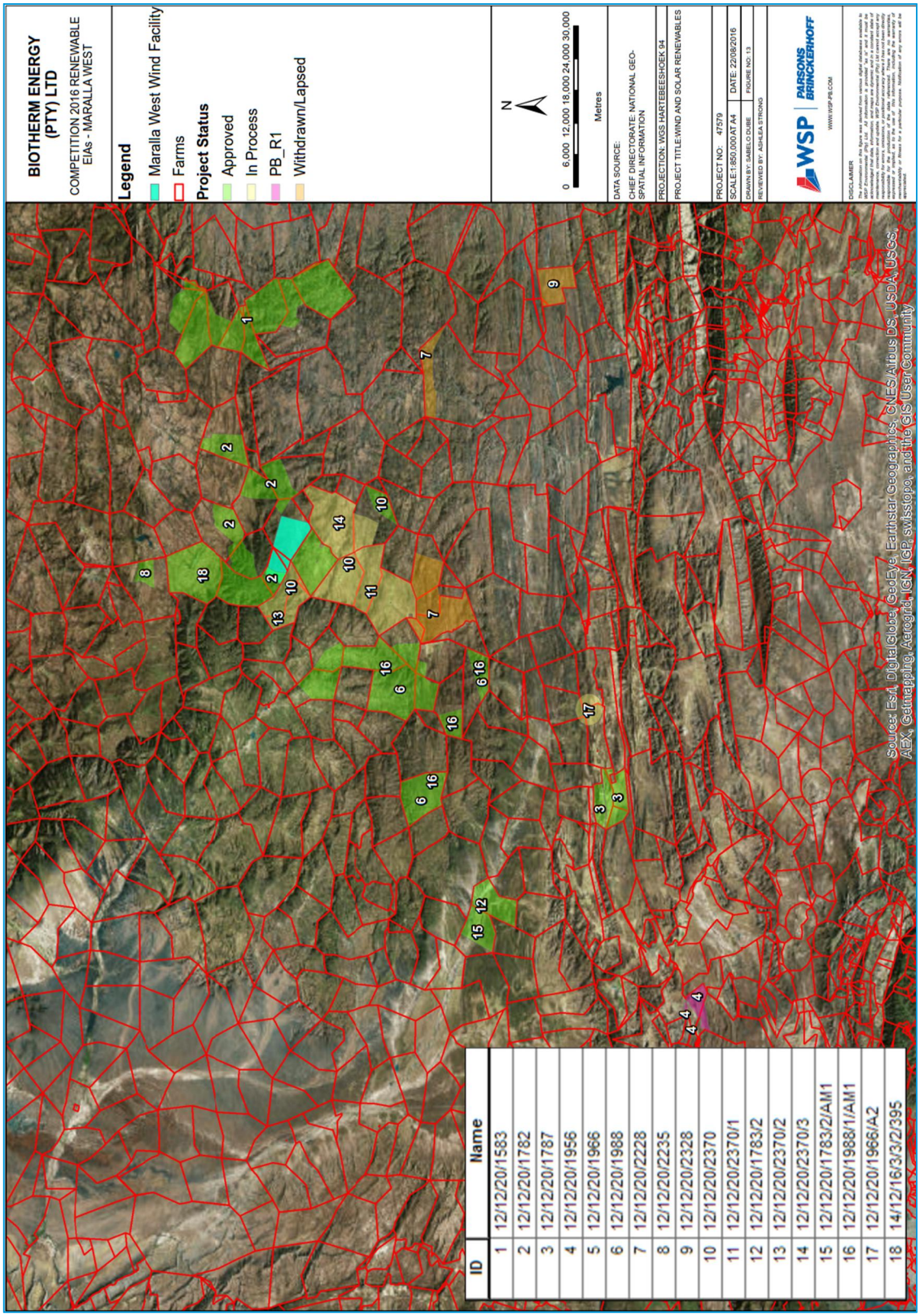

Figure 8-2 Latent Power Facilities – Maralla West

Source: WSP

The EIAs listed in Table 8.2 of the surrounding solar developments have been either withdrawn or have lapsed and are therefore not been considered as part of the cumulative impact assessment.

Table 8-2 Latent developments - withdrawn

Proposed Development Name	DEA Reference	Current EA Status	Proponent	Extent	Proposed Capacity	Farms
Proposed wind energy facility near Komsberg, Western Cape	12/12/20/2228	S&EIR	Inca Komsberg Wind (Pty) Ltd		300 MW	
Proposed wind and solar project near Laingsburg, Western Cape	12/12/20/2328	S&EIR	Unknown		50 MW	

8.3 CUMULATIVE TRANSPORT IMPACTS

Refer to Table 8.3 for the expected cumulative Transport impacts on the local road network due to the latent facilities in the study area.

Table 8-3 Summary of Transport impacts of the latent developments

DEA number	Facility	Transport Impact	Cumulative Transport Impact
12/12/20/1782	Sutherland 2 WEF	· The EIR do not state the expected number of vehicle trips that will be generated by the facility. · The EIA does not contain a TIA.	No cumulative impact due to maximum traffic generation of each site occurring at an unknown future time period that cannot be determined with the information available.
12/12/20/1988/1 /AM1	Roggeveld Wind Farm	· The EIR do not state the expected number of vehicle trips that will be generated by the facility. · The EIA does not contain a TIA. · The EIA states that 4 access roads off the R354 will be considered.	
12/12/20/2370 & 12/12/20/2370/2	Hidden Valley wind energy facility *	· The EIR do not state the expected number of vehicle trips that will be generated by the facility. · The EIA does not contain a TIA.	
?	Esizayo Wind Facility	· Safety of local access intersections off the R354 to Aanstoot and Aurora may be compromised due to increased construction traffic. Mitigating measures are proposed.	

8.4 SUMMARY

The maximum traffic generation of each site occurs at an unknown future time period that cannot be determined from the information available. It is known that The Hidden Valley facility will be constructed in 3 phases. It is therefore unlikely that these impacts will occur at the same time, therefore no cumulative Transport impact is foreseen.

It should be noted that the Significance of the Transport impact of each of these facilities is expected to be similar to the Maralla facilities, as their Construction phase trip generation will likely be similar.

Refer to Section 6.4 for the proposed upgrades to the local access intersections off the R354. The need for these upgrades will be more critical if any of the latent developments are constructed concurrently with the Maralla projects. It is recommended that the cost of the upgrades be shared if the developments are constructed during the same period and take access off the R354 via the same local roads.

9 CONCLUSIONS & RECOMMENDATIONS

Based on this study, the following key conclusions and recommendations are relevant:

- The proposed Maralla East & West Wind Facility will be located south of Sutherland in the Northern and Western Cape Provinces.
- The facility will be located over 6 farms with a total area of 10,106 ha, namely:
  - Remaining Extent of Farm 3 Roodeheuvels 180.
  - Remaining Extent of Farm Annex 3 Roodeheuvels 181.
  - Portion 1 of Farm Wolven Hoek 182.
  - Portion 2 of Farm Wolven Hoek 182.
  - Remaining Extent of Farm Schalkwykskraal 204.

    Located in Karoo Hoogland Municipality, Division Sutherland, in the Northern Cape Province.
  - Remaining Extent of Farm Welgemoed 268.

    Located in the Central Karoo District Municipality, Division Laingsburg, in the Western Cape Province.
- The facility will be two 250 MW wind energy facilities, each with 70 turbines up to 120 m high.
- The Scope of the TIA was informed by the Committee of Transport Officials' South African Traffic Impact and Site Traffic Assessment Manual, TMH16, Vol. 1, Version 1, August 2012.
- A single short term (2 year) Construction phase was assumed for analysis purposes.
- There are no known planned road upgrades in the study area.
- There are no known large scale latent developments in the vicinity of the site that may have an impact on the local road network, except for the latent energy developments that were assessed as part of the Cumulative Impact Assessment.
- The site will take access off existing accesses from the R354, a single carriageway 2-way surfaced road (1 lane per direction), with no surfaced shoulders. It is recommended that the existing access roads be utilised for access purposes during construction and the operational phase.
- The R354 is regarded as in "Fair" and "Good" condition in the vicinity of the site, as per the Provincial Government of the Western Cape (PGWC) Department of Transport's 2015 Surfaced Road Condition Assessment.
- Construction and operational phase parking will be accommodated on-site.
- There is no need for public transport services or non-motorised transport infrastructure to serve the site for the construction and operational phase, except for the transport of staff.

- The estimated peak trip generation of both facilities will be 188 veh/hr in the weekday AM and PM peaks during the Construction phase, and will be negligible for the operational phase.

- The expected traffic increase on the local access roads during the construction phase could result in deterioration of the access roads, as they are not designed for abnormal loads and large traffic volumes. The cost of maintaining and repairing the access roads during the Construction phase of the projects should be borne by the developer.

- The estimated total E80 loading for the duration of the construction period is 0.050 million, and no mitigating measures are deemed necessary on the R354.

- It is not possible to determine the volume of traffic that will be generated during the decommissioning phase. It can however be expected that the volumes will be lower than during the construction phase, and the resultant Transport impact on the local access roads will be lower than during the Construction phase. Any damage to the road caused by the decommissioning phase traffic should be repaired at the cost of the developer.

- The transport route/s between the origin of the turbine components and the facility may be National, Provincial or Local roads; and each authority will be required to provide the necessary permits for the transportation of any oversized or abnormally heavy components.

- It is recommended that an abnormal vehicle route management plan be undertaken when the port/s of entry of the tower components (masts, blades, rotor nacelles, generators, etc.) are known. These plans should include all aspects such as horizontal and vertical requirements along the routes, bridges along the route, speed limits, etc. These plans and the application for the abnormal permits is normally the responsibility of the logistics company that will transport the components to site.

- A capacity analysis of the accesses was not undertaken and is not deemed necessary, however the safety of these intersections should be improved through the provision of additional signage, as follows:

  - R354 / Komsberg / Kareedoringkraal access

    - Provide additional warning signs as follows:
    - Side road junction warning sign (W108) on the southern approach of the R354, located approximately 100 m from the intersection.
    - Provide a temporary truck crossing warning sign (TW345) on the same road sign pole as the W108 sign.
    - Staggered side road junctions warning sign (W110) on the northern approach of the R354, located approximately 100 m from the intersection.
    - Provide a temporary truck crossing warning sign (TW344) on the same road sign pole as the W110 sign.

  - R354 / Klein Roggeveld access

    - Provide a Stop Sign (R1.1) and solid stop line on the side road approach to the R354.
    - Provide additional warning signs as follows:

  - Side road junction warning sign (W108) on the southern approach of the R354, located approximately 100 m from the intersection.
  - Provide a temporary truck crossing warning sign (TW345) on the same road sign pole as the W108 sign.
  - Side road junction warning sign (W107) on the northern approach of the R354, located approximately 100 m from the intersection.

- Provide a temporary truck crossing warning sign (TW344) on the same road sign pole as the W110 sign.

- The overall significance of each Transport related impact during the Construction Phase of the facilities are Low or Medium. The impacts are limited to the peak construction period only, local in nature, and minor and will not result in an impact on processes or low and will cause a slight impact on processes. Mitigating measures are therefore not recommended for the expected trip generation of the facilities, except for the provision of additional signage to improve the safety of the intersections.

- Cumulative impact assessment: The maximum traffic generation of the latent sites may occur at an unknown future time period that cannot be determined from the information available. The implementation programme of these sites has also not been determined. It is unlikely that these impacts will occur at the same time, therefore no cumulative Transport impact is foreseen. It should be noted that the Significance of the Transport impact of each of these facilities is expected to be similar to the Maralla facilities, namely Low or Medium.
- The maintenance and repair of the local access roads due to damage by construction vehicles should also be the responsibility of each of the developers of the latent energy facilities.

It is concluded that the proposed Maralla East & West Wind Facility will have a negligible short-term Transport impact on the adjacent road network, and it is recommended that the TIA should be accepted as part of the EIA application.

BIBLIOGRAPHY

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- Amendment Application for the Proposed Splitting of the Sutherland Renewable Energy Facility into three 140 MW Wind Energy Facilities, Sutherland, Northern and Western Cape Provinces, Amendment Report for the proposed Sutherland 2 Wind Energy Facility, CSIR, May 2016.
- Amended Final Environmental Impact Assessment Report, Proposed Hidden Valley Wind Energy Facility (Comprising Three Development phases) on a site south of Sutherland, Northern Cape Province, Savannah Environmental (Pty) Ltd, May 2014.

Appendix A

PEER REVIEW

Ref: P0009/WSP Wind Farm TIA Review

10 January 2017

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For the attention of Mr Christo Bredenhann

Dear Sir

INDEPENDENT PEER REVIEW
MARALLA EAST & WEST WIND FACILITY TRAFFIC IMPACT ASSESSMENT

I hereby confirm that I have undertaken a comprehensive review of the above-mentioned Traffic Impact Assessment (TIA) (*Ver 1.2, Project no. 21102, dated November 2016*) as per the following terms of reference:

- Is the methodology clearly explained and acceptable;
- Evaluate the validity of the findings (review data evidence);
- Discuss the suitability of the mitigation measures and recommendations;
- Identify any short comings and mitigation measures to address the short comings;
- Evaluate the appropriateness of the reference literature;
- Indicate whether a site-inspection was carried out as part of the peer review; and
- Indicate whether the article is well-written and easy to understand.

Please note that this is a desk-top review and no site-inspection was made as part of this review. In addition, please note that this review was undertaken with limited understanding of the project and its context, other than what was written in the supplied TIA document.

My comments are as follows:

- P. 13 – The heavy / abnormal vehicle route is mentioned and it is stated that special permits will be required. You should probably go one step further and recommend that a separate heavy/abnormal vehicle route management plan will be required which assesses the route from the closest port to the site, checks that there are no bridges or obstructions along the route, determines hours of operation and speeds; and determines road widening / upgrades required etc.

- P. 15 – E80 Summary – I didn't really understand this section and I have a few questions:

    - Why are only the concrete and steel deliveries included in the calculation? Why not the mast components, rotor blades etc as well? These also arrive on heavy vehicles.

- When compared to the numbers in Table 6-2, I understand how the 14 000 concrete trips was calculated (7 000 trips in per facility), but how is the 420 steel trips calculated?
- It is deemed that the E80 loading is 0.050 million and no mitigating measures are deemed necessary. What does this mean? How was it calculated? And what is the minimum threshold of E80's before mitigating measures are required?
- Does the surfaced R354 road and the unsurfaced access roads have different thresholds of E80s before mitigation is required? I am not an expert in this, but I don't think the unsurfaced road will be able to take this kind of loading over 2 years without some sort of mitigation. (Maybe a road materials engineer should be consulted?)

- P. 15 – 6.4 Capacity Analysis. While I agree that from a traffic capacity analysis perspective, no upgrades are required, I am not so sure from a safety perspective. Upgrades of intersections in rural areas are mostly dictated by safety issues that arise due to large speed differentials. I assume The R354 has a speed limit of 100 or 120 km/h? In addition, the sight distance to the left when exiting both access roads onto the R354 doesn't look sufficient for the speed of the road (due to vertical and horizontal curvature). With an AADT of only 145, this development will more than double the AADT number during the construction phase, most of which will be heavy / abnormal vehicles. So, a heavy vehicle stopping to turn right off the R354 onto the unsurfaced roads, could potentially have a vehicle travelling at 120 km/h coming up behind it with poor sight distance. Under these circumstances, I think you may find that the Provincial Authorities would want these intersections upgraded to include a separate through-right or right-turn lane (as per the provincial design manual) on the R354 for safety reasons. This issue applies to both the Klein Roggeveld and Komsberg Accesses. I am not sure which one will be used, but I assume that only one route to the site will be designated. The existing yield at the Klein Roggeveld access should probably also be changed to a stop control to improve safety.

- P. 21 Section 7.2: As discussed above, I think that the potential impact on traffic safety will be an issue. Road accidents and deaths on high speed rural roads is a major issue these days. I suggest you add this as a factor and propose the mitigation discussed in the point above. You may even need a warning sign on the R 354 south approaches due to the poor sight distance.

- Is the possible deterioration and damage to the unsurfaced access road an impact that should be considered here (it is mentioned earlier in the report)? I am sure the mitigation will be that the Developer must possibly widen and regrade this road on a regular basis to keep it in acceptable condition, but a road materials engineer should probably be consulted in this regard.

- P. 27 Cumulative Impact – I agree that there is not much you can assess here if you do not have any information, but there is a possibility that even more heavy vehicles will be using the R354 / Klein Roggeveld and Komsberg intersections, which makes the proposed intersection upgrades even more important.

- Both the Esizayo and Maralla facilities will take access off the R354. Perhaps you should test the cumulative impact of both these developments?

- If an extreme accumulated worst-case scenario is required to be tested, then you could undertake a “what if” analysis assuming that at least one other development coincides with this one.

Please do not hesitate to contact me should you wish to discuss any of the above comments.

Yours faithfully
for UrbanEQ Consulting Engineers (Pty) Ltd

ANDREW BULMAN PrEng
Director