TRAFFIC IMPACT ASSESSMENT

FOR

PROPOSED DEVELOPMENT

OF THE

MULILO NEWCASTLE WIND POWER

NEWCASTLE

WITHIN

NEWCASTLE LOCAL MUNICIPALITY

FEBRUARY 2023
(Version 1.0)

PREPARED FOR**:**
c/o

CES - Environmental and Social Advisory Services

PO Box 8145
Nahoon
East London
5200

Telephone: 043 726 7809
Cellular: 083 379 9861

PREPARED BY:

31 Galway Road
Nahoon
East London
5241

Telephone: 043 735 0890
Cellular: 083 465 1558
E-mail: deonmcquirk@telkomsa.net

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF ABBREVIATIONS

HCM	Highway Capacity Manual
HSE	Health, Safety and Environment
KZNDOT	KwaZulu-Natal Department of Transport
LOS	Level of Service (as defined by Highway Capacity Manual)
MW	Mega Watts
NA	Not Analysed
NLM	Newcastle Local Municipality
PPE	Personal protective equipment
SAT	Saturday
SIDRA	Software for the design and evaluation of traffic/ pedestrian intersections
TIA	Traffic Impact Assessment
TMP	Traffic Management Plan
TTMP	Traffic and Transportation Management Plan
veh/h	vehicles per hour
WEF	Wind Energy Facility

1. INTRODUCTION AND BACKGROUND

1.1 Introduction

Emonti Consulting Engineers CC was approached to prepare a Traffic Impact Assessment (TIA) for the proposed development of the Mulilo Newcastle Wind Power situated within the Newcastle Local Municipality (NLM).

Following the investigation and study, recommendations regarding site access from the public road network, road network improvements, internal site layout, traffic safety, on-site circulation, parking and any loading facilities, will be made. The TIA will also include a desktop Traffic Management Plan (TMP).

The approach and methodology followed in conducting this study were in terms of the references included in Chapter Eleven.

1.2 Proposed development

The site is located just north-west of Newcastle, which is situated within the NLM area. A site locality map can be seen in Figure 1.1. The proposed development comprises the implementation of a Wind Energy Facility (WEF).

The current use of the site, coupled with the existing structures found thereon, generate very limited trips for the peak hours.

The Developer plans to develop, construct and operate the WEF located approximately 15km north-west of Newcastle in the KwaZulu-Natal Province. The Mulilo Newcastle Wind Power will consist of up to 37 turbines. The WEF will be capable of generating a maximum of 200 Mega Watts (MW) of power.

Although the current layout allows a maximum generating output of up to a total of 200 MW for the WEF, the final design may be reduced dependent on the outcome of the specialist studies undertaken during the Environmental Impact Assessment process.

A summary of the development is included in Appendix D for ease of reference.

The proposed land uses of the property in question are given in Table B.1 in Appendix B. The proposed site layout is illustrated in Figure 1.2.

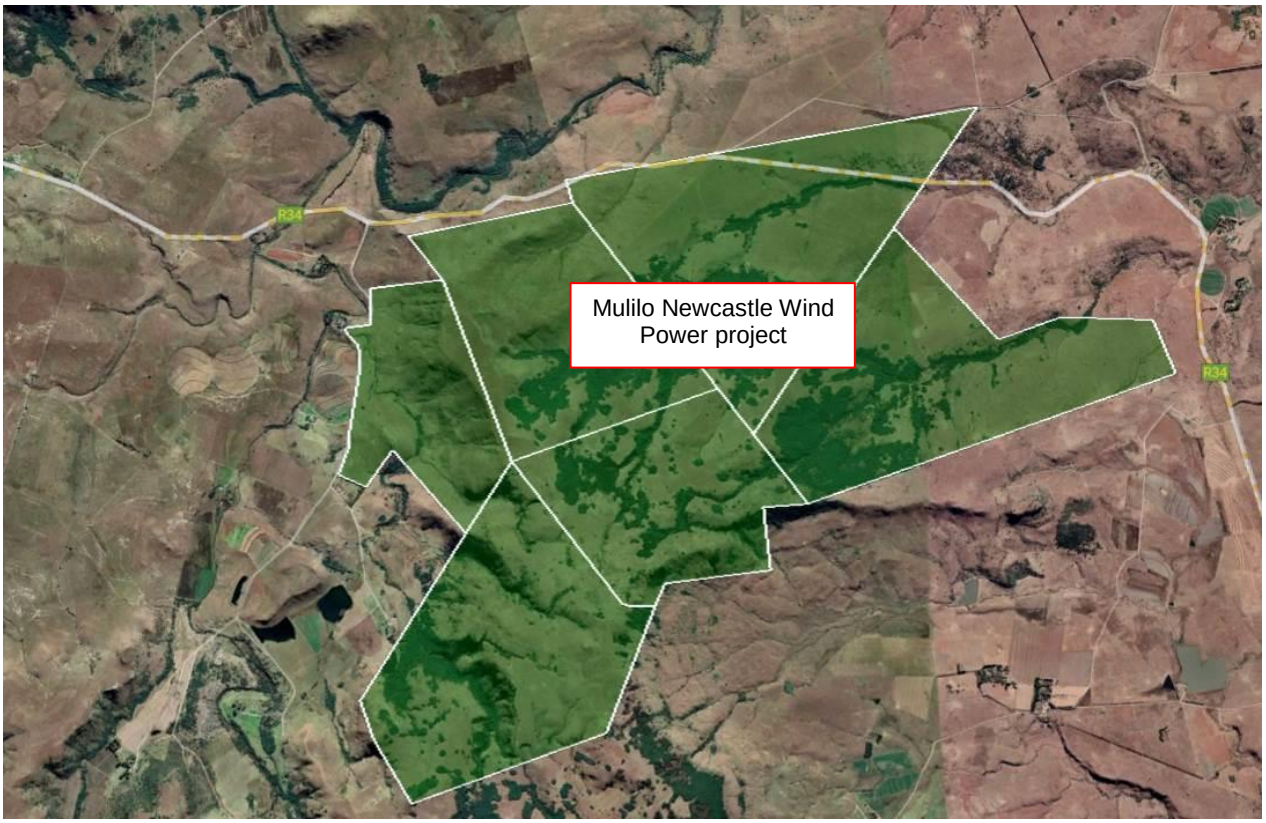


Figure 1.1: Site locality

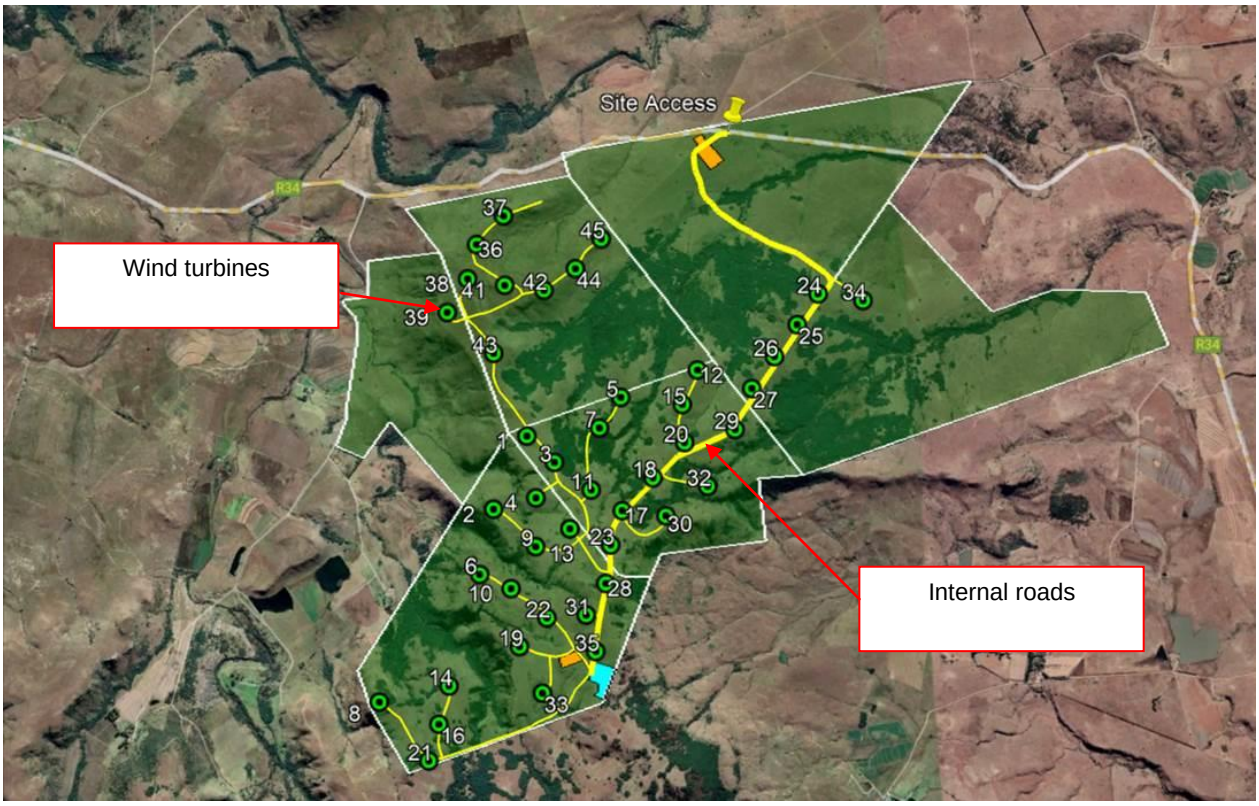


Figure 1.2: Proposed layout of the wind turbines

2. EXISTING OPERATING CONDITIONS

2.1 Intersection control

Control strategies at the existing intersections relevant to this study are presented in Table 2.1.

Table 2.1: Control strategies

No.	Intersection	Control
1	R34/Access Road (South)	Priority /stop
2	R34/Access Road (North)	Priority /stop

The following photographs reveal a number of intersections that will be utilised by traffic generated by the development.

R34/Access Road (South) intersection

R34/Access Road (North) intersection

2.2 Capacity along access roads

The R34, is a road of provincial significance and provides access to Newcastle in the east and the R103 in the west. From on-site observations sufficient spare capacity appears to exist along the road network to cater for the medium to long term future regarding anticipated traffic growth, including future trips relating to this development.

2.3 Traffic calming

No traffic calming exists along the R34 passing the site and the posted speed limit is 100 km/h. From on-site observations the vehicular speeds in the vicinity of the proposed access do on occasion exceed the posted speed limit.

2.4 Pedestrian and cycle facilities

No formalised pedestrian or cycle facilities are currently available on the surrounding road network. The only pedestrian facility worth mentioning is the wide grass verges and surfaced shoulders along the R34 that could be used by the occasional pedestrian.

2.5 Public transport facilities

No formalised public transport facilities are currently available on the surrounding road network.

2.6 Road condition

The R34 is relatively well maintained near the site access and should be capable of accommodating the expected traffic generated by the proposed development, both during the construction and operational stages.

However, it is noted that the section of the R34 within the Free State Province is in an extremely poor state of repair and would need to be traversed at low speeds by construction vehicles and abnormal load vehicles.

3. EXISTING TRAFFIC VOLUMES

Traffic volume surveys

In order to establish the current traffic conditions relevant traffic count information was used. This traffic count information is available in Appendix C.

Table 3.1 provides a summary of the traffic count information utilised in this study.

Table 3.1 Traffic count data used

No.	Station	Data Type	Date
1	R34/Access Road (South)	AM and PM peak manual classified (light and heavy) traffic volume	24-Jan-23
2	R34 near Access Road (South)	Manual speed surveys	

The analysis of current traffic performance is based on the observed traffic data that, when necessary, have been adjusted and smoothed in order to represent a balance network of traffic volumes for 2023. The balanced peak hour traffic flow volumes are displayed as network diagrams in Figures 4.1 to 4.5.

Speed survey

In order to determine if speeding occurs in close proximity to the existing/proposed access to the site, a speed survey was conducted near the access. Vehicular speeds in both directions were included in the survey. The current speed limit along the R34 is 100km/h.

Speed surveys, were conducted during the midday (off peak) period in order to determine the speeds that can be achieved under “less then congested” periods. The summary of these speed surveys are listed in Table 3.2. The detailed speed survey is included in Appendix C. The speeds were classified into light and heavy.

Table 3.2: Speed summary

Period	Location and direction		
		R34 - eastbound	R34 - westbound
Midday (off peak)	**Light**		
	Highest Speed	134	145
	Average Speed	103	100
	85th percentile Speed	116	118
	Heavy		
	Highest Speed	100	85
	Average Speed	75	58
	85th percentile Speed	85	75

From the results it can be seen that some speeding occurs along the R34, with the 85th percentile speeds for light vehicles being 116 and 118 km/h in an eastbound and westbound direction respectively.

4. FUTURE TRAFFIC VOLUMES

For purposes of this study it was assumed that the development will be functional in 2023 and therefore a design horizon of five years (i.e. 2028) was used for the future operational LOS analysis.

The recommended critical peak hours for analysing retail developments are weekday PM and SAT peak hours and weekday AM and PM peak hours for most other land uses. In this study the analyses were made for both the future weekday AM and PM peaks to address anticipated capacity problems in the peak hours most relevant to the development.

It is acceptable to project future traffic volumes by taking the recorded growth history of traffic counts into consideration. The generally accepted growth rate in the study area is 3% per annum. Applying the growth rate of 3% from the base year to the design horizon year the growth factor would be 1.13, meaning an increase in background traffic volume of 16% over the five year design horizon. According to Table 4.1 (Reference Four), this can be regarded as “low growth areas”.

Table 4.1: Typical traffic growth rates

Development Area	Growth rate
Low growth areas	0 - 3%
Average growth areas	3 - 4%
Above average growth areas	4 - 6%
Fast growing areas	6 - 8%
Exceptionally high growth areas	> 8%

For the future scenario analysis the current traffic volumes were maintained as background traffic and increased by an annual growth factor. New trips relating to the proposed development were added to obtain the future estimated traffic volumes for 2028.

4.1 Traffic generation

The recommended vehicle trip generation rates (as per References One and Four) for the land uses listed in Table B.1 were used to calculate the estimated number of trips for the various peak hours in order to determine the critical peak hour.

Based on the size of the development, less than 50 vehicles per hour are expected to be generated, in any given peak period, both for the construction and operational stages. This again implies that spare capacity will exist in the future to accommodate the volume of additional vehicles. The recommended in/out split for the peak hours can be seen in Table B.1 which also shows details of trip generation calculations for the various peak hours.

From Table B.1 it can be seen that the PM peak hour, in terms of trips generated, is equal to the AM peak hour for a regular week day. When the projected future traffic volumes and predicted traffic generated are added together, the combined effect does not change the critical peak period which remains the PM peak hour.

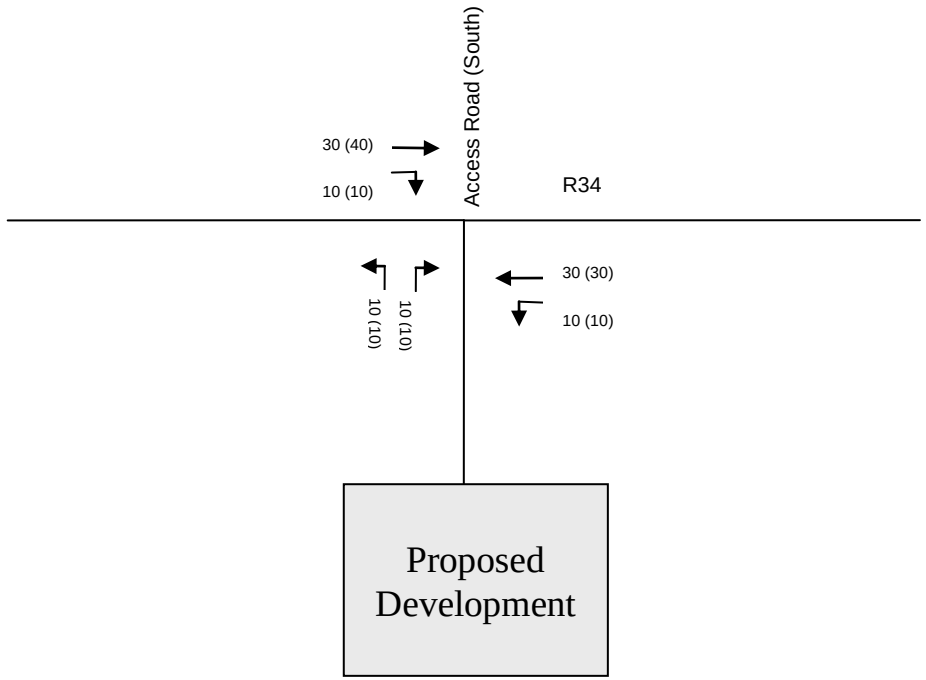
The following are the scenarios that were analysed, where necessary:

i. existing 2023 critical peak hour traffic,
ii. existing 2023 critical peak hour traffic **with development** traffic,
iii. projected 2028 critical peak hour **without development** traffic, and
iv. projected 2028 critical peak hour **with development** traffic.

4.2 Trip assignment/distribution

The generated trips, as identified in Section 4.1, have been distributed to the road network manually, based on the principles of the gravity model and taking into account knowledge of local conditions, Reference Five.

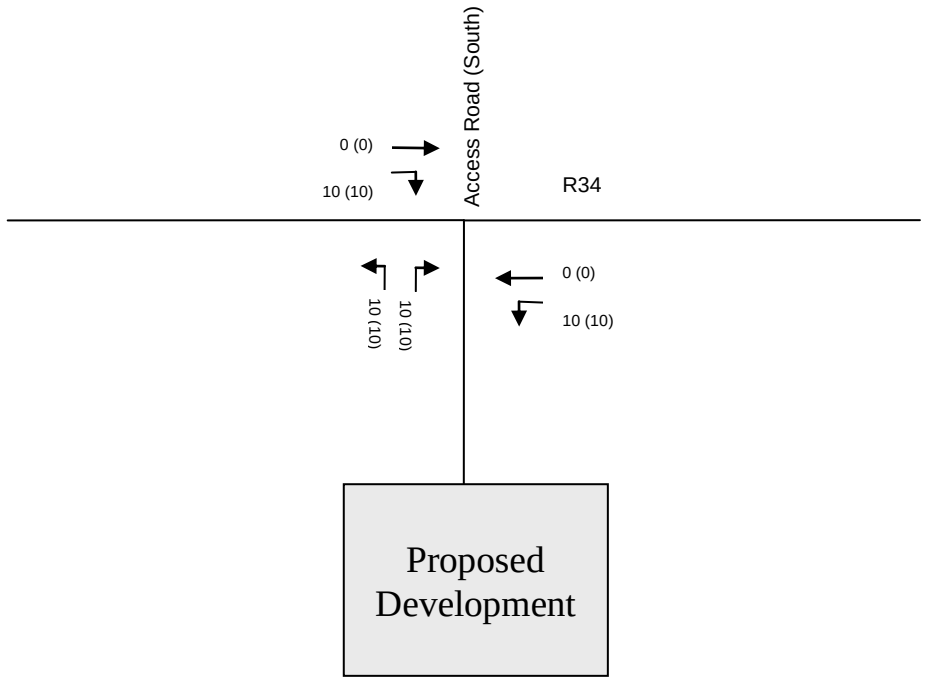
The resultant trip assignments are illustrated as network diagrams in Figures 4.1 to 4.5 for the various scenarios and time horizons tested.



Note: Minimum volumes used in analyses is 10 veh/h.

Figure 4.1: AM and PM 2023, without development trips.

Traffic Volume key:
AM (PM) = 1234 (1234) veh/h



Note: Trip generation has been set at 40 veh/h, which is considerably higher than what can be expected.

Figure 4.2: AM and PM 2023, development generated trips.

Traffic Volume key:
AM (PM) = 1234 (1234) veh/h

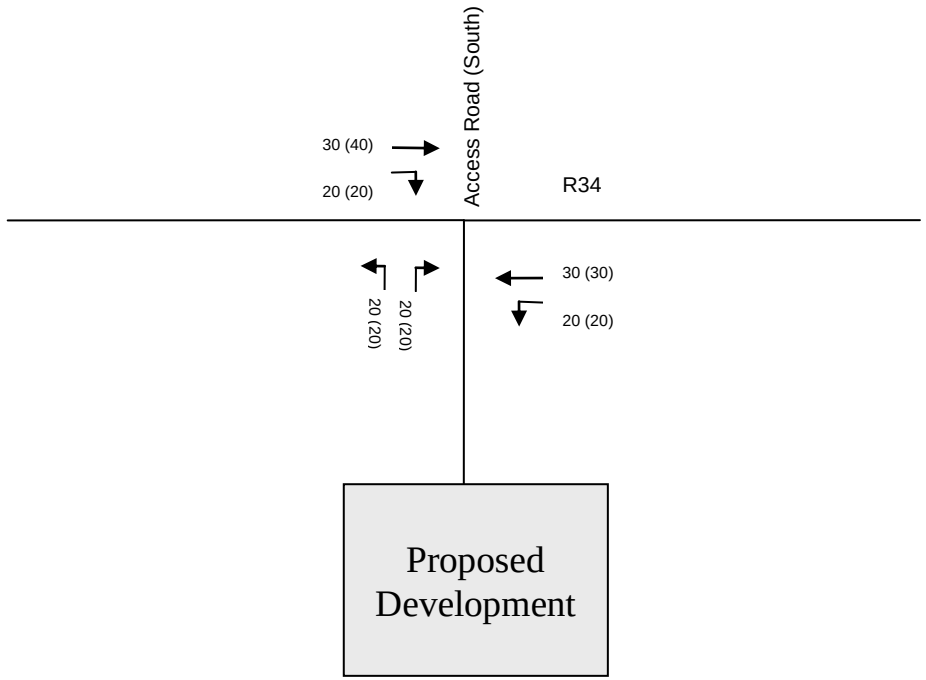


Figure 4.3: AM and PM 2023, development with generated trips.

Traffic Volume key:
AM (PM) = 1234 (1234) veh/h

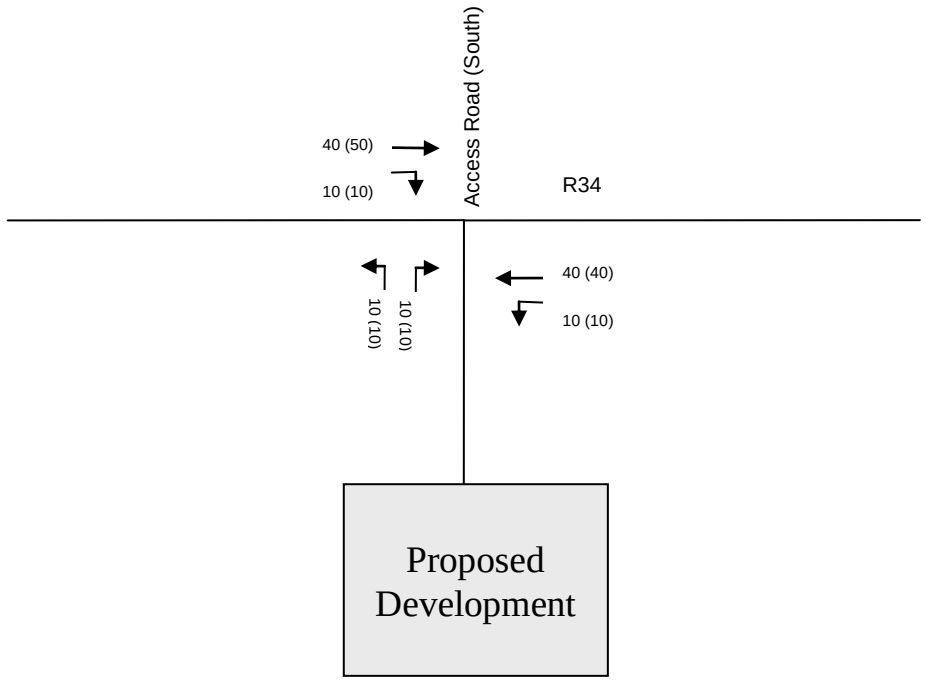


Figure 4.4: AM and PM 2028, without development trips.

Traffic Volume key:
AM (PM) = 1234 (1234) veh/h

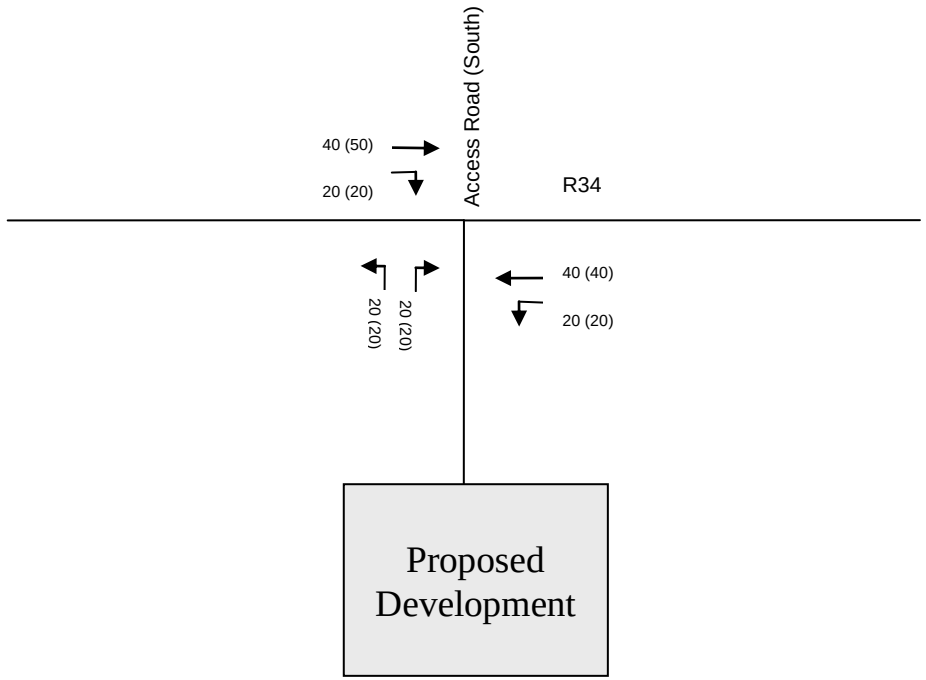


Figure 4.5: AM and PM 2028, development with generated trips.

Traffic Volume key:
AM (PM) = 1234 (1234) veh/h

5. INTERNAL CIRCULATION AND PARKING

5.1 Internal circulation

The internal circulating network proposed is shown in Figure 1.2 and the recommended layout in Figure 5.1. Minor changes to improve the overall efficiency of the development, as listed below, have been included in Figure 5.1.

i. parking layout,
ii. disabled parking bays,
iii. loading bays, and
iv. control strategy,
v. access control position.

It would be advisable for the Developer to plan, design and build the internal layout to a standard acceptable by the municipality in order to allow for accessibility of service and emergency vehicles, etc. The layout, as recommended in Figure 5.1, should meet these requirements and provides acceptable internal circulation.

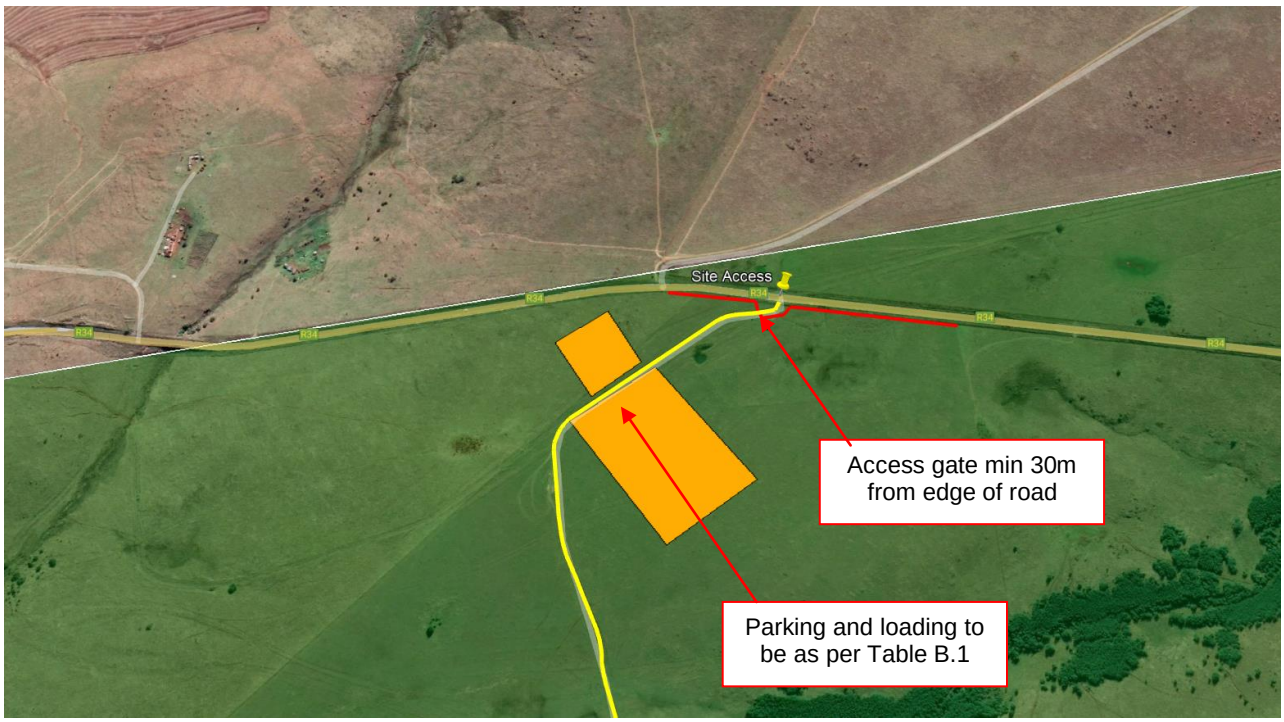


Figure 5.1: Recommended layout

5.2 Parking and loading facilities

The development will not be a major trip generator. As such the demand for parking and loading will be minimal. The period when parking and loading will be at its highest, will be during the construction stage. It should be noted that all the required loading and parking will need to be provided on the site. This will need to be located at the site office and construction compound. The parking area does not need to be hard surfaced as it is of a temporary nature. It will however need to be levelled to an acceptable gradient and gravel surfaced.

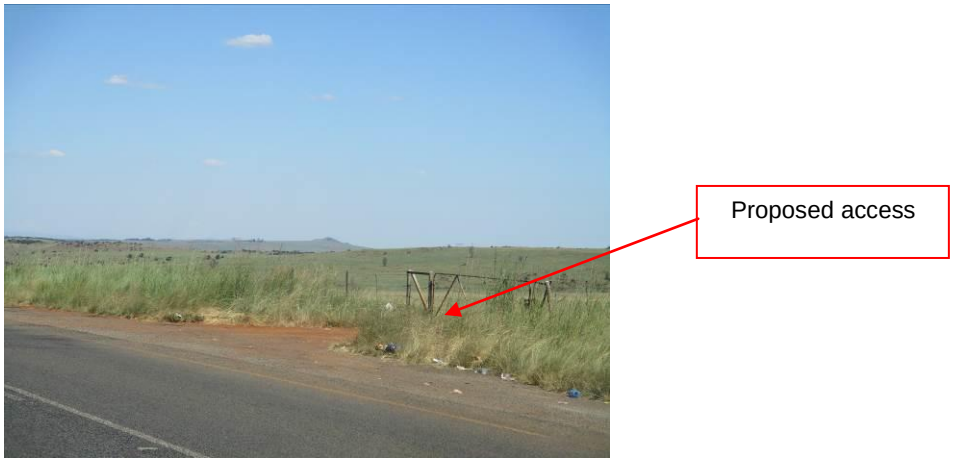
All parking and loading requirements are to be catered for on the site. The required minimum parking and loading bays are as set out in Table B.1.

Details of parking bays should be finalised at the design stage.

6. ACCESS PROPOSALS

6.1 Vehicular access

The proposed access to the site is onto the R34 via one proposed/existing access. The position of the proposed access is shown in Figure 5.1and in the photograph below.



Proposed/existing access onto the R34

The intersection sight distance for turning manoeuvres associated with the specific posted speed limit of 100 km/h and the site gradients experienced are approximately 250m. Both approaches on the R34 at the proposed access meet this minimum requirement for single unit vehicles under yield conditions.

However, during the entry and exiting of the abnormal loads special measures will need to be implemented in order to facilitate the turning movements which take longer than normal. These measures will be addressed in the detailed traffic management plan to be undertaken at a later stage.

It should be noted that the proposed access to be used should be that of a general “farm” type access, which will need to be temporarily improved in order to facilitate the expected abnormal loads during the construction stage.

6.2 Pedestrian and bicycle access

Pedestrian and bicycle access to the site is via the proposed/existing access.

Due to the relatively remote location of the site, linked with the extremely low pedestrian traffic, it is not warranted to construct a formal surfaced sidewalk. The current very wide grassed verges and the surfaced shoulders along the R34 should adequately cater for the expected pedestrian traffic.

Table 6.1: Summary of R34/Access Road (South)

Speed surveys on the main road (R34)

Speed Survey	Direction	
	Eastbound	Westbound
	Speed (km/h)	
Light		
Highest Speed	134	145
Average Speed	103	100
85th percentile Speed	116	118
Heavy		
Highest Speed	100	85
Average Speed	75	58
85th percentile Speed	85	75
Current speed limit		100 km/h

Position of access (nearest route marker)

17 P1-13

Sight distances

Sight Distance type	Distance (m)			Comments
	Required	Available- Direction towards		
		East	West	
Intersection sight distance - stop control	490	>500	260	Dooes meet the requirement in both directions for single unit vehicles, but not for abnormal load vehicles. Will require flagman etc.
Intersection sight distance - yield control	250			
Vegetation impacting on Sight distance	Yes			Long grass needs to be cut

General characteristics of roads

Road	Roadway		Shoulder	
	Width (m)	Surface type	Surface type	Width (m)
Main road - R34	9,7	Black top	Black top	North = 1,3 - South = 1,0
Access Road (South)	3,6	Gravel	None	NA

General characteristics of sidewalks

Along Road	Roadway			Comments
	Width (m)	Surface type	Condition	
Main road - R34 (Northern side)	NA	NA	NA	No sidewalk
Main road - R34 (Southern side)	NA	NA	NA	No sidewalk
Access Road (Western side)	NA	NA	NA	No sidewalk
Access Road (Eastern side)	NA	NA	NA	No sidewalk

General characteristics of access gate

Access	Distance (m)	Comments
Distance from edge of road to property	10,1	Width of farm gate is 4,4m
Distance from edge of property to gate	0	

Access

View to the East

View to the West

Access Road

None

Sidewalk along R34

None

Sidewalks along Access Road

6.3 Access control

The development indicates that the internal roads will be zoned private. The proposed access control is illustrated in Figure 1.2, while the actual recommended location for the access control is illustrated in Figure 5.1. The access gate's main function is to prevent livestock from accessing the R34. The position of the access gate should be located at a minimum distance of 30m from the R34 edge of tar.

7. ANALYSIS RESULTS

Tables 7.3.1 to 7.3.3 contain a summary of the SIDRA analysis results. More detail may be viewed in Appendix A. This includes all aspects of the input data used in the analyses including items such as lane configuration, control strategy, etc. The colour coding used in the graphic representations found in Appendix A is explained in Table 7.1.

Table 7.1: SIDRA LOS colour codes

Colour	Rating	Level of Service
Used in displays		Control delay, LOS
Green	Excellent	LOS A
Light blue	Very good	LOS B
Dark blue	Good	LOS C
Magenta	Acceptable	LOS D
Orange	Poor	LOS E
Red	Very poor	LOS F

The presented Level of Service (LOS) results are based on control delay and are illustrated in Table 7.2.

Table 7.2: Level of service definitions - HCM Method

Level of Service	Control delay per vehicle in seconds (d) (*including geometric delay*)	
	Signals and roundabouts	Stop and yield
A	d <=10	d <= 10
B	10 < d <= 20	10 < d <= 15
C	20 < d <= 35	15 < d <= 25
D	35 < d <= 55	25 < d <= 35
E	55 < d <= 80	35 < d <= 50
F	80 < d	50 < d

Note: Above Tables 7.1 and 7.2 and explanation courtesy of Reference Three.

Tables 7.3.1 to 7.3.2 contain a summary of the SIDRA analysis results as undertaken at the various intersections, where Table 7.3.3 shows the control types assumed for the analysis for the various scenarios.

From the results it is clear that while the two peak periods test similarly, the current critical peak hour is the PM peak hour. On completion of the development the PM peak hour remains the more critical in terms of volume and LOS at intersections.

The anticipated impact of the proposed development varies depending on the road segment under review. From the SIDRA analyses results, together with on-site observations, the following road segments require mentioning.

Table 7.3.1 Intersection Level of Service (AM) peak

KEY	A-C	D	E	F	NA

No.	Intersections	Level of Service									
		2023 AM status quo		2023 AM develop.		2023 AM improved		2028 AM option 1		2028 AM option 2	
		APPR.	INTERS.	APPR.	INTERS.	APPR.	INTERS.	APPR.	INTERS.	APPR.	INTERS.
1	R34/Access Road (South)	NA	NA	NA	NA	NA	NA	A	A	NA	NA

Table 7.3.2: Intersection Level of Service (PM peak)

KEY	A-C	D	E	F	NA

No.	Intersections	Level of Service									
		2023 PM status quo		2023 PM develop.		2023 PM improved		2028 PM option 1		2028 PM option 2	
		APPR.	INTERS.	APPR.	INTERS.	APPR.	INTERS.	APPR.	INTERS.	APPR.	INTERS.
1	R34/Access Road (South)	NA	NA	NA	NA	NA	NA	A	A	NA	NA

Table 7.3.3: Intersection control type

No.	Intersections	Intersection control type				
		2023 status quo	2023 develop.	2023 improved	2028 option 1	2028 option 2
1	R34/Access Road (South)	NA	NA	NA	Priority/stop	NA

Note: LOS is indicated per approach and per intersection. Movement LOS are reflected in Appendix A.

Building lines

Generally building lines along roads vary, based on the following:

i. whether they are rural or urban, and
ii. type of development (e.g. residential, commercial, etc.).

In addition to the above, road authorities generally have larger building lines for WEFs. These do change from time to time, but the information currently available indicated the following building lines for wind farms:

i. An absolute minimum offset of tip height plus 10% of the wind turbines may be considered but a desirable offset of tip height plus 50% is favoured to avoid the fall out of parts that might be flung around if a mast falls over. In this regard, the minimum offset of tip height plus 50% of the wind turbines equates to 322.5m.
ii. All other structures shall be erected at least 60m from a national or provincial road reserve fence and 500m from an intersection.

Currently it is proposed that the closest wind turbine be approximately 380m from the nearest provincial road, the R34, which is further than the minimum 322.5m, thus satisfying this minimum requirement.

Limited access

It is essential to ensure that no vehicular accesses are permitted onto the R34 other than at the proposed/existing access. It is therefore recommended that a suitable barrier be erected to prohibit such access. In this regard, the current fence serves such purpose.

R34/Access Road intersection

Based on traffic volumes the intersection does not require any upgrading. However, from on-site observations it will be necessary to do vegetation clearing (in the form of cutting the long grass) on the two southern corners of this intersection.

During the construction stage the abnormal load vehicles expected at the site will require the bell mouth of the R34/Access Road intersection to be increased to accommodate the large turning radius of these vehicles. The extent of the widening will be determined at the detailed design stage.

Internal roads

The internal roadways will be gravel and designed in accordance with the Guidelines for Human Settlement Planning and Design ("The Redbook"), Reference seven. Geometric designs of the roads will ensure that the requirements of all types of vehicles expected to visit the site are met, i.e. minimum turning radii, roadway widths, etc. The pavement design, where necessary, will form part of the detailed design stage.

8. TRAFFIC AND TRANSPORTATION MANAGEMENT PLAN (TTMP)

8.1 Purpose and objective

Purpose

A Traffic Management Plan (TMP) provides a means to safely and efficiently guide road users through road works and to ensure the network performance is not negatively affected by the road works.

Traffic management is the management of occupational safety and network performance risks associated with work activities undertaken in a traffic environment.

The TMP is therefore a risk management plan consisting of:

i. documentation of the risk assessment for the project,
ii. the procedures that will be utilised to manage the risk exposure, and
iii. traffic control procedure that will be used to outlining signage etc. which are commonly used.

A site inspection was undertaken in preparation of the TMP. During the site inspection specific site conditions were identified such as, non-motorised transport facilities, speed limits, operating speeds, accesses, sight distance, etc. The findings of the site inspection are included in this report.

Transportation management addresses the traffic-related impacts of a project in a cost-effective manner with minimal interference to the travelling public. Measures that can be implemented include public and traveller information, transportation and incident management, construction approaches, alternate routing, etc.

Objective

The main objectives of the TTMP are to ensure that the safety and health of the work personnel and road users are not unnecessary inconvenienced. Further objectives include:

i. project site overview and key project activities that may influence traffic patterns,
ii. a framework plan of the traffic and transportation management elements involved with undertaking the construction and operation of the proposed project,
iii. a structure within which the Developer can further develop more detailed traffic and transportation plans as a result of a detailed traffic impact study, and
iv. key management and mitigation measures that are to be adopted by the Developer, with final approval being obtained from relevant authorities.

8.2 Roles and responsibilities

This section outlines the responsibilities of the personnel to ensure the safety of workers and the road users that pass through the site. Possible management OHS hazards that will include the following:

i. Personal protective equipment (PPE) – High visibility clothing, appropriate footwear, sun protection, eye and respiratory equipment to be available.
ii. Plant and equipment – all equipment must have suitable flashing lights and reversing alarms.
iii. Incident/accident procedures – outlining first aid facilities, arrangements for obtaining medical assistance and the requirements for reporting incidents/accidents.

iv. Works personnel access – outlining details of where works personnel shall park their vehicles and how safe access is to be provided to and from the worksite.

v. Protection of non-motorised road users from hazards associated with the road works, prescribing the measures to be undertaken to address these hazards.

The roles of the key personnel regarding the TTMP are as follows:

i. *Project Manager*

The Project Manager will take overall responsibility of the TTMP and compliance with regards to the Road Traffic Act. The Project Manager will be responsible for the co-ordination of the engineering, procurement and construction activities, relevant policies, methods and the implementation of the TTMP. The Project Manager will ensure that all rules and procedures defined in the TTMP are adhered to. Encourage sound work practices and avoid those that are off a high risk nature. Ensure all employees comply with the TTMP.

ii. *Site Supervisors*

The Supervisors will continuously liaise with the Developer and the Health, Safety, Environment and Quality (HSEQ) department during the execution phase and ensure required tools and test equipment are in place, and are safe to use.

iii. *HSE Officer*

The Health, Safety and Environment (HSE) Officer will be responsible for all issues related to health, safety and environment and to see that employees conform to the requirements as laid down by the South African Occupational Health and Safety and Environmental Acts, and/or those acts applicable to South Africa.

iv. *HSE Manager*

The role of the HSE Manager is to lead all aspects of the HSE on the project and provide HSE leadership.

v. *Traffic Personnel*

The role of traffic personnel on site involves directing vehicular and pedestrian traffic around a construction zone, accident or other road disruption, thus ensuring the safety of emergency response teams, construction workers and the general public. The Traffic Safety Officer will manage the traffic on construction sites in line with SANRAL and Department of Transport specifications.

8.3 Statutory requirements

Traffic management is risk management and the principals, employers and persons in control of workplaces have a statutory duty under the Occupational Health and Safety Act, and Mine Health and Safety Act; to identify hazards, assess risks and consider means to control risk exposure.

Due to the size and quantity of components, trucks will be used to deliver components. It is anticipated that trucks carrying large enough loads to be considered abnormal loads in terms of the Road Traffic Act (Act No 29 of 1989) will be required. A permit for a vehicle carrying an abnormal load must be obtained from the relevant Provincial Authority and/or National Authority (SANRAL). It is expected that at least the M4, M7, N2, N3, R722 and R34 will be used to transport the power transformers from the manufacturing plant/supplier to the site. The vehicle must comply with the Administrative Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads.

Legal and other provisions

The current versions of the following documents and legislative provisions apply for those planning to conduct work within the road reserve of any public road, or to manage traffic for an event:

i. National Road Traffic Act (Act No 93 of 1996),
ii. Local Government Act,
iii. Occupational Health and Safety Act (Act 85 of 1993),
iv. Mine Health and Safety Act 1996 No.29,
v. Compensation for Occupational Diseases Act 1993, and
vi. NEMA 107 – 1998.

8.4 Risk identification and assessment

Risk Assessments will be drafted beforehand including all possible risks that may occur due to traffic and transportation management. Possible activities that might involve risk reviewing include the following:

i. Vehicles required for the transport of infrastructure (e.g. turbines and cables) and materials would result in a direct negative impact on the used roads and road users.

Impact magnitude – Medium

Extent: The extent of the impact is regional as it will extend along the selected transport route.

Duration: The duration would be short-term for the duration of construction.

Intensity: The intensity is likely to be medium given that the increase in traffic will temporary, but may create a nuisance and impact on the safety of other road users and the local neighbour.

Likelihood – There is a definite likelihood of increased traffic.

ii. Increased traffic from workers travelling to and from the site will result in a negative direct impact on people who use the site, the R34 and the access roads within the site.

Impact magnitude – Low

Extent: The extent of the impact is local as impact would be restricted to the immediate vicinity of the site.

Duration: The duration would be long-term for the operation of the wind farm, but greater during construction.

Intensity: The intensity is likely to be low given that the increase in traffic will be minimal.

Likelihood – There is a definite likelihood of increased traffic in the area surrounding the site and on-site during operation of the wind farm.

iii. Increased delays on vehicles at road construction sites, particularly at the access onto the R34.

Impact magnitude – Medium

Extent: The extent of the impact is local as impact would be restricted to the immediate vicinity of the accesses to the site.

Duration: The duration would be short-term for the duration of construction

Intensity: The intensity is likely to be medium given that the increase in traffic will temporary, but may create a nuisance and impact on the safety of other road users and the local neighbour

Likelihood – There is a definite likelihood of increased delays.

The risk assessors shall as far as reasonably possible, control and/or reduce the risks to an acceptable level.

The subcontractor that will be delivering and transporting the power transformers will be responsible for the compilation of the Method Statements and Risk Assessments for all activities associated with their activities.

8.5 General traffic and transportation

SARTSM, Chapter 13 and Volume 2
It is not possible to predict how all construction sites shall be managed because there are too many variables. It is however considered very important to plan, and work, in a systematic manner and in standardised steps. Extracts from the SARTSM, Chapter 13 and Volume 2, are included in Appendix E, which outline this planning process.

All road works need to comply with the SARTSM, Chapter 13 and Volume 2.

Factors such as speed limits will be conveyed to all workforce and signs will be posted where needed. These will be enforced by the traffic control official/s. Temporary traffic control zone signs are to be adequate in order to convey both general and specific messages to the road users. Adequate signage will be placed on the roads, such as: speed limits, caution: electrical road works in progress, use of alternative roads, stop/go signs, flagman ahead, etc.

Transporting of staff
Company transport will be in the form of appropriate transportation vehicle/s. No persons will be transported in the back of a bakkie.

Site access control
Access control will be managed at the gate to ensure that no authorized person enters the site unless a valid access card is presented at the gate to the security guards. Control at pick-up locations prior to entering the transportation vehicle/s, will also ensure that no unauthorized person enters the site. All persons must be inducted before entering the gate and proof of induction must be kept for inspection purposes. Upon entering the site all persons will also undergo alcohol testing.

All vehicles entering the site must have a beacon light and a whip and flag to ensure that these vehicles are visible. Necessary signage will be placed where needed and only vehicles designated as construction vehicles will be allowed to travel on the main roads. No private vehicles will be allowed to travel on the main roads. Those travelling with private vehicles will be escorted to the site with their vehicles and from there they will be escorted in designated construction vehicles.

Parking areas
Designated parking areas will be identified on site where vehicles will park during the day. A designated walkway will also be created which will be barricaded, whereby workers can walk to access their work areas.

Rules for vehicle safety:

i. Personnel must be trained, declared competent and authorised to operate a specified vehicle.
ii. The vehicle must be in a safe and good working condition, with daily inspections conducted.
iii. Drivers/operators must at all times consider and adapt to environment conditions.
iv. Drivers/operators must at all times comply with all relevant traffic rules and regulations.
v. Seatbelts shall be worn when driving and/or operating vehicles or plant fitted with seatbelts.
vii. No talking on cell phones while driving will be permitted and alcohol or drugs are prohibited.
viii Adhere to all site traffic rules and signage, including speed limits.

8.6 Access conditions

An on-site inspection was performed on 23 January 2023. The focus on the site inspection was to determine the desirability of the proposed access with regards to factors such as:

i. sight distance,
ii. non-motorised facilities,
iii. speed limits and operating speeds,
iv. access condition, access width, etc.

The location of the proposed access is shown in Figure 5.1. The findings of the on-site inspection are summarised in Table 6.1. The sight distance in Table 6.1 are based on a single unit vehicle, i.e. a standard construction vehicles. *It does not include abnormal vehicles as these will need to be escorted onto site via the relevant traffic official/s*.

Once the extent of the access improvements have been identified then the required traffic management measures are to be planned.

8.7 Abnormal loads transported on national roads

The National Road Traffic Act (Act 93 of 1996) (NRTA) and the National Road Traffic Regulations, 2000 (NRTR), prescribe certain limitations on vehicle dimensions and axle and vehicle masses that a vehicle using a public road must comply with. However, certain vehicles and loads cannot be moved on public roads without exceeding the limitations in terms of the dimensions and/or mass as prescribed in the NRTR. Where such a vehicle or load cannot be dismantled, without disproportionate effort, expense or risk of damage, into units that can travel or be transported legally, it is classified as an abnormal load. Provision for such abnormal vehicles and loads is made in the NRTA, and specifically in Section 811 of the NRTA, which reads as follows:

‘‘Vehicle and load may be exempted from provisions of Act

81. (1) The Minister may, after the applicant has paid the fees or charges referred to in Section 7(3) and subject to such conditions as he or she may determine, authorise in writing, either generally or specifically, the operation on a public road of a vehicle which, due to such vehicle’s original design cannot comply with this Act.
(2) The MEC may, after the applicant has paid the fees or charges referred to in Section 7(3) and subject to such conditions as he or she may determine, authorise in writing, either generally or specifically, the conveyance in a safe manner on a public road of passengers or any load otherwise than in accordance with this Act.

(3) An MEC shall determine the fees or charges payable for a vehicle or load that does not comply with this Act.'' When the movement of an abnormal load is considered to be in the economic and/or social interest of the country, an exemption permit may be issued to allow a vehicle(s) transporting such an abnormal load to operate on a public road for a limited period.

The Administrative Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads, issued by the COTO, 2015, deals with the administrative procedures relating to the registration of abnormal vehicles and the application to or issuing of exemption permits.

The fundamental principles guiding this process are:

i. An exemption permit for an abnormal load will only be considered for an indivisible load, abnormal in dimension and/or mass, where there is no possibility of transporting the load in a legal manner;
ii. The damage to the road infrastructure by an abnormal vehicle has to be recovered from the carrier;
iii. The risks to other road users must be reduced to a level equivalent to what it would be without the presence of the abnormal vehicle on the road; and
iv. The conditions imposed must take the economic and/or social interest of the country and public at large into account.
v. The purpose of the exemption permit system is not to undermine or circumvent the NRTA and the NRTR.
vi. The issuing authority can deviate from the guidelines and/or impose additional requirements when taking the circumstances applicable to each application into account.

As abnormal loads have to be transported by road to the site, a *permit* will need to be obtained from the Provincial Department of Transport.

In addition, SANRAL require a *route clearance report* to be undertaken. The requirements of the route clearance report are included in Section 8.8, which include the following:

i. Delay to road users.
ii. Road closures.
iii. Road construction works.
iv. Wide loads.
v. Monitoring and records.

SANRAL reserves the right to oppose any issued abnormal load permit in the event of any un-envisioned delay or disruption to public road users on National roads, or in the event that the carrier does not consistently meet the requirements as set out in Section 8.8.

A detailed programme will be issued in advance as to when the abnormal vehicles will be used. The local municipality will be notified prior to the transporting of abnormal loads which might have a negative impact on the public road users. Traffic planners/personnel will ensure that the lane width, turning movements and vertical alignments of temporary arrangements are suitable for these vehicles. All personnel will be advised to stay clear of any trucks with abnormal loads. Heavy oversized vehicles with abnormal loads will be escorted into site. All heavy oversized vehicles or heavy mobile equipment are to have the right of way.

8.8 Route clearance report and abnormal load permits

The statement by the Professional Engineer regarding road safety and traffic engineering aspects shall ensure that the transportation of the intended abnormal loads shall conform to the maximum impacts on road users as detailed below. In order to assist the analysis of traffic impacts, SANRAL traffic monitoring information is available for use.

1. Delay to Road Users:
    - Queue lengths: not more than 6 vehicles for longer than 1km should follow behind the abnormal load train without being afforded the opportunity to overtake.
    - No single vehicle may follow the abnormal train for more than 5km without being afforded the opportunity to overtake.
    - Assessment of the national road constraints and road user trends to be done to plan abnormal passage and to minimise delays to the public road users.
    - Utilisation of climbing lanes, rest areas and additional constructed pull-off areas must be actively planned to achieve overtaking of the abnormal train.
    - The above requirements must apply in all weather conditions.

2. Road Closures:
    - No longer than 3 hours of accumulated closures per week for all abnormal passage/ all carriers on a road link of 200km shall be permitted. (On mountain pass closures, this closure time could be extended to 6 hours accumulated per week, which closure would be required mainly for the long loads around small radius curves.)
    - The carrier must co-ordinate long closures (excess of 1 hour) with other Road Authorities as well as SANRAL construction projects where blasting or other closures could be undertaken. Advance warning of repetitive closures in excess of 15 minutes must be signposted, and signing to be approved by SANRAL. Where abnormal closures and construction closures are located within 50km, they must in all instances be co-ordinated.

3. Road Construction works:
    - The carrier shall liaise continuously at projects of road construction sites to ensure passage of abnormal loads at construction works constraints (which change regularly) and potential damage to temporary bypasses. Should alteration of construction works be required by the carrier, the carrier shall liaise with the Engineer supervising the construction project and be required to pay for any alterations, disruptions or construction delays which may be caused. SANRAL reserves the right to limit passage on construction works to non-abnormal vehicles dimensions and loads, unless suitable arrangements have been made to allow for the passage of abnormal vehicles and loads. Contact details of SANRAL construction projects are available from the relevant SANRAL Regional offices.

4. Wide Loads:
    - Unless other acceptable arrangements are provided to SANRAL, abnormally wide loads along two directional roads, where the abnormal width plus 0.4m is in excess of half the surfaced road width, must be done under stop/go conditions, not longer than 5 km in length. Public vehicles in both directions shall be afforded the opportunity to overtake the abnormal load at the stop/go point. For lesser trafficked roads, and with

SANRAL approval, the delay impact criteria (number of vehicles in queue and length of following) may be used instead of the 5km stop/go length criteria.
- Under conditions of reduced visibility, abnormally wide loads in the above stated vehicle width /road width limit should not be transported.

5. Monitoring and Records:
    - The carrier shall ensure that all dangerous/illegal overtaking of the abnormal load and train are recorded, and provided to SANRAL on request.
    - The carrier shall ensure that all deviations to these requirements are recorded, and provided to SANRAL on request.
    - The carrier shall ensure that all newly identified risks are recorded and conveyed to Provincial Roads Authority and to SANRAL, and negative impacts are mitigated.

6. General:
    - The detailed route description for each type of abnormal load, frequency and general travel times must be submitted to SANRAL for assessment. Periods of high or peak traffic flows must be identified and avoided as much as possible.
    - The route clearance statement for each type of abnormal load must be included in the report to be submitted to SANRAL for assessment, which must incorporate the above requirements.
    - A statement of passage of dimensional and mass abnormal loads over /under structures and bridges must be submitted to SANRAL for consideration, with protective measures where required.
    - The modification of National Road infrastructure for the passage of abnormal loads requires separate consents by SANRAL.
    - SANRAL approval shall be required in the event of abnormal loads being planned to overnight on a consistent basis, within National Road reserves.
    - The carrier must indicate what advertising will be done to warn to road users, nationally, of the impacts of the abnormal load passage, as well as indicating alternate routes. This must be done on a continuous basis as the transport of abnormal loading unfolds.
    - Provision for curtailing of transportation of abnormal loads in adverse weather conditions, and measures to be undertaken in the event of incidents such as crashes and breakdowns must be included in the planning.
    - SANRAL reserves the right to oppose any issued abnormal load permit in the event of any un-envisioned delay or disruption to public road users on National roads, or in the event that the carrier consistently not meeting the above requirements.

8.9 Emergency planning

Contact details of emergency services will be conveyed to all necessary personnel, thus ensuring that in the event of an incident occurring, the necessary service/s are informed immediately.

Provision will be made to ensure that in the event of an incident occurring, access to the site will be available and accessible to emergency services to travel through the site where the incident occurred.

The following list provides a few contact numbers for emergency services in the vicinity of the site:

i. Police – 10111
ii. Ambulance – 10 177/ Net care 082 911
iii. Fire Brigade – 034 328 7600
iv. Newcastle Provincial Hospital – 034 328 0000
v. Nepo Newcastle Private Hospital – 034 317 1545
vi. ER24 Newcastle Ambulance Service – 084 124
vii. Netcare 911 Air Ambulance – 082 911

8.10 Possible route to site from major port

The route for the abnormal loads will be determined as part of the route clearance report and abnormal load permits process. However, Figure 8.1 gives an indication of a possible route to be considered.

Figure 8.1: Possible route to site from major port

9. CONCLUSIONS

Following the investigation and analysis it is concluded that:

i. The current operating conditions on the road network within the study area are found to be acceptable with no LOS or capacity failures.
ii. The posted speed limit of 100 km/h along the R34, in the vicinity of the site access, is appropriate for the current and expected future traffic conditions, although not always observed by speeding motorists.
iii. The existing critical peak, in terms of traffic volume, was found to be the PM peak hour while the AM peak hour tested similarly but with marginally lower demands.
iv. Once developed and fully occupied, the proposed development may be expected to generate less than 50 new vehicle trips in each of the AM and PM commuter peak hours.
v. The combined critical peak hour of existing and development trips is found to be the PM peak hour.
vi. The network is not overloaded when development trips are assigned for any of the given tested peak hours, subject to the recommended road network improvements being undertaken.
vii. The proposed changes to the layout and road network, as shown in Figure 5.1, adequately serve the proposed development.

10. RECOMMENDATIONS

Based on the investigation and conclusions it is recommended that:

i. This Traffic Impact Assessment (TIA) being submitted to the Newcastle Local Municipality (NLM) and the KwaZulu-Natal Department of Transport (KZNDOT) for their perusal.

ii. The development proposal, that is the development of the Mulilo Newcastle Wind Power on Ptn 1 of Farm 3350, Rem of Farm 9447, Rem of Farm 9439, Rem of Farm 16302, Rem of Farm 9448, and Rem of Farm 3350, as submitted and reflected herein, being approved in principle from a traffic impact perspective by the NLM and the KZNDOT.

iii. The site layout changes, as shown in Figure 5.1, being made a condition of approval. The required internal road network improvements to be made by the development are as follows:
   a. parking layout,
   b. disabled parking bays,
   c. loading bays, and
   d. access control position.

iv. The road network improvements, as listed below and shown in Figure 5.1, to being made a condition of approval. It should however be noted that these improvements may change subject to subsequent investigations in consultation with the road authority. The required public road network improvements to be made to accommodate the development are as follows:
   a. Undertaking regular grass cutting on the two southern corners of the R34/Access Road intersection.
   b. The bell mouth of the R34/Access Road intersection to be increased temporarily to accommodate the large turning radius of the abnormal load vehicles during the construction stage. The extent of the widening will be determined at detailed design stage.
   c. The internal roadways will be gravel and designed in accordance with the Guidelines for Human Settlement Planning and Design ("The Redbook").
   d. A 322.5m building line being imposed along the R34 for the wind turbines. All other structures shall be erected at least 60m from a national or provincial road reserve fence and 500m from any major intersection.
   e. No direct vehicular access being permitted onto the R34 other than at the proposed/existing access.

v. Parking and loading bays being provided as per Table B.1.

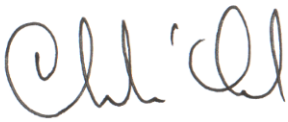
vi. Details of parking and loading bays being finalised at the design stage.

vii. A detailed route clearance report and abnormal load permits are to be done at the detailed design stage.

viii. All costs associated with the internal roads, as indicated in Figure 5.1, being solely to the Developer’s account.

ix. All costs associated with the recommendations, as listed in “iv”, being solely to the Developer’s account.

It should be noted that all figures represented in this Traffic Impact Assessment are concept drawings only and are not to be used for construction purposes. These concept drawings are to be developed into engineering drawings by the Developer's appointed civil engineer. The engineering drawings are then to be approved by the relevant road authority officials prior to construction.



D M McQUIRK Pr. Eng.

MSc. Transportation & Traffic Eng., BSc Civil Eng, Dipl Traffic Safety Management
Registered with ECSA 970660, member of IMESA

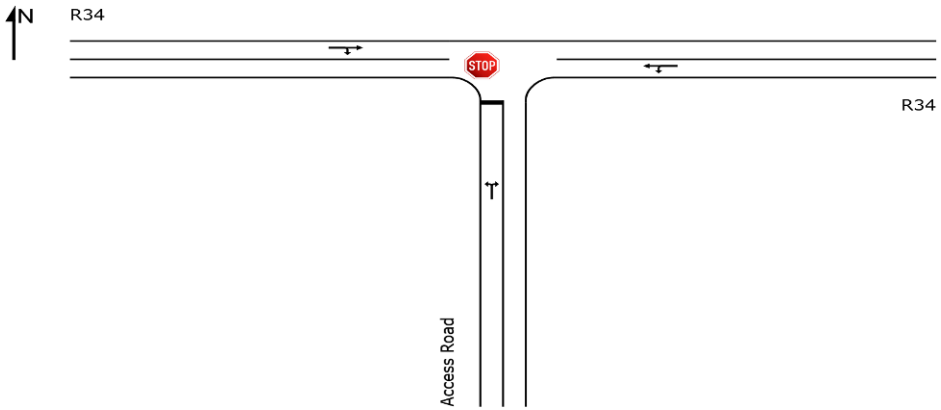
11. REFERENCES

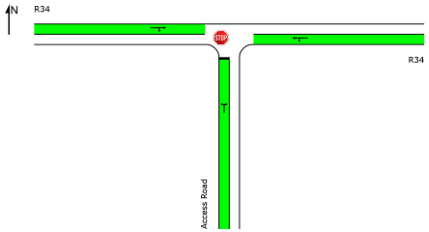
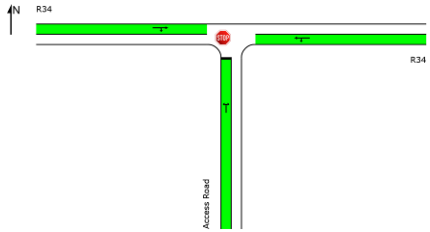
Reference 1	South African Trip Generation Rates. 2nd Edition, June 1995.
Reference 2	Manual for Traffic Impact Studies RR93/635, October 1995.
Reference 3	SIDRA operators manual.
Reference 4	South African Traffic Impact and Site Traffic Assessment Manual, Volumes 1and 2 (TMH16) August 2012.
Reference 5	South African Trip Data Manual, Volume 1 (TMH 17), September 2012.
Reference 6	Department of Transport Parking Standards, November 1985.
Reference 7	Guidelines for Human Settlement Planning and Design ("The Redbook").

APPENDIX A

SIDRA INTERSECTION LOS RESULTS

Figure A.1.A: Level of Service (LOS)

Intersection:	**R34/Access Road (South)**	**Peak**	**Design year**	
Without improvements			**2023**	**2028**
		**AM (without development trips)**	**NA**	**NA**
		PM (without development trips)	**NA**	**NA**

Design year					
2023		**2028**			
AM (with development trips)	**NA**		**PM (with development trips)**	**NA**	

APPENDIX B

LAND USE, TRIP GENERATION, PARKING AND LOADING

Table B.1: Land use, trip generation, parking and loading

Land use				Trip generation													
				Trip rates		Split (%)				Percentage reduction for developments in areas with, Pc**				Trips			
						AM peak		PM peak						AM peak		PM peak	
Land use	Size*	Size units	Units	AM peak	PM peak	In	Out	In	Out	Mixed use developments, Pm	Low vehicle Ownership, Pv	Public transport nodes or corridors, Pt	Trip factor***	In	Out	In	Out
WEF	37	1	Turbines	0,50	0,50	80	20	20	80	0%	0%	0%	1,00	15	4	4	15
Total														19		19	
Total split														15	4	4	15
Percentage split (%)														80	20	20	80
Split existing trips														0	0	0	0
Total new trips														19		19	
Split new trips														15	4	4	15

Note * Size adjustment factor already applied.

** Values in *italics* are estimated.

***Trip factor includes accumulative reduction Pc = 1-(1-Pm/100).(1-Pv/100).(1-Pt/100)

Parking																Loading			
						Parking bay reduction for										Loading bays			
Size*	Size units	Units	Parking per unit/ GLA	Parking required in terms of Guidelines (without reductions)	Proximity to public transport	On-site taxi bays	On-site bus bays	On-street taxi bays	On-street bus bays	On-site bicycle bays	Hourly/daily distribution	Other (specify)	Total recommended	Light	Medium	Heavy	Total
					0%	0	0	0	0	0	0	0%					
37	1	Turbines	0,25	9										1	1	1	3
Total parking/loading required in terms of guidelines				**9**										1	1	1	3
Parking reductions permitted as per guidelines/standards					**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**				
Maximum reduction permitted based on area and car ownership =					0 %, i.e.								0				
Total parking/loading required in terms of guidelines (including reductions)													**9**				
Parking bays required including reductions and bays provided to achieve reductions						**0**	**0**	**0**	**0**	**0**	**0**		**9**	**1**	**1**	**1**	**3**
Actual parking/loading bays provided			119%	**10**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**11**	**1**	**1**	**1**	**3**

Percentage of reduced rate	Standard on-site parking bays	Disabled parking bays	On-site taxi bays	On-site bus bays	On-street taxi bays	On-street bus bays	On-site bicycle bays	Standard on-street parking bays	Other (specify)	Total	Light	Medium	Heavy	Total

APPENDIX C

TRAFFIC VOLUMES

Project : TIA for Mulilo — No.: 1 — Date : 24/01/2023

Intersection : R34 and Access Road — Day : Tuesday

Time period: 6:00 - 9:00 & 15:00 - 18:00

EMONTI CONSULTING Engineers cc

ENDING TIME	R34 Eastbound				Access Road Southbound				R34 Westbound				Access Road Northbound				INTER-SECTION	
	1	2	3		4	5	6		7	8	9		10	11	12			
	Right	Through	Left	Total	Right	Through	Left	Total	Right	Through	Left	Total	Right	Through	Left	Total	Total	Hour
AM Peak																		
06:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:30	0	4	0	4	0	0	0	0	0	9	0	9	0	0	0	0	13	13
06:45	0	9	0	9	0	0	0	0	0	3	0	3	0	0	0	0	12	25
07:00	0	6	0	6	0	0	0	0	0	6	0	6	0	0	0	0	12	37
07:15	0	8	0	8	0	0	0	0	0	8	0	8	0	0	0	0	16	53
07:30	0	5	0	5	0	0	0	0	0	7	0	7	0	0	0	0	12	52
07:45	0	9	0	9	0	0	0	0	0	5	0	5	0	0	0	0	14	54
08:00	0	1	0	1	0	0	0	0	0	4	0	4	0	0	0	0	5	47
08:15	0	8	0	8	0	0	0	0	0	5	0	5	0	0	0	0	13	44
08:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	32
08:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
09:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
AM Peak																		
Peak hour	**0**	**28**	**0**	**28**	**0**	**0**	**0**	**0**	**0**	**26**	**0**	**26**	**0**	**0**	**0**	**0**	54	
PM Peak																		
15:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:00	0	14	0	14	0	0	0	0	0	5	0	5	0	0	0	0	19	19
16:15	0	8	0	8	0	0	0	0	0	5	0	5	1	0	0	1	14	33
16:30	0	11	0	11	0	0	0	0	0	8	0	8	0	0	0	0	19	52
16:45	0	5	0	5	0	0	0	0	0	8	0	8	0	0	0	0	13	65
17:00	0	7	0	7	0	0	0	0	0	6	0	6	0	0	0	0	13	59
17:15	0	9	0	9	0	0	0	0	0	5	0	5	0	0	0	0	14	59
17:30	0	12	0	12	0	0	0	0	0	4	0	4	0	0	0	0	16	56
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	43
18:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
PM Peak																		
Peak hour	**0**	**32**	**0**	**32**	**0**	**0**	**0**	**0**	**0**	**27**	**0**	**27**	**0**	**0**	**0**	**0**	59	

Class of vehicle

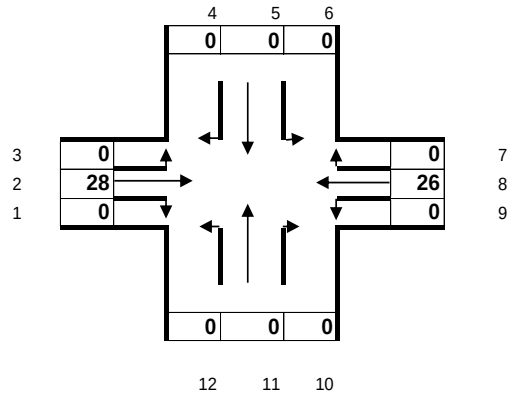
Light

General comments

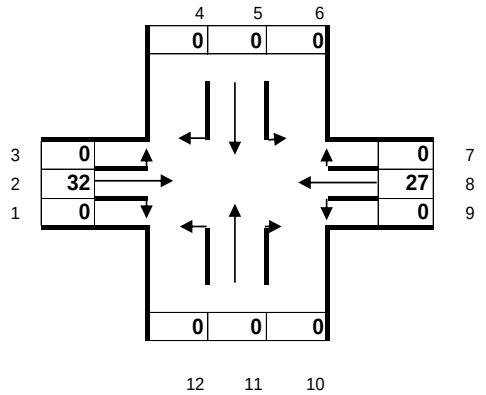
ORIENTATION

AM and PM Pealk volume diagrams

AM Peak (vehicles per hour)



PM Peak (vehicles per hour)



Project : TIA for Mulilo | No.: 1 | Date : 24/01/2023

Intersection : R34 and Access Road | Day : Tuesday

Time period: 6:00 - 9:00 & 15:00 - 18:00

EMONTI CONSULTING Engineers cc

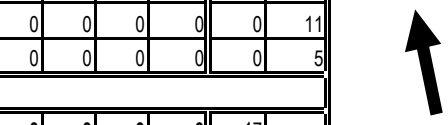
ENDING TIME	R34 Eastbound				Access Road Southbound				R34 Westbound				Access Road Northbound				INTER-SECTION	
	1	2	3		4	5	6		7	8	9		10	11	12			
	Right	Through	Left	Total	Right	Through	Left	Total	Right	Through	Left	Total	Right	Through	Left	Total	Total	Hour
AM Peak																		
06:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
06:30	0	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	2	2
06:45	0	4	0	4	0	0	0	0	0	3	0	3	0	0	0	0	7	9
07:00	0	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	2	11
07:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
07:30	0	0	0	0	0	0	0	0	0	2	0	2	0	0	0	0	2	11
07:45	0	2	0	2	0	0	0	0	0	1	0	1	0	0	0	0	3	7
08:00	0	2	0	2	0	0	0	0	0	2	0	2	0	0	0	0	4	9
08:15	0	2	0	2	0	0	0	0	0	2	0	2	0	0	0	0	4	13
08:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
08:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
09:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
AM Peak																		
Peak hour	**0**	**3**	**0**	**3**	**0**	**0**	**0**	**0**	**0**	**4**	**0**	**4**	**0**	**0**	**0**	**0**	7	
PM Peak																		
15:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16:00	0	0	0	0	0	0	0	0	0	3	0	3	0	0	0	0	3	3
16:15	0	5	0	5	0	0	0	0	0	2	0	2	0	0	0	0	7	10
16:30	0	1	0	1	0	0	0	0	0	3	0	3	0	0	0	0	4	14
16:45	0	2	0	2	0	0	0	0	0	2	0	2	0	0	0	0	4	18
17:00	0	5	0	5	0	0	0	0	0	1	0	1	0	0	0	0	6	21
17:15	0	2	0	2	0	0	0	0	0	1	0	1	0	0	0	0	3	17
17:30	0	1	0	1	0	0	0	0	0	1	0	1	0	0	0	0	2	15
17:45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
18:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
PM Peak																		
Peak hour	**0**	**10**	**0**	**10**	**0**	**0**	**0**	**0**	**0**	**7**	**0**	**7**	**0**	**0**	**0**	**0**	17	

Class of vehicle

Heavy

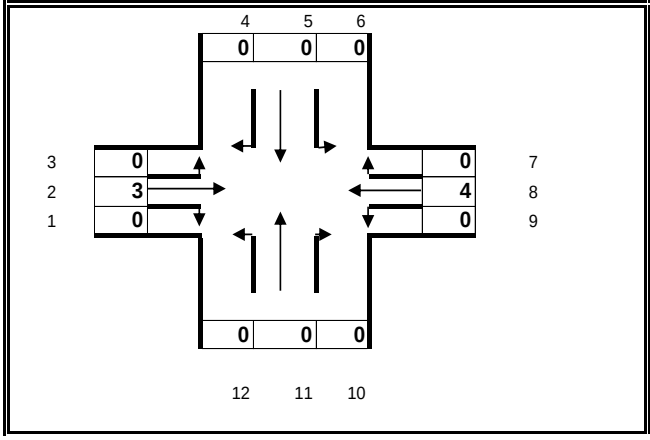
General comments

ORIENTATION

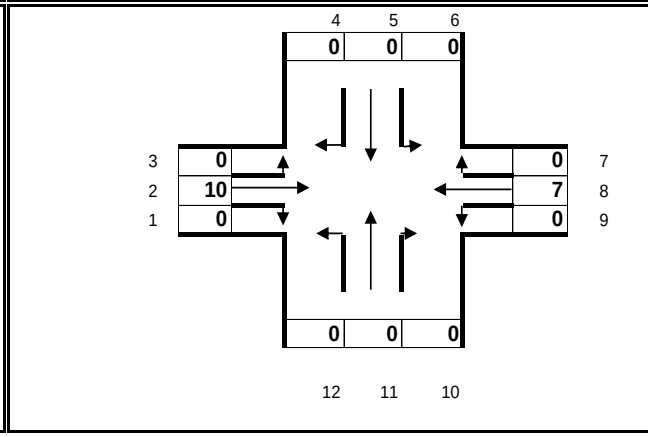


AM and PM Pealk volume diagrams

AM Peak (vehicles per hour)



PM Peak (vehicles per hour)



Speed Survey along the R34 near Access Road (South)

No. surveyed	Location	R34/Access Road (South)
	Eastbound	Westbound
	Speed (km/h)	Speed (km/h)
	Light	
1	63	73
2	74	74
3	83	77
4	84	78
5	89	78
6	92	81
7	93	83
8	94	88
9	94	92
10	95	94
11	97	95
12	99	97
13	100	98
14	103	99
15	103	99
16	105	99
17	105	100
18	106	100
19	106	100
20	107	103
21	107	103
22	110	106
23	115	108
24	115	109
25	116	111
26	***116***	***118***
27	119	120
28	121	137
29	132	141
30	134	145
Highest Speed	**134**	**145**
Average Speed	**103**	**100**
85th percentile Speed	**116**	**118**
Heavy	**Heavy**	
1	50	34
2	51	40
3	70	43
4	74	53
5	76	54
6	80	61
7	81	65
8	84	70
9	***85***	***75***
10	100	85
Highest Speed	**100**	**85**
Average Speed	**75**	**58**
85th percentile Speed	**85**	**75**

APPENDIX D

SUMMARY OF THE DEVELOPMENT

Mulilo Newcastle Wind Power

The Mulilo Newcastle Wind Power project will consist of up to thirty-seven (37) wind turbine generators. The current layout allows for a maximum generating output of up to 200 MW, however the final design will be reduced based on the outcome of the specialist studies undertaken during the EIA process. The proposed turbine footprints and associated facility infrastructure will cover an area of up to 124,324 ha depending on final layout design.

Turbine and WEF specifications

WEF Capacity	Up to 200 MW
No. Turbines	Up to 37
Hub Height	Up to 140 m
Rotor Diameter	Up to 200 m
Blade length	Up to 100 m

Facility component descriptions

Facility Component	**Description**
Crane platform and hardstand laydown area	Crane platform and hardstand laydown alongside each turbine position.
Turbine Foundations	Reinforced Concrete Foundation. Depth: up to 3.5 m Diameter: up to 25 m per turbine Volume of concrete: up to 800 m^3 per turbine
IPP Substation	33 kV to 132 kV collector substation to receive, convert and step-up electricity from the WEF to the 132 kV grid suitable supply. The substations maximum height will be Lightning Mast up to 25 m high. The facility will house control rooms and grid control yards for both Eskom and the IPP
Construction/office yard	This includes bunded fuel areas, oil storage areas, general stores (containers) and skips
WTG component laydown area	Temporary laydown area
On-site concrete batching plant	Temporary on-site concrete batching plant
Internal Access Roads	Site Access will where possible make use existing farm roads that get upgraded and maintained for the life of the plant). New roads will be constructed (where there no existing roads) with a width of 9 m (14 m servitude) and will connect all turbines. The existing roads to be used will be extended to a width of 9 m.
Operations and Maintenance (O&M) Buildings	Fencing of up to 2 m high around the O&M building and the on-site substation. Storm-water channels and culverts.
33 kV reticulation	A combination of 33 kV overhead lines and 33 kV underground cable will be used, running along the road network connecting each WTG position and the BESS to the IPP substation.
Met Masts	Two Met Masts (Up to 140 m height)
BESS	A Battery Energy Storage System (BESS) alongside the on-site substation, with an area of up to 16 ha. BESS technology to be confirmed, but likely Lithium-ion.

Facility Component Footprints

Facility Component	Construction footprint	Final footprint after rehabilitation
Crane platform and hardstand laydown area	Up to 0.8 ha per turbine *Which equates to 29.6 ha*	Up to 0.8 ha per turbine *Which equates to 29.6 ha*
Turbine Foundations	Up to 0.06 ha per turbine *Which equates to 2.22 ha*	Up to 0.06 ha per turbine *Which equates to 2.22 ha*
IPP Substation	Up to 1 ha	Up to 0.5 ha
Construction/office yard	Up to 2 ha	0 ha
WTG component laydown area	Up to 4 ha	0 ha
On-site concrete batching plant	Up to 1 ha	0 ha
Internal Access Roads	Up to 14 m width Up to 35 km total length *Which equates to 49 ha*	Up to 9 m width Up to 35 km total length *Which equates to 31.5 ha*
Operations and Maintenance (O&M) Buildings	Up to 0.5 ha	Up to 0.5 ha
33 kV reticulation	Up to 40 km total length 11 m width *Which equates to 44 ha*	Up to 40 km total length 11 m width *Which equates to 44 ha*
Met Masts	Up to 0.002 ha per met mast *Which equates to 0.004 ha*	Up to 0.002 ha per met mast *Which equates to 0.004 ha*
BESS	Up to 16 ha	Up to 16 ha
Total	*Up to 149.324 ha*	*Up to 124,324 ha*

Project Properties

Farm No.	Property	Size of property [ha]
1/3350	Portion 1 of the Farm Geelhoutboom No. 3350	647,4976
RE/9447	Remainder Farm Bernard No. 9447	464,8652
RE/9439	Remainder Farm Cliffdale No. 9439	587,2398
RE/16302	Remainder Farm Spitskop No. 16302	280,4491
RE/9448	Remainder Farm Byron No. 9448	392,2519
RE/3350	Remainder Farm Geelhoutboom No. 3350	566,9043

APPENDIX E

EXTRACTS FROM CHAPTER 13, VOLUME 2 OF THE SARTSM

13.3 TRAFFIC MANAGEMENT

13.3.1 General

1 In order to adequately deal with the needs of manual or handbook users, it is necessary to go beyond the specification of sign face designs and sequences. It is necessary to develop a standardised approach to the traffic management of roadworks sites. This applies particularly to the more complex conditions. Ideally it should be possible for almost any site condition to be simplified to a number of standard treatments and, therefore, traffic should be accommodated within the range of signs detailed in this Chapter. According to this principle, the motorist should then have to deal only with familiar situations and preferably with only one at a time.

2 The layouts provided in later sections have therefore been prepared with these objectives in mind. Each condition has been subdivided into standard components or sections as shown in Figure 13.20. In some cases, one or more of the area or zone subdivisions may be repeated. **The primary reason for this approach is the ultimate safety of drivers and workers.** It is not an uncommon practice to complicate the situation presented to drivers by superimposing changing conditions such as road width reductions or carriageway crossovers upon each other and/or by locating them at interchanges. This results in drivers trying to negotiate these changes in condition and interpret their directional needs at the same time. Wherever possible this situation should be avoided. There will,however,always be circumstances where, for reasons of cost or physical conditions,such a superimposing of activities is unavoidable. In this event carefully prepared special signing techniques will have to be employed.

3 In the interests of safety these principles should be carried through to the preparation of less complex traffic management situations. A systematic breakdown of any site into standardised sub-components is likely to result in more efficient and safe site operation because it will allow the site supervisor to clearly understand the traffic operation of the site.

4 In certain instances it will be necessary to create,within sections of a roadworks site, conditions where traffic is reduced to one-way operation. In this event the passage of traffic will have to be controlled manually or automatically. Three methods of traffic control available are:

(a) flagmen;

(b) STOP/RY-GO signs;

(c) temporary traffic signals.

Details of these traffic control methods are given in Subsection 13.3.9.

5 As part of the general traffic management effort at a roadworks site, the resident engineer AND the contractors' representative dealing with temporary signing and delineation should institute a regular programme of checking the site for compliance with specifications, including sign cleanliness. This inspection programme should occur as frequently as necessary to keep the site correctly signed and delineated. This may need several inspections a day. The inspection programme should pay particular attention to the effectiveness of the signs and delineation under adverse weather conditions, at dusk, and at night. In extreme cases, the illumination of critical signs may be justified by a combination of such conditions and high traffic volumes. Care should be exercised not to create running lanes which are too wide for one traffic stream but not quite wide enough for two traffic streams (see paragraph 13.4.3.2(c)).

13.3.2 The Advance Warning Area

1 This area is used to advise motorists that there are temporary conditions ahead of them which require particular care. Almost invariably, a stepped reduction in the speed will be required within this area. These speed reductions should be indicated at reasonable intervals (200 m minimum), and occur in 20 km/h steps until the speed for which the traffic control has been designed is indicated. It is good practice to repeat the final speed limit at least once. It should be noted that, depending on the nature of the change ahead, any of the DIAGRAMMATIC guidance sign layouts given in Figures 13.11 to 13.15 may be used, but the use of non-standardised sign layouts should be avoided.

2 The length of the Advance Warning Area should relate directly to measured approach speeds. A realistic distance must be allowed for speed reduction. High traffic volumes will be better handled if the standard length of this area is generous, since more time is needed to take in the sign messages and react to them under heavy traffic conditions. For approach speeds of around 120 km/h and moderately high to high volumes, a base length for the Advance Warning Area of 1000 m is required. If traffic volumes are low and/or approach speeds in the region of 80 km/h, this length may be reduced to 600 m. This reduction applies particularly when changes in road conditions, such as alignment or width, occur within the main site.

eg. a section of 16 kilometres of rural road may be under repair or reconstruction - the effects of work on traffic will vary widely through the site - assuming a 120-100 km/h approach speed and high traffic volumes, a full Advance Warning Area sign sequence covering 1000 m should be used - speed within the site is likely to be controlled at 80-60 km/h - at these approach speeds the secondary Advance Warning Area sign sequence for local deviations can be reduced to 600 m in length, or, for simple cases, even to 400 m.

3 Urban sites will commonly have limited space for Advanced Warning Area signs. However, every attempt should be made to provide adequate advance signing. High speed arterials should normally have sufficiently long block lengths to allow Advance Warning Areas in the range of 600-300 m. On lesser roads or in busy business areas, shorter Advance Warning Areas in the range of 150-75 m should be used. In the latter cases, consideration should be given to taking lane closures and the relevant signing into the preceding block.

13.3.3 The Transition Area

1 This is the area in which drivers are required to **take an action,** such as:

(a) shift position on the roadway without reduction in

the number of lanes;

(b) merge two lanes into one (lane drop);

(c) cross the central median (crossover);

(d) enter a detour completely separate from the road under construction.

2 The transition area must be clearly defined using delineator plates and should conform to the layout depicted on the guidance signs preceding it. The more complex roadworks sites should be broken down into a number of standard transition situations. No signing for subsequent transition conditions should be included within a transition area.

3 The transitionary action required of traffic can be achieved in a limited number of ways, eg.:

(a) a taper;

(b) a crossover;

(c) a deviation (normally reserved for complete re-routing).

4 The length of a transition area will depend on the approach speed of traffic and the amount of shift in alignment involved by the transition. Details of the length of tapers and crossovers are given in Subsections 13.5.5. and 13.5.6.

13.3.4 The Stabilising Area

1 The purpose of this area is to allow traffic flow to stabilise after negotiating a transition area before reaching another change of condition. If more than one transition area is required to achieve the final traffic configuration, the signing for second or subsequent transitions should be located within the stabilising area(s). The stabilising area is normally defined by delineator plates.

13.3.5 The Buffer Zone

1 This is the limiting form of stabilising area.It is normally used between a transition area and the work area. In a situation involving more than one transition area the buffer zone will occur after the transition area closest to the work area. The principal function of the buffer zone in such situations is to separate the traffic from the workers at the site in the interests of worker safety. It can be a relatively short distance but never less than 50 m. Provision of a longitudinal buffer zone, and indeed a lateral buffer zone within the work area, must be considered as fundamental to effective worker safety.

13.3.6 The Work Area

1 This area must be adequately defined by delineators in the less complex conditions. Where there is a risk to traffic or workers of vehicles entering the work area, temporary barriers of a standard sufficient to prevent vehicle penetration are recommended (see Subsection 13.5.3).

2 When traffic is relocated well away from the work area, little action is required along the length of the work area other than to protect contractors' vehicles and employees. If such a relocation results in two-way traffic flow then special attention should be paid to the definition of the line separating the two traffic flows. Under normal conditions, the minimum treatment should involve the marking of a temporary DIVIDING or NO OVERTAKING line where appropriate. This line should be supplemented by temporary roadstuds.

3 If the section of detour running parallel to the work area uses asymmetrical lane configurations, drivers should be reminded of this situation by using lane arrangement signs as shown in Figure 13.70. If the condition exists for considerable distances, it is recommended that these signs be repeated at regular intervals and that a distance plate indicating the remaining extent of the condition be added to the signs.

4 Where an asymmetrical lane configuration is varied to permit overtaking through a long site for instance, then the signing and marking of this treatment should follow the principles laid down for transition and stabilising areas. An example is given in Figure 13.70.

5 Experiences with major road rehabilitation contracts have shown a tendency towards increasingly long road sections under construction. There may be very valid economic reasons for such a practice. However, if a site is going to be long, extra care must be taken to ensure adequate overtaking opportunities. In addition, great care must be taken to control the manner in which work phases are completed and reopened to traffic. The random mixture of full construction, with and without road markings, and short incomplete sections of work should be avoided at all costs. The resultant confusion on the part of drivers is to be expected, and can be extremely hazardous.

13.3.7 The Termination Area

1 This area involves the return of traffic to normal flow conditions. In simple cases this can be achieved by a relatively rapid taper of delineator signs. In more complex conditions a reverse crossover may be required. This should follow the same principles given for such conditions at the start of a site and dealt with under Subsections 13.3.3 and 13.3.4.

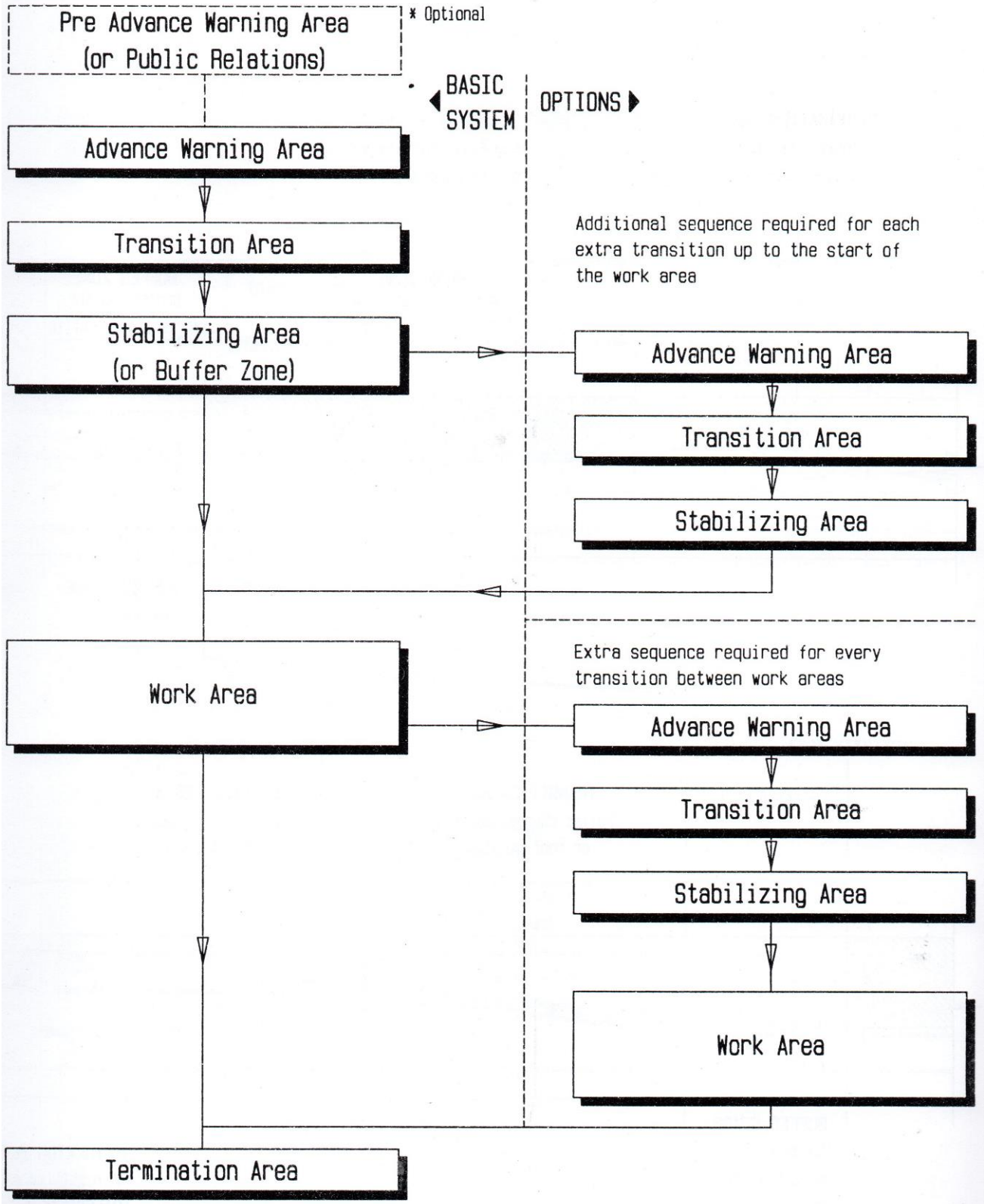
2 Courtesy signs and permanent speed limit signs restoring the normal speed limit conditions should be erected adjacent to each other as soon as possible after the end of the Termination Area.

13.3.8 Traffic Management Planning

1 It is not possible to predetermine how all construction sites shall be managed because there are too many variables. As has been mentioned earlier, however, it is considered very important to plan, and work, in a systematic manner and in standardised steps. The objective of such an approach is to optimize site efficiency, traffic flow and all aspects of safety.

2 The temporary road signing system covered by the typical applications in this chapter have been documented and in use for several years. However well developed the system may be, there will always be scope for improvement and refinement. It is therefore important that practitioners develop their utilization of the system along disciplined lines and include feedback at all phases of the process. Detail 13.21.1, in Figure 13.21, illustrates a breakdown of a structured planning process.

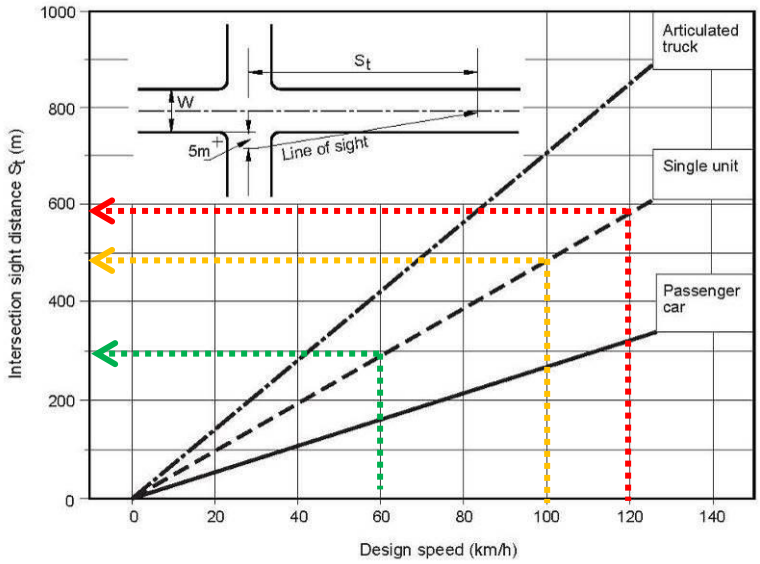
3 At a more detailed level planners should identify the component parts of a site long before ordering signs or transporting them to site. Detail 13.21.2 shows an



Detail 13.21.2 Systematic Arrangement of Typical Site Components.

APPENDIX F

SIGHT DISTANCES

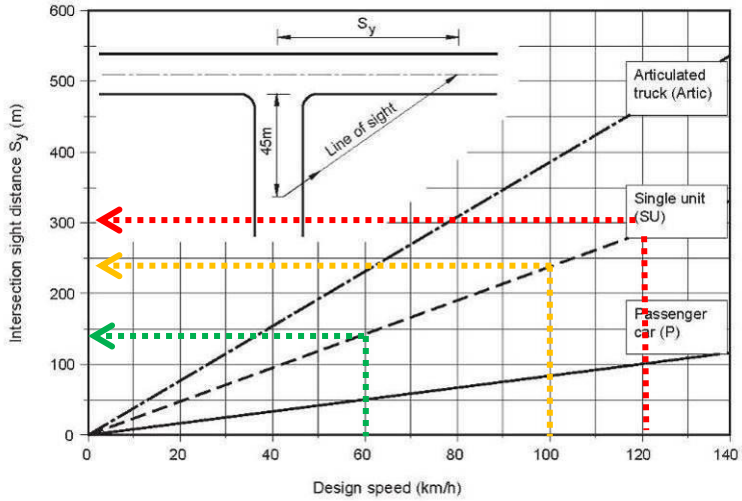


290m sight distance for yield condition- Single unit vehicles (60km/h)

490m sight distance for yield condition- Single unit vehicles (100km/h)

590m sight distance for yield condition- Single unit vehicles (120km/h)

Figure F.1: Intersection sight distance for turning maneuvers-stop condition

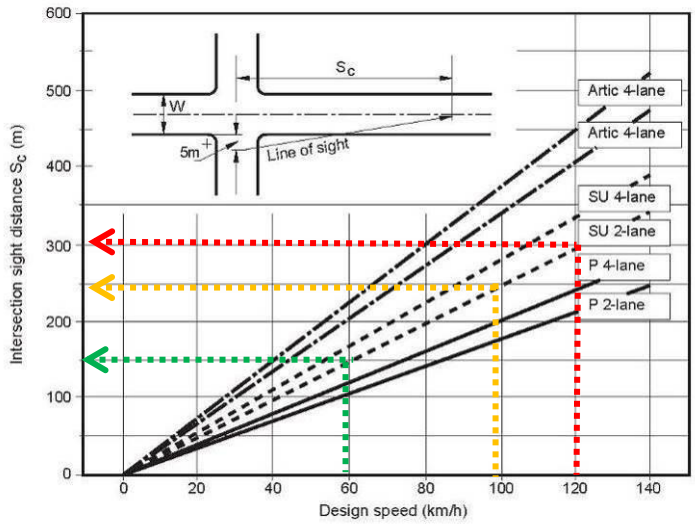


140m sight distance for yield condition- Single unit vehicles (60km/h)

230m sight distance for yield condition- Single unit vehicles (100km/h)

300m sight distance for yield condition- Single unit vehicles (120km/h)

Figure F.2: Intersection sight distance for turning maneuvers- yield condition



150m sight distance for crossing maneuvers- Single unit vehicles (two lanes) - (60km/h)

250m sight distance for crossing maneuvers- Single unit vehicles (two lanes) - (100km/h)

300m sight distance for crossing maneuvers- Single unit vehicles (two lanes) - (120km/h)

Figure F.3: Intersection sight distance for crossing maneuvers