

APPENDIX D₄

Traffic Impact Study

PORTION OF PORTION 5 OF THE FARM AVENHAM 2187,
BLOEMFONTEIN

RELOCATION OF DIESEL DEPOT & TRUCK STOP
TRAFFIC IMPACT STATEMENT


JUNE 2016



Project: 7065

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REPORT SHEET

Property Description:	<i>Portion of Portion 5 of the Farm Avenham 2187, Bloemfontein</i>
Municipal Area:	<i>Mangaung Metro Municipality</i>
Application:	<i>Change in land use</i>
Type of Report:	<i>Traffic Impact Statement</i>
Project Number:	<i>7065</i>
Declaration	<i>I, Koot Marais, author of this study, hereby certify that I am a professional traffic engineer (registration No 920023) and that I have the required experience and training in the field of traffic and transportation engineering as required by the Engineering Council of South Africa (ECOSA), to compile traffic impact studies and I take full responsibility for the content, including all calculations, conclusions and recommendations made herein.</i>
Compiled By:	<i>Koot Marais Pr Eng</i>
Signed:	
Date:	<i>June 2016</i>

PREPARED BY:

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INTRODUCTION

1.1 Aim of the Study

The aim of this study was to determine the traffic impact of a diesel depot, truck stop and related land uses on a **Portion of Portion 5 of the Farm Avenham 2187, Bloemfontein.**

1.2 Background

The diesel depot has been in existence adjacent to the N1 for many years on Portion 7 of the Farm Avenham 2187. The operator rented the area used for the diesel depot, but as the owner no longer want to rent the area out, the operator bought the adjacent portion, namely Portion 5 of Avenham 2187 and will basically relocate the existing facilities to the new site.

This report deals with the traffic impact of the planned change.

The Developer is as follows:

Ancor Familietrust

1.3 Site Location

The development is located to the north of Bloemfontein; to the west of the Avenham - Floradale Interchange (205) and to the south of the A194.

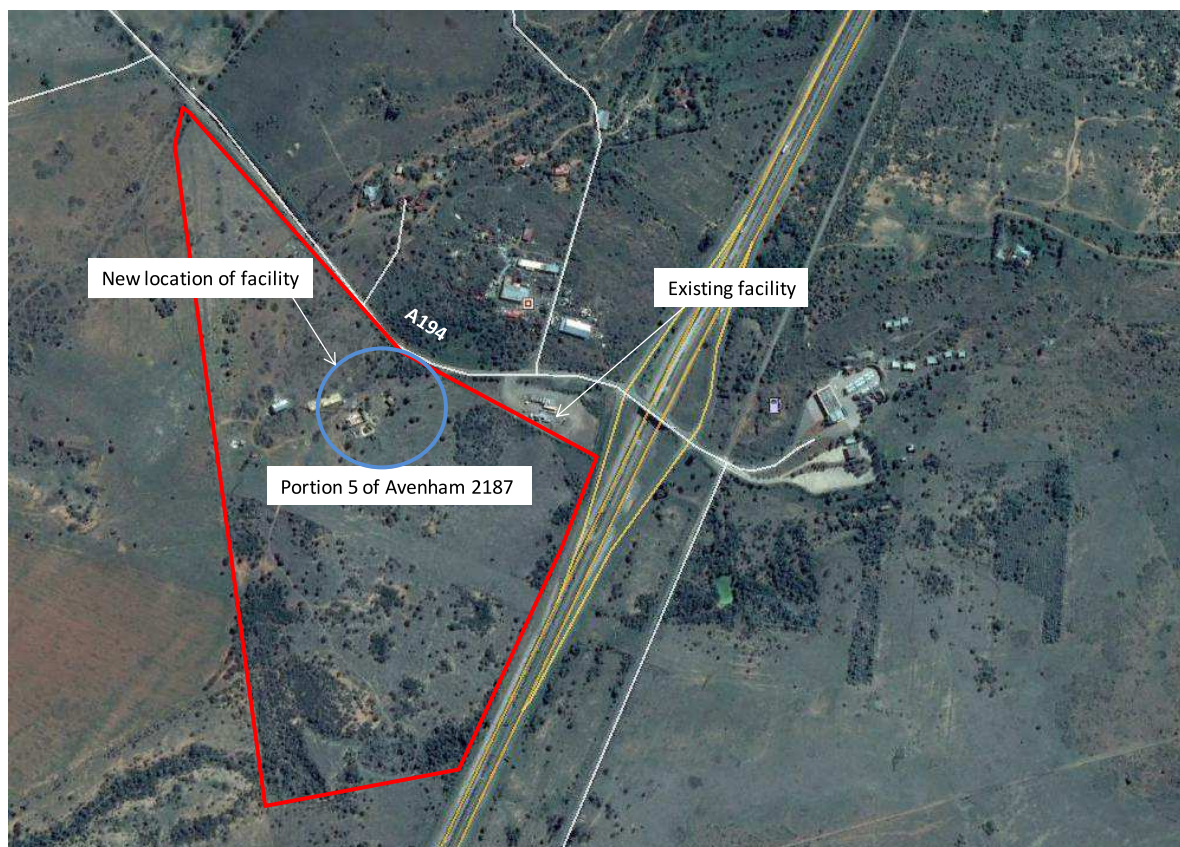


Figure 1.1 Location Plan

1.4 Proposed Development

As the property does not fall within the Bloemfontein Town Planning Scheme the application will be for a **Change in land use for a portion of agricultural land from agriculture to “truck stop, diesel depot and associated amenities”**.

In principle, the current facility will just be relocated as shown in the plan below. The plan must however be regarded as a conceptual plan as access will have to be provided as per the findings of this study.



Figure 1.2 Concept Layout Plan

The current facility has 4 pumps and it is planned to extend this to 6 pumps. Better provision will also be made for trucks to overnight and the site could potentially accommodate 150 trucks. Supporting facilities such as a take away restaurant and ablution facilities will also be provided.

1.5 Scope of Analysis

1.5.1 Period for Analysis

The relocation of the facility will not have a significant impact on traffic volumes as discussed in Chapter 3, with the result that no specific periods were analysed.

1.5.2 Warrants for a Traffic Impact Study

As the development is not expected to generate in excess of 50 new trips, according to the “Manual for Traffic Impact Studies”¹, a Traffic Impact Statement is not really warranted. The relocation will however have an impact on access, with the result that a study was undertaken.

1.5.3 Extent of Analysis

Not relevant. The study specifically deals with access from the A194.

1.5.4 Assessment Years

Not relevant.

1.6 Available Information

1.6.1 Traffic Counts

The site was visited and traffic operations observed on a number of occasions during May and June 2016.

2 BACKGROUND INFORMATION

2.1 Existing Road Network

The most important roads in the area are shown below:



Figure 2.1 Road Network

a) N1

This is the main north south road in South Africa. In the study area the road is a four lane freeway. The road falls under the jurisdiction of SANRAL.

b) A194 / T172

This provincial road is a paved two way road, becoming a gravel road. Further to the west the road becomes the T172.

2.2 Existing Land Use

The existing facility has been in existence for many years and is surrounded by farming areas as well as a filling station to the east of the N1.

2.3 Road Planning

There is no known road planning that will directly affect the development.

3 TRIP GENERATION

3.1 Trip Generation Rates

The following trip generation rates are potentially relevant to the application.

3.1.1 Filling Station

According to the “The South African Trip Generation Rates”² a filling station is expected to attract 4% of passing traffic with 16% of the attracted traffic expected to be new trips.

3.1.2 Truck Stop

There are no official known trip generation rates for a truck stop. It is often estimated that between 15% and 35% of trucks will stop at a truck stop, if it is conveniently located relative to a specific route used by trucks.

3.2 Trips Generated

The current facility is not highly visible and attractive, but still has fuel sales of between 650000 and 700000 litres per month. With an average fill of 330 litres per vehicle this relates to 68 to 71 vehicles per day for a 29 day per month (which is normally assumed for feasibility purposes).

The facility has contracts with various transport companies and attracts few if any random passerby traffic. Although the facility will be more attractive, visibility from the N1 will decrease and it is therefore not expected that the fuel sales, and thus the number of vehicles attracted to the facility, will significantly increase.

As far as the overnight facilities are concerned, these will mostly be used by the existing clients and are not expected to generate considerably more trips. The time when trips are made might however change as trucks normally stop to overnight between 19:00 and 21:00 and depart between 5:00 and 7:00. As traffic volumes at the interchange are low, a change in traffic patterns will not have a significant impact on traffic conditions, especially not considering the time when the trucks will arrive and leave the truck stop.

The other elements that will be established are in support of the facility and are not expected to generate primary trips.

In summary, it is believed that the relocation of the facility as planned will not have a significant impact on trip generation. Considering that the interchange only serves the diesel depot, a filling station and a tertiary road, traffic volumes at the interchange are low and it is not believed that it is necessary to formally analyse portion of the interchange or the access on the A194 as these will continue to operate at high levels of service.

4 SITE DEVELOPMENT PLAN AND OTHER ASPECTS

Other aspects of importance regarding traffic flow in the area are as follows:

4.1 Access Position

Considering the nature of the development, access is probably the most important aspect of the development. In this regards the access will be relocated to the west. The concept layout shows a possible position, but access requires further consideration.

4.1.1 Road Classification

To determine the appropriate access spacing, road classification needs to be determined. The *TRH 26 South African Road Classification and Access Management Manual*⁽¹⁰⁾ uses a six-class rural and urban road classification system. The first three classes in the system consist of mobility roads while the second three classes are used for access/activity roads or streets

Number	Function	Description
Class 1	Mobility	Principal arterial
Class 2		Major arterial
Class 3		Minor arterial
Class 4	Access/activity	Collector street
Class 5		Local street
Class 6		Walkway

A distinction is made between rural and urban areas. Roads in rural and urban areas have the same six functional classes but at different scales and standards. Rural roads have longer reaches of connectivity and therefore require higher levels of mobility than urban roads. It is therefore necessary that the classification system should differentiate between rural and urban areas.

Rural Classes		Urban Classes	
R1	Rural principal arterial*	U1	Urban principal arterial
R2	Rural major arterial*	U2	Urban major arterial
R3	Rural minor arterial*	U3	Urban minor arterial
R4	Rural collector road	U4	Urban collector street
R5	Rural local road	U5	Urban local street
R6	Rural walkway	U6	Urban Walkway

Based on the Manual the A194 and T172 can be classified as either a R4 Rural Collector Road or a R5 Rural Local Road. The Manual describes a Class R4 Rural Collector Road as follows:

These roads form the link to local destinations. They do not carry through traffic but only traffic with an origin or destination along or near the road. A collector road must never be quicker to use to pass through an area than the alternative mobility road.

These roads would typically give access to smaller rural settlements, tourist areas, mines, game and nature parks and heritage sites. The roads can also provide direct access to large farms. Collector roads can also be provided within larger rural settlements to provide a collector function in such settlements.

The length of these roads would mostly be shorter than 10 km. Traffic volumes should not be more than about 1 000 vehicles per day.

The Manual describes a Class R5 Rural Local Road as follows:

Class 5 roads provide direct access to smaller individual properties such as within rural settlements, as well as small to medium sized farms in rural areas. They serve no other purpose than to give such access.

The length of these roads would mostly be shorter than 5 km. Traffic volumes should not be more than about 500 vehicles per day.

As the access typology and intersection control of the two classes of roads are similar, it is not necessary to make a final decision on the road class.

4.1.2 Intersection / Access Spacing

The manual prescribes as follows:

Class R4 and R5 typology and intersection control

*Rural collectors and local roads have **intersections** with all road classes and **access** to adjacent land uses is to be permitted; in fact the major purpose is to give property access from these roads. Traffic signals would not be needed or allowed on rural collector roads, but stop and yield signs will be required at intersections. Commonly there will be no control signs at any of the property access points. Roundabouts are another acceptable form of control but care must be exercised that they are visible, particularly at night.*

Where regular farm access is required, it is preferred that access points are placed opposite each other rather than as a series of staggered intersections.

The following principles are contained in the Manual as far as filling stations are concerned.

Access to service (filling) stations shall be subject to the same conditions and requirements applicable to other types of developments, but the following exemptions shall apply:

- *Access may be provided by means of marginal access on all classes of roads in both urban and rural areas.*
- *Access separation requirements may be reduced as specified in this manual.*

The above exemptions may only be allowed when the access is restricted to the service station only and not to shared access with any other adjacent erven or other parts of the road network. This restriction is not applicable where the access meets all the requirements provided in this chapter (i.e. if no exemptions are required to accommodate the access).

A service station may include limited ancillary facilities and services that predominantly serve the driving public.

The current access situation is shown below.

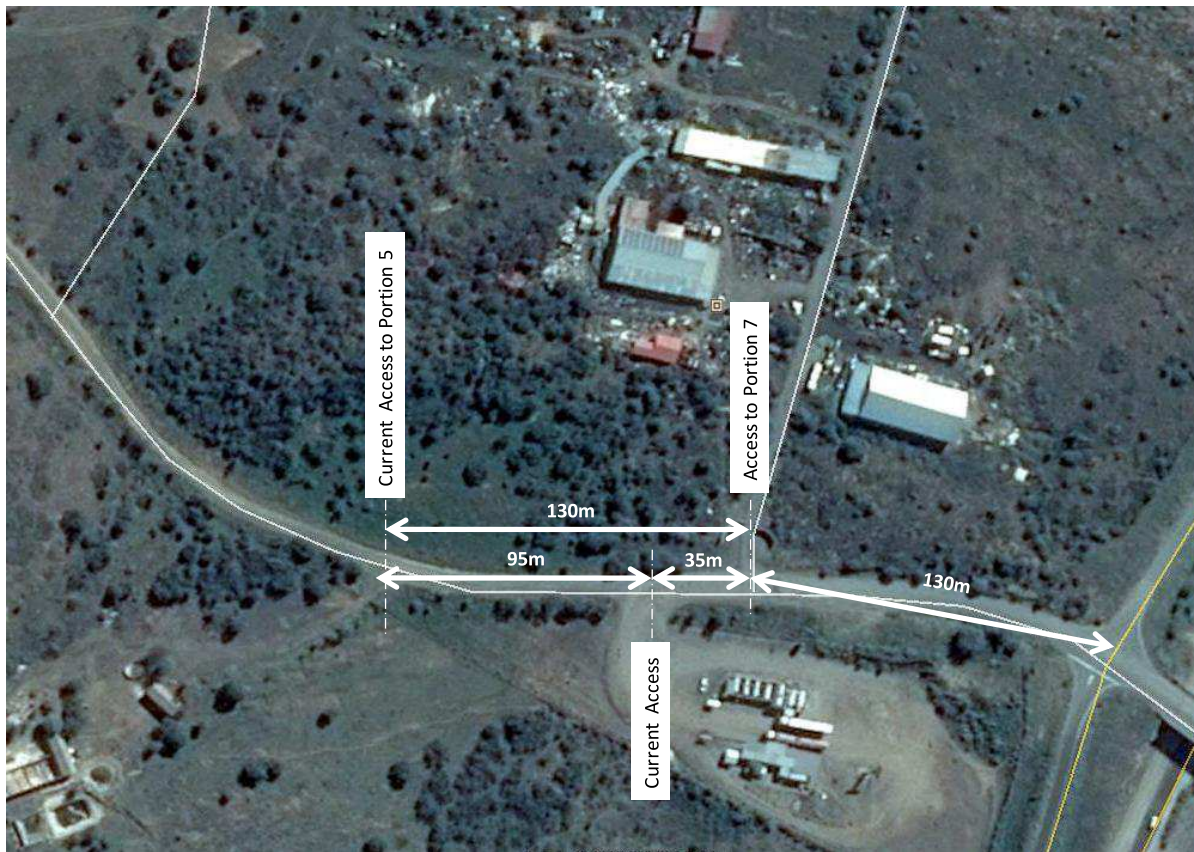


Figure 4.1 Access Spacing

As the current access is closely spaced to the access to Portion 7 and almost results in a staggered intersection, any relocation to the west will be an improvement on the current situation and is thus to be recommended.

The current access to Portion 5, which is indicated as the preferred access position in the concept layout, is in an acceptable position from a spacing point of view. The most important aspect is however site distances.

4.1.3 Sight Distances

Stopping sight distance should at least at all times be maintained. This is the distance required to enable a driver to observe an obstruction, and stop in time.

Basic stopping sight distances are as follows:

Table 34 Stopping sight distances (AASHTO, 2004)

Design speed (km/h)	Stopping sight distance (m) for gradients of:						
	-9%	-6%	-3%	0%	3%	6%	9%
20	25	20	20	20	20	20	20
30	35	35	35	35	35	30	30
40	55	50	50	50	45	45	45
50	75	70	70	65	65	60	60
60	100	95	90	85	80	80	75
70	125	120	110	105	100	100	95
80	155	145	140	130	125	120	115
90	190	175	165	155	150	145	140
100	225	210	195	185	175	170	160
110	265	245	230	215	205	195	190
120	305	285	265	250	235	225	215
130	350	325	305	285	270	255	245

For a design speed of 100km/h, the minimum sight distance should be 185m, and for 60km/h 85m.

Ideally adequate intersection sight distance must be provided at accesses to allow drivers to find a sufficiently large gap in the traffic stream to enter the road safely and with limited disruption to the traffic on the main road.

The *National Guidelines* prescribe the following as far as shoulder sight distance. (Gap Acceptance Sight Distance) is concerned:

TABLE 7.3: MINIMUM GAP ACCEPTANCE SIGHT DISTANCE (METRES)								
Vehicle type	Eye height	Design speed						
		40 km/h	50 km/h	60 km/h	70 km/h	80 km/h	100 km/h	120 km/h

Stop and yield control, 7.5m wide main road (X = 5m)

Passenger cars	1.05m	80	100	120	140	160	200	240
Single unit	1.80m	120	150	180	210	240	300	360
Single unit & trailer	1.80m	150	190	225	265	305	380	455

Stop and yield control 22.5m wide main road (X = 5m)

Passenger cars	1.05m	100	125	150	175	200	250	300
Single unit	1.80m	135	170	200	235	270	335	405
Single unit & trailer	1.80m	165	205	250	290	330	415	495

Yield control (X = 20m)

Passenger cars	1.05m	65	80	95	110	125	155	190
Single unit	1.80m	75	95	115	135	150	190	230
Single unit & trailer	1.80m	95	115	140	165	185	235	280

Gap acceptance sight distances measured from the eye height to an object height of 1.30m.

Based on the speed limit of 100km/h and main road width of 7.5m and considering the fact that it is a truck stop, a sight distance of 380m should preferably be available.

For a 60km/h design speed, the preferable sight distance should be 225m

Sight distances at the various positions are as follows:

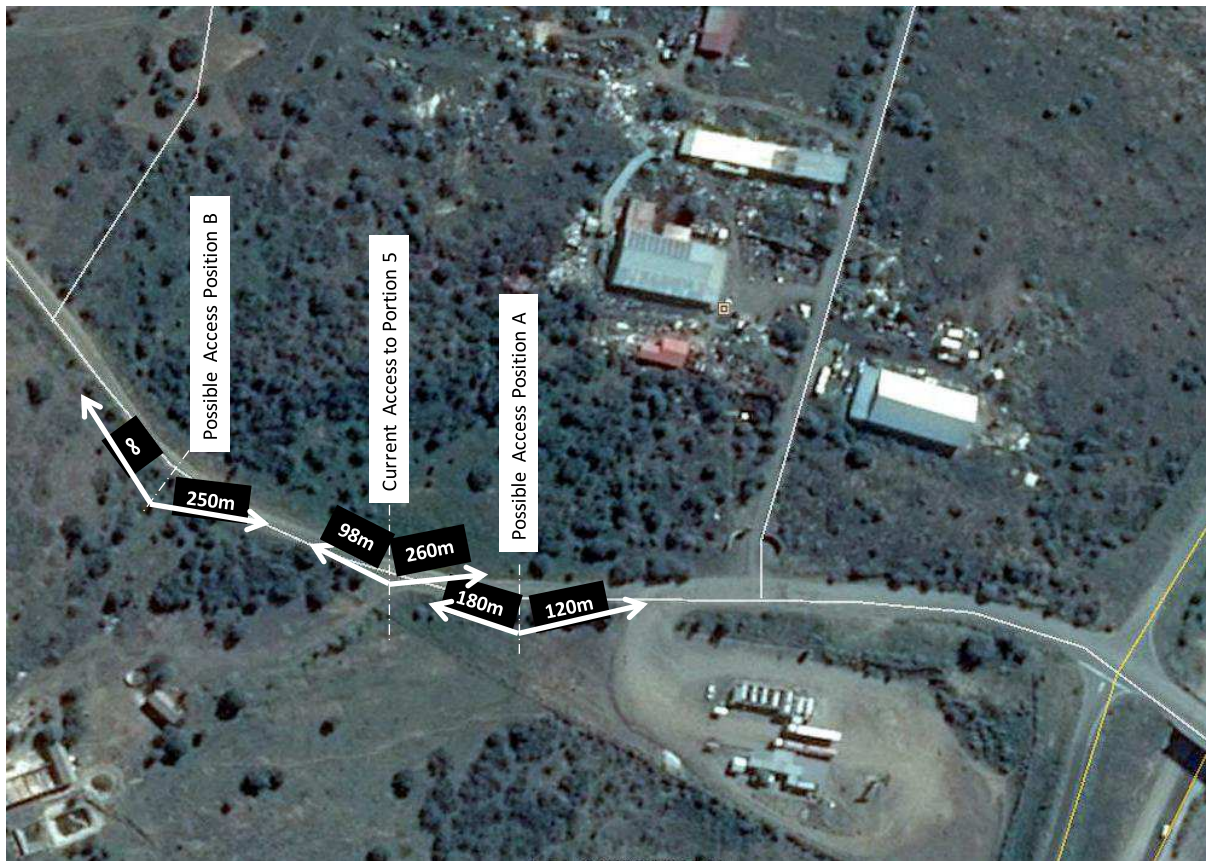


Figure 4.2 Sight Distances

As shown, the current access to Portion 5, which is indicated as the access position in the concept layout, does not provide acceptable sight distances, especially to the west where the 98m available is limited.

Possible access position A is located in a better position, but still does not comply with the minimum stopping sight distance.

Possible access position B is the best possible access position with unrestricted sight distance to the west. Although the sight distance to the east does not comply with the shoulder sight distance for 100km/h, due to the distance from the interchange and the horizontal alignment of the A194, operating speeds from the east are not expected to exceed 60 to 70km/h, with the result that sight distances should be acceptable.

Although the shoulder sight distances at position A do not comply with the standards, stopping sight distances are acceptable. An access-only at this position can thus still be considered.



Photo 1: Current Access to Portion 5 -Sight distance to east



Photo 2: Current Access to Portion 5 -Sight distance to west



Photo 3: Position B - Sight distance to east



Photo 4: Position B - Sight distance to west

4.1.4 Recommended Access

Based on the investigation, it is not recommended that access be provided at the current access to Portion 5, but that access rather be provided at the following position

-28.997167
26.267417

Full access can be provided at this position and in addition, a left-in-only access can be provided at Position B. A recommended access layout is shown below.



Figure 4.3 Recommended Access Layout

The particulars of the above layout are as follows:

- The main access should be at the mentioned coordinates
- The exact position of the left-in-only access will depend on the position of the property boundary
- The left-in-only access should be designed and constructed in such a way that exiting through this access is not possible

4.2 Other Aspects

4.2.1 Condition of A194

The existing facility is located just after the end of the paved portion and with the new location, the length of gravel road that will be used by trucks will increase. Ideally the portion of road used by trucks should be paved to reduce road maintenance and restrict dust. It will also be difficult to formally construct the access in such manner that the left-in access is not misused by vehicles as an exit if the road is not paved.

4.2.2 Throat Length

To ensure turning vehicles on the site do not affect vehicles entering the site, a throat length (clear portion of road between site boundary and first turn off) of approximately 45m should be provided. Provision is made for this in the concept layout plan.

4.2.3 Gradient of Access Road

There is a relatively steep gradient from the A194 to the site. To ensure that vehicles exit the site at a reasonable speed and also for safety purposes, the gradient of the access road for the first 20m should not exceed 4%.

5 CONCLUSIONS AND RECOMMENDATIONS

The following conclusions can be made from the study:

- a) The relocation of the facility as planned will not have a significant impact on trip generation and traffic flow in the area.
- b) The relocation of access to the west is an improvement on the current spacing, but the exact location of access is important to ensure acceptable sight distances. The main access should be located at the following coordinates:
 - 28.997167
 - 26.267417
- c) In addition to a full access, a left-in-only access from the east can also be provided.
- d) Ideally the portion of the A194 used by trucks should be paved to reduce road maintenance, restrict dust and to enable construction of a formal access in such manner that the left-in access is not misused by vehicles as an exit.
- e) An acceptable site layout is possible. Care should be taken with the gradient of the main access.

Based on the study it is recommended that the development be approved from a traffic point of view.

6 REFERENCES

1. **Manual for Traffic Impact Studies**, Department of Transport, Pretoria, 1995
2. **South African Trip Generation Rates**, Department of Transport, Pretoria, 1995
3. **ITE Trip Generation Rates, 6th Edition**, Institute of Transportation Engineers, Washington, 1998
4. **Transportation and Land Development**, Institute of Transportation Engineers, Washington, 1988
5. **UTG 1, Guidelines for the Geometric Design of Urban Arterial Roads**, CSIR, Pretoria, 1986
6. **National Guidelines for Road Management in South Africa**, COTO
7. **Spacing of Accesses on Major Arterials**, Department of Transport, Pretoria, 1993
8. **UTG 7, Guidelines for the Geometric Design of Urban Local Residential Streets**, CSIR, Pretoria, 1989
9. **SANRAL Geometric Design Guidelines**, SANRAL, 2004
10. **TRH 26, South African Road Classification and Access Management Manual, Version 1.0**, COTO, 2012
11. **Bethlehem Truck Stop Business Plan**, Du Plessis 7 Associates, Potchefstroom, 2013



MANGAUNG

Metro Transport Planning



Planning

Our ref. : Farm Lilyvale 2313
Your ref :
Date :29 August 2005

KMA Consulting Engineers
PO Box 20026
WILLOWS
9320
Bloemfontein

Attention: Mr. M.J. Marais

Sir

TRAFFIC IMPACT STUDY: APPLICATION FOR TOWNSHIP ESTABLISHMENT ON PLOT 13 LILYVALE, BLOEMFONTEIN

Your traffic impact statement, submitted on 17 May 2005 in support of the above mentioned proposed township establishment submitted by Messrs. Bopa Lesedi Management Consultants, refers.

The above mentioned traffic statement was evaluated by the Metropolitan Transport Planning Division of this directorate and found to be acceptable from a transportation planning perspective, subject to the following conditions:

- (a) that the land uses in the proposed township establishment be restricted to the sizes investigated in the traffic impact study, namely 48 housing units and fixed as such in the proclamation of the township establishment (if approved);
- (b) that a traffic impact statement be submitted for building plan approval purposes (if the township establishment is approved), investigating aspects such as parking, road gradients, accesses, loading areas and all the other site development plan traffic elements.
- (c) that written approval be obtained from the relevant department of the Free State Provincial Government regarding the proposed access from Rayton Road (S1013);
- (d) that ,due to the various permutations in which development can take place alongside Rayton Road, which may not necessarily be implemented in the same sequence of submission/approval of township establishment applications, or in the same sequence in which traffic impact statements/studies for the various applications have been submitted/approved, or in certain instances, some applications might not even have been approved, and unless the traffic engineer can indicate that the traffic impact statement/study submitted for township establishment purposes is still valid due to the fact that the development in the area has indeed realized in the same sequence as investigated in the applicable traffic impact statement/study, the proposed township establishment can only be supported from a transportation planning perspective subject to the following specific additional conditions:
 - (i) that an updated traffic impact statement/study be submitted, taking the total development potential (according to the approved zoning) into account, at the time the services agreement is being compiled, which traffic impact statement/study must be approved by the Mangaung Local Municipality before the services agreement is finalized. (This traffic impact statement can be combined with the traffic impact statement to be submitted as part of the building plan approval process referred to in (b) above);
 - (ii) that the traffic impact statement/study in (i) above investigates the traffic impact of the proposed development at the intersection of Rayton Road/Flockeman Street for the base year and future year (as investigated in the traffic impact study for township establishment) based on new intersection counts at the relevant intersection(s) during the month the traffic impact statement/study is

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conducted. The trips associated with already proclaimed township establishments (if any) for which services agreements have been finalized (or already submitted for finalization with an updated traffic impact study listed in (i) above submitted as part thereof) must be added to the background traffic volumes in accordance with the normal procedure prescribed in the Department of Transport's document "*Manual for Traffic Impact Studies*".

- (iii) that if the updated traffic impact study in (i) and (ii) above indicates road upgrading requirements, the developer **be fully responsible** for the upgrading to ensure Level of Service (LOS) of D or better for any individual traffic movement at any of the above mentioned intersections and that these required improvements form part of the services agreement.
- (iv) that the road upgrading requirements (if any) as determined in terms of (iii) above be implemented by the developer **within 6 months** after the finalization of the service agreement (even if only part of the township establishment is developed) and that no services certificate for any part of the township establishment be issued to the developer (which will allow the selling of land or the submission of building plans) before the required road upgrading, as specified in the services agreement, has been **fully** implemented.

The Free State Provincial Government (FSPG) will be informed that the current road reserve for the southern section of Rayton Road which falls under the jurisdiction of **Mangaung** Local Municipality is 31m wide, which seems to be more than the road reserve currently available for the rest of the road falling under the jurisdiction of the FSPG. With the envisaged development in the area, it seems logical that the extension of the 31m wide road reserve should be seriously considered for the rest of Rayton Road, which, if found necessary by the FSPG, could result in a portion of the proposed township establishment required as road reserve.

Please do not hesitate to discuss any of the comments with writer hereof, should you have any queries.

Yours sincerely



M.W. Machogo
GENERAL MANAGER