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FIGURES

ANNEXURES

1 INTRODUCTION

Route^2 – Transport Strategies have been appointed to undertake a Traffic Impact Study for the proposed Commercial and Light Industrial development on Portions 105, 109 & 331 of the Farm Knopjeslaagte 385 JR. The site located to the north of the N14 and south of the R114 (M34).

The Site

2 SCOPE OF THE REPORT

The purpose of this report is to identify the traffic impact that would be generated by the proposed development on the surrounding road network. The study area, development trip generation, trip distribution, capacity analysis and site access requirements are assessed in the report. Recommendations are also made in terms of public transport.

2.1 Study Area

The extent of the study area is driven by an estimation of the traffic generated by the proposed development and the intersections likely to be affected by the additional traffic. The development is expected to generate +/- **840** peak hour trips, therefore a traffic impact study is required.

The study includes the intersections of:

1. R511 and R114 (M34) – priority controlled.
2. R114 and Access Road – proposed signals.

2.2 Roads Affected

R511 (P39-1)

The R511 is a Class 2 road and was recently upgraded all the way to Erasmia. This road is also the future K46 with intersection spacing of 600m.

R114 (P102-1)

The R114 (M34) is a Class 2 road. This road is a normal provincial road and should have intersection spacing of 600m.

2.3 Peak Hours Analysed

Peak morning and afternoon traffic counts were conducted on Tuesday 24 May 2016 at the intersections mentioned above.

The existing weekday AM (07:00 – 08:00) and PM (16:00 – 17:00) peak hour traffic volumes are summarised in **Figure 2**.

2.4 Assessment Scenarios

To determine the likely impact of the additional traffic on the network the following three scenarios were analysed:

- **Existing 2016** AM and PM peak hour flows;
- **Base 2017** AM and PM peak hour flows with development traffic; and
- **Future 2021** traffic.

3 PROPOSED DEVELOPMENT

This traffic impact study is in support of the Rezoning Application for Commercial and Light Industrial use. The following development controls are applied for as per **Table 1** below.

Table 1: Development Controls

Township	Land Use	Potential Size
Portions 105, 109 & 331 Farm Knopjeslaagte	Commercial & Light Industrial (36 hectares @ FAR 0.5)	140 000m^2 GLA

4 DEVELOPMENT TRAFFIC

4.1 Trip Generation

The trip generation for the development was derived using the new COTO trip Manual for Manufacturing.

The predicted peak hour traffic to and from the site is summarised in **Table 2** below.

Table 2: Peak Hour Trip Generation

Peak Hour	Land Use	Trip Rate	Split	New Trips	
				IN	OUT
Weekday AM	Manufacturing (140 000m^2)	0.6	80:20	672	168
Weekday PM	Manufacturing (140 000m^2)	0.6	80:20	168	672

4.2 Trip Distribution

The following distribution was used as summarised in **Figure 3**:

- 20% from the north along the R511.
- 40% from the south along the R511.
- 40% from the east along R114 (M34).

Figure 3 illustrates the assumed trip distribution for the development traffic while **Figure 4** illustrates the **Base 2017** traffic with the additional development traffic and an expected 5% growth in background traffic.

5 TRAFFIC IMPACT & CAPACITY ANALYSES

5.1 Assessment Criteria

The intersections have been analysed using aaSIDRA traffic analysis software. SIDRA is a computer program that provides a number of performance measures including v/c ratios, delays, level of service (LOS), etc.

When elements of a road network such as intersections are analyzed, their operating conditions are described in terms of LOS. The six letters from A to F are used to indicate different LOS. LOS A indicates very light traffic with correspondingly low delays. LOS E reflects capacity conditions, with high delays and unstable flow. LOS F reflects conditions where traffic demand exceeds capacity and traffic experiences congestion and delays. Generally LOS A to D is considered acceptable in accordance with international standards. LOS E and F on the other hand are deemed unacceptable.

A further measure of the operating conditions prevailing at any one point in a road network is the volume to capacity ratio (v/c). As the name implies it is the traffic demand volume divided by the available capacity of the roadway element. Generally ratios of up to approximately 0.9 are internationally deemed acceptable.

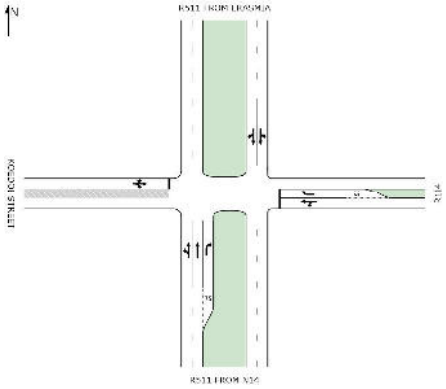
Results of the aaSIDRA capacity analyses at the intersections are discussed in the following sub sections, with details of the outputs enclosed in **Annexure A**.

5.2 Background Traffic

The analysis results of the background traffic with development traffic includes a 5% growth per annum. At this stage there is no approved latent rights in the area.

5.3 R511 and R114

Priority Controlled



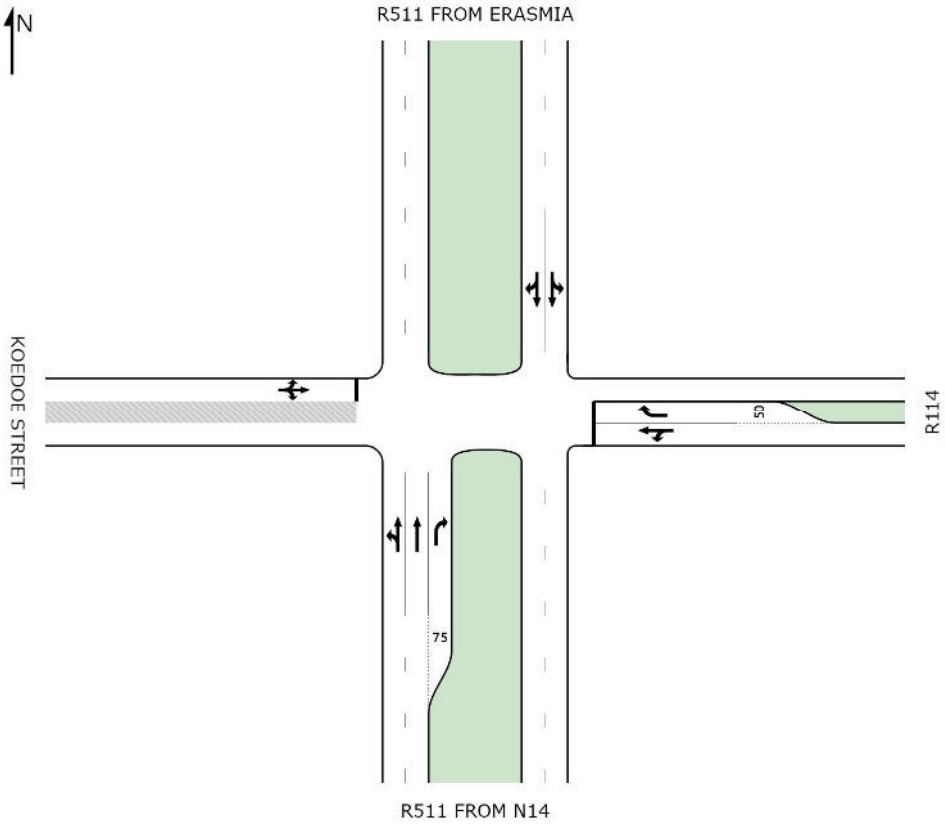
Results of Analysis:

Scenario	AM Peak Hour					PM Peak Hour				
	NB	WB	SB	EB	TOTAL	NB	WB	SB	EB	TOTAL
Existing 2015	**N/A** (34.2) {>1.0} [>120]	**F** (>120) {>1.0} [>120]	**N/A** (1.0) {0.36} [0.00]	**F** (>120) {>1.0} [66.1]	**N/A** (>120) {>1.0} [>120]	**N/A** (2.7) {0.23} [6.4]	**F** (92.1) {>1.0} [>120]	**N/A** (1.9) {0.15} [0.00]	**E** (40.8) {0.09} [1.6]	**N/A** (21.2) {>1.0} [>120]
Base 2017 + Development + Signals + Upgrades	**C** (20.4) {0.81} [108.8]	**C** (22.3) {0.85} [81.6]	**C** (26.5) {0.85} [114.3]	**C** (29.7) {0.17} [13.2]	**C** (23.1) {0.85} [114.3]	**C** (29.0) {0.69} [73.9]	**B** (12.8) {0.65} [45.8]	**B** (19.1) {0.43} [46.1]	**B** (12.0) {0.01} [1.1]	**C** (20.7) {0.69} [73.9]
Future 2021	**C** (22.3) {0.96} [>120]	**C** (25.8) {0.96} [82.2]	**D** (38.8) {0.94} [>120]	**C** (33.4) {0.20} [14.7]	**C** (29.8) {0.96} [>120]	**C** (26.6) {0.66} [86.2]	**B** (14.3) {0.69} [52.9]	**B** (18.0) {0.44} [53.2]	**B** (13.5) {0.01} [1.3]	**C** (20.2) {0.69} [86.2]

Legend	
A	Level of Service
(12.7)	Delay in Seconds
{0.95}	Volume / Capacity
[20]	Longest Average Queue in meters

For the **Existing 2016** scenario the analysis indicates that the intersection operates with major delays along the R114 approaches. To mitigate this traffic signals are proposed which has being proposed and is Warranted as per Warrant 1 of SARTSM. The signals are proposed since it is a direct result of the existing traffic volumes and not the additional development traffic.

With including the development traffic by **2017 & 2021** the intersection operation will improve considerably with the proposed traffic signals. The proposed layout is shown below with an additional northbound right turning lane.


N
R511 FROM ERASMIA
KOEDOE STREET
R114
50
75
R511 FROM N14

5.4 R114 and New Access Road

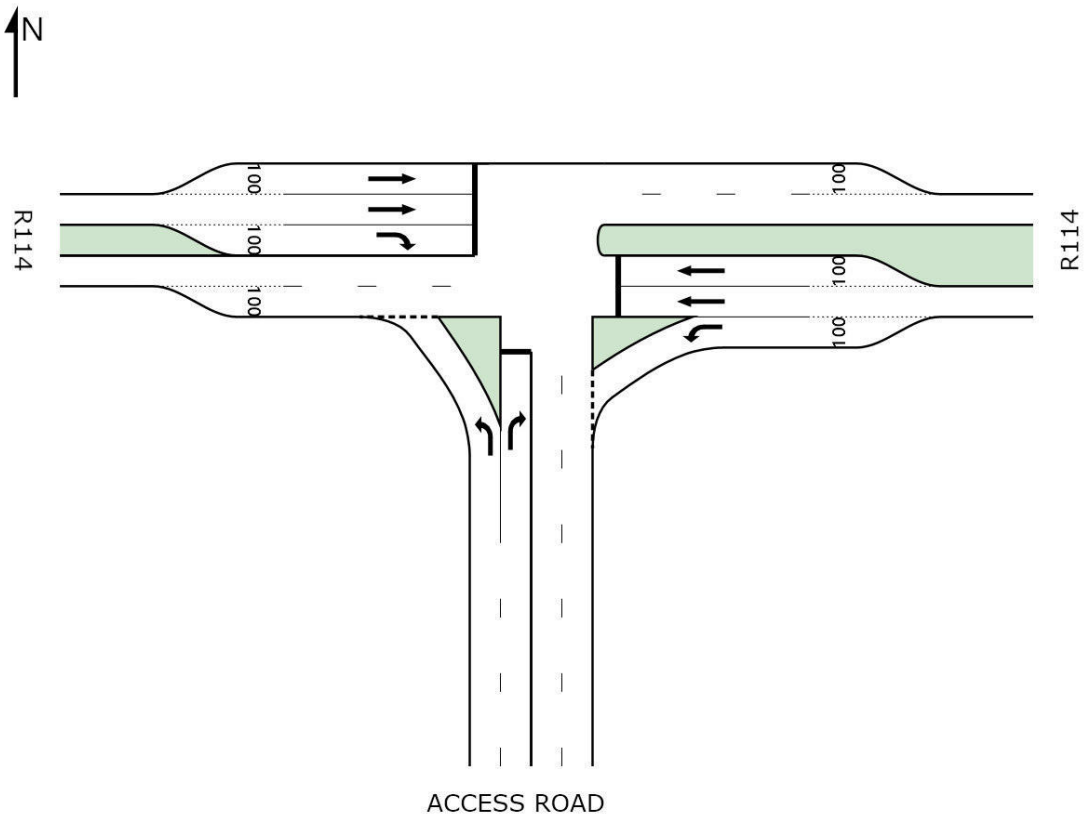
Proposed Signals

Results of Analysis:

Scenario	AM Peak Hour					PM Peak Hour				
	NB	WB	SB	EB	TOTAL	NB	WB	SB	EB	TOTAL
Base 2017 + Development + Signals	C (33.9) {0.74} [31.5]	B (12.6) {0.75} [111.7]		B (13.8) {0.75} [>120]	B (14.6) {0.75} [>120]	B (17.2) {0.46} [57.8]	B (19.4) {0.47} [55.6]		B (15.3) {0.28} [38.2]	B (17.3) {0.47} [57.8]
Future 2021	D (45.6) {0.71} [29.9]	A (4.8) {0.55} [83.1]		A (11.6) {0.72} [50.7]	A (10.3) {0.72} [83.1]	C (21.3) {0.51} [76.1]	B (17.9) {0.49} [64.4]		C (22.0) {0.43} [55.4]	C (20.4) {0.51} [76.1]

Legend	
A	Level of Service
(12.7)	Delay in Seconds
{0.95}	Volume / Capacity
[20]	Longest Average Queue in meters

For the **Base 2017 and Future 2021** scenarios the analysis indicates that the intersection operates with an acceptable LOS during the peak hours analysed if signalised. The proposed layout is illustrated below:



5.5 Concluding Remarks

Based on our site observations, the existing and base traffic volumes shown in the figures, as well as the above capacity analyses, it is concluded that the proposed development traffic will have some impact on the weekday AM and PM peak hour intersection capacities and therefore it is proposed that the R114 and Access Road to the development is signalised.

6 ACCESS REQUIREMENTS

6.1 Access Location

Access to the proposed development will be from a 25m wide road linking from the R114. The access road should have two lanes in and two lanes out.

6.2 Sight Distance & Intersection Spacing

The proposed access road will be located 600m from the R511 and R114 intersection which is in line with the Gautrans spacing requirements.

7 ACCESS TO PUBLIC TRANSPORT

7.1 Background

In terms of the "National Land Transport Act" (NLTA) (Act No.5 of 2009), it is required that an assessment of public transport be included in traffic impact studies. The following comments are relevant.

7.2 Public Transport

The following public transport facilities are recommended:

- ***The implementation of bus and minibus-taxi lay-bys on both sides of the R114 at the Access Road intersection.***

The following is proposed for pedestrians:

- ***Construction of a 1,5m wide sidewalk along the Access Road from the R114.***

8 CONCLUSION

Route 2 – Transport Strategies was appointed to prepare a Traffic Impact Study in support of the development of Portions 105, 109 & 331 Farm Knopjeslaagte Township.

The development is expected to generate 840 peak hour trips during the peak hours. The capacity analysis indicates that the intersection of the R511 and R114 needs to be signalised as a result of background traffic and the intersection of the R114 and Access Road should be signalised with the necessary turning lanes being constructed to Gautrans Standards.

The following is proposed and can be concluded:

- ***Provision of 1,5m wide sidewalk along the Access Road from the R114***.
- ***The access road should have two lanes in and two lanes out.***
- ***The implementation of bus and minibus-taxi lay-bys on both sides of the R114 and Access Road intersection.***
- ***Upgrading of the R511 and R114 intersection with signals, an additional northbound right turning lane, a southbound left turning slip lane and additional westbound turning lanes.***

Figures

ADDENDUM H

PREVIOUS APPROVALS - SEWAGE TREATMENT WITH PACKAGE PLANT

AquaPlan Business Park
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Bredell 1623
Gauteng
South Africa
Tel. 011 979 2510
Fax. 011 979 2587
e-mail: enquiries@aquaplansa.co.za

PROPOSAL

600m³/day Waste Water Treatment Plant

E/4998/16-01

Client	: **GFC Consulting**
Contact Person	**:** Gawie Combrinck
Tel No.	: 012 347 6299
E-Mail	: gawiecombrinck@gfc-holdings.co.za
Date	: 14 October 2016
No of Pages	: 14

REVISION SCHEDULE

REV	DATE	DESCRIPTION	ORIGINATOR
A	2016-09-16	Issued for Approval	Taigrine Jones
00	2016-10-14	Issued to Client	Taigrine Jones
01	2016-09-19	Issued to Client	Johan Bieseman

1 INFORMATION FROM THE CLIENT

The client requested a quote for a 600m^3/day sewage treatment plant.

2 PROCESS DESCRIPTION

AquaPlan MBBR:

The AquaPlan MBBR (Moving bed, biofilm reactor) process uses two reactors in series with a final clarification stage to lower the incoming effluent BOD and COD. This is mainly an aeration process during which nitrification occurs. The MBBR process is an excellent process solution that provides excellent BOD reduction, Nitrification, and total reduction of nitrogen removal processes.

The main advantage of this process is the floating media in the reactors which aids the attached growth of micro-organisms. This in turn increases the concentration of MLVSS. Unlike many other sewage treatment systems where the micro-organisms is continually removed from the reactor, the MBBR system is used to retain these organisms, cultivate and grow them to a point where more efficient sewage treatment can be established.

The micro-organisms will be cultivated on AquaPlan special floating media, which provides an excellent substrate for media growth while still ensuring a maintenance free, self-cleansing system.

To further aid in treatment efficiency, all AquaPlan reactors will be fitted with micro bubble or fine bubble aeration to increase oxygen transfer efficiency (SOTE) which in turn saves energy on the blower units.

The process will start with the raw effluent entering into a sump, from which it will be pumped at a continuous rate of 26m^3/h into the MBBR system. Therefore the level inside the inlet sump will fluctuate, but will serve as flow equalisation unit. The raw sewage will enter into the first MBBR in which breakdown of the sewage water will start. All the liquid from this sump, including settleable solids will overflow into the second reactor for further treatment and reduction of BOD and COD. Finally, all liquid and settleable solids will overflow into a clarifier unit. The solids will then sink to the bottom of the clarifier to form a sludge blanket while the product water will overflow from the top of the clarifier.

From the clarifier the water will be pumped into a multimedia sand filter for further polishing and reduction of suspended solids at a rate of 26m^3/h. Thus the flow through the entire process will be kept constant. After filtration the water will bed dosed with sodium hypochlorite for disinfection and will flow into the client storage tank or downstream water system.

Sludge will be drawn from the bottom of the clarifier and a portion of the sludge will be recycled back to the 1st reactor to aid in biological efficiency due to the increased concentration of micro-organism. The remainder of the sludge will be pumped to a sludge collection tank or can be treated with drying beds.

3 TECHNICAL SPECIFICATION AND SCOPE OF SUPPLY:

3.1 INLET CONDITIONS OF DOMESTIC RAW SEWAGE:

bCOD / BOD (ratio)	1.6
BOD_5	240 mg/L
sBOD	80 mg/L
COD	600 mg/L
sCOD	160 mg/L
VSS	200 mg/L
TSS	240 mg/L
Temperature	> 12 ^oC

3.2 OUTLET CONDITIONS OF TREATED WATER

COD	< 75 mg/L
NH_4	< 10 mg/L
TSS	< 25
Nitrate (NO_3)	10 – 20 mg/L

Flow	
Flow rate	600 m^3/day
Treatment duration	24 hours/day
Average flow	25 m^3/h
Flow per reactor	12,5 m^3/h
Design aeration	4 hours contact time
Reactor volume	51,6 m^3
Settling velocity	1,5 m/h
Physical Dimensions:	
Total reactor & clarifier length	12 m
Total reactor & clarifier width	2,4 m
Total reactor & clarifier height	2,8 m
Reactor length	8,3 m

Clarifier length	3,7 m
Total fill volume	74 m^3
Internal	
Floating media	0,15 m^3 fill / m^3 reactor volume
Total fill	8 m^3
Clarifier lamella packs	28 packs
Fine bubble aeration	16 per reactor
Equipment	
Blower	Ecotao
Blower capacity	320 Nm^3/h
Blower pressure	400 mbar
Power usage	5,5 Kw
Submersible pump	Cyclone Industries / Grundfos
Pump capacity	26 m^3/h
Pump pressure	1 bar
Pump rpm	2,400
Pump power usage	2 Kw
Sludge recycle pump	Cyclone Industries / Grundfos
Pump capacity	5 m^3/h
Pump pressure	0,8 bar
Pump rpm	2,400
Pump power usage	0,75 Kw
Product pump	Cyclone Industries / Grundfos
Pump capacity	26 m^3/h
Pump pressure	1,5 bar
Pump rpm	2,400
Pump power usage	1,4 Kw
Electrical	
PLC	Delta

4 SCOPE OF SUPPLY

- 2 off AquaPlan MBBR Unit with air diffuser:
  - Flow rate (combined): 600 m^3/day
  - 12m x 2,4m x 2,8m
  - Includes necessary valves
  - Includes 1 x ultrasonic level detector
  - Fitted with walk way and safety railing
  - Includes 1 x SS304 Aqua Drum (drum screen)
  - Note that the detail design of the exact size of the reactors (size and volume) rests with Aquaplan
- 1 off Auxiliary Skid
  - Control Panel:
    - Delta PLC
    - Delta colour HMI
    - Push button interface for manual override
    - PLC programming
  - Chlorine Disinfection tank (carbon steel)
    - Residence time of 30 minutes
    - Fitted with under draining system for maintenance and sludge removal
    - Includes positive displacement pump to dose the disinfectant
  - Pipework as part of skid:
    - Galvanised mild steel

4.1 COMMISSIONING AND TRAINING:

All Equipment installed on site by AquaPlan will tested for functionality at our workshop. Operators can also be trained as the testing of equipment takes place.

4.2 TREATED EFFLUENT QUALITY

Considering that the raw sewage would be of a domestic nature (not industrial), the following effluent quality, in line with the General standard for Sewage effluent, can be expected:

pH:	5.5 to 9.5
Oxygen absorbed:	< 10
Chemical oxygen demand mg/l:	< 75
Free and saline ammonia (mg/l):	< 10
Suspended solids m/l:	< 25
Soap, oil, grease (with input limit of 40 mg/l)	<2.5 mg/l

Residual chlorine (after 1 hour)	0.1 mg/l
Nitrate (mg/l)	10 – 20 mg/l
E-coli count:	0 per 100ml
Temperature:	below 30°C

Treated effluent can be used for non-crop irrigation purposes or for release into a maturation pond followed by a natural water cycle such as a river.

4.3 Engineering And Standards:

The Engineering and fabrication of the items supplied under this proposal will be in accordance with all the relevant SABS Specifications and manufactured in strict accordance with the AquaPlan quality management system.

4.4 Battery Limits

4.4.1 Start Location

The start location of the battery limit is at the Inlet pipework to the rotating drum screen. The feed pressure required is 2 bar. The client will be required to supply the main incomer cable that will supply power to our centralized control panel. From this point all electrical and instrumentation cable will be supplied by AquaPlan. The piping required up to the flange connection is for the clients account.

4.4.2 End Location

The end location of the battery limit is at the discharge flange of the chlorine contact tank. The handling and disposal of the dried sludge will be for the clients account.

4.4.3 Conclusion

All equipment within this location (as described in the start and end location) will be subjected to the scope of works as described in the scope of supply section.

4.5 Exclusions:

a) Installation – AquaPlan has excluded installation from the scope of work. The AquaPlan team will however advise the client if there are any problems or enquiries during installation. Installation will strictly be done by the client.

b) Scaffolding – AquaPlan will not be responsible for the set-up or removal of any scaffolding.

c) Cranage – AquaPlan will not arrange or pay for hire or use of a crane for transport purposes our premises. If cranage is required, it will be to the cost of the client.

d) Rigging – Rigging has not been included in the quote.

e) Arranging work permits – Transportation of units and on site team is a battery limit, obtaining any work permits, access cards, or vehicle permits required to bring a truck or employees on to site will be the responsibility of the client.

f) Clearance of site – AquaPlan will not do any site work relating to clearing of site so that work can commence.

g) Any civil works – No repair work or construction activities related to the foundation or plinths will be done by AquaPlan on site. All plinths to be provided by the client.

h) Electric components – AquaPlan will not provide any electric cables to supply power to the centralized panel or control system.

i) Operation and maintenance of the plant – AquaPlan will not operate the plant or maintain any part of the plant or clarifiers. If the client required plant operators to be trained on the process and separate quote will be provided.

j) Supply of standby equipment – AquaPlan will not supply any standby pumps or units.

k) Supply and installation of any storage tanks – AquaPlan will not supply any storage tanks other than what is specified in the inclusions.

l) Chemicals – AquaPlan will not provide any chemicals needed for the process.

m) Supply of any spare parts – spare parts such as pumps and plates will not be provided.

n) Supply, installation and testing of all piping.

o) Supply of spare parts list – to be finalised on detailed design.

p) Export documentation – AquaPlan will not provide a cost for export documentation as this quote is bas ex-works.

q) Off-loading and storage from transport.

r) Any item not explicitly mentioned.

s) The inlet raw sewage screen has not been included in our supply. It is however critical that the client considers that this is included, however has not been included in this supply.

t) The inlet balancing tank /or sump has also not been included in this scope of supply.

u) Our supply is a fully functional containerised system that is put down on a concrete plinth system. We have included the complete process as needed- excluding the two points s, and t, above.

v) The excavation and raw sewerage supply into an inlet sump is to be done by the client. The raw sewerage needs to be supplied into the reactor by the client. Once the raw sewerage has been supplied into the reactor, will the Aquaplan system take care of the screened sewage to be treated. Kindly note that a raw sewerage rotating screen is required at the sump, but has not been priced at this point.

w) The client is to provide a disposal point for the treated effluent.

x) The sludge removed periodically from the reactors needs to be Taken away by the client- a sludge tank will be provided- (5000 l)

4.6 Document Deliverable List:

Documents that will be supplied to the client at project design phase:

A)	**Project Initiation Documents**	
A1	Vendor Document Register	(Client)
A2	Tender / Formal Quote and Proposal	(AquaPlan)
A3	Official Order	(Client)
A4	Formal Contract	(AquaPlan / Client)
A5	Proposed Fabrication and Project Schedule	(AquaPlan)
A7	Payment Schedule	(AquaPlan / Client)
A8	Work Breakdown Structure	(AquaPlan)
B)	**Project Progress Documents**	
B1	Monthly Progress Reports	(AquaPlan)
B2	Monthly Updated Fabricated and Project Schedule	(AquaPlan)
C)	**Process Design Documents**	
C1	Process Flow Diagram	(AquaPlan)
C2	Battery Limit Schedule	(AquaPlan)
C3	Piping and Instrumentation Diagram	(AquaPlan)
C4	Functional Design Specifications	(AquaPlan / Client)
C5	Operating and Maintenance Manual	(AquaPlan)
D)	**Mechanical Design Documents**	
D1	Drawing Register (3D & Manufacturing)	(AquaPlan)
D2	Lubrication Schedule	(AquaPlan)
D3	Spare Part / Critical Schedule	(AquaPlan)
D4	Installation and Assembly Procedure	(AquaPlan)
D5	Technical Specification(s)	(AquaPlan)
D6	Engineering Data Book	(AquaPlan)
D7	Inspection Reports	(AquaPlan)
E)	**Electrical Design Documents**	
E1	Electrical Load Schedules	(AquaPlan)

E2	Electrical Equipment Schedule	(AquaPlan)
G)	**Manufacturing Documents**	
G1	Equipment and Bill of Materials Schedule	(AquaPlan)
G2	Manufacturing Procedures	(AquaPlan)
G3	Welding Documentation	(AquaPlan)
G4	Manufacturing QC Plan	(AquaPlan)
H)	**Project Completion Documents**	
H1	Final Release and handover certificate (C1-C6)	(AquaPlan / Client)
H2	Client Hand Over Documentation	(AquaPlan / Client)

5 PROJECT COSTING

5.1 COST BREAKDOWN

Item	Description	Qty	Unit	Amount Ea	Total
1	Engineering & Design	1	Sum	R 72 000,00	R 72 000,00
2	Inlet Works and connecting pipeworkEquipment – part of the reactors	1	Sum	R 320 000,00	R 320 000,00
3	600m^3/day MBBR System (2 off reactor containerised)	1	Sum	R 3 685 000,00	R 3 685 000,00
4	Auxiliary Skid & Electrical	1	Sum	R 530 700,00	R 530 700,00
5	Transport to site	1	Ea.	R 69 450,00	R 69 450,00
6	Commissioning	1	Sum	R 21 500,00	R 21 500,00
				Sub Total A (Ex-Works and Excl. Vat)	R 4 698 650,00
7	Project Management, Quality Assurance and Control	4,00%	% of Sub Total A	R 187 946,00	R 187 946,00
8	Health and Safety Overheads	3,00%	% of Sub Total A	R 140 959,50	R 140 959,50
9	Data Books Cost	1,20%	% of Sub Total A	R 56 383,80	R 56 383,80
10	P&G's, Head Office Overheads and Engineering Cost	6,80%	% of Sub Total A	R 319 508,20	R 319 508,20
				Total (excl. VAT)	**R 5 350 447,50**

5.2 TERMS OF PAYMENT:

The following terms will be adhered to:

- 30% of total contract value upon confirmation of order.
- 20% upon verification of cast numbers/MTC's or material delivery to site.
- 30% upon mechanical completion (before shipping).
- 15% upon delivery to site.
- 5% on completion of commissioning.
- All invoices to be settled within 7 day from invoice date.

6 COMMERCIAL CONDITIONS

6.1 CONDITIONS OF PROPOSAL:

This proposal is based on AquaPlan's Standard Conditions of Contract and Sale, which are described below.

6.2 PROJECT COST AND PRICE BASIS:

The Project Cost will be fixed and firm for an order placed within the validity period, to the amount in the ZAR currency.

Prices are comprehensive and cross-subsidised; no take out prices accepted.

6.3 VALIDITY:

This proposal remains valid for a period of thirty (30) days from date hereof, after which it will become subject to confirmation or re-negotiation.

6.4 WARRANTY:

All equipment supplied by AquaPlan in terms of this offer, will be fully guaranteed against faulty design or defective workmanship.

The guarantee will be for a period of thirteen (13) months from date of delivery of such equipment, or twelve (12) months from the date of commissioning of the complete system, whichever occurs first.

AquaPlan will not be held responsible to comply with the above stated guarantee in the event where equipment has been altered, or repaired, without our knowledge, or any damage caused by others to our equipment, or system, by improper operation, misuse, abuse, negligence, accidents. This will also apply in the event where the plant is expected to perform outside of the original design specification

6.5 PROJECT PROGRAM:

The Project will be executed in accordance with the current Project Program. We will require approximately **fourteen (14) to sixteen (16) weeks (depending on material availability and workshop load)** at receipt of official order, to complete the work.

6.6 TERMINATION OF CONTRACT:

Should the Contract be terminated by the Purchaser after placement of an official order, for any reasons that are not the responsibility of AquaPlan, damages that may be suffered arising out of such termination, will be charged to the Purchaser.

6.7 RATES OF EXCHANGE VALUES:

1 US$ - R 14.00 (ZAR)

6.8 LAW OF COUNTRY:

South African Law to apply for this Contract

6.9 OUT OF SCOPE COST

Delayed or Additional Time:

The client bill for days exceeding the contract will be charged at the individual daily rate for those required to stay onsite until project completion as outlined in table below:

Discipline	Rate ZAR/hr	Discipline	Rate ZAR/hr
Design engineer	R 785,00	Senior Draughtsman	R 525,00
Project consultant	R 635,00	Drawing office administration	R 285,00
Project manager	R 785,00	Snr design draftsman - civil	R 635,00
Project Assistant / technician	R 277,00	Checker civil	R 285,00
Project Engineer	R 525,00	Commissioning manager	R 785,00
Engineering manager	R 785,00	Workshop Manager	R 635,00
Packager engineer	R 525,00	Quality Engineer	R 525,00
Lead process Engineer - design	R 785,00	Safety officer	R 285,00
Senior process engineer	R 635,00	Housekeeping superintendent	R 264,00
Process engineer	R 525,00	Planner	R 396,00
Lead Mechanical Engineer - design	R 785,00	Store manager	R 525,00
Senior Mechanical engineer	R 635,00	Store officer	R 285,00
Mechanical engineer	R 525,00	Procurement officer	R 330,00
Lead Electrical Engineer - design	R 785,00	Driver - LDV	R 158,00
Senior Electrical engineer	R 635,00	Driver - code 18	R 285,00
Electrical engineer	R 525,00	Welder	R 180,00
Lead Civil Engineer - design	R 785,00	Welder - coded	R 285,00
Senior Civil engineer	R 635,00	Boilermaker	R 285,00
Civil engineer	R 525,00	Assistant	R 95,00
Lead C&I Engineer - design	R 785,00	Semi-skilled	R 120,00
Senior C&I engineer	R 635,00	Pipe fitter	R 285,00
C&I engineer	R 525,00	Electrician (Gov. ticket)	R 397,00
Lead Piping Engineer - design	R 785,00	Electrical assistant	R 195,00
Senior Piping engineer	R 635,00	Machine operator	R 285,00
Piping engineer	R 525,00	Forklift driver	R 145,00
Departmental manager - Process	R 785,00	Painter	R 105,00
Departmental manager - Mechanical	R 785,00	Labourer	R 85,00
Departmental manager - Piping	R 785,00	Brick-layer	R 85,00
Departmental manager - Civil/structural	R 785,00	Plasterer	R 85,00

Departmental manager - C&I	R 785,00	Concrete technologist	R 285,00
Departmental manager - Electrical	R 785,00	Tiler	R 120,00
Departmental drawing office manager	R 635,00	Site Supervisor	R 525,00
All subsistence will be reimbursed per person per day spent on site			R 450.00

Appendix G6

Traffic Impact Study

TRAFFIC IMPACT STUDY

Portions 105, 109 & 331 of the Farm Knopjeslaagte 385 JR

May 2016

route 2
transport strategies

po box 67823 highveld 0169
fax: + 27 (12) 665 1011 or 086 667 6883
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jac.botha@route2.co.za

CESA
Consulting Engineers South Africa

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FIGURES

ANNEXURES

1 INTRODUCTION

Route^2 – Transport Strategies have been appointed to undertake a Traffic Impact Study for the proposed Commercial and Light Industrial development on Portions 105, 109 & 331 of the Farm Knopjeslaagte 385 JR. The site located to the north of the N14 and south of the R114 (M34).

The Site

2 SCOPE OF THE REPORT

The purpose of this report is to identify the traffic impact that would be generated by the proposed development on the surrounding road network. The study area, development trip generation, trip distribution, capacity analysis and site access requirements are assessed in the report. Recommendations are also made in terms of public transport.

2.1 Study Area

The extent of the study area is driven by an estimation of the traffic generated by the proposed development and the intersections likely to be affected by the additional traffic. The development is expected to generate +/- **840** peak hour trips, therefore a traffic impact study is required.

The study includes the intersections of:

1. R511 and R114 (M34) – priority controlled.
2. R114 and Access Road – proposed signals.

2.2 Roads Affected

R511 (P39-1)

The R511 is a Class 2 road and was recently upgraded all the way to Erasmia. This road is also the future K46 with intersection spacing of 600m.

R114 (P102-1)

The R114 (M34) is a Class 2 road. This road is a normal provincial road and should have intersection spacing of 600m.

2.3 Peak Hours Analysed

Peak morning and afternoon traffic counts were conducted on Tuesday 24 May 2016 at the intersections mentioned above.

The existing weekday AM (07:00 – 08:00) and PM (16:00 – 17:00) peak hour traffic volumes are summarised in **Figure 2**.

2.4 Assessment Scenarios

To determine the likely impact of the additional traffic on the network the following three scenarios were analysed:

- **Existing 2016** AM and PM peak hour flows;
- **Base 2017** AM and PM peak hour flows with development traffic; and
- **Future 2021** traffic.

3 PROPOSED DEVELOPMENT

This traffic impact study is in support of the Rezoning Application for Commercial and Light Industrial use. The following development controls are applied for as per **Table 1** below.

Table 1: Development Controls

Township	Land Use	Potential Size
Portions 105, 109 & 331 Farm Knopjeslaagte	Commercial & Light Industrial (36 hectares @ FAR 0.5)	140 000m^2 GLA

4 DEVELOPMENT TRAFFIC

4.1 Trip Generation

The trip generation for the development was derived using the new COTO trip Manual for Manufacturing.

The predicted peak hour traffic to and from the site is summarised in **Table 2** below.

Table 2: Peak Hour Trip Generation

Peak Hour	Land Use	Trip Rate	Split	New Trips	
				IN	OUT
Weekday AM	Manufacturing (140 000m^2)	0.6	80:20	672	168
Weekday PM	Manufacturing (140 000m^2)	0.6	80:20	168	672

4.2 Trip Distribution

The following distribution was used as summarised in **Figure 3**:

- 20% from the north along the R511.
- 40% from the south along the R511.
- 40% from the east along R114 (M34).

Figure 3 illustrates the assumed trip distribution for the development traffic while **Figure 4** illustrates the **Base 2017** traffic with the additional development traffic and an expected 5% growth in background traffic.

5 TRAFFIC IMPACT & CAPACITY ANALYSES

5.1 Assessment Criteria

The intersections have been analysed using aaSIDRA traffic analysis software. SIDRA is a computer program that provides a number of performance measures including v/c ratios, delays, level of service (LOS), etc.

When elements of a road network such as intersections are analyzed, their operating conditions are described in terms of LOS. The six letters from A to F are used to indicate different LOS. LOS A indicates very light traffic with correspondingly low delays. LOS E reflects capacity conditions, with high delays and unstable flow. LOS F reflects conditions where traffic demand exceeds capacity and traffic experiences congestion and delays. Generally LOS A to D is considered acceptable in accordance with international standards. LOS E and F on the other hand are deemed unacceptable.

A further measure of the operating conditions prevailing at any one point in a road network is the volume to capacity ratio (v/c). As the name implies it is the traffic demand volume divided by the available capacity of the roadway element. Generally ratios of up to approximately 0.9 are internationally deemed acceptable.

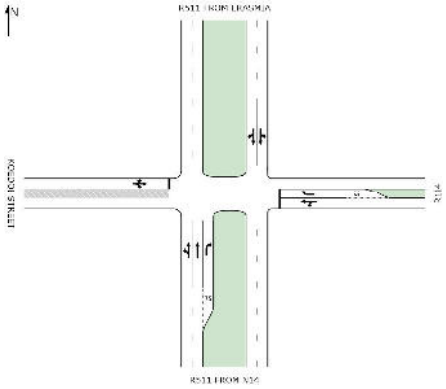
Results of the aaSIDRA capacity analyses at the intersections are discussed in the following sub sections, with details of the outputs enclosed in **Annexure A**.

5.2 Background Traffic

The analysis results of the background traffic with development traffic includes a 5% growth per annum. At this stage there is no approved latent rights in the area.

5.3 R511 and R114

Priority Controlled



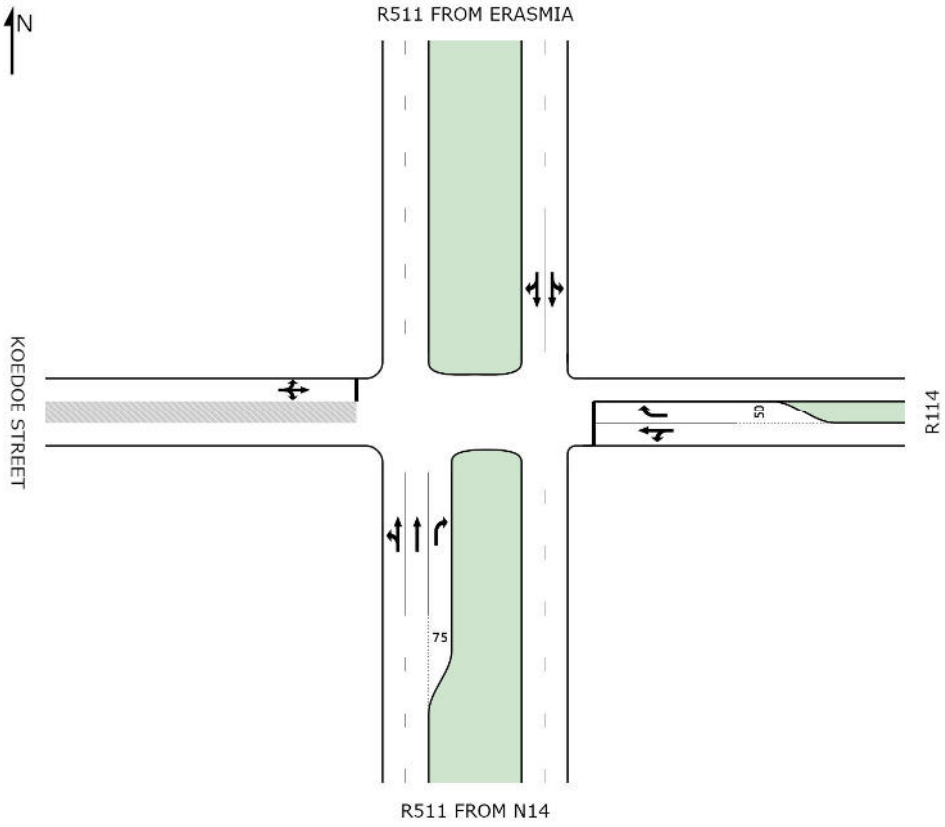
Results of Analysis:

Scenario	AM Peak Hour					PM Peak Hour				
	NB	WB	SB	EB	TOTAL	NB	WB	SB	EB	TOTAL
Existing 2015	**N/A** (34.2) {>1.0} [>120]	**F** (>120) {>1.0} [>120]	**N/A** (1.0) {0.36} [0.00]	**F** (>120) {>1.0} [66.1]	**N/A** (>120) {>1.0} [>120]	**N/A** (2.7) {0.23} [6.4]	**F** (92.1) {>1.0} [>120]	**N/A** (1.9) {0.15} [0.00]	**E** (40.8) {0.09} [1.6]	**N/A** (21.2) {>1.0} [>120]
Base 2017 + Development + Signals + Upgrades	**C** (20.4) {0.81} [108.8]	**C** (22.3) {0.85} [81.6]	**C** (26.5) {0.85} [114.3]	**C** (29.7) {0.17} [13.2]	**C** (23.1) {0.85} [114.3]	**C** (29.0) {0.69} [73.9]	**B** (12.8) {0.65} [45.8]	**B** (19.1) {0.43} [46.1]	**B** (12.0) {0.01} [1.1]	**C** (20.7) {0.69} [73.9]
Future 2021	**C** (22.3) {0.96} [>120]	**C** (25.8) {0.96} [82.2]	**D** (38.8) {0.94} [>120]	**C** (33.4) {0.20} [14.7]	**C** (29.8) {0.96} [>120]	**C** (26.6) {0.66} [86.2]	**B** (14.3) {0.69} [52.9]	**B** (18.0) {0.44} [53.2]	**B** (13.5) {0.01} [1.3]	**C** (20.2) {0.69} [86.2]

Legend	
A	Level of Service
(12.7)	Delay in Seconds
{0.95}	Volume / Capacity
[20]	Longest Average Queue in meters

For the **Existing 2016** scenario the analysis indicates that the intersection operates with major delays along the R114 approaches. To mitigate this traffic signals are proposed which has being proposed and is Warranted as per Warrant 1 of SARTSM. The signals are proposed since it is a direct result of the existing traffic volumes and not the additional development traffic.

With including the development traffic by **2017 & 2021** the intersection operation will improve considerably with the proposed traffic signals. The proposed layout is shown below with an additional northbound right turning lane.


N
R511 FROM ERASMIA
KOEDOE STREET
R114
50
75
R511 FROM N14

5.4 R114 and New Access Road

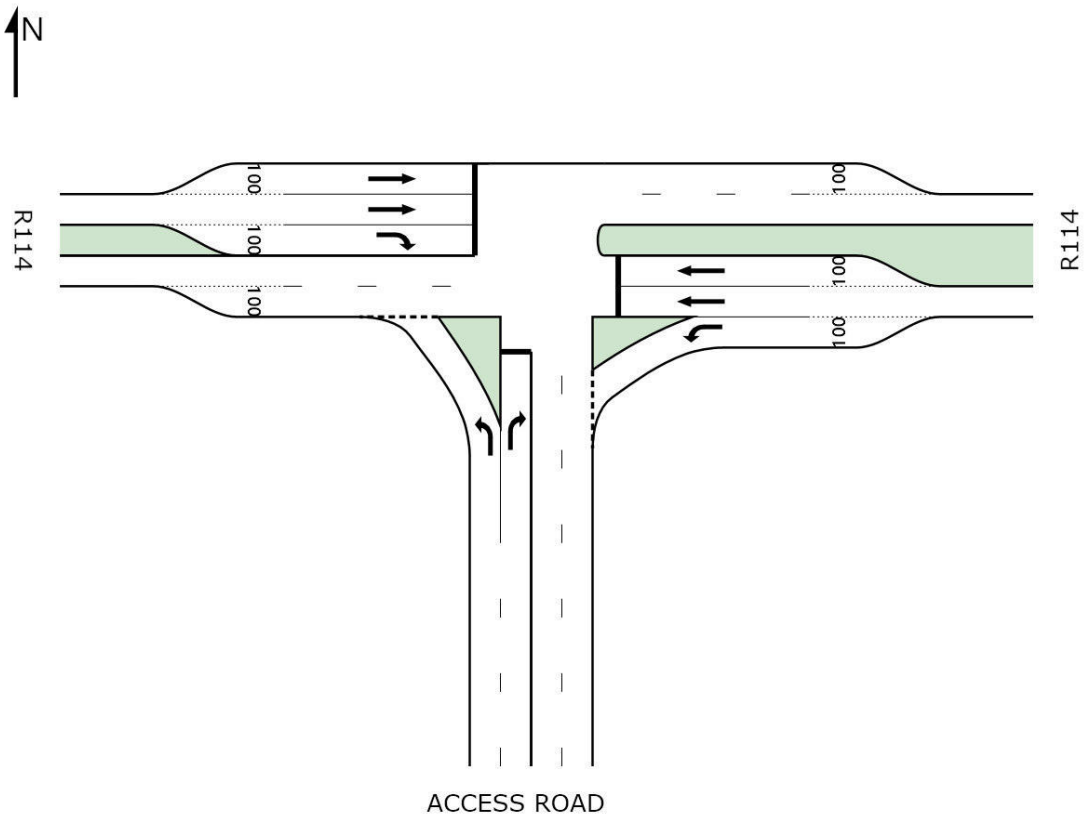
Proposed Signals

Results of Analysis:

Scenario	AM Peak Hour					PM Peak Hour				
	NB	WB	SB	EB	TOTAL	NB	WB	SB	EB	TOTAL
Base 2017 + Development + Signals	C (33.9) {0.74} [31.5]	B (12.6) {0.75} [111.7]		B (13.8) {0.75} [>120]	B (14.6) {0.75} [>120]	B (17.2) {0.46} [57.8]	B (19.4) {0.47} [55.6]		B (15.3) {0.28} [38.2]	B (17.3) {0.47} [57.8]
Future 2021	D (45.6) {0.71} [29.9]	A (4.8) {0.55} [83.1]		A (11.6) {0.72} [50.7]	A (10.3) {0.72} [83.1]	C (21.3) {0.51} [76.1]	B (17.9) {0.49} [64.4]		C (22.0) {0.43} [55.4]	C (20.4) {0.51} [76.1]

Legend	
A	Level of Service
(12.7)	Delay in Seconds
{0.95}	Volume / Capacity
[20]	Longest Average Queue in meters

For the **Base 2017 and Future 2021** scenarios the analysis indicates that the intersection operates with an acceptable LOS during the peak hours analysed if signalised. The proposed layout is illustrated below:



5.5 Concluding Remarks

Based on our site observations, the existing and base traffic volumes shown in the figures, as well as the above capacity analyses, it is concluded that the proposed development traffic will have some impact on the weekday AM and PM peak hour intersection capacities and therefore it is proposed that the R114 and Access Road to the development is signalised.

6 ACCESS REQUIREMENTS

6.1 Access Location

Access to the proposed development will be from a 25m wide road linking from the R114. The access road should have two lanes in and two lanes out.

6.2 Sight Distance & Intersection Spacing

The proposed access road will be located 600m from the R511 and R114 intersection which is in line with the Gautrans spacing requirements.

7 ACCESS TO PUBLIC TRANSPORT

7.1 Background

In terms of the "National Land Transport Act" (NLTA) (Act No.5 of 2009), it is required that an assessment of public transport be included in traffic impact studies. The following comments are relevant.

7.2 Public Transport

The following public transport facilities are recommended:

- ***The implementation of bus and minibus-taxi lay-bys on both sides of the R114 at the Access Road intersection.***

The following is proposed for pedestrians:

- ***Construction of a 1,5m wide sidewalk along the Access Road from the R114.***

8 CONCLUSION

Route 2 – Transport Strategies was appointed to prepare a Traffic Impact Study in support of the development of Portions 105, 109 & 331 Farm Knopjeslaagte Township.

The development is expected to generate 840 peak hour trips during the peak hours. The capacity analysis indicates that the intersection of the R511 and R114 needs to be signalised as a result of background traffic and the intersection of the R114 and Access Road should be signalised with the necessary turning lanes being constructed to Gautrans Standards.

The following is proposed and can be concluded:

- ***Provision of 1,5m wide sidewalk along the Access Road from the R114***.
- ***The access road should have two lanes in and two lanes out.***
- ***The implementation of bus and minibus-taxi lay-bys on both sides of the R114 and Access Road intersection.***
- ***Upgrading of the R511 and R114 intersection with signals, an additional northbound right turning lane, a southbound left turning slip lane and additional westbound turning lanes.***

Figures

Annexure A

OUTPUTS OF aaSIDRA INTERSECTION ANALYSES

LANE SUMMARY

Site: 2016AM1

R511 / R114
Stop (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: R511 FROM N14																
Lane 1	28	399	0	428	5.0	1882	0.227	100	0.6	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	356	69[0]	426	5.0	1872	0.227	100	0.0	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 3	0	0	364	364	5.0	340	1.068	100	113.7	LOS F	25.5	186.2	75	Turn Bay	0.0	49.8
Approach	28	756	433	1217	5.0		1.068		34.2	NA	25.5	186.2				
East: R114																
Lane 1	492	4	136[0]	632	5.0	250	2.525	100	1406.6	LOS F	246.8	1802.0	500	–	0.0	100.0
Lane 2	0	0	82	82	5.0	60[2]	1.365	100	427.4[8]	LOS F[8]	17.0[8]	124.3[8]	50	Turn Bay	0.0	49.9
Approach	492	4	218	714	5.0		2.525		1294.2	LOS F	246.8	1802.0				
North: R511 FROM ERASMIA																
Lane 1	164	499	0	664	5.0	1864	0.356	100	2.1	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	672	0	672	5.0	1889	0.356	100	0.0	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 3	0	0	1	1	5.0	695	0.002	100	11.3	LOS B	0.0	0.0	50	Turn Bay	0.0	0.0
Approach	164	1172	1	1337	5.0		0.356		1.0	NA	0.0	0.0				
West: KOEDOE STREET																
Lane 1	5	18	41	64	5.0	60[2]	1.070	100	253.0	LOS F	9.1	66.1	500	–	0.0	0.0
Approach	5	18	41	64	5.0		1.070		253.0	LOS F	9.1	66.1				
Intersection				3332	5.0		2.525		295.0	NA	246.8	1802.0				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

0 Excess flow from back of an adjacent short lane
2 Minimum Capacity
8 Delay, queue length and stops for the short lane have been cut down to fit in the queuing space. You may wish to change the short lane to a full lane to investigate the effect on the adjacent lane performance.

LANE SUMMARY

Site: 2016PM1

R511 / R114
Stop (Two-Way)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: R511 FROM N14																
Lane 1	16	310	0	326	5.0	1884	0.173	100	0.4	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	327	0	327	5.0	1889	0.173	100	0.0	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 3	0	0	202	202	5.0	872	0.232	100	10.7	LOS B	0.9	6.4	75	Turn Bay	0.0	0.0
Approach	16	637	202	855	5.0		0.232		2.7	NA	0.9	6.4				
East: R114																
Lane 1	207	4	19[0]	231	5.0	696	0.332	100	15.2	LOS C	1.4	10.0	500	–	0.0	0.0
Lane 2	0	0	143	143	5.0	126	1.137	100	216.1	LOS F	17.0	124.3	50	Turn Bay	0.0	49.9
Approach	207	4	162	374	5.0		1.137		92.1	LOS F	17.0	124.3				
North: R511 FROM ERASMIA																
Lane 1	125	153	0	278	5.0	1844	0.151	100	3.8	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 2	0	285	0	285	5.0	1889	0.151	100	0.0	LOS A	0.0	0.0	500	–	0.0	0.0
Lane 3	0	0	1	1	5.0	800	0.001	100	10.5	LOS B	0.0	0.0	50	Turn Bay	0.0	0.0
Approach	125	438	1	564	5.0		0.151		1.9	NA	0.0	0.0				
West: KOEDOE STREET																
Lane 1	1	4	5	11	5.0	123	0.086	100	40.8	LOS E	0.2	1.6	500	–	0.0	0.0
Approach	1	4	5	11	5.0		0.086		40.8	LOS E	0.2	1.6				
Intersection				1803	5.0		1.137		21.2	NA	17.0	124.3				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
SIDRA Standard Delay Model used.

0 Excess flow from back of an adjacent short lane

LANE SUMMARY

Site: 2017AM1_140 000sqm

R511 / R114
Signals - Fixed Time Cycle Time = 70 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: R511 FROM N14																
Lane 1	28	363	0	391	5.0	1129	0.347	100	8.2	LOS A	6.7	49.1	500	–	0.0	0.0
Lane 2	0	393	0	393	5.0	1133	0.347	100	7.6	LOS A	6.8	49.3	500	–	0.0	0.0
Lane 3	0	0	250	250	5.0	512	0.488	61[6]	30.8	LOS C	7.3	53.1	75	Turn Bay	0.0	0.0
Lane 4	0	0	413	413	5.0	512	0.806	100	38.0	LOS D	14.9	108.8	75	Turn Bay	0.0	39.0
Approach	28	756	663	1447	5.0		0.806		20.4	LOS C	14.9	108.8				
East: R114																
Lane 1	632	0	0	632	5.0	1011[1]	0.625	100	13.1	LOS B	7.7	56.0	100	Turn Bay	0.0	0.0
Lane 2	0	4	0	4	5.0	432	0.010	100	22.4	LOS C	0.1	0.8	500	–	0.0	0.0
Lane 3	0	0	295	295	5.0	349	0.845	100	42.1[8]	LOS D[8]	11.2[8]	81.6[8]	50	Turn Bay	0.0	50.0
Approach	632	4	295	931	5.0		0.845		22.3	LOS C	11.2	81.6				
North: R511 FROM ERASMIA																
Lane 1	421	0	0	421	5.0	1095	0.385	100	12.2	LOS B	5.7	41.7	100	Turn Bay	0.0	0.0
Lane 2	0	410	0	410	5.0	486	0.844	100	33.8	LOS C	15.7	114.3	500	–	0.0	0.0
Lane 3	0	410	0	410	5.0	486	0.844	100	33.8	LOS C	15.7	114.3	500	–	0.0	0.0
Lane 4	0	0	1	1	5.0	257	0.004	100	29.0	LOS C	0.0	0.2	50	Turn Bay	0.0	0.0
Approach	421	820	1	1242	5.0		0.844		26.5	LOS C	15.7	114.3				
West: KOEDOE STREET																
Lane 1	5	18	41	64	5.0	373	0.172	100	29.7	LOS C	1.8	13.2	500	–	0.0	0.0
Approach	5	18	41	64	5.0		0.172		29.7	LOS C	1.8	13.2				
Intersection				3684	5.0		0.845		23.1	LOS C	15.7	114.3				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
6 Lane underutilisation due to downstream effects
8 Delay, queue length and stops for the short lane have been cut down to fit in the queuing space. You may wish to change the short lane to a full lane to investigate the effect on the adjacent lane performance.

LANE SUMMARY

Site: 2017PM1_140 000sqm

R511 / R114
Signals - Fixed Time Cycle Time = 70 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: R511 FROM N14																
Lane 1	16	310	0	326	5.0	511	0.637	100	25.3	LOS C	10.1	73.7	500	–	0.0	0.0
Lane 2	0	327	0	327	5.0	513	0.637	100	24.9	LOS C	10.1	73.9	500	–	0.0	0.0
Lane 3	0	0	99	99	5.0	239	0.415	61[6]	36.7	LOS D	3.2	23.2	75	Turn Bay	0.0	0.0
Lane 4	0	0	164	164	5.0	239	0.685	100	40.0	LOS D	5.8	42.2	75	Turn Bay	0.0	0.0
Approach	16	637	263	916	5.0		0.685		29.0	LOS C	10.1	73.9				
East: R114																
Lane 1	526	0	0	526	5.0	1085[1]	0.485	100	10.0	LOS A	5.2	37.8	100	Turn Bay	0.0	0.0
Lane 2	0	4	0	4	5.0	1052	0.004	100	7.2	LOS A	0.1	0.5	500	–	0.0	0.0
Lane 3	0	0	316	316	5.0	488[1]	0.646	100	17.6	LOS B	6.3	45.8	50	Turn Bay	0.0	0.0
Approach	526	4	316	846	5.0		0.646		12.8	LOS B	6.3	45.8				
North: R511 FROM ERASMIA																
Lane 1	168	0	0	168	5.0	1247[1]	0.135	100	8.6	LOS A	0.8	5.5	100	Turn Bay	0.0	0.0
Lane 2	0	219	0	219	5.0	513	0.427	100	23.2	LOS C	6.3	46.1	500	–	0.0	0.0
Lane 3	0	219	0	219	5.0	513	0.427	100	23.2	LOS C	6.3	46.1	500	–	0.0	0.0
Lane 4	0	0	1	1	5.0	172	0.006	100	37.3	LOS D	0.0	0.2	50	Turn Bay	0.0	0.0
Approach	168	438	1	607	5.0		0.427		19.1	LOS B	6.3	46.1				
West: KOEDOE STREET																
Lane 1	1	4	5	11	5.0	899	0.012	100	12.0	LOS B	0.2	1.1	500	–	0.0	0.0
Approach	1	4	5	11	5.0		0.012		12.0	LOS B	0.2	1.1				
Intersection				2380	5.0		0.685		20.7	LOS C	10.1	73.9				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
6 Lane underutilisation due to downstream effects

SIDRA INTERSECTION

LANE SUMMARY

Site: 2021AM1_140 000sqm

R511 / R114
Signals - Fixed Time Cycle Time = 75 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: R511 FROM N14																
Lane 1	28	382	0	410	5.0	1204	0.341	100	7.2	LOS A	6.9	50.1	500	–	0.0	0.0
Lane 2	0	412	0	412	5.0	1209	0.341	100	6.6	LOS A	6.9	50.3	500	–	0.0	0.0
Lane 3	0	0	250	250	5.0	430	0.581	61[6]	35.8	LOS D	8.3	60.8	75	Turn Bay	0.0	0.0
Lane 4	0	0	413	413	5.0	430	0.960	100	44.6[8]	LOS D[8]	16.8[8]	122.4[8]	75	Turn Bay	0.0	50.0
Approach	28	794	663	1485	5.0		0.960		22.3	LOS C	16.8	122.4				
East: R114																
Lane 1	632	0	0	632	5.0	873[1]	0.723	100	18.5	LOS B	10.8	79.0	100	Turn Bay	0.0	0.0
Lane 2	0	4	0	4	5.0	378	0.011	100	25.9	LOS C	0.1	0.9	500	–	0.0	0.0
Lane 3	0	0	295	295	5.0	306	0.964	100	41.4[8]	LOS D[8]	11.3[8]	82.2[8]	50	Turn Bay	0.0	50.7
Approach	632	4	295	931	5.0		0.964		25.8	LOS C	11.3	82.2				
North: R511 FROM ERASMIA																
Lane 1	421	0	0	421	5.0	1168	0.360	100	12.2	LOS B	5.9	42.8	100	Turn Bay	0.0	0.0
Lane 2	0	615	0	615	5.0	655	0.939	100	47.9	LOS D	30.9	225.9	500	–	0.0	0.0
Lane 3	0	615	0	615	5.0	655	0.939	100	47.9	LOS D	30.9	225.9	500	–	0.0	0.0
Lane 4	0	0	1	1	5.0	303	0.003	100	25.2	LOS C	0.0	0.2	50	Turn Bay	0.0	0.0
Approach	421	1230	1	1652	5.0		0.939		38.8	LOS D	30.9	225.9				
West: KOEDOE STREET																
Lane 1	5	18	41	64	5.0	328	0.196	100	33.4	LOS C	2.0	14.7	500	–	0.0	0.0
Approach	5	18	41	64	5.0		0.196		33.4	LOS C	2.0	14.7				
Intersection				4132	5.0		0.964		29.8	LOS C	30.9	225.9				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
6 Lane underutilisation due to downstream effects
8 Delay, queue length and stops for the short lane have been cut down to fit in the queuing space. You may wish to change the short lane to a full lane to investigate the effect on the adjacent lane performance.

LANE SUMMARY

R511 / R114
Signals - Fixed Time Cycle Time = 70 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: R511 FROM N14																
Lane 1	16	374	0	390	5.0	592	0.658	100	23.2	LOS C	11.8	86.1	500	–	0.0	0.0
Lane 2	0	390	0	390	5.0	594	0.658	100	22.9	LOS C	11.8	86.2	500	–	0.0	0.0
Lane 3	0	0	99	99	5.0	253	0.392	61[6]	34.8	LOS C	3.1	22.5	75	Turn Bay	0.0	0.0
Lane 4	0	0	164	164	5.0	253	0.647	100	37.7	LOS D	5.6	40.8	75	Turn Bay	0.0	0.0
Approach	16	764	263	1043	5.0		0.658		26.5	LOS C	11.8	86.2				
East: R114																
Lane 1	526	0	0	526	5.0	1054[1]	0.499	100	10.4	LOS B	5.9	42.8	100	Turn Bay	0.0	0.0
Lane 2	0	4	0	4	5.0	971	0.004	100	8.7	LOS A	0.1	0.5	500	–	0.0	0.0
Lane 3	0	0	316	316	5.0	459[1]	0.689	100	20.9	LOS C	7.2	52.9	50	Turn Bay	0.0	10.1
Approach	526	4	316	846	5.0		0.689		14.3	LOS B	7.2	52.9				
North: R511 FROM ERASMIA																
Lane 1	168	0	0	168	5.0	1259[1]	0.134	100	8.6	LOS A	0.8	5.5	100	Turn Bay	0.0	0.0
Lane 2	0	263	0	263	5.0	594	0.443	100	21.0	LOS C	7.3	53.2	500	–	0.0	0.0
Lane 3	0	263	0	263	5.0	594	0.443	100	21.0	LOS C	7.3	53.2	500	–	0.0	0.0
Lane 4	0	0	1	1	5.0	175	0.006	100	36.4	LOS D	0.0	0.2	50	Turn Bay	0.0	0.0
Approach	168	525	1	695	5.0		0.443		18.0	LOS B	7.3	53.2				
West: KOEDOE STREET																
Lane 1	1	4	5	11	5.0	831	0.013	100	13.5	LOS B	0.2	1.3	500	–	0.0	0.0
Approach	1	4	5	11	5.0		0.013		13.5	LOS B	0.2	1.3				
Intersection				2595	5.0		0.689		20.2	LOS C	11.8	86.2				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
6 Lane underutilisation due to downstream effects

LANE SUMMARY

Site: 2017AM2 - 140 000sqm_less lanes

R114 / ACCESS ROAD
Signals - Fixed Time Cycle Time = 105 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: ACCESS ROAD																
Lane 1	105	0	0	105	10.0	785	0.134	100	10.6	LOS B	1.2	9.1	500	–	0.0	0.0
Lane 2	0	0	74	74	10.0	99	0.744	100	67.3	LOS E	4.1	31.5	500	–	0.0	0.0
Approach	105	0	74	179	10.0		0.744		33.9	LOS C	4.1	31.5				
East: R114																
Lane 1	284	0	0	284	10.0	991[1]	0.287	100	9.2	LOS A	2.1	16.2	100	Turn Bay	0.0	0.0
Lane 2	0	458	0	458	10.0	1099	0.417	56[6]	11.9	LOS B	12.4	93.9	500	–	0.0	0.0
Lane 3	0	505	0	505	10.0	672[1]	0.751	100	15.1	LOS B	14.7	111.7	100	Turn Bay	0.0	15.0
Approach	284	963	0	1247	10.0		0.751		12.6	LOS B	14.7	111.7				
West: R114																
Lane 1	0	182	0	182	10.0	1059[1]	0.172	56[6]	1.8	LOS A	1.7	13.2	100	Turn Bay	0.0	0.0
Lane 2	0	470	0	470	10.0	1517	0.310	100	2.2	LOS A	5.4	41.3	500	–	0.0	0.0
Lane 3	0	0	426	426	10.0	566	0.753	100	31.6	LOS C	18.9	143.8	100	Turn Bay	0.0	38.2
Approach	0	653	426	1079	10.0		0.753		13.8	LOS B	18.9	143.8				
Intersection				2505	10.0		0.753		14.6	LOS B	18.9	143.8				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
6 Lane underutilisation due to downstream effects

LANE SUMMARY

R114 / ACCESS ROAD
Signals - Fixed Time Cycle Time = 70 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: ACCESS ROAD																
Lane 1	426	0	0	426	10.0	1156	0.369	100	10.4	LOS B	4.2	31.8	500	–	0.0	0.0
Lane 2	0	0	284	284	10.0	619	0.459	100	27.3	LOS C	7.6	57.8	500	–	0.0	0.0
Approach	426	0	284	711	10.0		0.459		17.2	LOS B	7.6	57.8				
East: R114																
Lane 1	74	0	0	74	10.0	1333[1]	0.055	100	8.5	LOS A	0.3	2.0	100	Turn Bay	0.0	0.0
Lane 2	0	143	0	143	10.0	549	0.260	56[6]	20.4	LOS C	3.8	28.6	500	–	0.0	0.0
Lane 3	0	257	0	257	10.0	549	0.468	100	22.0	LOS C	7.3	55.6	100	Turn Bay	0.0	0.0
Approach	74	400	0	474	10.0		0.468		19.4	LOS B	7.3	55.6				
West: R114																
Lane 1	0	112	0	112	10.0	722[1]	0.155	56[6]	11.2	LOS B	2.1	16.3	100	Turn Bay	0.0	0.0
Lane 2	0	241	0	241	10.0	863	0.279	100	12.2	LOS B	5.0	38.2	500	–	0.0	0.0
Lane 3	0	0	105	105	10.0	386	0.272	100	26.9	LOS C	2.7	20.4	100	Turn Bay	0.0	0.0
Approach	0	353	105	458	10.0		0.279		15.3	LOS B	5.0	38.2				
Intersection				1642	10.0		0.468		17.3	LOS B	7.6	57.8				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
6 Lane underutilisation due to downstream effects

LANE SUMMARY

R114 / ACCESS ROAD
Signals - Fixed Time Cycle Time = 70 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: ACCESS ROAD																
Lane 1	105	0	0	105	10.0	149	0.709	100	46.6	LOS D	3.9	29.9	500	–	0.0	0.0
Lane 2	0	0	74	74	10.0	149	0.496	70[5]	44.1	LOS D	2.6	19.9	500	–	0.0	0.0
Approach	105	0	74	179	10.0		0.709		45.6	LOS D	3.9	29.9				
East: R114																
Lane 1	284	0	0	284	10.0	1005[1]	0.283	100	8.9	LOS A	1.4	10.9	100	Turn Bay	0.0	0.0
Lane 2	0	413	0	413	10.0	1360	0.303	56[6]	3.2	LOS A	4.6	35.3	500	–	0.0	0.0
Lane 3	0	743	0	743	10.0	1360	0.546	100	4.2	LOS A	10.9	83.1	500	–	0.0	0.0
Approach	284	1156	0	1440	10.0		0.546		4.8	LOS A	10.9	83.1				
West: R114																
Lane 1	0	280	0	280	10.0	1360	0.206	56[6]	2.9	LOS A	2.9	21.8	500	–	0.0	0.0
Lane 2	0	503	0	503	10.0	1360	0.370	100	3.4	LOS A	6.1	46.0	500	–	0.0	0.0
Lane 3	0	0	213	213	10.0	295	0.723	100	26.8	LOS C	6.7	50.7	100	Turn Bay	0.0	0.0
Lane 4	0	0	213	213	10.0	295	0.723	100	26.8	LOS C	6.7	50.7	100	Turn Bay	0.0	0.0
Approach	0	783	426	1209	10.0		0.723		11.6	LOS B	6.7	50.7				
Intersection				2828	10.0		0.723		10.3	LOS B	10.9	83.1				

Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
5 Lane underutilisation determined by program
6 Lane underutilisation due to downstream effects

SIDRA INTERSECTION

LANE SUMMARY

R114 / ACCESS ROAD
Signals - Fixed Time Cycle Time = 70 seconds (Optimum Cycle Time - Minimum Delay)

Lane Use and Performance

	Demand Flows L veh/h	T veh/h	R veh/h	Total veh/h	HV %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance m	Lane Length m	SL Type	Cap. Adj. %	Prob. Block. %
South: ACCESS ROAD																
Lane 1	426	0	0	426	10.0	842	0.506	100	21.9	LOS C	10.0	76.1	500	–	0.0	0.0
Lane 2	0	0	284	284	10.0	842	0.338	67[5]	20.3	LOS C	6.0	45.6	500	–	0.0	0.0
Approach	426	0	284	711	10.0		0.506		21.3	LOS C	10.0	76.1				
East: R114																
Lane 1	74	0	0	74	10.0	1350[1]	0.055	100	8.4	LOS A	0.2	1.7	100	Turn Bay	0.0	0.0
Lane 2	0	171	0	171	10.0	628	0.273	56[6]	18.2	LOS B	4.3	32.7	500	–	0.0	0.0
Lane 3	0	309	0	309	10.0	628	0.492	100	19.9	LOS B	8.5	64.4	500	–	0.0	0.0
Approach	74	480	0	554	10.0		0.492		17.9	LOS B	8.5	64.4				
West: R114																
Lane 1	0	151	0	151	10.0	628	0.241	56[6]	17.9	LOS B	3.7	28.4	500	–	0.0	0.0
Lane 2	0	272	0	272	10.0	628	0.433	100	19.4	LOS B	7.3	55.4	500	–	0.0	0.0
Lane 3	0	0	53	53	10.0	248	0.213	100	34.2	LOS C	1.6	11.8	100	Turn Bay	0.0	0.0
Lane 4	0	0	53	53	10.0	248	0.213	100	34.2	LOS C	1.6	11.8	100	Turn Bay	0.0	0.0
Approach	0	423	105	528	10.0		0.433		22.0	LOS C	7.3	55.4				
Intersection				1793	10.0		0.506		20.4	LOS C	10.0	76.1				

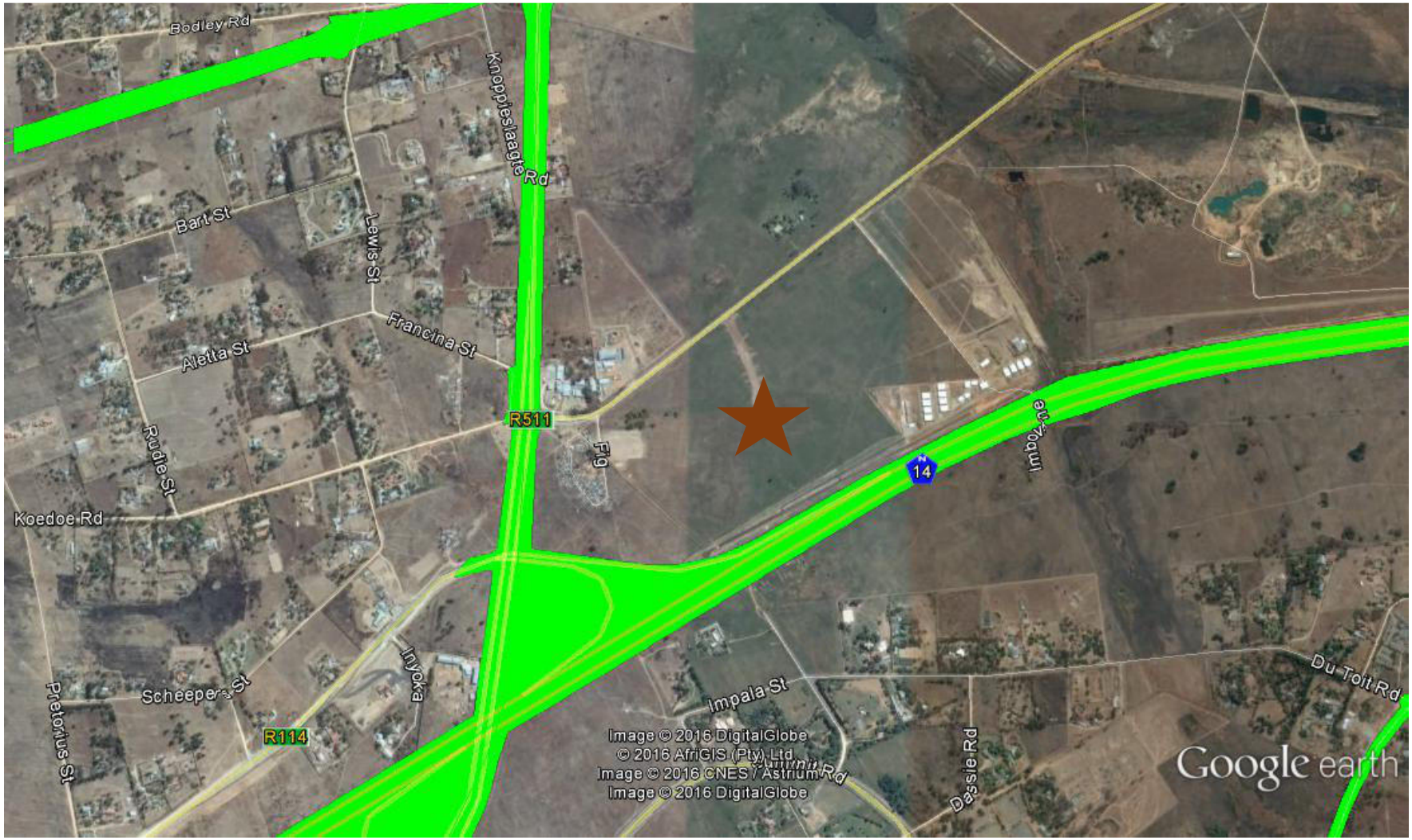
Level of Service (LOS) Method: Delay (HCM 2000).
Lane LOS values are based on average delay per lane.
Intersection and Approach LOS values are based on average delay for all lanes.
SIDRA Standard Delay Model used.

1 Reduced capacity due to a short lane effect
5 Lane underutilisation determined by program
6 Lane underutilisation due to downstream effects

SIDRA INTERSECTION

Annexure B

AERIAL PHOTO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Knoppieslaagte Rd
Bart St
Lewis St
Francina St
Aletta St
R511
Rudie St
Koedoe Rd
Fig
14
Impala St
Du Toit Rd
Dessie Rd
Pretorius St
Scheepers St
R114
Inyoka
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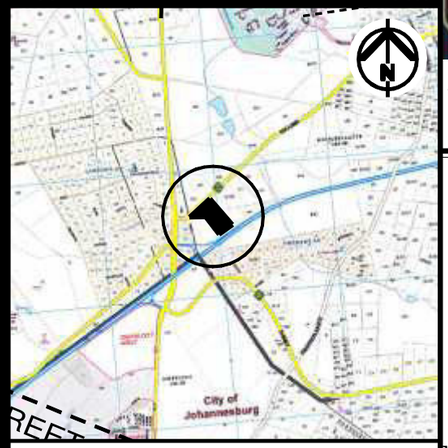
Image © 2016 DigitalGlobe
Google earth

Annexure C

PROPOSED SITE LAYOUT

PROPOSED TOWNSHIP: PEACH TREE EXTENSION 23

LOCALITY MAP 1:20 000



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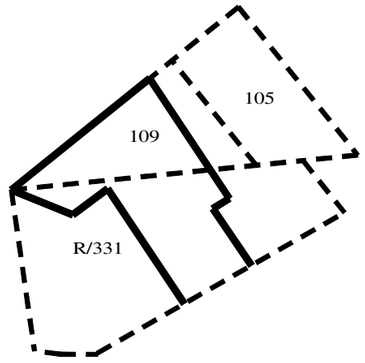
0105

GEOTECHNICAL ZONES



THIS IS TO CERTIFY THAT THE TOWNSHIP LAYOUT ON THE PLAN IS IN ACCORDANCE WITH THE PROVISIONS AND RECOMMENDATIONS AS SET OUT IN THE GEOTECHNICAL INVESTIGATION FOR THE PROPOSED TOWNSHIP.

GEOTECHNICAL ZONES:

ZONE	DESCRIPTION
P-C2-S2	THE ENTIRE SITE IS ZONED - NHBRC ZONE P(FILL)-C2-S2

FLOOD LINE CERTIFICATION

1 : 50 AND 1 : 100 YEAR FLOODS

I HEREBY CERTIFY THAT IN TERMS OF SECTION 144 OF THE NATIONAL WATER ACT, ACT OF 1996, IT IS HEREBY CERTIFIED THAT THE TOWNSHIP IS NOT SUBJECT TO A FLOOD WITH AN EXPECTED FREQUENCY OF 1 : 50 YEARS AND 1 : 100 YEARS.

GENERAL NOTE:

1. CONTOURS: SUPPLIED BY ISAZI SURVEYS LAND SURVEYORS.
   1,00m INTERVALS
   DATUM: SEA LEVEL
   SYSTEM WGS
   THE CONTOURS ARE IN ACCORDANCE WITH REGULATION 18(1) OF THE TOWN-PLANNING AND TOWNSHIPS ORDINANCE, 1986
2. ALL DIMENSIONS AND AREAS ARE APPROXIMATE PENDING FINAL SURVEY.
3. PROPOSED PHASES SUBJECT TO CHANGE.
4. REPRESENTS A GEOTECHNICAL ZONE LINE.
5. REPRESENTS A LINE OF NO ACCESS.
6. REPRESENTS THE RELEVANT BUILDING LINES.

SERVITUDE NOTE:

1. EXISTING SERVITUDES TO BE INCORPORATED IN THE DESIGN OF THE TOWNSHIP.
2. PROPOSED 5m WIDE WATER SERVITUDE OVER ERVEN 9 AND 10.
3. PROPOSED ROW SERVITUDE OVER ERVEN 9 AND 10.

PLAN No: PEACH TREE X23/1 **DATE:** AUG 2016

LAND USE

USE ZONE	ERF NUMBERS	TOT. NO. OF ERVEN	MIN. ERF SIZE (m²)	AVERAGE	TOTAL AREA (Ha)	
"INDUSTRIAL 2" FOR BUSINESS BUILDINGS, COMMERCIAL USE, LIGHT INDUSTRY, CAFETERIA, CAR WASH, PLACE OF REFRESHMENT, PARKING GARAGE, RETAIL INDUSTRY AND SHOPS.	1 - 7	7	N/A	N/A	10,8900	92,52
"SPECIAL" FOR ACCESS AND ACCESS CONTROL	8, 9	2	N/A	N/A	0,8800	7,48
EXISTING STREETS AND WIDENING	N/A	N/A	N/A	N/A	N/A	N/A
	TOTAL	9			11,7700	100,00

SITUATED ON PART OF PORTION 109 AND REM/331 OF THE FARM KNOPJESLAAGTE 385-JR.
REPRESENTED BY THE FIGURE A-B-C-D-E-F-G-H-J-K-L-M-N-O-P-Q-R-S-A

CITY OF TSHWANE METROPOLITAN MUNICIPALITY, GAUTENG

PORTION 107
KNOPJESLAAGTE 385-JR

PORTION 106
KNOPJESLAAGTE 385-JR

PORTION 11
KNOPJESLAAGTE

PEACH TREE X21

PEACH TREE X22

PEACH TREE X24

PORTION 105
KNOPJESLAAGTE 385-JR

PORTION 914

PORTION 109
KNOPJESLAAGTE 385-JR

R/PORTION 331
KNOPJESLAAGTE 385-JR

REM/PTN 22
KNOPJESLAAGTE 385-JR

M34 KRUGERSDORP PRETORIA ROAD

N14-HIGHWAY (P158/2)

PROPOSED 25m STREET

PROPOSED 20m STREET

16m BUILDING LINE

5m WIDE R.O.W SERVITUDE

5m WIDE WATER PIPELINE SERVITUDE S.G.No. 1094/6/2007

20m R.O.W SERVITUDE (FUTURE ROAD)

30m BUILDING LINE

20m BUILDING LINE

1 1,9485 Ha
2 1,7940 Ha
3 1,3350 Ha
4 1,1090Ha
5 1,0770 Ha
6 1,7915 Ha
7 1,8265 Ha
8 0,4760 Ha
9 0,4000 Ha

A B C D E F G H J K L M N O P Q R S

X 2866500 X 2866800 X 2867100
Y 97200 Y 96900 Y 96600 Y 96300 Y 96000 Y 95900

N
SCALE 1 : 3000
0 20 40 60 100m