



PROPOSED RESIDENTIAL DEVELOPMENT ON
ERF 3122
HARTENBOS HEUWELS
IN THE MOSSEL BAY LOCAL MUNICIPALITY,
EDEN DISTRICT MUNICIPALITY IN THE
WESTERN CAPE PROVINCE



TRAFFIC IMPACT ASSESSMENT REPORT FOR THE
ENVIRONMENTAL IMPACT ASSESSMENT

PROJECT NO: JOI 13/627-1
DECEMBER 2015

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1. SCOPE

ATKV, the owners of Erf 3122 Hartenbos Heuwels in Mossel Bay intend to apply for township establishment on the property for residential dwelling units, as well as ancillary social, recreational and business facilities. The development is known as Heidebos.

Tech IQ Consulting Engineers has been appointed to undertake a traffic impact assessment as part of an application for environmental authorization.

The report includes the following:

- Property description and land use
- Transportation system
- Traffic analysis
- Traffic impact and site traffic assessment
- Conclusion and recommendation.

2. PROPERTY DESCRIPTION AND LAND USE

2.1 *Property*

The proposed Heidebos development is situated on Erf 3122 Hartenbos Heuwels in Mossel Bay.

2.2 *Locality*

Heidebos is located approximately eight kilometres north of the Mossel Bay CBD on the plateau approximately 1.5 km to the west of the N2 national road as illustrated on Figure 1.

2.3 *Topography*

Development of the property and access to the existing municipal road network is constrained, not only by sensitive flora, but also the hilly topography traversed by access roads to the development. Existing gravel roads along the watershed forms the backbone of the proposed township layout.

2.4 *Township Layout*

The proposed township is 60.5061 ha in extent and layout Option 3 is shown on Figure 2. The layout is an evolution of the original township concept and includes refinements and improvements based, inter alia, on comments from a traffic engineering point of view.

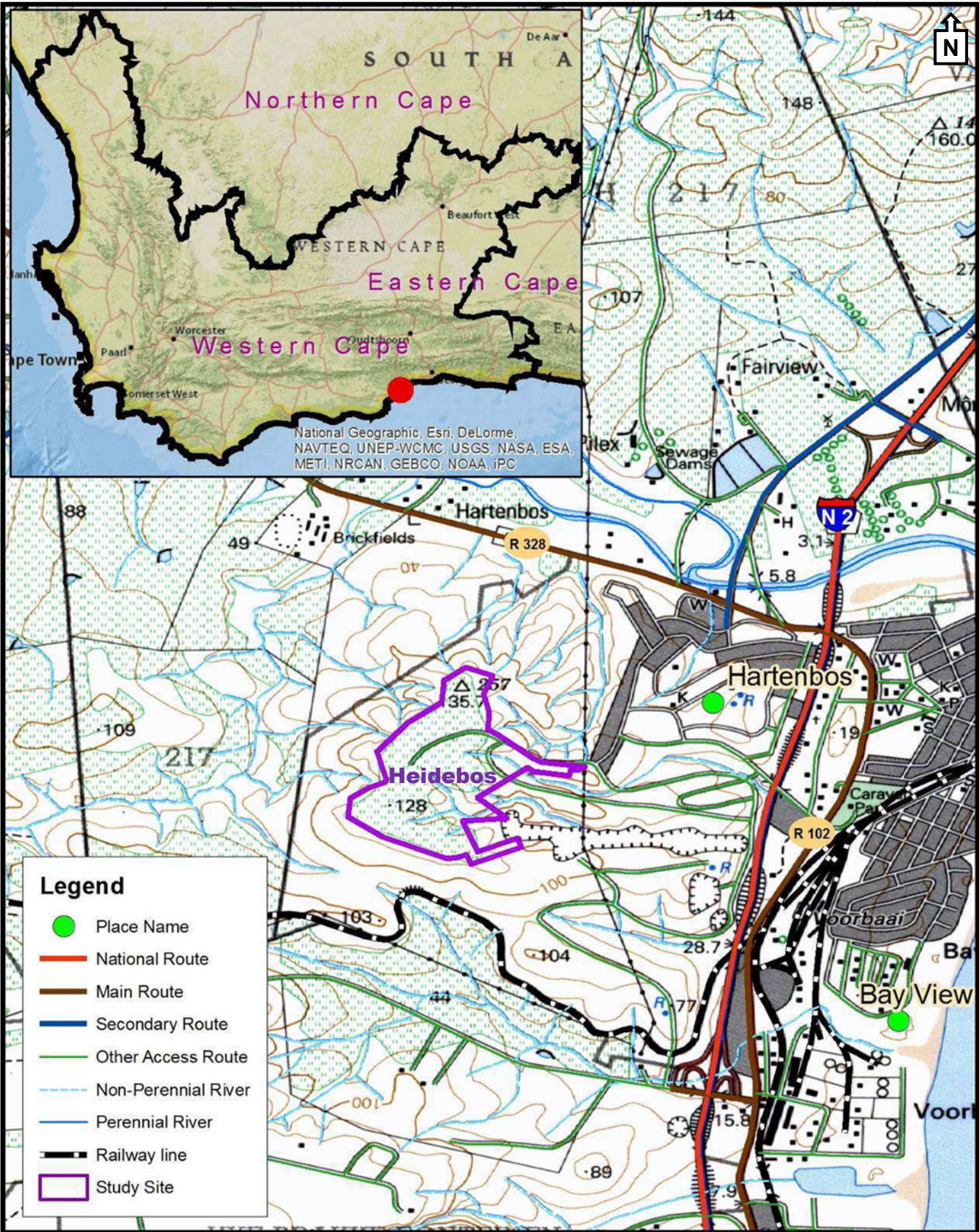
2.5 *Historical Use*

The land was previously utilised as agricultural land and is currently vacant as far as traffic impact is concerned.

2.6 *Land Use Budget*

The land use budget of the proposed Heidebos development can be summarised as follows:

USE ZONE	ERVEN	% OF AREA	EXTENT OF DEVELOPMENT
Single residential	153	20	153 dwelling units
Retirement village (special zone)	131	8	131 dwelling units
Institution: Retirement centre, club house, recreational and sporting facilities, residential buildings, frail care centre and ancillary facilities	3	5	11502m ² floor are, including: <ul style="list-style-type: none"> • 144 bed nurses accommodation • 2876m² medical centre / clinic • 240 frail care beds
Local business	1	1	2632m ² GLA convenience centre
Local government	1	1	Reservoir
Streets	NA	12	71686m ² public and private streets
Open space	7	1	3651m ² private open space
Conservation	7	52	314560m ² conservation



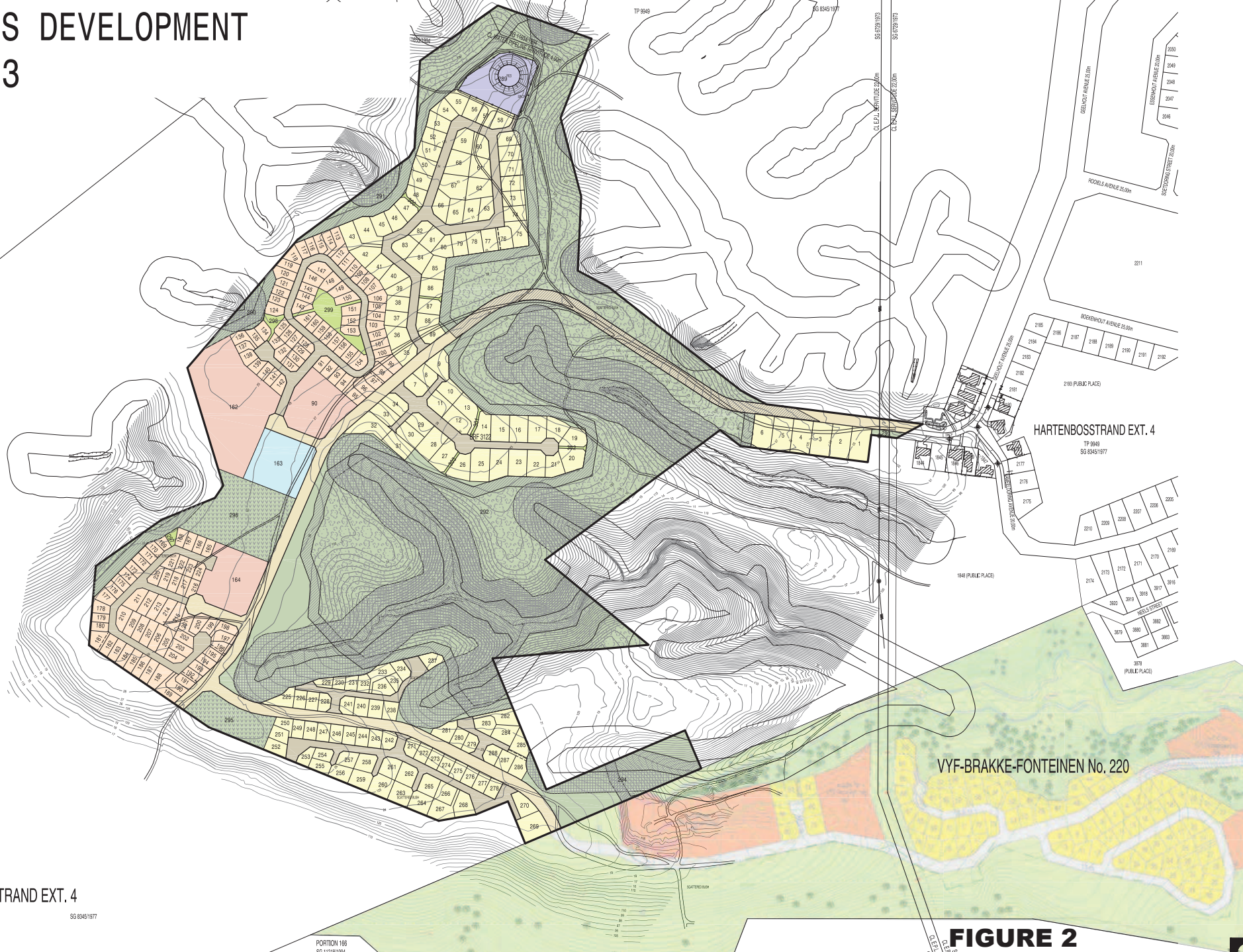
OBTAINED FROM WETLAND ASSESSMENT PREPARED BY STRATEGIC ENVIRONMENTAL FOCUS (SEF) (REF 504632)

NOT TO SCALE

HEIDEBOS DEVELOPMENT OPTION 3

REMAINDER
SG 3601983

HARTENBOSSTRAND EXT. 4
TP 9949
SG 6345/1977



HARTENBOSSTRAND EXT. 4
TP 9949
SG 6345/1977

VYF-BRAKKE-FONTEINEN No. 220

FIGURE 2

3. TRANSPORTATION SYSTEM

3.1 Road Network

Mossel Bay Municipality is served by a comprehensive hierarchy of roads and has recently revised its Road Master Plan (RMP). The Road Master Plan for the study area is illustrated on Figure 3.

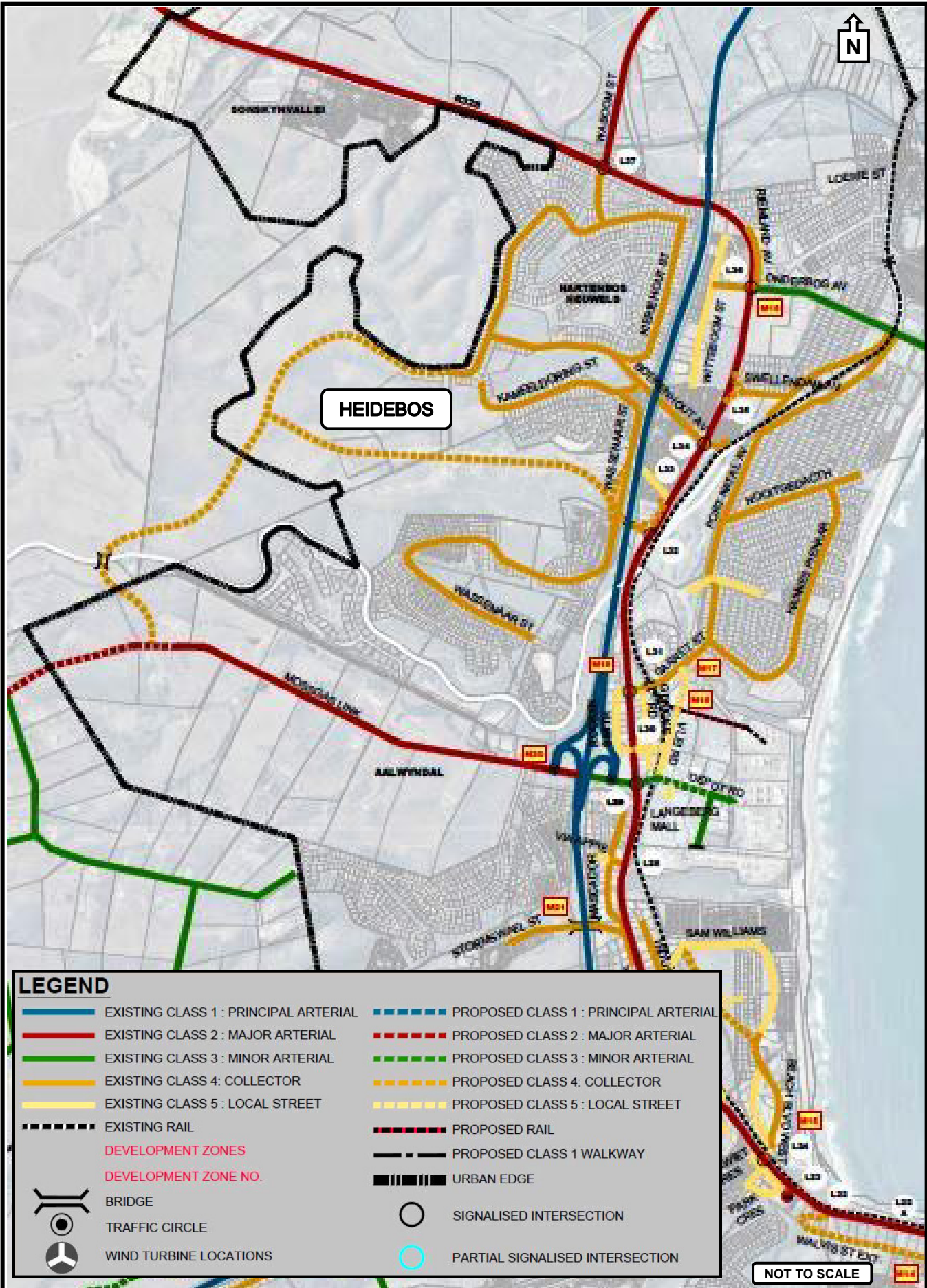
The following hierarchy of roads is proposed:

CLASSIFICATION	DESCRIPTION
Class 1 Principal arterial	N2 national road in a north-south orientation parallel to the beach. The closest interchange is interchange 393 Hartenbos (R102), approximately 2.5 km south-east of the site (as the crow flies).
Class 2 Major arterial	R102 Louis Fourie Avenue parallel to N2, linking Hartenbos with the CBD (south) and with R328 to Oudshoorn (north). Mossgas link. Provides access to N2 and to be extended in future to the R327. Waboom Street. Arterial route north-eastward along the coast to Klein Brak, Reebok and Groot Brak.
Class 3 Minor arterial	Onderbos Avenue / Kaapse Goede Hoop Avenue provides access to Hartenbos Resort.
Class 4 Collector (limited to area west of R102)	Boekenhout Avenue / Kameeldoring Street: alternative access options to Louis Fourie Avenue. Waboom Street / Geelhout Avenue: access to R328 and Waboom Street (to N2 to George). Wassenaar Street. Alternative access to the southern portion of the site via Vyfbrakkefontein No 220 (proposed Class 4 collector road). Proposed southern access to Mossgas link (will require new rail bridge).

A reasonable level of access control has been exercised along the Class 2 major arterial roads, but along the Class 4 collector roads that provide access to the proposed township, direct access to individual dwellings has been allowed; therefore the increase in through traffic should not exceed the environmental capacity of Class 4 roads.

The proposed township is located in an isolated area close to the urban edge and traffic volumes can be expected to be very low. In the proposed layout direct access to individual properties has been avoided as far as possible to mitigate the conflict between local traffic and external through traffic.

No external through traffic is expected as long as the rail crossing and link road to the Class 2 major arterial Mossgas link is not available. The proposed future connection will create a north-south link approximately 1.7 km west of the N2 and will therefore provide a distance saving in the long term future when the area to the south-west has been developed.



These areas are outside the urban edge; therefore as long as the urban edge is maintained, through traffic is not considered to pose a significant negative impact. When the extension of the urban edge is considered in future, mitigation measures will have to be implemented by the Municipality to avoid rat-running along collector roads within the residential area.

3.2 Municipal Transport Projects

i. Louis Fourie Corridor Management Plan

- L32. New Wassenaar underbridge to TR33/1 link connecting to Hartenzicht Street
- L33. Direct access to Louis Fourie Avenue restricted to left-in-left-out operation
- L34. Upgrade Boekenhout Avenue four-way intersection with additional left and right turn lanes
- L35. Extend Swellendam Road to Witteboom Street with median break and right turn protection lanes
- L36. Upgrade four-way intersection with dedicated left and right turn lanes
- L37. Signalise Waboom Street intersection with dedicated left and right turn lanes.

ii. Supporting municipal road upgrades

- M17. Upgrade sub-way to allow two-way vehicle travel
- M18. Close Riemland Avenue at Onderbos Avenue and restrict filling station access to left-in-left-out operation
- M19 Rookan-Smith Street. Provide a painted junction to prevent blocking of intersection with Lofty Nel Street.

The above planning initiatives of the Municipality will ensure efficient and convenient access to the proposed Heidebos development from the municipal arterial road network.

3.3 Public Transport

The area is currently vacant and fenced and there is no need for public transport. Residents, visitors and employees can be expected to create a demand for a range of public transport options that include minibus taxi services, shuttle services arranged by the retirement facilities and meter taxis.

The proposed road network can accommodate these public transport services. The frequency of use is not expected to justify any public transport ranks, but it is recommended that all business or multiple residential developments should provide appropriate facilities for public transport passengers and vehicles. This may include drop-off and pick-up facilities at residential developments and a few taxi bays at the business centre and clinic / medical centre.

3.4 Non-Motorised Traffic

The township has a strong open space and conservation component and it is recommended that continuous routes be provided for pedestrians and bicycles.

3.5 Universal Access

All facilities must comply with the requirements of SANS 10400 Part S, Universal Access for persons with disabilities and special needs such as the elderly or mothers with small children. This requirement includes all public transport facilities.

3.6 Design Standards

During a meeting with Mr Pieter Myburgh Pr Eng (Head Operational Manager: Roads and Stormwater) of the Mossel Bay Local Municipality, he indicated that the Municipality applies the Red Book (*Guidelines for the provision of engineering services and amenities in residential township development*) published by the CSIR in the planning and design of municipal road infrastructure.

The Guidelines provide for the following:

i. Desirable maximum environmental capacity

Class 4 Local distributor	400-1500 du	1500 passenger car units / hour (peak hour)
Class 5a Access collector	200-400 du	400 passenger car units / hour (peak hour)
Class 5b Residential access loop (2 lane)	120 du	120 passenger car units / hour (peak hour)

ii. Practical capacity of two lane roads with two-way traffic: pcu / hour (both directions of travel combined)

ROAD CONDITIONS	WIDTH BETWEEN KERBS		
	6.1m	6.7m	7.4m
All purpose road, no frontage access, no standing vehicles and little cross traffic	1200	1350	1500
All purpose road with large capacity junctions and 'no stopping' restrictions (Comment: Local distributor falls within this range because of restrictions on fronting access)	800	1000	1200
All purpose road with capacity restricted by junctions, cross-traffic and stationary vehicle	300 - 500	450-600	600-750

iii. Suggested roadway width

Single carriageway bus routes	6.0 - 7.4m
Access collectors	5.0 - 6.0m
Access streets	2.5m to 5.0m (depending on car ownership, drainage and number of dwelling units served)

Note that roadways of narrow roads should be widened on curves.

iv. *Design speed*

ROAD CLASS	DESIGN SPEED (km / h)	DESIRED MAXIMUM SPEED (km / h)
Class 4 Local distributor	50	60
Class 5a Residential access collector	-	40
Class 5b Residential access loop	-	30

v. *Centre line radius*

Class 4 (6.8m wide, 4% super-elevation, no curve widening)	150m
Class 4 (6.8m wide, 4% super-elevation, 1.1m widening on curve)	90m
Class 5 Residential access collector *	15m **
Class 5b Residential access loop	10m **

* Widening on curves may be required

** Minimum radius with deflection angle less than 60° = 30m on all Class 5 roads

vi. *Road gradients*

ROAD CLASS	MINIMUM GRADIENT	FAVOURED MAXIMUM GRADIENT	MAXIMUM GRADE (LENGTH)
Class 4 Local distributor	0.4%	7%	10 (100m)
Class 5a Residential access collector	0.4%	10%	12.5 (70m)
Class 5b Residential access loop	0.4%	12%	16% (50m)
Class 5c Access at cul-de-sac	0.4%	10%	12% (50m)

The above gradients can comfortably be achieved in the Heidebos development.

vii. *Intersection spacing*

(This section is based on the Draft TRH26, *South African Road Classification and Access Management Manual*, Version 1.0, August 2012).

Recommended minimum spacing on the local residential road network with priority control or roundabouts is tabulated below.

Class 4a residential local collector	150-250m
Class 5b Residential access street *	75-150m

* Should not be confused with Red Book Class 5b Residential access loop

Auxiliary lanes are not required and street parking should not be allowed on Class 4b residential collector roads.

In view of the above spacing requirement, access to individual properties on Class 4b roads is normally limited to cluster-type developments.

Along Class 4 roads in the Hartenbos Heuwels area access is typically allowed to individual residential dwelling houses.

4. TRAFFIC ANALYSIS

4.1 Traffic Characteristics

A comprehensive traffic impact study will form part of the future township application. The current traffic analysis is based on a knowledge of the traffic demand in Hartenbos, based on the Traffic Impact Assessment undertaken for the ATKV regarding the re-development of the Strandoord Centre in Hartenbos, (Project No J013/627/2, September 2013).

A particular characteristic of traffic in Mossel Bay is the very high December holiday season peak demand versus the low to moderate traffic volumes during off-peak periods, especially in the impact area of the proposed development.

The nature of the proposed development is that it will primarily be occupied by permanent residents without a significant December peak. Furthermore, retirement facilities have a low traffic demand during daily peak hours and hence a low to moderate traffic impact can be expected.

Ancillary facilities such as the clinic / medical care and convenience centre will be focused on residents of the surrounding area and do not have sufficient size to attract visitors from areas further away.

4.2 Current Traffic Demand

During the site visit, it was observed that traffic volumes on local streets, even the Class 4 collector roads are very low. Capacity considerations are not expected to play any significant role in the planning of the local street network and the nominal design standards applied by the Mossel Bay Local Municipality are considered to be adequate.

On the other hand, Louis Fourie Avenue (R102) experiences very high traffic volumes during the peak holiday season and observed traffic volumes during December 2012 will be used as an indication of the expected traffic demand at the access points to the proposed development from the Class 2 major road network.

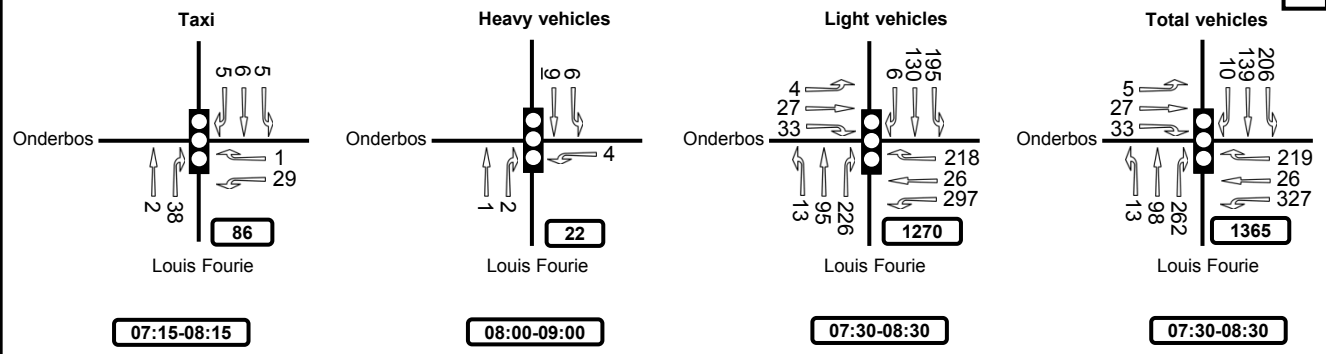
Traffic counts at the intersection of Louis Fourie Avenue and Onderbos Avenue are illustrated on Figure 4.

Salient aspects of the traffic observations include the following:

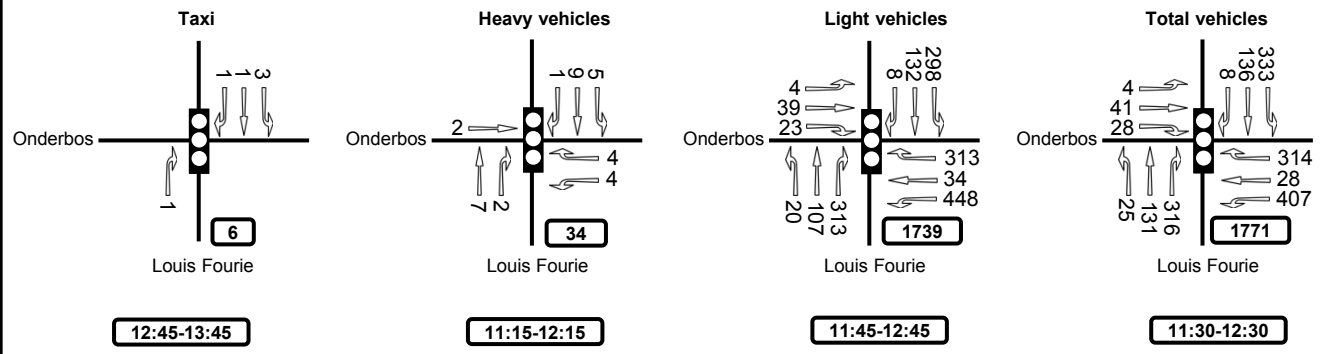
- The major minibus taxi movement is between the CBD and Hartenbos
- Minibus taxi operations are very active during the AM peak with lower volumes during the rest of the day
- Some minibus taxis operate in the residential area during off-peak periods
- The dominant freight movements are along Louis Fourie Avenue and between the CBD and Hartenbos
- Very few heavy vehicles enter the residential area



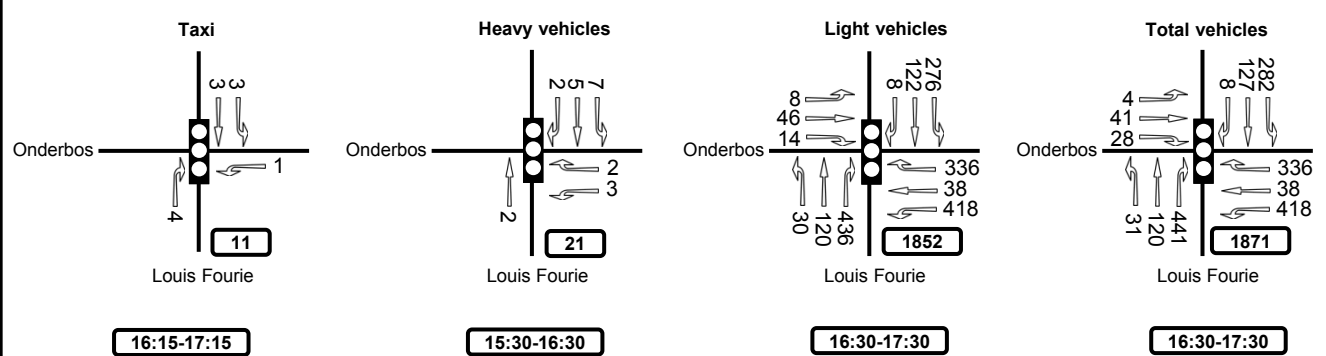
AM PEAK HOUR



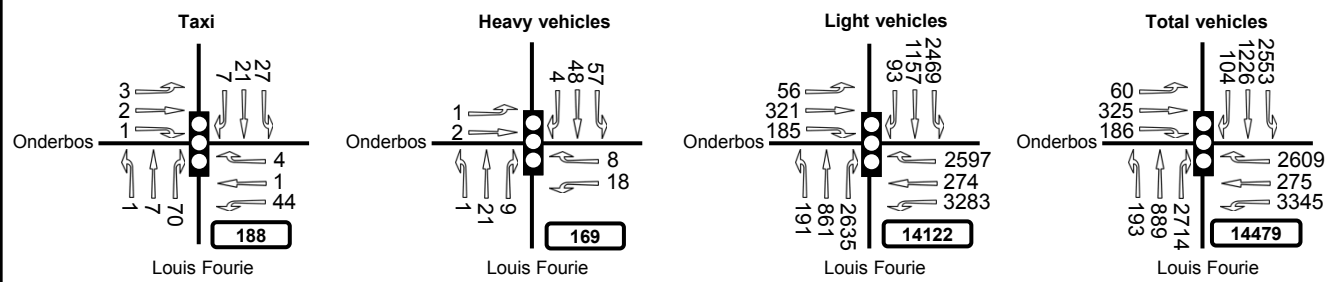
MIDDAY PEAK HOUR



PM PEAK HOUR



9.5 HOUR TRAFFIC



NOT TO SCALE



PROPOSED RESIDENTIAL DEVELOPMENT ON ERF 3122 HARTENBOS HEUWELS

Traffic counts: 19 December 2014

FIGURE 4

- Peak heavy vehicle demand during the AM occurs after the peak hour on the road network
- Light vehicles (excluding minibus taxis) represent the highest proportion (97.5%) of all vehicles. If minibus taxis are included, the percentage light vehicles increases to 98.8%
- Traffic volumes to and from the residential area.

The daily traffic volumes indicate the following trip distribution:

Hartenbos east of Louis Fourie Avenue	52%
Louis Fourie Avenue north	15%
Louis Fourie Avenue south	33%

- During the holiday period, the strongest traffic movement is between the CBD and Hartenbos (42%), followed by the movement between the R102 north and Hartenbos (36%) and lastly north-south traffic along R102 (Louis Fourie Avenue) (14%) and other traffic (8%).

4.3 Trip Generation

Trip generation rates published in TMH17, *South African Trip Data Manual*, as well as the ITE *Trip Generation* document (7th Edition, 2003) were applied in the trip generation calculations.

HEIDEBOS DEVELOPMENT: TRIP GENERATION RATES								
CODE	LAND USE	UNIT	PERIOD	RATE	SPLIT (IN:OUT)	REDUCTION *		NETT RATE
						MIX-USE	LVO	
210	Single residential du	1 du	AM	1.00	25:75	0 (10%)	0 (40%)	1.00
			PM	1.00	70:30	0 (10%)	0 (40%)	1.00
251	Retirement Village	1 du	AM	0.35	40:60	0 (5%)	0 (50%)	0.35
			PM	0.35	50:50	0 (5%)	0 (50%)	0.35
252/253	Frail care centre	1 bed	AM	0.07	65:35	0 (NA)	0 (NA)	0.07
			PM	0.10	40:60	0 (NA)	0 (NA)	0.10
630	Medical centre / clinic	100m ²	AM	6.00	60:40	0 (0%)	50 (50%)	3.00
			PM	6.00	40:60	0 (0%)	50 (50%)	3.00
820	Shopping centre	100m ²	AM	2.65	65:35	10 (10%)	15 (30%)	2.03
			PM	15.04	50:50	10 (10%)	15 (30%)	11.51

* Maximum reduction recommended in TMH17 shown in brackets

HEIDEBOS DEVELOPMENT: TRIP GENERATION								
CODE	LAND USE	UNIT	PERIOD	SIZE	NETT RATE	PEAK HOUR TRIPS		
						IN	OUT	TOTAL
210	Single residential du	1 du	AM	153	1.00	38	115	153
			PM		1.00	107	46	153
251	Retirement Village	1 du	AM	131	0.35	18	28	46
			PM		0.35	23	23	46
252/253	Frail care centre	1 bed	AM	240	0.07	11	6	17
			PM		0.10	10	14	24
630	Medical centre / clinic	100m ²	AM	2876	3.00	52	35	86
			PM		3.00	35	52	86
820	Shopping centre	100m ²	AM	2632	2.03	35	18	54
			PM		11.51	151	151	302
TOTAL			AM			154	201	355
			PM			326	286	612

Each of the land uses is briefly discussed below.

i. Single dwelling units

No reduction is applied in respect of mixed land use, vehicle ownership or use of public transport. However, in the trip distribution approximately 50% of trips are allocated to internal destinations.

ii. Retirement village

No reduction is applied in respect of mixed land use, vehicle ownership or use of public transport. However, in the trip distribution approximately 50% of trips are allocated to internal destinations.

iii. Nurses accommodation

Accommodation for nurses is not expected to generate peak hour trips and the trip generation is assumed to be zero. The assumption is supported by the following:

- Nurses work in shifts and shifts change outside peak hours
- Nurses work on site at the medical centre or serve residents at the frail care centre.

iv. Frail care centre

The following published rates were considered when selecting an appropriate trip generation rate for the proposed frail care centre:

TMH17 LAND USE CODE 254 OLD AGE HOME	
Trip generation rate	AM: 0.15 / du (65:35)
	PM: 0.20 / du (40:60)
Reduction	Mixed-use: 5%
	Low vehicle ownership: 50%

ITE TRIP GENERATION (7 TH Edition, 2003)		
Code 254	Assisted living	AM: 0.14 / bed (65:35) PM: 0.22 / bed (44:56)
Code 253	Congregate care facility	AM: 0.06 / du PM: 0.17 / du
Code 252	Senior adult housing attached	AM: 0.08 / occupied du PM: 0.11 / occupied du

(It should be noted that dwelling units are often occupied by more than one person and therefore the trip generation per bed will be less than the figure per dwelling unit. All beds in the frail care centre will also not be 100% occupied).

A rate of 0.07 trips / bed (65:35) during the AM and 0.10 trips / bed (40:60) during the PM peak hour respectively will be applied in the analysis.

v. *Medical centre / Clinic*

The full 50% reduction for low vehicle ownership (LVO) was applied in the trip generation rate for the medical centre / clinic because it will serve the retirement village, as well as residents at the frail care centre. Nurses also stay on the premises and will therefore not require transport to the medical centre.

vi. *Shopping centre (Code 820)*

The formula in TMH17 will be applied. Due to the absence of through traffic, no provision is made for pass-by or diverted trips.

A reduction of 10% will be applied for mixed-use due to the institutional facilities in the immediate vicinity of the shopping centre.

A further reduction of 15% (50% of allowable maximum) will be applied for low vehicle ownership due to the lower use of private cars by residents of the old age home. A large proportion of shopping centre trips can be expected from the residential developments within the Heidebos development.

SHOPPING CENTRE (2632m ² GLA)		AM	PM
Rate (total trips)		2.65 / 100m ²	15.04 / 100m ²
Reduction mixed-use		10%	10%
Reduction low vehicle ownership		15%	15%
Split		65:35	50:50
Pass-by trips		0	0
Diverted trips		0	0
Peak hour primary trips	IN	35	151
	OUT	19	151
	TOTAL	54	302

4.4 Traffic Assignment

Matrices of the various land uses within the proposed Heidebos development were developed to distribute internal trips within the township and determine the external trips to and from origins and destinations outside the township. Separate matrices were done for the AM and PM peak hours and are shown below.

AM		ORIGIN						
		Single unit dwellings	Retirement estate	Frail care centre	Medical centre / clinic	Shopping centre	External	Sum
DESTINATION	Single unit dwellings	4	1	1	7	5	20	38
	Retirement estate	1	1	0	1	2	13	18
	Frail care centre	1	1	0	1	1	7	11
	Medical centre / clinic	13	3	1	0	2	33	52
	Shopping centre	15	8	1	2	0	9	35
	External	81	14	3	24	9	0	131
	Sum	115	28	6	35	19	82	285

PM		ORIGIN						
		Single unit dwellings	Retirement estate	Frail care centre	Medical centre / clinic	Shopping centre	External	Sum
DESTINATION	Single unit dwellings	4	3	1	13	32	54	107
	Retirement estate	1	0	1	3	10	8	23
	Frail care centre	1	1	0	1	1	6	10
	Medical centre / clinic	5	3	3	0	6	18	35
	Shopping centre	12	4	3	8	0	124	151
	External	23	12	6	27	102	0	170
	Sum	46	23	14	52	151	210	496

	<i>Internal trips</i>
--	-----------------------

In summary, there is estimated to be 72 vehicles that travel between an origin and destination within the township during the AM peak hour (144 trip ends), plus 131 trips to external destinations and 82 trips with an external origin.

AM PEAK HOUR				
TYPE		INTERNAL	EXTERNAL	TOTAL
Destinations	In	72	131	203
Origins	Out	72	82	154

During the PM peak hour, 116 vehicles are expected to travel between an internal origin and internal destination, while 170 trips leave the development to external destinations and 210 trips arrive from external origins to destinations within the Heidedal development.

PM PEAK HOUR				
TYPE		INTERNAL	EXTERNAL	TOTAL
Destinations	In	116	170	286
Origins	Out	116	210	326

External trips will in the short term rely on the existing street network in Hartenbos Heuwels X4, namely Geelhout Avenue and Waboom Street to R326, the N2 towards George and Louis Fourie Avenue to the Hartenbos business area and Resort, or Kameeldoring Avenue and Boekenhout Avenue to Louis Fourie Avenue (R102) to the Hartenbos business area and Resort, the Mossel Bay CBD and the N2 towards Cape Town.

Once Vyfbrakkefontein has been developed, it will provide an alternative southern access to Louis Fourie Avenue and the N2.

Three primary destinations have been identified based on traffic counts at the intersection of Louis Fourie Avenue and Onderbos Street, namely:

- North towards Oudshoorn, Groot Brak and George via N2: 15%
- East to Hartenbos business node and resort: 50%
- South towards Mossel Bay CBD and N2 to Cape Town: 35%.

Traffic to the north will use Geelhout Avenue. The route via Geelhout Avenue to Hartenbos is slightly longer than the routes via Boekenhout Avenue or Kameeldoring Avenue. 40% of Hartenbos traffic is assumed to use Geelhout Avenue, while the remaining 60% will use Boekenhout Avenue or Kameeldoring Avenue. Boekenhout Avenue and Kameeldoring Avenue provide similar travel distances to Louis Fourie Avenue and traffic is assumed to split 50:50.

The traffic assignment to the various access routes is therefore as follows:

Geelhout Avenue	35%
Boekenhout Avenue	32.5%
Kameeldoring Avenue	32.5%

The increase in traffic demand along the above routes during the AM and PM peak hours respectively with the full development of the Heidebos development is tabulated below.

ROUTE	AM PEAK HOUR			PM PEAK HOUR		
	IN	OUT	TOTAL	IN	OUT	TOTAL
Geelhout Avenue (35%)	46	28	75	59	73	134
Boekenhout Avenue (32.5%)	43	27	69	56	69	123
Kameeldoring Avenue (32.5%)	43	27	69	56	69	123
TOTAL (external traffic)	131	82	213	170	210	380

It is concluded that the increased traffic demand on the local road network is small compared to the practical capacity of a Class 4 residential collector street. All three access routes to the proposed township have been classified as Class 4 roads in the Mossel Bay Road Master Plan. Current traffic volumes are low, particularly during the off-peak period outside the December holiday season and the roads can effectively and conveniently accommodate the projected increase in traffic demand.

Priority control or roundabouts are suitable methods to control traffic at intersections.

Proposals of the Mossel Bay Municipality in terms of the Louis Fourie Corridor Management Plan will ensure acceptable traffic conditions in the medium and long term.

The total traffic demand of the entire Heidebos development during the critical PM peak hour is 612 trips, which is approximately 50% of the capacity of a stop sign controlled junction. It is therefore concluded that all intersections within the township can be expected to operate effectively, efficiently and safely, subject to appropriate geometric design standards described above and applied by the Mossel Bay Local Municipality.

5. SITE TRAFFIC ASSESSMENT

An assessment of the proposed township from a traffic engineering perspective, according to TMH17, Vol 2, *South African Traffic Impact and Site Traffic Assessment Standards and Requirements Manual*, Version1.0, August 2012 is tabulated below. (A more detailed assessment will be undertaken as part of the Traffic Impact Assessment during the township application process).

INDEX	DESCRIPTION	ASSESSMENT
1.	Functional road network	The township is served by a comprehensive hierarchy of roads. The topography and layout can accommodate the recommended design speed of 50 km / h, as well as a WB-15 design vehicle on Class 4 and a SU truck design vehicle on Class 5 roads.
2.	Capacity analysis	The projected traffic demand is less than 50% of the practical capacity of the roads and intersections in the road network and an acceptable level of service can be expected.
3.	Road access and intersection provision and spacing	The spacing of intersections and access to properties comply with acceptable standards and guideline documents applied by the Municipality.
4.	Intersection control and improvement warrants	The capacity analysis indicates that priority control (stop streets) or roundabouts can effectively control traffic at junctions within the township. The Municipality has developed a corridor management plan for Louis Fourie Avenue, which will ensure efficient traffic operations where site traffic joins the municipal arterial road network.
5.	Intersection and access configuration	Right turn auxiliary lanes should be provided at all uncontrolled approaches on the Class 4 roads in the township (Par 7.4.2 (b) (ii)), or alternatively the road width should be increased to 9.0m. If roundabouts are considered in the design, the design illustrated on Figure 10 (par 7.9.9) should be followed. Turning spaces must be provided on all cul-de-sac roads, according to acceptable design standards.
6.	Geometric design of roads, intersections and driveways	No geometric design is available at this stage. The design must in due course be submitted to the Municipality for approval and the necessary way leaves to undertake construction. However, we have confirmed that acceptable geometric standards can be achieved for the layout as proposed.

7.	Throat length	<p>The propose layout can accommodate adequate throat length at land uses with a high trip generation.</p> <p>It should be taken into consideration that the developments are all relatively small and no difficulty is foreseen as far as throat length is concerned.</p> <p>SDP's will have to be submitted to the Municipality for consideration.</p>
8.	Sight distance requirements	<p>The vertical alignment and layout would provide sufficient sight distance. A number of horizontal curves with limited radius are proposed. In such cases, the roadway should be widened to accommodate the wheel paths of design vehicles and to provide adequate sight distance. Guideline documents used by the Municipality provide adequate guidance as far as sight distances are concerned.</p>
9.	Traffic management	<p>The proposed township is located in an isolated area along the urban edge and traffic management is not a major concern.</p> <p>Pedestrian crossings to allow universal access (SANS 1040 Part S) can be used for the safety and convenience of road users with disabilities or special needs, particularly elderly persons that are expected to constitute a high percentage of residents.</p> <p>It is a concern that the Class 4 roads within the township will in future, when the Mossgas access road has been extended and linked to the road network of the Heidebos development, create a short-cut that can lead to rat-running through the township. This aspect should be addressed by the Municipality as part of its road master plan.</p>
10.	Pedestrian and bicycle facilities	<p>Pedestrian safety and the needs of elderly persons must be taken into consideration in all developments that form part of the Heidebos development.</p> <p>A paved pedestrian walkway must be provided along at least one side of all streets within the township.</p>
11.	Public transport facilities	<p>The business site and institutional uses are concentrated in a development node within the township. This is the only area where public transport lay-bys are considered to be justified.</p> <p>Facilities for the loading and off-loading should be provided at all developments where a high number of employees are expected.</p>
12.	Parking provision and design	<p>Parking should be provided according to the Mossel Bay Town Planning Scheme, but provision should be made for the relaxation of the parking requirement based on a rational parking assessment, particularly in view of the reduced use of private vehicles by elderly residents.</p>

13.	Deliveries and refuse collection	<p>The proposed township layout can accommodate the requirements of vehicles used for deliveries and refuse collection.</p> <p>In the case of the proposed shopping centre all loading shall be on-site (off-street) and all trucks must leave and return to the street network in a forward moving direction.</p>
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6. CONCLUSION AND RECOMMENDATION

The development of the layout of the proposed Heidebos development on Erf 3122 Hartenbos Heuwels took input from a traffic engineering point of view into consideration.

Based on discussions with the town planning consultant and officials of the Mossel Bay Local Municipality, perusal of the proposed layout plan, a site visit, a knowledge of the area gained during previous traffic impact studies, observed traffic patterns, a traffic analysis, as well as a Site Traffic Assessment, it is concluded from a traffic engineering point of view that the proposed township is served by a comprehensive hierarchy of roads, as well as a public transport system and that the proposed layout is suitable to develop a road network that can effectively, conveniently and safely serve the proposed township.

From a traffic engineering perspective it is recommended that the proposed township layout should be authorised for implementation in terms of the relevant environmental legislation.