

**R300 EXTENSION/N21 CAPE TOWN RING ROAD TOLL PROJECT –
ENVIRONMENTAL IMPACT ASSESSMENT - MAMMALS**

	<u>Page</u>
1. Introduction	3
2. Methods	4
3. Sector 1: Southern Greenfields section	5
3.1 Species and habitats	5
3.2 Expected impacts	6
3.3 Significance of impacts	7
3.4 Mitigation	7
4. Sector 2: Existing N21/R300	8
5. Sector 3: Highway section 6	9
5.1 Species and habitats	9
5.2 Expected impacts	9
5.3 Significance of impacts	10
5.4 Mitigation	10
6. Sector 3: Highway section 7	11
6.1 Species and habitats	11
6.2 Expected impacts	12
6.3 Significance of impacts	12
6.4 Mitigation	12
7. Sector 3: Highway section 8	13
7.1 Species and habitats	13
7.2 Expected impacts	14
7.3 Significance of impacts	14
7.4 Mitigation	14
8. Sector 4: Stellenberg Interchange	15
8.1 Species and habitats	15
8.2 Expected impacts	15
8.3 Significance of impacts	16
8.4 Mitigation	16
9. Cumulative impacts	16
10. Summary of mitigation and rehabilitation requirements.	17
11. Summary and conclusion	19
12. References	21

13.	Appendices	Appendix 1:	23
		Appendix 2:	28

R300 EXTENSION/N21 CAPE TOWN RING ROAD TOLL PROJECT – ENVIRONMENTAL IMPACT ASSESSMENT - MAMMALS

1. INTRODUCTION

The terms of reference for this specialist study are to:

- Identify areas and habitats significant to the conservation of mammal species of special interest as identified from the scoping report as well as from additional evaluation of the proposed project,
- Make recommendations towards avoiding or mitigation of potential impacts, whether related to route alignment, road construction or operations, including recommendations regarding post construction rehabilitation,
- Do a field and desktop assessment of any impacts that may be identified, without and with proposed avoidance/mitigation measures, using the assessment method provided,
- Identify from the existing impact assessment reports any possible cumulative impacts that the construction of the Cape Flats Freeway Extension in conjunction with the R300/N21, would have on mammals of special interest,
- Assess the road design to ensure implementation of recommendations or concerns. This would be in the form of both desktop assessment and a workshop with the engineers and other specialists,
- Provide a detailed description of construction phase mitigation requirements/recommendations and rehabilitation requirements for inclusion into the construction phase management plan.

Fifty-six mammal species (Appendix 1) are expected to occur in close association with and in the immediate vicinity of the proposed road. Most of these species have adapted to urban and agricultural development and some have even benefited from such development. Species that could not adapt due to very restricted habitats, specific habitat requirements or specific habits or characteristics, which limit their ability to live in harmony with mankind, have long ago disappeared from the Western Cape Province. These include the larger species such as elephant, buffalo, various large antelope species and larger carnivores.

In a regional context it is unlikely that the proposed road will lead to the local extinction of any naturally occurring mammal species. Most of the species remaining in the area are mobile and should temporarily disperse during the road building process and recolonize their former habitats after completion of the construction works.

Fragmentation of the natural habitats in the Cape Peninsula is the most serious threat to most species and in this context it can be argued that the proposed road will lead to further fragmentation and would thus be detrimental to most mammal species. It can however also be argued that road verges, provided that they are correctly managed, can provide corridors between the isolated fragments of natural habitat and thus improve conditions for survival of some species. Various authors such as Gennard & Williams (1975), Dickman & Doncaster (1989), Getz *et al* (1977) and Way (1977) have

commented on this aspect but more detailed studies in respect of South African mammal species are needed.

In this report each section of the proposed ring road is assessed in terms of the possible impacts on mammal species expected to occur or confirmed for that section of the road. Some of the mitigation measures proposed are generic and would also appear in many of the other specialist reports, whereas others are broadly defined due to the fact that detailed design of the proposed road will only be done later.

2. METHODS

Checklists of the mammal fauna expected to occur along the various phases of the proposed R300 extension were compiled by making use of general field guides and distribution maps such as those of Apps (1996), Skinner and Smithers (1983), De Graaf (1981) and Stuart & Stuart (1994). The habitat requirements of the species were compared to the availability of suitable habitat in the study area and species were only included in the list if suitable habitat occurred close to the alignment of the proposed road.

Historical distribution records of Skead (1989), Stuart *et al* (1980) and the Natural History Museum (Drinkrow, pers. com.) were also consulted to confirm the presence of certain species in the area.

Distribution records of mammals are normally recorded on a quarter degree square, which is considerably less accurate than the scale required for a study of this nature. The distribution records were therefore augmented with field studies of selected portions of natural vegetation still occurring in the area. During these investigations field signs such as direct observations, spoor, droppings, runs, nests, territorial markings, burrows, calls, analysis of owl pellets etc. were also used to confirm the presence of certain species.

Consultations with knowledgeable people in the area also contributed to an understanding of the mammal fauna and confirmed the presence or absence of certain species. Most notable of these are:

Peter Lloyd –Zoologist, Cape Nature Conservation Board
Dalton Gibbs –Manager, Rondevlei Nature Reserve
Clifford Dorse - Manager, Zandvlei Nature Reserve
Boetie Louw –Farmer, Phisantekraal

3. SECTOR 1: SOUTHERN GREENFIELDS SECTIONS

This sector of the proposed road from the Westlake Intersection to the Mitchell's Plain Intersection, where the existing R300 starts, is the most critical sector in terms of the biophysical environment and ecological integrity in general. In this sector the alignment of the proposed road traverses some important wetlands such as the Strandfontein Sewerage Works and passes close to proclaimed nature reserves such as the Zandvlei and Zeekoeivlei Nature Reserves.

3.1 Species and habitats

Although the alignment of the proposed road is mostly through areas affected by urbanization and alien vegetation infestations, the present routing could affect important wetlands such as the Zandvlei Nature Reserve, Zeekoeivlei Nature Reserve, Rondevlei Nature Reserve and the Strandfontein Sewerage Works.

Mammal species expected to occur in the area, with those confirmed marked with an asterisk, are:

Forest shrew	<i>Myosorex varius</i> *
Greater musk shrew	<i>Crocidura flavescens</i>
Round-eared elephant shrew	<i>Macroscelides proboscideus</i> *
Cape golden mole	<i>Chrysochloris asiatica</i> *
Various bat species	Order: <i>Chiroptera</i> *
Cape hare	<i>Lepus capensis</i> *
Cape dune mole-rat	<i>Bathyergus suillus</i> *
Common mole-rat	<i>Cryptomys hottentotus</i>
Cape mole-rat	<i>Georynchus capensis</i> *
Porcupine	<i>Hystrix africaeaustralis</i> *
Vlei rat	<i>Otomys irroratus</i> *
Cape spiny mouse	<i>Acomys subspinosus</i>
Striped mouse	<i>Rhabdomys pumilio</i> *
House mouse	<i>Mus musculus</i> *
Pygmy mouse	<i>Mus minutoides</i> *
Verreaux mouse	<i>Praomys verreauxii</i>
House rat	<i>Rattus ratus</i>
Brown rat	<i>Rattus norvegicus</i> *
Cape gerbil	<i>Tatera afra</i> *
White-tailed mouse	<i>Mystromys albicaudatus</i>
Grey climbing mouse	<i>Dendromus melanotis</i>
Brant's climbing mouse	<i>Dendromus mesomelas</i> *
Kreb's fat mouse	<i>Steatomys krebsii</i>
African wild cat	<i>Felis lybica</i>
Caracal	<i>Felis caracal</i> *
Cape fox	<i>Vulpes chama</i> *
Cape clawless otter	<i>Aonyx capensis</i> *
Large spotted genet	<i>Genetta tigrina</i> *

Striped polecat	<i>Ictonyx striatus</i> *
Small grey mongoose	<i>Galarella pulverulenta</i> *
Egyptian mongoose	<i>Herpestes ichneumon</i>
Water mongoose	<i>Atilax paludinosus</i> *
Hippopotamus	<i>Hippopotamus amphibious</i> *
Rock dassie	<i>Procavia capensis</i> *
Common duiker	<i>Sylvicapra grimmia</i> *
Grysbok	<i>Raphicerus melanotis</i> *
Steenbok	<i>Raphicerus campestris</i> *

3.2 Expected impacts

Most of the mammal species expected to occur in this sector is common with a wide distribution range and the proposed road will have little effect on the overall population status of these species. Brant's climbing mouse (*Dendromus mesomelas*) however is classified as rare due to its discontinuous distribution and the African wild cat (*Felis lybica*) as vulnerable due to interbreeding with the domestic cat.

The preferred habitat of Brant's climbing mouse is in rank vegetation near water and the proposed road should therefore not affect any preferred habitat of this species. The African wild cat is still widespread and the reason for its status as vulnerable is due to interbreeding with the Domestic cat. The proposed road will therefore not add to this threat.

Although still widespread the Cape clawless otter (*Aonyx capensis*) is sensitive to pollution and its habitat is increasingly destroyed by development and agriculture. It is a charismatic species and likely to attract attention. The effects of the proposed road on this species would be in the form of limiting movement between the different water bodies unless mitigating measures are implemented and possibly increased pollution from oil runoff from the road.

The impact of the proposed road on the introduced population of Hippopotamus (*Hippopotamus amphibious*) at the Rondevlei Nature Reserve is negligible in terms of their present movements but relevant in terms of envisaged future expansions of the reserve. At present the hippos do not move between the Rondevlei Nature Reserve and the Zeekoeivlei Nature Reserve or the Strandfontein Sewerage Works. (Gibbs *pers.com.*) The social structure of the hippo group is however of such a nature that most of the calves born have been killed by adult bulls and plans to introduce more hippos to correct the social structure is far advanced. An increase in hippo numbers and the resultant demand for more feeding areas should lead to increased movement between the various water bodies. The physical presence of the proposed road would limit the movement of these bulky animals and adequate provision should be made in the road design to accommodate this.

The possibility of an accidental catastrophic release of a hazardous substance into the system is also a more serious impact in this sector of the development.

3.3 Significance of impacts

(a) Pollution

	Extent	Duration	Intensity	Probability	Consequence	Significance
Without mitigation	M	L	L-	L	M	L
With mitigation	L	L	L-	L	L	L

(b) Limitation of mammal movement

	Extent	Duration	Intensity	Probability	Consequence	Significance
Without mitigation	L	M	L-	M	L	M
With mitigation	L	L	L-	L	L	L

(c) Accidental release of hazardous substances

	Extent	Duration	Intensity	Probability	Consequence	Significance
Without mitigation	M	L	M-	L	M	L
With mitigation	L	L	M-	L	L	L

3.4 Mitigation

In the construction phase specific measures should be implemented to limit any physical damage to the minimum area possible. This would entail fencing off areas of importance and rigorous enforcement by the Environmental Site Officer (See more detailed prescriptions for construction mitigation measures under section 10).

Access between the various water bodies i.e. Zeekoevlei Nature Reserve and the Strandfontein Sewerage Works should be ensured by bridging rather than filling. Studies in the United States and Central Spain by Reed *et al* (1975), Reed (1981), Yanes *et al* (1995) and Foster & Humphrey (1995) have shown that a variety of mammal species such as panthers, bobcats, black bears, deer, raccoon, alligators, genets etc. readily use underpasses on a four-lane divided highway of up to 48,5 meters wide. No specific studies on South African mammal species could be found but there should be no reason why they should not react in a similar way.

Of critical importance in the construction of such underpasses are the width and height. Underpasses in this section should therefore be a minimum of 5 meters wide, and at least 3,0 meters high.

Despite the fact that both the Zeekoevlei and Strandfontein Sewerage Works are heavily polluted and eutrophic, care should be taken in the design of the road in this sector to prevent additional pollution from oil on the roads and accidental spills of chemicals. This should be done by making provision in the design of the road to dispose of storm water runoff and accidental spills at predetermined less sensitive points. This should be regarded as a generic mitigation measure to be applied in all cases where the road traverses wetlands. Consideration should be given to the escorting of hazardous material loads to contain any accidental spills without any delays. Trained staff should be acquired for this task. Alternatively "rapid response units" should be stationed at strategic places along the route to contain any spills of hazardous materials without delays.

Storage of sand, cement, fuel, tarmac and other hazardous materials should be at predetermined sites where the danger of leaching into watercourses can be kept at a minimum or completely prevented.

The locations of borrow pits and quarries should be selected to cause minimum environmental damage.

An Environmental Site Officer (ESO) should be appointed for the duration of the construction and rehabilitation phases of the project to ensure compliance with the environmental prescriptions and recommendations.

Regular environmental training should be given to construction workers during the construction phase to ensure that individuals of the various taxa affected are properly translocated and not killed.

The re-establishment of indigenous vegetation for rehabilitation of the road verges should be encouraged. Exotic vegetation and specifically invasive species should not be allowed. Pesticides and herbicides should not be allowed in the management of road verges. Burning of the road verges to create patches of uneven aged vegetation should be promoted to allow for a mosaic of habitats to promote dispersal of the various species.

4. SECTOR 2: EXISTING N21/R300

This sector is already built between the Swartklip Interchange on the N2 and the Stellenberg Interchange on the N1 and was therefore not assessed.

5. SECTOR 3: HIGHWAY SECTION 6

This sector from the Stellenberg Interchange on the N1 to Wellington Road in Durbanville is located within an area that is fully urbanized and extensively altered. The actual routing of the proposed road is hemmed in by residential developments and in fact fenced off with vibracrete walls. No direct ecological impact by the road is expected in this sector.

5.1 Species and habitats

Immediately to the west between the N2 and De Villiers Road remnants of wetlands still occur albeit extensively invaded by alien plant species. Storm water spillage, solid waste disposal and grazing by cattle contribute to the disturbances in the area. These wetlands however still support some mammal species. Species expected to still occur in this area (confirmed species indicated with an asterisk) are:

Cape golden mole	<i>Chrysochloris asiatica</i>
Hottentot golden mole	<i>Amblysomus hottentotus</i>
Various bat species	Order: <i>Chiroptera</i>
Cape hare	<i>Lepus capensis</i>
Grey squirrel	<i>Sciurus carolinensis</i>
Cape dune mole-rat	<i>Bathyergus suillus</i>
Common mole-rat	<i>Cryptomys hottentotus</i>
Cape mole-rat	<i>Georynchus capensis</i> *
Porcupine	<i>Hystrix africaeaustralis</i> *
Vlei rat	<i>Otomys irroratus</i> *
Striped mouse	<i>Rhabdomys pumilio</i> *
House mouse	<i>Mus musculus</i>
Pygmy mouse	<i>Mus minutoides</i>
Brown rat	<i>Rattus norvegicus</i>
Cape gerbil	<i>Tatera afra</i> *
Striped polecat	<i>Ictonyx striatus</i>
Small grey-mongoose	<i>Galerella pulverulentus</i>
Water mongoose	<i>Atilax paludinosus</i> *
Common duiker	<i>Sylvicapra grimmia</i>
Grysbok	<i>Raphicerus melanotis</i> *

5.2 Expected impacts

No impact of any significance is foreseen in this stage of the development. None of the mammal species expected to occur is rare or endangered or even scarce and are well adapted to urbanization.

The possibility of spills of hazardous material during the operational phase could however have implications for the remaining wetland habitat, west of the proposed road

and affect the vertebrate populations as no suitable refugia exist for the mammal population present.

5.3 Significance of impacts

Accidental release of hazardous substances

	Extent	Duration	Intensity	Probability	Consequence	Significance
Without mitigation	L	L	L-	L	L	L
With mitigation	L	L	L-	L	L	L

5.4 Mitigation

- Provision should be made in the design to avoid any accidental spillage of hazardous materials or oil runoff from the road from entering sensitive wetlands (See sections 3.2 and 10).
- The re-establishment of indigenous vegetation for rehabilitation of the road verges should be encouraged.
- Exotic vegetation and specifically invasive species should not be allowed.
- Pesticides and herbicides should not be allowed in the management of road verges.
- Burning of the road verges to create patches of uneven aged vegetation should be promoted to allow for a mosaic of habitats to promote dispersal of the various species.

6 SECTOR 3: HIGHWAY SECTION 7

The routing of the proposed road in this section is from Wellington Road, through agricultural land to the intersection with the N7/Vissershok Interchange. This phase of the development will take place in habitats, which have been converted extensively by man. Most of the natural habitat found in this sector has been converted to agriculture, with winter wheat, vineyards and dairy farming the predominant forms of agriculture.

6.1 Species and habitats

The most important habitat for mammals in this section is some ephemeral wetlands and remnants of renosterveld still remaining within the agriculturally dominated land. Some species of small mammals have also adapted to the agriculturally converted habitats. Mammal species expected to occur, with those confirmed marked with an asterisk, are:

Forest shrew	<i>Myosorex varius</i> *
Greater musk shrew	<i>Crocidura flavescens</i> *
Cape golden mole	<i>Chrysochloris asiatica</i>
Round eared elephant shrew	<i>Macroscelides proboscideus</i>
Various bat species	Order: <i>Chiroptera</i> *
Cape hare	<i>Lepus capensis</i> *
Shrub hare	<i>Lepus saxatilis</i>
Cape dune mole-rat	<i>Bathyergus suillus</i>
Common mole-rat	<i>Cryptomys hottentotus</i>
Cape mole-rat	<i>Georynchus capensis</i> *
Porcupine	<i>Hystrix africaeaustralis</i> *
Vlei rat	<i>Otomys irroratus</i> *
Striped mouse	<i>Rhabdomys pumilio</i> *
House mouse	<i>Mus musculus</i> *
Pygmy mouse	<i>Mus minutoides</i> *
Namaqua rock mouse	<i>Aethomys namaquensis</i>
House rat	<i>Rattus rattus</i>
Brown rat	<i>Rattus norvegicus</i>
Cape gerbil	<i>Tatera afra</i> *
African wild cat	<i>Felis lybica</i>
Caracal	<i>Felis caracal</i>
Cape fox	<i>Vulpes chama</i> *
Black backed jackal	<i>Canis mesomelas</i>
Bat-eared fox	<i>Otocyon megalotis</i>
Striped weasel	<i>Poecilogale albinucha</i>
Striped polecat	<i>Ictonyx striatus</i> *
Small grey mongoose	<i>Galarella pulverulenta</i> *
Egyptian mongoose	<i>Herpestes ichneumon</i>
Water mongoose	<i>Atilax paludinosus</i> *
Rock dassie	<i>Procavia capensis</i> *
European fallow deer	<i>Cervus dama</i> *
Common duiker	<i>Sylvicapra grimmia</i> *

Grysbok
Steenbok

Raphicerus melanotis *
Raphicerus campestris *

6.2 Expected impacts

Where the proposed road crosses ephemeral wetlands, populations of mammal species could be isolated as these wetland areas are expected to be the prime habitat for most species. The same situation would occur where continuous patches of natural veld are bisected. This could lead to reduction of genetic viability of some of the scarcer species.

None of the mammal species expected to occur on this section of the proposed road are endangered, rare or scarce and most have adapted to the agricultural land use. No other impact of any significance is foreseen for this section of the proposed road.

6.3 Significance of impacts

Isolation of species

	Extent	Duration	Intensity	Probability	Consequence	Significance
Without mitigation	L	M	L-	M	L	M
With mitigation	L	L	L-	L	L	L

6.4 Mitigation

- Provision must be made to allow underpass access to mammals where wetlands are traversed or where continuous patches of natural vegetation are bisected. The design should allow for a minimum width of 5 meters and maximum width consistent with engineering constraints and a minimum height of about 3 meters should be maintained.
- Provision should be made in the design of the road shoulder at important wetland crossings to avoid any oil accumulations or hazardous material spills to end up in such wetlands.
- The re-establishment of indigenous vegetation for rehabilitation of the road verges should be encouraged.
- Exotic vegetation and specifically invasive species should not be allowed.
- Pesticides and herbicides should not be allowed in the management of road verges.
- Burning of the road verges to create patches of uneven aged vegetation should be promoted to allow for a mosaic of habitats to promote dispersal of the various species.

7. SECTOR 3: HIGHWAY SECTION 8

The routing of the proposed road in this section is from the N7/Vissershok Interchange, through an area largely converted by agriculture and invasion by alien plant species to the Otto du Plessis Road (M14).

7.1 Species and habitats

Little natural habitat remains along this section of the proposed road. The area is largely converted by agriculture and invasion by alien plant species. The most important being Rooikrans (*Acacia cyclops*) and Port Jackson (*Acacia saligna*). Small patches of sandplain fynbos however still occur in the area.

Despite the large scale conversion of the area the following mammal species are expected to still occur (those confirmed are marked with an asterisk):

Cape golden mole	<i>Chrysochloris asiatica</i>
Round eared elephant shrew	<i>Macroscelides proboscideus</i>
Various bat species	Order: <i>Chiroptera</i>
Cape hare	<i>Lepus capensis</i>
Cape dune mole-rat	<i>Bathyergus suillus</i>
Common mole-rat	<i>Cryptomys hottentotus</i>
Cape mole-rat	<i>Georynchus capensis</i> *
Porcupine	<i>Hystrix africaeaustralis</i> *
Vlei rat	<i>Otomys irroratus</i>
Striped mouse	<i>Rhabdomys pumilio</i> *
House mouse	<i>Mus musculus</i>
Pygmy mouse	<i>Mus minutoides</i>
Namaqua rock mouse	<i>Aethomys namaquensis</i>
Brown rat	<i>Rattus norvegicus</i>
Cape gerbil	<i>Tatera afra</i>
African wild cat	<i>Felis lybica</i>
Bat-eared fox	<i>Otocyon megalotis</i>
Large-spotted genet	<i>Genetta tigrina</i>
Striped polecat	<i>Ictonyx striatus</i>
Small grey mongoose	<i>Galarella pulverulenta</i> *
Water mongoose	<i>Atilax paludinosus</i>
Common duiker	<i>Sylvicapra grimmia</i>
Grysbok	<i>Raphicerus melanotis</i>
Steenbok	<i>Raphicerus campestris</i>

7.2 Expected impacts

Where the proposed road crosses ephemeral wetlands, populations of mammal species could be isolated as these wetland areas are expected to be the prime habitat for most species. The same situation would occur where continuous patches of natural veld are bisected. This could lead to reduction of genetic viability of some of the scarcer species. None of the mammal species expected to occur on this section of the proposed road are endangered, rare or scarce and most have adapted to the agricultural land use. No other impacts of any significance are foreseen for this section of the proposed road.

7.3 Significance of impacts

Isolation of species

	Extent	Duration	Intensity	Probability	Consequence	Significance
Without mitigation	L	M	L-	M	L	M
With mitigation	L	L	L-	L	L	L

7.4 Mitigation

Provision must be made to allow underpass access to mammals where wetlands are traversed or where continuous patches of natural vegetation are bisected. The design should allow for a minimum width of 5 meters, maximum width consistent with engineering constraints and a minimum height of about 3 meters.

Provision should be made in the design of the road shoulder at important wetland crossings to avoid any oil accumulations or hazardous material spills to end up in such wetlands.

The re-establishment of indigenous vegetation for rehabilitation of the road verges should be encouraged. Exotic vegetation and specifically invasive species should not be allowed. Pesticides and herbicides should not be allowed in the management of road verges. Burning of the road verges to create patches of uneven aged vegetation should be promoted to allow for a mosaic of habitats to promote dispersal of the various species.

8. SECTOR 4 : STELLENBERG INTERCHANGE

This sector will entail the construction of an elevated interchange at the end of the existing R300 and the beginning of Sector 3: Highway Section 6 (See section 5). The area is extensively converted and little natural habitat remains.

8.1 Species and habitats

Directly to the west of the intersection small patches of wetland, albeit in a degraded state, still exist. Bulrushes (*Typha species*), fluitjiesriet (*Phragmites australis*) and vleibos (*Cliffortia strobilifera*) dominate the area but invasive alien plants such as Port Jackson (*Acacia saligna*) also abounds. These wetlands should support the same mammal species as those in Sector 3: Highway Section 6 i.e:

Cape golden mole	<i>Chrysochloris asiatica</i>
Hottentot golden mole	<i>Amblysomus hottentotus</i>
Various bat species	Order: <i>Chiroptera</i>
Cape hare	<i>Lepus capensis</i>
Cape dune mole-rat	<i>Bathyergus suillus</i>
Common mole-rat	<i>Cryptomys hottentotus</i>
Cape mole-rat	<i>Georynchus capensis</i> *
Porcupine	<i>Hystrix africaeaustralis</i> *
Vlei rat	<i>Otomys irroratus</i> *
Striped mouse	<i>Rhabdomys pumilio</i> *
House mouse	<i>Mus musculus</i>
Pygmy mouse	<i>Mus minutoides</i>
Brown rat	<i>Rattus norvegicus</i>
Cape gerbil	<i>Tatera afra</i> *
Striped polecat	<i>Ictonyx striatus</i>
Small grey-mongoose	<i>Galerella pulverulentus</i>
Water mongoose	<i>Atilax paludinosus</i> *
Common duiker	<i>Sylvicapra grimmia</i>
Grysbok	<i>Raphicerus melanotis</i> *

8.2 Expected impacts

No impact of any significance is foreseen in this stage of the development. None of the mammal species expected to occur are rare or endangered or even scarce and are well adapted to urbanization.

The possibility of major hazardous material spills during the operational phase could however have implications for the remaining wetland habitat and affect the vertebrate populations as no suitable refugia exist for the mammal populations present.

8.3 Significance of impacts

Accidental release of hazardous substances

	Extent	Duration	Intensity	Probability	Consequence	Significance
Without mitigation	L	L	L-	L	L	L
With mitigation	L	L	L-	L	L	L

8.4 Mitigation

Provision should be made in the design to avoid any accidental spillage of hazardous materials or oil runoff from the road from entering sensitive wetlands.

9. CUMULATIVE IMPACTS

The 56 species of mammals expected to be found in the general area of the Cape Peninsula are, with a few exceptions, widely distributed and common, despite the already altered state of their natural habitat. Conversion of natural habitats by residential and industrial development, agriculture, pollution and invasion by alien plant species has already changed the ecosystem to the extent that only the most adaptable and hardy species still remain in any viable populations.

Construction of a double carriageway in this changed environment, especially if the proposed mitigation measures are implemented, should not permanently affect any mammal population negatively. Provided that the rehabilitation of road verges is properly planned and consistently implemented and managed, the proposed road could be beneficial to many mammal species in certain sectors of the proposed road by providing corridors to link fragmented portions of natural habitat. This is especially relevant in Sections 7 and 8 of Sector 3 where the agricultural practices have already isolated patches of natural vegetation.

The most important impact of the proposed road would be the isolation of mammal populations, which already exist, in sub-optimal populations. This could have an effect on the genetic viability of such populations and should be avoided by providing access underneath the road where wetlands are traversed or continuous natural vegetation patches are bisected.

10. SUMMARY OF MITIGATION AND REHABILITATION REQUIREMENTS

Design:

- (1) Provision must be made to allow underpass access to mammals where wetlands are traversed or where continuous patches of natural vegetation are bisected. The design should allow for a minimum width of 5 meters, maximum width consistent with engineering constraints and minimum height of about 3 meters.
- (2) Provision should be made in the design of the road shoulders at important wetland crossings to avoid any oil accumulation or hazardous material spills from ending up in such wetlands.
- (3) Bridging rather than filling should be the preferred option in all cases where patches of natural vegetation are bisected or wetlands crossed.

Construction:

- (1) In the construction phase, care should be taken to ensure that the area physically destroyed or damaged is kept to a minimum by fencing off the construction sites.
- (2) Storage of sand, cement, fuel, tarmac and other hazardous material should be at predetermined sites where the danger of it leaching into watercourses can be kept at a minimum.
- (3) The location of borrow pits and quarries should be selected to cause minimum environmental damage.
- (4) An Environmental Site Officer should be appointed for the duration of the construction and rehabilitation phases of the project to ensure compliance with environmental prescriptions or recommendations.
- (5) Regular environmental training should be given to construction workers during the construction phase to ensure that individuals of the various taxa affected are properly translocated and not killed.

Rehabilitation:

- (1) The rehabilitation of the road verges should only be done with suitable indigenous plant species. A qualified horticulturist should advise on suitable species. Under no circumstances should invasive exotic species be used for this purpose.
- (2) Where alien invasive plant species occur in the road reserve area it should be removed.

- (3) No pesticides or herbicides should be used for controlling weeds or invertebrates in the road reserves. Burning of the road reserve in a mosaic pattern of uneven ages would provide the habitat diversity necessary to maintain the diversity of other taxa.

Operational:

- (1) Consideration should be given to the escorting of hazardous material loads to contain any accidental spills without any delays. Trained staff should be acquired for this task. Alternatively "rapid response units" should be stationed at strategic places along the route to contain any spills of hazardous materials without delays.

11. SUMMARY AND CONCLUSION

Fifty-six mammal species possibly still occur in the general area traversed by the proposed road. Most of these species are widely distributed elsewhere, are common or have adapted to urban and agricultural development and some have even benefited from such development. A list of the occurrence of these species along the various sectors and sections of the road is summarized in Appendix 2.

Mammal species with highly specialized habitat requirements, restricted habitats or those that could not live in harmony with agricultural or urban development, such as the larger carnivores, have long ago disappeared from the Western Cape Province. The species remaining are generally small, well adapted to development and mobile and should temporarily disperse during the road building process and recolonize their former habitats after completion of the construction works.

At the same time it must be considered that these remaining mammal species at present occupy the last remnants of natural habitat still left in the area and in this respect the integrity of riverine fringes and continuous patches of natural vegetation serves an important function to ensure healthy populations. Fragmentation of their natural habitat is probably the single most important threat to these species and further fragmentation will affect the genetic viability of some populations. The provision of corridors by means of underpasses and sound management of the road verges are thus important mitigation measures.

The White-tailed mouse (*Mystromys albicaudatus*) and Brant's climbing mouse (*Dendromus mesomelas*) are considered to be vulnerable or rare due to the widespread destruction of lowland fynbos and renosterveld in the case of the former and a discontinuous distribution in the latter case. In both cases the proposed mitigation measures such as the provision of corridors by means of underpasses, sound road verge management and the prevention of pollution should prevent fatal negative impacts.

In the case of the African wild cat (*Felis lybica*), which is classified as vulnerable due to interbreeding with the domestic cat, the proposed road should not negatively affect the remaining population in the Cape Peninsula.

Although the Cape clawless otter (*Aonyx capensis*) is still widespread in the Western Cape, the population in the Cape Peninsula is probably small. The proposed mitigation measures to protect wetlands and river fringes and the provision of adequate corridors by means of underpasses should remove any threats posed by the proposed road. It is also of special importance in the case of the Cape clawless otter to prevent pollution prevention methods in the construction and operational phases of the project, as these animals are extremely sensitive to pollution.

The introduced group of Hippopotamus (*Hippopotamus amphibious*) at Rondevlei will not immediately be affected by the proposed road. Plans to introduce more hippo to correct problems with the social structure of the present group, will inevitably lead to a

greater demand for feeding areas and possibly the incorporation of the Zeekoeivlei Nature Reserve and the Strandfontein Sewerage Works within the home ranges of the hippo. Provision will therefore have to be made in the design of the proposed road in this sector to allow free movement of these large herbivores between the various water bodies in this area.

From a mammal perspective and provided that the mitigation measures proposed are implemented there should not be any negative impact likely to affect the decision to proceed with the project. Special attention to the management of public concerns will however be needed in respect of Sector 1: Southern Greenfields Section. Not only does this section support the most diverse mammal fauna but also some "charismatic" species to which the general public relates more readily.

12. REFERENCES

- Apps, P.** 1996. *Smithers' Mammals of Southern Africa: A field guide*. Southern Book Publishers (Pty) Ltd. Halfway House.
- Beier, P. & Loe, S.** 1992. A checklist for evaluating impacts to wildlife movement corridors. *Wildl. Soc. Bull.* 20: 434-440
- De Graaf, G.** 1981. *The Rodents of Southern Africa*. Butterworths Press. Pretoria
- Dickerson, L.M.** 1939. The problem of wildlife destruction by automobile traffic. *J. Wildl. Mgmt.* 3: 104-116.
- Dickman, C.R. & Doncaster, C.P.** 1989. The ecology of small mammals in urban habitats. II. Demography and dispersal. *J. Anim. Ecol.* 58: 119-127.
- Foster, M.L. & Humphrey, S.R.** 1995. Use of highway underpasses by Florida panthers and other wildlife. *Wildl. Soc. Bull.* 23: 95-100.
- Free, J.B., Gennard, D. & Williams, I.H.** 1975. Beneficial insects present on a motorway verge. *Biol. Conserv.* 8: 61-72.
- Getz, L.L., Cole, R. & Gates, D.L.** 1977. Interstate roadsides as dispersal routes for *Microtus pennsylvanicus*. *J. Mamm.* 59: 208-212.
- Meester, J.A.J.** 1976. South African Red Data Book – Small Mammals. *South African National Scientific Programmes Report No. 11.:1-59*.
- Reed, D.F., Woodard, T.N. & Pojar, T.M.** 1975. Behavioral response of mule deer to a highway underpass. *J. Wildl. Manage.* 39: 361-367.
- Reed, D.F.** 1981. Mule deer behavior at a highway underpass exit. *J. Wildl. Manage.* 45: 542-543.
- Skinner, J.D. & Smithers, R.H.N.** 1983. *The mammals of the Southern African Sub region*. University of Pretoria. Pretoria.
- Smithers, R.H.N.** 1986. South African Red Data Book – Terrestrial Mammals. *South African National Scientific Programme Report No 125:1-216*.
- Skead, C.J.** 1989. Historical mammal incidence in the Cape Province. Volume 1: The Western and Northern Cape. Unpublished report, Department of Nature and Environmental Conservation, Cape Town.
- Storm, G.L.** 1972 Daytime retreats and movements of skunks on farmland in Illinois. *J. Wildl. Mgmt.* 36:31-45

Stuart, C. & Stuart, T. 1994. A Field Guide to the Tracks and Signs of Southern and East African Wildlife. Southern Book Publishers, Halfway House.

Stuart, C., Lloyd, P.H. & Herselman, J.C. 1980. Cape mammalian distribution maps (excluding Cetaceae) and mammal lists (internal use). Unpublished report. Cape Nature Conservation

Way, J.M. 1977. Roadside verges and conservation in Britain: A review. *Biol. Cons.* 12: 65-74.

Yanes, M., Velasco, J.M. & Suárez, F. 1995. Permeability of roads and railways to vertebrates: The importance of culverts. *Biol. Cons.* 71: 217-222.

APPENDIX 1: ANNOTATED CHECKLIST OF MAMMAL FAUNA LIKELY TO OCCUR IN HABITATS AFFECTED BY THE VARIOUS PHASES OF THE R300 EXTENTION.

ORDER: INSECTIVORA

FAMILY: Soricidae (Shrews)

1. *Myosorex varius* – Forest shrew – prefer densely vegetated areas, widespread and common locally, **Endemic to South Africa**. Presence confirmed from Barn Owl pellets.
2. *Crocidura flavescens* – Greater musk shrew – occupy wide range of habitats, often found in gardens, **endemic to South Africa**. Presence confirmed from Barn Owl pellets.

FAMILY: Chrysochloridae (Golden moles)

3. *Chrysochloris asiatica* – Cape golden mole – prefer sandy soils, often found in gardens and cultivated lands, **endemic to South Africa**, common
4. *Ablysomus hottentotus* – Hottentot golden mole - Widespread and common. Occurs in most habitats along the proposed route.

FAMILY: Macroscelidea (Elephant shrews)

5. *Macroscelides proboscideus* – Round-eared elephant shrew – prefer arid areas with sparse grass cover. Widespread distribution in the study area – been recorded from the Cape Flats.

ORDER: CHIROPTERA

FAMILY: Pteropodidae (Fruit bats)

6. *Rousettus aegyptiacus* – Egyptian fruit-bat – roost in caves, which should be within 24km of fruiting trees. Likely to occur along the routing of the proposed road.

FAMILY: Molossidae (Free-tailed bats)

7. *Tadarida pumila* – Little free-tailed bat – roost in rock crevices or

- trees, also found in buildings
8. *Tadarida aegyptiaca* – Egyptian free-tailed bat – roost in caves and rock crevices, depends on open water for drinking. Widespread and common in the study area.

FAMILY: Vespertilionidae (Vesper bats)

9. *Miniopterus schreibersii* – Schreibers' long-fingered bat – roost in caves, rock crevices or hollow trees.
10. *Myotis tricolor* – Temminck's hairy bat – roost in caves and old mines, Can move over distances of up to 90km.
11. *Eptesicus melckorum* - Melck's serotine bat - roost in roofs
12. *Eptesicus capensis* – Cape serotine bat – roost in roofs, rock crevices and on trees. Widespread and common in the study area.

FAMILY: Nycteridae (Slit-faced bats)

13. *Nycteris thebaica* – Common slit-faced bat – roost in caves, roofs and mines in half to total darkness. Widespread.

FAMILY: Rhinolophidae (Horseshoe bats)

14. *Rhinolophus clivosus* – Geoffroy's horseshoe bat – found in wide range of habitats, roost in caves, mines and rock crevices.
15. *Rhinolophus capensis* – Cape horseshoe bat - roost in caves in huge colonies.

ORDER: LAGOMORPHA

16. *Lepus capensis* – Cape hare – open grassland with light shrub, prefer more open habitat, independent of water, *
17. *Lepus saxatilis* – Scrub hare – prefer denser habitats than capensis.

ORDER: RODENTIA

FAMILY: Bathyergidae (Molerats)

18. *Bathyergus suillus* – Cape dune molerat – confined to sandy soils, **endemic to Western Cape**
19. *Cryptomys hottentotus* – Common molerat –prefers moister soils which are not compacted, common
20. *Georchus capensis* – Cape molerat – found in sandy soils, coastal

sand dunes, may become a pest in gardens,

FAMILY: Hystricidae (Porcupines)

21. *Hystrix africaeaustralis* – porcupine – well adapted to urbanization, wide habitat tolerance, common

FAMILY: Sciuridae (Squirrels)

22. *Sciurus carolinensis* – Grey squirrel - introduced, found in urban habitats.

FAMILY: Cricetidae & Muridae (Rats and mice)

23. *Otomys irroratus* –Vlei rat - favors wetter habitats such as vleis and swamps, widespread and common. Presence confirmed from Barn Owl pellets.
24. *Acomys subspinosus* – Cape spiny mouse – found in rocky wetter areas or alluvial sands along riverbanks, **endemic to the Western Cape.**
25. *Rhabdomys pumilio* – Striped mouse – very common, well adapted to urban areas
26. *Mus musculus* – House mouse – introduced, well adapted to **urbanization.** Presence confirmed from Barn Owl pellets.
27. *Mus minutoides* – Pygmy mouse – granivorous widespread, wide **habitat choice** Presence confirmed from Barn Owl pellets.
28. *Myomyscus verreauxii* – Verreaux's mouse – **endemic to the Western Cape**, lives in scrub, riverine forests and forest margins, eats Protea seeds and insects. Been recorded at the Cape of Good Hope Nature Reserve
29. *Aethomys namaquensis* – Namaqua rock mouse – preference for rocky habitats
30. *Rattus rattus* – House rat – introduced, very adaptable but prefer dense cover, have also adapted to outbuildings, stores and houses.
31. *Rattus norvegicus* – Brown rat – introduced, omnivorous, can become a serious pest
32. *Gerbillurus paeba* – Hairy-footed gerbil – probably too wet but has been recorded
33. *Tatera afra* – Cape gerbil – prefer open grasslands on well-drained sandy soils, common in cultivated areas, **endemic to Western Cape.**
34. *Mystromys albicaudatus* – White-tailed mouse- although widespread it occurs sparsely with only a relic population in the

Western Cape, recorded from the Cape Flats, **endemic, vulnerable status due to widespread destruction of renosterveld and lowland fynbos.**

35. *Dendromus melanotis* – Grey climbing mouse – prefer stands of tall grass mixed with bushes..
36. *Dendromus mesomelas* – Brants' climbing mouse – tall grass near water, **status rare because of discontinuous distribution.** Been recorded at Hout Bay.
37. *Steatomys krebsii* – Kreb's fat mouse – prefer sandy soils and is common in cultivated areas. Been recorded from the Cape of Good Hope Nature Reserve and the Cape Flats and is most likely to occur in Sector 1.

ORDER: CARNIVORA

FAMILY: Felidae (Cats)

38. *Felis lybica* – African wild cat – classified as **vulnerable** due to interbreeding with domestic cats.
39. *Felis caracal* – Caracal - move over extensive areas for prey, wide range of habitats.

FAMILY: Canidae (Foxes, wild dog and jackals)

40. *Vulpes chama* – Cape fox – well adapted to wheat farms in the Western Cape where they render a useful service by controlling rodents and insects.
41. *Canis mesomelas* – Black-backed jackal –doubtful if it still occurs in study area.
42. *Otocyon megalotis* – Bat-eared fox – A common species with a wide habitat tolerance. Probably only occurs in Sector 3 Highway section 7 of the proposed road alignment.

FAMILY: Mustelidae (Otters, polecats, weasel, honey badger)

43. *Aonyx capensis* – Cape clawless otter – habitat fresh water, estuaries, lagoons etc., **very sensitive to pollution.**
44. *Poecilogale albinucha* – Striped weasel – although this species historical distribution records indicate that it does not occur in the Cape Peninsula, recent records of Cape Nature Conservation confirms its presence in the area.
45. *Ictonyx striatus* – Striped polecat – widespread and occurs in almost all habitats, **susceptible to road accidents.**

FAMILY: Viverridae (Mongooses, civets, genets, and suricate)

- 46. *Genetta genetta* – Small - spotted genet – occurs in fynbos areas, sometimes nests in roofs of buildings
- 47. *Genetta tigrina* – Large – spotted genet - often found in stands of exotic trees
- 48. *Galerella pulverulenta* – Small grey-mongoose – common in the study area
- 49. *Atilax paludinosus* – Water mongoose – depends on open water and is common in the study area.
- 50. *Herpestes ichneumon* – Egyptian mongoose – Needs dense cover and only occurs in the fringes of rivers, vleis and dams.

ORDER: HYRACOIDEA

FAMILY: Procaviidae (Dassie)

- 51. *Procavia capensis* – Rock dassie – often lives in road culverts, probably uncommon in area of study but occurs in the agricultural area of Sector 3.

ORDER: ARTIODACTYLA

FAMILY: Hippopotamidae (Hippopotamus)

- 52. *Hippopotamus amphibius* – Hippopotamus - introduced, **move extensively for grazing**

FAMILY: Cervidae (Deer)

- 53. *Cervus dama* – European fallow deer – introduced common in the Durbanville area.

FAMILY: Bovidae

- 54. *Sylvicapra grimmia* – Common duiker - needs fairly dense cover, can survive in agricultural areas as long as cover is available.
- 55. *Raphicerus melanotis* – Grysbok – needs dense shrubs, can survive close to suburban areas, **endemic to the Western Cape**
- 56. *Raphicerus campestris* – Steenbok – can survive on farmland, fairly independent of water, needs cover.

The most important characteristics of the species in respect to the proposed development are highlighted in this appendix.

APPENDIX 2: SUMMARY OF MAMMALS EXPECTED TO OCCUR IN THE VICINITY OF THE VARIOUS CONSTRUCTION PHASES

SPECIES	Sector 1	Sector 3: Highway Section 6	Sector 3: Highway Section 7	Sector 3: Highway Section 8	Sector 4
Forest shrew	X		X		
Greater musk shrew	X		X		
Round eared elephant shrew	X		?	?	
Cape golden mole	X	X	X	X	X
Hottentot golden mole		X			X
Various bat species	X	X	X	X	X
Cape hare	X	X	X	X	X
Shrub hare			X		
Grey squirrel		X			X
Cape dune mole-rat	X	X	X	X	X
Common mole-rat	X	X	X	X	X
Cape mole-rat	X	X	X	X	X
Porcupine	X	X	X	X	X
Vlei rat	X	X	X	X	X
Cape spiny mouse	X				
Striped mouse	X	X	X	X	X
House mouse	X	X	X	X	X
Pygmy mouse	X	X	X	X	X
Verreaux's mouse	X				
Namaqua rock mouse			X	?	
House rat	X		X		
Brown rat	X	X	X	X	X
Hairy footed gerbil					
Cape gerbil	X	X	X	X	X
White tailed mouse	X				
Grey climbing mouse	X				
Brant's climbing mouse	X				
Kreb's fat mouse	X				
African wild cat	X		X	X	
Caracal	X		X		
Cape fox	X		X		
Black-backed jackal			X		
Bat-eared fox			X	X	
Cape clawless otter	X				
Striped weasel			X		
Small spotted genet	?		?		
Large spotted genet	X		?	X	
Striped polecat	X	X	X	X	X
Small grey mongoose	X	X	X	X	X
Egyptian mongoose	X		X		
Water mongoose	X	X	X	X	X
Hippopotamus	X				
Rock dassie	X		X	X	
European fallow deer			X		
Common duiker	X	X	X	X	X
Grysbok	X	X	X	X	X
Steenbok	X		X		