

CHAPTER 12 ASSESSMENT: LUSIKISIKI (MAGWA INTERSECTION) TO MTHAMVUNA RIVER

This chapter provides an assessment of the key potential biophysical, socio-economic and cultural/historical heritage impacts, as appropriate, that would result from the construction and operational phases of the proposed works, including physical toll plazas, between Lusikisiki (Magwa Intersection) and the Mthamvuna River (see Figure 12.1). A comparative assessment of the site-specific alternative route alignments and alternative mainline toll plaza locations is provided separately below (see Sections 12.3 and 12.4).

12.1 INTRODUCTION

The proposed works between Lusikisiki (Magwa Intersection) and the Mthamvuna River are described in detail in Section 4.2.6, with accompanying illustrations being shown in Figures 4.22 to 4.24. The proposed works along this section of the proposed toll highway would involve the construction of a new “greenfields” road to national road standards between Lusikisiki (Magwa Intersection) and the Mthamvuna River. A number of deeply incised gorges, some in the order of 200 m to 300 m deep, and minor streams would need to be crossed.

In summary, the following works are proposed along this section of the proposed toll highway:

- Construction of a new road to national road standards along the SANRAL preferred route (refer to Figure 4.22);
- Construction of new major bridges across the Msikaba, Kwadlambu, Mthentu, Mnyameni, Kulumbe, Mpahlane and Mzamba rivers;
- Over- and underpasses, improved and new intersections, fencing, road signs and guard rails;
- Construction of a new R61 Interchange (refer to Figure 4.23);
- Construction of a mainline toll plaza (refer to Figure 4.24); and
- Maintenance and rehabilitation of the existing Mthamvuna River bridge.

The Mthentu Toll Plaza north of the Mthentu River is SANRAL’s preferred mainline toll plaza position for the proposed toll section between Ntafufu and Southbroom - refer to section 3.5.2, Table 3.4 and Figures 4.22 and 4.24. An alternative locality for a toll plaza in the vicinity of the proposed intersection with the Holy Cross/Mkambati road has been identified (refer to Figure 4.22, Section 5.3.8 and Plate 5.2).

The proposed new road would comprise a two-lane single carriageway highway, with climbing lanes where required and a minimum design speed of 100 to 120 km/h. The width of the road would generally be a minimum of 12.4 m (2x3.7 m lanes and 2x2.5 m paved shoulders) within a road reserve of 80 m.

Bridge structures include high-span bridges over the Msikaba, Mthentu and Mpahlane rivers, with the Mzamba River bridge following the design of the Mzimvubu River bridge (i.e. eight piers, each with four piles located in the floodplain) and the Mnyameni and the Kulumbe River bridges being similar to the Ntafufu River bridge (i.e. three spans supported by two piers and abutments).

A description of the key characteristics of the biophysical, socio-economic and cultural/historical heritage environment along this section of the proposed toll highway is provided in Chapter 6, as appropriate.



Figure 12.1: Section of the proposed toll highway between Lusikisiki (Magwa Intersection) and the Mthamvuna River

As mentioned in Section 5.3, the following “feasible” alternatives have been investigated and assessed along this section of the proposed toll highway:

- Two alternative route alignments between Lusikisiki and the Mthamvuna River – referred to as the SANRAL preferred route and the Coastal Mzamba route – refer to Section 5.3.2 and Figure 5.3;
- Three site-specific alternative route alignments across the Msikaba River – referred to as Alternatives 5g, 5e and 5g4 (SANRAL preferred route) – refer to Section 5.3.5 and Figure 5.6;
- Two site-specific alternative route alignments across the Mthentu River – referred to as Alternatives 9e (SANRAL preferred route) and 9d5 – refer to Section 5.3.6 and Figure 5.7; and
- Three site-specific alternative route alignments across the Mnyameni River – referred to as Alternatives 10a, 10e and 10c (SANRAL preferred route) – refer to Section 5.3.7 and Figure 5.8.

It should be noted that the assessment of the proposed works (provided in Section 12.2 below) incorporates the SANRAL preferred routes mentioned above – i.e. the SANRAL preferred route between Lusikisiki and the Mthamvuna River, which incorporates Alternative 5g4 across the Msikaba River, Alternative 9e across the Mthentu River and Alternative 10c across the Mnyameni River.

It should also be noted that Sections 12.3 and 12.4 include all potential impacts considered important in undertaking a comparative assessment of the site-specific alternative route alignments and alternative mainline toll plaza locations, respectively (in contrast to Section 12.2, which focuses on “key potential impacts” only).

The assessment of potential direct, indirect and cumulative impacts associated with the construction and operational phases of the proposed project are based on the findings of the relevant specialist studies undertaken during the EIA process. The respective specialist reports provide detailed descriptions of the study approach followed, the identified risk sources and the potential impacts – Volumes 2 to 4, Appendices 1 to 13.

12.2 ASSESSMENT OF POTENTIAL IMPACTS: PROPOSED WORKS

It is anticipated that the proposed works along this section of the proposed toll highway, including the proposed Mthentu mainline toll plaza and bridge crossings, would result in key potential impacts relating to the following aspects: vegetation and flora; fauna; aquatic ecosystems; soils, land use and agriculture; social; tourism; cultural and historical heritage; noise; visual; and planning/development. These are addressed respectively below.

12.2.1 VEGETATION AND FLORA

The proposed new road along the SANRAL preferred route, Mthentu mainline toll plaza, major new bridges and ancillary works and R61 Interchange would result in key potential impacts on vegetation and flora in relation to the following, as appropriate: loss of habitat; loss of biodiversity; fragmentation of habitat; loss of species of special concern; increased run-off and drainage, soil erosion, silt loads and sedimentation; invasion by weeds and invasive alien plants; strip/ribbon/secondary development; increased accessibility of remote habitats; reduction in resilience/stability of ecosystems; and disruption of the flow of nutrients and materials. A summary of the assessment of the key potential impacts on vegetation and flora is provided in Table 12.1.

Loss of habitat

The construction of the proposed greenfields section between Lusikisiki and the Mthamvuna River would result in significant loss of habitat, including habitats associated with the Pondoland-Ugu Sandstone Coastal Sourveld vegetation (Vulnerable). This vegetation type forms one of the two primary habitats constituting the PCE. Approximately 34 km of the proposed new road would traverse untransformed grassland. Considering a road reserve width of 80 m, a maximum of approximately 272 ha of habitat could be affected. The national biodiversity assessment indicates that 92 419 ha of this vegetation type remains. Thus, the direct loss of habitat within Pondoland-Ugu Sandstone Coastal Sourveld due to construction of the road would be 0.3 % of the remaining total of this vegetation type. The anticipated permanent loss of habitat is assessed to be of high intensity at a regional level, thus the significance of the impact is rated as **very high**.

It is anticipated that construction of the proposed new bridges over the Mthentu and Kwadlambu rivers would result in localised loss of habitat of **high** significance. Grassland, rocky grassland and forest (in the gorge) would be affected at the Mthentu river while the main habitats at the Kwadlambu River site are marsh wetland as well as the stream channel and associated habitat. The marsh wetland is a habitat type with a relatively small area within the PCE and many of the species found in this habitat are restricted entirely to it.

Construction of the Msikaba, Mnyameni, Kulumbe, Mpahlane and Mzamba river bridges would probably result in loss of habitats associated with grassland, rocky grassland and/or forest (in the gorges). The probable permanent, localised loss of habitat is assessed to be of **medium** intensity and significance.

Minimisation and restriction of site clearing to the area required for construction purposes only, identification and “search-and-rescue”, as appropriate, of any threatened or protected species by a botanical expert prior to any site clearing, revegetation of remaining disturbed areas with site indigenous species and limiting disturbance to adjacent undisturbed natural vegetation, as appropriate, would result in residual impacts of **HIGH** (proposed new road), **MEDIUM** (Mthentu and Kwadlambu river bridges) and **LOW** (other bridges) significance.

Loss of biodiversity

The loss of habitat resulting from construction of the proposed new road and bridges over the rivers would probably result in an associated loss of biodiversity. The loss of biodiversity may also occur due to increased harvesting of desirable species in more remote areas. Some habitats within the grasslands, e.g. rocky outcrops, contain very high diversity. Impacts on these areas may lead to localised loss of biodiversity in the Pondoland-Ugu Sandstone Coastal Sourveld, but may not necessarily lead to loss of biodiversity in a regional context. The potential localised loss of biodiversity is assessed to be of **high** intensity and significance at the site of the Mthentu River bridge and **medium** intensity and significance along the proposed new road and at the other bridge crossing sites. The residual impacts (i.e. with implementation of mitigation measures as recommended for “loss of habitat” above) are assessed to be of **MEDIUM** and **LOW** significance, respectively.

Fragmentation of habitat

The SANRAL preferred route would result in fragmentation of habitat, but would avoid core untransformed areas within the PCE due to the position of the proposed alignment along the margin of the PCE between Lusikisiki and the Mthentu River. The areas with the highest possibility of fragmentation of habitat are between the Mthentu and the Mthamvuna rivers, which is also the area with the greatest degree of transformation and degradation due to cultivation. The anticipated permanent impacts on vegetation and flora associated with fragmentation of habitat, such as impaired gene flow within fragmented populations and creation of edges, is assessed to be of medium intensity at a regional

level. The impact is rated to be of **HIGH** significance without and with mitigation as it is considered unlikely that the impact can be effectively mitigated.

Construction of the proposed new bridges over the Mthentu and Kwadlambu rivers would probably result in localised fragmentation of habitat assessed to be of **high** significance. The Mthentu River bridge would pass through untransformed areas of vegetation but the construction of the bridge is not, however, expected to impact on the forest in the gorge to any major degree. If the latter were to be severe it could result in fragmentation of the forest habitat. The Kwadlambu River bridge would pass perpendicularly across the marsh wetland habitat. The anticipated loss of habitat could also fragment the habitat in such a way as to locally separate upstream and downstream areas entirely from one another. This may be aggravated by downstream erosion due to constriction of water flow at the bridge site. Implementation of mitigation measures recommended for “loss of habitat” above would result in a residual impact of **MEDIUM** significance.

The probable localised impacts on vegetation and flora due to fragmentation of habitat associated with construction of the Msikaba, Mnyameni, Kulumbe, Mpahlane and Mzamba river bridges is assessed to be of **MEDIUM** intensity and significance without and with mitigation as it is considered unlikely that the impact can be effectively mitigated.

Loss of species of special concern

There are 35 plant species of conservation importance occurring in grasslands within the Pondoland area while 38 plant species of conservation importance have been recorded in the forests. These include a number of PCE endemics, but constitute all Red Data List species as well as other species for which there could be conservation concern. According to Provincial Ordinances a number of protected species also occur in the grasslands. In addition, the route may also result in the loss of a number of medicinal species which may not appear on either of the mentioned lists.

It is considered highly probable that species of special concern would be encountered within the grasslands traversed by the SANRAL preferred route. The anticipated permanent, localised loss of species of special concern is considered to be of **high** intensity and significance. Implementation of mitigation measures recommended for “loss of habitat” above would result in a residual impact of **MEDIUM** significance.

Permanent, localised impacts of **high** intensity and significance would result from construction of the Msikaba, Mthentu and Kwadlambu River bridges since these sites contain a variety of grassland and forest habitats. A previous botanical study encountered at least 15 protected plant species at the Msikaba River bridge site while at least 29 species of special concern were encountered at the Mthentu River bridge site. Since there are 14 plant species of conservation importance occurring in wetlands and marshy areas within the Pondoland area, there is a high probability that the wetland habitats at the Kwadlambu River bridge site would contain species of special concern. Implementation of mitigation measures recommended for “loss of habitat” above would result in a residual impact of **MEDIUM** significance.

Construction of the Mnyameni, Kulumbe, Mpahlane and Mzamba River bridges would result in permanent, localised impacts considered of **medium** intensity and significance due to naturally high levels of biodiversity in the affected grassland, rocky grassland and/or forests. Implementation of mitigation measures recommended for “loss of habitat” above would result in a residual impact of **LOW** significance.

Increased run-off and drainage, soil erosion, silt loads and sedimentation

The increased pavement and bridge areas associated with the proposed new bridges would probably result in increased run-off and drainage, soil erosion, silt loads and sedimentation. The associated localised loss or disturbance to vegetation and flora is assessed to be of high intensity over the long term and is thus considered to be of **high** significance.

Operation of the proposed new road, new R61 interchange, new intersections with existing district roads and Mthentu mainline toll plaza would probably also result in potential impacts on vegetation and flora by way of increased run-off and drainage, soil erosion, silt loads and sedimentation. The potential impact is assessed to be of **medium** significance.

Minimisation and restriction of site clearing to areas required for construction purposes only, implementation of erosion and sediment control measures, appropriate location of site offices and ongoing monitoring and maintenance of revegetation works would reduce the significance of the potential impacts to **MEDIUM** and **LOW**, as appropriate.

Invasion by weeds and invasive alien plants

Invasion by weeds and invasive alien plants as a result of construction of the proposed new road and new bridges between Lusikisiki and the Mthamvuna River is considered potentially serious due to the high levels of invasion in similar disturbed habitats nearby and the fact that the invasion is almost certain to occur in the absence of any control measures. The forests in the gorges are considered especially vulnerable since alien plants could spread rapidly downslope and downstream. Alien plants are known to invade forests up to 150 m from the margin adjacent to disturbance and have been observed up to 100 m away in grasslands in the greenfields area. This indicates that 680 ha of additional habitat (100 m on each side of the road for 34 km) may be altered adjacent to the road over and above the area that would be lost due to road construction. This equates to approximately 3.3 % of the remaining total area of Pondoland-Ugu Sandstone Coastal Sourveld. Thus it is considered that probable localised, cumulative impacts of high intensity would occur over the long term. The potential impacts associated with invasion by weeds and invasive alien plants as a result of the construction of the proposed new road are thus deemed to be of **high** significance.

The proposed new R61 Interchange, new intersections with existing district roads and construction of the proposed Mthentu mainline toll plaza would probably result in long term, localised invasion by weeds and invasive alien plants. The potential impact is assessed to be of **medium** significance.

Implementation of an effective weed control programme would reduce the potential impacts to **MEDIUM** (proposed new road and bridges) and **LOW** significance.

Strip/ribbon/secondary development

A precautionary approach has been taken in assessing the potential impact associated with strip/ribbon/secondary development, where it has been assumed that there would be no limitation to development along the coast due to the increased accessibility of these areas. It is acknowledged that SANRAL would not necessarily have any control over this potential impact and that it would require political will from the relevant conservation/environmental authority to limit this potential effect. Under this scenario it is possible that large parts of the coastline may become developed for a distance of up to 2 km from the high tide mark. Although the likelihood of this would be very low under current legislation and the confidence in the assessment is low, the risk of this happening needs to be taken into account. Conservatively, up to 2 000 ha of coastal land could become developed under this scenario, approximately 9.6 % of the remaining total area of Pondoland-Ugu Sandstone Coastal Sourveld. The potential impact of strip development (with associated habitat loss, habitat fragmentation, loss of species

of special concern and spread of alien plant species) is assessed to be of medium intensity at a regional level in the long term, thus the significance is rated as **HIGH** without and with mitigation. It is considered unlikely that the impact can be effectively mitigated.

Potential impacts of **MEDIUM** significance are predicted as a result of the construction of the proposed new R61 Interchange, new intersections with district roads and the Mthentu mainline toll plaza (associated with the presence of the proposed new road). No applicable mitigation has been identified.

Increased accessibility of remote areas

The proposed new road and bridges over the Msikaba and Mthentu rivers would probably make previously inaccessible areas more accessible, especially for the removal of medicinal products and other species for which there may be horticultural interest. The current rates of harvesting of medicinal species in the area for muthi markets (mostly in Durban) has led to the depletion of many species near existing settlements. The gorges are home to a number of species that may be of horticultural interest, e.g. cycads. The probable impact is assessed to be of **HIGH** intensity and significance without and with mitigation as it is considered unlikely that the impact can be effectively mitigated.

Reduction in resilience/stability of ecosystems

It is considered that the resilience/stability of the grasslands, wetlands and forests (and associated vegetation and flora) between Lusikisiki and the Mthamvuna River would be impaired (e.g. change in vegetation structure and loss of productivity), cumulatively, via potential impacts such as direct loss of habitat, fragmentation of habitat, introduction of alien plants and the potential disruption of the flow of nutrients and materials through the landscape.

Potential impacts on vegetation and flora associated with the proposed new bridge over the Kwadlambu River are assessed to be of **high** intensity and significance. Implementation of mitigation measures recommended above in terms of loss and fragmentation of habitat would reduce the significance of the potential impact to **MEDIUM**.

The proposed new road would result in probable impacts of **MEDIUM** intensity and significance without and with mitigation. Potential residual impacts of **LOW** significance (with implementation of mitigation measures recommended above) are predicted as a result of the proposed construction of the other new bridges, new R61 Interchange, new intersections with existing district roads and the proposed Mthentu mainline toll plaza (associated with the presence of the proposed new road).

Disruption of the flow of nutrients and materials

Construction of the proposed new bridge over the Kwadlambu River would result in disruption of the flow of nutrients and materials due to it bisecting wetlands. Road infrastructure in the wetlands would result in potentially major changes to the flow of water, sediment and nutrients through the landscape and may result in pooling on the upstream side and erosion and fast flows on the downstream side, depending on the design of the bridge. The associated potential impacts on vegetation and flora is assessed to be of medium intensity at a regional level in the long term, thus the significance is rated as **high**. Minimising impacts on wetland areas through design (a single span from one side of the wetland to the other is recommended) and during construction would result in potential residual impacts of **MEDIUM** significance.

It is anticipated that the proposed new R61 Interchange, new intersections with district roads and the Mthentu mainline toll plaza would also result in localised impacts on vegetation and flora associated with disruption of flow of nutrients and materials. The potential impacts are assessed to be of medium intensity in the long term, thus the significance is deemed to be **medium**. Implementation of the

recommended mitigation measures aimed at reducing the impacts associated with additional runoff (above) would result in a potential residual impact of **LOW** significance.

Table 12.1: Summary assessment of key potential impacts on vegetation and flora – Lusikisiki (to Mthamvuna River

ISSUE / IMPACT	EXTENT	DURATION	INTENSITY	PROBABILITY	SIGNIFICANCE	CONFIDENCE
Loss of habitat						
Without mitigation	Local/Regional	Permanent	Medium/High	Probable/Definite	Medium/High/Very high	Medium/High
With mitigation	Local	Permanent	High/Medium	Probable/Definite	LOW/MEDIUM/HIGH	Medium/High
Loss of biodiversity						
Without mitigation	Local	Long term	Medium/High	Probable	Medium/High	Medium/High
With mitigation	Local	Long term	Low/Medium	Probable	LOW/MEDIUM	Medium/High
Fragmentation of habitat						
Without mitigation	Local/Regional	Permanent	Medium/High	Probable/Definite	Medium/High	High
With mitigation	Local/Regional	Permanent	Medium	Probable/Definite	MEDIUM/HIGH	High
Loss of species of special concern						
Without mitigation	Local	Permanent	Medium/High	Definite	Medium/High	Medium/High
With mitigation	Local	Permanent	Low/Medium	Definite	LOW/MEDIUM	Medium/High
Impacts associated with increased run-off and drainage, soil erosion, silt loads and sedimentation						
Without mitigation	Local	Long term	Medium/High	Probable	Medium/High	Medium
With mitigation	Local	Long term	Low/Medium	Probable	LOW/MEDIUM	Medium
Impacts associated with invasion by weeds and invasive alien plants						
Without mitigation	Local	Long term	Medium/High	Probable	Medium/High	Medium
With mitigation	Local	Long term	Low/Medium	Probable	LOW/MEDIUM	Medium
Impacts associated with strip/ribbon/secondary development						
Without mitigation	Local/Regional	Long term	Medium	Probable	Medium/High	Medium
With mitigation	Local/Regional	Long term	Medium	Probable	MEDIUM/HIGH	Medium
Impacts associated with increased accessibility of remote areas						
Without mitigation	Local	Long term	High	Probable	High	Medium
With mitigation	Local	Long term	High	Probable	HIGH	Medium
Impacts associated with reduction in resilience/stability of ecosystems						
Without mitigation	Local	Long term	Medium/High	Improbable/Probable	Medium/High	Medium
With mitigation	Local	Long term	Low	Improbable/Probable	LOW/MEDIUM	Medium
Impacts associated with disruption of flow of nutrients and materials						
Without mitigation	Local/Regional	Long term	Medium	Probable	Medium/High	Medium
With mitigation	Local/Regional	Long term	Low	Probable	LOW/MEDIUM	Medium

12.2.2 FAUNA

Key potential impacts on fauna are anticipated during the construction and operational phases of the proposed greenfields section between Lusikisiki and the Mthamvuna River. These would be associated with the following: loss of sensitive faunal habitats; loss of faunal diversity; loss of Species of Special Concern; impacts on the Cape Griffon Vulture; disruption of faunal movement; invasion of alien faunal species; increased fire risk; chemical pollution; noise and light pollution; and ecosystem disruption. A summary of the assessment of the key potential faunal impacts is provided in Table 12.2.

Loss of sensitive faunal habitats

The habitats which occur between Lusikisiki and the Mthamvuna River, such as the forests and thicket patches, wetlands and rock outcrops, are considered sensitive faunal habitats due to their isolated and fragmented nature. The proposed toll highway could bisect and thus increase the fragmentation of these

habitats. Most forest habitats, however, occur in the river gorges and would not be directly affected by the proposed toll highway. However, indirect effects mediated by changes in hydrodynamics of the adjacent wetlands and direct effects resulting from increased human activity in the area are considered highly probable. The permanent loss of sensitive faunal habitats during the construction and operational phases is assessed to be of **medium** intensity and significance. Careful design and development of rest stops, view points or associated projects at the bridge sites (to ensure that associated environmental impacts – e.g. erosion, litter, increased fire risk, etc. – do not impact the surrounding forest, wetland and rock outcrop habitats) and assistance in the formal protection of comparable habitats elsewhere in the Pondoland region, particularly in the proposed Pondoland National Park, would result in probable residual impacts of **LOW** significance.

Loss of faunal diversity

This section of the proposed toll highway has been characterised as still retaining high levels of faunal diversity (119 species of amphibians, reptiles and mammals). Highest levels of biodiversity occur in habitat mosaics, particularly associated with the forest, thicket and grassland habitats. It is considered that road traffic associated with this greenfields section of the proposed toll highway would result in an increased animal mortality rate when compared to the existing R61 between Lusikisiki and the Mthamvuna River – i.e., animals being killed or injured whilst crossing the road during normal movements within their home range (e.g. snakes), during annual breeding migrations (e.g. frogs), during seasonal migrations or when attracted to the road either for warmth (e.g. snakes) or for food from previous road kills (e.g. vultures). The highly probable loss of faunal diversity is assessed to be of medium intensity during the operational phase, thus the significance of the anticipated impact is assessed to be **MEDIUM** without and with mitigation. It is considered unlikely that the impact can be effectively mitigated.

Loss of Species of Special Concern

The section of the proposed toll highway between Lusikisiki and the Mthamvuna River contains 26 Species of Special Concern (comprising butterflies, slugs, reptiles, birds and mammals). It is considered that construction-phase impacts, such as habitat loss and associated fragmentation (assessed above), and operation of the proposed toll highway (with associated impacts such as increased fire risk, disturbance and road mortality) would, cumulatively, pose a threat to the survival of populations of threatened species. The potential permanent loss of Species of Species Concern is assessed to be of **MEDIUM** intensity and significance without and with mitigation.

Impacts on the Cape Griffon Vulture

Important vulture breeding sites in this section of the proposed toll highway have already declined or have been abandoned (e.g. the Mthentu River colony). The breeding colony on the cliffs of the Msikaba Gorge, downstream from the proposed bridge site, is considered of high priority. However, the survival of the Cape Griffon Vulture in the Transkei region depends not just on protecting important breeding sites on cliffs in the river gorges, but also in maintaining a suitable foraging environment with sufficient healthy carcasses for food. The main mortality factors for Cape Griffon Vultures have been ranked as loss of carrion (food), inadvertent poisoning and electrocution on electric transmission lines. It is considered that current levels of protection for vultures in the region are inadequate and that illegal exploitation of vultures in the region is likely to continue under the “do nothing” scenario.

Construction (and operation) of the proposed bridge across the Msikaba River would result in probable impacts of **high** intensity and significance on the Cape Griffon Vulture. Avoiding disturbance to the breeding colony during planning, construction and operation (e.g. the maximum possible exclusion zone around the Msikaba vulture colony should be observed and possible helicopter and fixed-wing flights down the Msikaba River from the bridge site should be banned, or maintain a minimum height of 1 000 m), prohibition of access to breeding ledges (other than for registered research), installation of suitable

bird diverters on cables across the river gorges, restriction of blasting to daylight periods and prohibition of blasting during the egg-laying season (March–July) and collaboration with the Vulture Study Group regarding any additional mitigation, monitoring and management requirements would reduce the probable residual impact to **MEDIUM** significance.

Disruption of faunal movement

The proposed new road and associated bridges in the greenfields section between Lusikisiki and the Mthamvuna River would result in direct and indirect disruption to faunal movement by way of increased mortalities from road traffic and disturbance and behavioural reluctance to cross alien habitat, respectively. The effects of the proposed toll highway can also act synergistically and reduce the quality of habitat available to birds and other animals alongside the road. For amphibians this potential impact would be greatest where the proposed new road is aligned adjacent to wetlands suitable for breeding.

The potential localised disruption to faunal movements is assessed to be of medium intensity over the long term and is thus considered of **MEDIUM** significance without and with mitigation as it is considered unlikely that the impact can be effectively mitigated.

Invasion of alien faunal species

The probable passive translocation of alien faunal species associated with the proposed greenfields section (leading to possible declines in Pondoland faunal populations) is assessed to be of medium intensity over the long term and is thus deemed to be of **medium** significance. Active culling programmes of problem animals would reduce the significance of the probable residual impact to **LOW**.

Increased fire risk

The operational phase of the greenfields section of the proposed toll highway would probably result in a risk of accidental fires extending into the sensitive habitats occurring between Lusikisiki and the Mthamvuna River, thereby causing localised loss of faunal habitats and diversity. The permanent long-term loss of fauna is assessed to be of **MEDIUM** intensity and significance without and with mitigation since it is considered unlikely that the potential impact could be effectively mitigated. However, it should be ensured that vegetation in the road reserve is kept low so that it serves as an effective fire break and that rest stops and other similar infrastructure are not situated adjacent to sensitive habitats.

Chemical pollution

It is considered that chemical pollution from exhaust fumes, oil spillage and accumulation of rubber compounds from tyre wear during the operational phase of the proposed toll highway would result in potential impacts of **MEDIUM** intensity and significance without and with mitigation. This would be of particular importance at the proposed interchanges and Mthentu mainline toll plaza location. It is considered unlikely that the intensity and significance of the potential impact could be reduced. However, it should be ensured that the use of herbicides in the road reserve and at the toll plaza is restricted and controlled, that impacts on sensitive habitats are minimised and that stormwater outlets, particularly from the toll plaza, do not drain into natural wetlands.

Noise and light pollution

The operation of the proposed toll highway in the greenfields section would result in noise from vehicle traffic and at night would also involve considerable light pollution from vehicle headlights. Cumulatively these factors could depress local faunal populations. For example, ponds adjacent to and illuminated by road traffic or elevated lighting associated with road interchanges and toll plazas (or service facilities) have been shown to have reduced amphibian populations. The potential faunal impact associated with noise and light pollution is assessed to be of **MEDIUM** intensity and significance without and with mitigation since it is considered unlikely that the impact can be effectively mitigated.

Ecosystem disruption

It is expected that the potential direct, indirect and cumulative impacts of the construction and operation of the proposed greenfields section between Lusikisiki and the Mthamvuna River would, overall, probably result in disruption of biological interactions which, in turn, may lead to a resultant loss or change of ecosystem function (e.g. nutrient cycling) or interruption of ecological processes. This potential localised, long-term impact is assessed to be of **medium** intensity and significance. Implementation of mitigation measures such as: the avoidance of sensitive habitats; maintaining natural drainage; maintaining road reserves as natural fire breaks; minimising silt loads into rivers, streams and wetlands; and ensuring that underpasses are large enough to allow the maintenance of water flow and soil hydrodynamics (and also to serve as migratory paths for small animals) would ensure that ecosystem functioning is maintained. The residual impact of the proposed toll highway between Lusikisiki and the Mthamvuna River with regard to ecosystem disruption is assessed to be of **LOW** significance.

Table 12.2: Summary assessment of key potential impacts on fauna – Lusikisiki to Mthamvuna River

ISSUE / IMPACT	EXTENT	DURATION	INTENSITY	PROBABILITY	SIGNIFICANCE	CONFIDENCE
Loss of sensitive faunal habitats						
Without mitigation	Local	Permanent	Medium	Definite	Medium	High
With mitigation	Local	Permanent	Low	Definite	LOW	Medium
Loss of faunal diversity						
Without mitigation	Local	Long term	Medium	Probable	Medium	Medium
With mitigation	Local	Long term	Medium	Probable	MEDIUM	Medium
Loss of Species of Special Concern						
Without mitigation	Local	Long term	Medium	Probable	Medium	Medium
With mitigation	Local	Long term	Medium	Probable	MEDIUM	Medium
Impacts on the Cape Griffon Vulture						
Without mitigation	Regional-National	Long term	High	Probable	High	Medium
With mitigation	Regional-National	Long term	Medium	Probable	MEDIUM	Medium
Disruption of faunal movement						
Without mitigation	Local	Long term	Medium	Probable	Medium	Medium
With mitigation	Local	Long term	Medium	Probable	MEDIUM	Medium
Impacts associated with invasion of alien fauna						
Without mitigation	Local	Long term	Medium	Probable	Medium	Medium
With mitigation	Local	Long term	Low	Probable	LOW	Medium
Impacts associated with increased fire risk						
Without mitigation	Local	Long term	Medium	Probable	Medium	Medium
With mitigation	Local	Long term	Medium	Probable	MEDIUM	Medium
Impacts associated with chemical pollution						
Without mitigation	Local	Long term	Medium	Probable	Medium	Medium
With mitigation	Local	Long term	Medium	Probable	MEDIUM	Medium
Impacts associated with noise and light pollution						
Without mitigation	Local	Long term	Medium	Probable	Medium	Medium
With mitigation	Local	Long term	Medium	Probable	MEDIUM	Medium
Ecosystem disruption						
Without mitigation	Local	Long term	Medium	Probable	Medium	Medium
With mitigation	Local	Long term	Low	Probable	LOW	Medium

12.2.3 AQUATIC ECOSYSTEMS

The following aspects relating to aquatic ecosystems are addressed separately below; riparian and instream vegetation; rivers; wetlands; and estuaries.

Riparian and instream vegetation

Key potential impacts on riparian and instream vegetation are anticipated during the construction and operational phases of the proposed greenfields section of the proposed toll highway. These would be associated with the following: destruction of riparian vegetation and loss of sensitive habitats; increased surface run-off; surface and groundwater pollution; reduction in permeable surfaces; diversion of flow by hard surfaces; and change in vegetation community type. A summary of the assessment of the key potential impacts on riparian and instream vegetation is provided in Table 12.3.

Destruction of riparian vegetation and loss of sensitive habitats

The greenfields section of the proposed toll highway between Lusikisiki and the Mthamvuna River would result in destruction of riparian vegetation and loss of sensitive habitat. The expected permanent impact is assessed to be of medium intensity at a local level and is assigned a **high** significance rating due to the nature of the riparian vegetation and the important role it plays within the riverine ecosystems. Clearing of vegetation during the drier winter months, limiting clearing to areas immediately needed for construction, undertaking vegetation stripping in parallel with road construction and avoiding large stands of Palmiet would reduce the significance of the potential impact to **LOW**.

Increased surface run-off

Site clearing activities and the increased pavement area associated with the proposed greenfields section would result in increased surface run-off and increased risk of erosion. Vegetation attenuates surface water flow which, consequently, encourages permeation of the soils and contributes to maintaining water table levels. The anticipated permanent impact on riparian and instream vegetation during the construction and operational phases is assessed to be of **medium** intensity and significance. Potential residual impacts of **LOW** significance are expected with implementation of a surface stormwater drainage system and the use of swales during construction (which should then be grassed for the operational phase).

Surface water and groundwater pollution

Construction activities would probably result in sediment loads entering the freshwater ecosystems in this section of the proposed toll highway, leading to increased turbidities and sedimentation risks in downstream areas. Diesel, oils and other chemical substances conveyed along the road during the operational phase would pose a threat to the continued functioning of the instream and adjacent areas, if by chance these are dispersed via surface run-off, or permeate into the groundwater. Changes to water quality (surface and groundwater) affect the functioning of plants and other instream biota. The potential impact on riparian and instream vegetation is assessed to be permanent and of medium intensity at a local level. The significance of the potential impact is thus rated as **medium**. Formulation and implementation of erosion and sediment control measures, proper storage of construction materials (including fuels and oils), emergency plans, construction camp management procedures and appropriate location (i.e. well removed from aquatic systems) of stockpiles, site offices, etc., would reduce the potential impact to **LOW** significance.

Reduction in permeable surfaces

The hard surfaces associated with the proposed greenfields section of the proposed toll highway would reduce the amount of permeable surfaces for water to penetrate the soils and maintain the local groundwater systems. The potential indirect impact on riparian and instream vegetation due to changes

in soil moisture status is assessed to be permanent and of medium intensity at a local level. This potential impact is thus rated of **medium** significance. Revegetation of all remaining disturbed areas with appropriate plant species would reduce the potential impact to **LOW** significance.

Diversion of flow by hard surfaces

The construction of hard surfaces associated with the proposed greenfields section would probably divert flow away from water bodies, as well as increase flow velocities of run-off and increase the risk of pollution if the stormwater contains any spilled oils, fuels or coolants from passing traffic. This would especially be the case at the proposed Ndwalane toll plaza, where large quantities of oils may leak from vehicles while idling. This potential permanent impact on riparian and instream vegetation is assessed to be of **medium** intensity and significance. Residual potential impacts of **LOW** significance would result by way of the design and use of stormwater retention swales and oil traps to prevent contamination of downstream areas.

Change in vegetation community type

Disturbance of the natural vegetation caused by the construction activities would lead to the potential introduction of exotic plant species. The potential localised change to the indigenous riparian and instream vegetation is assessed to be of permanent duration and **medium** intensity and significance. Implementation of an appropriate rehabilitation and weed control programme would result in a potential residual impact of **LOW** significance.

Table 12.3: Summary assessment of key potential impacts on riparian and instream vegetation – Lusikisiki to Mthamvuna River

ISSUE / IMPACT	EXTENT	DURATION	INTENSITY	PROBABILITY	SIGNIFICANCE	CONFIDENCE
Destruction of riparian vegetation and loss of sensitive habitats						
Without mitigation	Local	Permanent	Medium	Definite	Medium	High
With mitigation	Local	Permanent	Low	Definite	LOW	High
Impacts associated with increased surface run-off						
Without mitigation	Local	Permanent	Medium	Definite	Medium	High
With mitigation	Local	Permanent	Low	Definite	LOW	High
Impacts associated with surface and groundwater pollution						
Without mitigation	Local	Permanent	Medium	Definite	Medium	High
With mitigation	Local	Permanent	Low	Definite	LOW	High
Impacts associated with reduction in permeable surfaces						
Without mitigation	Local	Permanent	Medium	Definite	Medium	High
With mitigation	Local	Permanent	Low	Definite	LOW	High
Impacts associated with diversion of flow by hard surfaces						
Without mitigation	Local	Permanent	Medium	Definite	Medium	High
With mitigation	Local	Permanent	Low	Definite	LOW	High
Change in vegetation community type						
Without mitigation	Local	Permanent	Medium	Definite	Medium	High
With mitigation	Local	Permanent	Low	Definite	LOW	High

Rivers

The construction and operational phases of the proposed bridges would result in key potential impacts associated with the following riverine aspects: change in channel structure and loss of instream habitat; risk of surface and groundwater pollution; and changes in ecosystem structure and function, and loss of biodiversity. It should be noted that the specialist study elevated the significance of most of the potential impacts beyond the ratings that would have been assigned in terms of the “convention for assigning significance ratings to potential impacts” (refer to Section 2.2.2 and Table 2.3) due to the sensitivity of the

riverine environments and relatively close proximity to estuaries. A summary of the assessment of the key potential impacts on rivers is provided in Table 12.4.

Change in channel structure and loss of instream habitat

It is considered that the placing of the Mnyameni, Kulumbe and Mzamba River bridge structures in the river beds would cause immense damage to the structure of the river banks or beds, and therefore the channel in which the rivers flow. The physical channel forms the template for instream habitat, and is essential for maintaining habitat quality. Any changes in channel condition and structure would have a cumulative effect, and is sufficiently extreme, may result in a shift in population structure and possibly biodiversity at the sites. Macroinvertebrates are particularly dependent on instream habitat availability, and due to their short life-spans and localised habitats, are very vulnerable to changes in channel structure and resultant changes in instream habitat.

The significance of the change in channel structure and loss of instream habitat associated with the construction of these proposed new bridges is assessed to be **high**. Probable residual impacts of **LOW** significance would result with effective implementation of mitigation measures. The latter include the following: designing the bridges to span the entire width of the channel and floodplain so as to avoid disturbance to the riparian zones of the rivers (where possible); ensuring pillars, columns or bridge buttresses are not placed in instream or riparian zones (where possible); minimising disturbance of instream channels and riparian zones during bridge construction; and minimising the number and width of pillars, vertical columns and buttresses placed within the river channel and floodplain.

Risk of surface and groundwater pollution

The construction of the proposed greenfields section would be associated with the reduction of vegetated plant cover and work taking place within or close to wetlands, resulting in increased sediments in the systems. During the operation of the greenfields section of the proposed toll highway diesel and oils (and other chemical substances conveyed along the road) would pose a threat to the continued functioning of the instream and adjacent areas, if by chance these are dispersed via surface run-off, or permeate into the groundwater. Changes to water quality (surface and groundwater) affect the functioning of plants and other instream biota.

The significance of probable surface and groundwater pollution, including turbidity loads due to sedimentation and other pollutants, associated with the construction and operational phases of the proposed new bridges is assessed to be **high** and **medium**, respectively. It is recommended that pillars, vertical columns and buttresses should not be placed within river channels if at all possible. If this is necessary, all precautions should be taken to avoid excessive disturbance of the bank and increased sedimentation into the river channels. Formulation and implementation of erosion and sediment control measures (e.g. coffer dams and silt traps), proper storage of construction materials (including fuels and oils) and emergency plans during the construction and operational phases would reduce the extent and intensity of the potential impact, resulting in a residual potential impact of **LOW** significance.

Changes in ecosystem structure and function, and loss of biodiversity

Impacts on aquatic systems that result in changes in habitat, flow pattern or hydrodynamics and water quality (assessed above) have the potential, cumulatively, to cause changes in ecosystem structure and function. If the proposed development is undertaken without appropriate caution and effective mitigation, loss of biodiversity and replacement of certain organisms (e.g. indigenous fish species) with other organisms (e.g. alien fish species) may occur. This is of particular relevance in the areas where Red Data book species are found, where fish populations have not yet been surveyed and where disturbances may occur in the river channel.

Probable changes in ecosystem structure and function, and loss of biodiversity are assessed to be of **high** (Mnyameni, Kulumbe and Mzamba rivers) and **medium** (other bridges) intensity and significance. Implementation of mitigation measures such as ensuring base flows, reducing the potential for sedimentation and erosion, limiting large construction footprints (e.g. bridge piers) as far as possible and reducing the clearing of any vegetation to a minimum would result in a residual improbable impact of **LOW** significance.

Table 12.4: Summary assessment of key potential impacts on rivers – Lusikisiki to Mthamvuna River

ISSUE / IMPACT	EXTENT	DURATION	INTENSITY	PROBABILITY	SIGNIFICANCE	CONFIDENCE
Change in channel structure and loss of instream habitat						
Without mitigation	Regional	Short term	High	Highly probable	High	Medium
With mitigation	Local-Regional	Short term	Low	Probable	LOW	Medium
Risk of surface and groundwater pollution						
Without mitigation	Local/Regional	Short term	Medium/High	Highly probable	Medium/High	Medium
With mitigation	Local/Regional	Short term	Low	Probable	LOW	Medium
Changes in ecosystem structure and function, and loss of biodiversity						
Without mitigation	Regional	Short term	High	Highly probable	Medium/High	Medium
With mitigation	Local-Regional	Short term	Low	Improbable	LOW	Medium

Wetlands

The construction and operational phases of the proposed greenfields section would result in key potential impacts on wetlands in terms of the following aspects: increased surface run-off; risk of surface and groundwater pollution; reduction in permeable surfaces; diversion of flow by hard surfaces; change in vegetation community type; and physical change to wetland areas. A summary of the assessment of the key potential impacts on wetlands is provided in Table 12.5.

Increased surface run-off

Site clearing activities and the increased pavement area associated with the proposed SANRAL preferred route in the greenfields section between Lusikisiki and the Mthamvuna River would result in increased surface run-off and increased risk of erosion. Vegetation attenuates surface water flow which, consequently, encourages permeation of the soils and contributes to maintaining water table levels. If excessive stormwater is diverted into wetlands during the operational phase, these wetlands would change from temporary to permanent. The associated plant communities would then change from grasses or sedges to reeds and bulrushes, and if the wetlands are not sufficiently protected from sustained high flows, it could also erode. Temporary wetlands are an important source of winter grazing (bulrushes are not palatable) and also contain a high proportion of geophytes, considered a source of food or medicine. The anticipated permanent impact on wetlands during the construction and operational phases is assessed to be of **high** and **medium** intensity and significance, respectively. Potential residual impacts of **MEDIUM** (construction) and **LOW** (operational phase) significance are expected with implementation of a surface stormwater drainage system and the use of swales (which should then be grassed for the operational phase) and siltation and erosion structures.

Risk of surface and groundwater pollution

The construction of the SANRAL preferred route would be associated with the reduction of plant cover, resulting in increased sediments in wetland systems. During the operation of the greenfields section of the proposed toll highway diesel and oils (and other chemical substances conveyed along the road) would pose a threat to the continued functioning of the adjacent wetland areas, if by chance these are dispersed via surface run-off, or permeate into the groundwater. Changes to water quality (surface and

groundwater) affect the functioning of plants and other wetland biota and would also render the wetlands unsuitable for human use or contact.

The significance of probable surface and groundwater pollution associated with the construction and operational phases of the SANRAL preferred route in the greenfields section between Lusikisiki and the Mthamvuna River is assessed to be **high** and **medium**, respectively. Formulation and implementation of erosion and sediment control measures (e.g. coffer dams and silt traps), proper storage of construction materials (including fuels and oils) and emergency plans during the construction and operational phases would reduce the extent and intensity of the potential impact, resulting in a residual impact of **MEDIUM** and **LOW** significance, respectively.

Reduction in permeable surfaces

The hard surfaces associated with the proposed greenfields section would reduce the amount of permeable surfaces for water to penetrate the soils and maintain the local groundwater systems. The potential impact on wetlands due to changes in soil moisture status is assessed to be permanent and of high (operational phase) intensity at a local level. The potential impact associated with the operational phase is thus rated of **high** significance. Reduction of surface flow velocities by way of suitable stormwater run-off areas would allow time for the stormwater to permeate the local soils and groundwater systems and would maintain localised flows to sustain the surrounding wetlands and/or vegetation. The significance of the potential residual impact is deemed to be **LOW**.

Diversion of flow by hard surfaces

The increased area of hard surfaces would probably divert flow away from water bodies, as well as increase flow velocities of run-off and increase the risk of pollution if the stormwater contains any spilled oils, fuels or coolants from passing traffic. This would especially be the case at the proposed Mthentu mainline toll plaza, where large quantities of oils may leak from vehicles while idling. The potential permanent impact on wetlands is assessed to be of **medium** intensity and significance. Discharge of stormwater into retention swales before being allowed to flow into wetlands and use of oil traps to prevent contamination of downstream areas would reduce the potential impact to **LOW** significance.

Change in vegetation community type

Disturbance of the natural vegetation caused by the construction activities would lead to the potential introduction of exotic plant species. The potential localised change to the indigenous wetland vegetation is assessed to be of permanent duration and **medium** intensity and significance. Implementation of an appropriate rehabilitation and weed control programme would result in a potential residual impact of **LOW** significance.

Physical change to wetland areas

The proposed greenfields section between Lusikisiki and the Mthamvuna River would result in physical change to wetland areas both directly and due to changes to the wetland plant communities, diversion of flows and increased surface run-off (assessed above). The anticipated permanent, localised reduction in wetland functioning is assessed to be of **medium** intensity and significance. The potential impact would be reduced to **LOW** significance by ensuring that the location of construction infrastructure, materials and camps avoid wetlands as far as possible, and implementation of the recommended mitigation measures stipulated above.

Table 12.5: Summary assessment of key potential impacts on wetlands – Lusikisiki to Mthamvuna River

ISSUE / IMPACT	EXTENT	DURATION	INTENSITY	PROBABILITY	SIGNIFICANCE	CONFIDENCE
Impacts associated with increased surface run-off						
Without mitigation	Local	Permanent	Medium/High	Definite	Medium/High	High
With mitigation	Local	Permanent	Low/Medium	Definite	LOW/MEDIUM	High
Impacts associated with risk of surface and groundwater pollution						
Without mitigation	Local	Permanent	Medium/High	Definite	Medium/High	High
With mitigation	Local	Permanent	Low/Medium	Definite	LOW/MEDIUM	High
Impacts associated with reduction in permeable surfaces						
Without mitigation	Local	Permanent	High	Definite	High	High
With mitigation	Local	Permanent	Low	Definite	LOW	High
Impacts associated with diversion of flow by hard surfaces						
Without mitigation	Local	Permanent	Medium	Definite	Medium	High
With mitigation	Local	Permanent	Low	Definite	LOW	High
Change in vegetation community type						
Without mitigation	Local	Permanent	Medium	Probable/Definite	Medium	High
With mitigation	Local	Permanent	Low	Definite	LOW	High
Physical change to wetland areas						
Without mitigation	Local	Permanent	Medium	Probable/Definite	Medium	High
With mitigation	Local	Permanent	Low	Probable/Definite	LOW	High

Estuaries

The construction and operational phases of the SANRAL preferred route in the greenfields section of the proposed toll highway between Lusikisiki and the Mthamvuna River would result in key potential impacts on estuaries as a result of the following: sedimentation; water quality changes; and improved access. A summary of the assessment of the key potential impacts is provided in Table 12.6.

Sedimentation

Sediments, deposited into the two river catchments that would be crossed by the proposed new road construction in the greenfields section, would ultimately be conveyed into estuaries at which the ichthyofaunal, water quality and aesthetic status are described as “moderate-good”, “fair-good” and “moderate-good”, respectively. The Mzimvubu estuary currently suffers from excess siltation while the Ntafufu estuary is considered to be an important estuary due to the diverse range of habitats available to estuarine biota, i.e. both systems are sensitive to sedimentation impacts. It is predicted that highly probable impacts of high intensity in the short term would occur at a regional level due to the extent of the area covered and the importance of the estuaries in terms of diversity and fish breeding and nursery grounds. The impact is thus considered to be of **medium** significance. Implementation of mitigation measures applicable to “riparian and instream vegetation”, as stipulated above, would result in a probable impact of **LOW** significance.

Water quality changes

Water quality changes in the estuaries in this region are expected as a result of potential oil, grease and fuel spillages in the river catchments during both the construction and operational phases. The potential impact on the currently “fair-good” water quality status of the estuaries in the region is assessed to be of high intensity during construction, and medium intensity during the operational phase. The potential impact is thus assessed to be of **medium** significance during both the construction and operational phases. Implementation of construction-related mitigation measures applicable to “riparian and instream vegetation”, as stipulated above, would reduce the potential impact to **LOW** significance during the construction phase. It is considered, however, that potential impacts associated with the operational

phase, such as spillages and sheet-wash off the road into the river catchments (which would ultimately discharge into the estuaries) would be more difficult to mitigate. The significance of the potential residual impact on water quality changes in estuaries during the operational phase is thus considered to remain **MEDIUM**.

Improved access

It is anticipated that increased recreational and development-related pressures would be exerted on important and sensitive estuaries in this region as a result of the improved access to the region. The highly probable impacts on the ecological functioning and aesthetics of the estuaries would be of high intensity over the long term and are thus considered of **very high** significance. Implementation of applicable legislation promulgated for the protection of estuaries (see section 4.2.3 of the aquatic ecosystems specialist report – Volume 2, Appendix 3), enforcement of bag limits to protect estuarine resources such as fish and shell-fish (historically, however, this has proven difficult to manage) and the control of development in the floodplains of the estuaries would reduce the indirect impacts on estuaries to a probable residual impact of **HIGH** significance.

Table 12.6: Summary assessment of key potential impacts on estuaries – Lusikisiki to Mthamvuna River

ISSUE / IMPACT	EXTENT	DURATION	INTENSITY	PROBABILITY	SIGNIFICANCE	CONFIDENCE
Impacts associated with sedimentation						
Without mitigation	Regional	Short term	High	Highly probable	Medium	Medium
With mitigation	Regional	Short term	Medium	Probable	LOW	Medium
Impacts associated with water quality changes						
Without mitigation	Regional	Short/Medium term	Medium/High	Probable	Medium	Medium
With mitigation	Regional	Short/Medium term	Medium	Probable	LOW/MEDIUM	Medium
Impacts associated with improved access						
Without mitigation	Regional	Long term	High	Highly Probable	Very high	Medium
With mitigation	Regional	Long term	Medium	Probable	HIGH	Medium

12.2.4 SOILS, LAND USE AND AGRICULTURE

Key potential impacts on agriculture are anticipated as a result of the proposed toll highway. These would relate to the following: improved regional access; improved extension services; and improved access to production credit. A summary of the assessment of the key potential impacts on agriculture is provided in Table 12.7.

Improved regional access

The anticipated improved access which would be provided by the proposed toll highway would aid agriculture and forestry significantly by improving access to supplies and by rendering accessible regional and national markets which were not readily accessible previously. Since the distance travelled would decrease and the road quality improve, the associated road transport cost from most of Pondoland to the port cities of Durban and East London would be reduced. It is considered that the lack of good all-weather road has been one of the biggest limitations to the development of the agricultural potential of the northern Pondoland area. The development of the proposed toll highway would effectively open up Pondoland to timber and sugar production as well as a wide variety of other commodities.

The expected long-term impact is assessed to be of **POSITIVE HIGH** significance at a regional level. It is recommended that the Proponent ensures that agricultural development is further stimulated by way of

the development of markets and producer co-operatives for such commodities as sugarcane, timber, maize and livestock.

Improved extension services

Subsistence farmers rely on (government) extension workers. Good extension work is considered essential to the development of a higher level of technical expertise in farmers and requires that the extension officer has regular and easy access to the farmers as well as the regional office. The anticipated improved access which would be provided by the proposed toll highway, and a higher level of agricultural practice, would result in the farming community using more supplies of different kinds and purposes. As this increases, the distributors of such necessities could afford to send their own extension workers into the area (made possible by the improved access), resulting in a gradual increase in the level and depth of penetration of agricultural extension.

The improved extension service is assessed to be of **POSITIVE MEDIUM** intensity and significance. Liaison with the government extension services to determine how best to aid the extension workers to perform their work efficiently and effective implementation of the identified measures would further enhance this impact.

Improved access to production credit

Access to an affordable source of production credit is considered essential to the development of agriculture whereas peasant farmers cannot afford to finance crop production. Sources of such credit include commercial institutions/cooperatives, quasi government institutions and market linked organisations/processing facilities. Production credit from commercial institutions is considered more appropriate to commercial ventures (where the borrower has some form of collateral, normally the title deeds to the property) than to tribal/communal production where cooperatives, quasi government institutions or market linked organisations are most likely to find place. The proposed toll highway would change the economics/risk of crop production and therefore the risks to any potential lender organisation would diminish. It is considered that the most likely source of funding would be from the processor organisations who form the potential market base for the production (maize, timber and sugar mills, meat processors, etc.).

The improved access to production credit associated with the proposed toll highway is assessed to be of **POSITIVE MEDIUM** intensity and significance without and with mitigation. The availability of credit/production loans should be linked to the process of facilitating markets and availability of requirements (as recommended above) and limiting the risk to the farmer to the particular crop so as to avoid the possibility of losing title (where appropriate).

Table 12.7: Summary assessment of key potential impacts on agriculture – Lusikisiki to Mthamvuna River

ISSUE / IMPACT	EXTENT	DURATION	INTENSITY	PROBABILITY	SIGNIFICANCE	CONFIDENCE
Impacts associated with improved regional access						
Without mitigation	Regional	Long term	Medium	Definite	High+	Medium
With mitigation	Regional	Long term	Medium	Definite	HIGH+	High
Impacts associated with improved extension services						
Without mitigation	Local	Long term	Medium	Definite	Medium+	Medium
With mitigation	Local	Long term	Medium	Definite	MEDIUM+	High
Impacts associated with improved access to production credit						
Without mitigation	Local	Long term	Medium	Definite	Medium+	Medium
With mitigation	Local	Long term	Medium	Definite	MEDIUM+	High

12.2.5 SOCIAL

The proposed new road construction in the greenfields section between Lusikisiki and the Mthamvuna River would result in key potential social impacts relating to the following: increased employment opportunities; improved safety for vehicle road users; increased safety hazards for pedestrians and traffic; increased HIV/AIDS and STD risks; increased crime; increased taxi-related tension and violence; resettlement of affected households; rural severance effects; uncontrolled secondary development; improvement in transport provision; and negative influences on existing family networks and social structures. A summary of the assessment of the key potential impacts is provided in Table 12.8.

Increased employment opportunities

Considering the high unemployment levels and low levels of household income found in this area (refer to section 11.2.5) the need for both direct and indirect job creation in this area is high. The anticipated positive social impact associated with increased employment opportunities is assessed to be high intensity during construction and medium intensity during the operational phase. The significance of the impact is thus rated to be **positive high** (during construction) and **positive medium** (during the operational phase). Optimisation measures such as establishment of a “labour and employment desk”, use of labour-intensive methods where possible, use of local labour as far as possible and remuneration beyond the minimum wage rate would increase the significance of the potential positive impact to **POSITIVE HIGH** significance.

Improved safety for vehicle road users

The probable improved safety for vehicle road users (compared to poor and dangerous existing road conditions both locally and on the existing R61) is considered a positive impact of high intensity over the long term and is thus rated to be of **POSITIVE HIGH** significance. Ensuring close cooperation and effective communication between all relevant traffic authorities, effective traffic control mechanisms and carefully positioned under- and overpasses would not result in any further improvement in traffic safety risks, but would further enhance the probability of improved safety for vehicle road users.

Increased safety hazards for pedestrians and traffic

Construction sites and associated activities, and expected traffic during the operational phase, would lead to increased safety hazards for pedestrians and traffic, particularly where introduced into relatively remote rural areas such as between Lusikisiki and the Mthamvuna River. The adjacent communities are mainly unaccustomed to high-speed traffic and thus would pose, at least in the initial stages of the proposed project, a major safety hazard for pedestrians, especially schoolchildren. The anticipated impact is assessed to be of **high** (during construction) and **very high** (during the operational phase) intensity and significance. Regular inspection and maintenance of fencing, erection of appropriate warning signs and implementation of community risk awareness programmes would reduce the intensity and significance of the potential impact to **MEDIUM** during the construction and operational phases, respectively.

Increased risk of HIV/AIDS and STDs

The anticipated influx of construction workers during construction, and the anticipated increased long-distance truck traffic on the proposed toll highway, would probably result in an increased risk of HIV/AIDS and STDs. Notwithstanding the fact that in some areas along the proposed route the prevalence of HIV/AIDS and STDs is already high, the potential impact is assessed to be of **medium** (during construction) and **high** (during the operational phase) intensity and significance, respectively. Mitigation measures aimed at reducing the spread of HIV/AIDS and STDs, such as the design and implementation of appropriate HIV/AIDS and STD awareness and prevention campaigns, maximisation of job opportunities to local people who do not need to be housed in construction accommodation, and availability of an adequate supply of free condoms for workers would reduce the risk of the spread of

HIV/AIDS and STDs to **LOW** and **MEDIUM** significance during the construction and operational phases, respectively.

Increased crime

Potential increase in criminal activity, due to an influx of workers during construction and the greater accessibility of the area during the operational phase, has been raised as a serious concern in this section of the proposed toll highway. The probable impact is assessed of **medium** intensity and significance during the construction and operational phases. Liaison with the local police to monitor changes during construction and operation, provision of additional security if required and assistance with establishment of Community Policing Forums where they do not exist would reduce the significance of the potential impact to **LOW**.

Increased taxi-related tension and violence

It is anticipated that the proposed toll highway would result in potential increased internal taxi-related tension and violence associated with the profitability of certain routes. This potential impact is considered to be of **medium** intensity and significance over the long term. The intensity, and hence significance, of this potential impact would be reduced to **LOW** through consultation with the relevant taxi industries, in particular regarding the implementation of tolling and potential discounts.

Resettlement of affected households

Resettlement of affected households could result in associated social impacts such as social and economic marginalisation, social and cultural disruption, landlessness etc. This localised, permanent impact is assessed to be of **high** significance. This potential impact could be reduced to **MEDIUM** significance by undertaking resettlement in terms of international best practice, accompanied by a comprehensive resettlement action plan. These should ensure, amongst others, the following: that resettlement is avoided, or minimised where unavoidable; that resettlement plans and activities are seen and executed as development programmes (and are developed in full consultation with local headmen); and that displaced persons (and “host” communities) are meaningfully consulted, prior to resettlement, and participate in the planning and implementation of the resettlement programme.

Rural severance effects

Concerns were raised that the proposed new road in the greenfields section between Lusikisiki and the Mthamvuna River would cut communities off from their well established and long held access to local resources (such as water, forest and plantation resources). The potential effects on the livelihoods and well-being of local communities are assessed to be of medium intensity at a local level during construction, and high intensity at a local level during the operational phase. The potential rural severance effects are thus rated to be of **medium** (construction) and **high** (operational phase) significance. Implementation of effective mitigation measures, such as the appropriate location of crossing points (over- and underpasses), ensuring that central service nodes (such as schools, places of worship, etc.) remain easily and safely accessible and that crossing points are adequate for people and livestock, as appropriate, would reduce the significance of the potential impact during the construction and operational phases to **LOW** and **MEDIUM**, respectively.

Uncontrolled secondary development

The proposed new road between Lusikisiki and the Mthamvuna River would probably lead to the creation of unplanned nodes, for example around the proposed new intersections with existing district roads and Mthentu mainline toll plaza. Concern has also been expressed that, due to the generally weak capacity of the local authorities along this section of the proposed toll highway, the potential unplanned developments would not be controlled. This is considered to result in potential negative, localised social impacts of **medium-high** intensity and significance. Active engagement between the Proponent and the

relevant local, provincial and national authorities, aimed at ensuring that no unplanned secondary developments occur, would reduce the significance of the probable residual impact to **LOW**.

Improvement in transport provision to the area

It is anticipated that the proposed new road would enhance existing patterns of local and regional travel and transport and service delivery. For example, in the area around Mkamela there is a very limited transport system, with only one bus that travels on a daily basis to Lusikisiki via Holy Cross Mission and Flagstaff. Significant time and cost savings are anticipated in terms of journeying to and from Lusikisiki and KwaZulu-Natal as well as better and reliable access to regional services, markets, employment, etc. The potential positive impact is considered of **POSITIVE MEDIUM-HIGH** significance without and with mitigation.

Negative influences on existing family networks and social structures

The construction and operation of the proposed toll highway would probably result in localised negative influences on existing family networks and social structures, such as increased prostitution, unplanned and unwanted pregnancies, pressure on local services and competition for available jobs and resources as a result of an influx of workers and job seekers. The potential negative influences on existing family networks and social structures are assessed to be of **medium-high** significance. A probable residual impact of **MEDIUM** significance would result through implementation of mitigation measures such as the maximisation of job opportunities to local people, establishing and maintaining communication channels with local community structures, ensuring condoms are readily accessible to workers and provision of adequate on-site temporary accommodation and amenities for non-local workers.

Table 12.8: Summary assessment of key potential social impacts – Lusikisiki to Mthamvuna River

ISSUE / IMPACT	EXTENT	DURATION	INTENSITY	PROBABILITY	SIGNIFICANCE	CONFIDENCE
Impacts associated with increased employment opportunities						
Without mitigation	Local-Regional	Short/Long term	Medium/High	Definite	Medium+/High+	High
With mitigation	Local-Regional	Short/Long term	High	Definite	HIGH+	High
Impacts associated with improved safety for vehicle road users						
Without mitigation	Regional	Long term	High	Probable	High+	Medium
With mitigation	Regional	Long term	High	Probable	HIGH+	Medium
Increased safety hazards for pedestrians and traffic						
Without mitigation	Local-Regional	Short/Permanent	High/Very high	Definite	High/Very high	Medium
With mitigation	Local-Regional	Short/Permanent	Low/Medium	Definite	MEDIUM	Medium
Impacts associated with increased risk of HIV/AIDS and STDs						
Without mitigation	Local	Permanent	Medium/High	Probable	Medium/High	Medium
With mitigation	Local	Permanent	Low/Medium	Probable	LOW/MEDIUM	Medium
Increased crime						
Without mitigation	Local	Permanent	Medium	Probable	Medium	Medium
With mitigation	Local	Permanent	Low	Probable	LOW	Medium
Increased taxi-related tension and violence						
Without mitigation	Local	Long term	Medium	Probable	Medium	Medium
With mitigation	Local	Long term	Low	Probable	LOW	Medium
Impacts associated with resettlement of affected households						
Without mitigation	Local	Long term	High	Definite	High	High
With mitigation	Local	Long term	Medium	Definite	MEDIUM	Medium
Impacts associated with rural severance effects						
Without mitigation	Local	Permanent	Medium/High	Probable	Medium/high	High
With mitigation	Local	Permanent	Low/Medium	Probable	LOW/MEDIUM	High
Impacts associated with uncontrolled secondary development						

ISSUE / IMPACT	EXTENT	DURATION	INTENSITY	PROBABILITY	SIGNIFICANCE	CONFIDENCE
Without mitigation	Local	Permanent	Medium-high	Probable	Medium-high	Medium
With mitigation	Local	Permanent	Low	Probable	LOW	Medium
Impacts associated with improvement in transport provision						
Without mitigation	Local-Regional	Permanent	Medium-high	Definite	Medium-high+	Medium
With mitigation	Local-Regional	Permanent	Medium-high	Definite	MEDIUM-HIGH+	Medium
Impacts associated with negative influences on existing family networks and social structures						
Without mitigation	Local	Short/Long term	Medium-high	Probable	Medium-high	Medium
With mitigation	Local	Short/Long term	Medium	Probable	MEDIUM	Medium

12.2.6 TOURISM

The proposed toll highway would result in the following key potential impacts relating to tourism: increase in the number of tourism products; increase in growth in transit tourists on a KwaZulu-Natal/Eastern Cape/Western Cape route; and increased access to environmentally sensitive areas. A summary of the assessment of the key potential impacts is provided in Table 12.9.

Increase in the number of tourism products

As described in Section 7.2.5, the proposed toll highway would definitely result in an increase in the number of tourism products due to an expected increase in growth in overnight tourists and associated increase in the rate of growth of tourism products. The potential impact is rated to be of **positive medium** significance. Implementation of optimisation measures such as tourism promotion and product development would most probably increase the intensity of the potential impact, resulting in an impact of **POSITIVE HIGH** significance. However, there is a risk that this could be inhibited by various factors (availability of well-maintained feeder roads, ownership of land, alignment with municipal policies, etc.), therefore the assessment of the potential impact with mitigation is undertaken at a medium level of confidence.

Increase in growth in transit tourists on a KwaZulu-Natal/Eastern Cape/Western Cape route

As described in Section 7.2.5, it is anticipated that an increased growth in transit tourists on a KZN/Eastern Cape/Western Cape route would be of **positive medium** significance. Tourism promotion and development would increase the significance of the potential impact to **POSITIVE MEDIUM-HIGH**.

Increased access to environmentally sensitive areas

A number of indirect ecological impacts associated with increased access to the study area have been predicted (e.g., refer to section 12.2.1 above). Since the biophysical environment of the study area is an important tourism resource it is considered probable that negative ecological impacts would have an impact on the sustainability of eco-tourism ventures as many of these businesses currently trade on the availability of a relatively undisturbed biophysical environment in the study area. The probable impact on the sustainability of eco-tourism ventures associated with increased access to environmentally sensitive areas is assessed to be of **HIGH** intensity and significance without and with mitigation (measures as applicable to potential impacts on vegetation and flora, fauna and aquatic ecosystems).

Table 12.9: Summary assessment of key potential tourism impacts – Lusikisiki to Mthamvuna River

ISSUE / IMPACT	EXTENT	DURATION	INTENSITY	PROBABILITY	SIGNIFICANCE	CONFIDENCE
Impacts associated with increase in the number of tourism products						
Without mitigation	Regional	Long term	Low	Definite	Medium+	High
With mitigation	Regional	Long term	Medium	Probable	HIGH+	Medium

ISSUE / IMPACT	EXTENT	DURATION	INTENSITY	PROBABILITY	SIGNIFICANCE	CONFIDENCE
Impacts associated with increase in growth in transit tourists on a KZN/Eastern Cape/Western Cape route						
Without mitigation	Regional	Medium term	Medium	Probable	Medium+	Medium
With mitigation	Regional	Medium term	Medium-high	Probable	MEDIUM-HIGH+	Medium
Impacts associated with increased access to environmentally sensitive areas						
Without mitigation	Regional	Long term	Medium	Probable	High	Medium
With mitigation	Regional	Long term	Medium	Probable	HIGH	Medium

12.2.7 CULTURAL AND HISTORICAL HERITAGE

The construction and operation of the proposed new road in the greenfields section between Lusikisiki and the Mthamvuna River would result in the following key potential impacts relating to cultural and historical heritage: places to which oral traditions are attached or which are associated with living heritage: landscapes and natural features; graves; and archaeological sites. A summary of the assessment of this potential impact is provided in Table 12.10.

Places to which oral traditions are attached or which are associated with living heritage

The proposed new road in the greenfields section between Lusikisiki and the Mthamvuna River would traverse an area associated with the oral traditions and living heritage of the Amadiba Tribal Authority area. This area is deemed to have medium to high heritage significance at the site specific, local and regional levels, and low to medium significance at the provincial, national and international levels. The proposed new road would affect the ability of communities to continue utilising places and resources associated with oral traditions and living heritage. The anticipated localised impact is assessed to be of medium-high intensity over the long term, thus the significance of the impact is rated to be **HIGH** without and with mitigation. No applicable mitigation measures were identified. It is, however, recommended that a heritage practitioner should be appointed to undertake an oral history recording project within the Amadiba Tribal Authority area in order to capture all significant places to which oral traditions are attached or which are associated with living heritage in order to inform the final design of the proposed new road.

Landscapes and natural features

No formally protected landscapes or natural features occur within or immediately adjacent to the alignment of the proposed new road in the greenfields section between Lusikisiki and the Mthamvuna River. However, the entire Amadiba Tribal Authority area may be considered as an integral part of an ethnographic landscape that has evolved over the last 1 000 years due to a pattern of use, i.e. extensive livestock management within the context of low density human settlement and subsistence agriculture. This landscape has medium-high heritage significance at all levels. The proposed new road would result in a permanent visual change in this landscape and in terms of its current and potential land use while livestock movement, and human movement patterns between homesteads, will be altered. The significance of the anticipated localised impact is assessed to be **HIGH** without and with mitigation. No applicable mitigation measures were identified. It is, however, recommended that a heritage practitioner should be appointed to undertake a study within the Amadiba Tribal Authority area of all culturally relevant local landscape and natural features in order to inform the final design of the proposed new road.

Graves

The proposed greenfields route would result in the need to relocate graves. Since all human remains have high heritage significance for their social value, the potential permanent, localised impact is assessed to be of **high** intensity and significance. It is considered that implementation of all applicable legislative requirements, guidelines and regulations applicable to the removal of human remains (as part of the recommended resettlement action plan), such as notification of the impending removals, consultation with individuals or communities related or known to the deceased, observation of rituals or

ceremonies required by the families, etc. would reduce the significance of the potential impact to **MEDIUM**.

Archaeological sites

It is considered probable that the proposed new road would result in the alteration or destruction of Late Iron Age or Early Iron Age archaeological sites. The significance of the potential impact on the archaeological sites is deemed **medium-high**. Implementation of appropriate mitigation measures, such as the presence of an heritage practitioner at the onset of earthworks in order to identify any archaeological sites which may be affected, and obtaining a permit from SAHRA for the alteration or destruction of any affected archaeological sites would reduce the significance of the impact to **LOW-MEDIUM**.

Table 12.10: Summary assessment of key potential heritage impacts – Lusikisiki to Mthamvuna River

ISSUE / IMPACT	EXTENT	DURATION	INTENSITY	PROBABILITY	SIGNIFICANCE	CONFIDENCE
Places to which oral traditions are attached or which are associated with living heritage						
Without mitigation	Local	Permanent	High	Definite	High	Medium-high
With mitigation	Local	Permanent	High	Definite	HIGH	Medium-high
Landscapes and natural features						
Without mitigation	Local-Regional	Permanent	High	Definite	High	Medium-high
With mitigation	Local-Regional	Permanent	High	Definite	HIGH	Medium-high
Graves						
Without mitigation	Local	Permanent	High	Definite	High	High
With mitigation	Local	Permanent	Medium	Definite	MEDIUM	High
Archaeological sites						
Without mitigation	Local-Regional	Permanent	Medium	Highly probable	Medium-high	Medium-high
With mitigation	Local-Regional	Permanent	Low	Highly probable	LOW-MEDIUM	Medium-high

12.2.8 NOISE

The proposed new road between Lusikisiki and the Mthamvuna River would result in key potential noise impacts. A summary of the assessment of this key potential impact is provided in Table 12.11.

It is expected that the day-time noise rating level at residential dwellings located within 50 m of the proposed new road would be in excess of 65 dBA. The significance of the highly probable noise impact within 50 m of the road edge is assessed to be **very high**. In terms of the Noise Control Regulations noise mitigation would be required to ensure that the noise rating level does not exceed 65 dBA at any of the affected residential dwellings.

At separation distances greater than 50 m between the proposed new road and the nearest dwelling the noise rating level is expected to be less than 65 dBA. The intensity and significance of the potential impact is expected to range from **high** at distances slightly greater than 50 m reducing to **low** at an approximate range of 750 m. Although no noise mitigation measures would be required in terms of the Noise Control Regulations, it should be noted that compliance with the legal requirements of the Noise Control Regulations (ensuring that the noise rating level does not exceed 65 dBA) might still result in a noise impact that is unacceptable in terms of SANS 10103 (refer to the noise specialist report, Volume 3, Appendix 8).

It is recommended that a low-noise road surface be laid throughout this section and that, in addition, a 3 m high noise barrier be erected in the Mzamba Village/Wild Coast Casino area. The respective impacts would be reduced to **HIGH** intensity and significance at the nearest residences (50 m; a noise rating level

equal to 60 dBA would be in compliance with the Noise Control Regulations but would be 15 dB in excess of the acceptable SANS noise rating level of 45 dBA) and **LOW** intensity and significance at the furthest residences (750 m; a noise rating level equal to 50 dBA would be in compliance with the Noise Control Regulations but would be 5 dB in excess of the acceptable SANS noise rating level).

Table 12.11: Summary assessment of key potential noise impacts – Lusikisiki to Mthamvuna River

ISSUE / IMPACT	EXTENT	DURATION	INTENSITY	PROBABILITY	SIGNIFICANCE	CONFIDENCE
Impacts associated with the proposed new road						
Without mitigation	Local	Long term	Low/Very high	Highly probable	Low to Very high	Medium
With mitigation	Local	Long term	Low/High	Highly probable	LOW TO HIGH	Medium

12.2.9 VISUAL

Key potential visual impacts identified along this section of the proposed toll highway relates to the following: proposed new road; Msikaba River bridge; Mthentu River bridge; Mthentu mainline toll plaza; and Kwadlambu, Mnyameni, Kulumbe, Mpahlane and Mzamba River bridges. A summary of the assessment of the key potential impacts is provided in Table 12.12.

Proposed new road

The proposed new road would exert a negative influence on the current visual environment. This would be largely due to the following aspects: high visibility of the route, especially to the north-west; impact on the high visual quality in the vicinity of the Mateku Waterfall and escarpment; the high visibility of construction and operation activity within the uniform open grassland areas; the low Visual Absorption Capacity through these areas; the scale of the road within a generally rural setting; the introduction of a continuous corridor within a rural setting that will be brightly lit by vehicles throughout the night; and the need to cut into the existing landform to accommodate the vertical alignment and the width of the servitude.

The highly probable visual impact would extend from 2.5 km to the east and greater than 20 km to the west. Beyond 8-10 km the visibility of the road would become insignificant. The Visual Absorption Capacity would vary from low in the northern section to medium in the southern portion. Much of the route would traverse areas of relatively low visual quality, except the scenic area around the Mateku Waterfall. The significance of the visual impact is assessed to be **high** in the Mateku Waterfall area. Effective rehabilitation of the construction area and road reserve, ensuring that the cut and fill slopes of the road blend in with the landscape (i.e. edges should be rounded off and slopes vegetated) and shifting of the route out of the Mateku Waterfall viewshed (beyond the low ridge east of the current alignment) would reduce the significance to **MEDIUM** in the Mateku Waterfall area.

Msikaba River bridge

The highly probable visual impact of the Msikaba River bridge would extend for up to 15 km. The bridge would be located within an area of relatively high visual quality and would be approximately 3 km from the very scenic Mateku Waterfall and escarpment. The medium Visual Absorption Capacity of the valley would not assist in reducing the scale of the structure nor would it assist in blending the structure with the landscape. The intensity and significance of the impact is assessed to be **high** as it would dominate the scenic valley that it would cross due to its massive scale. The bridge would thus have a significant negative impact on the high quality of the surrounding visual environment, especially the Msikaba River Gorge, thus affecting the potential wilderness-based tourism experience. However, with sensitive, sympathetic and elegant design the massive bridge structure could become a positive tourism feature or focus point such as the Van Staadens Bridge, the Sydney Harbour Bridge or the new Milau Viaduct in

France. Together with minimum disturbance to the valley bottom and immediate and comprehensive rehabilitation of the works area would assist to reduce the significance of the negative impact to **MEDIUM-HIGH**.

Mthentu River bridge

The highly probable visual impact of the Mthentu River bridge would be highly intense as it would dominate the valley due to its great height and length (over a kilometre long). It would cross a broad and very scenic valley with visibility extending beyond a 20 km radius. The medium Visual Absorption Capacity of the valley would not assist in reducing the scale of the structure nor would it assist in blending the structure with the landscape. The intensity and significance of the impact is thus assessed to be **high**. The intrusion of the bridge would have a significant negative impact on the high visual quality of the scenic valley and could retard future wilderness-based tourism within the valley. However, with sensitive and elegant design the massive bridge structure could become a positive tourism feature of focus point much as the large bridges of the world do. Together with minimum disturbance to the valley bottom and immediate and comprehensive rehabilitation of the works area the significance of the negative impact would be reduced to **MEDIUM-HIGH**.

Mthentu mainline toll plaza

The Mthentu mainline toll plaza would be situated on a mid-slope within a broad valley with an aspect towards the north-west. The visibility would generally be towards the north and west with some views towards the south and south-west extending to the Mkambati Nature Reserve (one of the critical viewpoints identified), especially along the south bank of the Mthentu River. Most of the structure would not be visible to the south, but the tall light masts would extend above the ridge line spilling light to the south. Visibility extends beyond 20 km, specifically at night due to the floodlighting of the facility.

The highly probable visual impact of the Mthentu mainline toll plaza during the night is assessed to be of **high** intensity and significance due to the potential impact on the nature reserve at night where the toll plaza would be an intrusive light beacon in a relatively unlit surrounding landscape. The significance of this impact may reduce in the future if electricity is rolled out to the adjacent settlements which would gradually add to the night lighting. Implementation of mitigation measures such as the use of colour variations, building form, lighting, landscaping and screening in order to reduce scale, avoiding reflection or deflection of sunlight or artificial light and avoiding light spillage would result in a residual visual impact of **MEDIUM** significance.

Kwadlambu, Mnyameni, Kulumbe, Mpahlane and Mzamba River bridges

It is predicted that the visual impact of these bridges would be generally confined to the river valley with views extending up and down the valley for up to 2.5 km, occasionally extending to 5 km. Although the Visual Absorption Capacity within these valleys is considered medium to high, the bridges would be exposed. The visual quality of the rivers is considered high. Although the intensity of the visual impact is assessed to be high, it is considered that the significance of the visual impact would be **MEDIUM** since the extent of the visual impact would be limited. In order to contain the extent of the visual impact it is recommended that the disturbance footprint is limited to the absolute minimum across the valley bottom and that the remaining disturbed areas be rehabilitated immediately.

Table 12.12: Summary assessment of key potential visual impacts – Lusikisiki to Mthamvuna River

ISSUE / IMPACT	EXTENT	DURATION	INTENSITY	PROBABILITY	SIGNIFICANCE	CONFIDENCE
Impacts associated with the proposed new road (Mateku Waterfall area)						
Without mitigation	Local	Permanent	High	Highly probable	High	Medium
With mitigation	Local	Permanent	Medium	Highly probable	MEDIUM	Medium

ISSUE / IMPACT	EXTENT	DURATION	INTENSITY	PROBABILITY	SIGNIFICANCE	CONFIDENCE
Impacts associated with the proposed Msikaba River bridge						
Without mitigation	Local	Permanent	High	Highly probable	High	Medium
With mitigation	Local	Permanent	Medium-High	Highly probable	MEDIUM-HIGH	Medium
Impacts associated with the proposed Mthentu River bridge						
Without mitigation	Local	Permanent	High	Highly probable	High	Medium
With mitigation	Local	Permanent	Medium-High	Highly probable	MEDIUM-HIGH	Medium
Impacts associated with the proposed Mthentu mainline toll plaza						
Without mitigation	Local	Permanent	High	Highly probable	High	Medium
With mitigation	Local	Permanent	Medium	Highly probable	MEDIUM	Medium
Impacts associated with the proposed Kwadlambu, Mnyameni, Kulumbe, Mpahlane and Mzamba River bridges						
Without mitigation	Local	Permanent	High	Highly probable	Medium	Medium
With mitigation	Local	Permanent	High	Highly probable	MEDIUM	Medium

12.2.10 PLANNING/DEVELOPMENT

The proposed toll highway would result in key potential planning/development impacts relating to the following: land claims; ribbon development; and Wild Coast SDF and proposed Wild Coast/Pondoland National Park . A summary of the assessment of the key potential impacts, where appropriate, is provided in Table 12.13.

Land claims

Implementation of the proposed toll highway would be affected by land claims lodged on behalf of the Mgungundlovu and Kanyayo Communities. To date these claim have not been resolved. Experience to date has proven that all land claims take vast amounts of time to get resolved and could delay the implementation of any development. SANRAL would need to consult with the Regional Land Claims Commissioner's office and the claimants regarding the resolution of the land claim. The potential impact of the land claims is assessed to be of **MEDIUM** significance without and with mitigation.

Ribbon development

The study area shows that settlements and, thereafter, ancillary services become established adjacent to the main transportation routes. Establishment and densification of settlements on either side of transportation routes is an indicator of residents prioritising convenience over quality of environment. Most of the greenfields route would traverse unalienated State land or land registered in favour of the Department of Land Affairs. Although land vests in the Department of Land Affairs, it is generally held that the Department is merely holding this land as custodian for the tribes and communities residing thereon. It is thus considered that the proposed toll highway would result in uncontrolled, gradual establishment of settlements alongside the route. This would place a strain on Municipalities as a result of growing demands for new infrastructure and social services in these areas. As a consequence, large public-funded investments along the existing major routes may need to be re-prioritised to meet demands in the new areas, and competition for resources and delivery may thus occur. Also, the relevant IDPs and SDFs of the relevant Municipalities provide very broad, high level policies, strategies and plans considered of insufficient detail to enable effective management and control of development likely to result from the proposed toll highway.

The anticipated impact is assessed to be of **HIGH** significance. Pro-active and structured development planning following proper planning principles, political and institutional will to manage the settlement development implications of the proposed project, review and/or development of detailed Land Use Management Systems by Municipalities (so as to prevent land invasion and settlement sprawl/ribbon development and promote nodal development) and liaison between Traditional Authorities and

Municipalities with regard to allocation of land for settlement according to a common vision for orderly settlement development in agreed areas would reduce the probability of the expected impact.

Wild Coast SDF and proposed Wild Coast/Pondoland National Park

Although limited institutional capacity has been identified as a key issue in the Wild Coast SDF, Land Use Management Guidelines are in place to assist the land use planning in the area. The SANRAL preferred route between the Mthentu and the Mthamvuna rivers would predominantly traverse a “nature tourism” zone, identified in the Biodiversity Assessment of the Wild Coast as a “Priority Area”.

In terms of biodiversity conservation planning, approximately 22 km of the SANRAL preferred route (generally between the Lambasi area and the Mthentu River) would be situated approximately 2 km inside the boundary of the proposed Wild Coast/Pondoland National Park (see Figure 12.2). An additional 27 km of the proposed route, situated in the northern half of the proposed conservation area where the most severe degradation and transformation exist, would be situated well within this planning boundary. The SANRAL preferred route would thus result in fragmentation of the area being considered for the proposed National Park. Following the SANRAL preferred route would reduce the core area of the proposed Park to 88 % of its planned area, if the fragments were excluded from the Park. If the inland fragment (see Figure 12.2) were included in the proposed Park, little habitat would potentially be lost from the proposed Park. It is considered that the route would not have a major impact on the potential to undertake biodiversity conservation planning in the PCE area.

Table 12.13: Summary assessment of key potential planning/development impacts – Lusikisiki to Mthamvuna River

ISSUE / IMPACT	EXTENT	DURATION	INTENSITY	PROBABILITY	SIGNIFICANCE	CONFIDENCE
Land claims						
Without mitigation	Local	Short-Long term	Medium	Probable	Medium	Medium
With mitigation	Local	Short-Long term	Medium	Probable	MEDIUM	Medium
Ribbon development						
Without mitigation	Local	Long term	High	Definite	High	High
With mitigation	Local	Long term	High	Improbable-Probable	HIGH	Low-Medium

12.3 ASSESSMENT OF POTENTIAL IMPACTS: ALTERNATIVE ROUTE ALIGNMENTS

Potential impacts relevant to a comparative assessment of the alternative route alignments are discussed separately below.

12.3.1 COMPARATIVE ASSESSMENT OF THE COASTAL MZAMBA ROUTE VERSUS THE SANRAL PREFERRED ROUTE BETWEEN LUSIKISIKI AND THE MTHAMVUNA RIVER

A detailed description of the above two alternative alignments between Lusikisiki and the Mthamvuna River is provided in Section 5.3. In general, the Coastal Mzamba route would be aligned further inland than the SANRAL preferred route between the Mthentu and Mzamba rivers (refer to Figures 5.2 and 5.3).

A summary of potential residual impacts, where applicable, of the Coastal Mzamba route versus the SANRAL preferred route between Lusikisiki and the Mthamvuna River is provided in Table 12.14. Since the two routes would follow the same route up to the Mthentu River crossing, the comparative assessment focuses on the section between the Mthentu and Mthamvuna rivers.

Vegetation and flora

Large portions of both routes would traverse an area of the PCE that has been heavily impacted by rural agriculture and only fragments of natural habitat still remain. A key difference between the Coastal Mzamba and SANRAL preferred routes lies in their potential residual impacts in terms of loss and fragmentation of habitat. The disruption of the natural flow of nutrients and materials would occur along both alignments since both bisect a variety of landscape forms, including a large number of marsh wetland and sandy stream areas. Fragmentation of the source wetlands would lead to potentially serious impacts on their continued functioning and could change the entire hydrology of the catchment. Road infrastructure in the wetlands would result in major changes to the flow of water, sediment and nutrients through the landscape and may result in pooling on the upstream side and erosion and fast flows on the downstream side of the road infrastructure. The Coastal Mzamba route is considered more sensitive in this regard. The SANRAL preferred route between the Mthentu and Mthamvuna rivers would cross the wetlands lower down in the catchment where they have already formed channelled stream beds, either on sandy or rocky bottoms. In terms of loss and fragmentation of habitat the Coastal Mzamba route would result in residual impacts of **HIGH** significance, whereas the residual impacts of the SANRAL preferred route would be **LOW** in this regard. In most other respects the two alignments would result in similar effects. From a botanical perspective the SANRAL preferred route is considered more favourable.

Fauna

The Coastal Mzamba route would traverse large wetland areas in the drainage lines of the northern tributaries of the Mnyameni River. The wetlands serve as habitat for Endangered Spiny leaf-folding frog and for threatened wetland-associated birds such as Blackrumped buttonquail (Endangered), Grey crowned crane (Vulnerable), African Marsh Harrier (Vulnerable) and Grass Owl (Vulnerable). There is also a danger of increased erosion and run-off into the Mnyameni River that could affect water quality for the Endangered Kloof Frog and may also affect adjacent kloof forest habitats used by numerous faunal Species of Special Concern.

Although the SANRAL preferred route would avoid many sensitive habitats and would mainly traverse cultivated, cleared farmland, it would nevertheless result in negative residual faunal impacts of **LOW** to **MEDIUM** significance (as discussed in section 12.2.2 above) and would also possibly curtail future expansion of the proposed Wild Coast/Pondoland National Park, thereby limiting movement of large mammals and other animals across the landscape.

Thus, both alignments would cause significant negative faunal impacts, but the SANRAL preferred route would avoid the most sensitive habitats. However, the SANRAL preferred route would need to be considered against possibly limiting movement of large mammals and other animals in the proposed Park.

Aquatic ecosystems

Due to the dependence of the local communities on wetlands for water, the Coastal Mzamba route would result in a more severe impact than the SANRAL preferred route due to the increased number and size of the wetlands that would be traversed. Potential impacts on wetlands that would result from increased surface run-off during the construction and operational phase are assessed to be of **high** and **medium** significance, respectively, along both alternative routes due to the number, size and social importance of the wetlands that would be traversed. With mitigation (refer to section 12.2.3 above) the impacts could be reduced to **MEDIUM** significance for both project phases along the Coastal Mzamba route, while the residual impact associated with the operational phase of the SANRAL preferred route is considered of **LOW** significance (the SANRAL preferred route would affect fewer wetlands).

The following potential impacts affecting the riverine environments of the Mnyameni, Kulumbe and Mzamba rivers as a result of the bridge structures for the two alternative route alignments are considered of **high** significance: loss of instream habitat due to changes in channel structure and condition; risk of surface and groundwater pollution; and changes in ecosystem structure and function, and associated loss of biodiversity. However, it is considered that the potential impacts would probably occur along the Coastal Mzamba route and would occur with high probability along the SANRAL preferred route. With mitigation the significance of the potential impacts could be reduced to **LOW** for both routes, but would be improbable along the Coastal Mzamba route and probable along the SANRAL preferred route.

At other bridge sites (e.g. the Mpahlane River) these probable impacts along the Coastal Mzamba route are assessed to be of **medium** significance, while the SANRAL preferred route would result in highly probable impacts of **high** significance. With mitigation the impacts would be reduced to **LOW** for both route options, but again these impacts would be more probable along the SANRAL preferred route.

The major difference between the Coastal Mzamba and the SANRAL preferred route regarding potential impacts on rivers is that the Coastal Mzamba route would cross the same rivers but would avoid the headwaters of the Sikombe and the Mpahlanyane rivers. In terms of the riverine environment, the potential impact of the Coastal Mzamba route is considered slightly lower. This would, however, be negated by the potential impact of the Coastal Mzamba route on the inland wetland belt. Although wetlands are found throughout the area between the Mthentu and the Mthamvuna rivers, they are prolific along the Coastal Mzamba route and would essentially be permanently removed by the road and bridge-building activities. Due to the large dependence on the wetlands for domestic use, alternative water supply may have to be provided.

Both routes would result in similar impacts on estuaries in terms of sedimentation, water quality and improved access. The potential impacts are considered of **medium to very high** and **LOW TO HIGH** significance without and with mitigation, respectively. While the Coastal Mzamba route would be further from the coast, this route would traverse wetlands which are important sources of a continuous supply of freshwater to the rivers and estuaries. Interrupting the dynamics of these wetland systems by way of permanent road infrastructure would have water quantity impacts, i.e. wetlands have the ability to retain water and release it slowly and consistently over time and if replaced by impermeable surfaces, run-off will peak after rainfall events while not occurring during drier times, thus possibly changing the flow dynamics of estuaries. No water quantity changes are expected for the SANRAL preferred route (assuming no water is abstracted from or impounded in the river channel) as the rivers will be crossed via

high-span bridges over gorges. Interference with the functioning of wetlands along the Coastal Mzamba route is highly likely to have medium intensity water quantity impacts on the affected estuaries in the operational phase (i.e. in the long term). The potential impact associated with the Coastal Mzamba route is rated to be of **HIGH** significance without and with mitigation since it is considered unlikely that the impact could be effectively mitigated.

Overall, due to the absolute dependence on wetlands in the wetland belt along the Coastal Mzamba route and the cumulative impact of the disruption of wetland processes on the functioning of the rivers and estuaries, the SANRAL preferred route is considered more favourable as it would result in less severe impacts.

Soils, land use and agriculture

There is scattered subsistence cultivation along most of the proposed alignment of the Coastal Mzamba route. Cultivation is predominantly on the upper slopes because the soils on the lower slopes are wet in the upper catchments and shallow in the lower catchment. The SANRAL preferred route would follow a section of high potential agricultural land which is quite extensively cultivated between the Mthentu and Mnyameni River crossings. There is no cultivation along most of the route between the Mnyameni and Mzamba rivers. The two routes would result in similar residual positive impacts in terms of improved regional access (**POSITIVE HIGH** significance), improved extension services (**POSITIVE MEDIUM** significance) and improved access to production credit (**POSITIVE MEDIUM** significance). Neither alignment is considered more favourable from a soils, land use and agriculture perspective.

Social

Consultations with local leaders and residents regarding the two alternative alignments revealed a general preference for the route to be closest to their particular community. Each community indicated a belief that the potential positive impacts of the road, for the particular community, significantly outweighed the negative impacts, provided proper mitigation, compensation and consultation is undertaken, as appropriate. The Coastal Mzamba route would result in less severe potential impacts than the SANRAL preferred route, with fewer structures impacted, less land lost and a lower intensity of impacts concerning loss of access routes and community fragmentation. Also, the Coastal Mzamba route would affect less hectares of subsistence farming and fewer households. These reflect the fact that population densities are lower and the settlement pattern and services more dispersed along the alignment of the Coastal Mzamba route.

It is anticipated that the overall intensity of potential residual negative impacts along the Coastal Mzamba route would be lower than for the SANRAL preferred route, based on lower population densities along the Coastal Mzamba route. Thus, from a social perspective, the Coastal Mzamba route would be preferred.

Cultural and historical heritage

The Coastal Mzamba route would result in similar potential impacts on cultural and historical heritage as compared to the SANRAL preferred route. Neither alignment is thus considered more favourable from a cultural and historical heritage point of view.

Noise

There would be no significant difference between the two alternative routes with regard to the proximity of households to either proposed route. Also, there would be no significant change in vertical alignment of either route that would result in additional road traffic noise due to road gradients. Thus it is anticipated that there would be no difference between the two routes with regard to the impact of road traffic noise that would favour either route. Either route would introduce a new road to the respective area (refer to

the assessment of potential noise impacts in Section 12.2.8 above). Neither alignment is thus considered more favourable from a noise perspective.

Visual

The Coastal Mzamba route would exert a negative influence on the visual environment for the same reasons as those for the SANRAL preferred route (as discussed above). However, this route would be aligned further north-west and would traverse an area that has a lower visual sensitivity. The route would avoid the more scenic areas closer to the coast and most of the deep river valleys between the Mthentu and the Mzamba rivers. The overall significance of the visual impact between the Mthentu and Mthamvuna rivers is deemed to be **LOW**. From a visual perspective, however, the Coastal Mzamba route is considered more favourable than the SANRAL preferred route.

Planning/development

The SANRAL preferred route has been incorporated into the SDFs of both the Ingquza Hill LM and the Mbizana LM. Link roads off the proposed toll highway to the coastal nodes are also indicated. In terms of level of compatibility with the Wild Coast SDF's Land Use Management Areas (refer to section 12.2.10 above), the Coastal Mzamba route would be more compatible since it would traverse a smaller area earmarked for "nature tourism" compared to the SANRAL preferred route. However, both routes would result in similar planning/development implications (e.g. ribbon development) – refer to Section 12.2.10 above. Should uncontrolled ribbon development or attraction of settlements take place along the SANRAL preferred route, this would affect greater proportions of the proposed Wild Coast/Pondoland National Park and the "nature tourism zones". In light of these aspects, the Coastal Mzamba route is considered more favourable.

Approximately 27 km of the SANRAL preferred route, situated in the northern half of the proposed conservation area where the most severe degradation and transformation exist, would be situated well within the planning boundary of the proposed Wild Coast/Pondoland National Park. The Coastal Mzamba route would reduce the additional 27 km of route situated well within the planning boundary of the proposed Park to 15 km (see Figure 12.2). The SANRAL preferred route would thus result in greater fragmentation of the area being considered for the proposed National Park. Following the SANRAL preferred route would reduce the core area of the proposed Park to 88 % of its planned area, if the fragments were excluded from the Park. If the inland fragment (see Figure 12.2) were included in the proposed Park, little habitat would potentially be lost from the proposed Park. The Coastal Mzamba route would result in the proportion of the Park being included becoming almost 92 % of the desired area. It is considered that the two routes would not have a major impact on the potential to undertake biodiversity conservation planning in the PCE area. However, the Coastal Mzamba route would be more favourable in this regard.

Discussion

The above comparative assessment indicates that the Coastal Mzamba route would offer a number of advantages over the SANRAL preferred route between the Mthentu and Mthamvuna rivers, in particular relating to its compatibility with the Wild Coast SDF's proposed Land Use Management Areas and lower social and visual impacts. Also, should uncontrolled ribbon development or attraction of settlements take place along the SANRAL preferred route, this would affect a greater proportion of the planned area for the proposed Wild Coast/Pondoland National Park and identified "nature tourism zones".

In many other respects, especially in terms of direct, indirect and cumulative biophysical impacts associated with the presence of numerous source wetland areas, the Coastal Mzamba route is considered less favourable than the SANRAL preferred route. Key differences in this regard relate to loss and fragmentation of habitat and water quantity impacts on the affected estuaries.

Thus, the key factor to consider in selecting a preferred route is whether the relative importance attached to compatibility with the Wild Coast SDF's Land Use Management Areas and the additional area (4 %) of the proposed Park that would be incorporated east of the Coastal Mzamba route outweighs the likely direct, indirect and cumulative impacts on aquatic ecosystems that would be associated with this route. In terms of economic aspects, the economic specialist study calculated the Present Worth of Cost of the Coastal Mzamba route (R 1,597.91 million) to be higher than the SANRAL preferred route (R 1,587.59 million). Thus, from an economic (and technical - primarily associated with construction of a major road through numerous wetland areas) perspective the Coastal Mzamba route would be less favourable. However, irrespective of the selected route, it should be ensured that political and institutional will and capacity is developed to undertake pro-active and structured development planning, review and/or development of detailed Land Use Management Systems and liaison between Traditional Authorities and Municipalities with regard to allocation of land according to a common vision – ecologically sustainable development, if the proposed project is approved.

Table 12.14: Summary comparative assessment of potential residual impacts, where applicable, of the Coastal Mzamba versus the SANRAL preferred route

ISSUE / IMPACT	SIGNIFICANCE OF POTENTIAL RESIDUAL IMPACTS	
	SANRAL PREFERRED ROUTE	COASTAL MZAMBA ROUTE
VEGETATION AND FLORA		
Loss and fragmentation of habitat	LOW	HIGH
Increased runoff and drainage, soils erosion, silt loads and sedimentation, reduction in resilience/stability of ecosystems and disruption of the flow of nutrients	LOW	MEDIUM
Strip/ribbon/secondary development and increased access to remote habitats	MEDIUM	MEDIUM
Loss of biodiversity, loss of species of special concern, invasion by weeds and invasive alien plants and vehicular pollution of soil, air or water	LOW	LOW
Pollution at construction camps and increased risk of veld fires	VERY LOW	VERY LOW
FAUNA		
Overall faunal impacts	LOW TO MEDIUM	LOW TO MEDIUM
AQUATIC ECOSYSTEMS		
Overall impacts on riparian and instream vegetation	LOW	LOW
Overall impacts on riverine environments	LOW	LOW
Overall impacts on wetlands	LOW TO MEDIUM	LOW TO MEDIUM
Overall impacts on estuaries (sedimentation, water quality changes and improved access)	LOW TO HIGH	LOW TO HIGH
Overall impacts on estuaries (water quantity)	NONE	HIGH
SOILS, LAND USE AND AGRICULTURE		
Overall impacts on soils, land use and agriculture (improved regional access, improved extension services and improved access to production credit)	<i>MEDIUM+ TO HIGH+</i>	<i>MEDIUM+ TO HIGH+</i>
SOCIAL		
Overall social impacts (employment, severance effects, etc.)	LOW TO <i>HIGH+</i>	LOW TO <i>HIGH+</i>
CULTURAL AND HISTORICAL HERITAGE		
Overall cultural and historical heritage impacts	LOW-MEDIUM TO HIGH	LOW-MEDIUM TO HIGH
NOISE		
Noise impacts	LOW TO HIGH	LOW TO HIGH
VISUAL		
Visual impacts (between Mthentu and Mthamvuna rivers)	LOW	LOW
PLANNING/DEVELOPMENT		
Overall impacts	MEDIUM TO HIGH	MEDIUM TO HIGH

12.3.2 COMPARATIVE ASSESSMENT OF ALTERNATIVES 5E AND 5G VERSUS THE SANRAL PREFERRED ROUTE ACROSS THE MSIKABA RIVER

A detailed description of the above three alternative alignments across the Msikaba River is provided in Section 5.3 (and refer to Figure 5.6). It should be noted that the assessment of Alternatives 5e and 5g is given relative to the assessment of potential impacts associated with the comparative section of the SANRAL preferred route (i.e. Alternative 5g4) across the Msikaba River.

A summary of the potential residual impacts, where applicable, of Alternatives 5e and 5g versus the SANRAL preferred route (Alternative 5g4) is provided in Table 12.15. Relevant potential impacts are discussed separately below.

Vegetation and flora

The three alignments would have similar impacts, but Alternative 5e would introduce greater potential impacts on forests and would traverse some steep slopes from which there may be serious erosion problems. For example, the proposed new road along any of the alignments would definitely make previously inaccessible areas more accessible for the removal of medicinal products and other species for which there may be horticultural interest (residual impact deemed of **HIGH** significance). Alternative 5e is therefore the least favoured alignment across the Msikaba River. The SANRAL preferred route would cross a greater number of rocky habitats and wetlands than Alternative 5g. It is within these rocky habitats that great biodiversity is found and in which Species of Special Concern are more likely to occur. The potential residual loss of biodiversity associated with the SANRAL preferred route is deemed of **HIGH** significance while the residual impact associated with Alternative 5g is assessed to be **MEDIUM**. The SANRAL preferred route is therefore assessed as resulting in marginally higher impacts on biodiversity and potentially higher impacts on Species of Special Concern than Alternative 5g, although both are considered relatively similar in terms of overall potential impacts (see Table 12.15). Thus, Alternative 5g is considered most favourable from a vegetation and flora perspective.

Fauna

Alternatives 5g and, in particular Alternative 5e, would potentially cause greater faunal impact than the SANRAL preferred route, including disturbance to Lanner Falcon nests on the cliffs at the Mateku Waterfall, loss of sensitive faunal forest habitat and greater danger of erosion along the rim of the Msikaba Gorge. The SANRAL preferred route is thus considered most favourable of the three alternative alignments.

Aquatic ecosystems

It is considered that the alternative alignments would result in similar potential residual impacts on aquatic ecosystems, ranging from **LOW** to **MEDIUM** significance. None of the alternative alignments are thus considered more favourable from an aquatic ecosystems perspective.

Soils, land use and agriculture

Alternatives 5e and 5g would traverse shallow soils with minimal rock exposure. No cultivation is undertaken on the southern side of the river along both routes. From the soils, land use and agriculture perspective the alternative alignments would result in similar potential residual impacts (ranging from **LOW** to **MEDIUM** significance).

Social

The three alternative alignments would result in similar potential resettlement of homesteads, losses to arable and grazing land and access to such land. The community in the vicinity of the proposed toll highway anticipate comprehensive consultations regarding suitable under- or overpasses to ensure

continued access to essential facilities and resources, and the minimisation of any relocation, should the proposed project be implemented. From the social perspective none of the alternative alignments are thus considered more favourable.

Cultural and historical heritage

It is considered that Alternatives 5e and 5g would offer no advantage in reducing potential cultural and historical heritage impacts over the SANRAL preferred route. Potential residual impacts of **LOW-MEDIUM** to **MEDIUM** significance are anticipated for all three alternative alignments. None of the alignments is thus considered more favourable from a cultural and historical heritage point of view.

Noise

The three alternative route alignments would all pass relatively close to residences which would be situated on both sides of the southern portion of the route alignments. Whereas the SANRAL preferred route would pass through a valley which would largely shield it from nearby residences, the southern portion of Alternatives 5e and 5g would be exposed to nearby residences. Thus, from a noise perspective, the SANRAL preferred route is considered most favourable. Potential residual noise impacts of **HIGH** significance are, however, anticipated (a noise rating level of 60 dBA would be in compliance with the Noise Control Regulations but would be 15 dB in excess of the acceptable SANS noise rating level of 45 dBA).

Discussion

Alternative 5e is considered the least favourable route alignment from vegetation/flora and faunal perspectives since it would result in most severe impacts on forests and faunal habitat, including disturbance to Lanner Falcon nests on the cliffs at the Mateku Waterfall, and would pose the greatest potential risk of erosion. While Alternative 5g would be marginally favoured over the SANRAL preferred route (Alternative 5g4) from a botanical point of view, it is less favoured in terms of potential noise impacts. Thus, consideration of the overall implications of Alternatives 5g and 5g4 does not reveal a clearly favoured route option. It should be noted, however, that Alternative 5g and the SANRAL preferred route would both result in potential residual impacts of **HIGH** significance in terms of loss of habitat, increased accessibility of remote areas and noise impacts.

Table 12.15: Summary comparative assessment of potential residual impacts, where applicable, of the site-specific alternative alignments across the Msikaba River

ISSUE / IMPACT	SIGNIFICANCE OF POTENTIAL RESIDUAL IMPACTS		
	SANRAL PREFERRED ROUTE	ALTERNATIVE 5E	ALTERNATIVE 5G
VEGETATION AND FLORA			
Loss of habitat and increased accessibility of remote areas	HIGH	HIGH	HIGH
Loss of biodiversity	HIGH	HIGH	MEDIUM
Fragmentation of habitat, loss of species of special concern, increased runoff and drainage, soils erosion, silt loads and sedimentation, strip/ribbon/secondary development, reduction in resilience/stability of ecosystems and disruption of the flow of nutrients and materials	MEDIUM	MEDIUM	MEDIUM
Invasion by weeds and invasive alien plants and vehicular pollution of soil, air or water	LOW	LOW	LOW
Pollution at construction camps and increased risk of veld fires	VERY LOW	VERY LOW	VERY LOW
FAUNA			
Overall impacts on fauna (via loss of habitats, loss of faunal diversity, ecosystem disruption, etc.)	LOW TO MEDIUM	LOW TO MEDIUM-HIGH	LOW TO MEDIUM

ISSUE / IMPACT	SIGNIFICANCE OF POTENTIAL RESIDUAL IMPACTS		
	SANRAL PREFERRED ROUTE	ALTERNATIVE 5E	ALTERNATIVE 5G
AQUATIC ECOSYSTEMS			
Overall impacts on riparian and instream vegetation	LOW	LOW	LOW
Overall impacts on riverine environments	LOW	LOW	LOW
Overall impacts on wetlands	LOW TO MEDIUM	LOW TO MEDIUM	LOW TO MEDIUM
Overall impacts on estuaries	LOW TO MEDIUM	LOW TO MEDIUM	LOW TO MEDIUM
SOILS, LAND USE AND AGRICULTURE			
Overall impacts on soils, land use and agriculture	LOW TO MEDIUM	LOW TO MEDIUM	LOW TO MEDIUM
SOCIAL			
Overall social impacts (severance effects, loss of arable land etc.)	LOW TO HIGH+	LOW TO HIGH+	LOW TO HIGH+
CULTURAL AND HISTORICAL HERITAGE			
Overall cultural and historical heritage impacts (graves, archaeological sites)	LOW-MEDIUM TO MEDIUM	LOW-MEDIUM TO MEDIUM	LOW-MEDIUM TO MEDIUM
NOISE			
Overall noise impacts	LOW TO HIGH	LOW TO HIGH	LOW TO HIGH

12.3.3 COMPARATIVE ASSESSMENT OF ALTERNATIVE 9D5 VERSUS THE SANRAL PREFERRED ROUTE ACROSS THE MTHENTU RIVER

A detailed description of the above two alternative alignments across the Mthentu River is provided in Section 5.3 (and refer to Figure 5.7).

It should be noted that the assessment of Alternative 9d5 is given relative to the assessment of potential impacts associated with the comparative sections of the SANRAL preferred route (i.e. Alternative 9e) across the Mthentu River. A summary of the potential residual impacts, where applicable, of Alternative 9d5 versus the SANRAL preferred route (Alternative 9e) is provided in Table 12.16. Relevant potential impacts are discussed separately below.

Vegetation and flora

A variety of habitats are located along Alternative 9d5 and the SANRAL preferred route, including grassland, rocky grassland and marsh wetland. Key potential residual impacts that would result from the two alternative routes across the Mthentu River relate to loss of habitat, including habitats associated with the Pondoland-Ugu Sandstone Coastal Sourveld, along with the associated potential loss of biodiversity, potential loss of individuals of Species of Special Concern and fragmentation of these habitats. Other key potential impacts include increased runoff and drainage, soil erosion, silt loads and sedimentation, strip/ribbon/secondary development, increased accessibility of remote habitats and reduction in the resilience/stability of ecosystems. Alternative 9d5 would result in similar botanical impacts to the SANRAL preferred route across the Mthentu River, thus neither alignment is considered more favourable.

Fauna

Alternative 9d5 would cross the Mthentu River closer to a significant Cape Griffon Vulture colony than the SANRAL preferred route. Thus it is considered that the alternative route would potentially cause greater impact on the Cape Griffon Vulture colony. The SANRAL preferred route is thus considered a more favourable route from a faunal perspective.

Aquatic ecosystems

Alternative 9d5 would offer no advantage in reducing potential impacts on aquatic ecosystems over the SANRAL preferred route. Neither alignment is thus considered more favourable from an aquatic ecosystems perspective.

Soils, land use and agriculture

Alternative 9d5 would pass through (and bisect) a larger area of cultivated fields than would the SANRAL preferred route (Alternative 9e). Thus, in terms of soils, land use and agriculture the SANRAL preferred alignment is therefore favoured over Alternative 9d5, although the differences are considered to be minimal.

Social

Both alternative alignments would result in the relocation of homesteads and reallocation of the associated arable land. According to local views, the SANRAL preferred route would represent easier pedestrian and vehicular crossing of the Mthentu River, and less danger compared to having to negotiate a much longer bridge structure. The SANRAL preferred route is thus considered a more favourable option from a social perspective.

Cultural and historical heritage

It is considered that Alternative 9d5 would offer no advantage in reducing potential cultural and historical heritage impacts over the SANRAL preferred route. Neither alignment is thus considered more favourable from a cultural and historical heritage point of view.

Noise

The SANRAL preferred route would be located within 50 m of several residences between the Mthentu River crossing and the proposed intersection with the Amadiba road whereas Alternative 9d5 would not pass close to any residences/settlements in the equivalent section. The situation would, however, be reversed for the section of the alignments east of the proposed intersection with the Amadiba road, where about a dozen scattered residences would be situated closer to Alternative 9d5 than the SANRAL preferred route. From a noise perspective Alternative 9d5 across the Mthentu River would be favoured up to the proposed intersection with the Amadiba road. East of this point the SANRAL preferred route would be favoured.

Discussion

The above comparative assessment indicates that the SANRAL preferred route would be favoured in terms of fauna, soils, land use and agriculture and social aspects. Neither alignment is considered more favourable from botanical and cultural/historical heritage perspectives. In terms of potential noise impacts, certain sections of both routes are considered more suitable than the other. Thus, on balance, the SANRAL preferred route (Alternative 9e) is considered more favourable. It should be noted, however, that potential residual impacts of **HIGH** significance are anticipated in terms of loss of habitat, loss of biodiversity and noise impacts (a noise rating level equal to 60 dBA would be in compliance with the Noise Control Regulations but would be 15 dB in excess of the acceptable SANS noise rating level of 45 dBA).

Table 12.16: Summary comparative assessment of potential residual impacts, where applicable, of Alternative 9d5 versus the SANRAL preferred route across the Mthentu River

ISSUE / IMPACT	SIGNIFICANCE OF POTENTIAL RESIDUAL IMPACTS	
	SANRAL PREFERRED ROUTE	ALTERNATIVE 9D5
VEGETATION AND FLORA		
Loss of habitat and biodiversity	HIGH	HIGH
Fragmentation of habitat, loss of species of special concern, increased runoff and drainage, soils erosion, silt loads and sedimentation, strip/ribbon/secondary development, increased accessibility of remote areas and reduction in the resilience/stability of ecosystems	MEDIUM	MEDIUM
Invasion by weeds and invasive alien plants, vehicular pollution of soil, air or water and disruption of the flow of nutrients and materials	LOW	LOW
Pollution at construction camps and increased risk of veld fires	VERY LOW	VERY LOW
FAUNA		
Overall faunal impacts	LOW TO MEDIUM	LOW TO MEDIUM
AQUATIC ECOSYSTEMS		
Overall impacts on riparian and instream vegetation	LOW	LOW
Overall impacts on riverine environments	LOW	LOW
Overall impacts on wetlands	LOW TO MEDIUM	LOW TO MEDIUM
Overall impacts on estuaries	LOW TO MEDIUM	LOW TO MEDIUM
SOILS, LAND USE AND AGRICULTURE		
Overall impacts on soils, land use and agriculture	LOW TO MEDIUM	LOW TO MEDIUM
SOCIAL		
Overall social impacts (severance effects, loss of arable land, etc.)	LOW TO HIGH+	LOW TO HIGH+
CULTURAL AND HISTORICAL HERITAGE		
Overall cultural and historical heritage impacts (graves, archaeological sites)	LOW-MEDIUM TO MEDIUM	LOW-MEDIUM TO MEDIUM
NOISE		
Noise impacts	LOW TO HIGH	LOW TO HIGH

12.3.4 COMPARATIVE ASSESSMENT OF ALTERNATIVES 10A AND 10E VERSUS THE SANRAL PREFERRED ROUTE ACROSS THE MNYAMENI RIVER

A detailed description of the above three alternative alignments across the Mnyameni River is provided in Section 5.3 (and refer to Figure 5.8). It should be noted that the assessment of Alternatives 10a and 10e is given relative to the assessment of potential impacts associated with the comparative sections of the SANRAL preferred route (i.e. Alternative 10c) across the Mnyameni River.

A summary of the potential residual impacts, where applicable, of Alternatives 10a and 10e versus the SANRAL preferred route (Alternative 10c) is provided in Table 12.17. Relevant potential impacts are discussed separately below.

Vegetation and flora

The main habitats along these alignments are grassland, rocky grassland and some forested gulleys. These habitats contain high levels of biodiversity. The three alternative alignments would result in similar impacts. Key potential residual impacts include loss of habitat, loss of biodiversity, fragmentation of habitat, loss of Species of Special Concern, increased runoff and drainage, soil erosion, silt loads and sedimentation, strip/ribbon/secondary development, increased accessibility of remote areas and reduction in the resilience/stability of ecosystems. The SANRAL preferred route would traverse a lower proportion of rocky grassland of high diversity and would therefore result in marginally lower impacts on biodiversity. Thus, from a botanical perspective, the SANRAL preferred route is considered most favourable.

Fauna

None of the three alternative alignments would pass through significant amounts of sensitive faunal habitat, although Alternative 10a would traverse three small head streams and may result in a greater environmental impact, with the danger of increased erosion and run-off into the Mnyameni River. Alternative 10a is thus considered the least favourable. Alternative 10e and SANRAL's preferred route would result in similar faunal impacts.

Aquatic ecosystems

Alternative 10a is considered least favourable since additional erosion and run-off into the Mnyameni River would result in additional impacts on the riverine environment. It is considered that Alternative 10e and SANRAL's preferred route would result in similar impacts on aquatic ecosystems.

Soils, land use and agriculture

None of the alternative route alignments would traverse cultivated land. Alternative 10e would impact least on agriculture because the carrying capacity along the route is the lowest. It is shorter than the SANRAL preferred route and has a poorer grass coverage. From the perspective of soils, land use and agriculture, Alternative 10e would be preferred over the other alignments, although the differences between the alignments are considered to be minimal.

Social

The settlement pattern in the vicinity of all three alternative route alignments are equally dispersed, thus it is expected that the routes would result in similar social impacts. Community members should be consulted on the location of under- and overpasses, as it has been indicated that walking distances to homesteads, and from homesteads to grazing lands in this area are extensive. From a social perspective there is no clear preference for any of the site-specific alternative route alignments across the Mnyameni River.

Cultural and historical heritage

Alternative 10e would impact on caves identified within the valley of the Mnyameni River and its tributary and is thus considered least favourable. Alternative 10e and SANRAL's preferred route would result in similar impacts on cultural and historical heritage.

Noise

There would be no significant difference between the alternative route alignments with regard to the number of settlements that would be traversed and their proximity to any of the alternative route alignments. It is thus anticipated that all three alternative route alignments would result in similar noise impacts. From a noise perspective, no alignment is thus considered more favourable than the other. Potential residual noise impacts of **HIGH** significance are, however, anticipated (a noise rating level of 60 dBA would be in compliance with the Noise Control Regulations but would be 15 dB in excess of the acceptable SANS noise rating level of 45 dBA).

Discussion

In light of the above comparative assessment, the key differences between the various alternative route alignments across the Mnyameni River relate to potential impacts associated with loss of habitat, loss of biodiversity, fragmentation of habitat and cultural and historical heritage. Since the SANRAL preferred route would generally result in lower impacts than Alternatives 10a and 10e it is considered the most favourable alignment. It should be noted, however, that potential residual impacts of **HIGH** significance are anticipated in terms of potential noise impacts, irrespective of the selected route.

Table 12.17: Summary comparative assessment of potential residual impacts of Alternatives 10a and 10e versus the SANRAL preferred route across the Mnyameni River

ISSUE / IMPACT	SIGNIFICANCE OF POTENTIAL RESIDUAL IMPACTS		
	SANRAL PREFERRED ROUTE	ALTERNATIVE 10A	ALTERNATIVE 10E
VEGETATION AND FLORA			
Loss of habitat	MEDIUM	HIGH	HIGH
Loss of biodiversity and fragmentation of habitat	MEDIUM	HIGH	MEDIUM
Loss of species of special concern, increased runoff and drainage, soils erosion, silt loads and sedimentation, strip/ribbon/secondary development, increased accessibility of remote areas and reduction in resilience/stability of ecosystems	MEDIUM	MEDIUM	MEDIUM
Invasion by weeds and invasive alien plants, vehicular pollution of soil, air or water and disruption of the flow of nutrients and materials	LOW	LOW	LOW
Pollution at construction camps and increased risk of veld fires	VERY LOW	VERY LOW	VERY LOW
FAUNA			
Overall impacts on fauna (via loss of habitats, loss of faunal diversity, ecosystem disruption, etc.)	LOW TO MEDIUM	LOW TO MEDIUM	LOW TO MEDIUM
AQUATIC ECOSYSTEMS			
Overall impacts on riparian and instream vegetation	LOW	LOW	LOW
Overall impacts on riverine environments	LOW	LOW	LOW
Overall impacts on wetlands	LOW TO MEDIUM	LOW TO MEDIUM	LOW TO MEDIUM
Overall impacts on estuaries	LOW TO MEDIUM	LOW TO MEDIUM	LOW TO MEDIUM
SOILS, LAND USE AND AGRICULTURE			
Overall impacts on soils, land use and agriculture	LOW TO MEDIUM	LOW TO MEDIUM	LOW TO MEDIUM
SOCIAL			
Overall social impacts (severance effects, loss of arable land, etc.)	LOW TO HIGH+	LOW TO HIGH+	LOW TO HIGH+
CULTURAL AND HISTORICAL HERITAGE			
Overall cultural and historical heritage impacts (graves, archaeological sites)	LOW-MEDIUM TO MEDIUM	LOW-MEDIUM TO MEDIUM	LOW-MEDIUM TO HIGH
NOISE			
Noise impacts	LOW TO HIGH	LOW TO HIGH	LOW TO HIGH

12.4 ASSESSMENT OF POTENTIAL IMPACTS: ALTERNATIVE MAINLINE TOLL PLAZA LOCATIONS

Potential impacts relevant to a comparative assessment of the alternative locations for the proposed Mthentu Toll Plaza are discussed separately below.

SANRAL's preferred location for the Mthentu mainline toll plaza, north of the Mthentu River, is described and illustrated in Section 4.2.6 and Figure 4.24. The alternative location for this mainline toll plaza, in the vicinity of the proposed intersection with the Holy Cross/Mkambati road, is described and illustrated in Sections 4.2.6 and 5.3.8, Figure 4.22 and Plate 5.2).

A summary of potential residual impacts, where applicable, of the Alternative Mthentu mainline toll plaza location versus SANRAL'S preferred Mthentu mainline toll plaza location is provided in Table 12.18. Relevant potential impacts are discussed separately below.

Vegetation and flora

The proposed Mthentu and Alternative Mthentu mainline toll plazas would result in similar potential residual impacts on vegetation and flora of **VERY LOW** or **LOW** significance. Applicable mitigation measures include the minimisation and restriction of site clearing to the area required for construction purposes only, demarcating and avoiding sensitive areas and limiting disturbance to adjacent undisturbed natural vegetation communities. Both locations would result in a risk of strip/ribbon/secondary development and associated impacts on Pondoland-Ugu Sandstone Coastal Sourveld vegetation due to the existence of settlements nearby, existing roads, proposed intersections and the presence of the toll plaza infrastructure (deemed of **MEDIUM** significance). Neither location is thus considered more favourable from a vegetation and flora perspective.

Fauna

Faunal impacts associated with the two alternative locations for the Mthentu mainline toll plaza are considered to be similar and of **low** significance. Implementation of mitigation measures (as described in Section 12.2.2 above) would result in a residual faunal impact of **VERY LOW** significance. Neither location is thus considered more favourable from a faunal perspective.

Aquatic ecosystems

The proposed Mthentu and Alternative Mthentu mainline toll plazas would both be situated close to drainage lines. The Alternative Mthentu mainline toll plaza location would, however, be preferred since it would avoid the risk of any potential negative impacts on larger wetland habitats.

Soils, land use and agriculture

Since the receiving environment at the two alternative mainline toll plaza locations is similar, it is anticipated that neither toll plaza location would offer any advantage over the other in terms of potential impacts on soils, land use and agriculture.

Cultural and historical heritage

It is considered that the Alternative Mthentu mainline toll plaza would result in similar potential impacts on cultural and historical heritage impacts as compared to the SANRAL preferred Mthentu Toll Plaza. Neither location is thus considered more favourable from a cultural and historical heritage point of view.

Noise

There would be no significant difference between the alternative mainline toll plaza locations with regard to their proximity to settlements. It is anticipated that both toll plaza locations would result in potential residual noise impacts of **LOW** significance.

Visual

The Alternative Mthentu Toll Plaza would be located in an area with views extending beyond 20 km to the north and south, but limited by topography to the east and west. Although the intensity of the visual impact is considered high, especially within 500 m of the plaza, the significance is deemed **medium** due to the impact not extending to the Mkambati Nature Reserve. It would, however, affect the northern edge of the Mthentu River Valley. As with all the toll plazas, the night-time impact would be higher as the plaza would be an intrusive light beacon in an otherwise relatively unlit landscape. With the implementation of the recommended mitigation measures, the significance of the visual impact could be reduced to **LOW-MEDIUM**. Based on the predicted **high** and **MEDIUM** significance, without and with mitigation respectively, of the anticipated visual impacts of the proposed Mthentu mainline toll plaza (refer to Section 12.2.9 above), the Alternative Mthentu mainline toll plaza location is considered more favourable.

Discussion

The above comparative assessment (and Table 12.18) indicates that the key difference between the two alternative mainline plaza locations relates to potential residual visual impacts. The Alternative Mthentu Toll Plaza location is considered more favourable as it would result in lower potential visual impacts. Also, although the significance ratings for potential residual impacts on aquatic ecosystems are the same, it is considered that the Alternative Mthentu mainline toll plaza location would be preferred since it would avoid the risk of any potential negative impacts on larger wetland habitats. Key potential residual impacts on vegetation and flora are anticipated in terms of possible strip/ribbon/secondary development, irrespective of the selected mainline toll plaza location.

Table 12.18: Summary comparative assessment of potential residual impacts, where applicable, of the Alternative Mthentu Toll Plaza versus the proposed Mthentu Toll Plaza

ISSUE / IMPACT	SIGNIFICANCE OF POTENTIAL RESIDUAL IMPACTS	
	PROPOSED MTHENTU TOLL PLAZA	ALTERNATIVE MTHENTU TOLL PLAZA
VEGETATION AND FLORA		
Strip/ribbon/secondary development	MEDIUM	MEDIUM
Loss of habitat and biodiversity, increased runoff and drainage, soils erosion, silt loads and sedimentation, invasion by weeds and invasive alien plants, reduction in the resilience/stability of ecosystems and disruption of the flow of nutrients and materials	LOW	LOW
Pollution at construction camps and increased risk of veld fires	VERY LOW	VERY LOW
FAUNA		
Overall faunal impacts	VERY LOW	VERY LOW
AQUATIC ECOSYSTEMS		
Overall impacts on aquatic ecosystems	LOW	LOW
SOILS, LAND USE AND AGRICULTURE		
Overall impacts on soils, land use and agriculture	LOW	LOW
SOCIAL		
Overall social impacts	LOW	LOW
CULTURAL AND HISTORICAL HERITAGE		
Overall cultural and historical heritage impacts (graves, archaeological sites)	LOW-MEDIUM	LOW-MEDIUM
NOISE		
Noise impacts	LOW	LOW
VISUAL		
Visual impacts	MEDIUM	LOW-MEDIUM

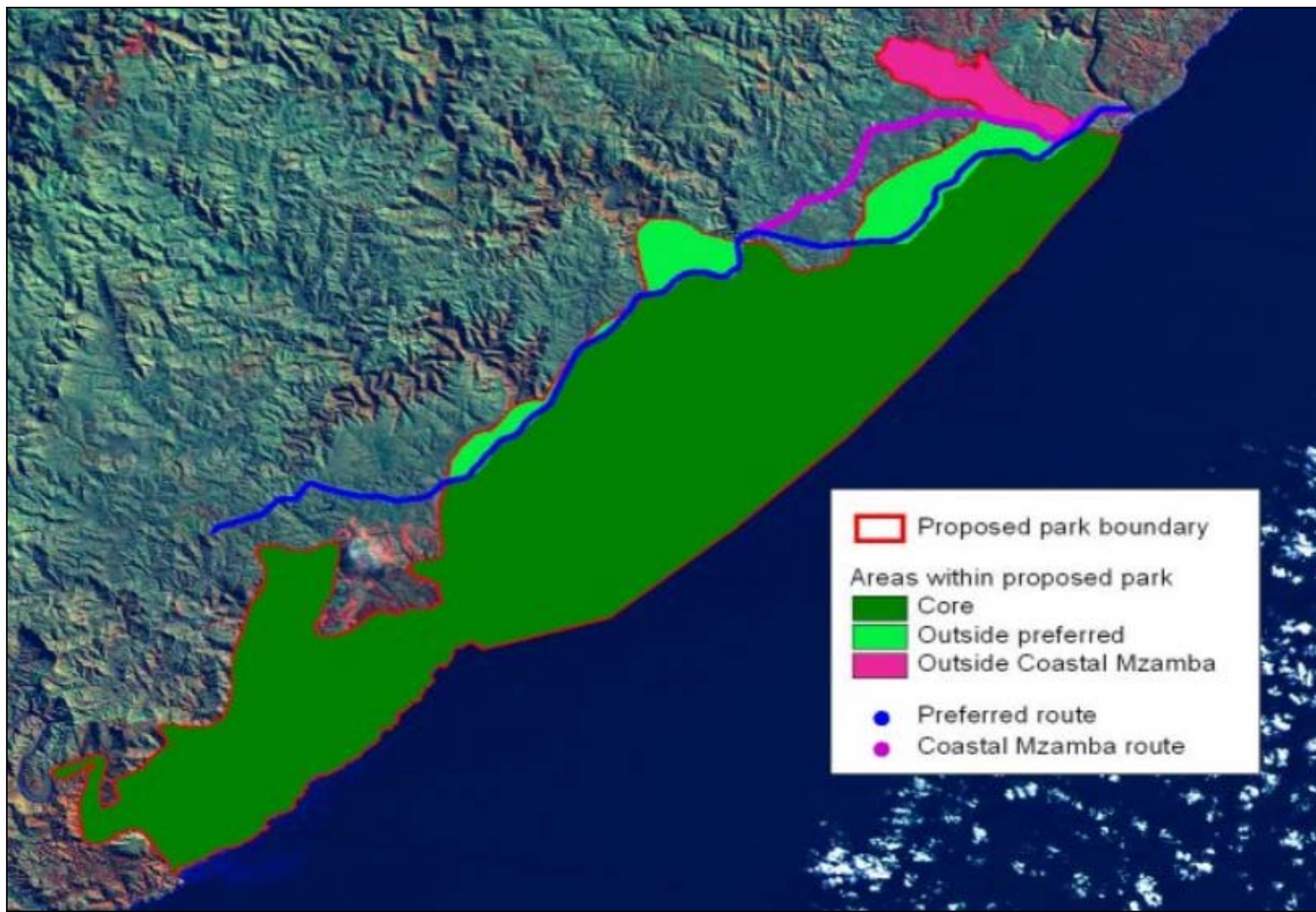


Figure 12.2: Relationship between the proposed greenfields alignments (SANRAL preferred and Coastal Mzamba routes) and the proposed Wild Coast/Pondoland National Park boundary