7. DESCRIPTION OF THE ENVIRONMENT THAT MAY BE AFFECTED BY THE PROJECT

7.1 BIO-PHYSICAL ASPECTS

7.1.1 GEOLOGY AND SOIL

According to the 1: 250 000, sheet 2722 Kuruman geological map, the sites are underlain by the Ghaap Group of the Transvaal Supergroup, which forms part of Griqualand West Sequence.

Locally, the overall lithology encountered in the drilled boreholes encompasses an overburden material; i.e. colluvium / alluvium / hillwash / aeolian deposits, pedogenic material (calcrete and ferricrete), chert rubble, dolomitic residuum which includes WAD in some places, weathered shale, overlying weathered dolomite/limestone and hard dolomite bedrock, of the Ghaap group (Transvaal Supergroup). Large parts of the sites are characterised by dolomite outcrops, scattered dolomite and chert boulders and minor calcrete and ferricrete boulders.

During drilling, groundwater (both water strike and groundwater rest level) was recorded in 69 boreholes of the 118 boreholes drilled. Groundwater measurements were taken using a dip meter as per SANS 1936-1(2012) requirements. Sixty five (65) boreholes recorded groundwater to be occurring on the blanketing material while in 53 boreholes it is occurring within bedrock. Water rest levels recorded varied between 6.7 m (BH 34) and 57.8 m (PLA 46) with an average of 24.7 m. (1300 m AMSL).

The sites gravity values show a striking gravity low feature to the north east, south, west and central east gradually increases towards the central west, north, north east and south east. However, there is also a strong striking low feature to the northern portion of the site characterised by a very steep gradient from gravity high. This may indicate a general decrease in depth of dolomite bedrock towards north and south of the site. Military Veteran site gravity gradually moves from gravity lows on the southern portion of the site to gravity highs on the northern section of the site.

The hazard zonation is based on the results of geophysical surveys and percussion drilling of 118 boreholes. The stability evaluation was conducted in accordance with the Scenario Supposition Method which consider factors including blanketing layer, receptacles, mobilisation potential, mobilizing agents and maximum potential development space, as indicated in the SANS 1936 (2012) standard. The dolomite stability of the sites is described in terms of the following zones:

Zone I: Dolomite area Designation of D3 and Inherent Hazard Class IHC 3/(4)(5)// (4)1
Zone I is characterised by a medium inherent susceptibility of up to a medium size sinkhole and subsidence formation (2 m to 5 m in diameter) with respect to ingress and small size sinkhole (<2 m) with respect to groundwater level drawdown. Zone I occupies mainly the gravity high and gradient areas. This zone encompasses pockets of IHC5 due to the encounter of dolomite bedrock at 1 m and 4 m in BH43 and PLA23, respectively. The blanketing layer is characterised by colluvium, chert rubble, dolomite chert residuum (containing fines-Wad in some instances) underlain by weathered dolomite and dolomite bedrock.

Zone II: Dolomite area Designation of D3 and Inherent Hazard Class IHC 4//4(1)
This zone is characterised by a medium inherent susceptibility of up to a medium to large size sinkhole and subsidence formation (2 m to 5 m in diameter) with respect to both ingress and groundwater level drawdown. The blanketing layer is characterised by colluvium, chert residuum, dolomite chert residuum (containing fines-Wad) underlain by weathered dolomite and dolomite bedrock. The depth to dolomite

bedrock is variable and groundwater rest level is mainly within the blanketing layer. Zone II is the most dominant zone in terms of areal coverage.

Zone III: Dolomite area Designation of D4 and Inherent Hazard Class IHC 7/8//7/8
This zone is characterised by a medium to high inherent susceptibility of up to a large to very large size sinkhole and subsidence formation (2 m to >15 m in diameter) with respect to both groundwater level drawdown and water ingress. The ground conditions in this zone are highly variable. Zone III occupies the gravity lows mainly in the northern section of the map. The blanketing layer is considerably thick and is characterised by colluvium, chert residuum, dolomite chert residuum (fines-Wad) underlain by weathered dolomite. The depth to dolomite bedrock is generally deep (>20 m) and groundwater rest level is mainly within the blanketing layer or within the cavity.

Based on the above hazard zonation and in accordance with SANS 1936-1 (2012), the following is recommended:

In general, a high-density residential development, i.e. 150 m2 (RN1) stands, have a higher density of wet services and a greater chance of an undetected leak than a commercial development on the same property. Therefore, future development on the study area should take into cognizance the allowable land use densities shown in **Appendix D** as per SANS 1936-1 (2012) permissible land use tables.

- **Zone I and II have a Dolomite Area Designation of D3**: These D3 areas could be considered for certain types of residential development (i.e. RN2/DH2 or RN3/DH3, greater than 300 m2 stands) according to Table 2 of SANS 1936-1:2012 and Table 10 of NHBRC Home Building Manual 2015.

- **Zone III has a Dolomite Area Designation of D4:** D4 is not considered suitable for residential development of any type. Only certain types of commercial/light industrial may be considered as per SANS 1936-1 (**Appendix II**), subject to conditions.

- In general, a regional Dolomite Risk Management Plan is recommended for implementation by the Municipality as a whole. This should include groundwater monitoring, as existing developments within Kuruman could be negatively affected by a continued decline in the groundwater level.

- Any signs of ground instabilities or subsidence should be reported immediately to the municipality, and remediated in accordance with SANS 1936-4 (2012).

According to SANS 1936-1 (2012), in proposing suitable foundation types in a D3 area, consideration shall be given to the potential loss of support anticipated for the designated IHC based on the expected sinkhole size. Foundation design on such land shall provide sufficient structural integrity and stability to allow occupants to safely escape in the event of sudden loss of support under the foundations. The provisional foundation design requirement on parcels of land categorized as D3 is that foundations should at least be able to span a 5 m loss of support and no residential housing development is allowed on land categorized as D4.

The depth to dolomite bedrock generally ranges between 6 m to 15 m. Groundwater rest level in this zone is mainly within bedrock.

The dolomite stability of the area is described in terms of the following zones:

Zone I: Dolomite area Designation of D3 and Inherent Hazard Class IHC 3/(4)(5)// (4)1

Zone I is characterised by a medium inherent susceptibility of up to a medium size sinkhole and subsidence formation (2m to 5m in diameter) with respect to ingress and small size sinkhole (<2m) with respect to groundwater level drawdown.

Zone II: Dolomite area Designation of D3 and Inherent Hazard Class IHC 4//4(1)
Zone II is characterised by a medium inherent susceptibility of up to a medium to large size sinkhole and subsidence formation (2m to 5m in diameter) with respect to both ingress and groundwater level drawdown.

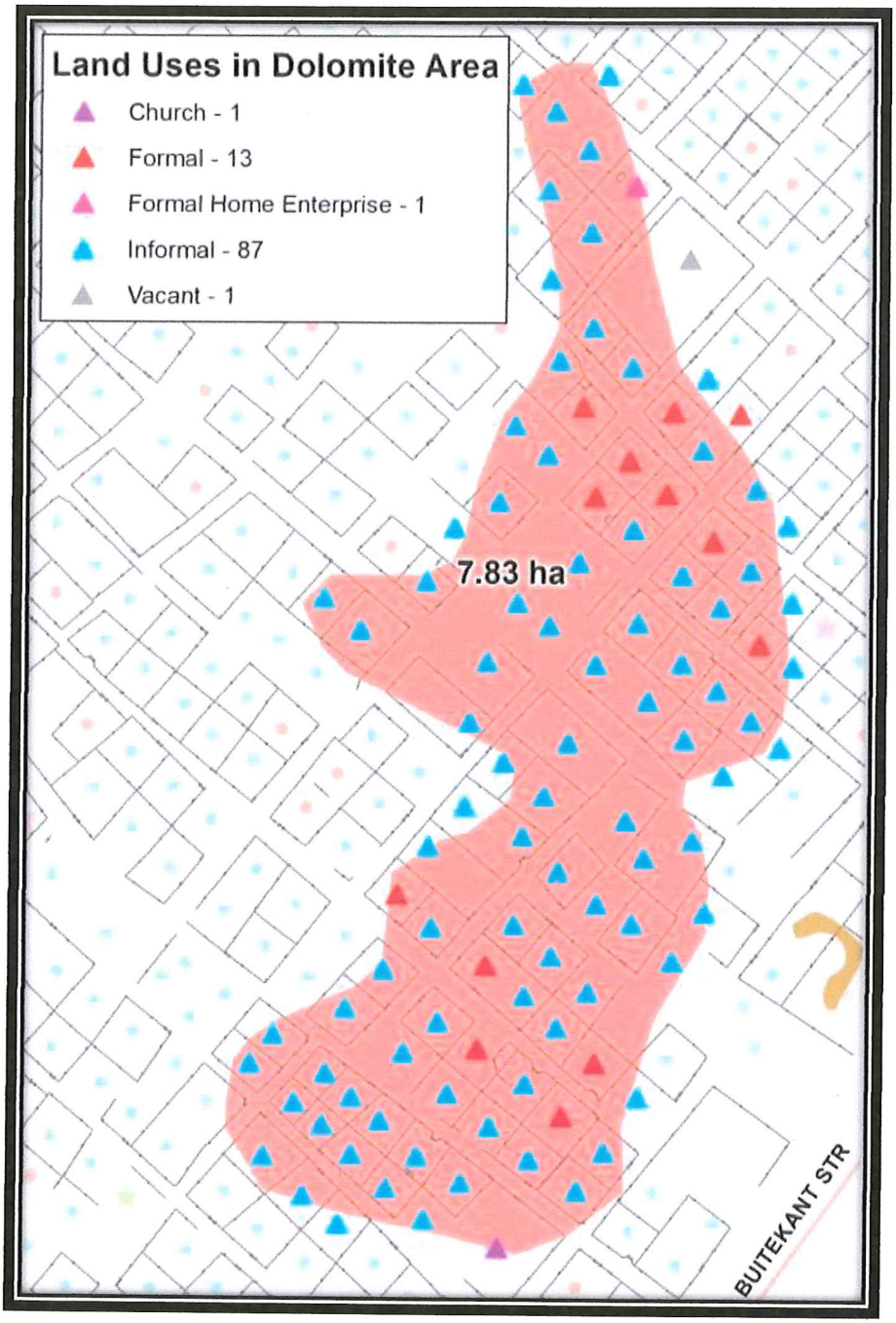
Zone III: Dolomite area Designation of D4 and Inherent Hazard Class IHC 7/8//7/8
Zone II is characterised by a medium to high inherent susceptibility of up to a large to very large size sinkhole and subsidence formation (2m to >15m in diameter) with respect to both groundwater level drawdown water ingress.

Summary:

Zone I and II have a Dolomite Area Designation of D3:
• These D3 areas could be considered for certain types of residential development (i.e. RN2/DH3, greater than 300m² stands)

Zone III has a Dolomite Area Designation of D4:
• D4 is not considered suitable for residential development of any type. Only certain types of commercial/light industrial may be considered as per SANS 1936-1, subject to conditions.

As far as Promised Land is concerned, an area of ±7,8 ha in the central part of the village, as well as 2 smaller areas of 1, 78 ha in the northern boundary, are affected by the Zone III dolomite area. Refer to **Map 3: Dolomite Zonation**



7.1.2 TOPOGRAPHY

The study area and Kuruman as a whole is bounded by a prominent ridge and scattered hills to the north and west. The maximum elevation is approximately 1326 m AMSL. The elevation of the study areas ranges between 1326 m AMSL on the south and 1311 m AMSL to the north. The landscape of the sites is in the form of gentle undulating topography and low relief. Undulating topography in the study area is characterised by areas of rock outcrops and flat planes are characterised by highly weathered rocks).

A detailed site survey has been carried out to establish levels. The Engineering report and the Layout plan will address issues regarding storm water. As the proposed development will be in close proximity to residential areas, safety of children and people need to be taken into consideration.

7.1.3 CLIMATE

According to Mucina and Rutherford (2006), Kuruman is a summer rainfall area. It normally receives about 266 mm of rain per year, with most of the rainfall (58 mm) occurring mainly in February while the lowest rainfall (0 mm) is in June. The monthly distribution of average daily maximum temperatures ranges from 17.5°C in June to 32.6°C in January. The region is the coldest during June when the mercury drops to 0°C on average during the night. Mean annual evaporation potential (MAEP) is between 2700 mm and 2786 mm.

Kuruman has relatively mild weather patterns compared to other neighbouring Northern Cape towns. The Weinerts N value for this area is greater than 5, indicating that mechanical weathering takes place rather than chemical weathering.

Extreme climatic events may have an influence on the project during the construction and operational phase and will have to be taken into consideration.

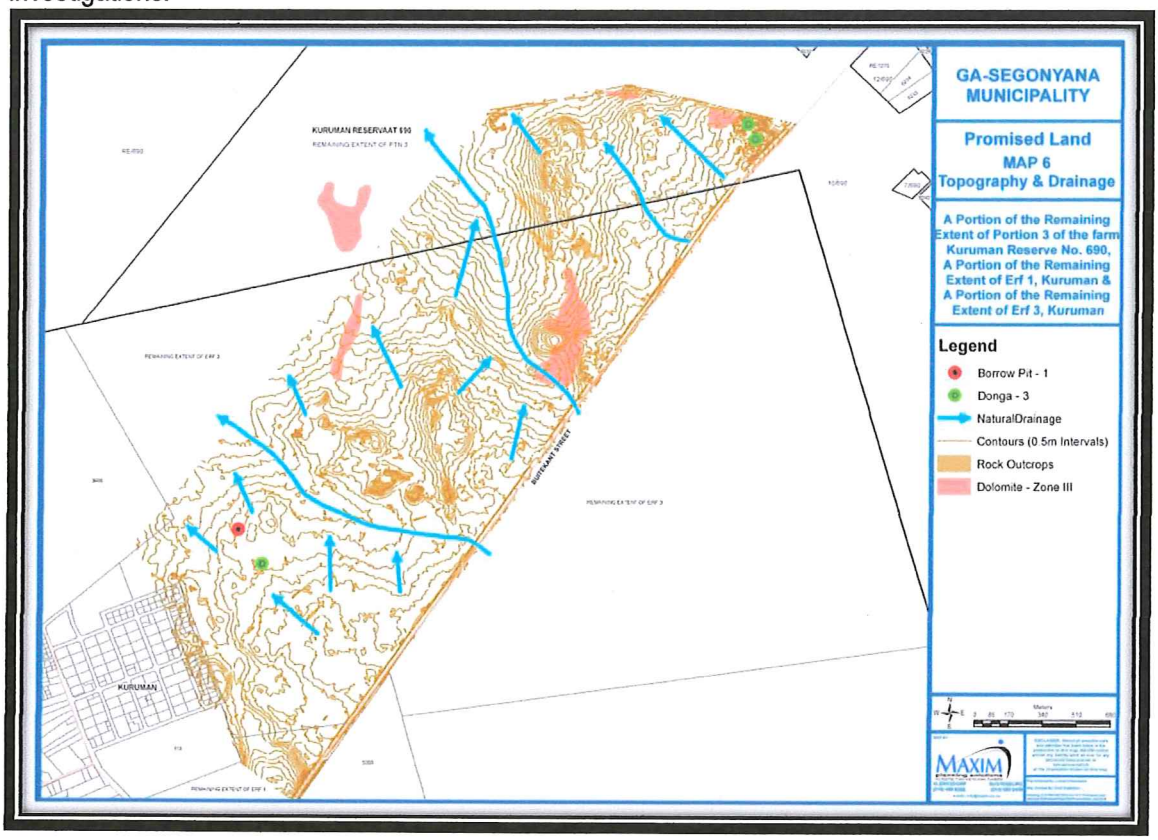
Climate Change

According to: WIREs Clim Change 2014, 5605-620. Doi:10.1002/wcc.295: "Climate change is a key concern within South Africa. Mean annual temperatures have increased by at least 1.5 times the observed global average of 0.65◦C over the past five decades and extreme rainfall events have increased in frequency. These changes are likely to continue. Climate change poses a significant threat to South Africa's water resources, food security, health, infrastructure, as well as its ecosystem services and biodiversity. Considering South Africa's high levels of poverty and inequality, these impacts pose critical challenges for national development. In relation to water, impact studies for the water resources sector have begun to look beyond changes in streamflow to changes in the timing of flows and the partitioning of streamflow into baseflows and stormflows, reservoir yields, and extreme hydrological events. Spatially the eastern seaboard and central interior of the country are likely to experience increases in water runoff. Higher frequencies of flooding and drought events are projected for the future. Complexities of the hydrological cycle, influences of land use and management and the linkages to society, health, and the economy indicate far higher levels of complexity in the water resources sector than in other sectors. What has emerged is that land uses that currently have significant impacts on catchment water resources will place proportionally greater demands on the catchment's water resources if the climate were to become drier. The influence of climate change on water quality is an emerging research field in South Africa, with assessments limited to water temperature and non-point source nitrogen and phosphorus movement. A critical interaction that has not been explored is between changes in water quality and quantity and the combined impacts, such changes might have impact on various types of water use, e.g., irrigation, domestic consumption, or aquatic ecosystems support".

Water availability and demand has been calculated by the consulting Civil Engineers, to enable a sustainable waterborne sewage system as well as potable water supply for both the existing and future developments in the area.

7.1.4 SURFACE DRAINAGE

The natural drainage in the area is mainly in a north and north-western direction. No streamlines intersects the site. The study area, to the east is characterised by gullies of a tributary which during the investigation was dry. Figure below shows the Kuruman River flowing northwards to the west of the study area. The Kuruman River tributaries are non-perennial and were dry during the current Investigations.



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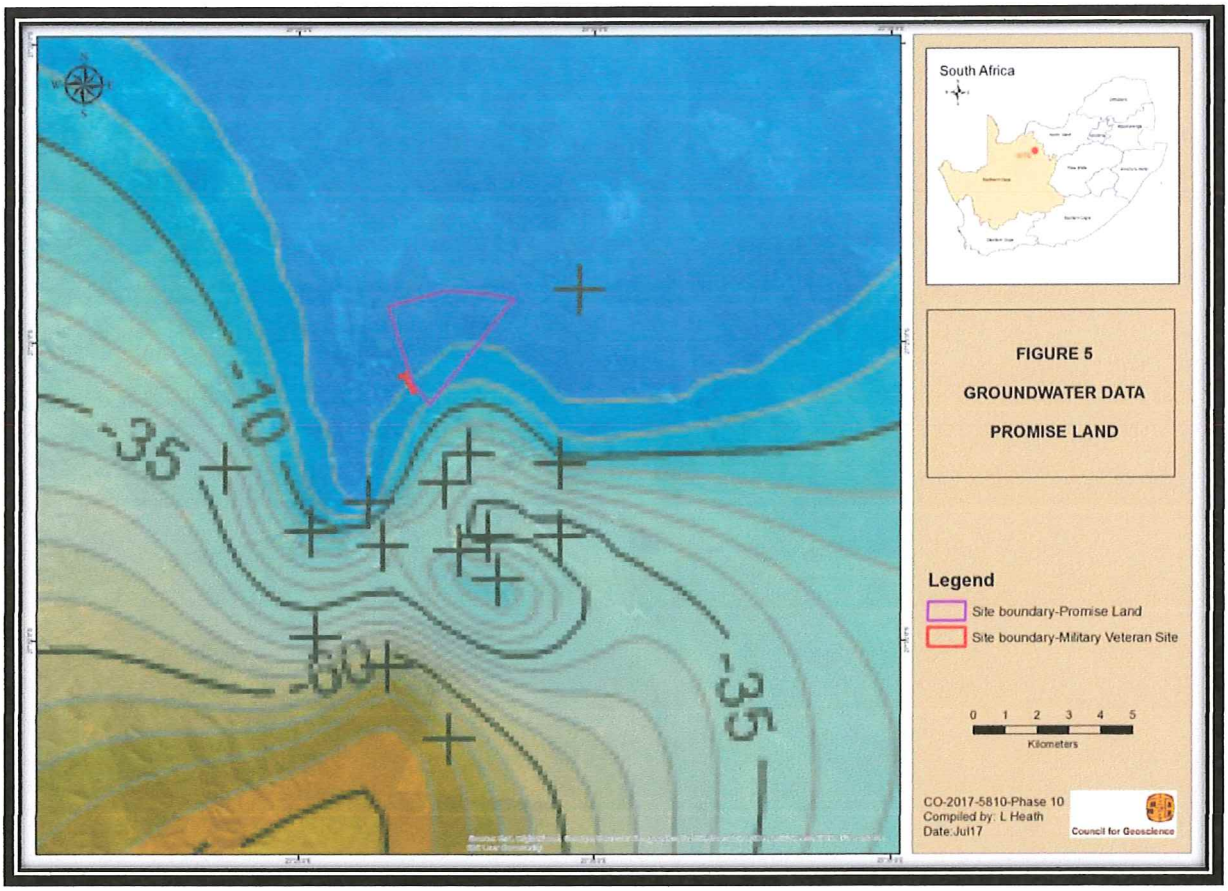
7.1.5 GROUND WATER

The nature of dolomite bedrock is impervious with porosity of less than 0.3 %. However, due to the jointing, fractures and faulting; water is able to percolate and seeps through the rock (Brink, 1979). The dolomite of the study area is also considered as an aquifer, due to faulting, dolerite intrusions and fracturing.

The groundwater level is a key risk assessment factor in the engineering-geological characterisation of any dolomitic environments. According to the 1: 50 000 hydro-geological Map 2722 Kimberly, the principal groundwater occurrence system is a karst type. Groundwater map below indicates the location of site with respect to groundwater level.



Groundwater Data (DWA, 2010)

According to the Department of Water Affairs Groundwater Assessment: Dolomite Aquifers Study conducted in December 2006, Kuruman is located on Kuruman Groundwater Compartment. The compartment is being dewatered. Kuruman and surrounding communities are almost entirely dependent on groundwater.

During drilling, groundwater (both water strike and groundwater rest level) was recorded in 69 boreholes of the 118 boreholes drilled. Groundwater measurements were taken using a dip meter as per SANS 1936-1(2012) requirements. Sixty five (65) boreholes recorded groundwater to be occurring on the blanketing material while in 53 boreholes it is occurring within bedrock. **Table 1** indicates that the water rest levels recorded varied between 6.7 m (BH 34) and 57.8 m (PLA 46) with an average of 24.7 m. (1300 m AMSL).

The results of the investigations show that the water table lies within the blanketing layer above bedrock in most cases. This indicates that fluctuations in the regional groundwater level could have an influence on the stability of the site. Significant lowering of the groundwater level could adversely affect the stability of the sites.

7.1.6 FLORA

To serve as local context for the vegetation at the site an outline of the Kuruman Thornveld vegetation type from Mucina and Rutherford (2006) follows.

SVk 9 Kuruman Thornveld

Distribution: In South Africa the Kuruman Thornveld is found at the North West and Northern Cape Provinces. Kuruman Thornveld occurs on the flats from the vicinity of Postmasburg and Danielskuil (here west of the Kuruman Hills) in the south extending via Kuruman to Tsineng and Dewar in the north. Altitude is 1100 – 1500 m (Mucina & Rutherford, 2006).

Vegetation and landscape features: Flat rocky plains and some sloping hills with very well-developed, closed shrub layer and well-developed open tree stratum consisting of *Acacia erioloba* (Mucina & Rutherford, 2006).

Geology and soils: Some Campbell Group dolomite and chert and mostly younger, superficial Kalahari Group sediments, with red wind-blown (0.3 – 1.2 m deep) sand. Locally, rocky pavements are formed in places. Most important land types Ae, Ai, Ag and Ah, with Hutton soil form (Mucina & Rutherford, 2006).

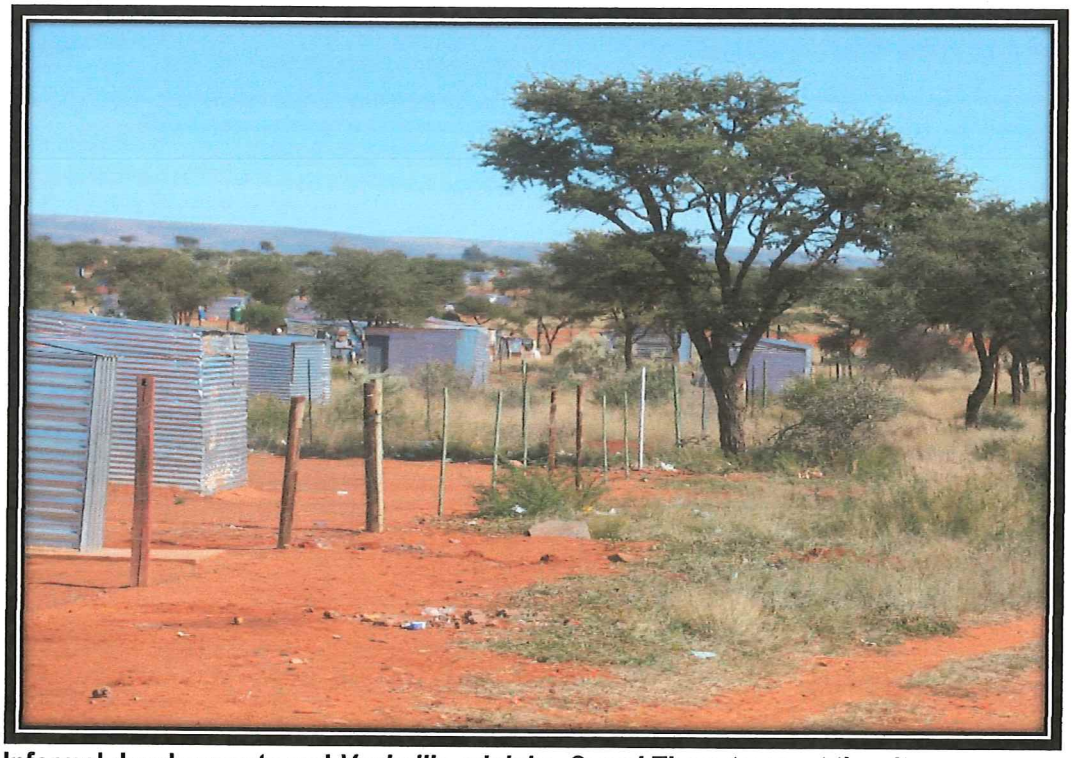
Climate: Summer and autumn rainfall with very dry winters. Mean annual precipitation (MAP) about 300-450 mm. Frost frequent in winter (Mucina & Rutherford, 2006).

Important taxa: Tall tree: *Acacia erioloba*. Small trees: *Acacia mellifera* subsp. *detinens*, *Boscia albitrunca*. Tall Shrubs: *Grewia flava, Lycium hirsitum, Tarchonanthus camphoratus, Gymnosporia buxifolia.* Low Shrubs: *Acacia hebeclada* subsp. *hebeclada. Monechma divaricatum, Gnidia polycephala, Helichrysum zeyheri, Hermannia comosa, Pentzia calcarea, Plinthus sericeus.* Geoxylic Suffrutex: *Elephantorrhiza elephantina*. Graminoids: *Aristida meridionalis, Aristida stipitata* subsp. *stipitata, Eragrostis lehmanniana, Eragrostis echinochloidea, Melinis repens.* Herbs: *Dicoma schinzii, Gisekia africana, Harpagophytum procumbens* subsp. *procumbens, Indigofera daleoides, Limeum fenestratum, Nolletia ciliaris, Seddera capensis, Tripteris aghillana, Vahlia capensis* subsp. *vulgaris*.

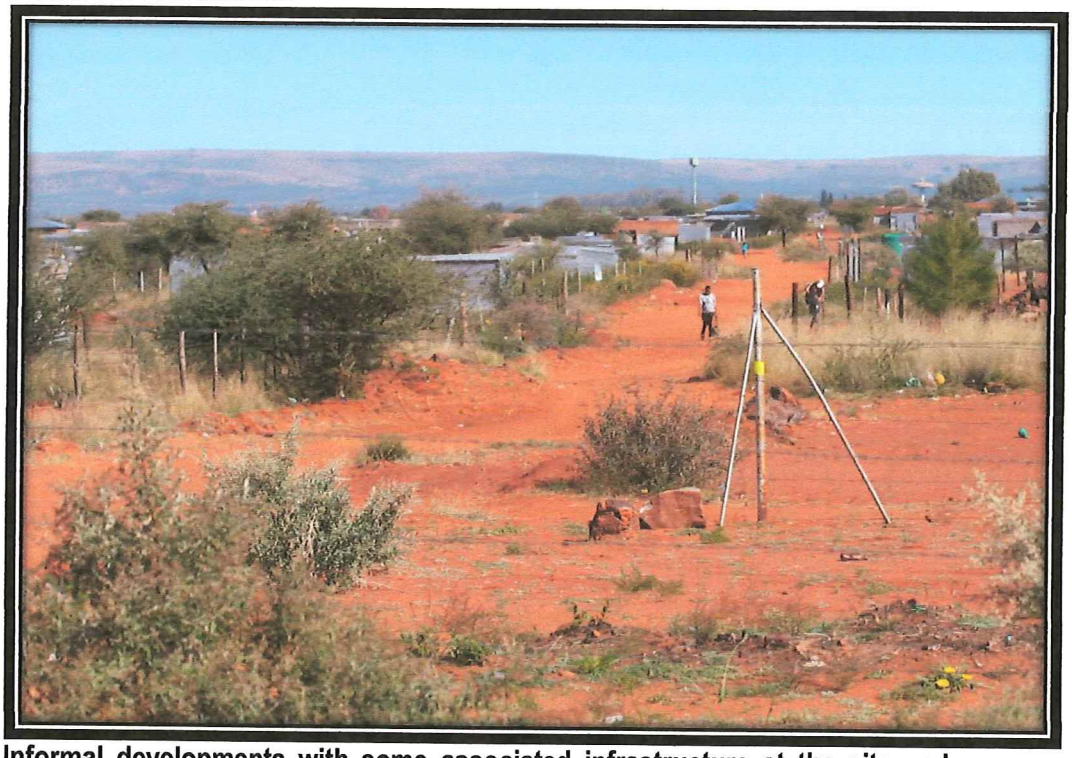
Note: Though some plant species of the above listed vegetation type are present at the site, not necessarily all of the plant species listed above are present at the site.

Vegetation at much of the site is transformed or modified. Numerous areas where vegetation has been cleared, are present at the site. Some fragmented and ecologically disturbed patches of indigenous vegtation remain at some places at the site. *Vachellia erioloba* (Camel Thorn) trees still remain and some appear to be conserved even in areas that are otherwise cleared. Other indigenous small trees at the site include *Tarchonanthus camphoratus* (Vaalbos), *Vachellia hebeclada* (Candlepod Thorn), *Senegalia mellifera* (Black Thorn), *Grewia flava* (Velvet Raisin), *Ziziphus mucronata* (Buffalo-thorn) and *Vachellia tortilis* (Umbrella Thorn). Indigenous grass species include *Eragrostis lehmanniana* (Lehman's Love Grass), *Aristida congesta* (Tassel Three-awn) and *Enneapogon cenchroides.* Indigenous herbs at the site include *Hirpicium echinus, Acrotome inflata, Dicoma schinzii, Elephantorrhiza elephantina, Senna italica* and *Hermannia tomentosa*. Numerous alien invasive weeds are found at the site such as *Verbesina encelioides, Argemone ochroleuca* (White-flowered Mexican Poppy), *Schkuhria pinnata* (Dwarf Marigold), *Chenopodium album* (White Goosefoot), *Tagetes minuta* (Khaki Weed), *Bidens pilosa* (Common Blackjack), *Bidens bipinnata* (Spanish Black Jack), *Datura ferox* (Large Thorn-apple) and *Datura stramonium* (Common Thorn-apple).
Informal buildings, roads, numerous scraped areas and fences are found widespread at the site. Informal dumping occurs at some parts. Various alien invasive weeds are widespread at the site.

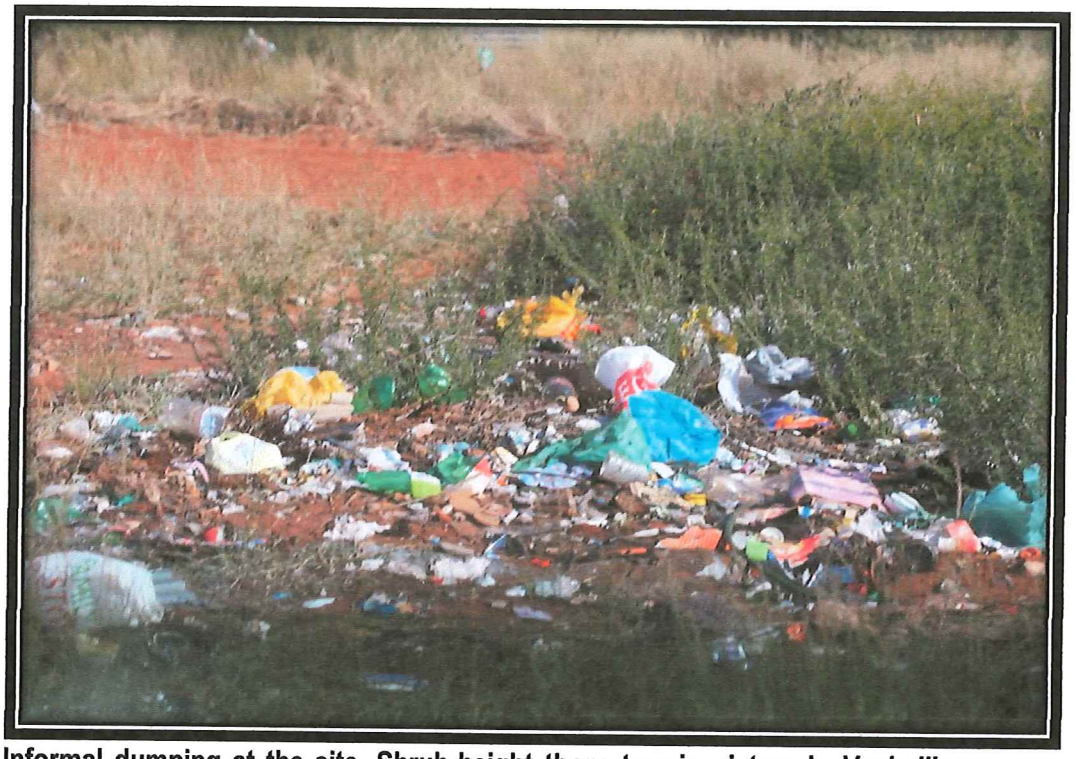
Scope for the site to be part of a corridor of particular conservation concern is small.



Informal developments and *Vachellia erioloba*, Camel Thorn trees, at the site.
Photo: R.F. Terblanche.

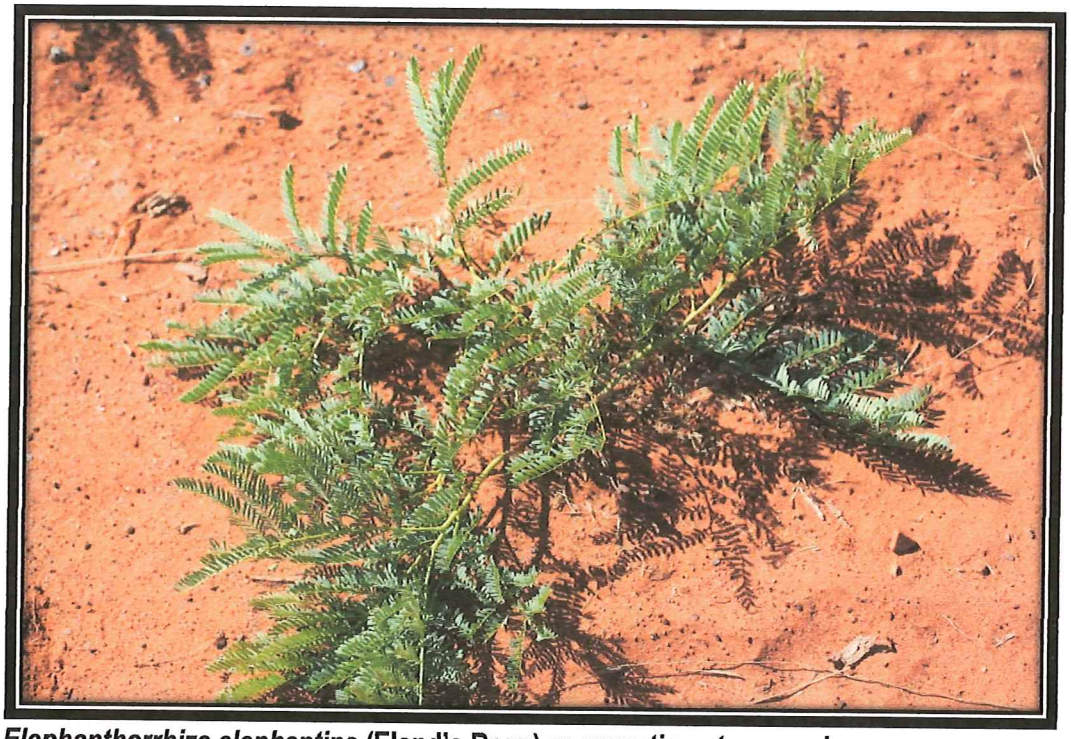


Informal developments with some associated infrastructure at the site and remains of some indigenous vegetation.
Photo: R.F. Terblanche.



Informal dumping at the site. Shrub-height thorn tree in picture is *Vachellia hebeclada* (Candlepod Thorn)
Photo: R.F. Terblanche.

Widespread indigenous herbaceous species, *Hirpicium echinus*, at the site.
Photo: R.F. Terblanche.



Elephanthorrhiza elephantina **(Eland's Bean) re-sprouting at scraped area.**
Photo: R.F. Terblanche.

Foliage and pods of the Camel Thorn, *Vachellia erioloba* at the study area.
Photo: R.F. Terblanche.

7.1.7 FAUNA

The fauna of the area is highly disturbed by the people living in the adjoining suburbs. The likelihood of the presence of larger mammals is doubtful. No listed species were identified during the fieldwork phase.

VERTEBRATES

Mammals

Since the site falls outside reserves, threatened species such as the black rhinoceros (*Diceros bicornis*) and the African wild dog (*Lycaon pictus*) are obviously not present. No smaller mammals of particular high conservation significance are likely to be found on the site as well.

Birds

With bird species which often have a large distributional range, their presence does not imply that they are particularly dependent on a site as breeding location. Therefore the emphasis in the right hand columns of. Literature sources that were mainly consulted are Barnes (2000), Hockey, Dean & Ryan, P.G. (2005) and Chittenden (2007). No threat to any threatened bird species or any bird species of particular conservation importance are foreseen.

Reptiles

While the conservation statuses of reptile species are under revision Alexander & Marais (2007) as well as Tolley & Burger 2007) give useful indications of possible red listings in the near future. There appears to be no threat to any reptile species of particular high conservation importance if the site is developed.

Amphibians

There is no suitable habitat for *Pyxicephalus adspersus* (Giant Bullfrog) at the site. There appears to be no threat to any amphibian species of particular high conservation importance if the site is developed.

INVERTEBRATES

Butterflies

Studies relating to the vegetation and habitat of threatened butterfly species in South Africa showed that ecosystems with a unique combination of features are selected by these often localised threatened butterfly species (Deutschländer and Bredenkamp 1999; Edge 2002, 2005; Terblanche, Morgenthal & Cilliers 2003; Lubke, Hoare, Victor & Ketelaar 2003; Edge, Cilliers & Terblanche, 2008). Threatened butterfly species in South Africa can then be regarded as bio-indicators of rare ecosystems.

Four species of butterfly in Gauteng Province, northeastern Northern Cape Province and North West Province combined are listed as threatened in the recent butterfly conservation assessment of South Africa (Mecenero *et al.*, 2013). The expected presence or not of these threatened butterfly species as well as species of high conservation priority that are not threatened, at the site.

Assessment of threatened butterfly species

Aloeides dentatis dentatis (Roodepoort Copper)

The proposed global red list status for Aloeides dentatis dentatis according to the most recent IUCN criteria and categories is Endangered (Mecenero et al., 2013). Aloeides dentatis dentatis colonies are found where one of its host plants Hermannia depressa or Lotononis eriantha is present. Larval ant association is with Lepisiota capensis (S.F. Henning 1983; S.F. Henning & G.A. Henning 1989). The habitat requirements of Aloeides dentatis dentatis are complex and not fully understood yet. See Deutschländer and Bredenkamp (1999) for the description of the vegetation and habitat characteristics of one locality of Aloeides dentatis subsp. dentatis at Ruimsig, Roodepoort, Gauteng Province. There is not an ideal habitat of Aloeides dentatis subsp. dentatis on the site and it is unlikely that the butterfly is present at the site.

Anthene lindae **(Kalahari Hairtail)**
Small but distinct butterfly species discovered by R.F. Terblanche in 1990 at the present Witsand Nature Reserve in the Northern Cape. Recent red listing and exinction risk assessments list *Anthene lindae* as Vulnerable (Henning, Terblanche & Ball, 2009; Mecenero *et al.*, 2013). The butterfly is intimately associated with *Acacia erioloba* which may prove to be the larval food plant (Terblanche, 1994; Jessnitz pers. comm). However, all the localities for this butterfly species have been found on what appears to be a unique catchment area and basins with particular high water tables on the western side of the Langberg mountain chain, Northern Cape Province (Terblanche & Taylor, 2000). According to Henning *et al.* (2009) *Anthene lindae* has up to date only been found at an ecotone between Gordonia Plains Shrubland and Olifantshoek Plains Thornveld (Mucina & Rutherford, 2006). *Anthene lindae* is not found everywhere where *Vachellia erioloba* is present (Terblanche In prep.) and based on the present knowledge and surveys, presence of the butterfly at the site is unlikely.

Chrysoritis aureus (Golden Opal/ Heidelberg Copper)
The proposed global red list status for Chrysoritis aureus according to the most recent IUCN criteria and categories is Endangered (Mecenero et al., 2013) Chrysoritis aureus (Golden Opal/ Heidelberg Copper) is a resident where the larval host plant, Clutia pulchella is present. However, the distribution of the butterfly is much more restricted than that of the larval host plant (S.F. Henning 1983; Terblanche, Morgenthal & Cilliers 2003). One of the reasons for the localised distribution of Chrysoritis aureus is that a specific host ant Crematogaster liengmei must also be present at the habitat. Fire appears to be an essential factor for the maintenance of suitable habitat (Terblanche, Morgenthal & Cilliers 2003). Research revealed that Chrysorits aureus (Golden Opal/ Heidelberg Copper) has very specific habitat requirements, which include rocky ridges with a steep slope and a southern aspect (Terblanche, Morgenthal & Cilliers 2003). Owing to a lack of habitat requirements and ideal habitat the presence of the taxon is highly unlikely.

Lepidochrysops praeterita **(Highveld Blue)**
The proposed global red list status for Lepidochrysops praeterita according to the most recent IUCN criteria and categories is Endangered (G.A. Henning, Terblanche & Ball, 2009; Mecenero et al., 2013). Lepidochrysops praeterita is a butterfly that occurs where the larval host plant Ocimum obovatum (= Becium obovatum) is present (Pringle, G.A. Henning & Ball, 1994), but the distribution of the butterfly is much more restricted than the distribution of the host plant. Lepidochrysops praeterita is found on selected rocky ridges and rocky hillsides in parts of Gauteng, the extreme northern Free State and the south-eastern Gauteng Province. No ideal habitat appears to be present for the butterfly on the site. It is unlikely that Lepidochrysops praeterita would be present on the site and at the footprint proposed for the development.

Conclusion on threatened butterfly species
There appears to be no threat to any threatened butterfly species if the site is developed.

Assessment of butterfly species that are not threatened but also of high conservation priority

Colotis celimene amina (Lilac tip)
Colotis celimene amina is listed as Rare (Low density) by Mecenero et al. (2013). In South Africa Colotis celimene amina is present from Pietermaritzburg in the south and northwards into parts of Kwa-Zulu Natal, Gauteng, Limpopo, Mpumalanga and the North West Provinces (Mecenero et al. In press.). Reasons for its rarity are poorly understood. It is highly unlikely that Colotis celimene amina would be present at the site.

Lepidochrysops procera (Savanna Blue)
Lepidochrysops procera is listed as Rare (Habitat specialist) by Mecenero et al. (2013). Lepidochrysops procera is endemic to South Africa and found in Gauteng, KwaZulu-Natal, Mpumalanga and North West (Mecenero et al., 2013). Owing to a lack of habitat requirements and ideal habitat the presence of the taxon at the site is highly unlikely.

Metisella meninx (Marsh Sylph)
Henning and Henning (1989) in the first South African Red Data Book of Butterflies, listed Metisella meninx as threatened under the former IUCN category Indeterminate. Even earlier in the 20th century Swanepoel (1953) raised concern about vanishing wetlands leading to habitat loss and loss of populations of Metisella meninx. According to the second South African Red Data Book of butterflies (Henning, Terblanche & Ball, 2009) the proposed global red list status of Metisella meninx has been Vulnerable. During a recent large scale atlassing project the Conservation Assessment of Butterflies of South Africa, Lesotho and Swaziland: Red List and Atlas (Mecenero et al., 2013) it was found that more Metisella meninx populations are present than thought before. Based on this valid new information, the conservation status of Metisella meninx is now regarded as Rare (Habitat specialist) (Mecenero et al., 2013). Though Metisella meninx is more widespread and less threatened than perceived before, it should be regarded as a localised rare habitat specialist of conservation priority, which is dependent on wetlands with suitable patches of grass at wetlands (Terblanche In prep.). Another important factor to keep in mind for the conservation of Metisella meninx is that based on very recent discoveries of new taxa in the group the present Metisella meninx is species complex consisting of at least three taxa (Terblanche In prep., Terblanche & Henning In prep.). The ideal habitat of Metisella meninx is treeless marshy areas where Leersia hexandra (rice grass) is abundant (Terblanche In prep.). The larval host plant of Metisella meninx is wild rice grass, Leersia hexandra (G.A. Henning & Roos, 2001). Owing to a lack of habitat requirements and ideal habitat the presence of the taxon at the site is highly unlikely.

Platylesches dolomitica (Hilltop Hopper)
Platylesches dolomitica is listed as Rare (Low density) by Mecenero et al. (2013). Historically the conservation status of Platylesches dolomitica was proposed to be Vulnerable (Henning, Terblanche & Ball 2009). However this butterfly which is easily overlooked and has a wider distribution than percieved before. Platylesches dolomitica has a patchy distribution and is found on rocky ledges where Parinari capensis occurs, between 1300 m and 1800m (Mecenero et al. 2013, Dobson Pers comm.). Owing to a lack of habitat requirements and ideal habitat the presence of the taxon at the site is highly unlikely.

7.1.8. AIR QUALITY

Air quality will have no influence on the project. The project will however create a certain amount of dust during the construction phase. If proper dust suppression measures are implemented this variable will have very little impact (low in intensity and significance during the construction phase).

7.1.9 NOISE

It is a fact that a certain amount of noise will be generated during the construction phase of the project. Noise levels should however rarely exceed the allowable limits. It is unlikely that the project will create any more noise during the operational phase than that already experienced on site.

7.1.10 ARCHAEOLOGY AND CULTURAL SITES

A Pelser Archaeological Consulting (APAC) was appointed by Maxim Planning Solutions to undertake a Phase 1 HIA for the proposed township Promised Land on a Portion of the Remaining Extent of Erven 1 and 3 Kuruman and a Portion of the Remaining Extent of Portion 3 of the farm Kuruman Reserve No. 690 at Ga-Segonyana Local Municipality Northern Cape Province. The project is conducted under instruction from the Housing Development Agency (HDA).

A number of known cultural heritage sites (archaeological and/or historical) exist in the larger geographical area within which the study area falls. There are no known sites on the specific land parcel and none was identified and recorded during the recent assessment. The area has been heavily impacted and disturbed in the recent past by current ongoing residential and related activities. If any did exist here in the past it would have been disturbed or destroyed as a result. It is clear from aerial views of the study area that recent large scale human settlement has slowly encroached on the area since 2005. It is therefore highly unlikely that any significant and intact sites, features or material would be present here.

Finally, it should be noted that although all efforts are made to locate, identify and record all possible cultural heritage sites and features (including archaeological remains) there is always a possibility that some might have been missed as a result of grass cover and other factors. The subterranean nature of these resources (including low stone-packed or unmarked graves) should also be taken into consideration. Should any previously unknown or invisible sites, features or material be uncovered during any development actions then an expert should be contacted to investigate and provide recommendations on the way forward.

From a cultural heritage point of view the development can therefore continue, taking cognizance of the above recommendations.

7.2 SOCIOLOGICAL AND ECONOMIC ISSUES

As in the rest of South Africa, there is a housing shortage in the area. This is totally unacceptable as Informal settlements consist of non-conventional housing built without complying with legal building procedures. Broadly, these crude dwellings mostly lack proper indoor infrastructure, such as water supply, sanitation, drainage, waste disposal and proper road access. There is also a bond between poor housing and environmental conditions in informal settlements which also reflects poverty. Linking basic services such as water to health is viewed as a false separation as these services are 'intimately related to housing'. It becomes a housing issue if children playing outside the house contract diarrhoea via ingesting pathogens from fecal matter which contaminates the land on which they play. Otherwise, it is the house which provides for shelter against injury, weather and disease. Improving the surroundings of the house is to limit severe health risks existing within poor quality housing.

According to the Ga-Segonyana SDF, the area where the Promised Land Informal Settlement is situated has been earmarked as a zone of integration that includes future residential development as well as the D3456 Street Corridor for business and mixed land use development. By introducing a formalized township on the farm portion, the existing informal settlement will be relocated and further "squatting" will be reduced.

As mentioned, development guidelines from the Guidelines for human settlement planning and design were taken into account to develop a sustainable area for people to have job opportunities and public facilities close to home. This will encourage a sustainable community and by implementing these guidelines, will help contribute to the upliftment of the community in whole.

During the construction phase, temporary employment will be created. The increased employment in the area during the construction phase will also result in increased expenditure, which, in addition, will mean that more than just the proposed jobs required for the construction on the site will be created due to economic spin-offs that will result.

8. ENVIRONMENTAL MANAGEMENT OBJECTIVES AND TARGETS

The following table is a summary of the impact management objectives, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process.

ENVIRONMENTAL ASPECTS	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS
DOCUMENTATION AND TRAINING		
The necessary documentation must be available in the site office	Ensure that all concerned is aware of the EMPr and related environmental aspects	Availability of documents Trained and informed workforce.
SITE ACCESS & TRAFFIC MANAGEMENT		
Access roads may increase the construction footprints	Construction vehicles, machinery and workers must be restricted to the designated access roads, and may not drive through undeveloped vegetation outside of the existing access route except where that vegetation falls within the authorised working area (development footprint) at the site.	Minimizing eradication of vegetation.
VEGETATION CLEARING		
Vegetation will be cleared from within the footprint of the working area, before earthmoving and construction activities commence.	Vegetation clearing may only commence once the working area has been clearly demarcated to the ECO's satisfaction.	Land clearing must be restricted to the demarcated working area, and no vegetation may be cleared outside of the demarcated working area.
TOPSOIL & SUBSOIL MANAGEMENT		
Topsoil (where present) will be removed from any area where physical disturbance of the surface will occur.	Removed topsoil and subsoil should be stockpiled for the duration of the active construction period, and utilized for the final landscaping and rehabilitation of disturbed areas on site	The topsoil must be adequately protected from being blown away or eroded by storm water. Removed subsoil should be stockpiled separately from topsoil. Topsoil should be the final layer applied during rehabilitation, after subsoil/ spoil material has been placed and shaped on the site
EXCAVATIONS & EARTHWORKS		
It will be necessary to employ heavy machinery (excavators, back-actors, bulldozers, dump trucks etc.) for the earthmoving required	Use of heavy machinery can substantially increase the likelihood, intensity and significance of potential negative environmental impacts, and it is thus essential that earthworks be performed under constant supervision, and that operators must be made aware of all the environmental obligations, as there is always the potential to inflict damage to sensitive areas.	Use of machinery should be restricted to only that which is strictly required, and the unnecessary or excessive movement/ use of such machinery must be kept to a minimum. Machinery must enter and exit the site via the indicated access roads, and may not enter/ exit the river channel at any other location. Excavations and earth-moving may only take place within the demarcated working area
DANGEROUS AND TOXIC MATERIALS (CHEMICALS)		

ENVIRONMENTAL ASPECTS	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS
Safe storage of chemicals See also below for further aspects on this subject Availability of safety kits to prevent oils/toxic materials spreading in the environment Proper storage must be provided for chemicals , paint and construction materials needed	Clean environment Safe storage of materials	No spills of chemicals Proper storage provided
STORAGE OF OIL AND FUEL		
Safe handling of fuel and oil and prevention of spills.	Clean environment	No spills of oil or fuel No leakages of oil
USE OF OIL AND CHEMICALS		
Drip trays must be provided for vehicles in storage yard Wash bay and oil trap to be provided	No spills of oil Cleaning area for vehicles	No oil spills from vehicles No oil or fuel into environment due to cleaning of vehicles or equipment
STORAGE OF CEMENT		
Safe handling of cement	Clean environment	No spills of cement
STORAGE OF EQUIPMENT AND MATERIALS		
Safe and proper storage of equipment and material	Safe and proper storage of equipment and material	Neat, clean and ordered storage of material
CONCRETE		
The contractors must provide information on proposed handling of concrete.	Minimise the possibility of concrete residue entering into the surrounding environment	No evidence of contaminated soil on the construction site
TOILETS AND ABLUTION FACILITIES		
Clean sanitary environment	Clean and sanitary environment	Toilets for workers in accordance with the instructions in the EMP
WASTE MANAGEMENT		
A clean and waste free environment	Clean environment with waste handled in accordance with the EMP	No waste in the environment
WORKSHOP EQUIPMENT, MAINTENANCE AND STORAGE OF MATERIAL		
Clean and safe work area	Clean and safe work area	Safe and clean work and storage area
FIRES		
No burning of waste and or fires originating from the construction area	No burning of waste and or fires originating from the construction area	No fire incidents
OTHER ENVIRONMENTAL ASPECTS		
Stockpiles All stockpiled material must be easily accessible without any environmental damage to adjacent grasslands/farmlands. All temporarily stockpiled material must be stockpiled in such a way that the spread of materials are minimised. The stockpiles may only be placed within the demarcated areas - the location of which must be approved by the ER or ECO. Stockpiled material at batching plant must be contained to prevent the spread of gravel in the area. **Erosion, sedimentation and storm water** No erosion and or sedimentation	Properly constructed and well maintained stockpiles	No erosion or spread of material from stockpiles Gravel stockpiles must be properly managed

ENVIRONMENTAL ASPECTS	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS
Vegetation The contractor must avoid vegetated areas that will not be cleared.	• Minimise scarring of the soil surface and land features • Minimise disturbance and loss of soil • Minimise construction footprint Minimise impacts on vegetation	No erosion or sedimentation. Limit impact on vegetation
Waste management Any illegal dumping of waste must not be tolerated. This aspect must be closely monitored and reported on; proof of legal dumping must be able to be produced on request. Bins must be clearly marked for ease of management. Sufficient closed containers must be strategically located around the construction site to handle the amount of litter, wastes, rubbish, debris, and builder's wastes generated on the site.	• Sustainable management of waste; to keep the site neat and tidy. This will control potential influx of vermin and flies thereby minimising the potential of diseases on site and the surrounding environment. It will also minimise the potential to pollute soils, water resources and natural habitats	• Disposal of rubble and refuse in an appropriate manner with no rubble and refuse lying on site • Sufficient containers available on site
Dust Dust production must be controlled by regular watering of roads and works area, should the need arise.	Reduce dust fall out	No visible signs of dust
SAFETY	Children's access to construction site controlled, Access to construction camp controlled Safety aspects considered	No children on construction site Safety fence and controlled access available Safety signs with necessary information displayed

9. ENVIRONMENTAL IMPACT MANAGEMENT OUTCOMES

9.1 ASSESSMENT CRITERIA

Impacts were rated and are discussed in detail – see EIAR for detailed impact assessment.

10. MITIGATION MEASURES

10.1. GEOLOGY

Pre-construction phase

- Plan for excavations that will be necessary to construct the new infrastructure - this is the responsibility of the engineer.
- Plan for the dumping of excess rock spoils at a suitable site. No excess rock spoils will be allowed to remain on site. Ensure that contractors are aware of this prerequisite. It will be the responsibility of the contractor to ensure that this task is adequately planned for, and that a proper site is determined. The ECO will be responsible to monitor this aspect.
- Following a request to the Council for Geo-Science regarding the formal houses on areas designated as D4 (Zone III) in terms of the Dolomite Stability Investigation, the Council for Geo-Science did not recommend the relocation or demolishing of formal houses but recommend strict adherence the following precautionary requirements:
- Site specific Dolomite Risk Management Plan in accordance with SANS 1936-4:2012 must be compiled and implemented for these houses / formal structures in D4 Land. The owners/responsible persons must be made aware of the risks involved in building on dolomite, and be informed about how to be vigilant and act pro-actively by applying sound water management principles.
- General precautionary measures as set out in SANS 1936 Part 3: Design and construction of buildings, structures and infrastructure, must be studied and implemented
- The following recommendations has been proposed by the Geo-Technical Engineer and it will be the responsibility of the Engineer to incorporate these mitigation measures into the design of the infrastructure.

  These include :

  - The buildings must be designed in such a manner, that the most likely sinkhole size predicted shall not result in the toppling or sliding failure of the building into the sinkhole.
  - There is sufficient period of structural stability to allow occupants to escape from a building, should a sinkhole occur below the structure.
  - Where guttering is not provided, impervious paved areas or apron slabs shall be provided, with runoff into lined channels feeding into a designed storm water system.
  - Storm water upstream of the buildings and structures shall be diverted away
  - Storm water shall be controlled and disposed of using suitable means i.e. contouring and shaping, open storm water channels.

- Structural design of the building to span the maximum predicted sinkhole size.
- Limit the number of buried water borne services and plant

- Plan the construction of foundations according to the specifications as determined by the geotechnical Engineer. This will be the responsibility of the Civil Engineer to be monitored by the ECO.

Construction phase

- Use the most practical methods (limiting force) for the excavations necessary to construct the new infrastructure. If explosives are to be used, the ECO must first of all ensure that it is necessary and secondly ensure, together with the Safety Officer, that all procedures as required by law are implemented.
- Ensure that no rock spoils remain in the area. This should be monitored by the ECO and will remain the responsibility of the contractor.
- Ensure that excess spoils are removed to a suitably licensed site. This should be monitored by the ECO and will remain the responsibility of the contractor.
- Ensure that the infrastructure are constructed as described above. This will be the responsibility of the Engineer and the Contractor, to be monitored by the ECO.
- All wet services should be of good quality in order to ensure low maintenance.
- Piping materials selected should also be appropriate to local subsurface conditions.

- All wet services should be of good quality in order to ensure low maintenance.
- Piping materials selected should also be appropriate to local subsurface conditions. If clay pipes are utilized in areas of shallow dolomite, a higher standard of pipe bedding is recommended e.g. stabilized bedding or over excavation and re-compaction with an approved material (minimum specification to be G7 material) in layers of 150 mm thickness, compacted to 93% mod AASHTO.

- Some soils may have low pH values, which will render the use of ferrous material for underground services unsuitable. Chapter II in 'A Technical Guide to Good House Construction' NBRI of the CSIR (July 1984) should be consulted concerning the potential corrosion of pipes.
- **The NHBRC1 makes the following recommendations:**
  - Waterpiping materials shall be one or more of the following:
  - * High impact PVC pipes with vitualic joints.
  - * Other flexible (as defined in SABS 0102, Part 1) water pipes with flexible, self anchoring connections.
  - Pipes having a diameter of less than 75 mm.
  - * HDPE type IV.
  - * Polypropylene.
  - Pipes should be flexible, while joints should be minimised.
  - Encasement of pipes in concrete or soilcrete should be avoided. Preferably place pipes in sleeves. If this cannot be achieved, care must be taken to ensure that differential movement can still be accommodated without the pipe breaking.

- All storm water, sewerage and water pipes and channels must be watertight. All laid wet services should be tested for leakage on installation using the air test (see NBRI Info Sheet X/BOU 2-34) for water pipes, and the water test for sewerage pipes.
- Water leakage testing must be undertaken regularly, as set out in the risk management system.
- The roots of trees planted in close proximity to the line of water-bearing services often cause leaks in or malfunctioning of the services. Care should therefore be taken to avoid the unfortunate positioning of trees and other plants

Operational phase

Monitoring comprises three activities and will have to be done by the Municipality as described below:

a) infrastructure monitoring, which entails the inspection of water-bearing services, buildings, roads etc.;

b) ground surface monitoring, which entails the inspection of the ground surface as it is disturbed and affected by man's activities; and

c) groundwater level monitoring, which entails the measuring and recording of the dolomite groundwater level in boreholes together with, where appropriate, the record keeping of volumes of water pumped per unit measure of time for specific time periods.

Monitoring practices differ from site to site but might also differ from one monitoring designation area to another within a site. Some inherent hazard class areas might require more stringent precautionary measures and might, as such, need to be monitored on a more frequent basis. This monitoring may be monthly, quarterly, yearly or as designated by a competent person.

Infrastructure monitoring

The following infrastructure monitoring should be considered on

a) a seasonal interval basis:

1) visual checks for debris in open stormwater channels at the start of the rainy season and after heavy storms;

2) visual checks for water flowing out of stormwater manholes at the start of the rainy season and after heavy storms; and

3) the examination of buildings for cracks at the start of the rainy season.

b) a short interval basis (weekly/monthly):

1) visual checks for dripping taps and pressure valves outside;

2) visual checks for damp or moss-grown areas;

3) visual checks for debris in open stormwater channels;

4) visual checks for water flowing out of sewer and stormwater manholes;

5) the examination of buildings, paving, walls, etc. for cracks;

6) visual check for over-wetting of gardens; and

7) visual check for blocked drainage ports in garden walls.

c) an intermediate interval basis (four-monthly or six-monthly/annually):

1) the activities in 1(b); and

2) the activities in .2.2 and .2.3.

d) a long interval basis (every two years): inspection to assess the integrity of the system including checking for blockages and leaks.

2.2 In certain instances, visual inspections might not be sufficient. It might be necessary to undertake air and water tests on wet services. Consideration should also be given to the design of the infrastructure so that these tests might be possible.

3 Ground surface monitoring

3.1 Ground surface monitoring should be undertaken visually on a regular basis by inspecting paved areas after rainstorms (ponding water indicates an area of differential settlement) and by looking for cracks in the ground or in lined and unlined channels.

3.2 In areas that have been rehabilitated after an event or where signs of ground settlement have been observed, visual inspections might not be sufficient and ground surface levelling by a surveyor might be required. The results of such levelling should be recorded and stored in the database. Suitable actions should be taken if the levelling surveys show signs of ongoing or accelerating movements.

4 Groundwater level monitoring

4.1 One or more boreholes should be equipped with the necessary equipment to measure fluctuations in groundwater level. The measurement of the groundwater level in such boreholes should be recorded by a designated person (appointed by the local authority) at predetermined intervals. The actual measurements should ultimately be reported to the relevant national department (see foreword).

4.2 The local authority should monitor the effect(s) of any large scale abstraction of ground water for irrigation, water supply or other purposes whether such abstraction is undertaken by the local authority or others. The local authority should also check that the necessary permits have been obtained for any new water abstraction schemes.

10.2. TOPOGRAPHY

Certain management steps, which are related to the topography, will be described in other sections of the management plan (geology, climate, drainage, aesthetics etc.).

Pre-construction phase

- Plan the layout of the infrastructure taking gradients into account. This will be the responsibility of the Civil Engineer, using the topographical map provided by the Surveyor.
- Plan to prevent concentrated runoff by means of a storm water management plan (Including detailed design of storm water outlet structures). This will be the Civil Engineer's responsibility, using the topographical map provided by the surveyor.
- Plan that the amount of post-developed runoff which is discharged into the existing drainage system does not exceed the pre-developed discharge in a major storm event; as to prevent flooding of the natural water courses.

Construction phase

- The layout of the proposed infrastructure have been planned taking the prerequisite with regard to slopes into full consideration. (See layout plan). The ECO will have to monitor the construction of the infrastructure to ensure that the layout plan is in accordance with the designs.
- All storm water management will be in accordance with DW&S and GDARD specifications.

- Use of heavy machinery can substantially increase the likelihood, intensity and significance of potential negative environmental impacts, and it is thus essential that earthworks be performed under constant supervision, and that operators must be made aware of all the environmental obligations, as there is always the potential to inflict damage to sensitive areas.
- Use of machinery should be restricted to only that which is strictly required, and the unnecessary or excessive movement/ use of such machinery must be kept to a minimum.
- Machinery must enter and exit the site via the indicated access roads, and may not enter/ exit the river channel at any other location.
- Excavations and earth-moving may only take place within the demarcated working area.
- Surface water or storm water must not be allowed to concentrate, or to flow down cut or fill sloped routes without erosion protection measures being in place.
- Ensure that storm water channels do not discharge straight down the contours. These must be aligned at such an angle to the contours that they have the least possible gradient.
- To reduce the loss of material by erosion, the contractor must ensure that disturbance on site is kept to a minimum. The contractor is responsible for rehabilitating all eroded areas in such a way that the erosion potential is minimised after construction has been completed.
- All disturbed areas will require rehabilitation and must be mulched to encourage vegetation re-growth. Mulch used must be free from alien seed.
- These areas must be cordoned off so that vehicles or construction personnel cannot gain access to these areas.

Operational phase

- Maintain anti-erosion and runoff measures. This will be the responsibility of the Municipality after construction has been completed.
- Implement monitoring plans and safety checks of the associated water runoff structures, especially after high rainfall events.

10.3. CLIMATE

10.3.1. RAINFALL

Pre-construction phase

- Plan for extreme events to ensure that no concentrated runoff in excess of the capacity of the drainage network occurs. In the event of an extreme event occurring, plan to move all contractors from the construction site. They can only move back to the construction sites once all damage caused by the extreme event has been mitigated. This will have to be initiated by the developer and executed by the contractor and monitored by the ECO.
- Develop a contingency plan to cope with very hot dry spells and the possibility of fires occurring. This will have to be done by the contractor and monitored by the ECO.
- Plan for dust suppression during dry spells. This will have to be done by the contractor and monitored by the ECO.

Construction phase

- Implement the above-mentioned steps to ensure that the effects of extreme events can be mitigated. It is extremely important to ensure that the effects of high rainfall events are planned for during the pre-construction phase. This will prevent erosion during the construction phase when large tracts of land could be denuded. This will have to be done by the contractor and monitored by the ECO.

- Trenches and excavation works should be opened and closed as rapidly as possible. Avoid leaving trenches open over weekends or holidays. A berm should be created to divert surface water away from the trenches while they are open. All trenches and excavation works must be properly backfilled and compacted according to specifications given in subclause 5.2.4 of SABS 1200 DA, but specifically to ground surface to prevent it from acting as french drains. Once services are installed and backfilling is completed, it must be ensured that ground surface is graded to match the slope of the surrounding area. No rocks in the top layer.

- Berms should be constructed on the up-slope side of trenches to prevent the inflow of water during storms

- Implement fire prevention and control measures. To be implemented by the contractor and monitored by the ECO.

- Implement dust suppression measures. This is the responsibility of the contractor to be monitored by the ECO.

Operational phase

- Implement the steps described in the previous phase to ensure that the anti-erosion measures are implemented and that erosion prevention structures are maintained and regularly cleaned. This will be the responsibility of the municipality after construction has been completed.

10.3.2 TEMPERATURE

No further management steps will be needed other than those described in the previous section.

10.3.3 WIND

If the management steps described in the section with regard to dust suppression is properly implemented, no extra management steps will be needed to mitigate the possible effects of this variable.

10.4 SOIL

Pre- construction phase

- Plan the development in such a manner that minimum disturbance of soil is necessary. This will be the responsibility of the Engineer.

- Undertake the necessary detailed engineering investigations and plan to implement their findings. This has to be done by the Geotechnical Engineer and his findings will have to be incorporated into the Civil Engineer's designs

- Ensure that the planned surface water runoff control structures do not cause erosion in the areas to which the water is diverted to. This will have to be planned for by the Civil Engineer.

- Plan to control erosion as specified in the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983).

Construction phase

- Construct the development in such a manner that minimum disturbance of soil occurs. This will be the responsibility of the developer to be implemented by the contractor and monitored by the ECO.

- Provide for the use of power tools where necessary for excavations. Ensure that the sides of excavations are either shored or else battered back. These activities are the responsibility of the civil engineer and the contractor.

- Construct the storm water system / drains as planned. The correct construction is the responsibility of the Civil Engineer and the contractor.

- Implement the plans to ensure that the infrastructure will cause minimum soil disturbance. This will have to be done by the contractor and monitored by the ECO.

- Increased runoff due to vegetation clearance will have to be managed and steps will have to be taken to ensure that storm water does not lead to bank instability and excessive levels of silt entering the watercourse. This will have to be done by the contractor and monitored by the ECO.

- Topsoil should be stockpiled in such a manner that the soil does not erode (a maximum side slope of 18° is allowable). Excess topsoil must be used for soil rehabilitation of previously disturbed areas. The excavated and stockpiled soil material should be stored and bermed on higher lying areas of the site and not in any storm water channels. This is the responsibility of the contractor to be monitored by the ECO.

- Control erosion as specified in the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983).

Operational phase

- Implement a maintenance plan to ensure that no soil erosion can occur as specified in the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983).

- It is crucially important to maintain anti-erosion structures. See other sections dealing with surface drainage and flora. This will be the responsibility of the applicant after construction has been completed.

10.5. WATER

10.5.1. SURFACE WATER

Pre-construction phase

- Plan to ensure that all contractors that are employed on site are aware of their responsibilities with regard to the prevention of pollution of water according to the requirements of the National Water Act, 1998 (Act 36 of 1998). This will be the responsibility of the Applicant and will have to be monitored by the ECO.

- No raw sewage or other pollutants such as plastic, oil, cement, etc. will be allowed to pollute water. (See also sections on underground water and socio-economic aspects). This will be the responsibility of the Applicant and the contractor and will have to be monitored by the ECO.

- Develop a management plan to ensure a clean-water environment during all phases of the project. The services of a suitably qualified engineer are essential in the planning phase. The Civil Engineer will be responsible to develop such a plan.

- Design all storm water structures; (and other surface water flow modifications) in such a manner that the impact on the natural systems are minimised (see section: 10.2 Topography, re: drainage and storm water flow above as well as geology). Keep in mind that increased runoff invariably results from enlarged bare surfaces. All excess runoff structures must terminate in infiltration structures (thereby

ensuring maximum groundwater recharge). The Civil Engineer will be responsible to develop such a plan.

- Plan to slope ground surfaces in such a way that no ponding occurs. This will have to be done by the contractor and monitored by the ECO.

- Plan to prevent concentrated runoff by means of a storm water management plan (Including detailed design of storm water outlet structures). This will be the Civil Engineer's responsibility, using the topographical map provided by the surveyor.

Construction phase

- Ensure that contractors are aware of their responsibilities as far as water pollution is concerned in terms of the requirements of the National Water Act, 1998 (Act 36 of 1998). It will be imperative to monitor their activities. It is suggested that a penalty clause be inserted in the contracts to enable the applicant to take the necessary rehabilitation measures in case of non-compliance. This will have to be done by the Applicant and monitored by the ECO.

- Implement the water management plan and construct the necessary storm water structures to ensure adequate and sustainable water dispersion (See Section 10.2 Topography). This will have to be done by the contractor and monitored by the ECO.

- Construct the infrastructure according to the above mentioned method statements as compiled by the Civil Engineer. This will have to be done by the Contractor and be monitored by the ECO.

- Construct the infrastructure as designed. This will be the responsibility of the contractor, and will have to be monitored by the ECO.

Operational phase

- Maintain the surface water management infrastructure. This will be the responsibility of the Local Municipality after construction has been completed.

- Implement monitoring plans and safety checks of the infrastructure.

10.5.2. GROUND WATER

Pre- construction phase

- Ensure that all activities that may possibly affect ground water are performed in accordance with the requirements of the National Water Act, 1998 (Act 36 of 1998), DW&S and the Local Authority.

- Plan for adequate chemical toilets to be used by contractors during the construction phase. The provision and maintenance of which must form part of the contractor liabilities and must be described as such in their contracts. It will be essential that the ECO monitor this aspect very closely.

- The storage and handling of lubricants, oils, paint and material such as cement must be provided for as part of the different contractor's contracts. Specially demarcated and secure storage facilities must be provided for. It will be essential that the ECO monitor this aspect very closely.

- Plan the disposal from hard surfaces in such a manner that the water can infiltrate into the underground without causing surface erosion. The Civil Engineer will do this.

Construction phase

- Implement the mitigation measures as described in the pre-construction phase. This will be the responsibility of the Applicant to be monitored by the ECO.

- Ensure that all construction activities that may possibly affect ground water are performed in accordance with the requirements of the National Water Act, 1998 (Act 36 of 1998), DW&S and the Local Authority. This will have to be done by the contractor and monitored by the ECO.

- Ensure that adequate chemical toilets (1 for every 30 workers) are available and are used by contractors during the construction phase - the provision and maintenance of which must form part of the contractor's liabilities. It will be essential that the ECO monitor this aspect very closely.

- The storage and handling of lubricants, oils, paint, and material such as cement must be provided for as part of contractor's contracts. Specially demarcated and secure storage facilities must be used. It will be essential that the ECO monitor this aspect very closely.

- Construct the disposal from hard surfaces in such a manner that the water can infiltrate into the underground water without causing surface erosion. This will have to be done by the contractor and monitored by the ECO to ensure that the construction is according to the plan.

Operational phase

- Continue to treat all operational activities that may possibly affect ground water in accordance with the requirements of DW&S and the Local Authority. This will be the responsibility of the Applicant after construction has been completed.

- Maintain the disposal systems that originate on hard surfaces in order to allow the water to infiltrate into the underground without causing surface erosion. This will be the responsibility of the local municipality after construction has been completed.

10.6. FLORA

Pre-construction phase

- Plan for the rehabilitation of all areas disturbed during construction. This will be the responsibility of the developer.

- Prepare a contingency plan to deal with the invasive species in terms of the Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983). This will be the responsibility of the Applicant to be executed by the contractor and monitored by the ECO.

- Plan to prevent veldt fires in the adjoining land. Firebreaks should be established in terms of the requirements and conditions of the National Veldt and Forest Fires Act (Act No. 101 of 1998). Plan a fire-fighting program that adheres to the by-laws of the Local Municipality. This will be the responsibility of the contractor to be monitored by the ECO.

- In terms of a part of section 15(1) of the National Forests Act No. 84 of 1998, no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a license granted by the Minister. If developments are approved, such a permit should be applied for if any of the Vachellia erioloba (= Acacia erioloba) (Camel Thorn tree) be affected.

Construction phase

- Prior to the commencement of any land-clearing or construction activity, the outer boundary of the development area must be surveyed and pegged. The "development area" includes the working area around the proposed development and access roads – i.e. the area to be cleared of vegetation.

- The demarcation boundary should be tight around the footprint of the proposed infrastructure, typically

allowing a working area of no more than 5-8 meters around the footprint – unless otherwise agreed with the ECO.

- This demarcation boundary is to ensure that land-clearing activities are restricted to only that area strictly required for the proposed development, and to prevent unnecessary disturbance of soil surfaces outside of the development footprint. The outer boundary of the working area should be demarcated in such a way that will enable construction workers to clearly identify the boundaries during construction. This will be the responsibility of the contractor and will have to be monitored by the ECO.

- Implement the eradication programme for invasive species in terms of the Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983). This will have to be done by the contractor and monitored by the ECO.

- Rehabilitate areas as soon as construction activities allows it. The sooner rehabilitation starts, the more beneficial it will be for the overall environment. To be implemented by the contractor and monitored by the ECO.

- Implement the plan to prevent veldt fires in the adjoining land. Establish firebreaks in terms of the requirements and conditions of the National Veldt and Forest Fires Act (Act No. 101 of 1998). Fire-fighting programs must adhere to the by-laws of the Local Municipality. This will have to be done by the contractor and monitored by the ECO.

Operational phase

- Implement the rehabilitation plan for disturbed areas. Ensure that rehabilitation is in accordance with the above-mentioned criteria. This will be the responsibility of the Applicant after construction has been completed.

- Continue with invader eradication. This will be the responsibility of the Applicant after construction has been completed.

10.7. FAUNA

Pre-construction phase

- Develop a management plan with CLEAR instructions to ensure that the least disturbance of fauna will take place during all phases of the project. The principle of NO disturbance of animal life must be the rule. This will be the responsibility of the Applicant to be executed by the contractor and monitored by the ECO.

Construction phase

- Implement the management plan to ensure that the least disturbance of fauna will occur. This will have to be done by the contractor and monitored by the ECO.

Operational phase

- Maintain management plan for the preservation of fauna. This will be the responsibility of the Applicant after construction has been completed.

10.8. AIR QUALITY

Pre-construction phase

- Impose a speed limit on vehicles using all non-surfaced roads in order to curb dust. This will have to be enforced by the contractor and monitored by the ECO.

- Plan for the implementation of rehabilitation as described in previous sections of this management plan. This will be the responsibility of the contractor and the action will be monitored by the ECO.
- Ensure that contractor's contracts contain clauses with their responsibilities with regard to possible losses incurred from fires originating from their contract areas. They will be held responsible for damages in the case of a fire spreading from their site.
- Plan to ensure that NO refuse is burnt. This will be the responsibility of the contractor to be executed by the contractor and monitored by the ECO.

Construction and operational phases

- Implement the measures devised in the pre-construction phase by rehabilitating as soon as possible. This will be the responsibility of the contractor to be executed by him and monitored by the ECO.
- Enforce speed regulations. This will have to be enforced by the contractor and monitored by the ECO during the construction phase, and will be the responsibility of the applicant during the operational phase.
- No refuse may be burnt on site. This will have to be monitored by the ECO during the construction phase.
- Spray bare surfaces with water to ensure that dust is suppressed. This will be the responsibility of the contractor to be monitored by the ECO.

10.9. NOISE

Pre-construction phase

- Plan to ensure that construction vehicles are fitted with proper noise reduction fittings such as silencers. This will have to be done by the contractor and monitored by the ECO.

Construction and Operational phase

- Implement the measures devised in the pre-construction phase. This will have to be done by the contractor and monitored by the ECO.
- Normal working hours are between 08h00 and 17h00 (Mondays to Saturdays). No work will be allowed on Sundays or outside of the abovementioned hours. This will have to be done by the contractor and monitored by the ECO.

10.10. ARCHAEOLOGY

A **Heritage Impact Study** revealed a number of known cultural heritage sites (archaeological and/or historical) exist in the larger geographical area within which the study area falls. There are no known sites on the specific land parcel and none was identified and recorded during the recent assessment. The area has been heavily impacted and disturbed in the recent past by current ongoing residential and related activities. If any did exist here in the past it would have been disturbed or destroyed as a result. It is clear from aerial views of the study area that recent large scale human settlement has slowly encroached on the area since 2005. It is therefore highly unlikely that any significant and intact sites, features or material would be present here.

If during the construction phase any archaeological / historical / cultural features are discovered, the work in the direct vicinity of the find must be stopped. Under no circumstances shall any artifacts be destroyed. Such a site must be marked and fenced off and SAHRA notified as soon as possible.

10.11 AESTHETICS

Pre-construction phase

- Plan to implement proper maintenance of the infrastructure. This will be the responsibility of the Local Municipality.

Operational phase

- Maintain the infrastructure to ensure that it can be operational for a long period of time. This will be the responsibility of the Local Municipality.

10.12 OTHER SOCIO-ECONOMIC FACTORS

Pre-construction phase

- Plan the project in such a way that optimal use is made of local labour. All labour practices must conform to the rules and regulations of the Occupational Health and Safety Act, 85 of 1993. This will be the responsibility of the Applicant to be executed by the contractor and monitored by the ECO.
- Devise a management plan for the project as a whole to ensure that the environmental issues can be addressed as described in this report. This will be the responsibility of the Applicant.
- Ensure that the management steps concerning the construction phase of the project are part of the construction contracts. This will be the responsibility of the Applicant to be monitored by the ECO.
- Ensure that all the people involved with the project are aware of the implications of non-compliance. This will be the responsibility of the Applicant to be monitored by the ECO.
- It is imperative to devise a set of rules that must form part of the overall management strategy of the development. These rules must provide for all the issues raised in this document with regard to sound environmental practices as well as with regard to good housekeeping. This will be the responsibility of the Applicant to be monitored by the ECO.
- Plan for solid waste storage and disposal. All solid waste generated during all the phases of the project will be stored on site and disposed of only at a suitably licensed site in accordance with the stipulations of the National Environmental Act, 1998 (Act No. 107 of 1998, as amended). This will be the responsibility of the Applicant and contractors, to be monitored by the ECO.
- Plan to ensure that the transportation, storage and handling of hazardous materials on site conforms to the rules and regulations stipulated in terms of the Hazardous Substances Act, No. 15 of 1973. This will be the responsibility of the Applicant to be monitored by the ECO.
- Plan to implement all the instructions and mitigation measures contained in the specialists reports. This will be the responsibility of the Applicant to be monitored by the ECO.
- The development will have an impact on graveyard that was found on site. Graves always carry a High Cultural Significance rating and should not be impacted if possible and be left intact. If the site cannot be avoided then the graves can be exhumed and relocated after all due processes (social consultation/getting consent/permits have been obtained) have been successfully completed. The best would be however to keep the site fenced-off and protected.

Construction phase

- Utilise local labour optimally. Ensure that all labour practices conform to the rules and regulations of the Occupational Health and Safety Act, 85 of 1993. This will be the responsibility of the Applicant and contractors, to be monitored by the ECO.

- Solid waste storage and disposal. All solid waste generated during all the phases of the project will only be stored on site temporarily and disposed of at a suitably licensed site in accordance with the stipulations of the National Environmental Act, 1998 (Act No. 107 of 1998, as amended). This will be the responsibility of the Applicant and contractors, to be monitored by the ECO.

- Ensure that the transportation, storage and handling of hazardous materials on site conforms to the rules and regulations stipulated in terms of the Hazardous Substances Act, No. 15 of 1973. This will be the responsibility of the Applicant to be monitored by the ECO.

- Enforce management steps with regard to provisions in contractor contracts. This will be the responsibility of the Applicant to be monitored by the ECO.

- Install all services as planned and described in the various reports mentioned in this document. This will be the responsibility of the Applicant and the contractors, to be monitored by the ECO.

Operational phase

- Maintain all infrastructures in an environmentally responsible manner. This will be the responsibility of the Applicant after construction has been completed.

- All solid waste generated during this phase of the project will only be stored on site temporarily and disposed of at a suitably licensed site in accordance with the stipulations of the National Environmental Act, 1998 (Act No. 107 of 1998, as amended). This will be the responsibility of the Applicant.

10.13 SITE SPECIFIC MITIGATION MEASURES FOR THE CONSTRUCTION PHASE

10.13.1 Site Establishment

- Ensure that all site personnel have a basic level of environmental awareness training. The Contractor must submit a proposal for this training to the ECO for approval. Topics covered should include;
    - What is meant by "Environment?"
    - Why the environment needs to be protected and conserved
    - How construction activities can impact on the environment
    - What can be done to mitigate against such impacts
    - Awareness of emergency and spills response provisions
    - Social responsibility during construction e.g. being considerate to local residents
- Training should be undertaken by a party such as the ECO who has sufficient expertise and knowledge of environmental issues.
- It is the Contractor's responsibility to provide the site foreman with environmental training and to ensure that the foreman has sufficient understanding to pass this information onto the construction staff.
- Use should be made of environmental awareness posters on site.
- The need for a "clean site" policy also needs to be explained to the workers.
- Staff operating equipment (such as excavators, loaders, etc.) shall be adequately trained and sensitised to any potential hazards associated with their tasks.
- Unsocial activities such as consumption or illegal selling of alcohol, drug utilisation or selling and prostitution on site shall be prohibited. Any persons found to be engaged in such activities should receive disciplinary or criminal action taken against them.
- Secure the site in order to reduce the opportunity for criminal activity in the locality of the construction site.
- No site staff, other than security personnel and skeleton staff will be housed on site. Security personnel and skeleton staff must be supplied with adequate protective clothing, ablution facilities, water and refuse collection facilities, facilities for cooking and heating so that open fires are not necessary.
- The site and crew are to be managed in strict accordance with the Occupational Health and Safety

Act, 1993 (Act No. 85 of 1993) and the National Building Regulations.

- The contractor must ensure that all emergency procedures are in place prior to commencing work. Emergency procedures must include (but not be limited to) fire, spills, contamination of the ground, accidents to employees, use of hazardous substances and materials, etc.
- The contractor must ensure that lists of all emergency telephone numbers/contact persons are kept up to date and that all numbers and names are posted at relevant locations throughout the construction site.
- The nearest emergency service provider must be identified during all phases of the project as well as its capacity and the magnitude of accidents it will be able to handle. The contact details of this emergency centre, as well as the police and ambulance services must be available at prominent locations around the construction site and the construction crew camps.

10.13.2 Construction camp

- Choice of site for the Contractor's camp requires the Project Manager permission and must take into account location of local residents.
- The size of the construction camp should be minimized.
- Adequate parking must be provided for site staff and visitors. This should not inconvenience or serve as a nuisance to neighbours.
- The Contractor must attend to drainage of the camp site to avoid standing water and / or sheet erosion.
- Suitable control measures over the Contractor's yard, plant and material storage to mitigate any visual impact of the construction activity must be implemented.

10.13.3 Site access & traffic management

- Existing access roads must be utilised to access the site camp(s) and working/ construction areas.
- Turning circles may be created at the end of each access road, to allow vehicles and machinery to turn around. A single turning circle may be created per access road.
- Turning circles must be the smallest size possible and should be located within the area that has been considered to be a servitude.
- Construction vehicles, machinery and workers must be restricted to the designated access roads, and may not drive through undeveloped vegetation outside of the access route.
- The Applicant must ensure that the activities of construction vehicles and workers do not obstruct or interfere with any other road user.
- Appropriate traffic management strategies must be implemented to ensure the safety of construction vehicles and other road-users.
- If needed, signage to warn other road users of the presence of construction vehicles should be erected at appropriate locations, where the signage will be clearly visible to potentially affected road users.

10.13.4 No-Go Areas

- All areas outside of the demarcated working area, site camp area/s and access routes must be regarded as "No-Go" areas that are off-limits to all construction workers, vehicles and machinery during all phases of the development.
- No vegetation may be cleared from within the no-go areas, and no dumping of any material (waste,

topsoil, subsoil etc.) may occur in these areas.

- Construction workers must be informed of the no-go areas, and the need to protect these areas from disturbance. This must form part of the environmental awareness training given to construction workers and the instruction must be emphasized and enforced throughout the construction and post-construction rehabilitation phases.
- If deemed necessary by the ECO appropriate signage and/or fencing and/or other temporary barriers should be erected to designate the no-go areas, and to ensure that these areas are protected from physical disturbance by construction activities.
- Signage/ fencing (where present) must be maintained for the duration of the construction period.

10.13.5 Vegetation clearing

- Vegetation will be cleared from within the footprint of the working area, before earthmoving and construction activities commence.
- Vegetation clearing may only commence once the working area has been clearly demarcated to the ECO's satisfaction.
- Land clearing must be restricted to the demarcated working area, and no vegetation may be cleared outside of the demarcated working area or site camp areas.
- Bulldozing will clear vegetation as well as the top 20-30 cm of soil/sediment.
- Vegetation and soil removed during clearing must be stockpiled in a demarcated areas and retained for use as top-dressing, mulch or brush-packing during the final rehabilitation of the site.

10.13.6 Topsoil & subsoil management

- Topsoil (where present) should be removed from any area where physical disturbance of the surface will occur.
- The removed topsoil must be stockpiled in a berm, in a demarcated area as agreed with the ECO.
- The topsoil storage area must be located on a level area outside of any surface drainage/ storm-water channels, and at a location where it can be protected from disturbance during construction and where it will not interfere with construction activities.
- Handling of topsoil should be minimized as much as possible, and the location of the topsoil berm should be chosen carefully to avoid needing to relocate the topsoil berm at a later date.
- Ideally, topsoil is to be handled twice only, once to strip and stockpile, and once to replace, level, shape and scarify.
- The topsoil berm may be a few meters wide but should ideally not be more than 0.5m high to allow sufficient light and air penetration.
- The topsoil stored in the berm must be adequately protected from being blown away or eroded by storm water. If necessary, shade cloth, "anchovy nets" or other suitable measures should be used to stabilize and protect the stockpile from wind/water erosion.
- Topsoil stockpiles should not be covered with tarpaulin, as this may smother and decrease the virility of topsoil.
- Removed subsoil should be stockpiled separately from topsoil.
- Removed topsoil and subsoil should be stockpiled for the duration of the active construction period, and utilized for the final landscaping and rehabilitation of disturbed areas on site.
- Where possible, soil stockpiles should be kept clear of weeds and alien vegetation growth by regular weeding, (or application of herbicides if agreed with the ECO).
- Note that the topsoil should be the final layer applied during rehabilitation, after subsoil/ spoil material

has been placed and shaped on the site.

10.13.7 Excavations & earthworks

- Use of heavy machinery can substantially increase the likelihood, intensity and significance of potential negative environmental impacts, and it is thus essential that earthworks be performed under constant supervision, and that operators must be made aware of all the environmental obligations, as there is always the potential to inflict damage to sensitive areas.
- Use of machinery should be restricted to only that which is strictly required, and the unnecessary or excessive movement/ use of such machinery must be kept to a minimum.
- Machinery must enter and exit the site via the indicated access roads, and may not enter/ exit the river channel at any other location.
- Excavations and earth-moving may only take place within the demarcated working area.

10.13.8 Oil and chemicals

- The contractor must provide **method statements** for the "handling & storage of oils and chemicals", "fire", and "emergency spills procedures".
- These substances must be confined to specific and secured areas within the contractor's camp, and in a way that does not pose a danger of pollution even during times of high rainfall. These areas must be imperviously bunded with adequate containment (at least 1.5 times the volume of the fuel) for potential spills or leaks
- Drip trays (minimum of 10cm deep) must be placed under all vehicles that stand for more than 24 hours. Vehicles suspected of leaking must not be left unattended, drip trays must be utilised.
- The surface area of the drip trays will be dependent on the vehicle and must be large enough to catch any hydrocarbons that may leak from the vehicle while standing.
- The depth of the drip tray must be determined considering the total amount / volume of oil in the vehicle. The drip tray must be able to contain the volume of oil in the vehicle.
- Spill kits must be available on site and in all vehicles that transport hydrocarbons for dispensing to other vehicles on the construction site. Spill kits must be made up of material/product that is in line with environmental best practice (SUNSORB is a recommended product that is environmentally friendly).
- All spilled hazardous substances must be contained in impermeable containers for removal to a licensed hazardous waste site, (this includes contaminated soils, and drenched spill kit material).

10.13.9 Cement

- The contractors must provide and maintain a **method statement** for "cement and concrete batching". The method statement must provide information on proposed storage, washing & disposal of cement, packaging, tools and plants.
- The mixing of concrete must only be done at specifically selected sites on mortar boards or similar structures to contain run-off into soils rocky outcrops, streams and natural vegetation.
- Cleaning of cement mixing and handling equipment must be done using proper cleaning trays.
- All empty containers must be stored in a dedicated area and later removed from the site for appropriate disposal at a licensed facility.
- Any spillage that may occur must be investigated and immediate remedial action must be taken.
- The visible remains either of concrete, solid, or from washings, must be physically removed immediately or disposed of as waste to a registered landfill site.

- Cement batching areas must be located in an area where residues are contained and that the location does not fall within storm water channels.

10.13.10 Dangerous and Toxic Materials

(Provision of storage facilities)

- Materials such as fuel and oil must be sealed and stored in bermed areas or under lock and key, as appropriate, in well-ventilated areas.
- Sufficient care must be taken when handling these materials to prevent pollution. Training on the handling of dangerous and toxic materials must be conducted for all staff prior to the commencement of construction.
- In the case of pollution of any surface or groundwater, the Regional Representative of the **Department of Water and Sanitation (DW&S)** must be informed immediately.
- Storage areas must display the required safety signs depicting "no smoking", "No Naked lights" and "Danger". Containers must be clearly marked to indicate contents as well as safety requirements.
- The contractor must supply a **method statement** for the storage of hazardous materials.
- Material Safety Data Sheets (MSDS) must be prepared for all hazardous substances on site and supplied by the supplier where relevant. MSDS's must be updated as required.

10.13.11 Storage of fuels and oils

- The contractors must provide and maintain a **method statement** for "Fuel tanks and refuelling procedures".
- Fuel storage tanks on the site must be on an impervious surface that is bunded and able to contain at least 110% of the volume of the tanks. The filler tap must be inside the bunded area where possible and the bund wall must not have a tap or valve.
- A Flammable Liquid License must be obtained for diesel volumes greater than 200 litres.
- Environmental Authorisation is required for volumes greater than 80 000 litres
- Fuel storage tanks must be located in a portion of the construction camp where they do not pose a high risk in terms of water pollution (i.e. they must be located away from water courses).
- Fuel storage tanks must be placed so that they are out of the way of traffic, so that the risk of the tanks being ruptured or damaged by vehicles is minimised.

10.13.12 Use of dangerous and toxic materials

- The contractor must keep the necessary materials and equipment on site to deal with spills/ fire of the materials present should they occur.
- The contractor must set up a procedure for dealing with spills/ fire, which will include notifying the ECO and the relevant authorities prior to commencing with construction. These procedures must be developed in consultation with and approval by the appointed ECO.
- A record must be kept of all spills and the corrective action taken.

10.13.13 Toilets and ablution facilities

- The contractor is responsible for providing all sanitary arrangements for his and the sub-contractors team. A minimum of one chemical toilet must be provided per 30 persons.

- Sanitary arrangements must be to the satisfaction of the ECO. Toilets must be of the chemical type. The contractor must keep the toilets in a clean, neat and hygienic condition. The contractor must supply toilet paper to all toilets at all times. Toilet paper dispensers must be provided in all toilets.
- Toilets provided by the contractor must be easily accessible and a maximum of 50m from the works area to ensure they are utilised. All toilets will be located within the contractor's camp. Should toilets be needed elsewhere, their location must first be approved by the ECO.
- The contractor must ensure that toilets are moved with the labour force.
- The contractor must be responsible for the cleaning, maintenance and servicing of the toilets. The contractor must ensure that all toilets are cleaned and emptied before the builder's or other public holidays.
- Toilets out on site must be secured to the ground and have a sufficient locking mechanism operational at all times.

10.13.14 Waste management

- The contractors must provide and maintain a **method statement** for "solid waste management". The method statement must provide information on the proposed licensed facility to be utilised and details must be kept of record keeping for auditing purposes.
- Waste must be separated into recyclable and non-recyclable waste, and must be separated as follows:
    - **Hazardous waste**: including (but not limited to) old oil, paint, etc.,
    - **General waste**: including (but not limited to) construction rubble.
- Any illegal dumping of waste must not be tolerated, this action will result in a fine and if required further legal action will be taken. This aspect must be closely monitored and reported on; proof of legal dumping must be able to be produced on request.
- Bins must be clearly marked for ease of management.
- All refuse bins must have a lid secured so that animals cannot gain access.
- Sufficient closed containers must be strategically located around the construction site to handle the amount of litter, wastes, rubbish, debris, and builder's waste generated on the site.
- Subcontractor(s) contracts must contain a clause to the effect that the disposal of all construction-generated refuse / waste to an officially approved dumping site is the responsibility of the subcontractor in question and that the subcontractors are bound to the management activities stipulated in this EMP. Proof of this undertaking must be issued to the ECO.
- All solid and chemical wastes that are generated must be removed and disposed of at a licensed waste disposal site. The contractor is to provide proof of such to the ECO.
- Chemical containers and packaging brought onto the site must be removed for disposal at a suitable site.
- A skip, with a cover, must be used to contain refuse from campsite bins, rubble and other construction material.

10.13.15 Dust

- The contractors must provide and maintain a method statement for "dust control". The **method statement** must provide information on the proposed source of water to be utilised and the details of the licenses acquired for such usage.
- **Potable water must, wherever possible, not be used as a means of dust suppression,** and

alternative measures must be sourced. The use of 'grey' water must be investigated as an alternative. The contractor will be responsible to source this water and obtain the required approvals to utilise this water for the purpose of dust suppression.

- The construction camp must be watered during dry and windy conditions to control dust fallout.
- Dust production must be controlled by regular watering of roads and work area, should the need arise.
- At the end of construction, the site camp must be fully rehabilitated by removing the temporary surface, ripping the area to loosen the soil and the area must be re-vegetated with local indigenous vegetation only.
- All vehicles transporting upgrading material (e.g. soil, rubble etc.) must be covered with a tarpaulin, and speed limits of 20 km/h must be adhered to.
- Excessive dust conditions must be reported to the ECO.
- All forms of dust pollution must be managed in terms of the Atmospheric Pollution Prevention Act, 1965 (Act No. 45 of 1965)

10.13.16 Workshop equipment, maintenance and storage

- The contractors must provide and maintain a **method statement** for "workshop maintenance and cleaning of plant".
- Leaking equipment must be repaired immediately or be removed from site to facilitate repair. All potentially hazardous and non-degradable waste must be collected and removed to a registered waste site.
- Cleaning and remediation must be done with products that are in line with best environmental practice.
- A **method statement** is required from the Contractor, tendering for the project to show procedures for dealing with possible emergencies that can occur, such as fire and accidental leaks and spillage.
- The Contractor must be in possession of an emergency spill kit that is complete and available at all times on site. The Contractor must ensure that senior and other relevant members of the workforce are trained in dealing with spills by using emergency spill kits.
- The following must be applied:
    - All contaminated soil shall be removed and disposed of as hazardous waste at a registered facility or placed in containers to be taken to one central point where bio-remediation can be done. (Bio-remediation should only be an option if an Environmental Authorisation has been issued)
    - A specialist Contractor shall be used for the bio-remediation of contaminated soil where the required remediation material and expertise is not available on site.
    - All spills of hazardous substances must be reported to the ECO.
- The contractor must comply with the regulations of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993).

10.13.17 Noise

- In terms of noise impact for various increases over the ambient, the National Noise Regulations define an increase of 7dB as "disturbing". Noise levels during construction must therefore be kept within 7dB of the baseline data.

- All construction vehicles must be in a good working order to reduce possible noise pollution.
- Noisy activities must be reserved for daytime hours.

10.13.18 Fires

- The contractors must provide and **maintain a method statement** for "fires", clearly indicating where and for what, fires will be utilised plus details on the fuel to be utilised
- Absolutely no burning of waste is permitted.
- Fires will only be allowed in facilities especially constructed for this purpose within fenced Contractor's camps. Wood, charcoal or anthracite are the only fuels permitted to be used for fires. The contractor must provide sufficient wood (fuel) for this purpose.
- Fires within the designated areas must be small in scale so as to prevent excessive smoke being released into the air.
- The contractor must designate a smoking area for the labour force so as to prevent unanticipated incidents of veldt fires.
- No wood is to be collected, chopped or felled for fires from private or public property as well as from no-go or sensitive areas within the site and any surrounding natural vegetation.

10.13.19 Erosion and sedimentation

- Surface water or storm water must not be allowed to concentrate, or to flow down cut or fill sloped routes without erosion protection measures being in place.
- Ensure that storm water channels do not discharge straight down the contours. These must be aligned at such an angle to the contours that they have the least possible gradient.
- To reduce the loss of material by erosion, the contractor must ensure that disturbance on site is kept to a minimum. The contractor is responsible for rehabilitating all eroded areas in such a way that the erosion potential is minimised after construction has been completed.
- All disturbed areas will require rehabilitation and must be mulched to encourage vegetation re-growth. Mulch used must be free from alien seed.
- These areas must be cordoned off so that vehicles or construction personnel cannot gain access to these areas.

10.13.20 Fauna

- All activities on site must comply with the regulations of the Animal Protection Act, 1962 (Act No. 71 of 1962).
- All construction workers must be informed that the intentional killing of any animal is not permitted as faunal species are a benefit to society. Poaching is illegal and it must be a condition of employment that any employee caught poaching will be dismissed. Employees must be trained on how to deal with fauna species as intentional killing will not be tolerated. In the case of a problem animal e.g. a large snake, a

specialist must be called in to safely relocate the animal if the ECO is not able to.

- Environmental induction training and awareness must include aspects dealing in safety with wild animals into and on site. Focus on animals such as snakes and other reptiles that often generate fear by telling workers how to move safely away and to whom to report the sighting. Workers should also be informed where snakes most often hide so that they can be vigilant when lifting stones, etc.

10.13.21 Flora

- The contractor must rehabilitate the construction camp and any other disturbed areas once construction activities have terminated. Compacted areas will be ripped and mulched in order to ensure recovery of the natural vegetation cover. A method statement must be provided and maintained by the contractor.

- It is imperative to keep any disturbances associated with construction into the mid- and upper slopes of rocky hills, if development is approved, to an absolute minimum

- Once activities on site are complete, rehabilitation of un-built areas must be undertaken in order to restore the aesthetic & ecological value of the area.

- **Under no circumstances shall open fires be allowed on site,** fires will only be permitted in adequate facilities within the crew camp, Forest Act, 1984 (Act No. 122 of 1984).

10.13.22 Heritage

- In terms of the National Heritage Act, 1999 (Act No. 25 of 1999), construction personnel must be alert and must inform the local heritage agency within 48 hours should they come across any signs of heritage resources.

- Should any archaeological artefacts be exposed during site activities, work on the area where the artefacts were found must cease immediately and the ECO must be notified within 48 hours.

- Under no circumstances must archaeological artefacts be removed, destroyed or interfered with.

10.13.23 Crime, safety and security

- No site staff, other than security personnel and skeleton staff will be housed on site. Security personnel and skeleton staff must be supplied with adequate protective clothing, ablution facilities, water and refuse collection facilities, facilities for cooking and heating so that open fires are not necessary.

- The site and crew are to be managed in strict accordance with the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) and the National Building Regulations.

- The contractor must ensure that all emergency procedures are in place prior to commencing work. Emergency procedures must include (but not be limited to) fire, spills, contamination of the ground, accidents to employees, use of hazardous substances and materials, etc.

- The contractor must ensure that lists of all emergency telephone numbers / contact persons are kept up to date and that all numbers and names are posted at relevant locations throughout the construction site.

- The nearest emergency service provider must be identified during all phases of the project as well as its capacity and the magnitude of accidents it will be able to handle. The contact details of this emergency centre, as well as the police and ambulance services must be available at prominent locations around the construction site and the construction crew camps.

10.13.24 Visual Impact

- Rubble and litter must be removed every two weeks or more often as the need arises and be disposed of at a registered landfill.

- The ECO should comment on the visual impact as part of the ECO's monitoring requirements.

10.13.25 Hydrology

- In the event of pollution caused as a result of construction activities, the contractor, according to section 20 of the National Water Act, 1998 (Act No. 36 of 1998) is responsible for all costs incurred by organisations called to assist in pollution control and/or to clean up polluted areas.

- No wastewater may run freely into any naturally vegetated areas. Run-off containing high sediment loads must not be released into drainage channels.

- Approval must be obtained from DW&S for any activities that require authorisation in terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998).

11. ENVIRONMENTAL AWARENESS PLAN

11.1 INTRODUCTION

Training is essential for ensuring that the EMP provisions are implemented efficiently and effectively. It is vital that all personnel are adequately trained to perform their designated tasks to an acceptable standard.

The Construction Contractor should make allowance for all construction workers, including all subcontractors that will be working at the site, to attend environmental awareness training sessions (undertaken by the ECO) before commencing work on site. During this training, the ECO will explain the EMP and the conditions contained therein. Attention will be given to the construction process and how the EMP fits into this process.

In addition to training, general environmental awareness must be fostered among the project's workforce to encourage the implementation of environmentally sound practices throughout its duration. This ensures that environmental accidents are minimized and environmental compliance maximized.

Environmental awareness training and education should be ongoing throughout the construction phase, and should be undertaken regularly if deemed necessary (especially if it becomes apparent that there are repeat contraventions of the conditions of the EMP), or as new workers come to site. Translators should be utilized where needed.

Environmental awareness could be fostered in the following manner:

- Induction course for all workers on site, before commencing work on site.
- Refresher courses as and when required.
- Daily toolbox talks at the start of each day with all workers coming on site, where workers might be alerted to particular environmental concerns associated with their tasks for that day or the area/habitat in which they are working.

Courses must be given by suitably qualified personnel and in a language and medium understood by workers/employees.

11.2 ORGANISATIONAL STRUCTURE

This section describes the roles and responsibilities of the key stakeholders involved in the development, implementation and review of the EMP.

11.2.1 PROJECT PROPONENT

The Project Proponent will be the ***Ga-Segonyana Local Municipality***. Ultimately, they will be responsible for the development and implementation of the EMP and MMP and for ensuring that the conditions in the eventual Environmental Authorization (EA) are satisfied. Although construction activities will be contracted out, the liability associated with non-compliance still rests with the Project

Proponent. The Project Proponent (and not the Contractor) is therefore responsible for liaising directly with the relevant authorities with respect to the preparation and implementation of the EMP and meeting EA conditions.

The Project Proponent must inform the Contractor of the EA and EMP obligations, as well as **Method Statements** to be prepared and environmental training to be undertaken by the Contractor in terms of these obligations.

The Project Proponent must identify a **Project Manager (PM)** who has overall responsibility for managing the Project, Contractors and for ensuring that the environmental management requirements are met. During the construction phase, the Project Manager will be the Proponent's construction manager; during the operations phase this role will be fulfilled by the operations manager.

All decisions regarding environmental procedures and protocol must be approved by the Project Manager, who also has the authority to stop any construction activity in contravention of the EMP or EA.

An **Environmental Control Officer (ECO) must** be employed by the Project Proponent for the duration of the project. The ECO should have appropriate training and experience in the implementation of environmental management specifications. The ECO provides feedback to the Project Manager regarding all environmental matters. Contractors are answerable to the ECO (or Project Manager, depending on contractual arrangements) for non-compliance with the requirements stated in the EMP or EA.

11.2.2 ENVIRONMENTAL CONTROL OFFICER (ECO)

The appointed Environmental Control Officer (ECO) is responsible for monitoring the site at regular intervals (including pre-construction set-up and final rehabilitation), in order to ensure that the provisions of this EMP and MMP are adhered to and that sound environmental management is ensuing on site.

The ECO must inspect all areas of the site that may be affected by construction-related activities, including the working area, site camp, stockpile areas and access roads. After each ECO inspection the ECO must compile an ECO report detailing the ECO's observations on site, any instances of non-compliance and any issues or aspects that require attention, follow-up or remedial action. The ECO reports must be submitted to the Applicant, the ER, Construction Contractor(s) and the Competent Authority. The ECO inspection reports should include both photographic and written records.

The ECO will have the following responsibilities:

- Maintenance, update and review of the EMP.
- Liaison between the Project Proponent, Contractors, authorities and other lead stakeholders on all environmental concerns.
- Compilation and administration of an environmental monitoring plan to ensure that the environmental management measures are implemented and are effective.

> Use of dangerous and toxic materials

> Toilets and ablution facilities

> Waste Management

> Dust

> Workshop equipment, maintenance and storage

> Noise

> Fires

> Erosion and sedimentation

> Flora and Fauna (Including no-go areas)

> Crime, safety and security

> Hydrology

The Contractor may appoint an **Environmental Officer (EO)**, or officers, if more than one is required. Their primary role is to coordinate the environmental management activities of the Contractor on site. The EO may be required to perform the following roles:

- Support the ECO in the monitoring and execution of the Contractors or Sub-contractors' Method Statements by maintaining a permanent presence on site.
- Inspect the site as required to ensure adherence to the management actions of the EMP, EA and the Method Statements.
- Complete Site Inspection Forms on a regular basis (eg. daily or weekly).
- Provide inputs to the regular (eg. monthly) environment report to be prepared by the ECO.
- Liaise with the construction team on issues related to implementation of, and compliance with, the EMP and EA.
- Maintain a *record of environmental incidents* (spills, impacts, legal transgressions etc) as well as corrective and preventive actions taken, for submission to the Project Proponent.
- Maintain a *public complaints register* in which all complaints are recorded, as well as action taken, for submission to the Project Proponent.

11.3 CHECKLISTS

The table below provide the main mitigation measures and/or management interventions to minimise or reduce the negative impacts and enhance positive impacts identified by the specialists associated with the proposed development.

The intent is for the document to be a live, dynamic document that should be maintained and updated throughout the project lifecycle, *inter alia*, by including the necessary Environmental Authorisation from the approving Authority as an attachment.

The table below provide the main mitigation measures and/or management interventions appropriate to the Planning and Construction Phases of the proposed project. The tables present the objectives to be achieved and the management actions that need to be implemented in order to reduce the negative impacts and enhance the positive impacts per management activity. The associated monitoring and implementation frequencies and the responsible person(s) are indicated.

	Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
1.	Construction and operational activities planning	The construction/operational activities must conform to the conditions of authorisation contained in the Environmental Authorisation and mitigation measures contained within this EMPr	Proponent	Continuous
2.	Appointment of the ECO	The Proponent must appoint an independent Environmental Control Officer (ECO) who must monitor the Contractor's compliance with the EMPr and who must complete ECO checklist reports (audits) on a regular basis (at least once a month).	Proponent	Once-off
		The Proponent must provide the ECO with a copy of the EMPr.	ECO	Once-off
		The ECO must form part of the project management team and should attend the monthly project progress meetings.	ECO	Continuous
		The Contractor must ensure that the construction crew attend an environmental briefing and training session presented by the ECO prior to commencing activities on site.	ECO, Contractor	Once-off
3.	EMPr	This EMPr must be made binding to the main Contractor and to individual Contractors, and must be included in the tender documentation for the construction contract.	Proponent	Once-off
4.	Licences/ permits and permissions	The Proponent must ensure that all pertinent licences/permits, certificates and permissions required for the project have been obtained prior to any activities commencing on site and ensure that they are strictly enforced/adhered to. These documents must be made available on site at all times, and the Contractor must be made aware of their content.	Contractor, Proponent, ECO	Prior to commencement of work
		The Contractor must maintain a database of all pertinent permits and permissions required for the contract.	Contractor, Proponent, ECO	Continuous
5.	Method Statements	The Contractor must submit written Method Statements to the PM and ECO for the activities identified during consultation.	Contractor, PM, ECO	As required
		Method Statements must be submitted at least five working days prior to the proposed commencement of work on an activity to allow the PM (and/or ECO) time to study and approve the method statement.	Contractor, PM, ECO	As required
		The Contractor may not commence work on that activity until such time as the Method Statement has been approved in writing.	Contractor, PM, ECO	Continuous
		The Contractor must carry out the activities in accordance with the approved Method Statement.	Contractor, PM, ECO	Continuous

Activity/Impact		Action Required	Responsible Party	Monitoring Frequency
		Under certain circumstances, the PM may require changes to an approved Method Statement. In such cases the proposed changes must be agreed upon in writing between the Contractor and the PM, and appropriate records retained.	Contractor, PM, ECO	Continuous
		Approved Method Statements must be readily available on the site and must be communicated to all relevant personnel. Approval of the Method Statement shall not absolve the Contractor from any of his/her obligations or responsibilities in terms of the EMPr specifications.	Contractor, Proponent	Continuous
6.	Existing services and infrastructure	The Contractor must ensure that existing services (e.g. roads, pipelines, power lines and telephone services) are not damaged or disrupted unless required by the contract and with the permission of the PM, ensuring the necessary way-leaves; permissions and permits are in place.	Contractor, PM, ECO	Continuous
		The Contractor must be responsible for the repair and reinstatement of any existing infrastructure that is damaged, or services which are interrupted, at his/her own cost.	Contractor	As required
		The Contractor must adhere to any time limits for the repairs that may be stipulated by the PM in consultation with the Contractor.	Contractor, ECO	As required
7.	Environmental incidents	The Contractor must take timeous corrective action to mitigate an incident appropriate to the nature and scale of the incident and must also rehabilitate any residual environmental damage caused by the incident or by the mitigation measures themselves. The Contractor must adhere to any time limits for such corrective actions that may be stipulated by the ECO in consultation with the PM.	ECO, Contractor	Continuous
8.	Labour	Local labour must be used wherever possible to stimulate the local economy.	Contractor	Once-off
		The Contractor should use labour intensive construction measures where appropriate, practical and financially feasible.	Contractor	Once-off
		The workforce should be trained to benefit individuals beyond the completion of the project.	Contractor	Once-off
		The Contractor should use local suppliers where possible.	Contractor	Once-off
		The PM must ensure that all staff working on the project must be in possession of a South African Identity Document or a relevant work permit. A register must be kept on site of all staff working on site.	PM	Continuous
		Equal opportunities for employment should be created to ensure that all sectors of society (especially women) have equal access to such opportunities.	Contractor	Continuous
9.	Training of staff	The Contractor must ensure that all construction staff receive environmental awareness training concerning, amongst others, the prevention of accidental spillage of hazardous chemicals and oil; pollution of water resources (both surface and groundwater), air pollution and litter control and identification of archaeological artefacts, protection of any animals encountered on site, no-go areas, the use of toilets and basic sanitation, and basic health and safety on site.	Contractor, ECO	Once-off
		It is the Contractor's responsibility to provide the site foreman with environmental training (including explaining the content of the EMPr and any Conditions of Approval) and is to ensure that the foreman has sufficient understanding to pass this information onto the construction staff.	Contractor, ECO	Once-off
		Training must be provided to the staff members in the use of the appropriate fire-fighting equipment.	Contractor, Health and Safety Officer	Once-off
		The Contractor must ensure that all staff operating machinery/construction vehicles are adequately trained to carry out the designated tasks.	Contractor, Health and Safety Officer	Once-off

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
10. Worker health and safety	A Health and Safety Plan must be developed and implemented by the Contractor for the construction period to ensure worker safety. Should any injury be obtained as a result of work the Contractor must ensure the necessary medical attention is received. The necessary Health and Safety file and incident register must be kept on site at all times.	Contractor, Health and Safety Officer	Continuous
11. Site access & traffic management	Construction vehicles, machinery and workers must be restricted to the designated access roads, and may not drive through undeveloped vegetation outside of the existing access route except where that vegetation falls within the authorised working area (development footprint) at the site.	Contractor ECO	Continuous
12. Vegetation clearing	Vegetation clearing may only commence once the working area has been clearly demarcated to the ECO's satisfaction.	Proponent Contractor ECO	Once-off
13. EMPr	This EMPr must be made binding to the main Contractor and to individual Contractors, and must be included in the tender documentation for the construction contract.	Proponent	Once-off
14. Topsoil & subsoil management	Removed topsoil and subsoil should be stockpiled for the duration of the active construction period, and utilized for the final landscaping and rehabilitation of disturbed areas on site. The topsoil must be adequately protected from being blown away or eroded by storm water. Removed subsoil should be stockpiled separately from topsoil. Topsoil should be the final layer applied during rehabilitation, after subsoil/ spoil material has been placed and shaped on the site	Contractor ECO	Continuous
15. Excavations & earthworks	Use of heavy machinery can substantially increase the likelihood, intensity and significance of potential negative environmental impacts, and it is thus essential that earthworks be performed under constant supervision, and that operators must be made aware of all the environmental obligations, as there is always the potential to inflict damage to sensitive areas. Use of machinery should be restricted to only that which is strictly required, and the unnecessary or excessive movement/ use of such machinery must be kept to a minimum. Machinery must enter and exit the site via the indicated access roads, and may not enter/ exit the river channel at any other location. Excavations and earth-moving may only take place within the demarcated working area	Contractor ECO	Continuous
16. Groundwater contamination	Ensure vehicles are serviced and refuelled in bunded areas	Contractor	Continuous
	Ensure vehicles are checked weekly for faults and serviced timeously if faulty	Contractor	As required
	Should any leaks occur ensure contaminated soil is dug up to 1 cm below the level of visible contamination and disposed of as hazardous waste	Contractor	As required

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
	Drip trays should be placed under all vehicles remaining stationary for more than 24 hours	Contractor	Continuous
17. Noise	Limit construction activities to normal working hours	Contractor	Continuous
	Coincide any excessively noisy activities to minimise duration of inconvenience	Contractor	As required
	Ensure noise standards are complied with and that construction staff are provided with personal protective equipment when undertaking noisy operations	Contractor	Continuous
18. Construction in a watercourse: river diversion	It is recommended that construction be undertaken during the dry summer months when water flow in the river is low or non-existent, in order to reduce the magnitude of the diversion required and to reduce the potential disturbance to the aquatic environment. The temporary diversion channel should take the shape and form of the stream, upstream and downstream of the diversion	Proponent	As required
19. Safety	No children on construction site. Safety fence and controlled access should be enforced Safety signs with necessary information displayed	Proponent Contractor ECO	Continuous
20. No go areas	Any sensitive areas identified as such by the ECO need to be considered no-go areas.	Contractor, ECO	Monthly
	The Contractor must, as advised by the ECO, erect temporary fencing along the perimeter of designated sensitive no-go areas. Temporary fencing must, as a minimum, consist of wooden or metal posts at 3 m intervals, with two plain wire/plastic strands tensioned horizontally at heights of 300 mm and 900 mm above the ground – it is essential that the strands are visible. The Contractor must maintain in good order all demarcation fencing and barriers for the duration of construction activities, or as otherwise instructed. Commercial type danger tape should not be used, as this perishes rapidly, and pollute the environment when torn and blown away by strong winds.	Contractor, ECO	Once-off, as required
21. Stockpiles	Soil stockpiles must not be situated within 50m of any water course.	Contractor, ECO	Monthly
	If stockpiles are exposed to windy conditions or heavy rain, they should be covered either by vegetation or cloth, depending on the duration of the project. Stockpiles may further be protected by the construction of berms or low brick walls around their bases.	Contractor, ECO	Monthly
	Stockpiles must be kept clear of weeds and alien vegetation growth by regular weeding.	Contractor, ECO	Monthly
	Where contamination of soil is expected, analysis must be done prior to disposal of excess soil to determine the appropriate disposal method. Proof from an applicable waste disposal site where contaminated soils are dumped if and when a spillage / leakage occur must be provided to the ECO upon request.	Contractor, ECO	Monthly
	Stockpiles must not exceed 2m in height unless otherwise permitted by the PM and / or ECO.	Contractor, ECO	Monthly
22. Erosion control	Wind screening and stormwater control must be undertaken where required by the ECO to prevent soil loss from the site.	Contractor, ECO	Twice monthly
	The use of silt fences and sand bags must be implemented in areas that are susceptible to erosion, if required by the ECO.	Contractor, ECO	Twice monthly
	Other erosion control measures that can be implemented are as follows: • Brush packing with cleared vegetation; • Mulch or chip packing; • Planting of vegetation; and • Hydro-seeding / hand sowing.	Contractor, ECO	

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
	Sensitive areas need to be identified prior to construction so that the necessary precautions can be implemented.	Contractor, ECO	Twice monthly
	All erosion control mechanisms need to be regularly maintained.	Contractor, ECO	Twice monthly
	Re-vegetation of disturbed surfaces must occur as soon as possible after construction activities are completed.	Contractor, ECO	Twice monthly
	No impediment to the natural water flow o site other than approved erosion control or rehabilitation works is permitted.	Contractor, ECO	Twice monthly
	Stockpiles not used in three (3) months after stripping should be seeded to prevent dust and erosion, as advised by the ECO	Contractor, ECO	Twice monthly
23. Hazardous materials	Use and or storage of materials, fuels and chemicals which could potentially leak into the ground must be controlled.	Contractor, ECO	Monthly
	Any hazardous substances must be stored at least 50m from any of the watercourses on site in a bunded area.	Contractor, ECO	Monthly
	The Contractor must ensure that potentially harmful materials are properly stored in a dry, secure, ventilated environment, with concrete or sealed flooring and a means of preventing unauthorised entry. Such materials may also be temporarily stored on drip-trays.	Contractor, ECO	Monthly
	Contaminated wastewater must be managed by the Contractor to ensure existing water resources on the site are not contaminated. All wastewater from general activities in the camp must be collected and removed from the site for appropriate disposal at a licenced waste disposal facility or sewage works.	Contractor, ECO	Monthly
	All storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces. The bund wall must be high enough to contain 110% of the total volume of the stored hazardous material. Such bunded areas must be regularly emptied of accumulated rainwater. Wastewater from such emptying, if contaminated, must be disposed at an appropriately licenced waste disposal facility or sewage works.	Contractor, ECO	Monthly
	In the event of a spill, the Contractor must take prompt action to clear polluted areas and prevent spreading of the pollutants. The Contractor will be liable to arrange for professional service providers to clear affected areas, if required.	Contractor, ECO	As required
	Proper facilities for the storage of oils, paints, grease, fuels, chemicals and any hazardous materials to be used must be provided to prevent the migration of spillage into the ground and groundwater. These pollution prevention measures for storage must include a bunded containment area with a wall high enough to contain at least 110% of any stored volume. This containment area must be sited at least 50m away from any drainage line, in a site approved by the ECO.	Contractor, ECO	Monthly
	Cement storage and batching must only take place in a bunded area, and any runoff		
	Any spillage, which may occur, must be investigated and immediate action must be taken. This must be reported to the ECO and to the relevant authorities if so required by the ECO.	Contractor, ECO	As required
24. Cement and concrete batching	Concrete must not be mixed on the ground, but in a bunded area with any runoff captured for disposal as hazardous wastewater.	Contractor, ECO	Continuous
	The batching area is to be located in an area of low environmental sensitivity, as approved by the ECO.	Contractor, ECO	Once-off
	Cement bags must only be stored in a covered, bunded area and not directly on the ground. Used cement bags must be disposed of as hazardous waste.	Contractor, ECO	Weekly

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
25. Hydrology and stormwater	Silt fences must be used where required by the ECO to remove any suspended silt from stormwater before it enters the stormwater system.	Contractor, ECO	Monthly
	Temporary cut-off drains and berms must be used where necessary to capture stormwater and promote infiltration.	Contractor, ECO	Monthly
	Stormwater and surface water must be diverted away from excavation trenches, and care must be taken to avoid surface stormwater from the site running into the seasonal pan on the site.	Contractor, ECO	Monthly
	No rubble, litter or sand may be deposited into any freshwater systems or water courses.	Contractor, ECO	Monthly
26. General materials handling, use and storage	Choice of location for storage areas must take into account prevailing winds, distances to the seasonal watercourses (50m minimum), general onsite topography and water erosion potential of the soil. Impervious surfaces must be provided where necessary.	Contractor, ECO, Health and Safety Officer	Once-off
	Storage areas must be designated, demarcated and fenced. Storage areas must be secure so as to minimize the risk of crime. They must also be safe from access by unauthorised persons. Fire prevention facilities must be present at all storage facilities.	Contractor, ECO	Monthly
	Material Safety Data Sheets (MSDSs) must be readily available on site for all chemicals and hazardous substances to be used on site. Where possible, the available MSDSs should include information on ecological impacts and measures to minimise negative environmental impacts during accidental spills.	Contractor, ECO, Health and Safety Officer	Once-off, as required
	Clear signage must be placed at all storage areas containing hazardous substances / materials.	Contractor, ECO, Health and Safety Officer	Once-off
	The Contractor must be responsible for the training and education of all personnel on site who will be handling the hazardous material about its proper use, handling and disposal. The Contractor must ensure that information on the management of spill and accidental ingestion is kept on site. Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures.	Contractor, Health and Safety Officer	Once-off
	The provisions of the Hazardous Chemical Substances Regulations promulgated in terms of the Occupational Health and Safety Act 85 of 1993 and the SABS Code of Practice must be adhered to. This applies to solvents and other chemicals possibly used in the construction time.	Contractor, Health and Safety Officer	Continuous
	The Contractor must ensure that its staff is made aware of the health risks associated with any hazardous substances used and has been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training.	Contractor, Health and Safety Officer	Continuous
	All excess cement and concrete mixes must be contained on the construction site prior to disposal off site.	Contractor, ECO	Monthly
	Hazardous substances must be stored at least 50m away from any water bodies on site to avoid pollution.	Contractor, ECO	Monthly
27. Fuel storage	Topsoil and subsoil to be protected from contamination.	Contractor, ECO	Monthly
	Fuel and material storage must be away from stockpiles on site in appropriate containers in a bunded area.	Contractor, ECO	Twice monthly
	Chemicals must be mixed on an impermeable surface and provisions must be made to contain spillages or overflows into the soil.	Contractor, ECO	Monthly

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
	Any storage tanks containing hazardous materials must be placed in bunded containment areas with sealed surfaces. The bund walls must be high enough to contain 110% of the total volume of the stored hazardous material. Drip trays may be used for temporary storage of such materials.	Contractor, ECO	Monthly
	Contaminated soil must be contained and disposed of off-site at an approved hazardous waste disposal site.	Contractor, ECO	Monthly
28. Transportation	Material must be appropriately secured to ensure safe passage between destinations during transportation. Loads must have appropriate cover to prevent them spilling from the vehicle during transit. The Contractor must be responsible for any clean-up resulting from the failure by his employees or suppliers to property secure transported materials.	Contractor, ECO, Health and Safety Officer	Monthly
29. General waste management	Litter generated by the construction crew must be separated on site into general waste and recyclables and collected in covered rubbish bins. General waste is to be removed to a licenced landfill site on a weekly basis and recyclables must be taken to a recycling centre monthly.	Contractor, ECO	Weekly/ Monthly
	Ensure that no refuse wastes are burnt on the premises or on surrounding premises. No fires shall be allowed on site, unless in designated areas approved by the PM and by the ECO or by the Health and Safety Officer.	Contractor, ECO, PM, Health and Safety Officer	Monthly
	The Contractor must supply waste bins/skips throughout the site at locations where construction personnel are working. The bins must be provided with lids and an external closing mechanism to prevent their contents blowing out and must be scavenger-proof to deter animals that may be attracted to the waste. The Contractor must ensure that all personnel immediately deposit all waste in the waste bins for removal by the Contractor. Bins must be emptied on a weekly basis and the waste removed to the construction camp where it must be properly contained in scavenger, water and windproof containers until disposed of. The bins must not be used for any purposes other than waste collection.	Contractor, ECO	Monthly
	Ensure that no litter, refuse, wastes, rubbish, rubble, debris and builders waste generated on the premises be placed, dumped or deposited on adjacent/surrounding properties during or after the construction period of the project.	Contractor, ECO	Monthly
	If possible and feasible, all waste generated on site must be separated into glass, plastic, paper, metal and wood and recycled.	Contractor, ECO	Monthly
30. Hazardous waste management	The waste, resulting from the use of hazardous materials, must be disposed of at a registered hazardous waste disposal site by a certified waste disposal Contractor as approved by the ECO. A disposal certificate must be obtained from the disposal Contractor.	Contractor, ECO	As required
	Staff must be trained in the identification of hazardous waste.	Contractor, ECO	As required
	Temporary storage and disposal of hazardous waste is regulated by legislation which must be complied with, i.e. the Occupational Health and Safety Act.	Contractor, ECO	Monthly
31. Noise	The Contractor must aim to adhere to the relevant noise regulations and limit noise to within standard working hours.	Contractor, ECO	Monthly
	Construction site camp and other noisy facilities must be located well away from noise sensitive neighbours.	Contractor, ECO	Once-off
	Truck traffic must be routed away from noise sensitive areas, where possible.	Contractor, ECO	As required
	All noise and sounds generated must adhere to SABS 0103 specifications for maximum allowable noise levels for residential areas. No pure tone sirens or hooters may be	Contractor, ECO	Monthly

Africa Geographical Association	1993-1995	Vice-President.
Society for the Vaal River Catchment	1980-1999	Member
S.A. Society for Photogrammetry, Remote Sensing and Cartography	1984-1996	Member
Dendrological Society	1986-2005	Member
BirdLife South Africa	2003-present	Member
British Geomorphological Research Group	1985-1997	Member
Int Com on Water Resource Systems	1985-1997	Member
Int Com on Continental Erosion	1986-1990	Member
Int Com on Remote Sensing and Data Transmission	1986-1991	Member
Society for S.A. Geographers	1995-2005	Member
SA Photogrammetrical and Geo. Info.	1995-2003	Member
S.A. Association of Geomorphologists	1994-1999	Board Member and member
SADC Mine Dump Study Group	1996-2005	Member

***Chairman of the Committee for Interested and Affected Parties (CIP) (2004-2008)** for International Accreditation by the influential accrediting body of **Price, Waterhouse Coopers-International Environmental Auditors in Southern Africa.**

Member of Price Waterhouse Coopers CIP (2008-2010)

1. ACADEMIC COURSES TAUGHT AT POST-MATRIC LEVEL

1.1 The Geography of Economic Activities and Regional Geography (3rd year and honours students)
1.2 Weather and Climate (1st, 2nd, and 3rd year students)
1.3 Geomorphology (1st year up to Ph D level)
1.4 Remote Sensing and the Environment (3rd year and Honours)
1.5 Quantitative Geography (3rd year up to Masters Level)
1.6 Environmental Management (2nd year, up to PhD level)
1.7 Environmental Analysis (3rd year and up to Masters Level)
1.8 Geography of Soil (3rd year and Honours)
1.9 Cartography (1st year to Honours)
1.10 As professor 26 Masters & 4 PhD students completed their studies in environmentally related subjects under his tutor- and co-tutorship.

2 INVOLVEMENT IN COURSES AND WORKSHOPS

2.1 ENVIRONMENTAL COURSES: Partially responsible for course development and taught various courses for environmental officers employed by the North West Province over a period of 3 years (1998-2001). These courses were aimed at improving their knowledge of the environment as well as their understanding of the environmental interactions specifically related to the North West province.

2.2 STATE OF THE ENVIRONMENT REPORT (SOE) Involved in the first SOE prepared by the North West Province and was responsible for most of the physical geographical aspects (1999).

3 ENVIRONMENTAL PROJECTS

The following projects are typical examples, of such projects which he co-ordinated and managed:

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
	utilised except where required in terms of SABS standards or in emergencies.		
	Noisy operations must be combined so that they occur where possible at the same time.	Contractor, ECO	Monthly
	Construction activities must be contained to reasonable working hours. Night-time activities near noise sensitive receptors must not be allowed.	Contractor, ECO	Monthly
	With regard to unavoidable noisy construction activities, the Contractor must liaise with local residents to inform them of such events.	Contractor	As required
	As construction workers operate in a noisy environment, it must be ensured that their working conditions comply with the requirements of the Occupational Health and Safety Act (Act No 85 of 1993). Where necessary, ear protection gear must be worn.	Contractor, ECO, Health and Safety Officer	Monthly
	Noise suppression measures must be applied to all construction equipment where required. Construction equipment must be kept in good working order and where appropriate fitted with silencers which are kept in good working order. Should the vehicles or equipment not be in good working order, the Contractor may be instructed to remove the offending vehicle or machinery from site.	Contractor, ECO, Health and Safety Officer	Monthly
32. Worker health and safety	Safety measures, work procedures and first aid must be implemented on site.	Contractor, , Health and Safety Officer	Monthly
	A Health and Safety Plan in terms of the Occupational Health and Safety Act (Act No. 85 of 1993) must be drawn up to ensure worker safety.	Contractor, Health and Safety Officer	Once-off
	Workers must be thoroughly trained in using potentially dangerous equipment.	Contractor, Health and Safety Officer	As required
	Contractors must ensure that all equipment is maintained in a safe operating condition.	Contractor	Monthly
	A safety officer must be appointed.	Contractor	Once-off
	A record of health and safety incidents must be kept on site.	Contractor, , Health and Safety Officer	Monthly
	Any health and safety incidents must be reported to the project manager immediately.	Contractor, , Health and Safety Officer	As required
	First aid facilities must be available on site at all times. All incidents requiring first aid occurring on site must be recorded in the incidents book on site.	Contractor, , Health and Safety Officer	Monthly
	A record must be kept of medication administered or precautions taken and the time and dates when this was done. This can then be used as evidence in court should any claims be instituted against the Contractor.	Contractor, , Health and Safety Officer	Monthly
	Material stockpiles or stacks must be stable and well secured to avoid collapse and possible injury to site workers / local residents.	Contractor, ECO, Health and Safety Officer	Monthly
33. Personal Protective Equipment	Personal Protective Equipment (PPE) must be made available to all construction staff and must be compulsory. Hard hats and safety shoes must be worn at all times and other PPE worn were necessary i.e. dust masks, ear plugs etc.	Contractor, ECO, Health and Safety Officer	Monthly
	No person is to enter the portion of the site where construction activities are being undertaken without the necessary PPE.	Contractor, ECO, Health and Safety Officer	Monthly

Activity/Impact	Action Required	Responsible Party	Monitoring Frequency
	SABS Standards and specifications governing dangerous processes such as welding must be strictly applied, with a view to proper protection of the public and workers.	Contractor, ECO, Health and Safety Officer	As required
34. Fauna and Flora	Implement the eradication programme for invasive species in terms of the Conservation of Agricultural Resources Act (Act No. 43 of 1983).	Contractor, ECO	Monthly
	Institute the rehabilitation of areas as soon as construction activity allows it.	Contractor, ECO	As required
	No disturbance, capture or injury of any fauna will be permitted. Should any fauna be found on site it must be removed from site by the ECO or a suitably qualified person.	Contractor, ECO	Continuous

12. MONITORING, AUDITING AND REPORTING

The Applicant (***Ga-Segonyana Local Municipality)*** is responsible for ensuring that all environmental management measures prescribed in this EMPr and MMP, as well as any other conditions specified by the relevant authorities, are implemented and adhered to during all phases of the proposed development. The Applicant may delegate the responsibilities for implementing the requirements to other persons/entities, however the Applicant remains responsible for ensuring that the delegated responsibilities are carried out.

It is the responsibility of the project team or their delegate to ensure that regular monitoring of environmental issues addressed in this management plan is undertaken. The applicant is responsible for the monitoring of the infrastructure.

Site inspections to determine maintenance needs during the operational phase are imperative for good housekeeping.

Internal environmental audits must be undertaken at regular monthly intervals throughout the construction phase to ensure compliance.

The applicant will be responsible for maintaining a database of all records pertaining to the environment for the study area.

All incidents such as spills of toxic or any other substance that may negatively affect the environment must be reported to the relevant authorities.

FINES

The ECO can impose fines on the Contractor for any contraventions of this EMPR. The imposition of fines will enable the ECO to ensure that the requirements of the EMPR are taken seriously by the Contractor.

The Contractor shall be advised in writing of the nature of the infringement and the amount of the fine. The Contractor shall also take the necessary steps (e.g. training) to prevent a recurrence of the infringement.

The Contractor is also advised that the imposition of spot fines does not replace any legal proceedings the authorities, landowners and/or members of the public may institute against the Contractor.

In addition to the fine, the Contractor shall be required to make good any damage caused as a result of the infringement at his own expense.

APPENDIX K:
DETAILS OF EAP AND EXPERTISE

COMPANY PROFILE

DETAILS AND EXPERTISE OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONERS

AB ENVIRO CONSULT CC IS A REGISTERED CONSULTANCY, OWNED AND OPERATED AS AN INDEPENDENT UNIT BY THE REGISTERED OWNER AND CONSULTANT: **PROF. A.B. DE VILLIERS**
MR J.P. DE VILLIERS JOINED THE CONSULTANCY DURING 2004
MRS J.E. DU PLOOY IS AN ASSOCIATE SINCE 2001

PERSONAL PARTICULARS AND CAREER HISTORY OF PROF DE VILLIERS

Name : ABRAHAM BAREND (BRAAM) DE VILLIERS
Date of birth : 1944/01/26
Telephone : (018) 294-5005
Fax : (018) 293-0671
Electronic mail : brama@abenviro.co.za
Address : 7 LOUIS LEIPOLDT STREET
POTCHEFSTROOM
2531
Lecturer & Professor – Potchefstroom University 1969- 2004

ACADEMIC AND PROFESSIONAL QUALIFICATIONS

Post–Matric Qualifications

YEAR	Qualification	Institution	Field of Study
1968	B.Sc.	PU FOR CHE	Geography, Geology
1970	HONNS. B.Sc.	PU FOR CHE	Soil Science
1974	M.Sc.	PU FOR CHE	Geography
1981	Ph.D.	UOFS	Geography

PROFESSIONAL QUALIFICATIONS AND REGISTRATIONS

YEAR	Qualification/ Registration	Institution	Field of Study
1986	Professional Environmental Scientist	S.A. Council for Natural Scientific Profesions	Environmental Science
1994	Quality Auditor	ESKOM	Environmental Auditing
1998	Personnel & Verifying Auditor	SAATCA	Environmental Auditing
2006	Environmental Assessment Practitioner	Interim Certification Board EAPSA	Environmental Science

MEMBERSHIP AND PARTICIPATION IN SOCIETIES, COUNCILS, ETC.

Name of professional societies	YEAR	Capacity
S.A. Geographical Society.	1967-1996	Member and Board Member
Society for Geography	1968-2004	Member
SAGS Western Transvaal	1985-1989 1987-1989 1996	Chairman

Africa Geographical Association	1993-1995	Vice-President.
Society for the Vaal River Catchment	1980-1999	Member
S.A. Society for Photogrammetry, Remote Sensing and Cartography	1984-1996	Member
Dendrological Society	1986-2005	Member
BirdLife South Africa	2003-present	Member
British Geomorphological Research Group	1985-1997	Member
Int Com on Water Resource Systems	1985-1997	Member
Int Com on Continental Erosion	1986-1990	Member
Int Com on Remote Sensing and Data Transmission	1986-1991	Member
Society for S.A. Geographers	1995-2005	Member
SA Photogrammetrical and Geo. Info.	1995-2003	Member
S.A. Association of Geomorphologists	1994-1999	Board Member and member
SADC Mine Dump Study Group	1996-2005	Member

***Chairman of the Committee for Interested and Affected Parties (CIP) (2004-2008)** for International Accreditation by the influential accrediting body of **Price, Waterhouse Coopers-International Environmental Auditors in Southern Africa.**

Member of Price Waterhouse Coopers CIP (2008-2010)

1. ACADEMIC COURSES TAUGHT AT POST-MATRIC LEVEL

1.1 The Geography of Economic Activities and Regional Geography (3rd year and honours students)
1.2 Weather and Climate (1st, 2nd, and 3rd year students)
1.3 Geomorphology (1st year up to Ph D level)
1.4 Remote Sensing and the Environment (3rd year and Honours)
1.5 Quantitative Geography (3rd year up to Masters Level)
1.6 Environmental Management (2nd year, up to PhD level)
1.7 Environmental Analysis (3rd year and up to Masters Level)
1.8 Geography of Soil (3rd year and Honours)
1.9 Cartography (1st year to Honours)
1.10 As professor 26 Masters & 4 PhD students completed their studies in environmentally related subjects under his tutor- and co-tutorship.

2 INVOLVEMENT IN COURSES AND WORKSHOPS

2.1 ENVIRONMENTAL COURSES: Partially responsible for course development and taught various courses for environmental officers employed by the North West Province over a period of 3 years (1998-2001). These courses were aimed at improving their knowledge of the environment as well as their understanding of the environmental interactions specifically related to the North West province.

2.2 STATE OF THE ENVIRONMENT REPORT (SOE) Involved in the first SOE prepared by the North West Province and was responsible for most of the physical geographical aspects (1999).

3 ENVIRONMENTAL PROJECTS

The following projects are typical examples, of such projects which he co-ordinated and managed:

3.1 MOOI RIVER CATCHMENT STUDIES: This was a study on the impacts of the mining activities on the quality and quantity of water in the Mooi River catchments and was done for the North West Province. He co-ordinated and managed this project. The team consisted of a PhD student as well as two teams of local and international students; one responsible for the biophysical variables, and the other for socio-cultural aspects.

3.2 SADC MINE DUMPS STUDY GROUP: Acted as coordinator for the formulation of tools to assess the effects of mine dumps on the environment in the SADC region. One group was involved in the Zimbabwean copper belt region, and the other in the Tanzanian gold mining area. The studies were undertaken for the Carl Duisburg Geselschaft (Germany). The research team consisted of geographers, ecologists and mining experts. From this study, a pilot program, the "South African Environmental Management System" (SEMS) developed, which was applied successfully by a team of researchers in a pilot study in the Carletonville region.

3.3 SADC DEVELOPMENT OF TRAINING MODULES FOR ENVIRONMENTAL STUDIES USING GIS: Member of the three-person team who developed these training modules. It was applied at the Copper belt University, the University of Dar Es Salaam as well as at the Potchefstroom University as an introduction to the integration of environmental data (both biophysical and socio-economic) for the interpretation of geographical regions.

3.4 ENVIRONMENTAL DEGRADATION - THE RESULT OF INDISCRIMINATE LOCATION OF SLIME DAMS IN THE SADC REGION: Coordinated this study in the Far West Rand Area; conducted case studies in Zambia and South Africa. The team consisted of researchers from the Netherlands, Germany, Zambia and Tanzania.

3.5 LAND USE CHANGES IN THE NORTH WEST PROVINCE: An Environmental Management Support System for SOE North-West University Team leader. This project was undertaken for DACE (NWP) and various students participated – each involved in a specific aspect of the environment. This data was co-ordinated and eventually incorporated into the SOE report.

4 RESEARCH PUBLICATIONS AND CONFERENCES

He published 11 environmentally related articles in peer-reviewed magazines, and appeared professionally at 30 conferences with a direct bearing on environmental work.

ACADEMIC AND PROFESSIONAL QUALIFICATIONS MR J.P. DE VILLIERS

YEAR	Qualification	Institution	Field of Study
1993	BA	PU FOR CHE	Geography, Economics
1994	HED	PU FOR CHE	Geography Economics
2006	B.Sc.(Honns) Cum Laude	North-West University	Environmental Management
2007	M.Sc	North-West University	Geography

PROFESSIONAL QUALIFICATIONS AND REGISTRATIONS

YEAR	Qualification/ Registration	Institution	Field of Study
2008	Basic Principles of Ecological	Centre for Environmental	Ecological Rehabilitation

	Rehabilitation and Mine Closure	Management (North West University)	

ACADEMIC AND PROFESSIONAL QUALIFICATIONS MRS J.E. DU PLOOY

YEAR	Qualification	Institution	Field of Study
1999	BA	PU FOR CHE	Geography, Tourism
2000	BA(Honns) Cum Laude	PU FOR CHE	Geography
2002	Masters in Environmental Management	PU FOR CHE	Environmental Management
2001	Aquabase Intro	AQUABASE	Hydrology
2001	Geomedia Professional	INTERTECH	GIS
2001	Map Info	SPATIAL TECHNOLOGY	GIS
2014	Water Use Licence Application Processes	CARIN BOSMAN SUSTAINABLE SOLUTIONS	Water Uses

EXPERIENCE OF THE CONSULTANCY

Over a period of 23 years (1996-2019) this consultancy has successfully applied for, and obtained positive ROD's and EA's for more than 365 projects. Environmental Control Officer's duties are also performed on various projects.

The company was involved (from 1992-1994) in evaluation of 114 applications for the subdivision of land, 23 applications for resort developments, and 54 applications for business rights for the Department of Agriculture, Conservation and the Environment - North West Province.

The consultancy is qualified to undertake professional studies in waste management and is still involved in the development of waste disposal- (solid and liquid effluent), and emission studies. These studies are conducted both academically and practically. This work relates to mine waste, domestic waste and effluent as well as to the monitoring of waste disposal. Environmental audits in this respect are undertaken on a regular basis.

APPENDIX L:
PROOF THAT THE S24G HAS BEEN SENT TO DW&S

CONTRACT FOR CARRIAGE / DISPATCH NOTE

DSV

DSV Road (Pty) Ltd
t/a DSV Distribution
PO Box 63, The Reeds 0061
Tel (012) 673-2000
Reg. No. 2000/016342/07
VAT Reg. No. 4880189685

Re: Kuruman + Vryburg

PREPAID ECONOMY

Sender's Details. Full Street Address	Recipients Details. Full Street Address
Company Name: AB Griviro Consult cc	Company Name: Dept: Water and Sanitation (NC)
Address: 7 Louis Leipoldt Street	Address: 28 Central Road
Suburb:	Suburb: Beaconsfield
City / Town: Potchefstroom Postal Code: 2531	City / Town: Kimberley Postal Code: 8315
Contact Name: J P de Villiers	Contact Name: Mr. A. Abrahami
Phone: 083 5488 105	Phone: 053 830 8800/ 67600

The sender warrants that they have **authority** to contract with DSV **o.b.o. the owner** of the goods on these terms and conditions. DSV is **not a public or common carrier**. DSV does **not carry fragile, dangerous or hazardous goods** and the sender is liable for all and any damages and losses which result from carriage of same. Goods are carried at **owner's risk**. DSV's **maximum liability** for loss or damage to goods, howsoever caused, will be **R250 per shipment**, regardless of the value of the goods. DSV is **not liable** in any circumstances for any **consequential or indirect losses or damage**, howsoever caused. Any **claim** i.r.o loss or damage to goods must be received by DSV **within 7 days of dispatch**, failing which DSV will have **no liability** whatsoever.

SENDER'S AUTHORISED SIGNATORY: [signature] DATE: 12/04/19

Received Goods in full without damage - Print Name:

Date Received: D D M M Y Y Time Received: H H M M

Signature:

Received by Driver Name:

Date Received: D D M M Y Y Time Received: H H M M

Signature:

Litotech SJ 011 474 1828 SUN030/014 02/18

GOODS RECEIVED IN GOOD ORDER

PROOF OF DELIVERY

NAME: PRINTED	TIME	DATE DD	MM	YY
SIGNATURE				
ID				

" LIFT TO PEEL AND ATTACH TO DELIVERY SHEET "

PAK2D20101180

DSV POD

004880

SENDERS COPY: TEAR OFF AND KEEP SAFE

PAK2D20101180

- Complete the waybill in full.
- Tear off the "Senders copy slip" and keep it safe.
- Insert the waybill back into the sleeve.
- Seal the parcel using the "Tamper proof seal".

Not to use for: Deliveries to mines, embassies, informal settlements, appointment based deliveries or tender documents

PEEL O
APPL
NECES

TA
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S

AB ENVIRO-CONSULT CC

Reg no. 2000/016653/23

7 Louis Leipoldt Street,
Potchefstroom, 2531
Fax: + 27 (18) 293 0671
Cell: + 27 (83) 5488 105
E-mail: jp@abenviro.co.za

10/04/2019

Mr Abe Abrahams
28 Central Road
Beaconsfield
KIMBERLY
8301
Tel: (053) 830 8800/6 7600

Dear Sir/Madam

Legalization of the commencement of the clearance of 361.4146 ha of indigenous vegetation in order to formalise a township, currently known as "Promised Land" situated on a Portion of the Remaining Extent of Erf 1 and Erf 3 Kuruman and a Portion of the Remaining Extent of Portion 3 of the Farm Kuruman Reserve No. 690 within the Ga-Segonyana Local Municipality, Northern-Cape Province

AB ENVIRO CONSULT was appointed by **Ga-Segonyana Local Municipality** to submit an application to the Northern Cape Province Department: Environment and Nature Conservation for the above mentioned proposed development.

Please find enclosed an electronic copy of the Section 24G report. We must receive your comments within a period of 30 days from the date of this letter. In the event of your organisation/department not wishing to comment on this matter, it would be appreciated if we could receive written confirmation thereof to enable us to continue with the finalisation of the application.

If no response is however received from your Department/organisation within the said time, it will be assumed that your department/organisation does not wish to comment on this matter and the application will be processed further.

Please do not hesitate to contact us should any further information or clarification be required.

Yours sincerely,

PROF. A.B. DE VILLIERS