

10.8 Borrow Pit 8

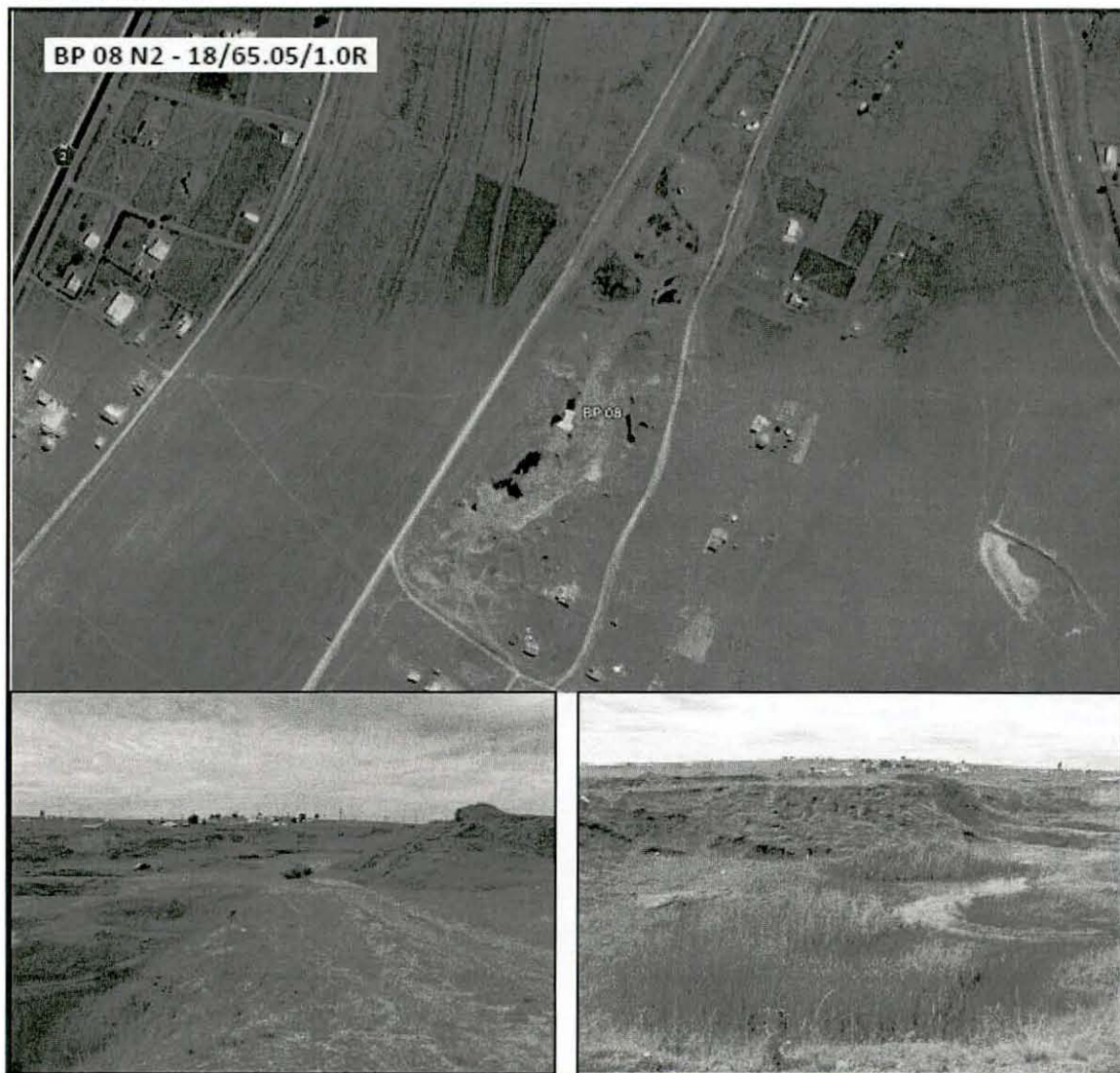
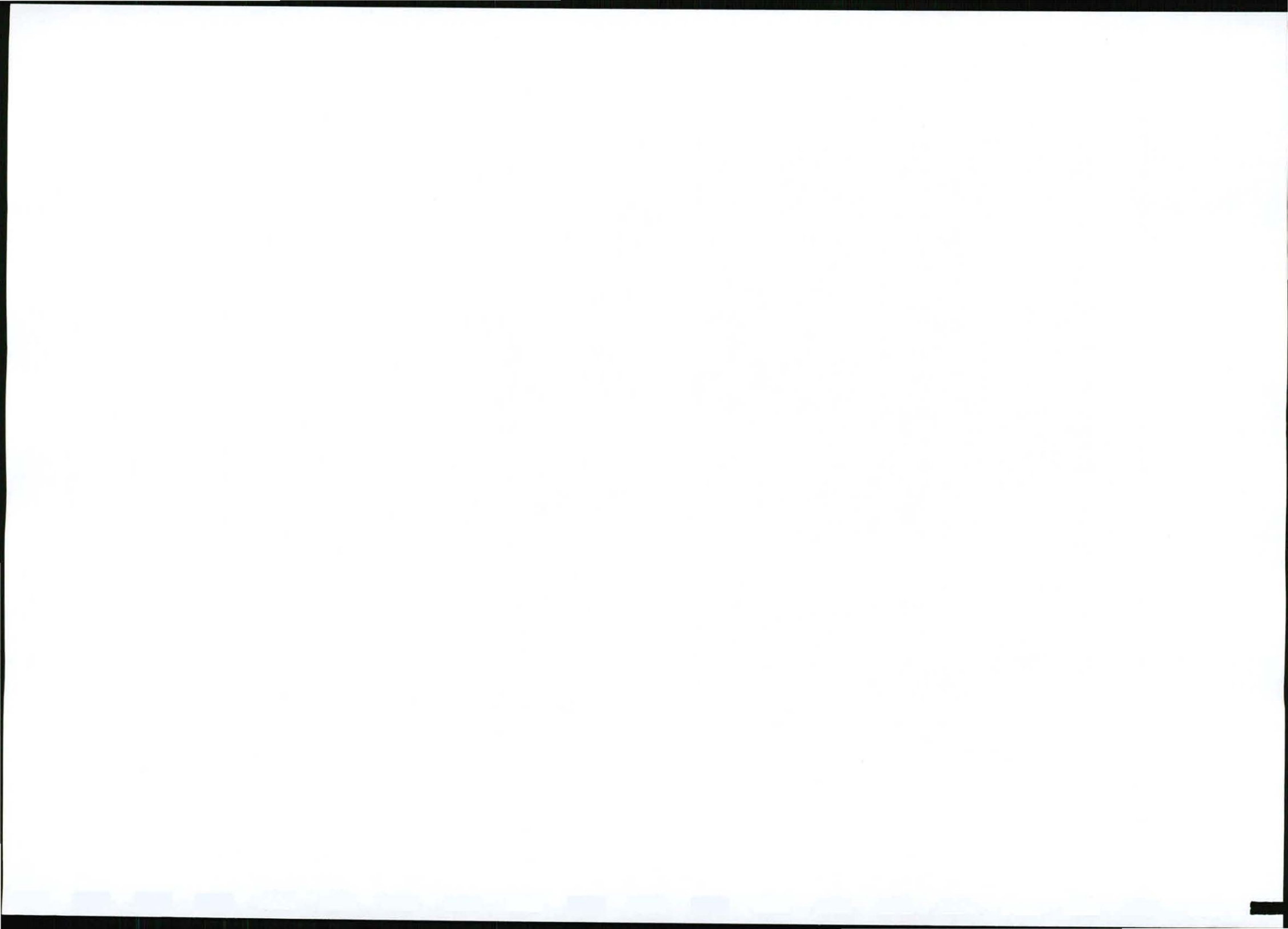


Figure 11: Borrow Pit 08.



General Description:

Borrow Pit 8 is an existing borrow pit which has been used extensively in the past as a source for road building material. It is located on a flat landscape in close proximity of some residential houses of the Jojewni village. Although the borrow pit is located in close proximity to houses, it will not be necessary to relocate any of the households. There are various small areas of water ponding that has developed at the base and along the sides of the borrow pit which is used by the local residents for washing clothes and watering of stock. The borrow pit is accessed from the Jojewni village/Coffee Bay turnoff road leading off the N2. The mining plan is attached under **Appendix A**.

Site preparation will consist of stripping off topsoil and overburden into stockpiles. Existing topsoil stockpiles will be shifted out of the way to allow for mining of the material beneath. The entire mining area will be fenced and the existing access road will be upgraded to allow for trucks to access the working face. The material will be excavated and loaded directly onto haul trucks.

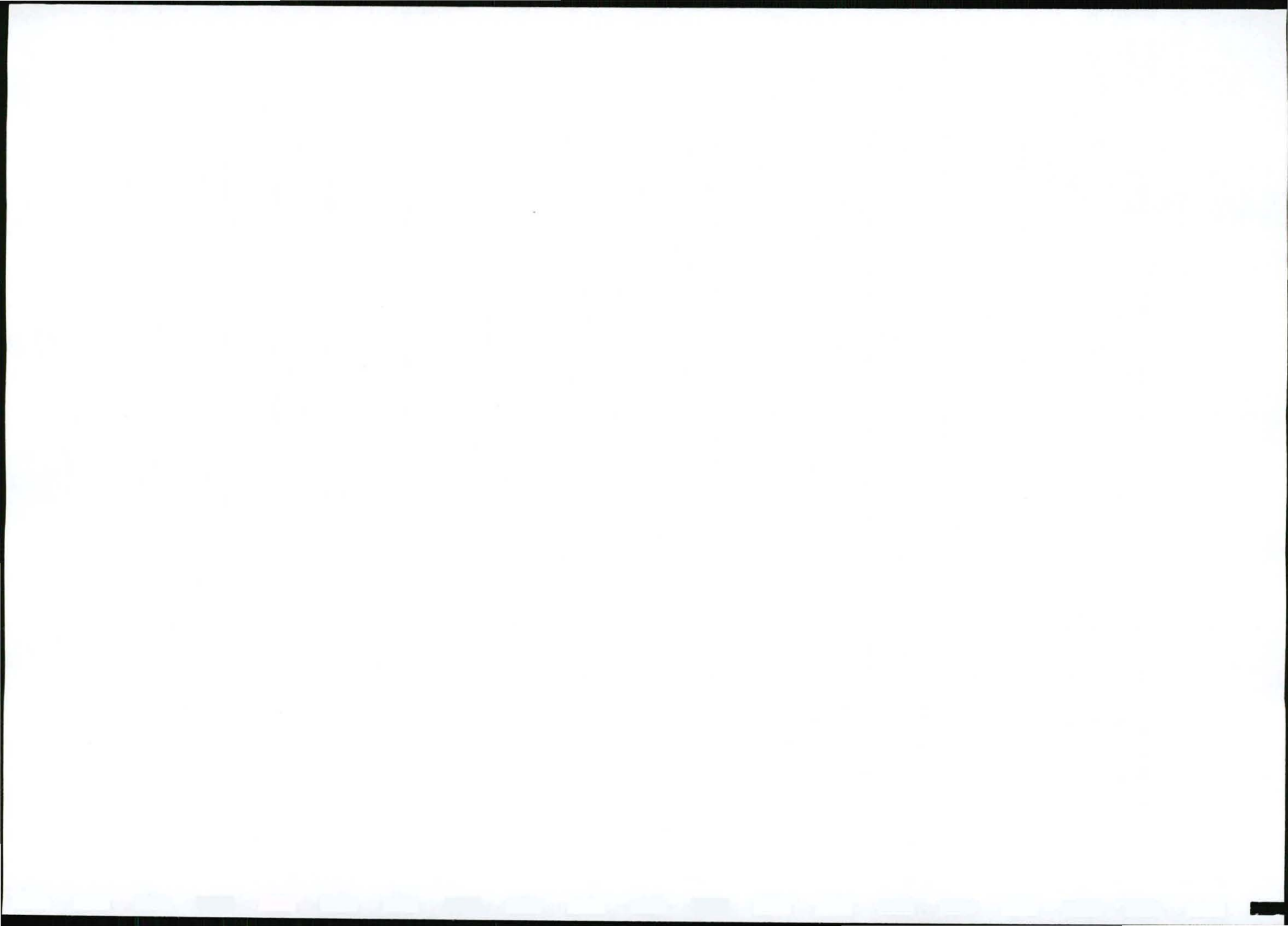
Material to be mined:

The material to be mined is weathered dolerite of Karoo Age, which has intruded Beaufort Group sandstone in the form of a thick sill with an irregular upper surface. The materials have already been partly exploited and lies partly exposed.

The material to be mined has been classified as either: silty clayey, silty sandy gravel derived by a high degree of weathering of dolerite (G7 Quality Material), or silty sandy gravel derived by weathered sandstone (G8/G9 Quality Material).

Extraction Plan:

- Mining may commence by full face removal of material from the existing and new faces.
- The un-mined materials have an overburden, including topsoil (0.5m) with a thickness of about 1.5m.
- The approximate volume from this pit is approximately 336 000m³. It has been assumed for the calculations of these volumes that no large core-stone/in-situ boulders will be encountered.
- The final extent of mining should be determined by the volume of material required at any one time.
- Mining should take place by advancing from the existing face towards the proposed limit of mining.



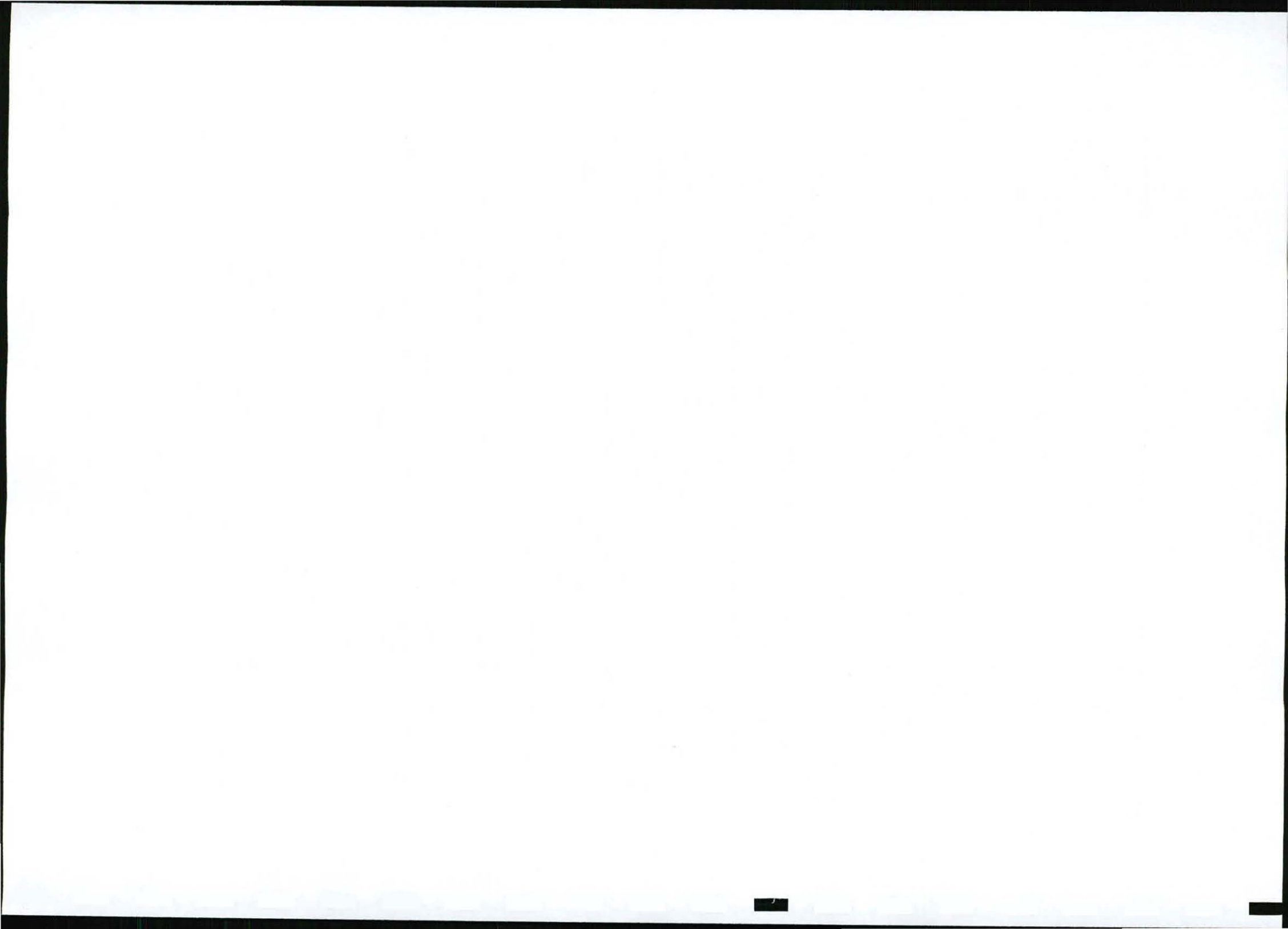
Proposed Rehabilitation Measures:

- Rehabilitation will consist not only of top soiling and landscaping the newly worked areas, but shall also consist of rehabilitation of the existing workings to the same standards.
- The cut slopes of the new portion of this pit have been set as 1:5, to reflect the virgin slopes of the local landscape in order that, after rehabilitation, they may be cultivated.
- A limited amount of loosened material is to be stockpiled in the floor (at the foot of the access ramps) of the pit for maintenance purposes.

Additional Recommended Rehabilitation Measures:

On completion of mining, the faces should be sloped to a 1:2 - 1:3 slope, with a contour berm installed half way down the slope to minimise erosion. Topsoil (which may be required to be imported from other work areas as may be available as it is an existing borrow pit with limited topsoil cover) should be spread over the surface of the mining area, and the temporary access road must be ripped and re-grassed. The entire area should be fertilized and hydro-seeded with an indigenous grass mix which includes quick-growing pioneers and climax species. The storm water berms and dissipation beds must be retained on closure. Any near vertical slopes (1:1) should be stabilised by natural rock wall structures using conventional building methods or in other forms with mortar forced between the rocks. All structures must have a 'natural' look and facilities for plants to grow in. All areas where the slopes are 1:3 to 1:6 should be logged or otherwise stepped (using stabilisation cylinders or similar) in order to prevent soil erosion. Logs/ cylinders must be laid in continuous lines following the contours and spaced vertically 0.8-1.2 m apart, depending on the steepness of the slope. These logs/ cylinders must be secured by means of steel pegs and wire in rocky areas, and treated wooden pegs in other areas.

Post construction site inspections must be undertaken to ensure that erosion is minimized and to monitor the success of the revegetation. Should any damage occur the necessary repair works will be undertaken. The intention is to establish an 80% grass cover within two years of rehabilitation. Should this not be achieved, it may be necessary to lightly rip, fertilise and reseed the site. The fence will be maintained by the contractor until the end of the contract's liability period.



11 Description of the Environment

11.1 Landform & Geology

11.1.1 Regional Geology & Soils

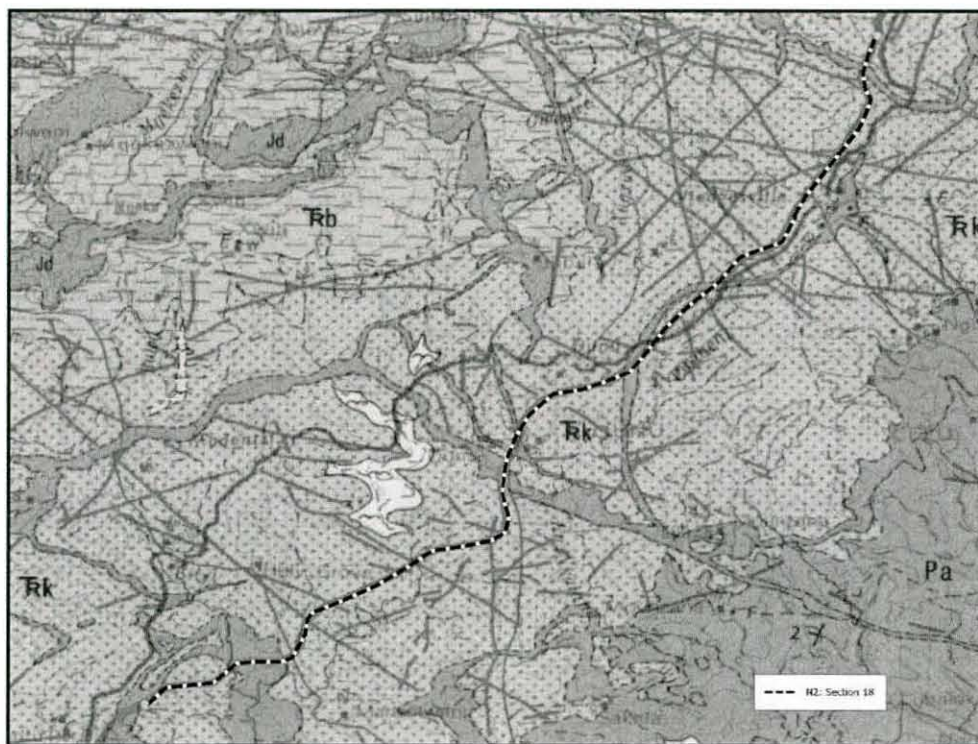
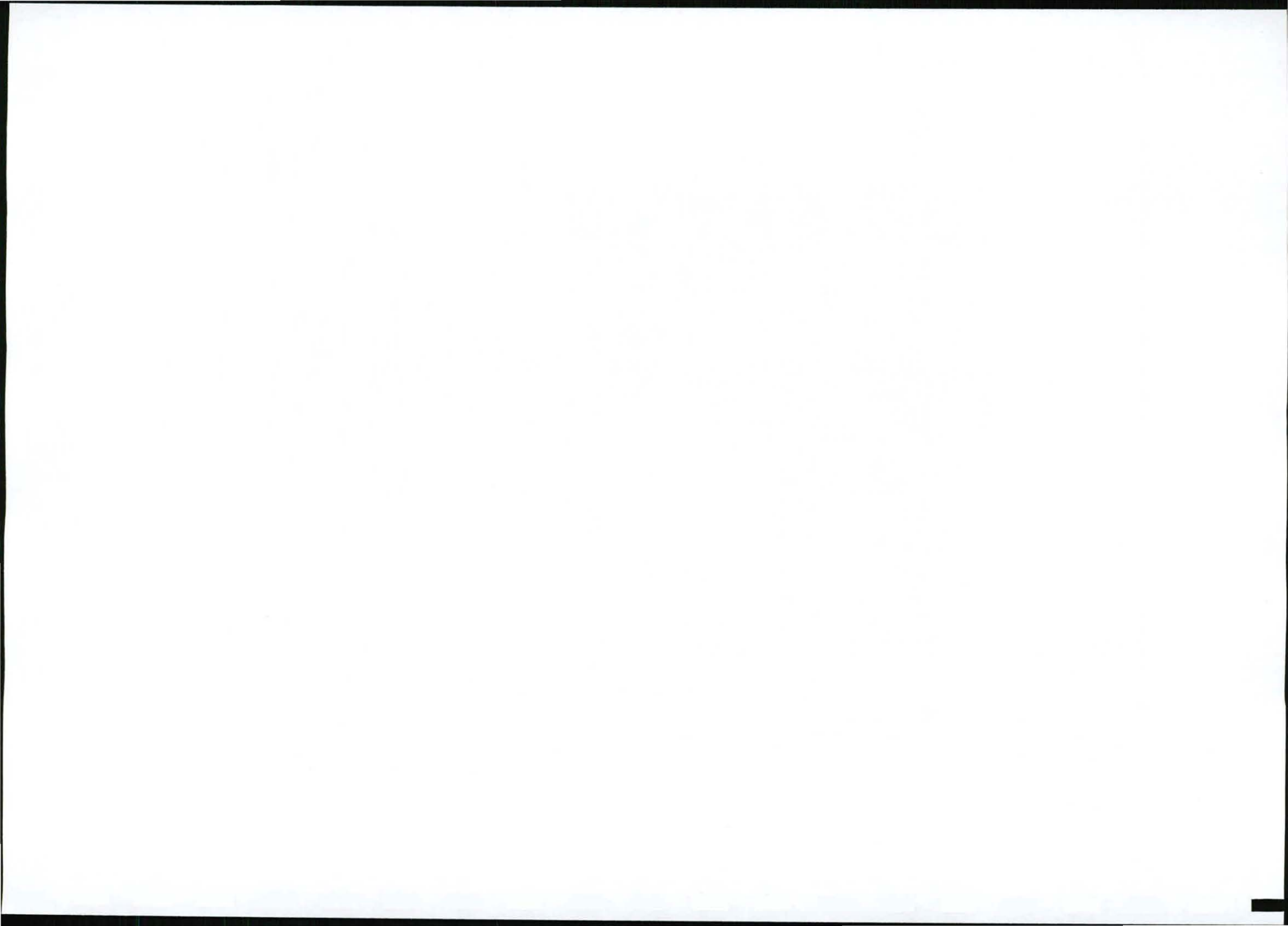


Figure 12: The geology of the study area

The geology of the study site is underlain by Katberg Formation, which belongs to the Tarkastad Subgroup, and forms part of the Beaufort Group belonging to the Karoo sequence (Figure 12). The Katberg Formation is characterized by thick horizons of yellow-grey to light greenish-grey lithofeldspathic sandstone up to 30m thick, with subordinate bluish-grey and reddish-grey mudstones. The sandstones themselves consist of a repetition of mutually truncating, through cross-bedded channel fill sand lenses, individually up to 1m thick. Mud-pebble conglomerates are often present at the base. The mudstones are generally thin and of limited lateral extent. Pebbles, including granite & quartzite clasts, are usually well rounded and found in the sandstone.

The strata have been intruded by dykes and sills of dolerite, with quaternary alluvium and sand covering the older rocks in places. Structurally, the inland area dips more gently than the



complicated coastal area where a number of prominent faults can be distinguished. Potential economic deposits in the area are dimension stone, copper and nickel, coal and heavy mineral sands.

Due to past land use practices and the geology the areas along drainage lines and abandoned agricultural lands are heavily eroded. As such mining activities can lead to severe erosion (especially in previously undisturbed areas) if not managed or mitigated against appropriately.

11.1.1.1 Erodibility Index

Erodibility of soils can be described as the sensitivity of soils to the effects of wind and water on the soil structure. This property is expressed as an erodibility index, where low values indicate high potential for erosion, and high values correspondingly indicate a low potential for erosion.

The erodibility index is determined by combining the effects of slope and soil type, rainfall intensity and land use. These aspects are represented by terrain morphology, mean annual rainfall and broad land use patterns.

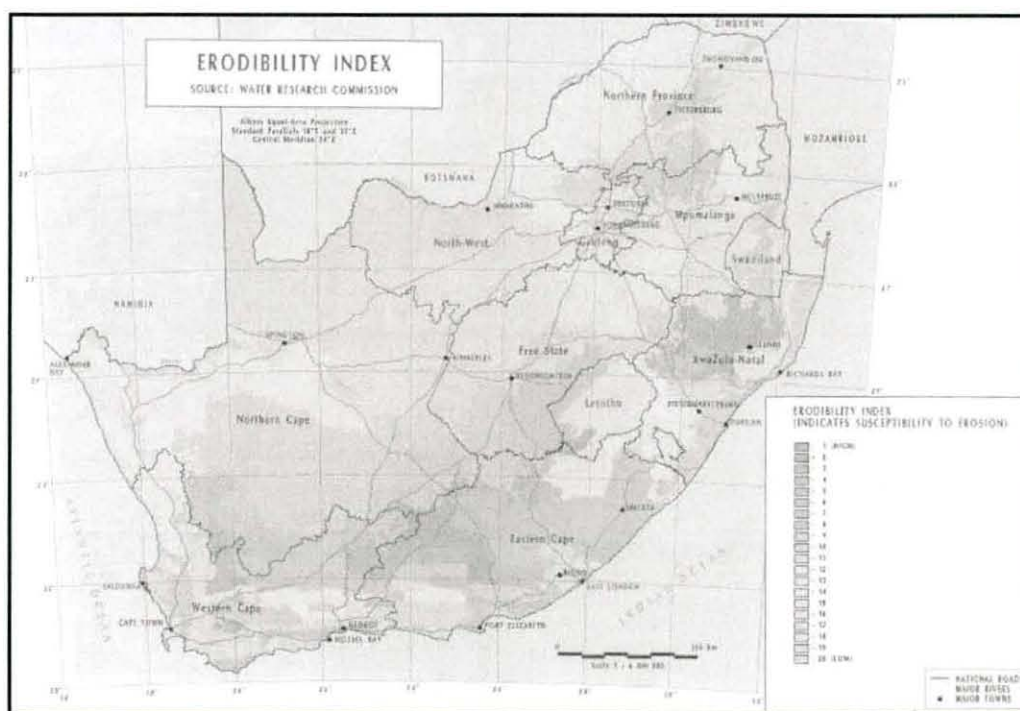
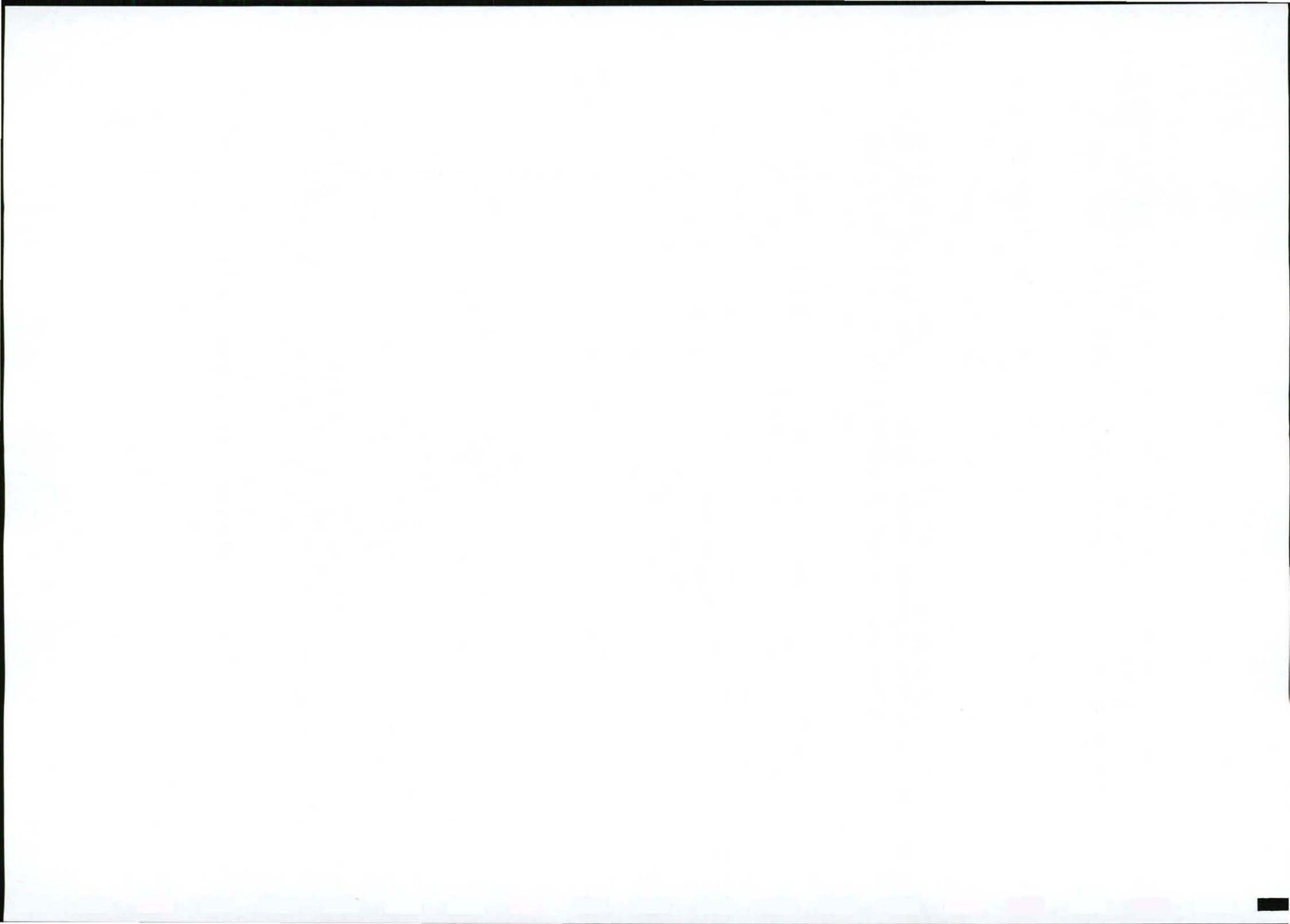


Figure 13: Erodibility Index



According to the Environmental Potential Atlas for South Africa, the study area falls within an Erodibility Index of between 7 and 9, which is at the lower end of the scale (1 being High and 20 being Low), indicating that the area is moderately to highly susceptible to erosion.

11.1.2 Topography and Drainage

The topography of this region consists of the high mountains of the Drakensberg in the interior with the rugged foothills of the mountains falling to a hilly central plateau which is bounded along its south-eastern edge by a coastal strip consisting of steep grassy hills separated by numerous deeply incised valleys. The area along the proposed route is characterised by rolling hills and gentle valleys.

The study area falls within Drainage Region T, which extends into the Mvoti to Mzimkulu Water Management Areas (WMA). The portion of Drainage Region T within the Mzimvubu to Keiskamma WMA contains the catchments of the Mthatha River (T20A to T20G) which rises at an altitude of about 1 600 m above mean sea level in the foothills of the Drakensberg (T20B), before flowing across the central plateau (T20B, T20C, T20D) and through the rugged topography of the 60 km wide coastal strip (T20E, T20F, T20G) to the sea.

The main river is the Mthatha River which drains the T20 catchment. There are also several smaller coastal rivers with the Mngazi River (T70) the most significant. The total catchment area is 5 526km², and the mean annual runoff (MAR) from the Mthatha River catchment is approximately 382 million m³.

11.2 Archaeology, Palaeontology & Heritage Sites

The Beaufort Group is Late Permian (255 million years) to Mid Triassic (237 million years) in age. Characteristic fossils include fish, amphibians and reptiles with a dominance of mammal-like reptiles (Therapsids). In addition, characteristic fossils include plant fossils of the *Glossopteris* flora with occasional invertebrate fossils (freshwater bivalve molluscs). Most of the fossils specimens represent groups that are now extinct. It is estimated that less than 5% of sites have been identified in the Eastern Cape.

No general listing of the sites of palaeontological, archaeological and historical significance within the area is available. The South African Heritage Resources Agency (SAHRA) does possess a database of National Monuments within each province, but this is only of limited use since it only lists National Monuments (as declared within the Government Gazette), and the vast majority of these occur within urban areas.



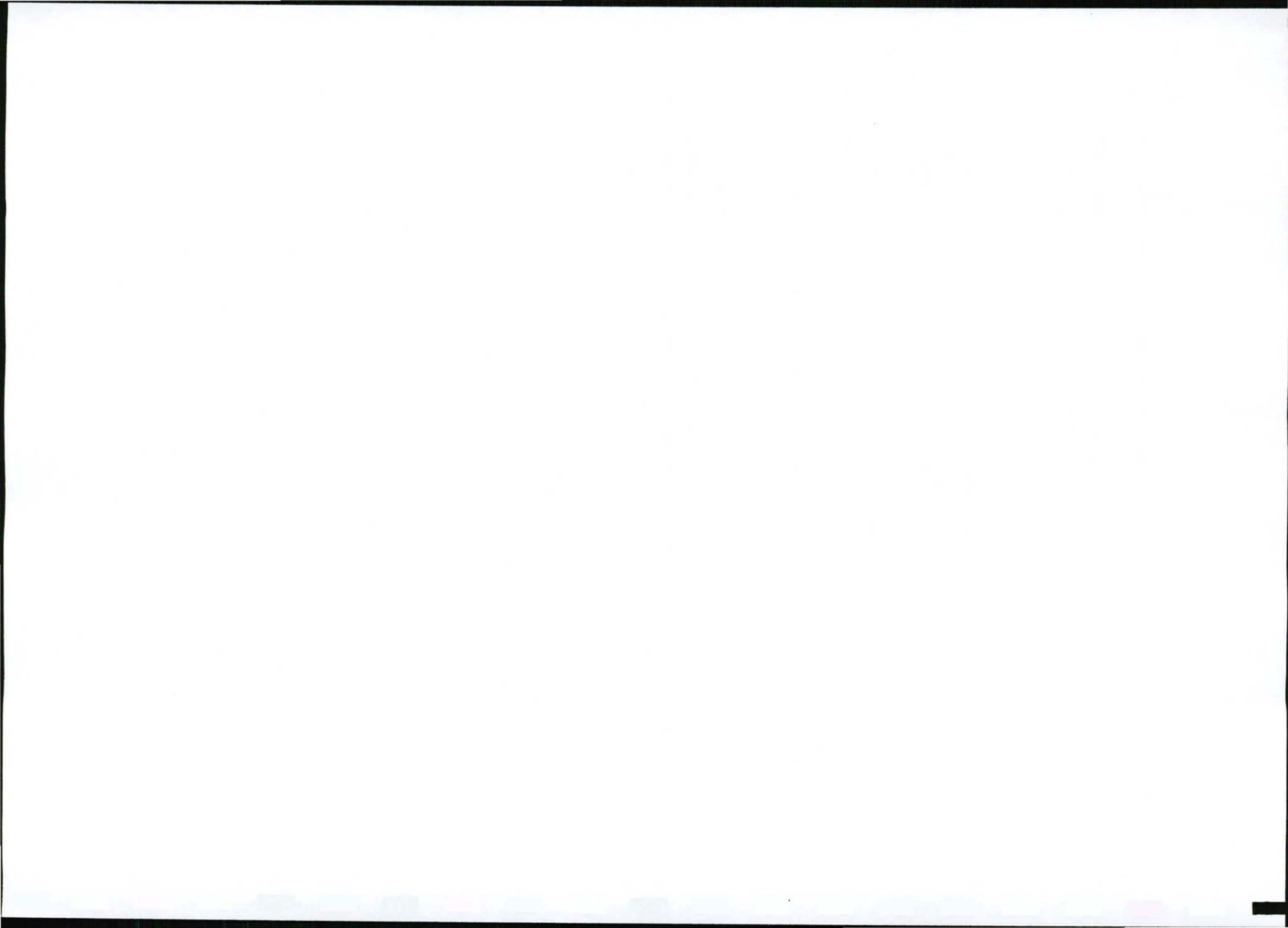
A Phase 1 Archaeological Impact Assessment was conducted and concluded that the assessment of the borrow pits yielded no archaeological or tangible heritage resources as defined and protected by the NHRA 1999.

The Palaeontological Desk Top Study concluded that apart from fossil wood, there are few palaeontological records for the Katberg succession in the Mthatha area. For these reasons, further mitigation by a professional palaeontologist was not regarded as necessary.

11.3 Climate

The mean annual temperature ranges between 20 °C along the coast and 8 °C on the border with Lesotho, with an average of 16.1 °C. Maximum temperatures are experienced in January and minimum temperatures usually occur in July. Frost occurs in the inland areas in winter, typically over the period from mid-May to late August and snowfalls occur on the mountains in the winter.

Rainfall occurs mainly in summer, but the winter months are not completely dry, with approximately 30% of the annual rainfall occurring between April and September. There is a great variation of the quantity of rainfall throughout the area. The mean annual precipitation (MAP) along the coastal region ranges from a low of 600 mm in the west to a high of 1 208 mm in the east, and varies from 400 mm to 1 200 mm in the central plateau and along the north.



11.4 Flora

11.4.1 General vegetation

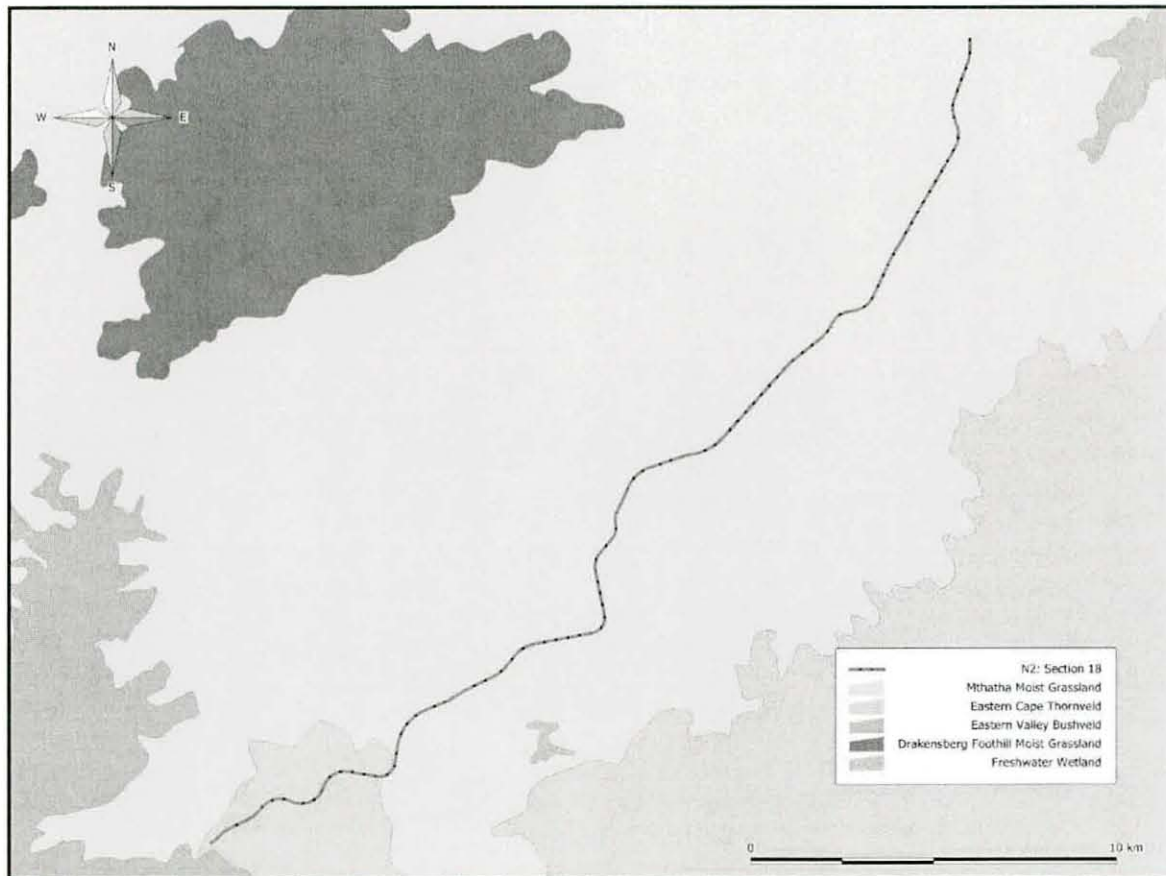
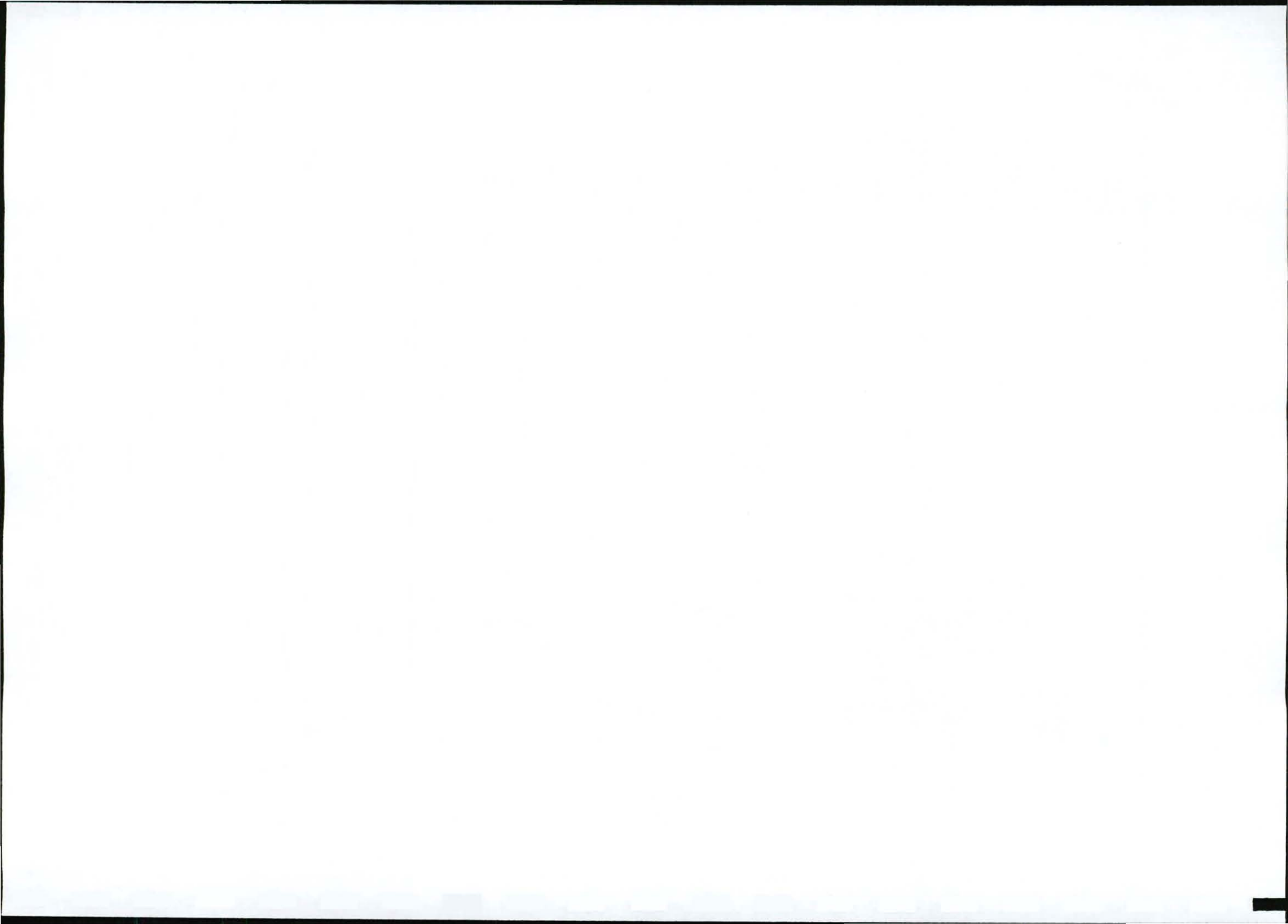


Figure 14: General vegetation and the proposed route.

The proposed route falls within Mthatha Moist Grassland according to Mucina & Rutherford (2006).

The Mthatha Moist Grassland is found on the plains between Mthatha and Butterworth and runs parallel to the coastline, but excludes valleys that intrude landwards into this vegetation unit. This unit supports a species-poor, sour, wiry grassland with *Eragrostis plana* and *Sporobolus africanus* being dominant. In good condition it is more likely to be dominated by *Themeda triandra*.

The conservation status of this vegetation unit is currently seen as "Endangered", with only a small fraction statutorily conserved in the Luchaba and Nduli Wildlife reserves. More than 40% has been transformed for cultivation, plantations or dense rural settlements. Previously cultivated, or fallow



lands, possibly constitute an estimated 25%. *Acacia mearnsii*, *Solanum mauritianum* and *Richardia humistrata* are the most important alien invasive species. Erosion is a serious problem, with high to very high erosion levels in 34% of this unit.

There is a high level of utilization of this unit leading to degradation and transformation. The vegetation unit shows various stages of over-utilization, and the shifting effects of development have caused continuous disturbance of the soil surface, which has led to secondary succession changes in the grassland. Poor grazing management has led to the dominance of unpalatable grasses and invasion by weedy, mostly alien, forbs.

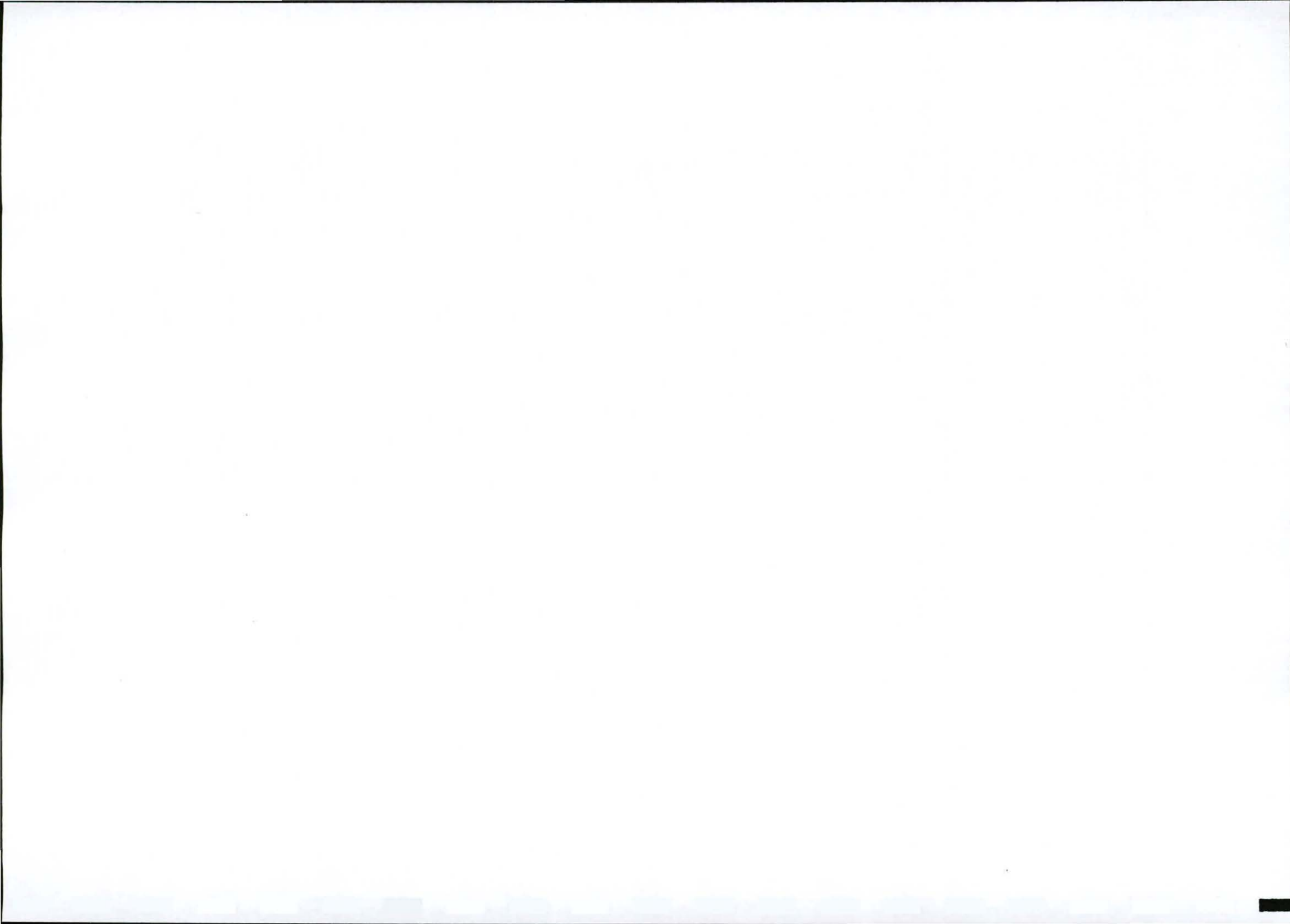


Table 2: Important Taxa - Mthatha Moist Grassland.

Graminoids	
<i>Abildgaardia ovata</i>	<i>Eragrostis plana</i>
<i>Alloteropsis semialata</i>	<i>Eustachys paspaloides</i>
<i>Aristida congesta</i>	<i>Harpochloa falx</i>
<i>Brachiaria serrata</i>	<i>Hemarthia altissima</i>
<i>Chloris virgata</i>	<i>Heteropogon contortus</i>
<i>Cymbopogon marginatus</i>	<i>Hyperrhenia hirta</i>
<i>Cynodon dactylon</i>	<i>Microchloa caffra</i>
<i>Cyperus heaematocephalus</i>	<i>Panicum ecklnii</i>
<i>Cyperus obtusiflorus</i>	<i>Paspalum dilatatum</i>
<i>Cyperus obtusiflorus</i>	<i>Paspalum scorbiculatum</i>
<i>Digiteria eriantha</i>	<i>Setaria nigrirostris</i>
<i>Digiteria ternate</i>	<i>Sporobolus africanus</i>
<i>Elionurus muticus</i>	<i>Themeda triandra</i>
<i>Eragrostis capensis</i>	<i>Tristachya leucothrix</i>
<i>Eragrostis curvula</i>	
Herbs	
<i>Cantella asiatica</i>	<i>Lobelia flaccida</i>
<i>Chamaecrista mimosoides</i>	<i>Pentanisia prunelloides</i>
<i>Cyanotis speciosa</i>	<i>Senecio coronatus</i>
<i>Eriosema salignum</i>	<i>Senecio retrorsus</i>
<i>Falkia repens</i>	<i>Sonchus dregeanus</i>
<i>Helichrysum rugulosum</i>	<i>Vernonia natalensis</i>
<i>Indigofera hedyantha</i>	<i>Vernonia capensis</i>
<i>Indigofera hiliaris</i>	<i>Wahlbergia stellarioides</i>
<i>Ipomoea crassipes</i>	
Herbaceous Climbers	
<i>Rhynchosia totta</i>	
Geophytic herbs	
<i>Boophone disticha</i>	
<i>Habenaria dives</i>	
Small Tree	
<i>Acacia natalitia</i>	
Low Shrubs	
<i>Coddia rudis</i>	
<i>Erica caffrorum</i>	
<i>Felecia filifolia</i>	
<i>Hermannia parviflora</i>	
<i>Senecio pterophorus</i>	



11.4.2 Eastern Cape Biodiversity Conservation Plan

A Biodiversity Land Management Class (BLMC) refers to the desired ecological state that a parcel of land should be kept in so as to ensure biodiversity persistence (designations may be at the scale of habitat patch, landscape or catchment). It can be described using sets of ecosystem condition indicators, referred to as Limits to Acceptable Change indicators (or LACs). LAC values are assigned for each BLMC to describe upper limits for the degree of acceptable ecological change or impact that any proposed land-use change may bring about without compromising the designated ecological state.

The borrow pits are located mainly in the following BLMC units (Figure 15):

- BLMC 2: Near natural landscapes: where the objective is to maintain the near-natural state with minimal loss in ecosystem integrity and functioning.
- BLMC 4: Towns & Settlements - where the objective is to manage land to optimize sustainable agricultural production.
- BLMC 4: Cultivated land - where the objective is to manage land to optimize sustainable agricultural production.
- BLMC 4: Plantation/woodlots - where the objective is to manage land to optimize sustainable agricultural production.
- Degraded Lands - Areas that have been degraded due to bad land use management practices and rural settlements.



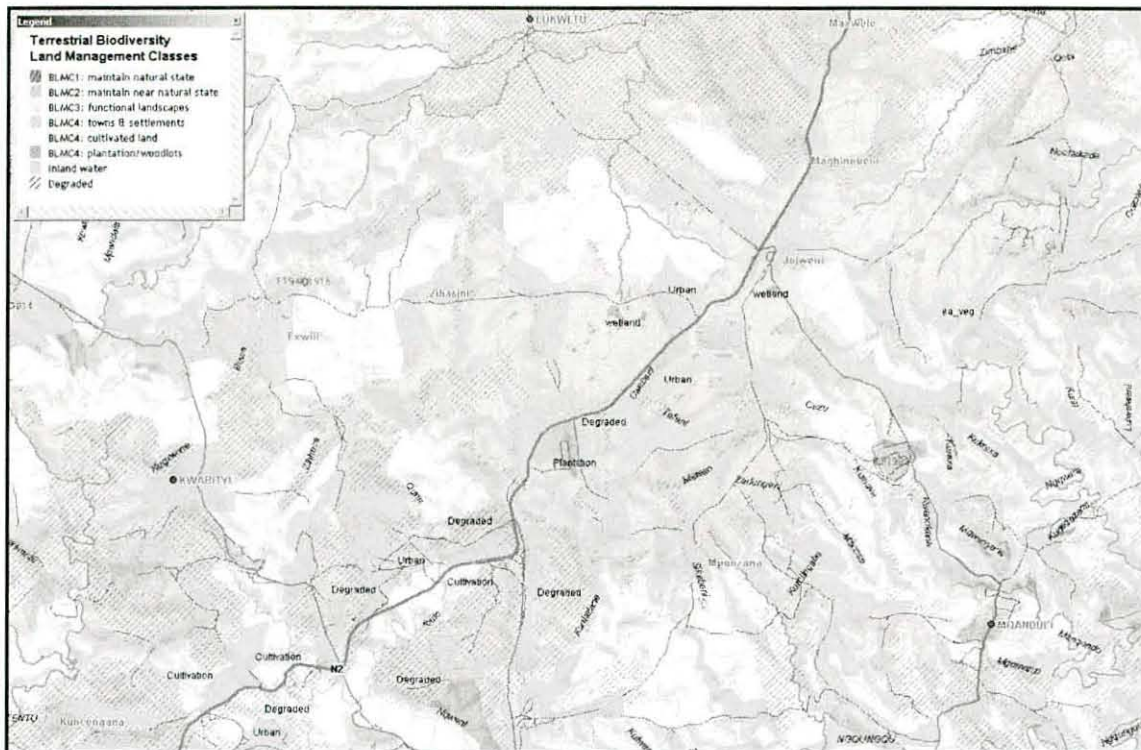
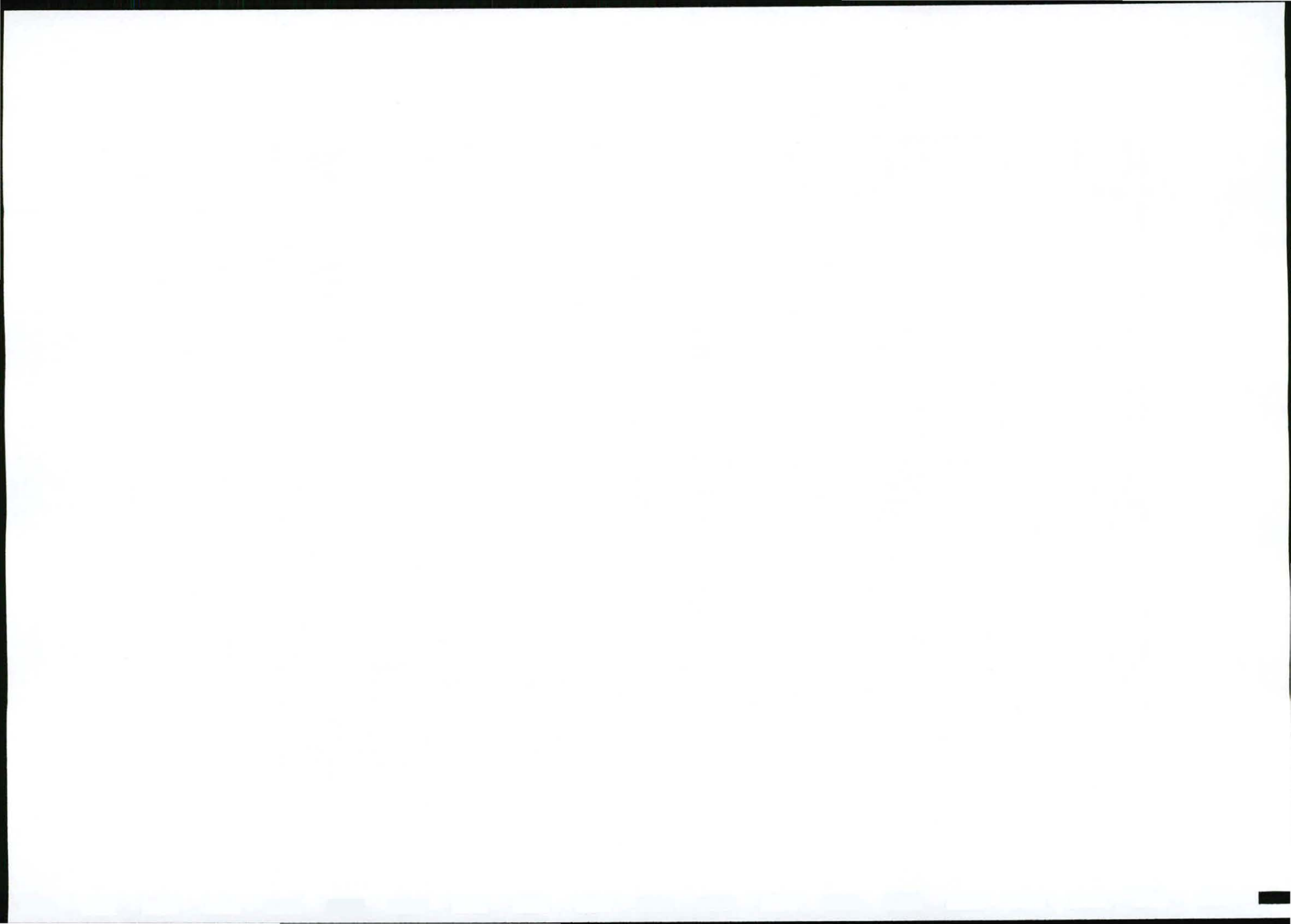


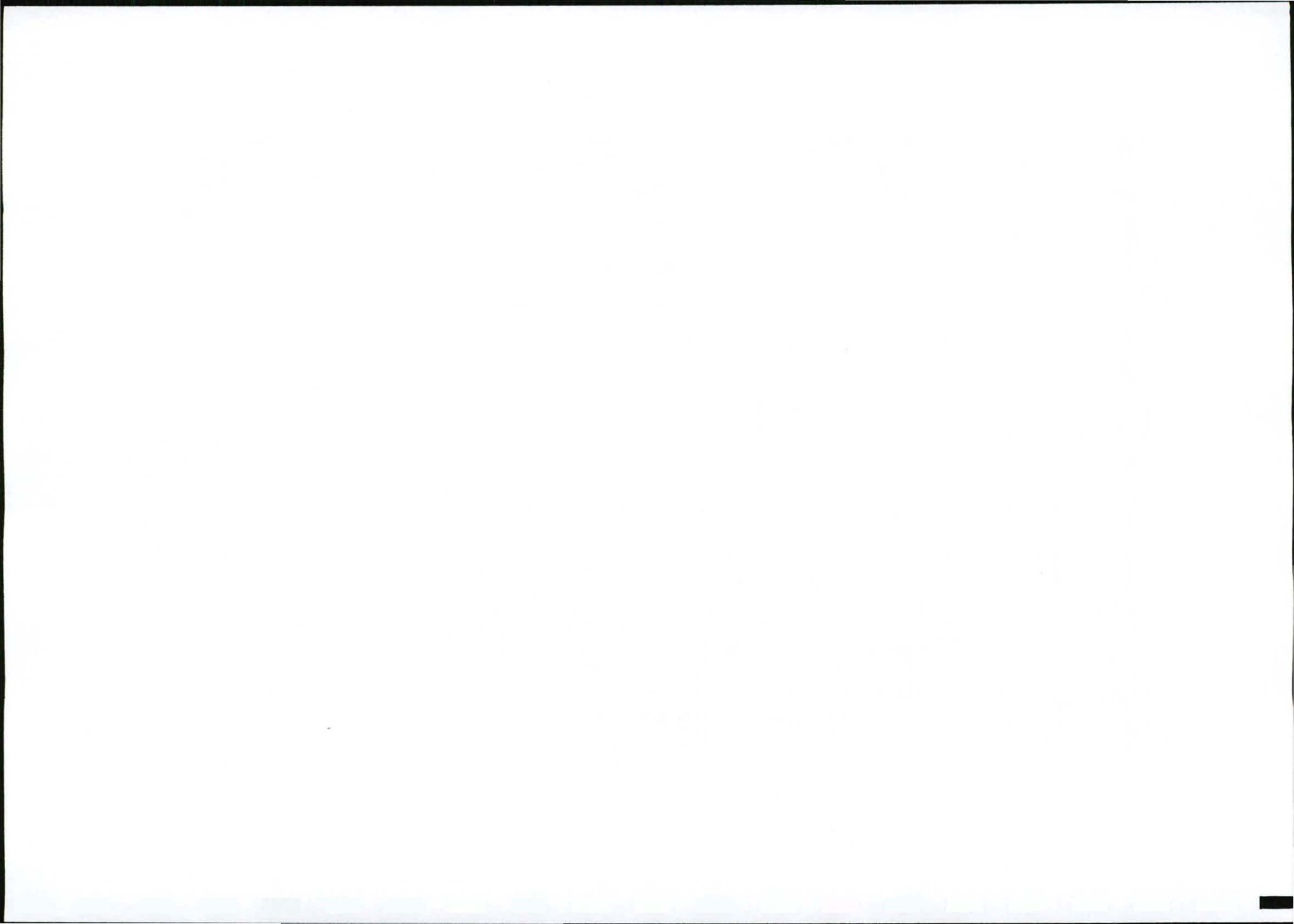
Figure 15: The ECBCP Map and the study area.

Table 3: Present Ecological State of the study area.

Aspect	Description
Landscape Description	
Aspect, Slope, Topography	Rolling hills with gentle valleys
Substrate	Sandstone & mudstone
Community Description	
Vegetation units	Predominantly transformed through past cultivation & grazing activities. Vegetation community dominated by grassland of the Mthatha Moist Grassland vegetation unit
Total Cover (%)	>90 %
Tree Canopy Cover (%)	>1 %
Shrub Cover (%)	>10%
Herb Cover (%)	< 5%
Grass Cover (%)	>80 %
Bare soil/rock (%)	<5 %
Estimated Tree Height (m)	< 5 m
Disturbances, current land uses and sources of degradation	
Human disturbances/impacts	Related to clearing activities for cultivation & grazing. Historical land abandonment prominent.
Invasive Alien Plants	Tend to be scant and isolated



Aspect	Description
Relative remaining intact habitat:	All areas with substantial remaining habitat
Grazing (livestock)	Cattle, sheep & goats
Hunting	None evident. Snaring & trapping likely to occur.
Conservation (flora)	No formalised conservation sites along route
Sensitivities	
Conservation importance	Moderate
Patterns of Biodiversity	
Flora	Natural indigenous grassland vegetation
Indigenous Species of Special Concern	None identified
Alien invasion	Low and isolated along route
Ecological Processes	
Barriers to gene dispersal	The presence of the road & fences would have also prevented the movement of some fauna and hence plant propagules (i.e. as their agents of dispersal).
Corridors for gene dispersal	Fences and utility structures (e.g. transmission lines, telephone lines) that act as perches for birds may be viewed as corridors for bird mediated seed dispersal.
Climatic gradients	None
Drainage Lines/ Riparian Vegetation	Highly eroded drainage lines present. Important from an ecological process perspective within associated drainage lines.
Refugia	Some exposed areas of minor significance and without atypical associated flora.
Erosion	High to very high in some places
Carbon storage	Moderate to Low in grassland
Food	The value of the study area as a direct source of food for human consumption is very low.
Fuel-wood (availability)	No collection observed, although bush clearing would have generated wood which may have been collected for fuel-wood. The Qunu Plantation is used for fuel-wood.
Building materials	No collection observed
Grazing	Used by cattle, sheep & goats
Conservation Importance	
Current Distribution (extent)	On the plains between Mthatha and Butterworth and runs parallel to the coastline.
Relative Conservation importance (local)	Moderate - dependence on grazing land
Relative Conservation importance (regional)	High - dependence on grazing land



11.5 Fauna

11.5.1 Reptiles & Amphibians

Of the 480 reptiles recorded from South Africa at least 130 of these occur within the Eastern Cape, and comprise eleven chelians (including sea-turtles, terrapins and tortoises), seventy-two lizards, and forty-six snakes. Despite this high diversity, only twelve reptile taxa are endemic to the Eastern Cape, and none of these endemic to the study area.

There are 102 amphibian species recorded in South Africa and about 47% of these occur in the Eastern Cape. One of these is an Artholeptid (frog), one is a Pipid (aquatic frog), three are Helephrynids (frogs which live in mountain streams and are endemic to South Africa), nine are Bufonids (true frogs) three are Bevicepids (stout bodied frogs) twenty-one are Ranids (frog family) and nine are Hyperolids (reed frogs). The amphibians of the province are an important component of the vertebrate diversity of the province.

Approximately 60 species of reptiles may occur along the proposed route. Whilst some are wide-ranging species (e.g. snakes such as the boomslang and puff adder), others have relatively restricted distributions. Sensitive and localised species may include the common slug-eating snake (*Duberria lutrix*) and the giant legless skink (*Acontias plumbeus*). Although several isolated populations of dwarf chameleons are known to occur in isolated populations in forest and thicket habitat in the study area, no species are likely to occur adjacent to the proposed route. New chameleon species have been described from the Mkambati Nature Reserve, the Mthamvuna Nature Reserve and the Oribi Gorge region.

11.5.2 Mammals

A total of three hundred and thirty eight mammals are recorded for South Africa, and the study area falls within the distribution range of ninety of these species. Of this ninety species, none are endemic to the Eastern Cape or the study area. The dominant small mammal species associated with Coastal Grasslands and Acacia Savannah's are *Rhabdomys pumilio* (Striped mouse) and *Otomys irroratus* (vlei rat). Other relatively common animals include various mole species, mole rats, *Orycteropus afer* (Aardvark) and *Cynictis penicillata* (Yellow Mongoose).

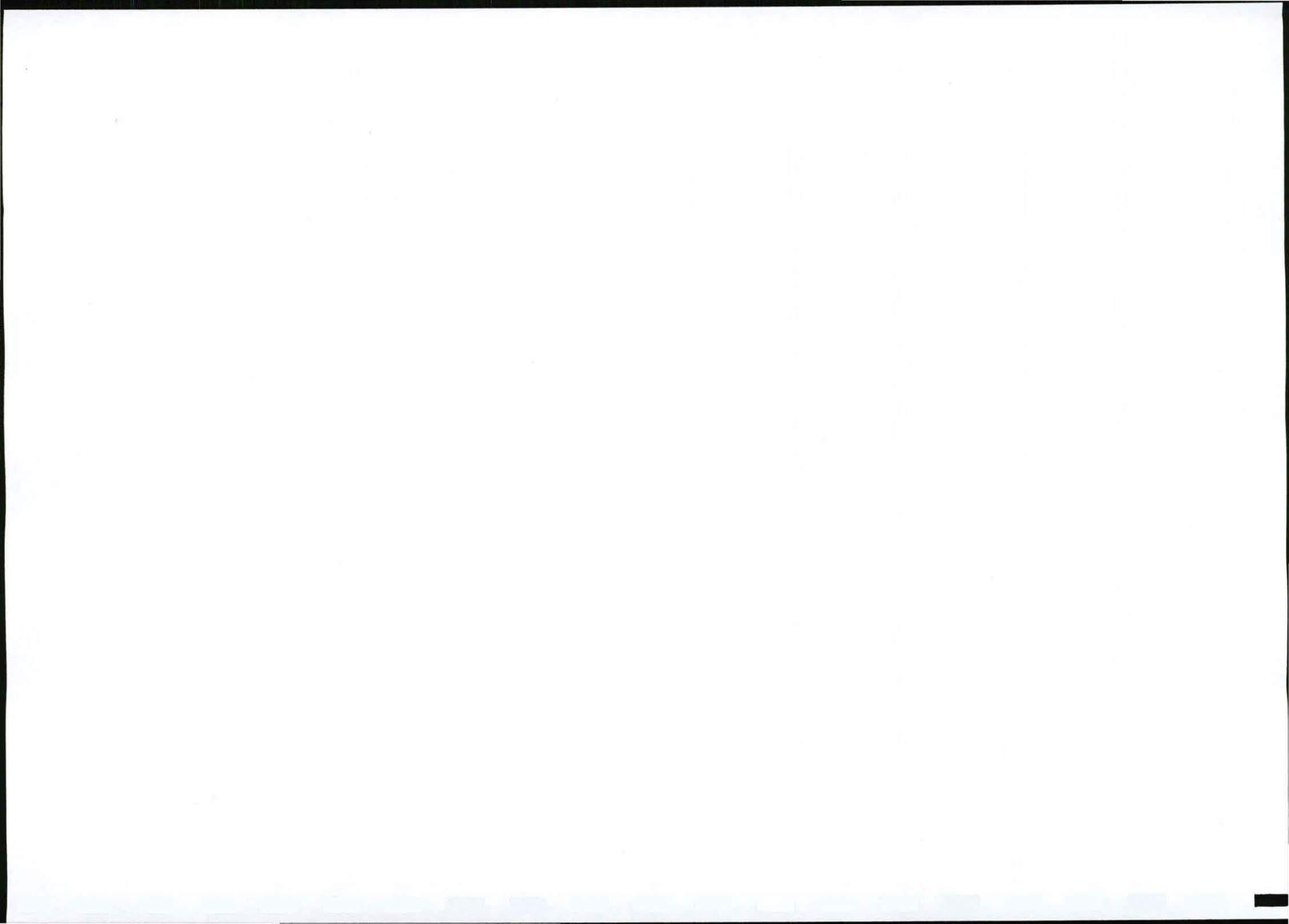


Table 4: Terrestrial Mammal Red Data Book (RDB) Species.

SPECIES	COMMON NAME	RDB STATUS
<i>Alerix frontalis</i>	South African hedgehog	Rare
<i>Felis lybica</i>	African wild cat	Vulnerable
<i>Mellivora capensis</i>	Honey badger	Vulnerable
<i>Mystromys albicaudatus</i>	White-tailed mouse	Vulnerable
<i>Orycteropus afer</i>	Aardvark	Vulnerable
<i>Poecilogale albinucha</i>	Striped weasel	Rare
<i>Proteles cristatus</i>	Aardwolf	Rare
<i>Suncus infinitesimus</i>	Least dwarf shrew	Indeterminate

Approximately 80 mammal species have been recorded, including insectivores, bats, primates, lagomorphs, rodents, carnivores, ant bear, hyrax, bush pig and small antelope species. However, the surviving mammal fauna of the Wild Coast is now impoverished by the local extinction of many of the mega-herbivores (elephants, buffalo, rhino, eland, etc.). Few mammals of conservation concern now survive in the study area with only a few large mega-herbivores, such as the bushbuck, common duiker and Cape Grysbok surviving. In addition, the Chacma baboon, Vervet Monkey, bush pig and a variety of small carnivores survive in small pockets. All are non-threatened and many have successfully adapted to surviving in peri-urban areas. Large and medium-sized mammals thought to be locally extinct may still occur in small fragmented populations in isolated forests.

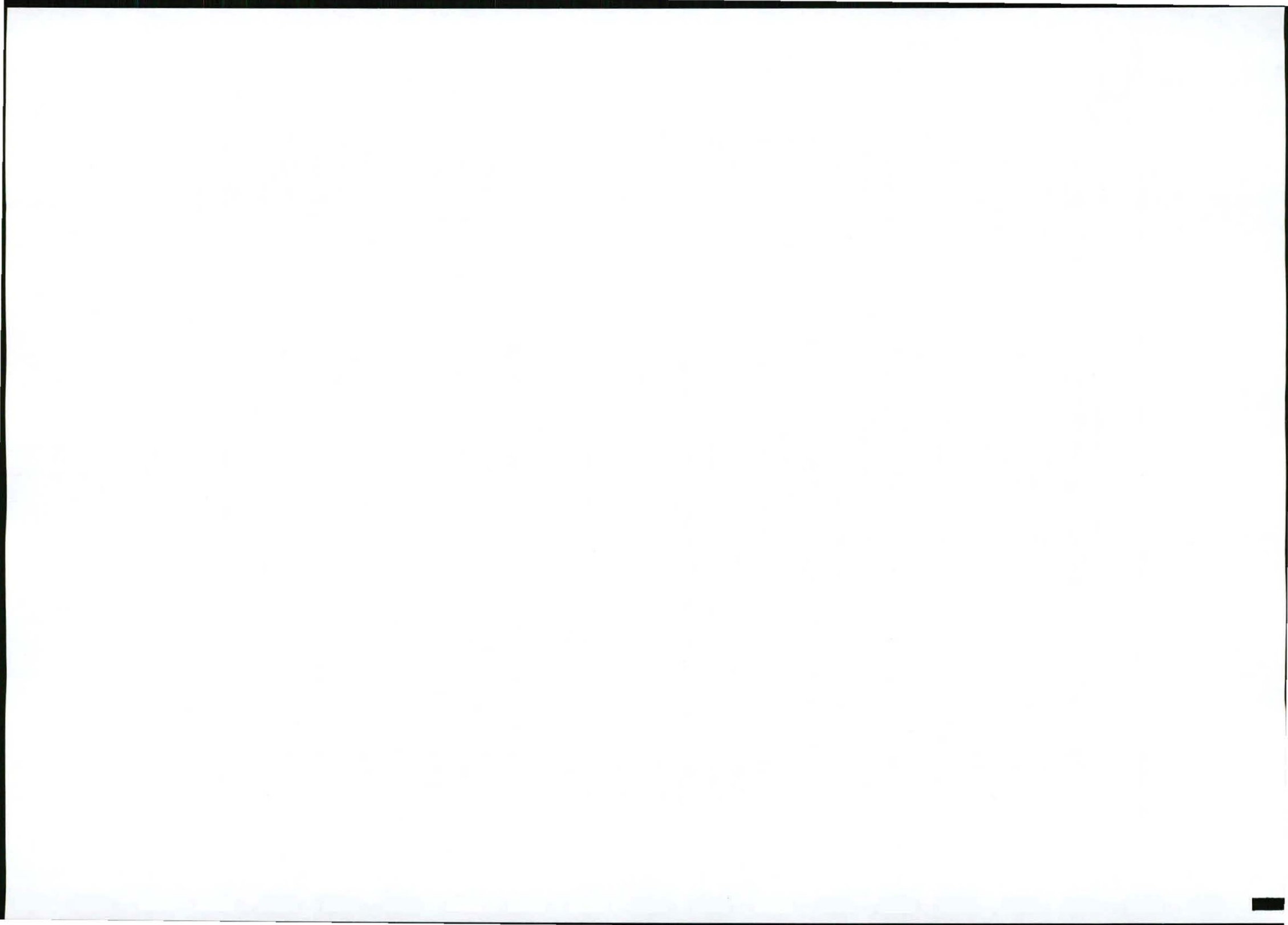
11.5.3 Birds

From a vast number of bird species in the Eastern Cape, only *Accipter melanoleucus* (Black sparrow hawk) has Red Data Book status, but this species is no longer considered threatened.

The former Transkei region has a rich avifauna with nearly 500 species recorded from the region. Of these, numerous are sensitive and threatened species. The coastal mosaic of grassland and forest habitats are important areas for montane species in the winter and many Intra-African summer migrant birds also use the region both for breeding and in transit to more southerly areas.

11.6 Socio - Economic Environment

Although the Mthatha key area is heavily populated, it has a low level of economic development, with the level of economic activity gradually decreasing. This is to some extent offset by growth in the informal sector. Most industries and businesses which once flourished in the area and particularly in Mthatha town, the former capital of the Transkei, have since relocated, mainly to East



London because of better access to markets. The subsidy structures which once favoured investment in Mthatha are no longer in place.

There are also several smaller rural and coastal towns in the key area. Rural poverty and lack of employment present serious problems, and major intervention would be required to bring about an economic turnaround in this key area. Any developments should be focused on creating employment and poverty eradication. The Provincial Growth and Development Strategy identified the urgent need to stimulate economic development in the whole area and particularly the Mthatha key area. The agricultural sector is poorly developed and largely of subsistence nature, with small patches of irrigation taking place with water use estimated at about 2 million m³ per annum. The Langeni Forest is seen as a major contributor to the economic value added and employment of this key area. There are two main sawmills in the area, Langeni and KwaBhaca. Relatively little manufacturing based on commercial timber is taking place.

The OR Tambo District Municipality's IDP Report indicate that government and community services have the largest share of the district economic output at 43% followed by trade (22%), agriculture (12%), manufacturing (5%), transport (4%), construction (2%), electricity (0%) and mining (0%). The report also indicates that the King Sabata Dalindyebo Local Municipality plays a major role in the OR Tambo District Municipality's economy as it contributes more than any other municipality in all sectors of the district economy, with the exception of mining. Of significance is the important role that Mthatha plays as a single major contributor to both the secondary and tertiary sectors of the district.



12 Potential Issues & Environmental Impacts

12.1 Geology & Soils

Soil may be lost due to vegetation removal, soil erosion, soil pollution as a result of spillages and loss of viability due to compaction. The topsoil is a particularly scarce resource in this environment, and must therefore be protected against wind, erosion, compaction, alien invasive plant species and pollution as the topsoil will be needed for rehabilitation purposes. The borrow pits are not normally associated with blasting activities and should therefore not have a significant impact on the geology of the area.

12.2 Topography & Drainage

The topography may be impacted upon by extensive cut and fill sections being created during mining activities. This could in turn have an effect on the storm water runoff and drainage of the immediate surrounding areas.

12.3 Consumption of Non-renewable Resources

The mining activities may impact on the local and regional natural resources as soil and hard rock will be used during construction activities. The proposed quantities mined from the borrow pits can be seen as relatively low and should therefore not deplete local or regional resources significantly.

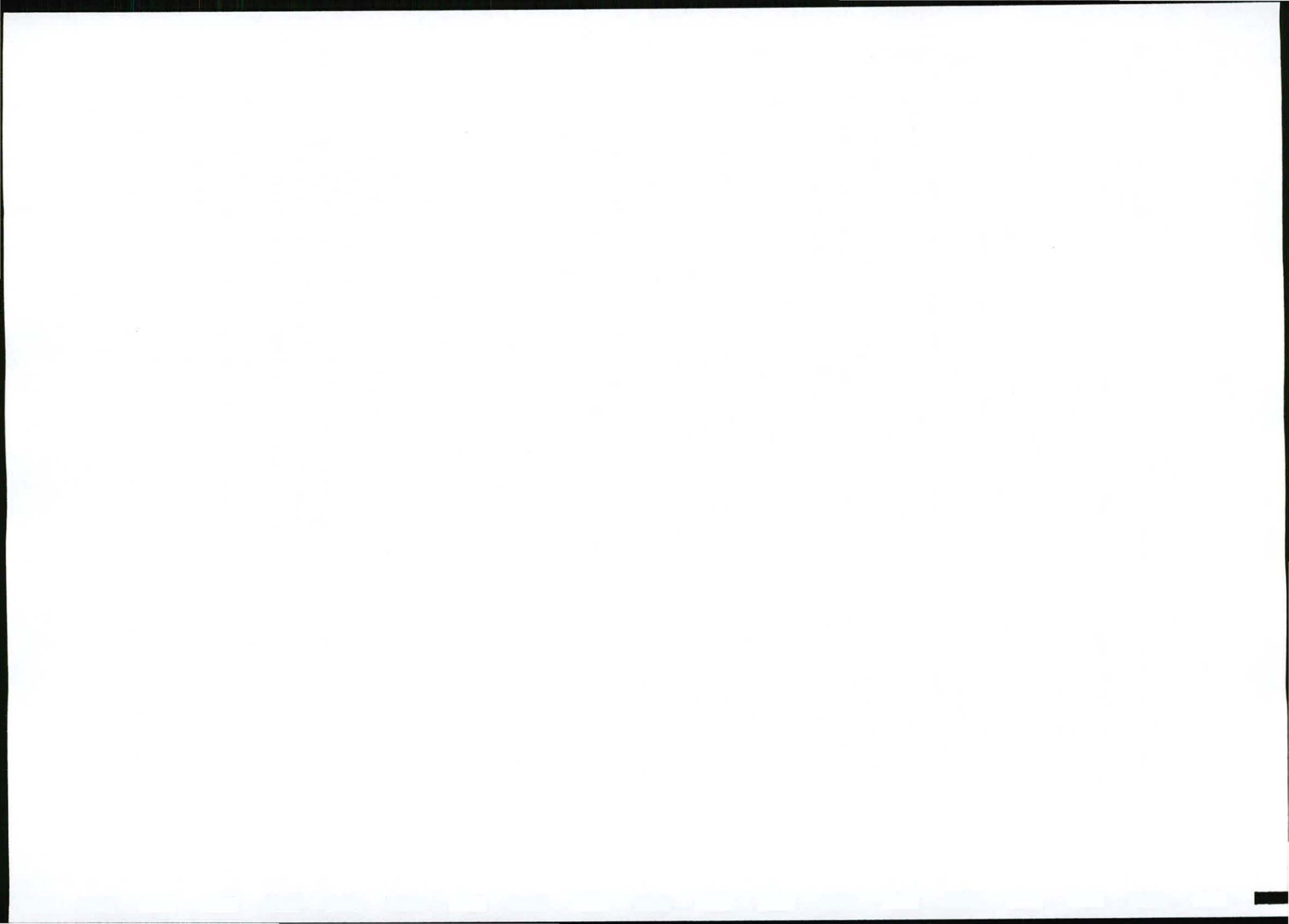
12.4 Surface Water

Surface water may become polluted via point source and/or diffuse discharge such as oil, fuel and chemical spills. Construction activities may also lead to soil erosion, which could lead to sedimentation of the rivers, and subsequently, the water quality. This may lead to an impact on downstream biota of the river/stream. None of the borrow pits are located within 100m of a water course.

If any surface water is to be abstracted for construction purposes then the contractor must obtain a permit from the Department of Water Affairs prior to any abstraction taking place.

12.5 Groundwater

Groundwater may also become polluted via point source and/or diffuse discharge such as oil, fuel and chemical spills. Petroleum products released to the environment migrate through soil via two general pathways, namely, as bulk flow infiltrating the soil under the forces of gravity and capillary action, and, as individual compounds separating from the bulk petroleum mixture and dissolving in air or water. As the products migrate through the soil column, a small amount of the product mass is retained by soil particles.



The bulk product retained by the soil particles is known as "residual saturation", and depending upon the persistence of the products, residual saturation can potentially reside in the soil for years. Residual saturation is important as it determines the degree of soil contamination and can act as a continuing source of contamination for individual compounds to separate from the bulk product and migrate independently.

If any groundwater is to be abstracted for construction purposes then the contractor must obtain a permit from the Department of Water Affairs prior to any abstraction taking place.

12.6 Vegetation Removal and Habitat Disturbance

Seven (7) out of the eight (8) borrow pits are existing, and has therefore been disturbed significantly, with few of the borrow pits showing more than 30% vegetation cover. Borrow pit #7 is the only new borrow pit proposed for the improvement of N2: Section 18. It is therefore a "greenfields site", however the area has been severely degraded by footpaths and tracks formed by the people and livestock, which lead to minimal vegetation cover. As such it is not expected to have a significant impact on the vegetation of the area.

Majority of the borrow pits are located within areas where there is a high level of utilization leading to degradation and transformation. The vegetation units show various stages of over-utilization, and the shifting effects of development have caused continuous disturbance of the soil surface, which has led to secondary succession changes in the grassland. Poor grazing management has led to the dominance of unpalatable grasses and invasion by weedy, mostly alien, forbs.

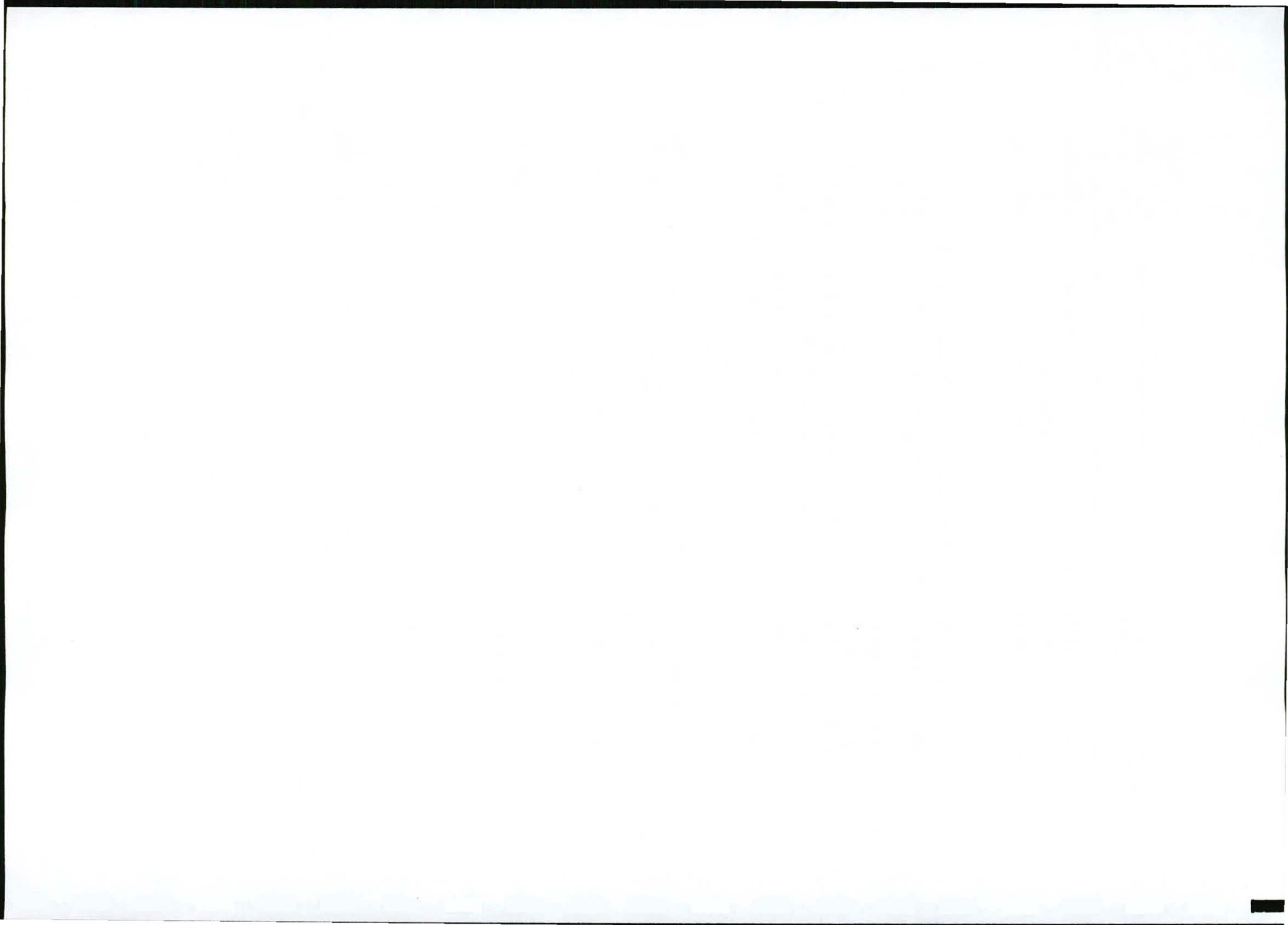
Rehabilitation should however form an integral part of the post construction phase in order to avoid further soil erosion, vegetation removal and alien invasive weeds.

12.7 Air Quality

The air quality may be impacted upon by the mining activities due to dust generation and fugitive emissions from construction, excavation and hauling vehicles

12.8 Visual Impact

Borrow pit activities may lead to dust generation and vegetation removal which could have a visual impact visually on the rural character of the area.



12.9 Archaeology, Palaeontology & Heritage Sites

An Archaeological Impact Assessment was conducted on the proposed borrow pits. Assessment of the borrow pits yielded no archaeological or tangible heritage resources as defined and protected by the NHRA 1999.

The Palaeontological Desk Top Study concluded that the overall impact of the proposed development on palaeontological heritage is likely to be minor because:

- The Katberg Formation in the Mthatha region is, as far as known, only sparsely fossiliferous (plant fragments and rare tetrapod bones, teeth).
- Many of the potentially fossiliferous Katberg Formation sediments have probably been extensively baked by nearby dolerite intrusions.

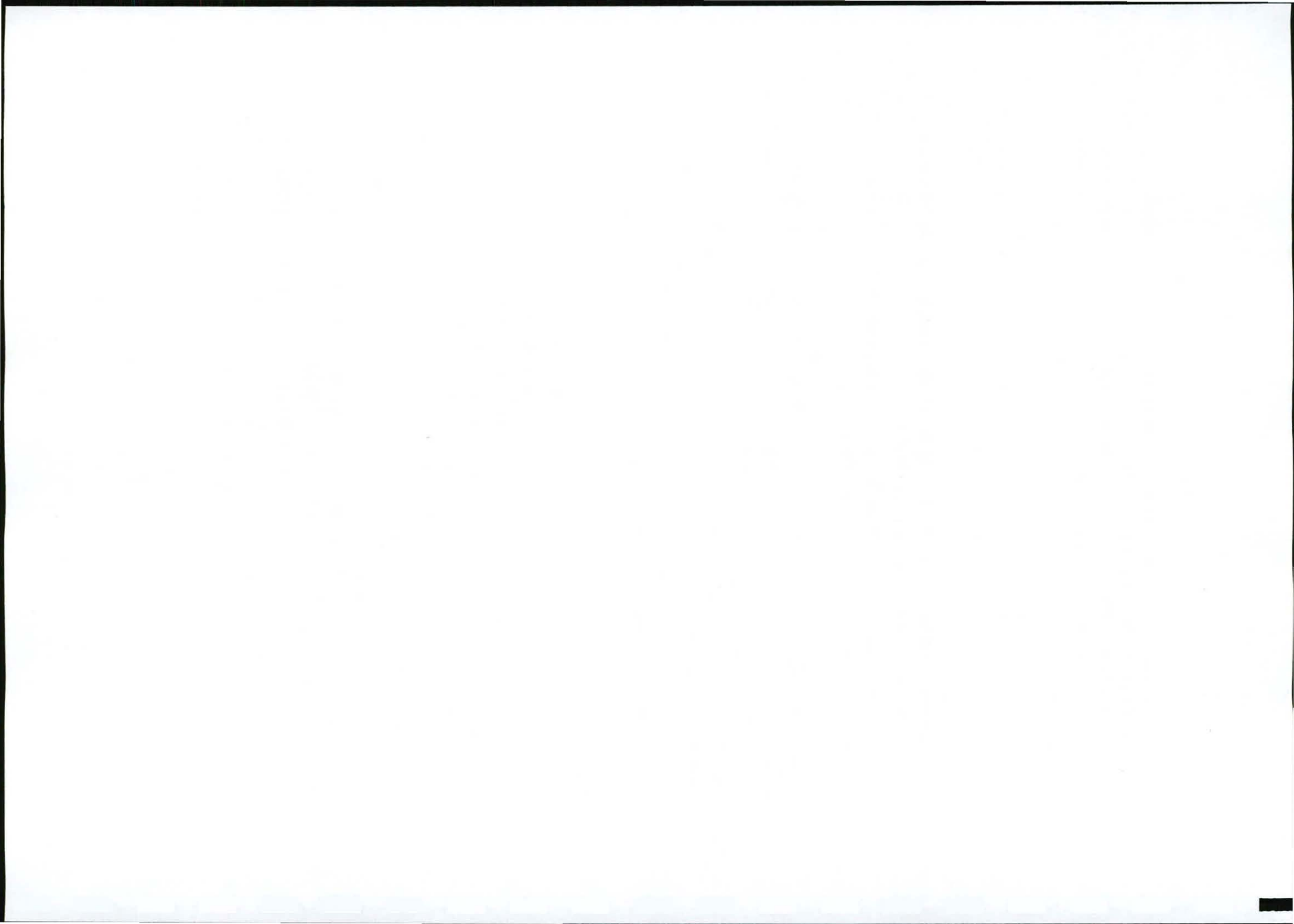
Specialist palaeontological mitigation of this development is therefore not regarded as necessary at this stage. However, deep excavations into fresh (un-weathered) Beaufort Group bedrock during the proposed development may reveal palaeontologically useful fossil material of Early Triassic age. Fossil vertebrates (bones, teeth, traces such as burrows or track ways), vertebrate burrows or plants from these beds would be of particular interest because there has been little formal collection in this area and new finds may well help resolve current ambiguities regarding the Beaufort Group biostratigraphy in the Eastern Cape.

12.10 Land use

Seven (7) out of the eight (8) borrow pits are existing, and has therefore been disturbed significantly, with few of the borrow pits showing more than 30% vegetation cover. As such the land use of the areas will remain as is. Borrow pit #7 is the only new borrow pit proposed for the improvement of N2: Section 18. It is therefore a "greenfields site", however the area has been severely degraded by footpaths and tracks formed by the people and livestock, which lead to minimal vegetation cover. As such it is not expected to have a significant impact on the land use of the area as there is an existing road leading to the school which can be used by the people and livestock.

12.11 Socio-Economic Environment

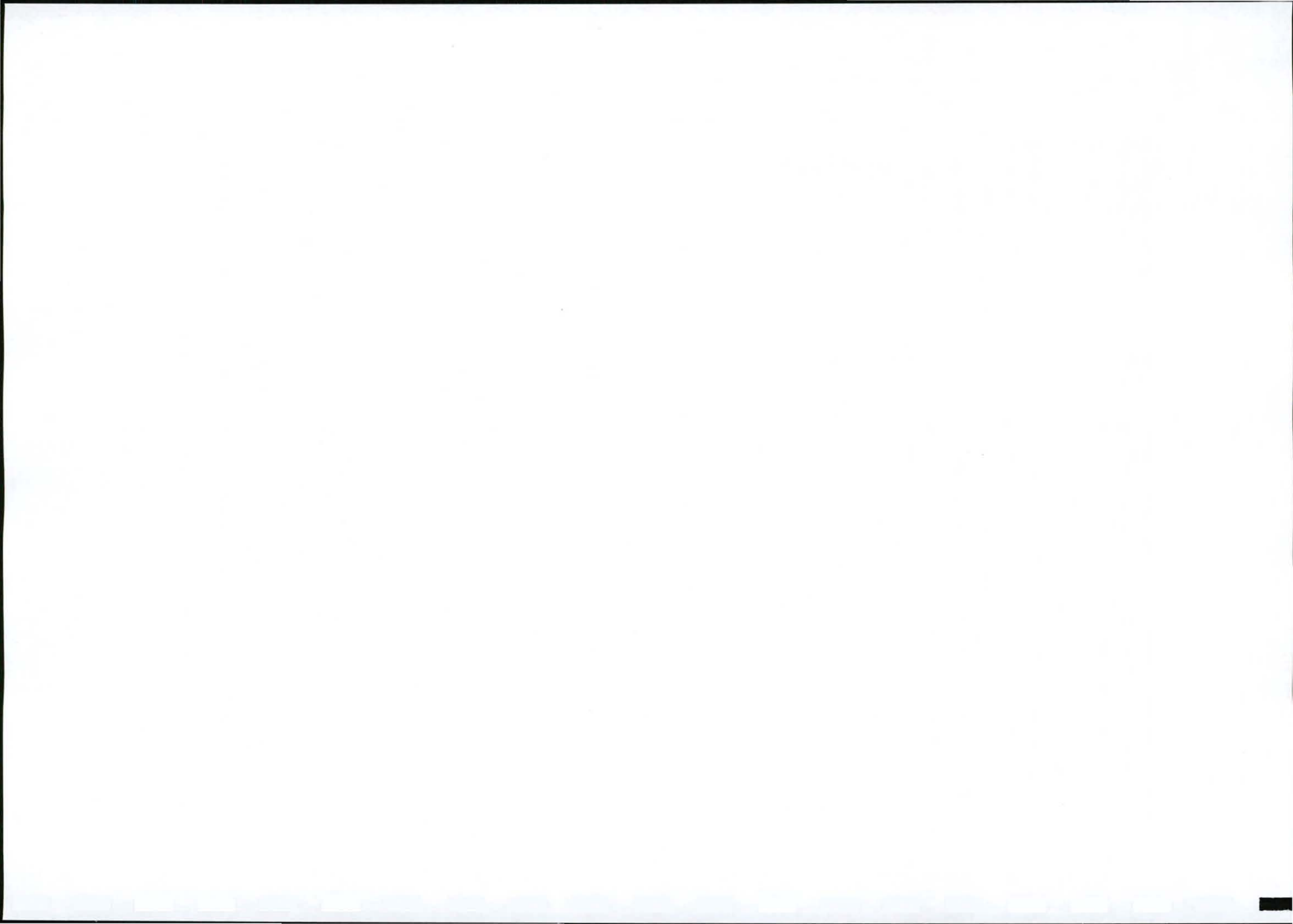
The local community could benefit through employment, income generation, skills development and small business enterprises (i.e. fencing companies). These benefits may be enhanced with focused procurement and by employing labour intensive methods during construction and



rehabilitation of the borrow pits. Labour should be sourced from the target area so that those affected stand to benefit the most.

12.11.1 Health and Safety

There are certain risks posed to human health & safety via exposure to high noise and dust levels, as well as steep and/or unstable faces formed during mining activities. Community health and safety risks should be controlled through the implementation of a Health & Safety Management Plan to be implemented by the contractor. Existing unsafe excavations (with vertical faces) should be "made safe" on closure.



13 Environmental Impact Assessment

13.1 Environmental Impact Assessment Risk Assessment

Environmental impact is assessed using an in-house methodology and software (EIA-RA 05[®]), developed by BESC, which operates a 3-D risk assessment protocol based on severity of impact, duration of impact and confidence of impact occurring.

The first step in assessing any environmental impact to listed possible activities or processes that are likely to occur and then identify any resultant or consequential environmental issue. The potential impact associated with an environmental issue is then identified as is the spatial range that any such impact would affect or take place in. The assessment is undertaken under two primary conditions, namely:

- Degree of impact WITHOUT environmental management protocols in place
- Degree of impact WITH environmental management protocols in place

To achieve this, information on severity of impact, duration of impact and confidence of impact occurring are entered, with a risk assessment output for each environmental impact being computed. The environmental impacts are thus categorised into ten negative impact categories and a four positive impact categories.

The ten negative categories are arranged on a scale of importance from category 1 being most negative and category 10 being least negative. Whilst the positive impact categories are arranged on a similar scale whereas category A is most positive and category D being least positive. In order to place a degree of significance to each impact (positive and negative), significance of impact has been defined as:

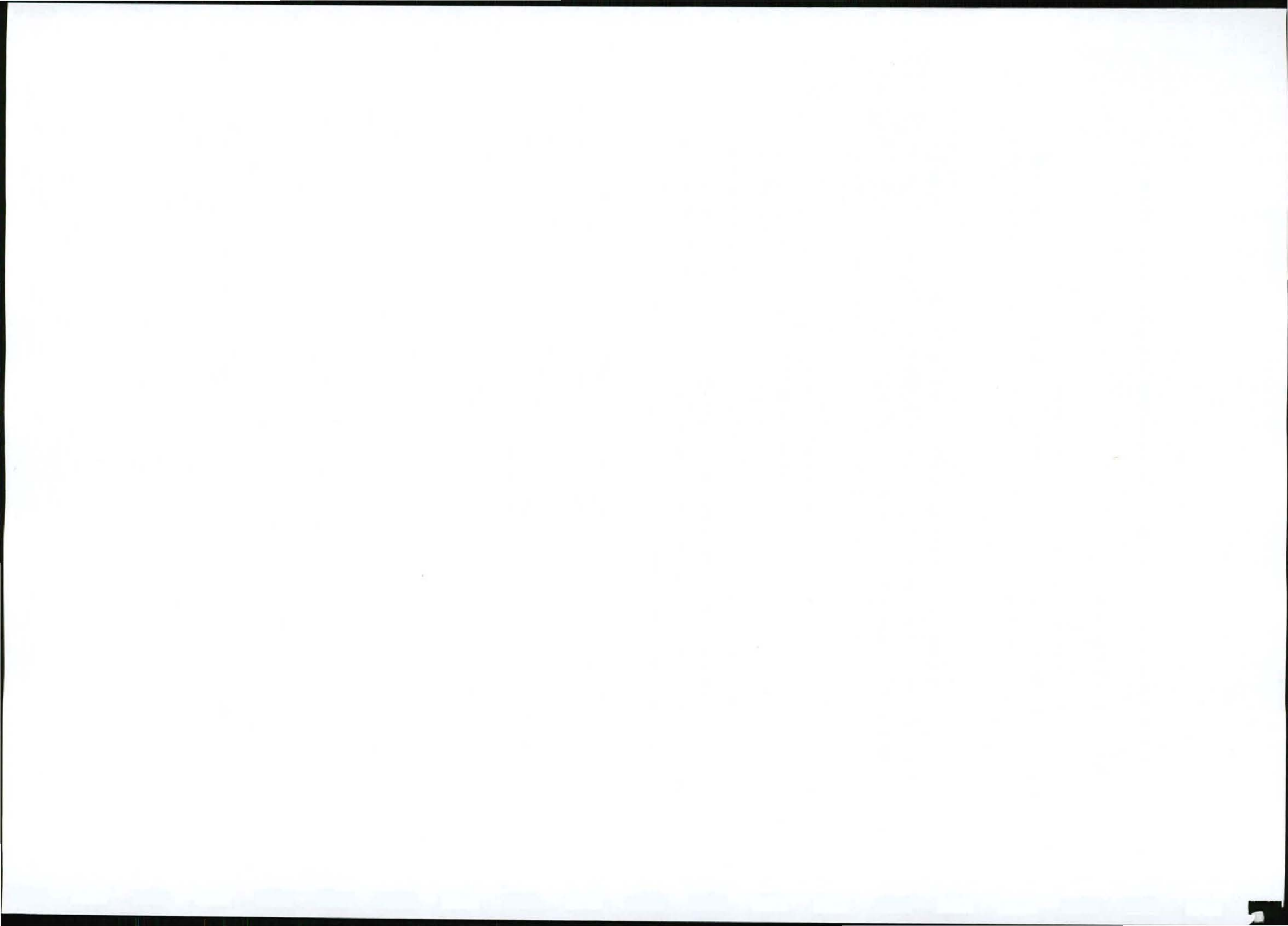
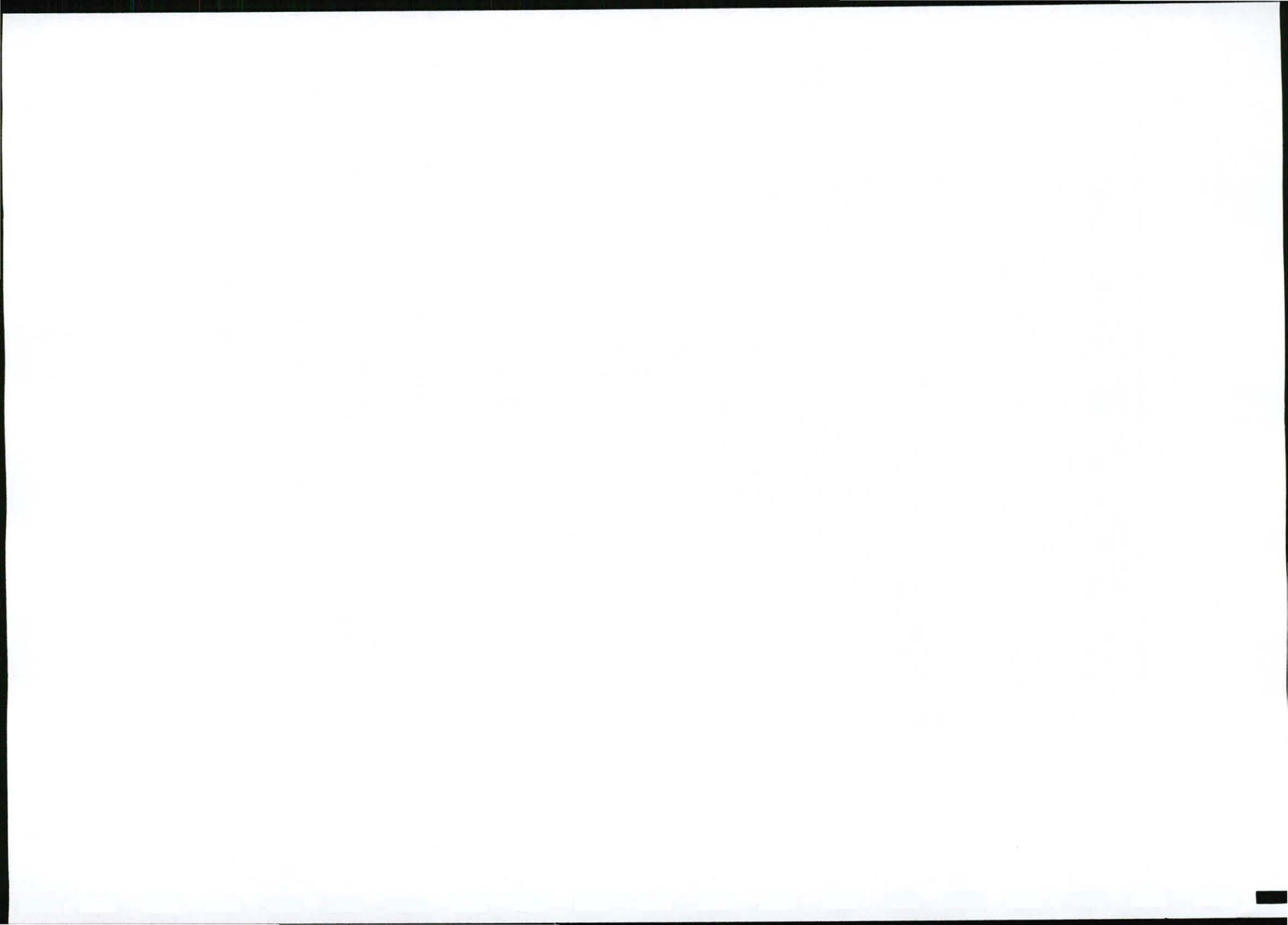


Table 5: EIA-RA 05^o - Risk Assessment Ratings.

Significance	Categories	Definition
Very High	1 & 2	<p>These impacts would be considered by society as constituting a major and usually permanent change to the (natural and/or social) environment.</p> <ul style="list-style-type: none"> ○ Example: The loss of a species would be viewed by informed society as being of VERY HIGH significance.
High	3 & 4	<p>These impacts will usually result in long term effects on the social and/or natural environment. Impacts rated as HIGH will need to be considered by society as constituting an important and usually long term change to the (natural and/or social) environment. Society would probably view these impacts in a serious light.</p> <ul style="list-style-type: none"> ○ Example: The loss of a diverse vegetation type, which is fairly common elsewhere, would have a significance rating of HIGH over the long term, as the area could be rehabilitated.
Moderate	5, 6 & 7	<p>These impacts will usually result in medium to long term effects on the social and/or natural environment. Impacts rated as MODERATE will need to be considered by society as constituting a fairly important and usually medium term change to the (natural and/or social) environment.</p> <ul style="list-style-type: none"> ○ Example: The loss of a sparse, open vegetation type of low diversity may be regarded as MODERATELY significant.
Low	8, 9 & 10	<p>These impacts will usually result in medium to short term effects on the social and/or natural environment. Impacts rated as LOW will need to be considered by the public and/or the specialist as constituting a fairly unimportant and usually short term change to the (natural and/or social) environment. These impacts are not substantial and are likely to have little real effect.</p> <ul style="list-style-type: none"> ○ Example: The temporary change in the water table of a wetland habitat, as these systems are adapted to fluctuating water levels. <p>or,</p> <p>There are no primary or secondary effects at all that are important to scientists or the public.</p> <ul style="list-style-type: none"> ○ Example: A change to the geology of a particular formation may be regarded as severe from a geological perspective, but is of NO significance in the overall context.
Positive	A, B, C, D	<p>Any beneficial impact to the environment:</p> <p>A = Very Beneficial</p> <ul style="list-style-type: none"> ○ Example: Protection of an environmental asset or removal of an existing/latent negative environmental impact; <p>B = Beneficial</p> <ul style="list-style-type: none"> ○ Example: Improve management of the environment; <p>C = Moderately Beneficial</p> <ul style="list-style-type: none"> ○ Example: Removal of alien species from the property; <p>D = Slightly Beneficial</p> <ul style="list-style-type: none"> ○ Example: Minor improvement that has no material significance to the immediate environment.



13.2 Sensitivity

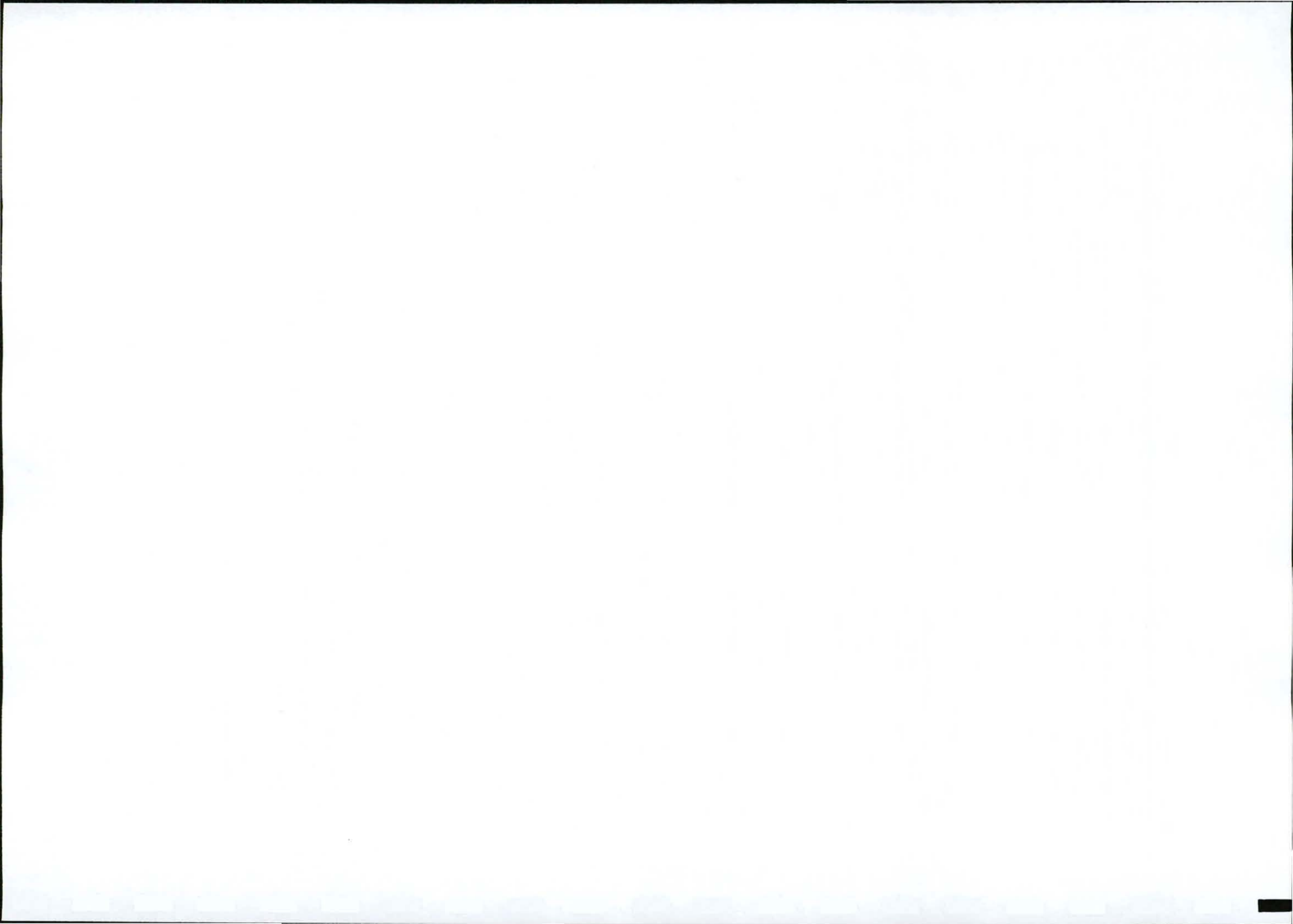
An overall sensitivity assessment will be made by including condition or state of degradation, invasion status, extent and relative importance of the vegetation types as well as the degree to which successful rehabilitation can take place. Three sensitivity scores are allocated as follows:

1. Areas scoring a low sensitivity are those areas that tend to be highly degraded and it is unlikely that they could be rehabilitated to a normal functioning state without extreme effort and expense.
2. Areas of moderate sensitivity are those areas that contain reasonably intact habitat with low or no alien infestation.
3. Areas scoring a high sensitivity on site are those having an important ecological function.

13.3 Impacts and Mitigation Measures

Four factors will need to be considered when assessing the significance of impacts, namely:

- A. the relationship of the impact to temporal scales
 - B. the relationship of the impact to spatial scales
 - C. the actual significance of the impact, and
 - D. the degree of confidence placed in the assessment
- A. The **temporal scale** defines the significance of the impact at various time scales, as an indication of the duration of the impact.
1. **Short term:** less than 5 years. Many construction phase impacts will be of a short duration.
 2. **Medium term:** between 5-20 years, the approximate duration of a mining operation.
 3. **Long term:** between 20-40 years, and from a human perspective essentially permanent.
 4. **Permanent:** over 40 years, and resulting in a permanent and lasting change that will always be there.
- B. The **spatial scale** defines physical extent of the impact.
1. **Site Specific:** having an impact only within the confined of the development.
 2. **Localized:** having an impact within close proximity of the development.
 3. **Municipal:** having an impact within the municipal area
 4. **Regional:** having an impact within the regional context
 5. **National:** having an impact at the National Level

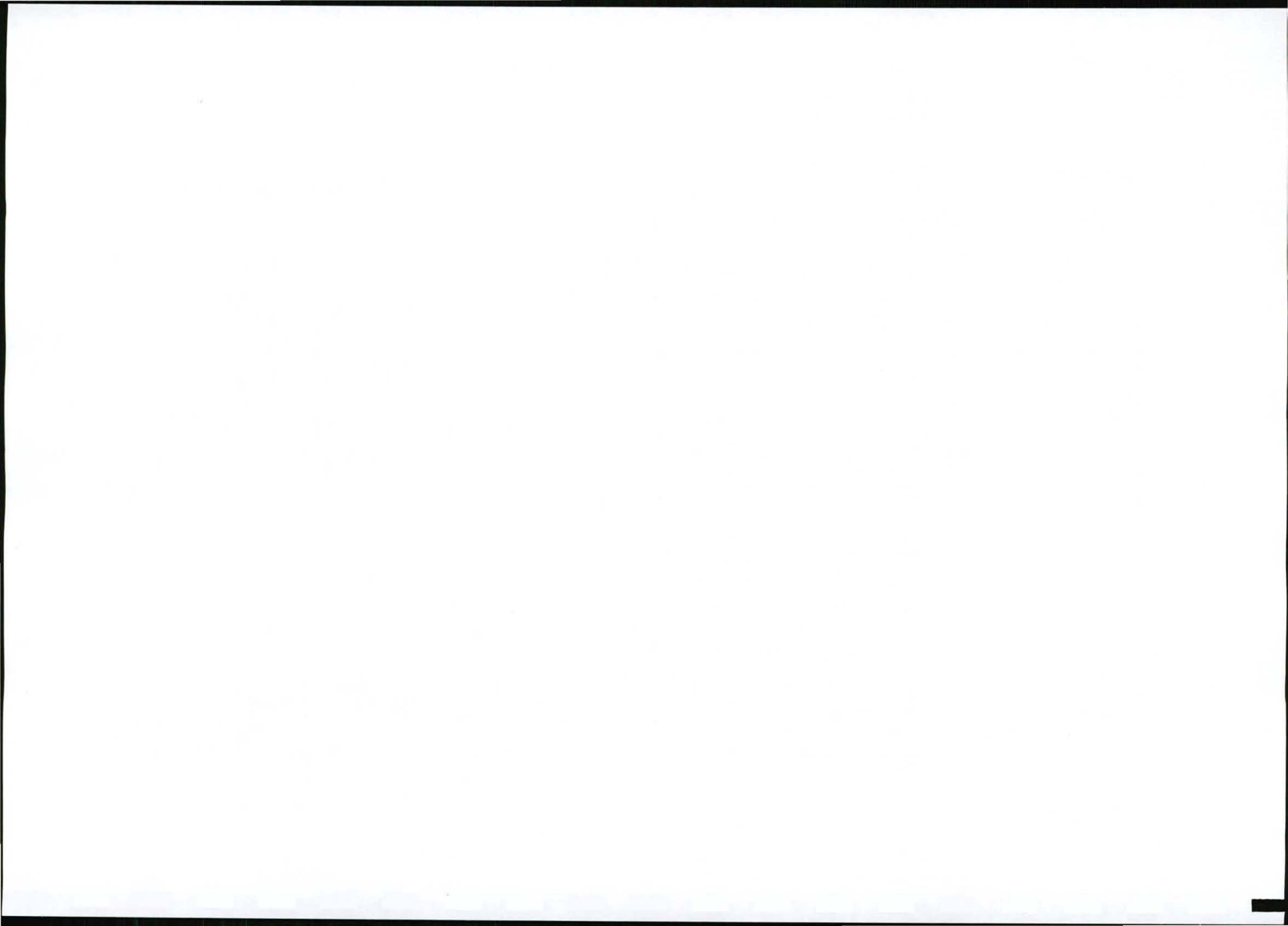


- C. The **Environmental Significance** scale is an attempt to evaluate the importance of a particular impact. This evaluation needs to be undertaken in the relevant context, as an impact can either be ecological or social, or both. The evaluation of the significance of an impact relies heavily on the values of the person making the judgment. For this reason, impacts of especially a social nature need to reflect the values of the affected society. SIGNIFICANCE will need to be evaluated with and without mitigation. In many cases, mitigation will take place, as it will have been incorporated into project design. A five-point significance scale will be applied.
1. **Very High:** These impacts are considered by the specialist as constituting a major and usually permanent change to the environment, and usually result in severe or very severe effects, or beneficial or very beneficial effects
 2. **High:** These impacts will usually result in long-term effects on the natural environment. Impacts rated as high are considered by the specialist as constituting an important and usually long-term change to the environment.
 3. **Moderate:** These impacts will usually result in medium- to long-term effects on the natural environment. Impacts rated as moderate are considered by the specialist as constituting a fairly important and usually medium term change to the environment. These impacts are real but not substantial.
 4. **Low:** These impacts will usually result in medium- to short-term effects on the natural environment. Impacts rated as low are considered by the specialist as constituting a fairly unimportant and usually short-term change to the environment. These impacts are not substantial and are likely to have little real effect.
 5. **Positive:** These impacts will usually result in a positive impact on the environment. These impacts can range from slightly beneficial to very beneficial for the environment.
- D. It is also necessary to state the **degree of confidence** with which one has predicted the significance of an impact.
1. **Definite:** More than 90% sure of a particular fact. To use this one will need to have substantial supportive data.
 2. **Probable:** Over 70% sure of a particular fact, or of the likelihood of that impact occurring.
 3. **Possible:** Only over 40% sure of a particular factor of the likelihood of an impact occurring.
 4. **Unsure:** Less than 40% sure of a particular fact or the likelihood of an impact occurring.

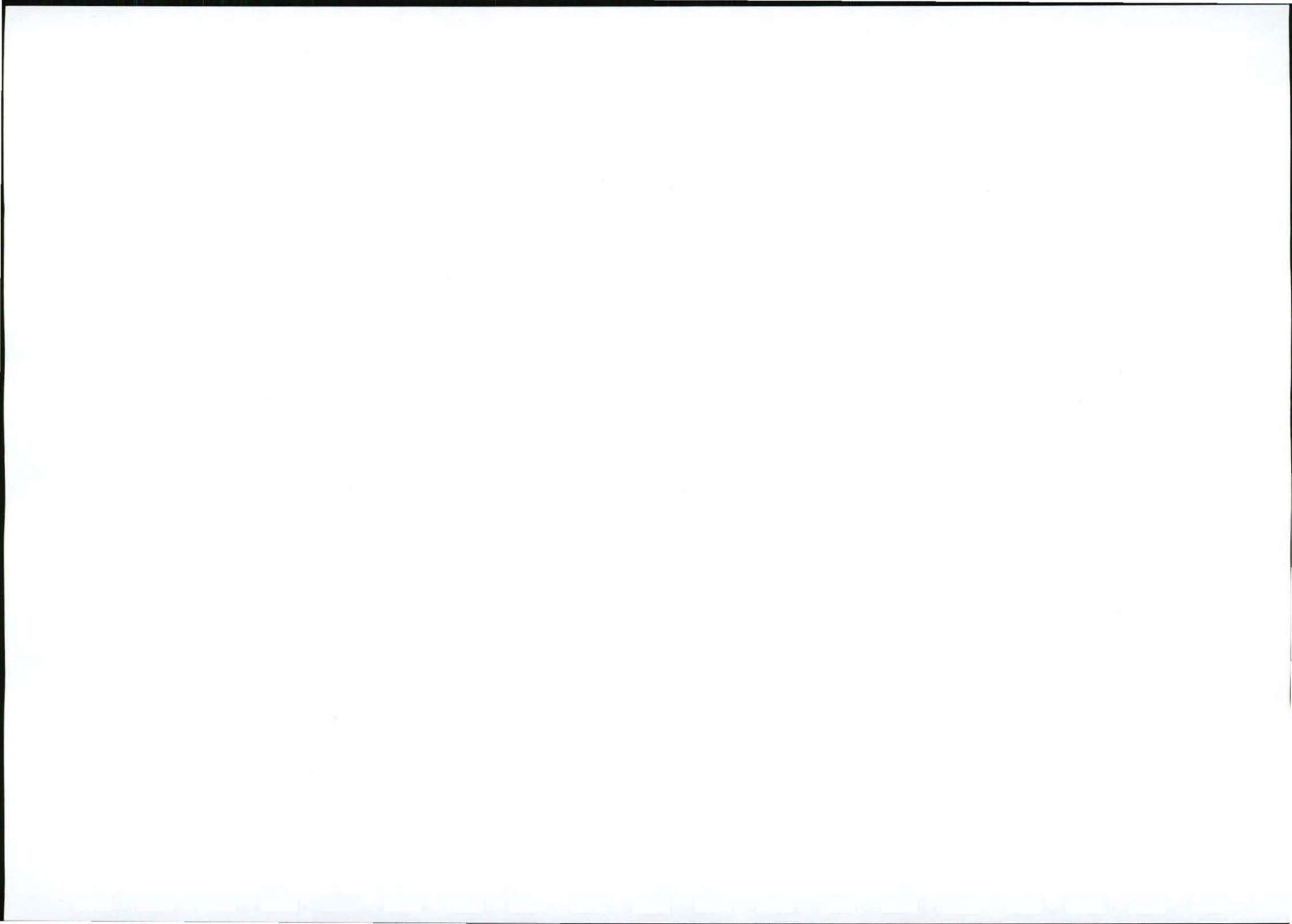


Table 6: Assessment of Significance of Environmental Impacts.

ASSESSMENT				PRIOR TO MITIGATION					POST MITIGATION					
Environmental Issue	Environmental Impact	Positive or Negative	Phase	Spatial	Severity	Duration	Probability	Significance Assessment	Mitigation Measures	Spatial	Severity	Duration	Probability	Significance Assessment
Geology & Soils	Soil Erosion	Negative	Construction, Operational & Closure	Site Specific	3	4	2	High	Minimize the areas of disturbance or vegetation clearance. Revegetate areas that have been disturbed as soon as possible. Cut and fill slopes shall be made stable and be revegetated as soon as possible during the construction phase.	Site Specific	5	4	2	Moderate
Geology & Soils	Soil Pollution	Negative	Construction & Operational	Site Specific	5	4	2	Moderate	Under no circumstances shall hazardous substances be disposed of on site or into the surrounding environment. Accidental pollution incidents shall be reported to the Project Manager/ECO immediately and shall be cleaned up by the Contractor or a nominated clean-up organization at the expense of the contractor. Vehicles should be well maintained.	Site Specific	5	4	4	Low
Geology & Soils	Soil Loss	Negative	Construction, Operational & Closure	Site Specific	3	4	2	High	Minimize the areas of disturbance or vegetation clearance. Revegetate areas that have been disturbed as soon as possible. Cut and fill slopes shall be made stable and be revegetated as soon as possible during the construction phase.	Site Specific	5	7	5	Low
Topography & Drainage	Cut & Fill	Negative	Construction & Operational	Site Specific	5	3	4	Low	Cut and fill slopes shall be made stable and be revegetated as soon as possible	Site Specific	7	6	4	Low
Topography & Drainage	Increased Stormwater Runoff	Negative	Construction & Operational	Site Specific	5	8	4	Low	All areas of storm water release must be suitable stabilized	Site Specific	8	9	8	Low
Topography & Drainage	Increased Soil Erosion	Negative	Construction & Operational	Site Specific	3	4	2	High	Minimize the areas of disturbance or vegetation clearance. Revegetate areas that have been disturbed as soon as possible. Cut and fill slopes shall be made stable and be revegetated as soon as possible during the construction phase.	Site Specific	5	7	4	Low
Non-renewable Resources	Consumption of Non-renewable Resource	Negative	Operational	Municipal	2	2	3	Very High	The proposed quantities mined should not exceed limits specified in the mining plans	Local	5	4	2	Moderate
Non-renewable	Material	Positive	Operational	Municipal	5	4	2	Moderate	No Mitigation Required	N/A				#N/A



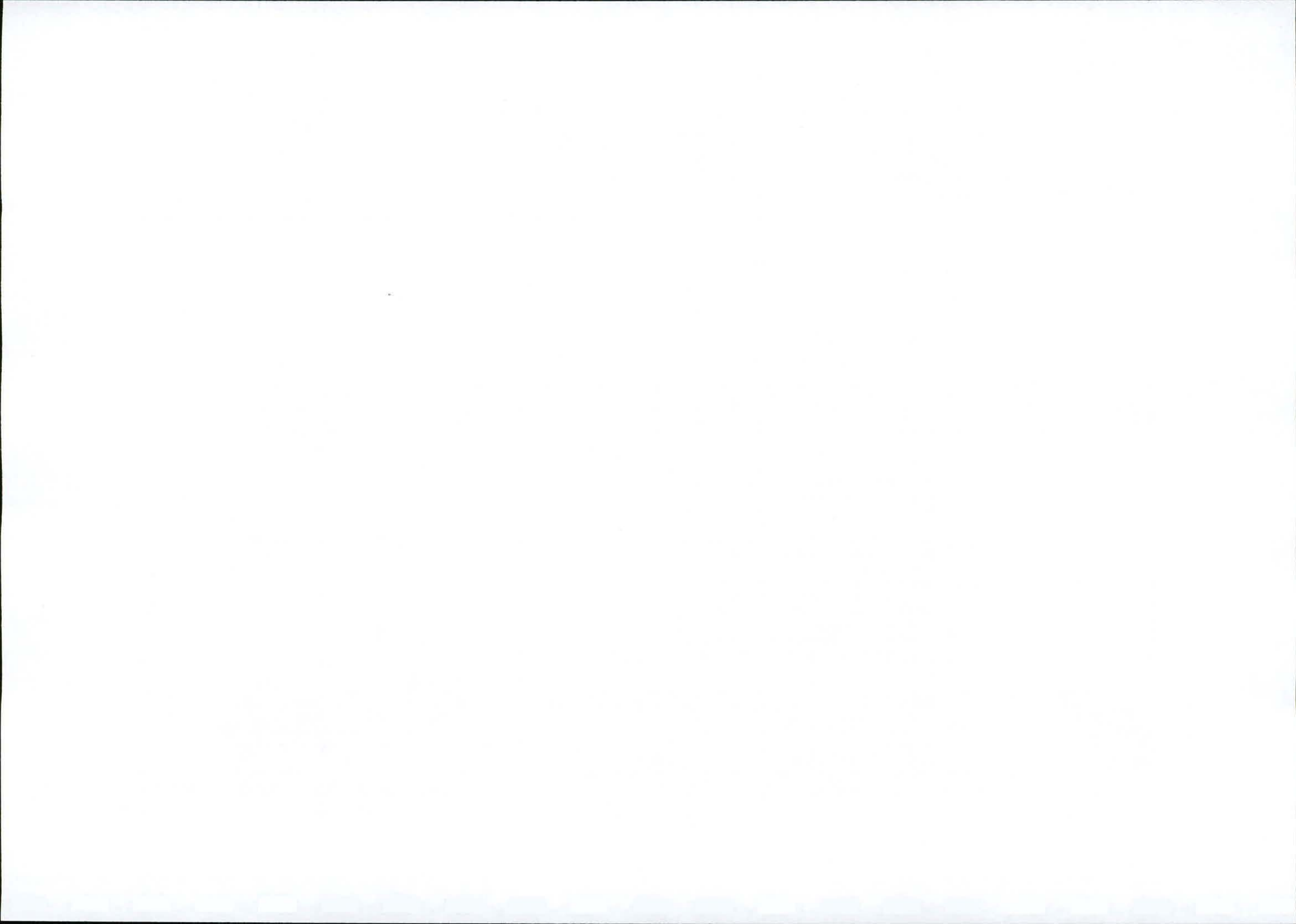
ASSESSMENT				PRIOR TO MITIGATION					POST MITIGATION					
Environmental Issue	Environmental Impact	Positive or Negative	Phase	Spatial	Severity	Duration	Probability	Significance Assessment	Mitigation Measures	Spatial	Severity	Duration	Probability	Significance Assessment
Resources	Resources for road upgrade													
Surface Water	Surface water contamination	Negative	Construction & Operational	Local	4	5	5	Low	Areas of spillages and/or contamination shall be cleaned up immediately and disposed of at a licensed landfill site	Site Specific	8	5	8	Low
Surface Water	Sedimentation	Negative	Construction & Operational	Local	5	6	5	Low	Minimize the areas of disturbance or vegetation clearance. Revegetate areas that have been disturbed as soon as possible. Cut and fill slopes shall be made stable and be revegetated as soon as possible during the construction phase.	Site Specific	8	5	8	Low
Surface Water	Decreased water quality	Negative	Construction & Operational	Local	5	6	5	Low	Stormwater runoff must be captured and managed prior to reaching the rivers.	Site Specific	8	5	8	Low
Surface Water	Decrease in Benthic microalgae	Negative	Construction & Operational	Local	5	6	5	Low	Stormwater runoff must be captured and managed prior to reaching the rivers.	Site Specific	8	5	8	Low
Surface Water	Decrease in Submerged macrophytes	Negative	Construction & Operational	Local	5	6	5	Low	Stormwater runoff must be captured and managed prior to reaching the rivers.	Site Specific	8	5	8	Low
Surface Water	Decrease in Macro benthos	Negative	Construction & Operational	Local	5	6	5	Low	Stormwater runoff must be captured and managed prior to reaching the rivers.	Site Specific	8	5	8	Low
Surface Water	Change in fish community structure	Negative	Construction & Operational	Local	5	6	5	Low	Stormwater runoff must be captured and managed prior to reaching the rivers.	Site Specific	8	5	8	Low
Surface Water	Surface water abstraction	Negative	Operational	Local	3	5	2	Moderate	Applications for a water use license must be made in terms of the National Water Act, (Act 36 of 1998). Conditions contained in the approval(s) must be strictly adhered to	Local	4	5	4	Low
Groundwater	Groundwater contamination	Negative	Construction & Operational	Local	4	3	3	Moderate	Areas of spillages and/or contamination shall be cleaned up immediately and disposed of at a licensed landfill site	Site Specific	5	4	5	Low



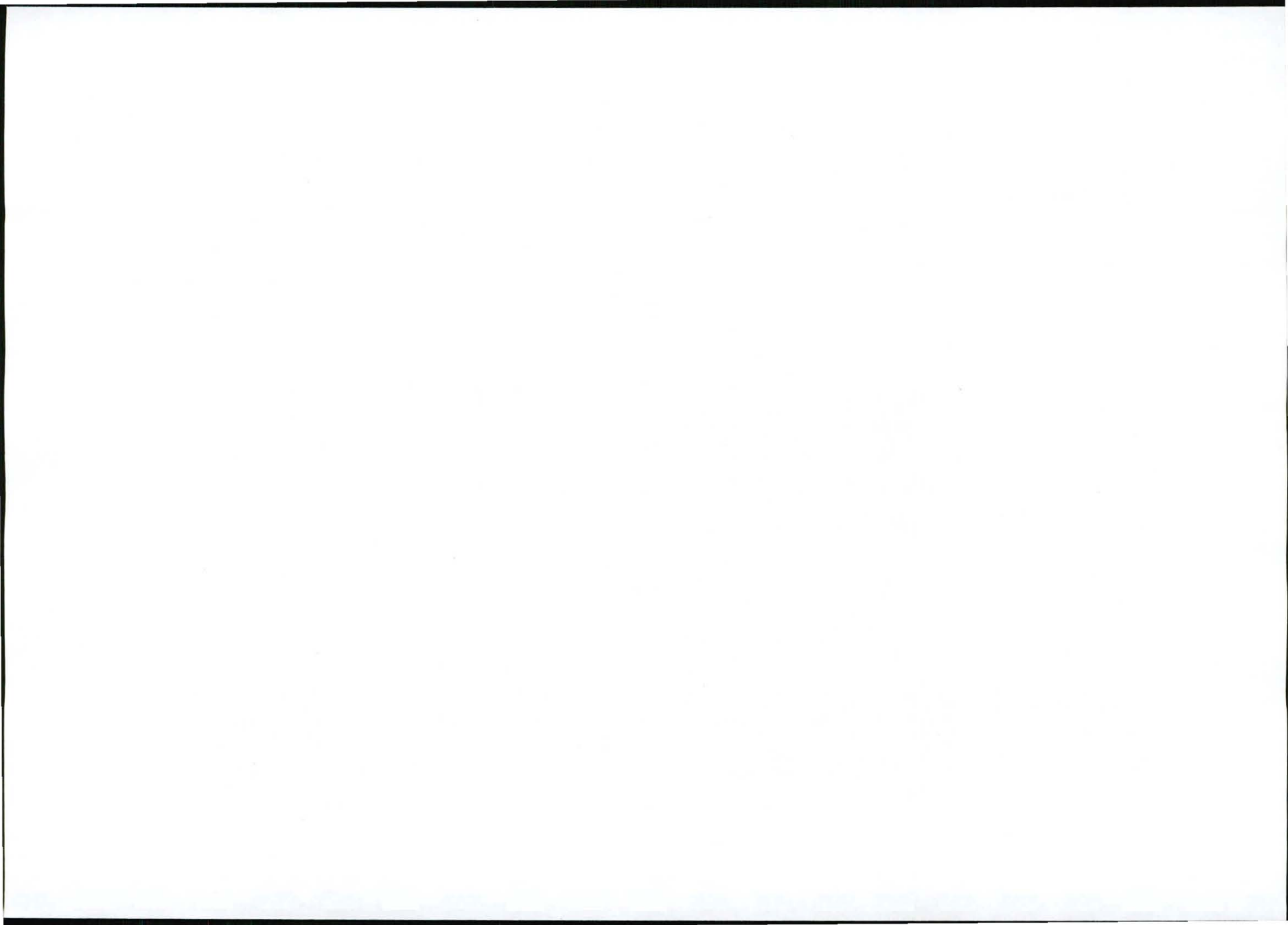
ASSESSMENT				PRIOR TO MITIGATION					POST MITIGATION					
Environmental Issue	Environmental Impact	Positive or Negative	Phase	Spatial	Severity	Duration	Probability	Significance Assessment	Mitigation Measures	Spatial	Severity	Duration	Probability	Significance Assessment
Groundwater	Groundwater abstraction	Negative	Operational	Local	3	5	2	Moderate	Applications for a water use license must be made in terms of the National Water Act, (Act 36 of 1998). Conditions contained in the approval(s) must be strictly adhered to	Local	4	5	4	Low
Vegetation and Habitat	Loss of indigenous vegetation	Negative	Construction & Operational	Local	3	4	3	Moderate	Minimize the areas of disturbance or vegetation clearance. Revegetate areas that have been disturbed as soon as possible.	Site Specific	6	5	5	Low
Vegetation and Habitat	Disturbance of habitat	Negative	Construction & Operational	Site Specific	5	4	3	Low	Minimize the areas of disturbance or vegetation clearance. Revegetate areas that have been disturbed as soon as possible.	Site Specific	8	8	5	Low
Vegetation and Habitat	Alien Invasive Plant Species	Negative	Construction, Operational & Closure	Local	3	4	3	Moderate	All alien invasive plant species should be removed according to the Conservation of Agricultural Resources Act.	Site Specific	5	7	8	Low
Vegetation and Habitat	Removal of alien invasive species	Positive	Construction, Operational & Closure	Local	5	5	4	Low	No Mitigation Required	N/A				#N/A
Air Quality	Dust Generation	Negative	Construction & Operational	Local	6	8	3	Low	Avoid dust generating activities during periods of medium to high winds. Cover and/or maintain appropriate freeboard on trucks hauling any loose material that could produce dust when travelling. Limit the areas that need to be cleared of vegetation. Revegetate disturbed areas as soon as possible after clearing. Dampen exposed soil to suppress dust i.e. with water bowser	Site Specific	8	8	7	Low
Air Quality	Fugitive Emissions	Negative	Construction & Operational	Site Specific	8	8	3	Low	Vehicles should be properly maintained and serviced.	Site Specific	8	8	5	Low
Visual	Change in	Negative	Construction,	Local	4	3	4	Low	Borrow Pits are to be rehabilitated to represent the former	Local	8	5	6	Low



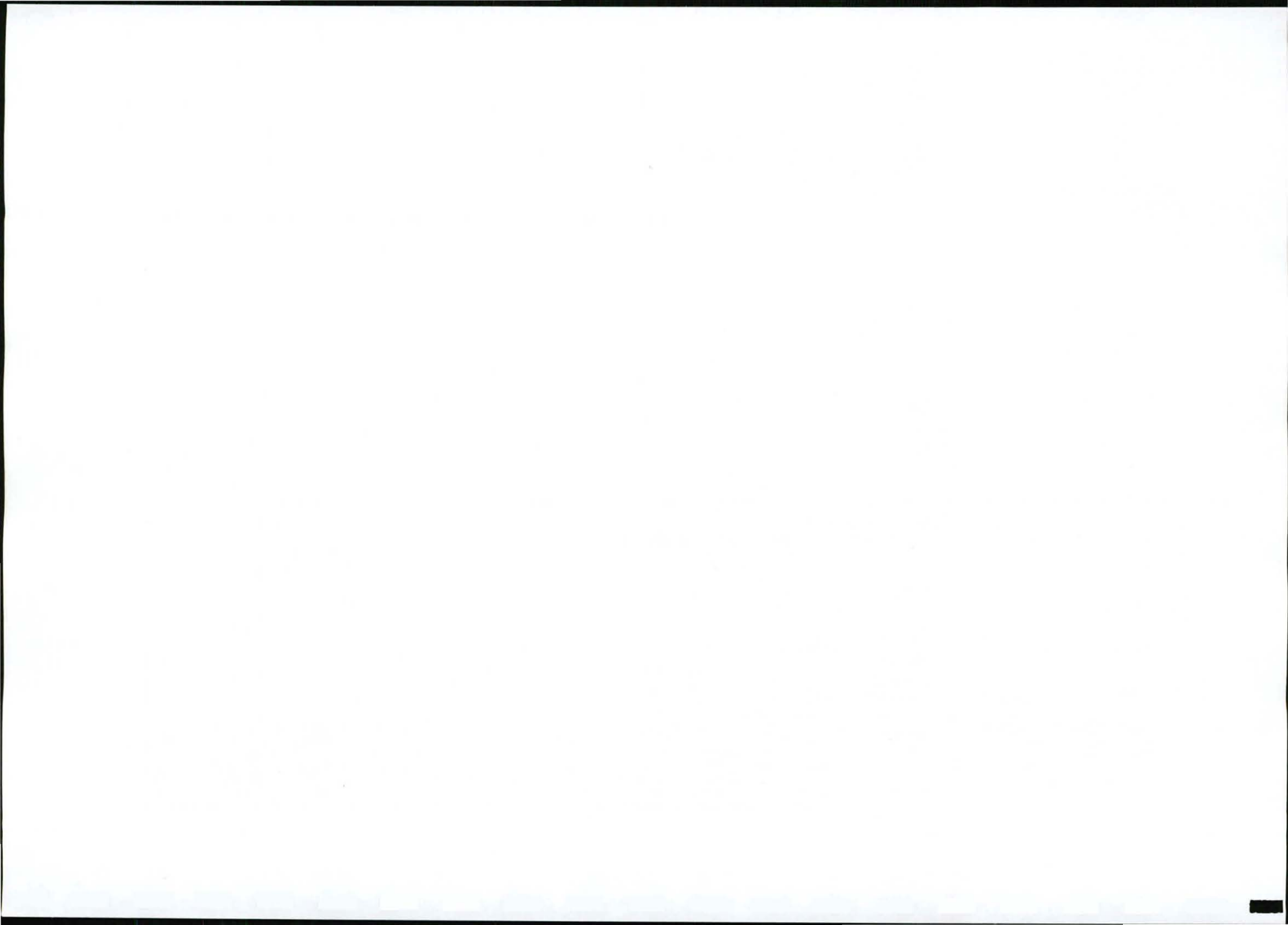
ASSESSMENT				PRIOR TO MITIGATION					POST MITIGATION					
Environmental Issue	Environmental Impact	Positive or Negative	Phase	Spatial	Severity	Duration	Probability	Significance Assessment	Mitigation Measures	Spatial	Severity	Duration	Probability	Significance Assessment
	Sense of Place		Operational & Closure						habitat/surrounding land use character.					
Visual	Decreased Visual Quality	Negative	Construction, Operational & Closure	Local	4	3	4	Low	Protect and maintain the forested slopes as a natural screen. Ensure that any signage (i.e. at entrance gate of construction camp site) is visible but not visually intrusive. Ensure good housekeeping at the construction campsite and control litter and general site cleanliness. Ensure that adequate ablution facilities are in place, that the workforce utilizes these facilities and that they are placed where they are not visible to the public. Workforce shall be dressed in appropriate neat and safe construction uniforms. Safety lighting should only be used for the safety issues for which they are intended. Security lighting should be avoided where possible or placed so that they only illuminate the area to be protected. Only emergency after-hours work should be done.	Local	8	5	6	Low
Visual	Rehabilitation of existing borrow pits	Positive	Closure	Local	4	4	2	Moderate	No Mitigation Required	N/A				#N/A



ASSESSMENT				PRIOR TO MITIGATION					POST MITIGATION					
Environmental Issue	Environmental Impact	Positive or Negative	Phase	Spatial	Severity	Duration	Probability	Significance Assessment	Mitigation Measures	Spatial	Severity	Duration	Probability	Significance Assessment
Archaeology, Palaeontology & Heritage Sites	Disturbance of sites	Negative	Construction & Operational	Local	4	3	3	Moderate	All finds of human remains shall be reported to the nearest police station. Human remains from the graves of victims of conflict, or any burial ground or part thereof which contains such graves and any other graves that are deemed to be of cultural significance may not be destroyed, damaged, altered, exhumed or removed from their original positions without a permit from the South African Heritage and Resource Agency (SAHRA) Work in areas where artefacts are found shall cease immediately and SAHRA notified. Under no circumstances shall the Contractor, employees, subcontractors or subcontractors' employees remove, destroy or interfere with archaeological artefacts.	Local	8	6	7	Low
Archaeology, Palaeontology & Heritage Sites	Loss of sites	Negative	Construction & Operational	Local	3	3	2	High	All finds of human remains shall be reported to the nearest police station. Human remains from the graves of victims of conflict, or any burial ground or part thereof which contains such graves and any other graves that are deemed to be of cultural significance may not be destroyed, damaged, altered, exhumed or removed from their original positions without a permit from the South African Heritage and Resource Agency (SAHRA) Work in areas where artefacts are found shall cease immediately and SAHRA notified. Under no circumstances shall the Contractor, employees, subcontractors or subcontractors' employees remove, destroy or interfere with archaeological artefacts.	Local	5	6	7	Low
Archaeology, Palaeontology & Heritage Sites	Discovery of new/buried sites	Positive	Construction & Operational	Municipal	2	3	5	Moderate	No Mitigation Required	N/A				#N/A



ASSESSMENT				PRIOR TO MITIGATION					POST MITIGATION					
Environmental Issue	Environmental Impact	Positive or Negative	Phase	Spatial	Severity	Duration	Probability	Significance Assessment	Mitigation Measures	Spatial	Severity	Duration	Probability	Significance Assessment
Land Use	Change in land use	Negative	Construction, Operational & Closure	Local	3	3	4	Moderate	Borrow Pits are to be rehabilitated to represent the former habitat/surrounding land use character.	Local	8	4	8	Low
Socio -Economic	Disturbance to rural character	Negative	Construction, Operational & Closure	Local	5	3	3	Low	Borrow Pits are to be rehabilitated to represent the former habitat/surrounding land use character.	Local	8	5	6	Low
Socio -Economic	Job Creation	Positive	Construction & Operational	Municipal	4	3	3	Moderate	No Mitigation Required	N/A				#N/A
Socio -Economic	Skills Development	Positive	Construction & Operational	Municipal	4	3	3	Moderate	No Mitigation Required	N/A				#N/A
Socio -Economic	Safety Risk	Negative	Construction & Operational	Local	2	2	3	Very High	All Occupational Health & Safety Standards shall be strictly adhered to. Excavations should be made safe prior to closure.	Site Specific	6	5	5	Low



14 Mitigatory Measures

These guidelines, operating procedures and rehabilitation/pollution control requirements contained in this Environmental Management Plan will be binding on the holder of the mining permit/prospecting permission/ reconnaissance permission after approval of this Environmental Management Plan by the Department of Minerals. It is essential that this portion be carefully studied, understood, implemented and adhered to at all time.

14.1 General Requirements

14.1.1 Mining Plans

- A copy of the mining plan shall be available at the mining site for scrutiny when required.
- A final layout plan must be submitted at closure of the mine or when operations have ceased.

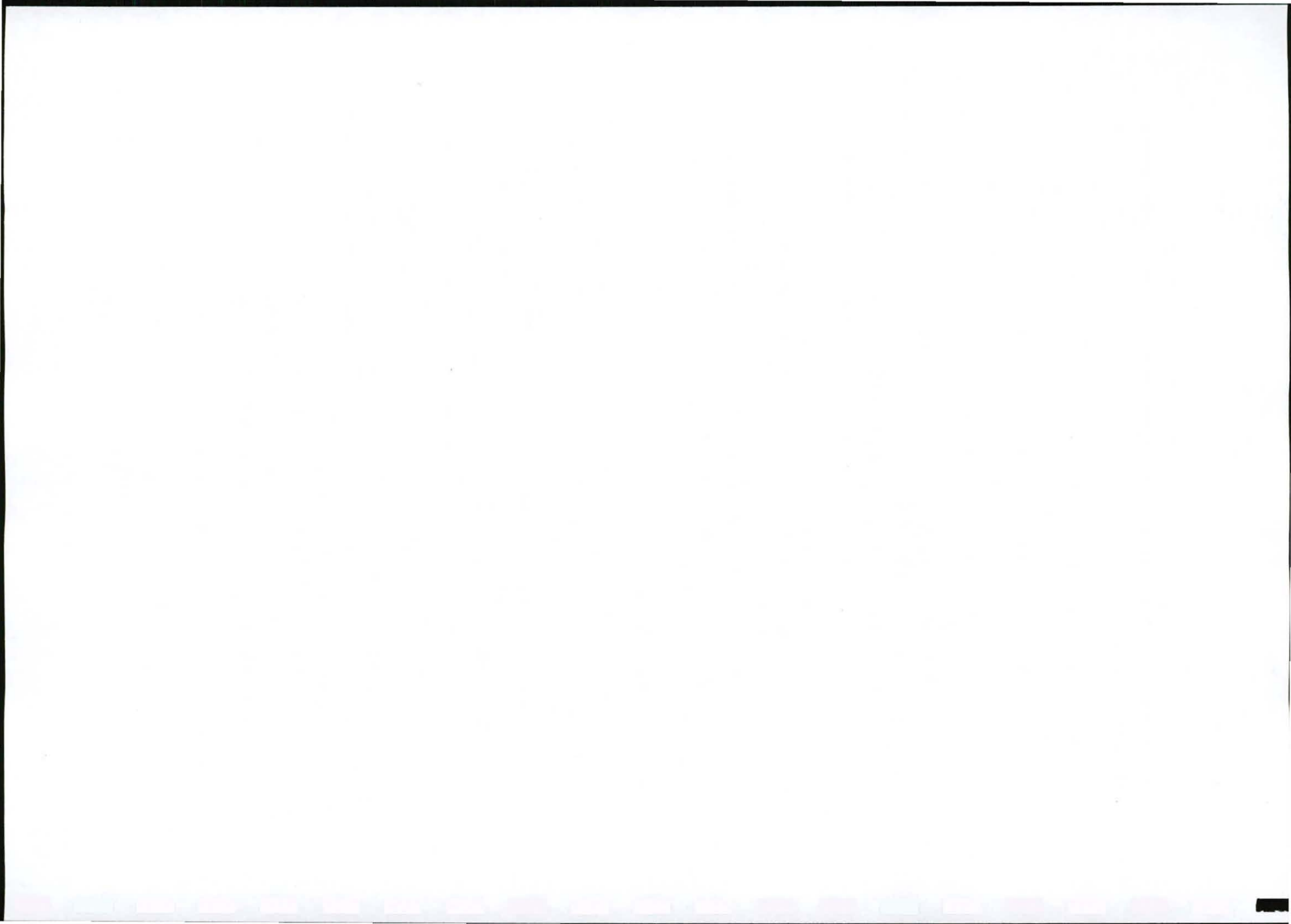
14.1.2 Demarcating the mining area

- The mining area must be clearly demarcated by means of beacons at its corners and/or by fencing off the mining area.
- Permanent beacons as indicated on the mining plans must be firmly erected and maintained in their correct position throughout the life of the operation.
- Mining operations shall only take place within this demarcated area.

14.2 Infrastructural Requirements

14.2.1 Topsoil Management

- Stripping of topsoil shall be undertaken in such a manner as to minimise erosion by wind or runoff.
- All available topsoil shall be stripped to a depth not exceeding 300mm from the original ground level unless otherwise specified by the Project Manager in consultation with ECO.
- Areas from which the topsoil is to be removed shall be cleared of any foreign material which may come to form part of the topsoil during removal including bricks, rubble, any waste material, litter, excess vegetation and any other material which could reduce the quality of the topsoil.
- The Contractor shall ensure that subsoil and topsoil are not mixed during stripping, excavation, reinstatement and rehabilitation. If mixed with sub-soil the usefulness of the topsoil for rehabilitation of the site shall be lost.
- Soils should be exposed for the minimum time possible once cleared.
- Topsoil shall be temporarily stockpiled, separately from subsoil and rocky materials.
- Topsoil shall be stockpiled in the Top Soil designated storage areas.



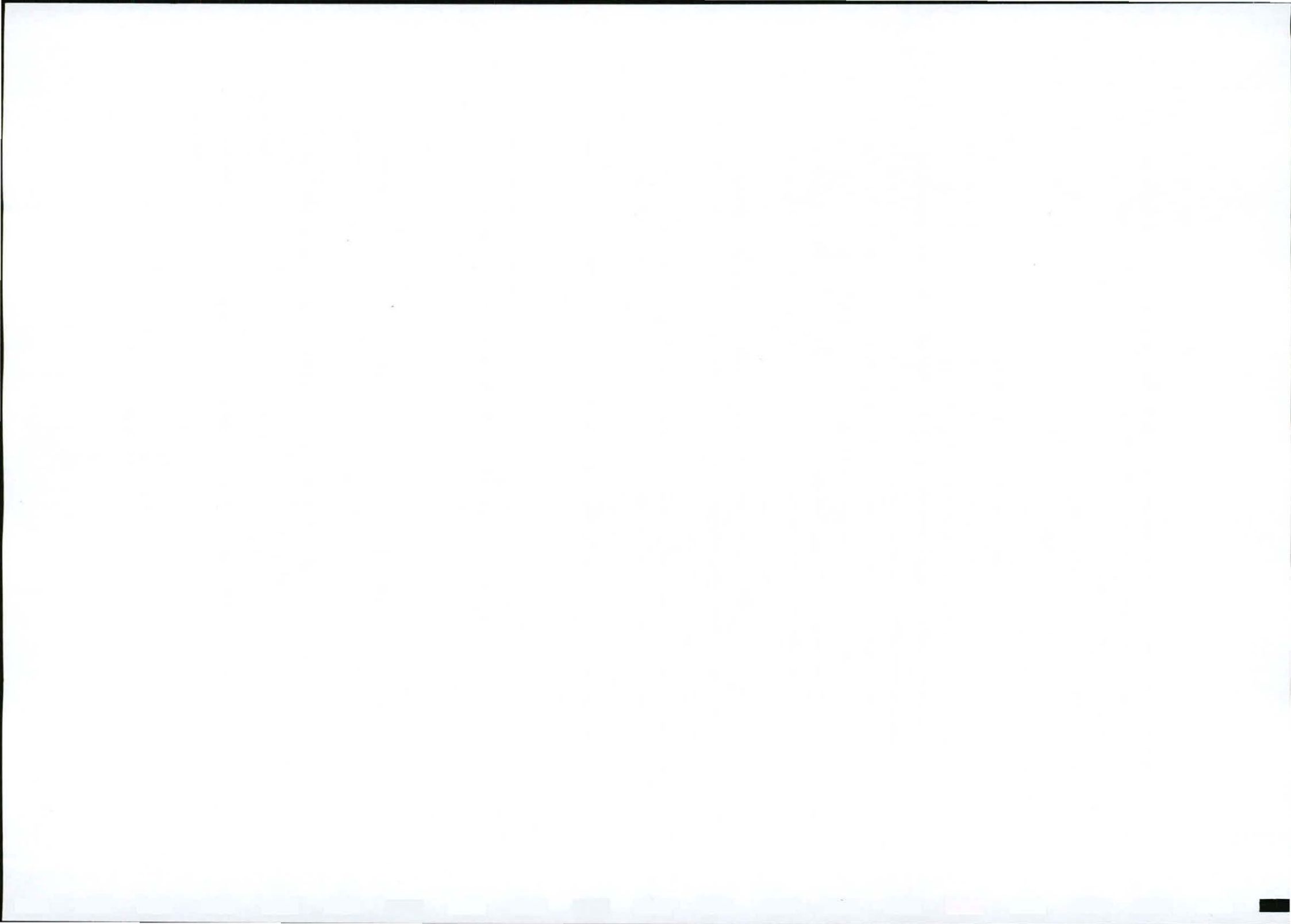
- Soil shall not be stockpiled near drainage lines, watercourses or on steep slopes.
- Stockpiles shall be protected to prevent erosion and invasion of weeds.
- Stockpiled topsoil shall not be compacted.
- Topsoil shall be used for rehabilitation of disturbed areas only.

14.2.1.1 Topsoil stripping

- Prior to the stripping of topsoil, as much as possible of the aboveground grass layer shall be removed and stockpiled. This is to be placed on top of the topsoil once the topsoil has been replaced and shall be stored separately from the topsoil. The purpose of using this vegetation material is that it contains grass seed and would therefore assist with re-establishment of the indigenous grasses that naturally occur in the area. Aside from this, the grass covering of the soil would also assist in preventing erosion prior to the re-establishment of a dense vegetation covering. Should insufficient grass covering be available to cover the soil, grass cuttings must be obtained from areas of natural grassland in the immediate vicinity of the particular area, with the consent of the affected landowner, or hydro seeding must be conducted.
- Topsoil shall be stripped from all areas that are to be utilised during the mining period and where permanent structures and access is required. Topsoil shall be stripped after clearing of woody vegetation and before excavation commences.
- While topsoil is being stripped, it should be scanned for the presence of bulbous plants. Should bulbous plants be detected, they shall be removed from the topsoil and an ecologist shall be contacted to provide advice on suitable habitats and methods for replanting.
- The topsoil is regarded as the top 200mm of the soil profile, unless there is a clearer shallower boundary between the topsoil and subsoil indicated by texture, colour or structure.
- No topsoil which has been stripped shall be buried or in any other way be rendered unsuitable for further use by mixing with spoil or by compaction using machinery.
- Topsoil shall preferably be stripped when it is in a dry condition in order to prevent compaction.

14.2.1.2 Soil stockpiling

- Stripped topsoil shall be stockpiled in areas, which have been approved by the Engineer.
- Topsoil stripped from different soil zones shall be stockpiled separately and clearly identified as such.
- Soil stockpiles shall not be higher than 2.5m. The slopes of soil stockpiles shall not be steeper than 1 vertical to 5 horizontal.



- No vehicles shall be allowed access onto the stockpiles after they have been placed. Topsoil stockpiles shall be clearly demarcated in order to prevent vehicle access and for later identification when required.
- Soil stockpiles shall not be allowed to become contaminated with oil, diesel, petrol, litter or any other material that may later inhibit the growth of vegetation in the soil.
- After topsoil removal has been completed, the Contractor shall apply soil conservation measures to the stockpiles to prevent erosion and invasion of weeds. This may include the use of erosion control fabric or grass seeding.

14.2.2 Access to the Site

14.2.2.1 Establishment of Access Roads

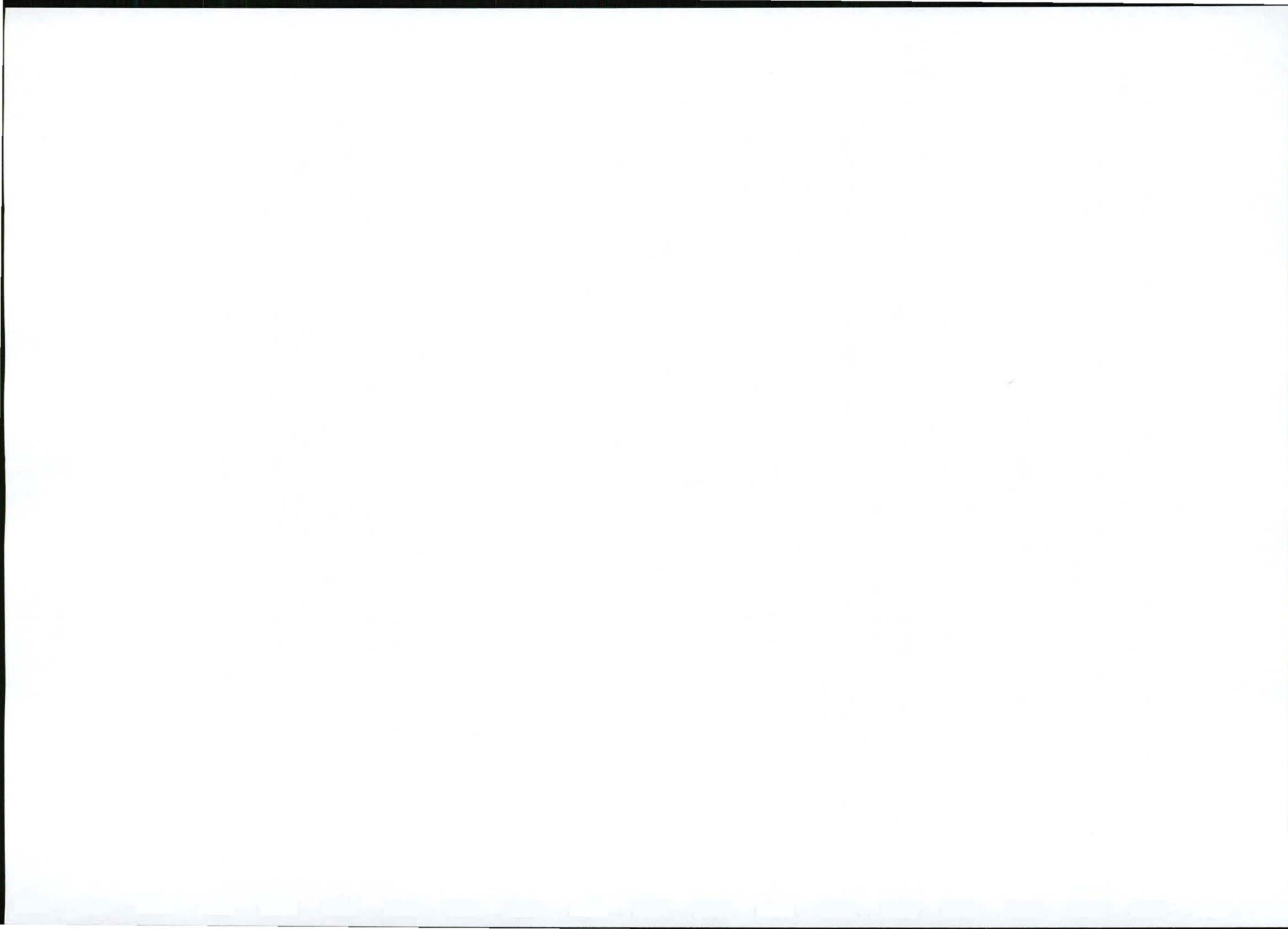
- The access road to the mining area and the camp-site/site office must be established in consultation with the landowner/tenant.
- Existing roads shall be used as far as practicable.
- Should a portion of the access road be newly constructed the following must be adhered to:
 - The route shall be selected that a minimum number of bushes or trees are felled and existing fence lines shall be followed as far as possible.
 - Water courses and steep gradients shall be avoided as far as is practicable.
 - Adequate drainage and erosion protection in the form of cut-off berms or trenches shall be provided where necessary.
- The erection of gates in fence lines and the open/closed status of gates in new and existing positions shall be clarified in consultation with the landowner/tenant and maintained throughout the operational period.
- No other routes will be used by vehicles or personnel for the purpose of gaining access to the site.

14.2.2.2 Maintenance of Access Roads

- The maintenance of access roads will be the responsibility of the holder of the mining permit.
- Newly constructed access roads shall be adequately maintained so as to minimize dust, soil erosion or undue surface damage (i.e. adequate storm water control).

14.2.2.3 Dust control on the access and haul roads

- The liberation of dust into the surrounding environment shall be effectively controlled by the use of water spraying and/or other dust-allaying agents.
- The speed of haul trucks and other vehicles must be strictly controlled to avoid dangerous conditions, excessive dust generation or excessive deterioration of the road being used.



14.2.2.4 Rehabilitation of access roads

- Whenever a mining permit is suspended, cancelled or abandoned or if it lapses and the holder does not wish to renew the permit or right, any access road or portions thereof, constructed by the holder and which will no longer be required by the landowner/tenant, shall be removed and/or rehabilitated in order to represent the former habitat.
- Any gate or fence erected by the holder which is not required by the landowner/tenant, shall be removed and the situation restored to the pre mining/ prospecting situation.
- Roads shall be ripped or ploughed, and if necessary, appropriately fertilized to ensure the regrowth of vegetation. Imported road construction materials which may hamper regrowth of vegetation must be removed and disposed of in an approved manner prior to rehabilitation.
- If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the soil may be analyzed and any deleterious effects on the soil arising from the mining operation be corrected and the area be re-seeded with a seed mix to the ECO/Engineer's specification.

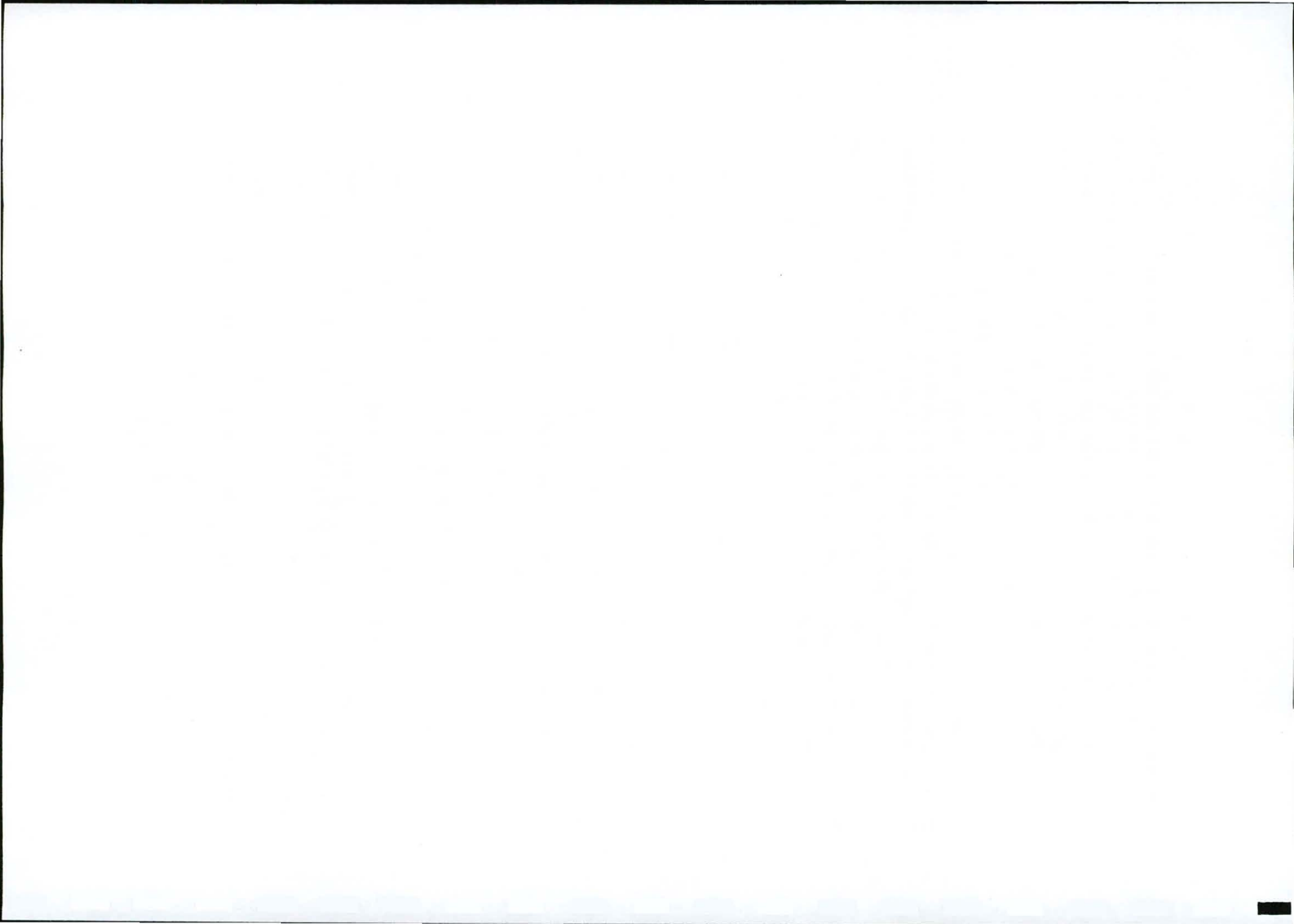
14.2.3 Office/Camp Sites

14.2.3.1 Establishing Office/Camp Sites

- Any offices and camp sites that may be required shall be established within the boundaries of the mining area.
- Such camp or office sites shall be located closer than 100 meters from a stream, river, spring, dam or pan.
- The area chosen for these purposes shall be the minimum reasonably required in order to remove as little vegetation as possible.
- Topsoil shall be handled as described in this EMP. This topsoil is to be used for rehabilitation of the area once the office/camp sites have been removed.
- Designated cooking facilities shall be provided.
- Lighting and noise disturbance or any other form of disturbance that may have an effect on the public living in the vicinity shall be kept to a minimum by avoiding work after hours.

14.2.3.2 Toilet facilities, waste water and refuse disposal

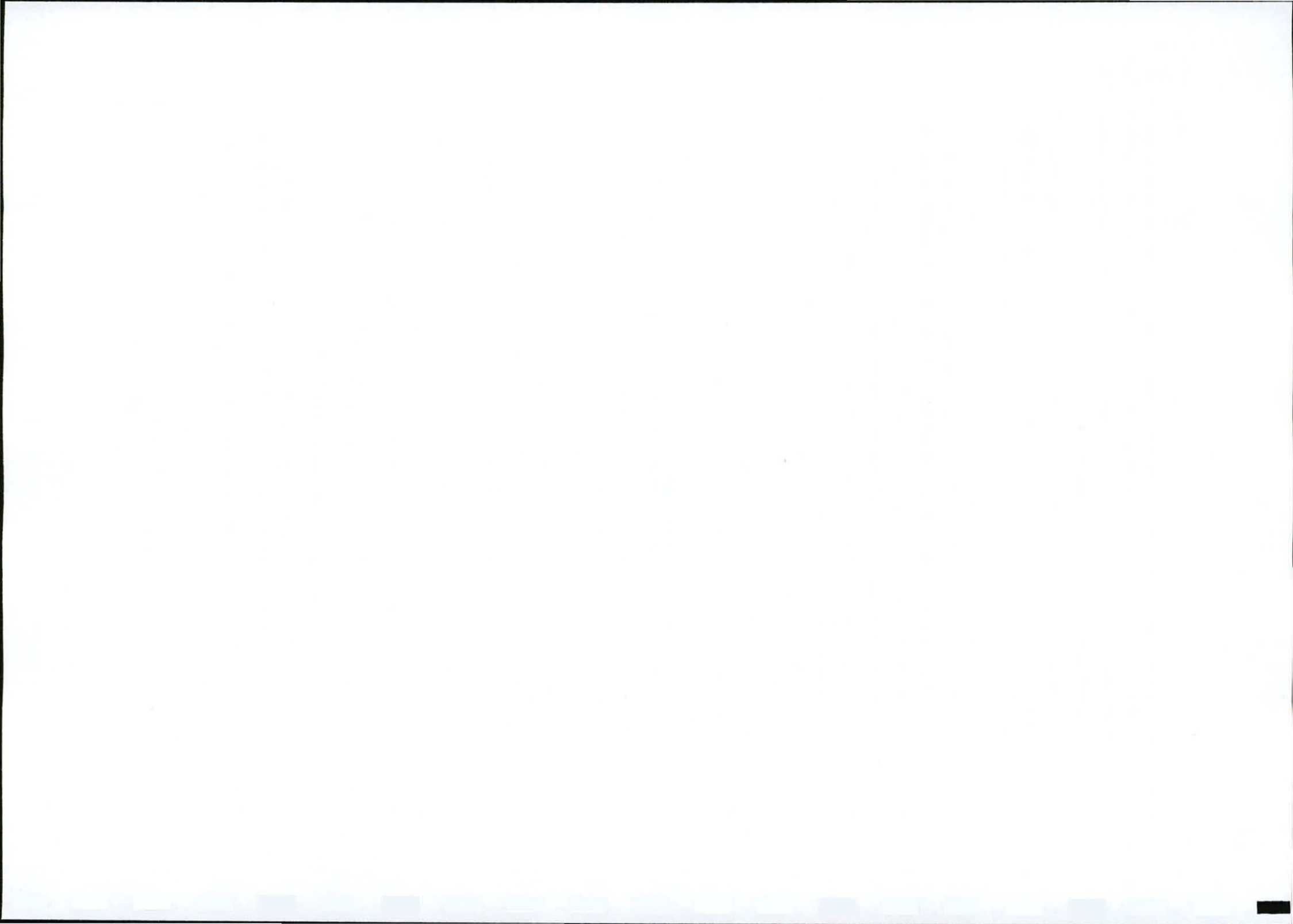
- The contractor shall provide suitable ablution facilities for employees and proper hygiene measures shall be established.
- Chemical toilet facilities or other approved toilet facilities such as a septic drain shall preferably be used and sited on the camp site at least 100 meters away from any river/stream/watercourse. The use of existing facilities must take place in consultation with the landowner/tenant.



- All effluent water from the camp washing facility shall be disposed of in a properly constructed French drain, situated as far as possible, but not less than 200 meters, from any stream, river, pan, dam or borehole.
- Only domestic type wash water shall be allowed to enter this drain and any effluents containing oil, grease or other industrial substances must be collected in a suitable receptacle and removed from the site for appropriate disposal at a licensed waste disposal facility. Records of safe disposal shall be kept on site and presented to the ECO.
- Spills should be cleaned up immediately to the satisfaction of the Engineer/ECO by removing the spillage together with the polluted soil and by disposing of them at a licensed waste disposal facility.
- Non-biodegradable refuse such as glass bottles, plastic bags, metal scrap, etc., shall be stored in a container at a collecting point and collected on a regular basis and disposed of at a licensed waste disposal facility.
- All other waste shall also be removed from site on a regular basis and disposed of at a licensed waste disposal facility.
- Specific precautions shall be taken to prevent refuse from being dumped on or in the vicinity of the camp site. This could include environmental awareness training and the provision of a suitable number of refuse bins.

14.2.3.3 Rehabilitation of the office/camp site

- When the mining permit lapses, is cancelled or is abandoned or when any prospecting or mining operation comes to an end, the holder of any such right or permit may not demolish or remove any building, structure, object -
 - which may not be demolished in terms of any other law;
 - which has been identified in writing by the Minister; or
 - which is to be retained in terms of an agreement between the holder and the owner or occupier of the land, which agreement has been approved by the Minister in writing.
- Where office/camp sites have been rendered devoid of vegetation/grass or where soils have been compacted owing to traffic, the surface shall be scarified or ripped.
- Areas containing French drains shall be compacted and covered with a final layer of topsoil to a height of 10cm above the surrounding ground surface in order to allow for the settling of the soil.
- The site shall be seeded with an indigenous grass seed mix.
- If a reasonable assessment indicates that the re-establishment of vegetation is unacceptably slow, the soil may be analyzed and any deleterious effects on the soil arising



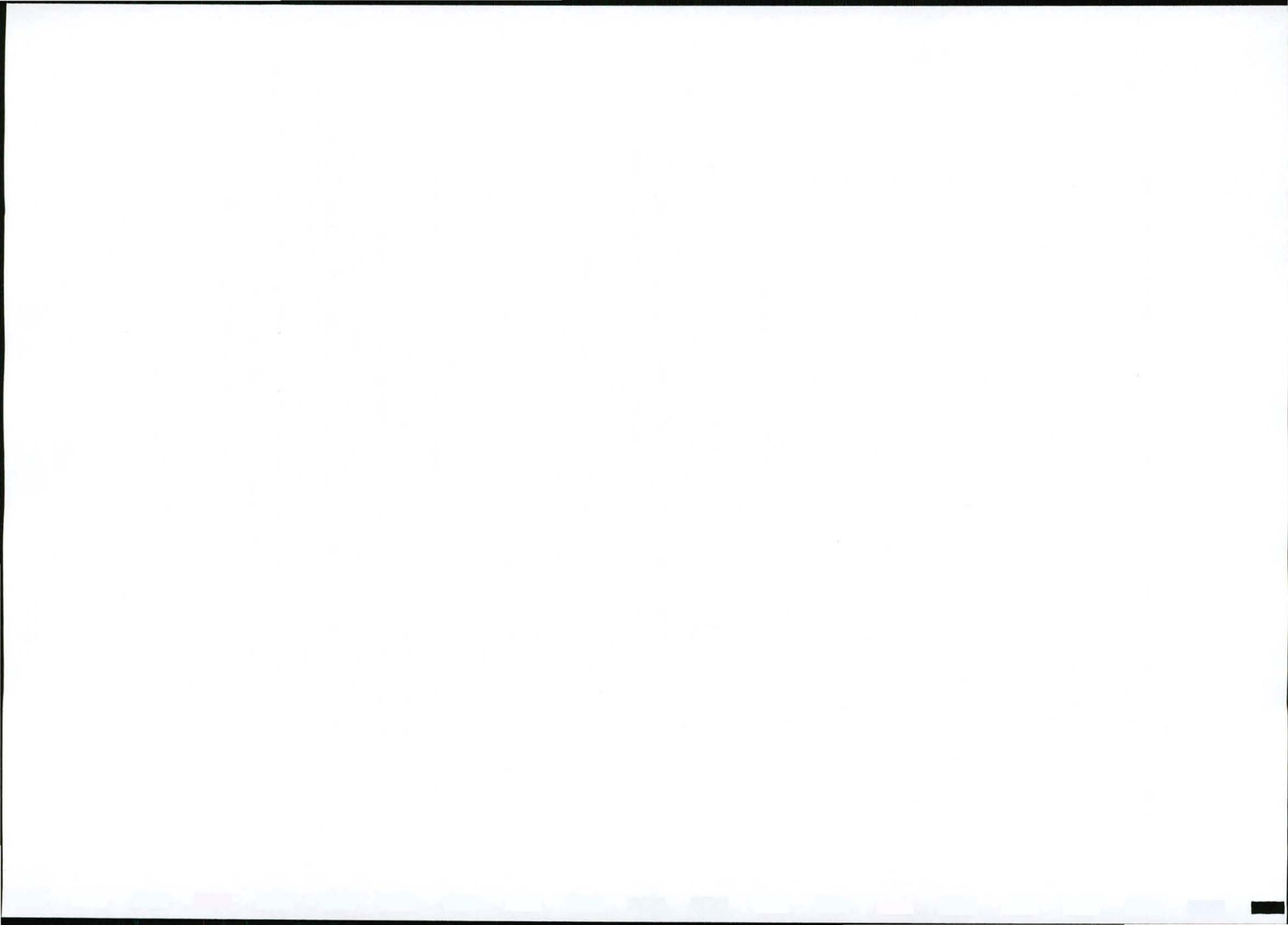
from the mining operation be corrected and the area be re-seeded with a seed mix to the ECO/Engineer specification.

- Photographs of the camp and office sites, before, during and after the mining operations shall be taken by the ECO and/or ELO at selected fixed points and kept on record.

14.2.4 Maintenance Yard & Storage Areas

14.2.4.1 Establishing the vehicle maintenance yard and secured storage areas

- The vehicle maintenance yards and secured storage areas shall not be located closer than 100 meters from any stream, river, spring, dam or pan, and shall be within the boundaries of the mining area.
- The areas chosen for these purposes shall be the minimum reasonably required and involve the least disturbance to vegetation.
- Topsoil shall be removed from these areas and handled as described in this EMP.
- The vehicle maintenance yard and secured storage areas shall be constructed of impermeable material and bunded.
- Runoff from vehicle maintenance yards and secured storage areas shall be contained on site in a suitable receptacle and removed for appropriate disposal at a licensed waste disposal facility. The receptacle shall be emptied when 75% full. Records of safe disposal shall be kept on site and presented to the ECO.
- Store all materials defined as hazardous within a bunded and secure area (>50L).
- The floor and bund walls should be impervious to the material stored and should be capable of containing 110% of the total volume of hazardous substance stored.
- Fuel or lubricant tanks shall be secured and provided with collision protection.
- Valves shall be locked when not in use, and shall be protected from vandalism and unauthorized use.
- Valves shall be within the confines of the bunded/impervious areas.
- Small quantities of hazardous substances (50L or less) shall be stored in appropriate containers within a secure storage area.
- Base of the storage area shall be impervious and so designed as to ensure that the hazardous substances do not infiltrate into the soil.
- Used fuels, oils, hydraulic fluids, paints and solvents and grease shall be stored in drums or other suitable containers. Care shall be taken to avoid ingress of rain water into containers.
- Once the containers are full then they shall be labeled, sealed and removed from the site to a licensed waste disposal site.
- Provide collection systems (i.e. trays or impervious linings) under machinery or equipment that may dispense hazardous substances (i.e. generators and pumps).



14.2.4.2 Maintenance of vehicles and equipment

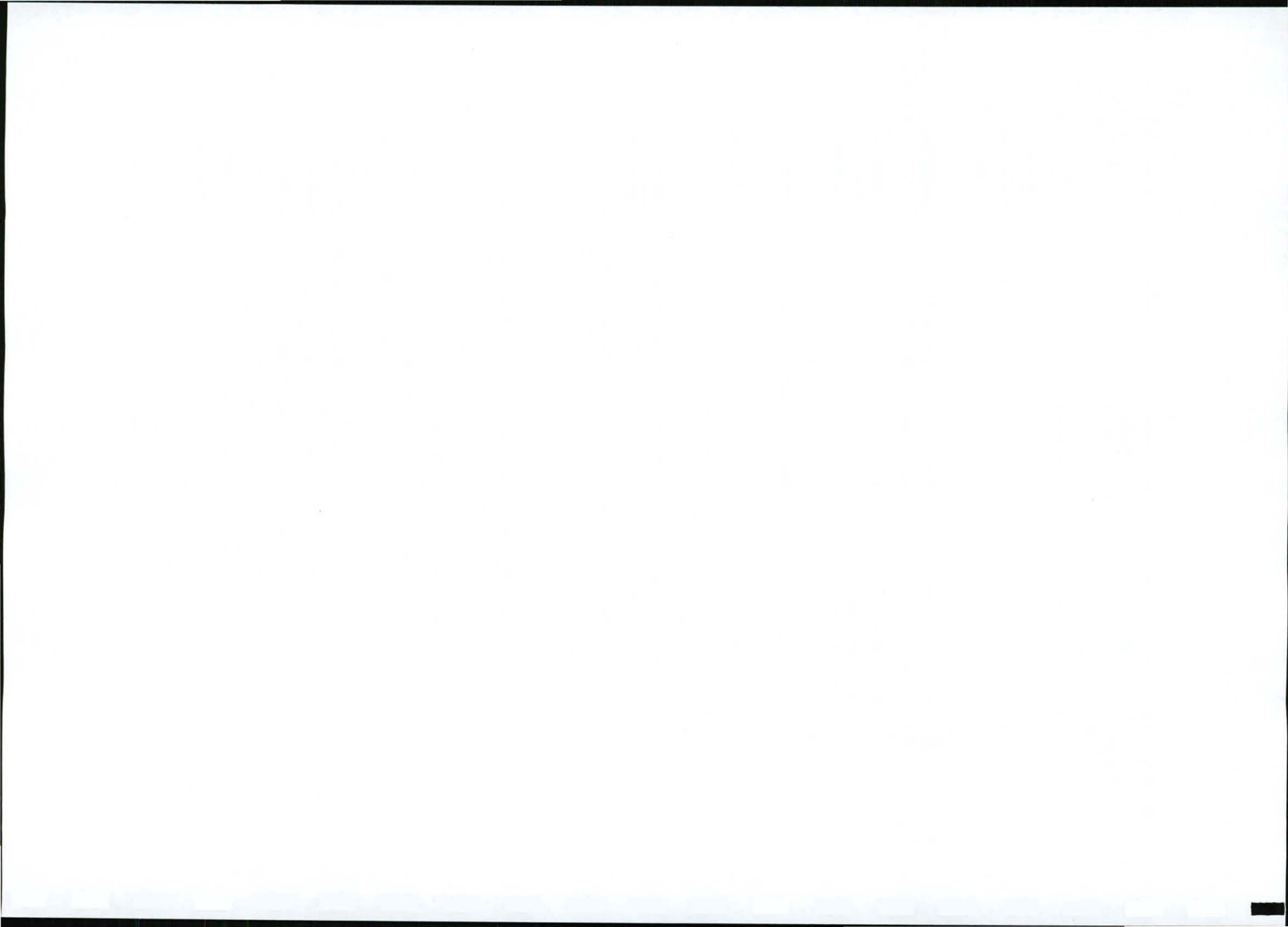
- The maintenance of vehicles and equipment used for any purpose shall take place only in the maintenance yard areas provided.
- The maintenance yard areas shall be fully contained and impervious.
- Runoff from the maintenance yard areas shall be collected and contained on site in a suitable receptacle and removed for appropriate disposal at a licensed waste disposal facility. The receptacle shall be emptied when 75% full. Records of safe disposal shall be kept on site and presented to the ECO.
- Equipment used in the mining/ process must be adequately maintained so that during operations it does not spill oil, diesel, fuel, or hydraulic fluid.
- Machinery or equipment used on the mining area must not constitute a pollution hazard..

14.2.4.3 Waste disposal

- Suitable waste disposal containers shall be made available at all times and conveniently placed for the disposal of waste.
- Collected waste shall be separated into the different categories of hazardous, general waste and construction rubble.
- Waste containers shall be provided with lids or netting to prevent waste from being disturbed by scavengers or being blown away by wind.
- Waste shall be removed from site on a regular basis.
- All used oils, grease or hydraulic fluids shall be placed therein and these receptacles will be removed from the site on a regular basis for disposal at a registered or licensed waste disposal facility. Records of safe disposal shall be kept on site and presented to the ECO.
- All spills should be cleaned up immediately to the satisfaction of the ECO/Engineer by removing the spillage together with the polluted soil and by disposing of them at a licensed waste disposal facility

14.2.4.4 Rehabilitation of vehicle maintenance yard and secured storages areas.

- On completion of mining operations, the above areas shall be cleared of any contaminated soil, which must be disposed of at a licensed waste disposal facility. Records of safe disposal shall be kept on site and presented to the ECO.
- All buildings, structures or objects on the vehicle maintenance yard and secured storage areas shall be dealt with in accordance with section 44 of the Mineral and Petroleum Resources Development Act, 2002.
- The surface shall be ripped or ploughed to a depth of at least 300mm and topsoil previously removed from these areas shall be spread evenly to its original depth over the whole area.
- The area shall then be fertilized if necessary in order to assist re-establishment of the vegetation and then be seeded with an indigenous grass seed mix.



14.3 Operational Procedures

14.3.1 Limitations on mining/prospecting

- Mining shall be limited to the areas indicated on the mining plans for each individual borrow pit.
- The contractor shall ensure that operations take place only in the demarcated areas.
- Operations shall not be conducted closer than one and a half times the height of the bank from the edge of any river channel/stream. Damage to the bank of the river/stream caused by the operations, shall be rehabilitated to a condition acceptable to the ECO/Engineer at the expense of the contractor.

14.3.2 Water Use License

- If any surface or groundwater abstraction is needed then applications for a water use license must be made in terms of the National Water Act, (Act 36 of 1998).
- Approval(s) must be granted by the Department of Water Affairs prior to any abstraction taking place.
- Conditions contained in the approval(s) must be strictly adhered to.
- The appropriate license forms for each kind of expected water use should be completed together with supporting documentation.

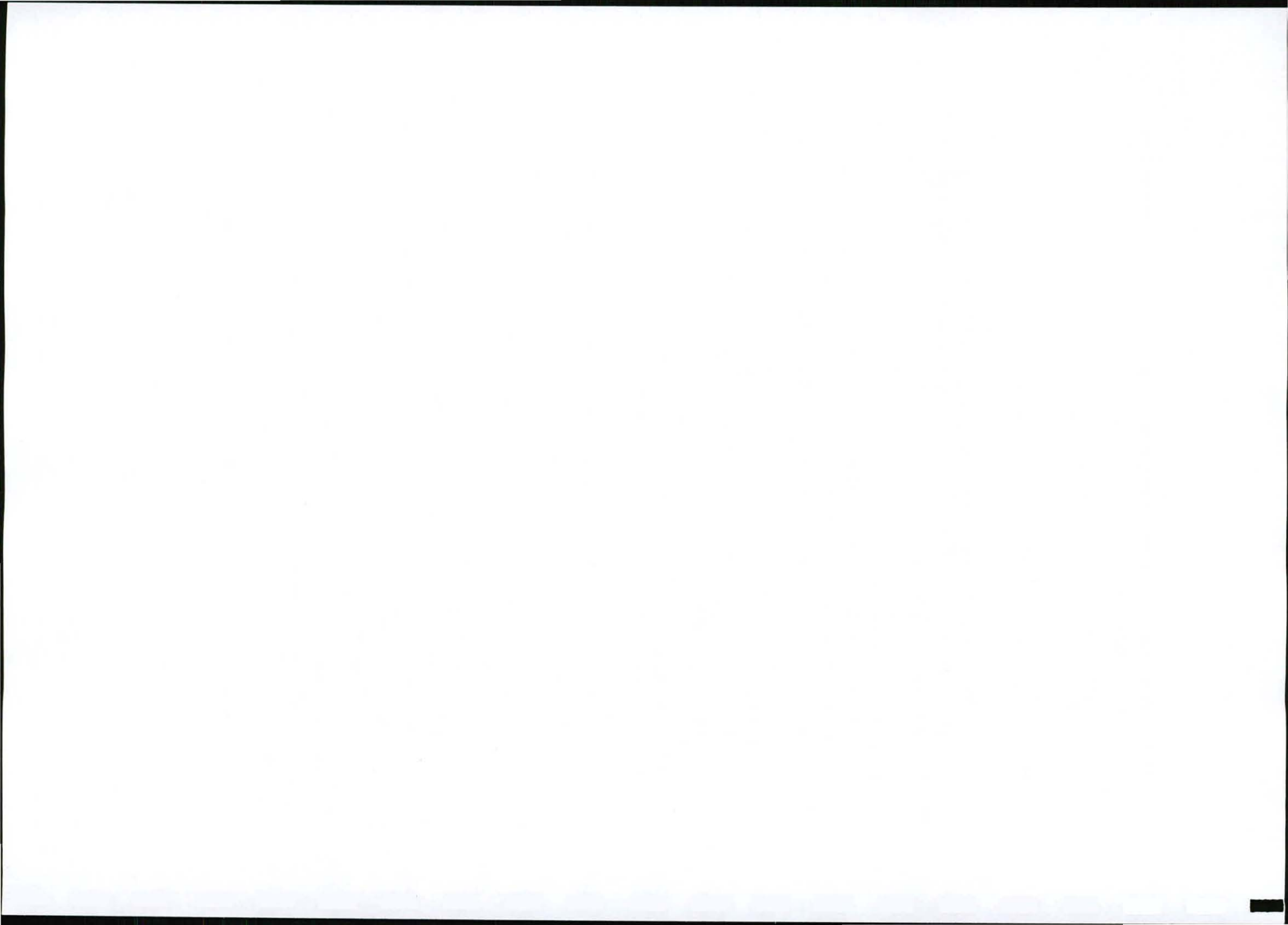
14.3.3 Excavations

Whenever any excavation is undertaken the following operating procedures shall be adhered to:

- Topsoil shall, in all cases be handled as described in this EMP.
- Excavations shall take place only within the approved demarcated mining area as indicated in the mining plans.
- Overburden rocks and coarse material shall be placed concurrently in the excavations or stored adjacent to the excavation, if practicable, to be used as backfill material once mining operations have ceased.
- Trenches shall be backfilled as soon as possible.
- Areas of expected increased surface runoff along the down-slope borders of the excavation areas (i.e. areas natural runoff may be concentrated) shall be suitable stabilized using gabions and/or rock material. These areas shall be maintained until the borrow pits have been fully rehabilitated.

14.3.4 Rehabilitation of excavation areas

The following operating procedures shall be adhered to during the rehabilitation of excavation areas:



- The excavated area must serve as a final depositing rocks and coarse material not used in the road construction.
- Waste material (general waste, litter, etc) shall not be deposited in the excavations.
- Once excavations have been refilled and profiled with acceptable contours and erosion control measures, the topsoil previously removed shall be returned to form a layer no less than 50mm. If insufficient topsoil is available, then it must be imported from elsewhere if such material is available.
- The areas shall be fertilized if necessary to allow vegetation to establish rapidly. The site shall be seeded (by hand or hydro seeded) with an indigenous grass seed mix in order to propagate the locally or regionally occurring vegetation.
- Near vertical slopes (1:1 to 1:2) must be stabilized using natural rock wall structures constructed using conventional building methods or in other forms with mortar forced between the structures. All structures must have a 'natural' look and provide facilities for plants to grow in.
- All areas where the slopes are 1:3 to 1:6 must be logged or otherwise stepped (using stabilization cylinders or similar) after the placement of topsoil in order to prevent soil erosion. Logs/ cylinders must be laid in continuous lines following the contours and spaced vertically 0.8-1.2 m apart, depending on the steepness of the slope. These logs/ cylinders must be secured by means of steel pegs and wire in rocky areas, and treated wooden pegs in other areas.
- The post-mining area must be fenced off in order to prevent access by livestock until such time that the vegetation has been allowed to establish sufficiently.
- The site must remain fenced with warning signs erected to caution the general public of the altered state of the environment in the area. Drainage structures must also be left intact.
- No dangerous faces which present a safety threat to communities should be left.

14.4 Emergency Procedures & Remediation

- Emergency procedures must be developed for the following incidents:
 - Fire
 - Spillage of Hazardous Materials (fuel, chemicals, sewage etc)
- It is the Contractor's responsibility to develop the emergency action plans. These must be checked and approved by the ECO and by the Department of Minerals.

14.5 Fire Risk & Burning

- The Contractor shall take all the necessary precautions to ensure that fires are not started on site.

