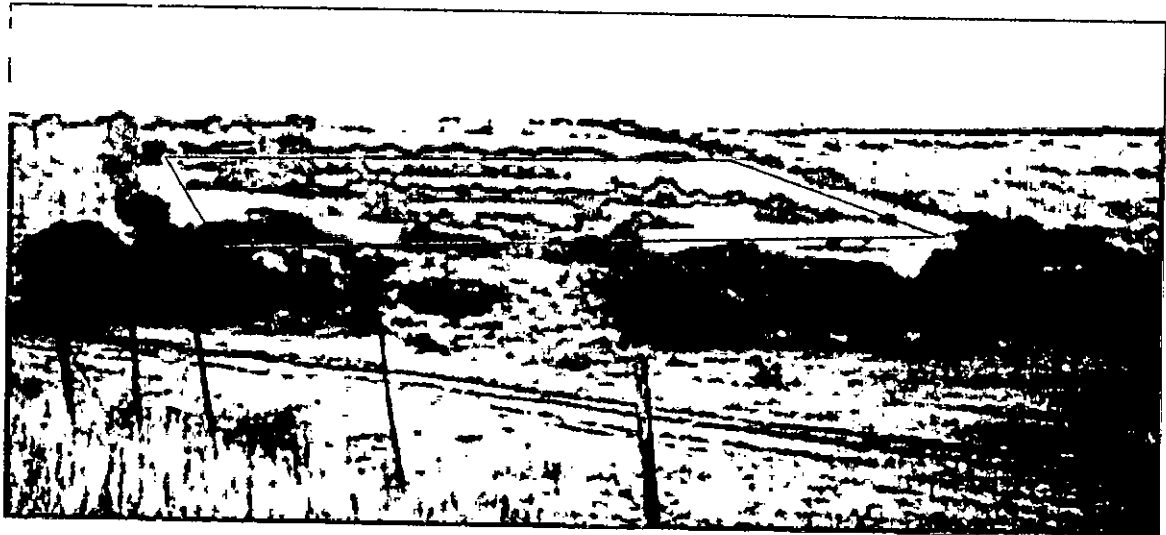




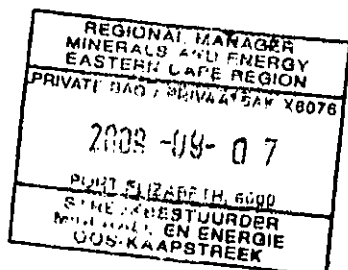
STELLENRYCK ENVIRONMENTAL SOLUTIONS

*Final Permit Application: Background Information to  
Finaly Heritage Impact Assessment: Sand Mining  
On Remainder of Portion 1 of the Farm  
Gorch no. 398, District of Bathurst*



PREPARED FOR:

KENTON ON SEA AGRIBUSINESS  
& MULTI-PURPOSE CO LTD  
P. O. BOX 426  
KENTON ON SEA  
6191



JUNE 2009

Tel. & Fax: 041 3672049 · Cell 08241-0464 · 4 Josephine Avenue LORRAINE 6070  
Member: J. A. van As: B.Sc (Botany & Zoology), B.Sc (Hons) (Eco-Physiology), M.Sc (Plant Physiology)

**ENVIRONMENTAL MANAGEMENT PROGRAMME FOR SAND QUARRY AT KENTON-ON-SEA****INTRODUCTION & BACKGROUND**

There is generally a shortage of sand in the Alexandria & Kenton-on-Sea areas and sand is either imported from Port Alfred or Alexandria or obtained from unauthorized sources. This extensive distance that sand has to be transported, causes it to be an expensive commodity and results in inflated construction costs. Since there is no commercial source available within a radius of 30km, the proposed concern will be able to supply all local building contractors and private individuals, which in turn will result in adequate demand to ensure it become a viable mining venture.

Mining will be conducted by Mr. Hennie Venter, a well-known farmer and former mine owner who dispose of adequate knowledge for developing as well as rehabilitation of the mine. His involvement will ensure that optimal extraction is achieved but also that it is done in an environmentally acceptable manner. The applicant has recently acquired the farm on which the sand quarry is located as part of the redistribution of agricultural land initiative and will use the income from the sand quarry for the development of the farm concerned with specific reference to the extension of its cattle herd.

In terms of the STEP Programme the conservation status of the area is categorized as least threatened and can therefore withstand some loss of natural land through disturbance or development. In addition, the area also form not part of any STEP corridor, therefore mining activities will not affect ecological processes in the area. It should be noted that the area concerned has been totally transformed by previous agricultural activities and a low environmental impact is anticipated, mainly soil degradation. Development guidelines provided in this EMP will ensure that no post closure environmental degradation is experienced. In terms of the development proposal 1,5ha of land will be developed. There are no permanent infrastructure close to the proposed sand quarry whilst nearest residences are approximately 300-400m it therefore no social impact is anticipated.

**TERMS OF REFERENCE**

Stellenryck was appointed to perform the entire application process and submission to the Department of Minerals and Energy (DME) and include the following:

1. Applications for mining permit, which has been provisionally accepted.
2. A public participation process prescribed in terms of section 27(5) of the MPRDA was conducted and abutting land owners were consulted. The outcome was submitted to the DME. No objections were received regarding the proposed quarry development.
3. Compilation of an EIA & EMP for the proposed sand quarries.
4. The EMP would cover all biotic and abiotic components on basic assessment level.
5. Considering the environmental status of the area caused by previous agricultural activities as well as the status of the land in terms of STEP no detailed faunal survey was conducted but a floral survey was conducted of the remaining vegetation strips that currently acts as contours in the development area.

The findings of the EMP are based on information gathered from:

- Quarry operations in the Port Alfred/Kenton-on-Sea area submitted to the DME in the past.
- STEP Programme, EMPAT, Mucina & Rutherford and SANBI,
- Quarry sites visited/evaluated in the past that occurred in similar veld type.
- Two site visites conducted early 2009.

Applicant

Kenton-On-Sea Agribusiness and Multi-Purpose  
P O Box 426  
Kenton-On- Sea  
6191

Reg No: 2008/002092/24

Tel no: 0845865175

Applicants Representative

Ms N. Zweni

Mine manager

Mr. E. H. Venter  
P O Box 163  
Kenton-On-Sea  
6191

Tel: 046 – 654 0286

Fax No: 046 – 654 0283

Surface owner

Under Milkwood Estates (Pty) Ltd  
P O Box 426  
Kenton-On- Sea  
6191

Tel no: 0845865175 (M. Sparg - Contractor)

Holder of mineral rights

State

Title deed description

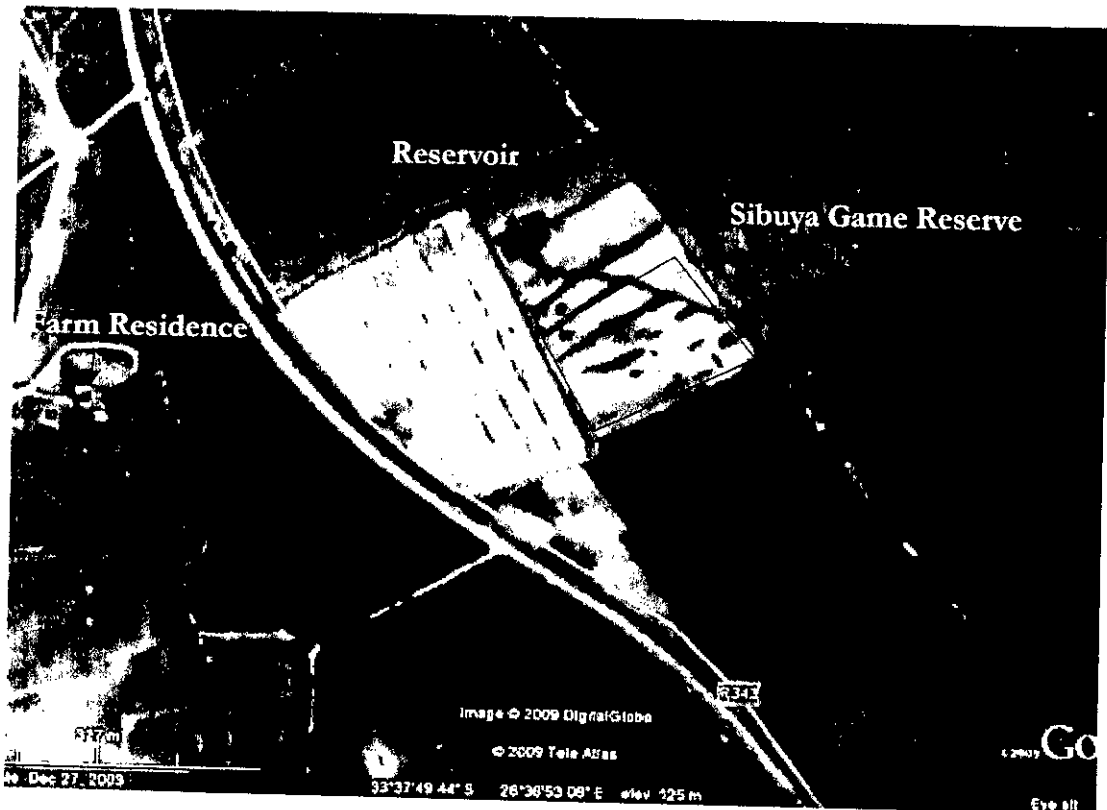
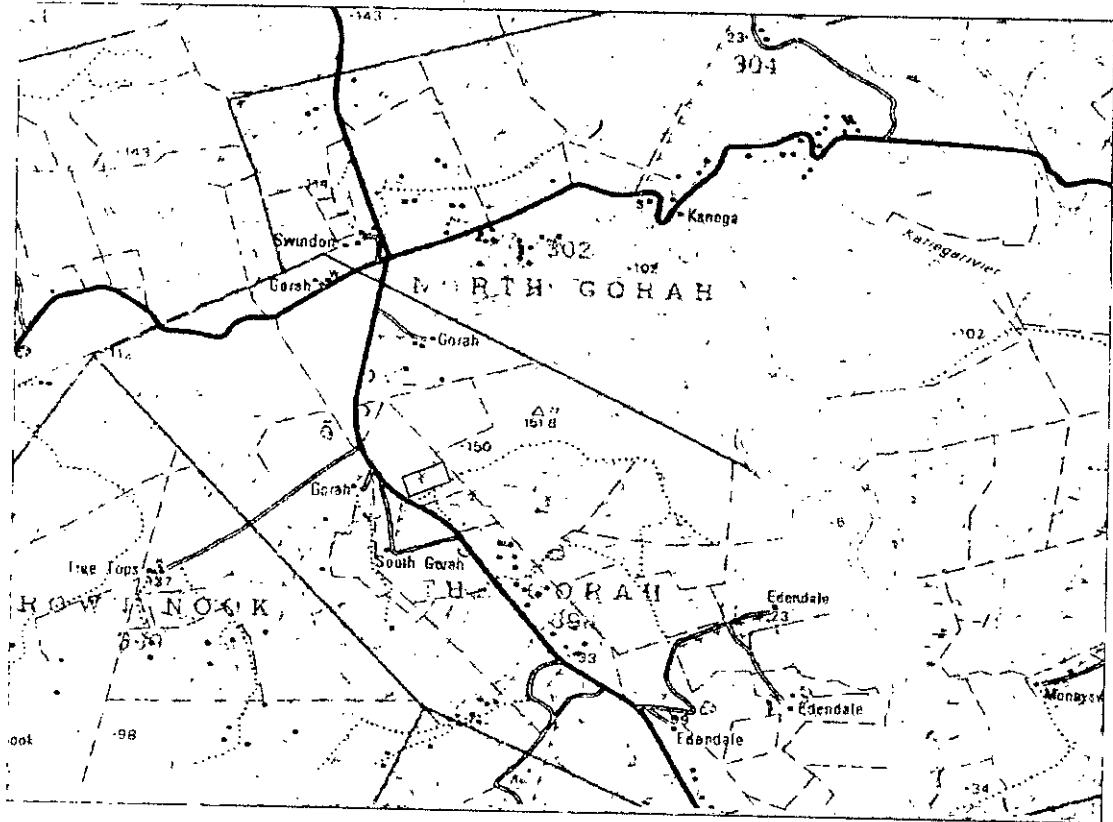
Remainder of Portion 1 of the farm The Gorah no 398, Bathurst

Title Deed No: T17237/2008

**LAND DESCRIPTION**

Regional setting

The proposed quarry is located on Portion 1 of the Farm Gorah number 398 in the magisterial district of Bathurst and is under control of the Ndlambe Municipality. The proposed quarry is situated ±5.5km from Kenton-On-Sea on the right hand side of the Kariega Road, approximately 250m from the road. The mining area represents a pasture area. The property is surrounded by farmland and Game Park.



**PROJECT DESCRIPTION**

## Surface infrastructure

Surrounding areas

The quarry surrounds are sparsely populated with only a few residences on the surrounding farms. There are farm residences approximately 1,1km & 1,84km west-south-west, 1,5km north-north-west, 570m & 2km south-south-west and the landowner's residence 600m to the west, 500m south-south-west and one 500m to the north-north-east. Power line servitude is registered next to the R343, 200m west from the site and will be used as main haul road to the relevant markets in and around Kenton-on-Sea. A water reservoir (irrigation) is located 90m to the north. The Sibuja Game Reserve borders the site to the immediate east.

Mine

There is an existing farm road to the quarry that will be used to access the R343 and will not impact on the activities of the farm since main crop production activities are taking place more to the east. The road(s) to be used will be upgraded with a 30cm-wearing course of shale to be imported from a source on the farm used for upgrading farm roads. Considering the rainfall of the area as well as the availability of the water reticulation network for irrigation no borehole will be drilled for dust suppression purposes. No labour accommodation, fuel tanks or campsite will be established on site.

A chemical toilet/pit toilet will be positioned at the western end of the quarry area. Should it be required that the sand be screened a single stage screen will be erected at the quarry. In such case an onboard generator will be used as power source but considering that the sand reserves of the area seems generally clean it might not be necessary. Stockpile area of 100m<sup>2</sup> will be required next to the production face or screen depending on the nature of the sand reserves.

There is a dysfunctional borehole in the middle of the study area within a bush clump and will not be disturbed

## Presence of servitudes

There are no servitudes registered in the proposed quarry area. A 30m boundary pillar on the Game Reserve side will be maintained.

## Land tenure and use of immediately adjacent land

North – Cleared area vegetated to secondary grassland – Grazing. Further afield Water Reservoir on expropriated land.

West – Cleared pasture area vegetated to secondary grassland – Grazing, R343 and further afield applicants residence and crop production

South – Natural Valley Bushveld - Grazing – Applicant's land.

East – Cleared pasture area vegetated to secondary grassland – Sibuja Game Reserve

## Existing land uses that impact on the environment in/outside the proposed mining area

1. Residences, farm outbuildings causing very limited visual interference and loss of aesthetic value.
2. Transformation of land through bush clearing, cultivation and grazing causing extensive loss of ecological integrity and visuals.

3. The R343 that carries low traffic volumes causing limited increased air pollution and noise levels.

Based on the above the proposed sand quarry will only marginally affect farming activities. In terms of the biodiversity and conservation potential, the land is classified as least threatened. That means the land can accommodate development and/or withstand limited loss of natural areas through disturbances. Notwithstanding this rating, the applicant will ensure that the affected land is rehabilitated properly and restored in such a manner that no post closure impacts are imposed on the natural and social environment with specific reference to the Sibuya Game Reserve.

Name of the river catchment in which the quarry is situated:

There are no rivers in the immediate area but the study is represent the very head of a drainage channel. The site falls within the Kariega River catchment. Water quality of this river will not be affected due to the extensive distance involved.

### Zoning

Current zoning is agriculture but since mining is seen to be a temporary change of land use, no application for change of land use in terms of LUPO is required. In this regard, the repealed Minerals Act 50 of 1991 and the current MPRDA 28 of 2002 has substituted the provisions of the Physical Planning Act.

### Mineral Deposit & Mine Product

No mineral processing will be carried out, since the sand will be loaded directly after stripping it and hauled to the relevant markets. No residue would be produced and thus no disposal measures are required.

Any overburden will be returned to the excavation and be covered with topsoil as part of the rehabilitation plan. Since no chemical processes, mineral processing or washing plant is required, no chemical/mineral waste or effluent will be generated.

### Estimated reserves

An extraction rate of 500 cubic meters of sand per month is anticipated and will deplete the available reserves in less than two years.

### Prospecting

The soil profile reflected by a prospecting trench reveals a sandy E-horizon of between 0,5m & 1m and provides for a sand reserve of approximately 11000 cubic meters if the exclusion areas are taken into consideration.

The land above the mining area reveals only a thin veneer of sand whilst the area below the mining area is dissected by a large water course and the area is not mineable. To the south-west the soil profile reflect good agricultural soils with also a thin orthic sand horizon. The mining area therefore represents a small area at the head of a drainage line that developed a mineable sand reserve through a process of sheet wash and natural beneficiation.



### Mining methodology

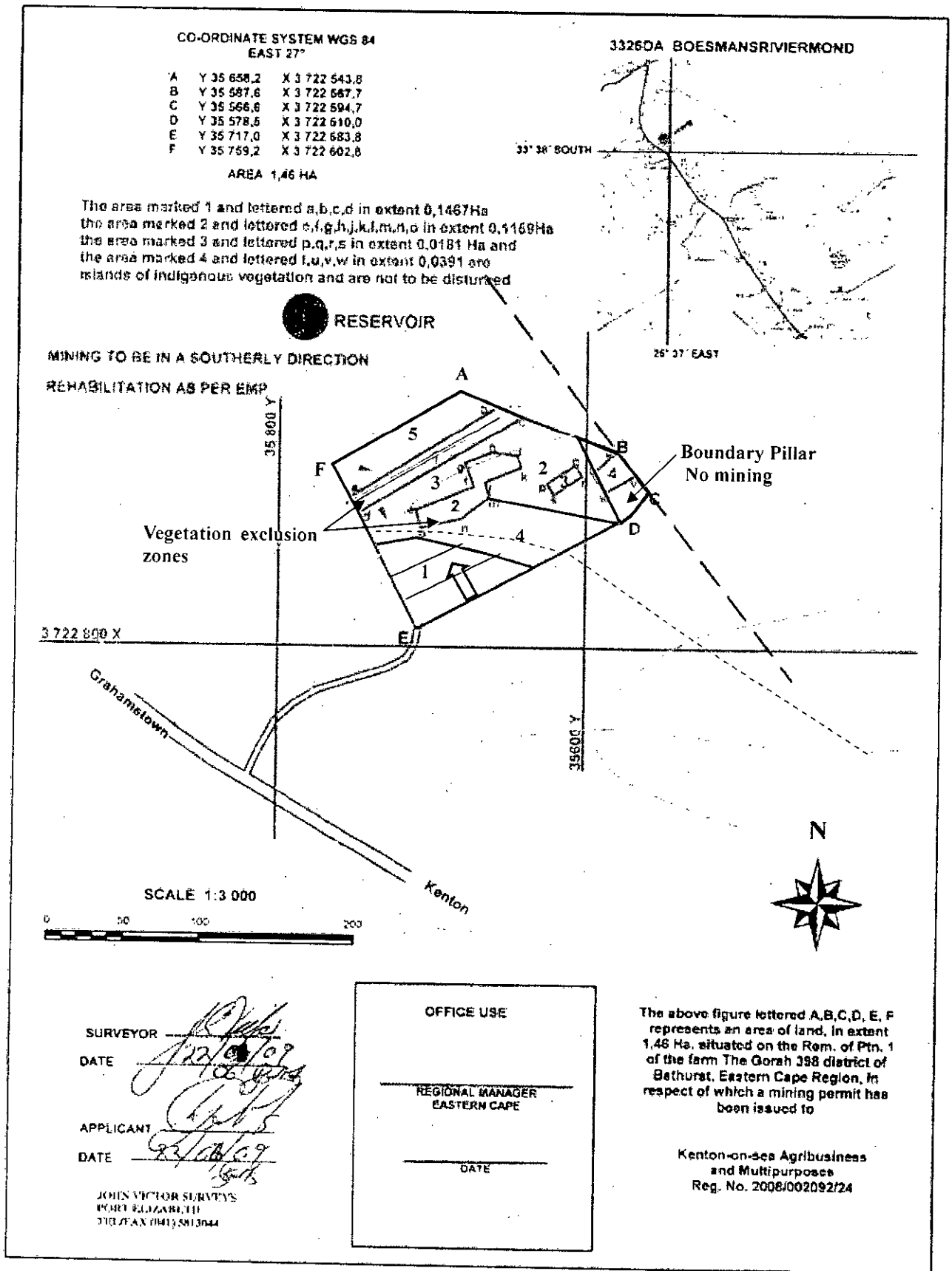
The total mine area comprises about 1,43 ha and will be mined to an average depth of 0,7-1m. Approximately 11000-13000 cubic meters of sand will be extracted over a period of 23 months with the aid of an excavator. Extracted material will be hauled to the identified markets with three tipper trucks.

Mining will be done in Five phases as depicted on the mine plan and will commence from the south and extended northwards in slots of approximately 50m x 30m. On completion of the first phase, rehabilitation of this phase will coincide with the development of the second phase and will include profiling and backfilling with limited amounts of orthic topsoil/organic material. The same scenario would apply to the remainder of the phases. It is important that the phase 4 be mined only when phases 1 & 2 are fully rehabilitated to prevent scour within this area. The floor of the mine area will reflect more or less the slope that the current land reveals.

The thin lines of Valley Bushveld will be retained as natural contours to protect the area against scouring during periods of high precipitation. In each phase the production faces will be profiled through the cut & fill method to 1:3 slope and vegetated.

Potable water would be provided by the contractor and brought to site daily by workers. The workforce would not reside on the mine, but will commute to work every day. Considering that at most two persons would be on site for short periods, no waste disposal site is required. A container with a lid would be placed within the mining area for the storage of any household waste. The sewage system will comprise a pit toilet on the northern side of the site. No additional infrastructure will be erected on site.

A dust suppression system consisting of a sprinkler system connected to the PVC water pipeline located to the north-east of the study area will be put in place. As a rule sand deposits do not contain large quantities of fines/silt but windblown sand is a common phenomenon in the area and might require dampening to prevent unnecessary air pollution. No vehicle maintenance will be conducted on site. The proposed operation would be conducted from 7.30 am to 5pm five days a week, with cessation of activities at 1pm on Saturdays if market demand requires. An average extraction rate of 500 cubic meters per month will be maintained.





### Construction phase

The only construction activity will be the removal of topsoil and the grass cover, which will be stored on the northern and eastern perimeter of each phase or sub-phase. The existing farm road will be used as haul road and will be upgraded with shale from an old gravel pit on the farm.

The mining area will be fenced off to prevent vegetated areas to be grazed. At this stage no office is required.

A weighbridge will not be positioned in the mine area since extracted material will be sold by volume. No hydrocarbon storage facilities will be constructed on the property and refueling of trucks will be done in town. One day's supply of fuel will be brought to the farm on a daily basis or whenever extraction is anticipated. No other construction activities that could result in environmental or health & safety impacts will take place on the property.

No Eskom and Telkom service points are required.

### Planned production rate

Approximately 500 cubic meters sand will be extracted per month but may increase because of the close proximity of the mine to town and lower price structure that will be applicable.

### Planned life of mine

At the proposed production rate the lifespan of the quarry is approximately 22-24 months.

### Economic sustainability

Kenton-on-Sea is a small coastal town that experiences slow, but constant growth as more people tend to retire in town with the result of an increase in demand for construction material. There is generally a shortage of sand in the Kenton-on-Sea area since it does not dispose of a commercial sand source and all material has to be carted in from Port Alfred at an additional cost of approximately R25 per cubic meter. To circumvent this inflated commodity price, sand is obtained from numerous unauthorised sand quarries on farms in the Alexandria/Kenton/Port Alfred areas. Registering the concern may contribute to downscaling the illegal sand market. The poor availability of sand therefore guarantees a reasonable market which in turn will ensure a financial sustainable quarry concern.

The contractor to develop the site has been involved with mining and distribution of the site for many years and dispose of adequate clientele to ensure good monthly sales

### Financial competency

Venter Stene CC will provide the finances to develop the proposed mining site. From the Absa Bank statement of Venter Stene CC, it is evident that on average R100 000 will be available for the development/ rehabilitation of the mine. This amount would be able to pay for development and rehabilitation costs and the concern should therefore not pose a financial risk to the DME. The proposed concern has limited Health and Safety considerations and available finances are more than adequate to cover such costs.

### Technical/Environmental competency

Technical competency will be provided by the Venter Stene CC

### Experience

Mr. Venter, was the owner of two clay quarries and brick manufacturing plants, Venter Stene CC, in Kenton-on Sea for approximately 10 years and has therefore gained adequate experience in mining techniques. He has most of the time fully complied with the provisions/guidelines on the development of open cast mines and according to the authors knowledge no directives were issued for negligence in terms of Health & Safety matters. Over time, he has become well acquainted with the general requirements of the DME and the MHSA related to opencast mining procedures. Operating within the ambient of the DME health & safety standards is therefore within reach of Mr. Venter. During his previous mining ventures he became fully skilled with regards to safe extraction methods and safe development of slopes.

Mr. Venter has been actively involved with road construction for the past 20 years and has excellent knowledge of earthmoving techniques and of operating heavy machinery. He also owns equipment required for road construction.

The environmental impacts associated with the proposed mining concern is restricted to slope destabilization and soil disturbance and to a limited extent social impact in terms of hauling material on public roads. All of these fall within the scope of the contractor's capabilities.

Mr. Venter is also an experienced stock, dairy and cash crop farmer and establishing pastures on steep slopes caused him to gain adequate knowledge on safety aspects involved when working with heavy equipment in these environments. From a rehabilitation perspective Mr. Venter has vast knowledge of establishing pastures and implementing soil protection measures and would therefore ensure that the mining area is developed in a sustainable manner without posing any health & safety risks during mining or post-closure. Considering the expertise of the applicant in terms of pasture management and through implementing the conditions of the EMP the site should be developed in a sustainable manner.

The applicant will also submit an annual performance assessment report reflecting on its ability to manage the environment

Being a farmer also give provide the contractor access to farm equipment like tractors, wagons and ploughs that will assist him in rehabilitating the mined area.

Developing this shallow opencast quarry would be a relative easy task and Mr. Venter disposes of the required skills to develop the proposed mine.

### Mining Equipment

Technical support to develop the quarry will be provided by Venter Stene CC, who will also be responsible for the rehabilitation of the site. The following equipment will be made available:

- 2 x Volvo Loader Pump Lifters
- 1 x Volvo Excavator
- 1 x Hino Heavy Load Vehicle Tipper truck
- 1 x Nissan Tipper A520 truck
- 1 x Isuzu Tipper FTR 49 L truck

Venter Stene CC has been operating in the local mining sector for a number of years and employees are fully trained and experienced operators that will be able to conduct mining in a healthy and safe manner.

## **HEALTH AND SAFETY MATTERS**

The applicant will endeavor to comply with the conditions of the Mine Health & Safety Act, Act 29 of 1996 and as a minimum will ensure the following:

- Workers will be provided with dust masks and earth muffs when working in areas that require such protective measures.
- All workers will be medically tested annually as per the Mine Health and Safety Regulations.
- Clean drinking water will be provided in an acceptable container
- Operators of vehicles will have the required licenses.
- Only one front-end loader/excavator will extract material in the quarry and will load it onto waiting trucks to be dispatched to the identified markets. Only one truck will be allowed inside the quarry at any given time to limit the risk of accidents.
- Vehicles will be maintained properly and reverse hooters will be fitted.
- No mining would take place during the evening or very early morning or during adverse weather conditions when visibility or surface conditions are impaired.
- The production faces will be suitably sloped to eliminate safety risks and to retain the required slopes for easy rehabilitation as described earlier. Operators will receive the necessary training to mine and cart the sand.
- The mining area will be a restricted area and visitors will not be allowed unsupervised access to the operations during the day. The necessary signage to this effect will be posted at the entrances to the property and mine respectively. Access to the mining concern will be restricted at the end of the working day by means of the gate at the entrance to the property. No foreign vehicles will be allowed in the mine area.
- Machine operators and truck drivers will on a regular basis be informed on the potential health and safety issues involved and efforts will be focused on safe distances from operating vehicles, turning circles of vehicles, moving machinery parts, procedures for vehicles entering the mine area, the stability of production faces, safe driving, mechanical safety of vehicles and medical matters.
- No electrical equipment will be used onsite.
- The property is fenced and mining area will also be fenced in to increase safety at the mine.
- The placement of medical kits in the cabin of loader/excavator will be implemented.
- The Principle Inspector of Mines will be informed on the date on which mining commences.
- Any accidents will be reported immediately to the Principle Inspector of Mines telephonically and in writing in the applicable format.
- Access to the property will be controlled through the existing lockable gate.
- Noise generation by vehicles will be controlled through regular servicing and fitting of standard exhaust systems.
- Dust will be curbed by means of re-vegetation of disturbed areas as soon as possible and by means of irrigation and windscreens, if required.
- A competent mine manager will be appointed.
- A risk & safety officer will be appointed if deemed necessary by the Principle Inspector of Mines.
- Acceptable sanitation facilities will be provided at the quarry.

- Workers will be granted the right to refuse working in unsafe areas.
- Post rehabilitation slopes will be stable, vegetated and safe.
- There are no immediate residences in the quarry area; therefore no nuisance impact would be applicable.
- Risk assessments will be submitted to the Principle Inspector of Mines.
- Visibility at the intersection with the R343 is good to the south-east and reasonable to the north-west. Any vegetation on the road verge that could reduce visibility will be removed to reduce the risks of accidents from occurring.
- All vehicles will come to a dead stop before accessing any road. Operators will be trained to observe carefully whether any traffic is nearing the access and operators will make use of indicator lights when turning onto any road.
- Vehicles will turn their lights on whilst hauling takes place.
- If required, a flagman will be used to improve safety standards at access points.
- Equipment will be well maintained to reduce the risks of accidents.
- Pit development will comply with standard procedures prescribed by the Mine Health & Safety Act and regular consultations with personnel of the Mine Health & Safety Directorate will be held in this regard.
- The applicant will ensure that they are conversant with the requirements of the Mine Health and Safety Act 29 of 1996.

#### **NO GO OPTION**

The landowner has the obligation to develop the farm in such a manner that the economical viability of the farming unit is ensured. This can only be achieved by expanding the cattle herd and cash crop production on the farm. Without the constant financial support of the sand quarry, this objective will not be attained over the short term and considering the poor economic climate where loans are not easily granted by financial institutions, the farm might never reach its true potential.

Over the short term the unavailability of sand will continue and the illegal sand market will be maintained.

Embarking on this option would prevent the study area to be temporarily used as grazing area and limited loss of income, approximately R3500 per annum will be recorded. Mining the area will generate an income forty times this amount. The no go option will also prevent the area being subject to temporary, but limited soil erosion. Considering the income to be generated this impact can be accommodated and with the contractor's pasture establishment and maintenance ability the impact will be removed within four year's time. The current traffic volumes on the R343 will be insignificantly lower since only 6-8 trips per day is envisaged. Safety conditions will be insignificantly better considering that this road primarily caters for hauling of produce and livestock from farms in the area.

Since the site is located along aside a Game Reserve, it could pose a minor impact on visuals and thus tourism but no road was observed in close range of the fence line therefore it is the opinion that the proposed mine will not interfere with tourism activities on the abutting property.

Considering the above, it seems that the 'no go' option does not have any major social or financial advantages.

#### **EXISTING MINING AUTHORIZATIONS HELD BY THE APPLICANT**

None.

**JOB CREATION**

The proposed mining concern will create at least two permanent job opportunities with most definitely maintaining a few downstream opportunities associated with the hauling of sand and construction activities. Casual labour opportunities will be created during the re-vegetation stages. Current unemployment figures indicates that job losses are at an all time high levels due to the economic recession and it is therefore vitally important to support sustainable developments.

**REGIONAL CLIMATE**

Climatic conditions such as temperature, rainfall and wind velocity influence for example plant growth, erosion levels of disturbed areas, dust generation and air pollution levels as well as social impact in terms of quality of life. Climatic conditions can therefore influence the significance of impacts caused by developments such as mines. It is therefore important to understand the role thereof when determining the impacts of a specific development and the remedial measures that need to be implemented.

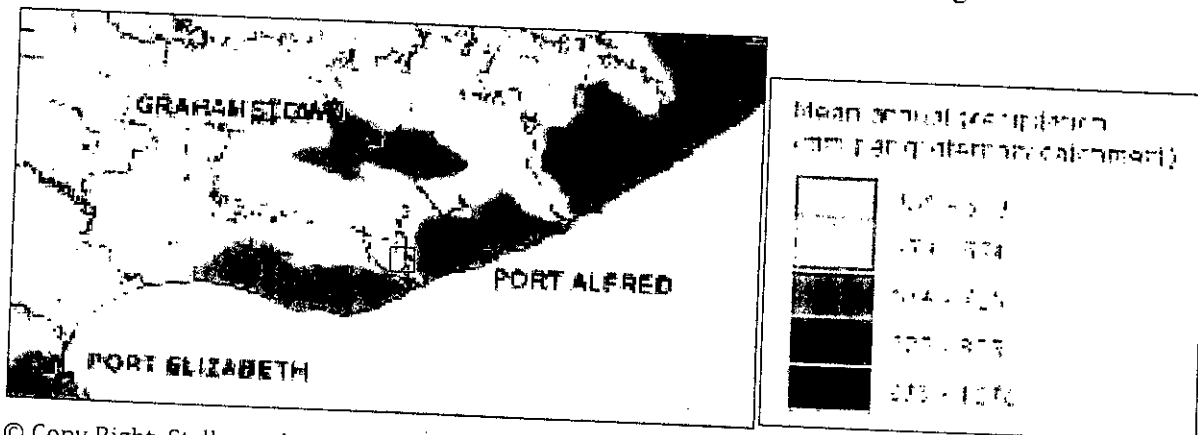
The study site falls into the South-east Coast Grassland. The area has generally a wet climate with moderate temperatures and mild to strong winds.

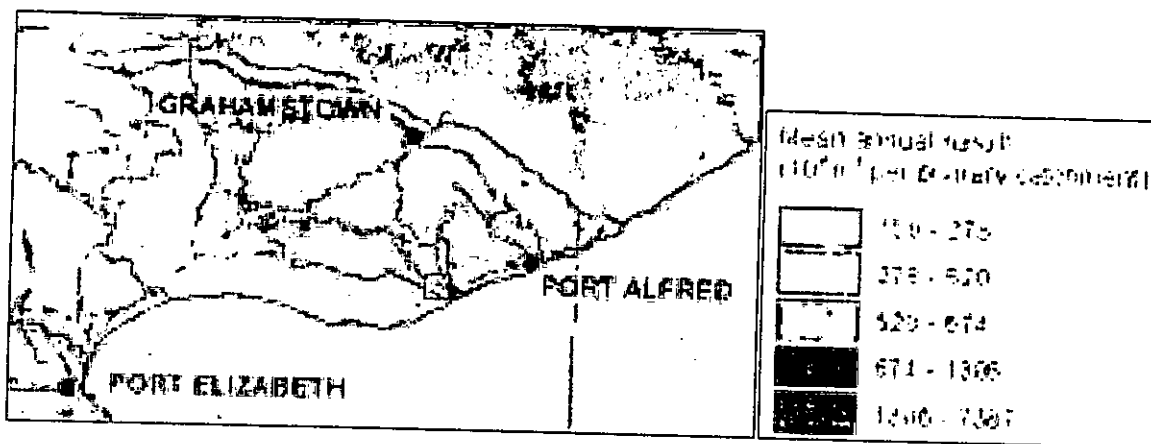
**Rainfall**

The Eastern Cape Province experiences a bimodal rainfall pattern with pronounced wet seasons coinciding with spring and autumn. These rain periods are frequently associated with north-easterly winds. Spring rains may also be associated with the passage of cold fronts drifting in from the west. The Port Alfred/Kenton area has few instances of thunderstorms, with on average about 19 thunderstorms per annum, mostly associated with the period Spring to autumn, with March having the highest number of thunderstorms. Dry periods are coinciding with midsummer and mid winter. The average annual rainfall for the Province is approximately 873mm.

The area falls within rainfall area R5A and receives between 574 and 725mm per annum, which will stimulate plant growth and reduce dust generation to some extent. However, it will increase erosion on disturbed and uncovered mine areas and the necessary storm water control measures need to be implemented. Seeding must coincide with early spring and early autumn to ensure a successful re-vegetation phase. Hail, frost or snow is not common phenomena in this area and will not affect the re-vegetation process. During the summer period 10-11days with rain can be expected per months whilst during the winter months 7-7days with rain can be expected. The most rain that fell in the area was 175mm in 24 hours.

Fog is uncommon in the area due to the influence of the sea with March and November the months during which fog can be expected. Hail, snow and frost are rare in the region





Port Alfred (1961-1990)

Month	Average	Minimum	Maximum
January	52	7	135
February	63	11	170
March	82	15	335
April	53	7	204
May	48	2	182
June	46	1	141
July	47	0	297
August	56	3	250
September	59	8	271
October	79	8	233
November	78	17	340
December	54	9	236
YEAR	717	88	2794

### Temperature

The area experiences warm summers with maximum temperatures in February and minimum temperatures July. The coldest minimum temperature is 10.2 °C during July. Mean monthly temperatures are between 21.7 °C and 15.4 °C. Temperatures in this area are mild due to the moderating influence of the ocean. Hot north-westerly berg winds may occur in winter and may last for a few days, usually preceding cold fronts. From the statistics it is essential that seeding be restricted to the warmer periods to achieved optimum germination and growth. The annual evaporation of the area totals approximately 1400mm with the highest evaporation rates associated with the summer months.

Port Alfred

Month	Average	Ave. Max.	Ave. Min.
January	21,7	26,3	17,1
February	21,9	26,3	17,4
March	21,1	25,5	16,6
April	19,4	24,1	14,7
May	17,6	22,6	12,7
June	15,9	20,8	11
July	15,4	20,6	10,2

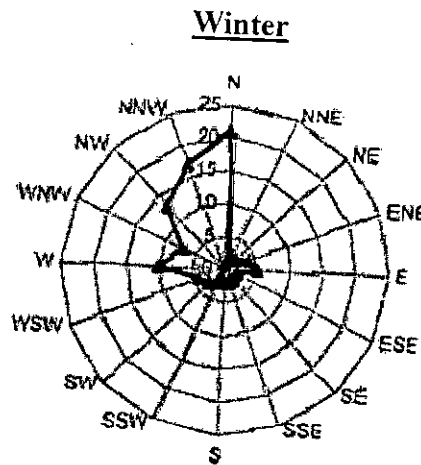
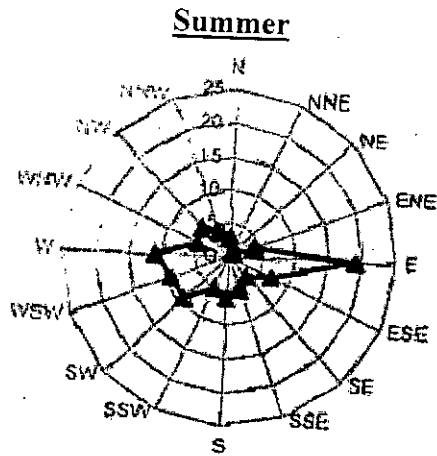
August	15,8	21,09	10,7
September	16,3	21,1	11,6
October	17,3	21,8	12,8
November	18,6	23	14,2
December	20,4	25,1	15,7

The average monthly evaporation rates for the region ranges from 104,5mm in winter to 210.7mm in summer. Rainfall runoff never exceeds evaporation in this region. In terms of DWAF criteria runoff needs to be managed where runoff exceeds evaporation for more than 20% of the time.

### Wind Regimes

The prevailing wind directions are predominantly westerly for both summer and winter. Onshore easterly winds are common during the summer whilst westerly and especially north-westerly winds dominates during the winter. High winds of  $30\text{m}\cdot\text{s}^{-1}$  occur frequently during the summer, September to December.

Wind erosion is an environmental parameter that needs to be controlled when sandy soils are predominant, whilst it would have a lesser effect when well-developed loam or clayey soils are encountered.



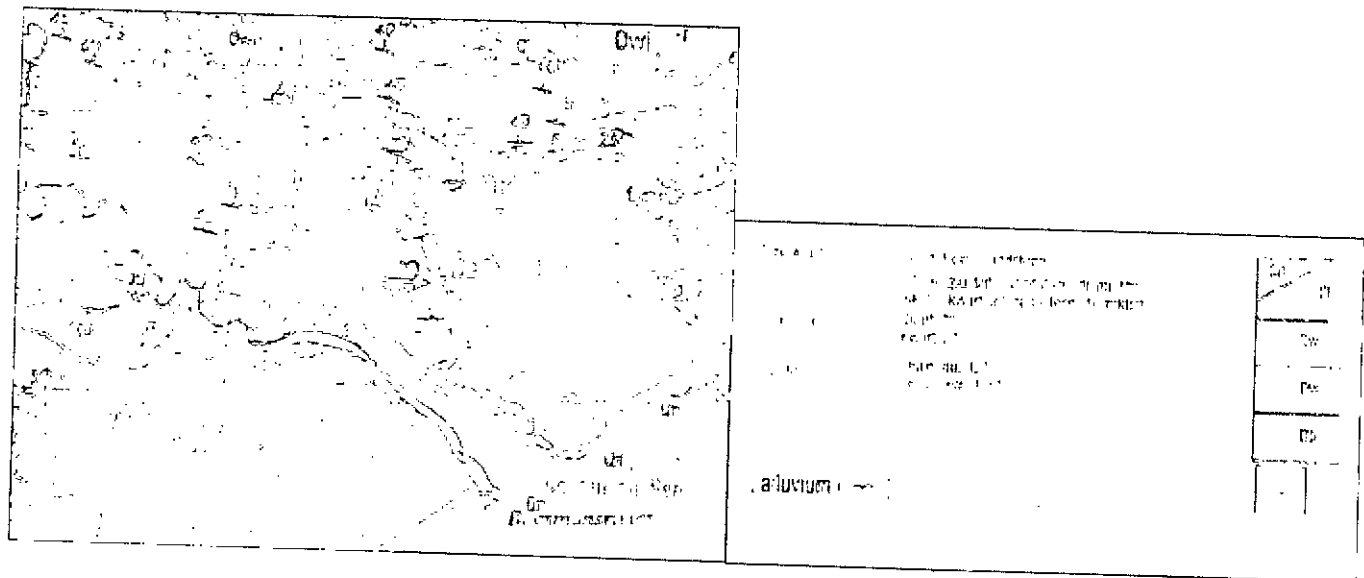
**GEOLOGY**

Rocks of the area belong to the Cape Supergroup, are sedimentary in nature and embrace the Bokkeveld and Witteberg Groups.

The Bokkeveld Group consists of mudrock and quartzitic sandstone and underlies the Weltevrede Formation and is of Early to Middle Devonian in age. The Bokkeveld Group will not affect the quality of material except for at depth.

The Witteberg Group embraces the Weltevrede and Witpoort Formations in this particular area. The Witpoort Formation is the most prominent formation of the Witteberg Group and consists of well over 90% sandstone with a total thickness that ranges from 300m in the west to 800m in the east. This formation consists essentially of medium light-grey to light-grey, medium-grained, moderately sorted, siliceous ultraquartzose sandstone plus minor greyish-black (olive-grey to greyish-red when weathered) micaceous lenticular-bedded or massive mudrock units up to 6m thick. Both the upper and lower boundaries of the formation are fairly sharp and unambiguous. No mudrock lenses have been exposed to date. The Witpoort sandstones is interpreted as a deltaic/fluviatile deposit with currents directed at right angles to south-east –northwest palaeostrike and shoreline, or a shoreface deposit produced by currents flowing parallel to a north-east-southwest shoreline. The lithology of the Weltevrede Formation closely resembles that of the Sandpoort Formation of the Bokkeveld Group but the sandstone component is more abundant, paler in colour and almost feldspar free. Sand from the study area most probably originated from these Formations.

Alluvium found in the area is mostly scattered high-level terrace remnants located between contour levels 30m-60m. Rivers generally flow in incised channels and the occurrence of significant deposits of alluvium is normally limited to the coastal region. The study area is located much higher and may therefore represent historic floodplains of the Kariega River, especially since the river represents a meandering system in this area, which would have facilitated more extensive deposition than incision because of the flatter levels in this area.



However, the closer locality of the Nanaga Formation (T-Q) may have contributed to the sand deposit in the study area through general weathering of the calcareous sandstone of this Formation. Sand deposits in the Port Alfred area, due to its scarcity can be seen as a strategic mineral and the mining thereof can be rated as of moderate significance. The site is not a geo-site and is therefore of less importance.



The area displays no fault lines.

The impact on the geology is site specific but since sand will again accumulate within the area through surface flow and natural beneficiation, it is not deemed a permanent impact. The small section of land to be mined as well as the occurrence of limited but similar geological features in the greater Kenton-on-Sea area renders the impact of low-moderate significance. Since there are currently no other mining activities in the area, cumulative impacts are not a consideration.

## SOILS

Topsoil is a very precious, non-renewable resource with high conservation importance and is necessary for the effective rehabilitation of disturbances caused by development. It is therefore essential that it be preserved and protected and if necessary obtained from outside sources to ensure proper rehabilitation of such areas.

### Soil properties

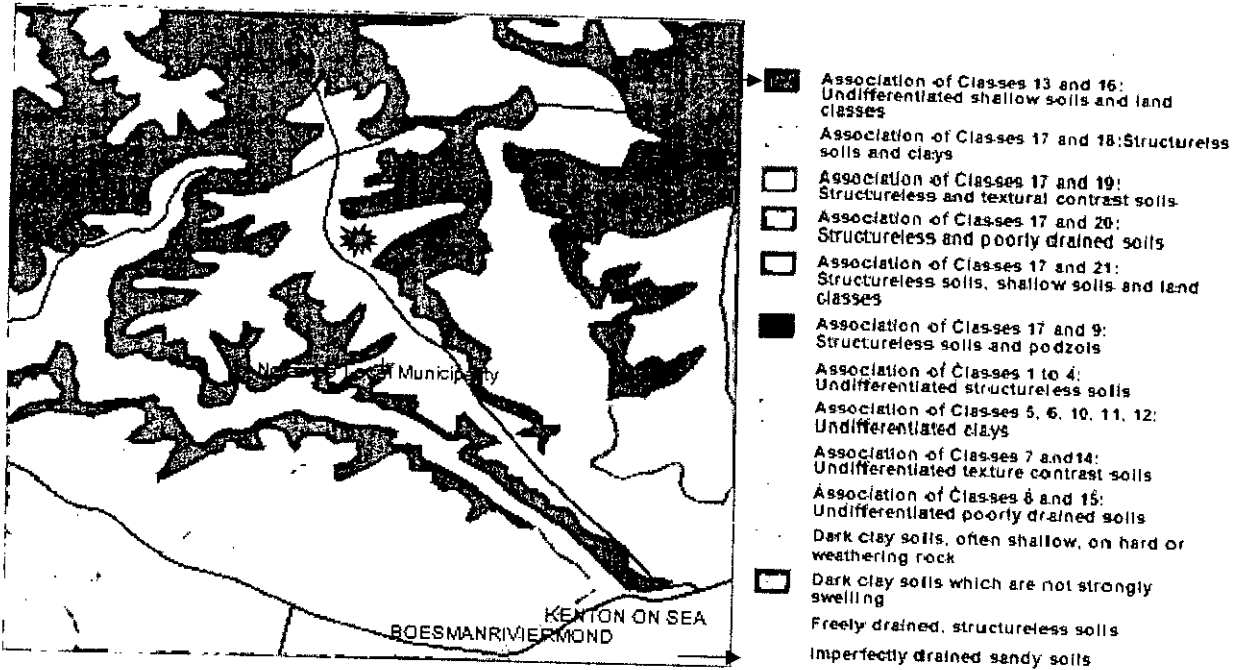
Topsoil is a very precious, non-renewable resource with high conservation importance and from a development perspective is necessary for the effective rehabilitation of disturbances caused by development. The potential of soils to rehabilitate is defined by its depth, structure, texture, and sequence of soil horizons. It is therefore essential that it be preserved and protected and if necessary obtained from outside sources to effect proper rehabilitation of disturbed areas.

Soil is a complex mixture of eroded rock, mineral nutrients, decaying organic matter, water, air and micro organisms. Soil forms when organic matter decay, solid rock weathers and crumbles, and when sediments are deposited by erosion. Mature soils are arranged in a series of zones called soil horizons, each with a distinct texture and composition that vary in different types of soils. Colour generally indicates fertility of arable soils for example; dark brown or black topsoil is nitrogen rich and high in organic matter. Grey, bright yellow or red topsoils are low in organic matter and will need enrichment to support a proper vegetation cover.

The average size of the spaces or pores in a soil determines soil permeability, i.e. the rate at which water and air move from upper to lower soil layers. Soil permeability is also influenced by soil structure: how soil particles are organized and clumped together. Soils vary in their contents of clay (very fine particles), silt (fine particles), sand (medium size particles), and gravel (course to very course particles). The proportion of the different sizes and types of mineral particles determines the soil texture. Loam soils which are comprised of roughly equal mixtures of clay, sand silt and humus, are the best soils for growing most crops. Calcareous soils are those that contain free calcium carbonate and can also be regarded as alkaline soils. The term "dystrophic" refers to an imbalance in nutrients. Dystrophic soils are therefore soils that are rich in humus, giving them a brown colour. They have variable amounts of nutrients and are sometimes depleted of oxygen owing to the high concentration of humus. The term "leaching" refers to a process whereby various soil components are dissolved by water moving through the upper layers, carrying the dissolved material to lower layers. Highly leached soils are those where most of the nutrients, etc. have been leached from the upper layers.

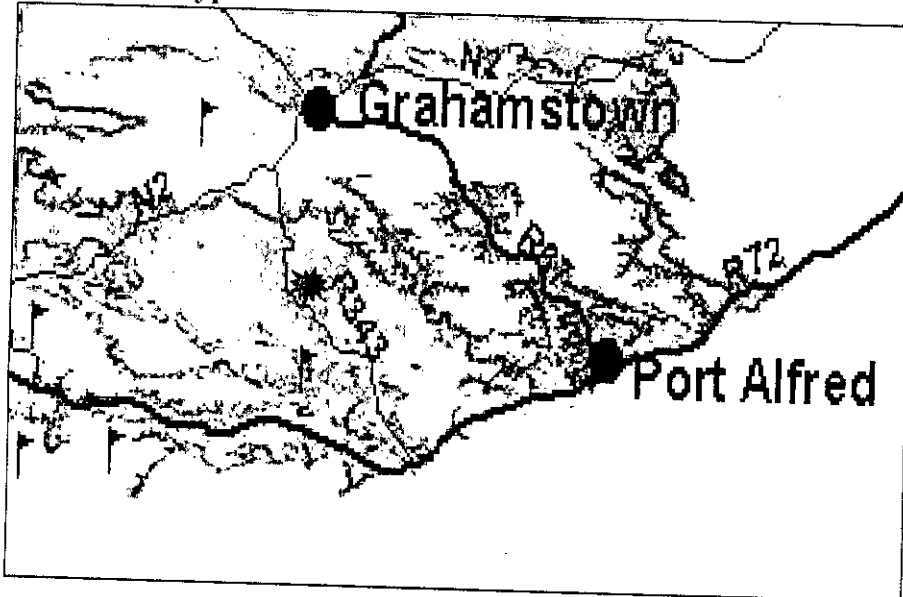
Soils within the greater study area derived from the Karoo sediments are geologically complex and derived from the Beaufort Group mudstones and sandstones. Soil properties have been influenced by both mudstone and sandstone parent material. Soil colour varies from light-brown to greyish and soils are classed as freely drained, structureless soils (S2) with low fertility, excessive drainage and high erodibility with topsoil abruptly overlying a slowly permeable B-horizon. Soils have favourable physical properties. To the east soils are categorized as S21 soils (association of classes 13 & 21) revealing undifferentiated shallow soils.

**Broad soil classes**



Onsite evaluation revealed a light-brown-grayish, shallow topsoil underlain by a regic E-horizon that constitute the target mineral. The shallow topsoil will result in a difficult rehabilitation process and all soils must be conserved. The sandy E-horizon is directly underlain by mudstone and soils will therefore be prone to erosion. Due to the secondary grass cover of the study area soils show a low organic component and the percentage of carbon content would be below 1,8% and will require upgrading.. Due to intermediate microbial activity and high soil temperature the organic component will be broken quickly once the system is disturbed hence topsoil storage time must be restricted to the minimum. Since the organic matter is relatively fine, it will also expedite the breakdown of organic matter. It would from a fertility point of view be pertinent that all organic matter removed from site is reintroduced to profiled areas to increase the humus component of reinstated soils.

**Specific soil type**

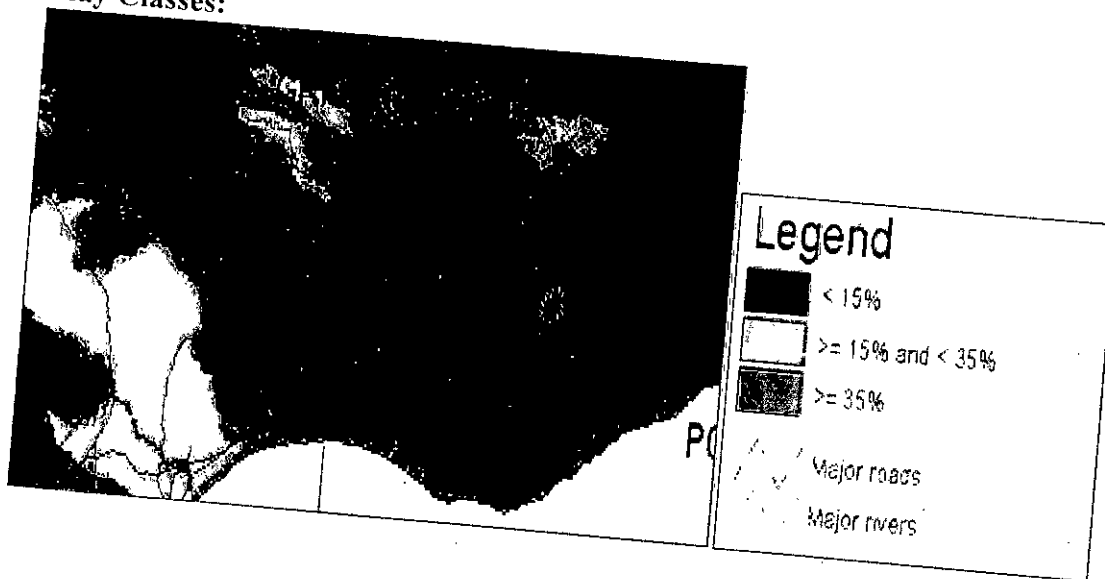


- Prismacutanic and/or pedocutanic diagnostic/Giencunic horizons dominant
- Da Red B horizons
- Db B horizons not red
- Dc In addition, one or more of: vertic, melanic, red structured diagnostic horizons

**Db PRISMACUTANIC, PEDOCUTANIC AND/OR GLEYCUTANIC DIAGNOSTIC HORIZONS DOMINANT** (Non-red B horizons). These are soils where the non-red B-horizon (subsoil) has a strongly to very strongly developed structure, usually also with a high clay content. The soil is thus mostly imperfectly to poorly drained and the strong structure in the subsoil places a restriction on root development. Due to the fact that most of these soils have a sandier topsoil on a clay subsoil, they are usually sensitive to erosion if poor management practices are used, especially concerning overgrazing.

Topsoil reveals very low clay content and will therefore be unstable when disturbed and will not readily retain moisture, which will negatively affect the re-vegetation process. However, once the E-horizon is removed, the subsoil with its high clay content and good stability will improve the water holding capacity of the topsoil, which, if erosion is properly controlled, will assist the re-vegetation process. Once the subsoil is exposed, it tend to decompose/weather and will over time facilitate soil development, which will be able to increase the depth of the soil and improve rehabilitation potential.

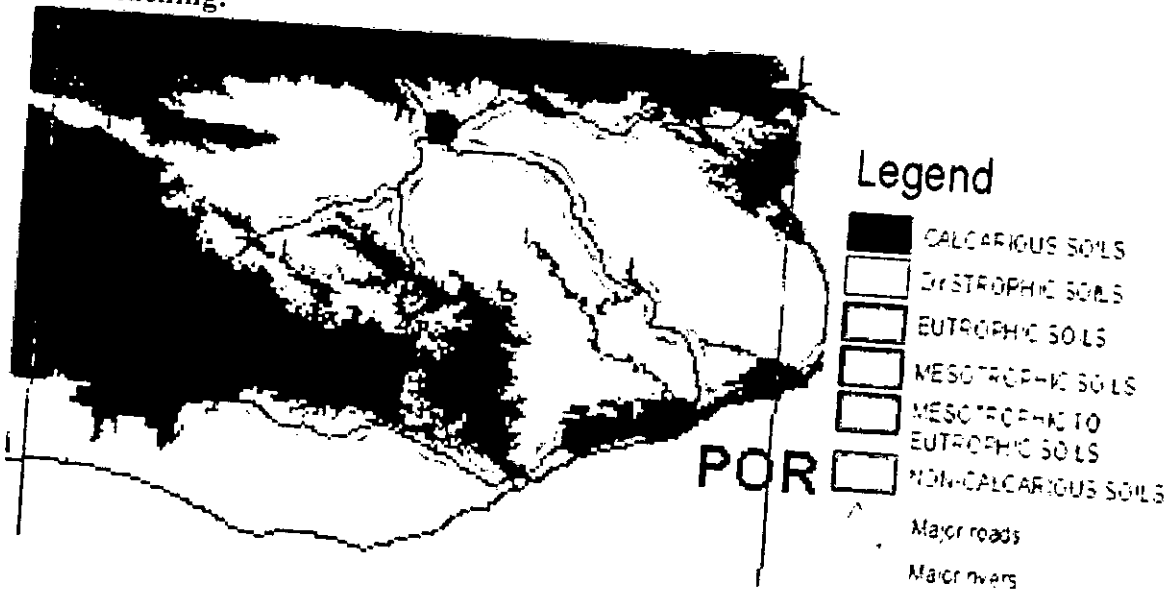
**Clay Classes:**



Due to lower penetration capability of the clayey B-horizon, increased runoff rates can be expected during heavy precipitation, especially on slopes and this in turn will result in increase flow volumes within the drainage line once the soils are denuded. Due to poor fertility and drainage capacity incorrect stockpiling of topsoil can cause its physical nature to deteriorate and become sterile due to compaction, loss of nutrients, texture and structure, chemical properties and decline in biological activity. It is therefore important that soils are reinstated within a three-six month period.

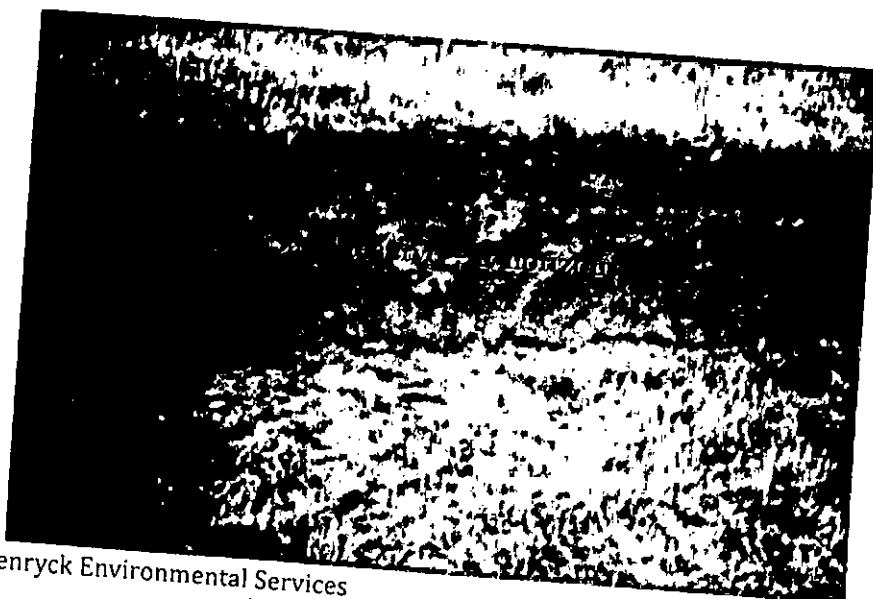
Due to excessive leaching and influence of quartzitic sandstones soils in this area is non-calcareous which will impact on rehabilitation potential in terms of mineral availability. It is essential that lime is applied during the re-vegetation phase. It is anticipated that low nitrogen, phosphate and trace element levels would prevail and hence soils should be upgraded to reinstate and maintain nutrient cycles in the soil. High internal drainage capacity and low adsorption capacity due to the low clay content will cause during the summer periods that these soils will display low field capacity values, which will have a negative effect on biomass accumulation. This could require at certain stages that seeded areas be irrigated.

**Soil Leaching:**



Soils of the study area have high leaching capabilities hence the soils will not remain fertile after clearing and prolonged heavy precipitation. It would, therefore also not re-establish its positive nutrient cycles over the short term and re-vegetation process will require the necessary attention and dedication. Even if used shortly after stripping inorganic upgrading would be necessary. Once reinstated, upgrading of soil during spring and autumn will be necessary and light application of fertilizers when rainfall permits must be considered. The impact on soil properties is rated moderate-high and it should be understood that soil fertility, humus content and the ability to sustain plant life would be affected moderately.

Topsoil removed from mining areas will be temporarily stored on the northern and southern sides of each phase the excavation and will be reinstated as mining progresses. Incorrect stockpiling thereof will most definitely caused its physical properties to deteriorate and the soil will become sterile due to compaction, loss of nutrients, texture and structure and decline in biological activity. It is important to fertilize it and if possible irrigate it as soon as possible. Once the topsoil is integrated with the clayey subsoil, the properties of the topsoil will change drastically and will benefit the rehabilitation process. The AEC & CEC of the subsoil is generally good and it is anticipated that both important macro as well as micro elements, will be well represented in these soils and good and calcium: magnesium ratios are present. The pH-values are good and will ensure an effective nutrient cycle and mineral absorption, which in turn will stimulate plant growth.



Low internal drainage capacity and high adsorption capacity (available water capacity) of the subsoil will during the summer periods cause these soils to display moderate field capacity values, which will have a positive effect on biomass accumulation. This soil characteristic would preclude prolonged irrigation of reinstated soils and only initial irrigation would, during very dry periods, be applicable. Subsoils of the study area have thus low leaching capabilities; hence the soils will remain fertile after prolonged heavy precipitation. Considering the soil characteristics, the impact on soils removed during the mining process is rated moderate-high if no mitigation measures are applied, but low if it is integrated with the subsoil, seeded and irrigated.

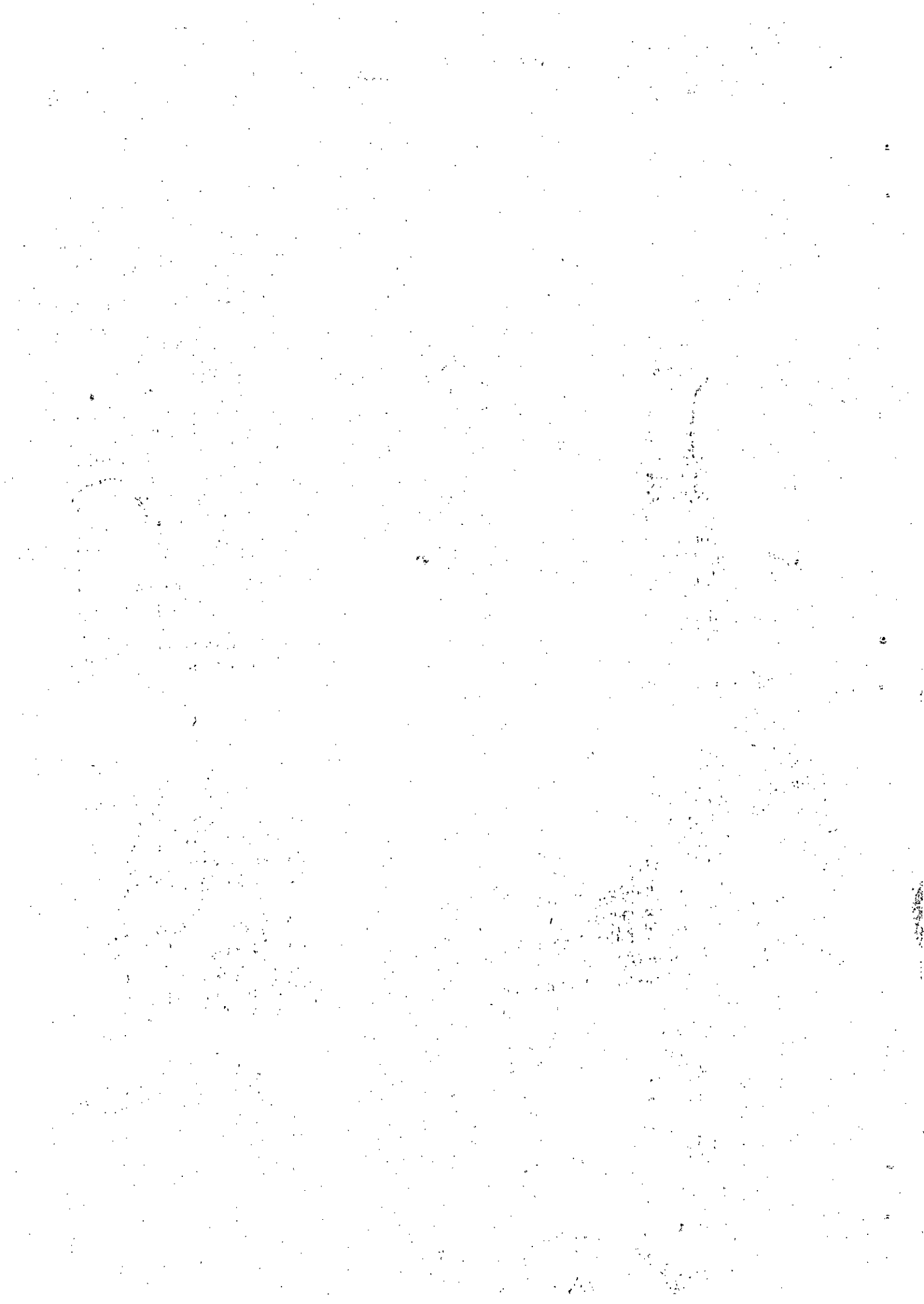
### SITES AND STRUCTURES OF ARCHAEOLOGICAL AND CULTURAL INTEREST:

These sites represent the heritage of communities and are therefore protected in terms of current legislation. In addition all material older than 60 years is protected. There is no known natural heritage or cultural sites close to the study area. No areas of social, cultural or historic value were identified onsite and the impact is rated insignificant in this regard, especially since the topsoil was disturbed previously. Nevertheless the operator of the excavator should be briefed regarding this aspect. The Khoisan people inhabited the study area historically and since it is within 5km from the coast it is therefore possible that artifacts and site of archaeological importance could be identified onsite. Fragments of marine organisms and shell middens may be hosted onsite.

Since all important Thicket vegetation has been removed, local communities will not make use of the site for medicinal purposes and the fact that the site is not located close to residential areas and the fact that it is private property renders the impact negligible. To address the matter, Dr. Johan Binneman of the Albany Museum has been appointed to perform a phase 1 investigation and will be submitted to the DME together with the financial guarantee within 60 days from submission of the EMP.

### Remedial measures

- Should any grave areas be discovered, the area will be appropriately fenced off and excluded from the mining area and appropriate setback lines will be determined in conjunction with SAHRA/DEDEA.
- Findings of any historic tools, fossils, bone fragments, skulls and complete remains will be immediately reported to SAHRA & the DME and no effort will be made retrieve any object.
- Any potential archaeological site will be immediately fenced off and protected until officials from SAHRA have visited the site.
- The operators excavation equipment will be informed of the applicant's obligation in the above regard and to inform management when anything of interest is noted on the site.
- Dr. Johan Binneman at the Albany Museum in Grahamstown and SAHRA office in East London will be contacted immediately if any object of importance is observed and all operations would be suspended immediately in such area.



**STUDY AREA**







