mineral resources
Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

Private Bag X6076, Port Elizabeth, 6000
Tel: (041) 396 3934
Fax: 0865768004
Cnr.Diaz and Mount Roads
Mount Croix
Port Elizabeth, 6001

Enquiries: D. A. Watkins
E-mail: deidre.watkins@dme.gov.za

Reference: EC30/5/1/3/3/2/1/0425EM
Date: 7 May 2010

South African Heritage Resources Agency
P.O. Box 758
GRAHAMSTOWN
6140

ATTENTION: MR. T. LUNGILE

case ID: 2485

Sir

CONSULTATION IN TERMS OF SECTION 40 OF THE MPRDA OF 2002: STONE AGGREGATE; GRAVEL MINING ON PORTION 52 (HOPEWELL) OF THE FARM KUYGA 8, DIVISION OF PORT ELIZABETH, EASTERN CAPE

1. The above refers.

2. Attached, a copy of the EMP received from Hopewell Quarries Cc.

3. Any written comments or requirements your department may have in this regard can be forwarded to this office no later than **4 July 2010.** Failure to do so, will lead to the assumption that your department has no objection(s) or comments with regard to the said documents. Comments may be submitted at your earliest convenience e.g. 30 days from the date hereof in order to reduce the turn around time for the application process.

4. Consultation in this regard has also been initiated with other relevant State Departments.

5. Please use the reference numbers as indicated in all future correspondence.

6. Your co-operation is appreciated.

Yours faithfully

REGIONAL MANAGER

EASTERN CAPE

425mp

STELLENRYCK ENVIRONMENTAL SOLUTIONS

DRAFT ENVIRONMENTAL MANAGEMENT PLAN

PREPARED FOR:

HOPEWELL QUARRIES CC

8 BLUEWATER CRESCENT

BLUE WATER BAY

6210

Tel. & Fax: 041 3672049 · Cell 0824140464/0824140472 · 4 Josephine Avenue LORRAINE 6070

Member: Jannie van As: B.Sc (Botany & Zoology), B.Sc (Hons) (Eco-Physiology), M.Sc (Plant Physiology)

Consultant: Natalie Sharp BSc (Botany & Zoology); BSc (Hons) (Limnology) & Magister in Environmental Management

TABLE OF CONTENTS

Stellenryck Environmental Solutions			
COMPILED BY	**DATE**	**DRAFT/FINAL**	**FINAL: CHECKED & AUTHORIZED**
N. Sharp	**15 April 2010**	**Draft**	**Draft**

INTRODUCTION AND BACKGROUND

In 2006, members of Hopewell Quarries CC came to the conclusion that the Port Elizabeth aggregate market will be able to sustain another hard rock quarry and applied for a Prospecting Right in 2006 to determine the stone reserves on the property concerned, with the intension to establish a hard rock quarry and crushing operation, should a positive outcome to the prospecting venture be achieved. The Prospecting Right was granted on 6 September 2007, granting the holder the exclusive right to apply for a mining authorization. Prospecting on the property has been concluded and revealed competent rock reserves which then form the basis of this application. In order to consider the environment the mining footprint will be restricted to severely degraded areas caused by illegal mining operations that were allowed on the property concerned.

PERSONAL PARTICULARS OF THE APPLICANT

APPLICANT AND RESPONSIBLE PERSON

Mr. Matule Patience Headbush

8 Bluewater Crescent

Blue Water Bay

6210

Tel: 041 365 4701 Fax No. 086 651 6589

Cell: 082 266 4479 Email: mark@headbush.com OR mark@vula.co.za

ALTERNATIVE CONTACT PERSON

Thapelo Mokhati Cell no: 072 258 7876

MINE MANAGER

Mr. Matule Patience Headbush

8 Bluewater Crescent

Blue Water Bay

6210

Tel: 041 365 4701

Fax No. 086 651 6589

Cell: 082 266 4479

Email: mark@headbush.com OR mark@vula.co.za

SURFACE OWNER

Judith Issroff

TITLE DEED DESCRIPTION

Portion 52 of the Farm Kuyga 8, Port Elizabeth.

LAND DESCRIPTION / INFORMATION

REGIONAL SETTING

The proposed quarry is situated in the magisterial district of Port Elizabeth and is under control of the Nelson Mandela Bay Municipality. The quarry is situated approximately 14km north-west of Port Elizabeth and about 3 km north-west from the nearest informal residential area, Greenbushes and 4km south-west of Booysen Park. The site is situated in a semi-rural area surrounded by small farms. There is no power line, telephone line or road servitude in close proximity of the proposed quarry area.

The proposed quarry is also situated within an approved development area, known as the Hopewell Conservation Project between Greenbushes and Kwanobuhle. This project entails the development of a rural estate and retirement village, an equestrian estate and bush lodges and conservation area; all together it occupies an area of 2 991 Ha (See Appendix 1 & 2). Although this project has been approved by the Department of Environmental Affairs, no application was made to the Department of Minerals for a Section 53 of the MPRDA, by the developer to sterilize the mineral, with the development of this estate.

The social impacts related to this application would highly increase should the DME approves this application and the developer of the Hopewell Conservation Project also decides to continue. This however will be discussed further on in this document.

SURFACE INFRASTRUCTURE

SURROUNDING AREAS

The area is surrounded by farms and other property. To the south-east of the propose area, Afrimat Quarries are operating and to the north-west of the site, Scribante Quarries are operating. In general the area surrounding the proposed site is sparsely populated with only a few residences, however to the south to the site a golf estate is being developed. Old Cape Road and Standford Road are located approximately 4km to the south and 1.2km to the north-west respectively. Standford Road connecting with Old Cape Road will be used as main access to the property and to the relevant markets.

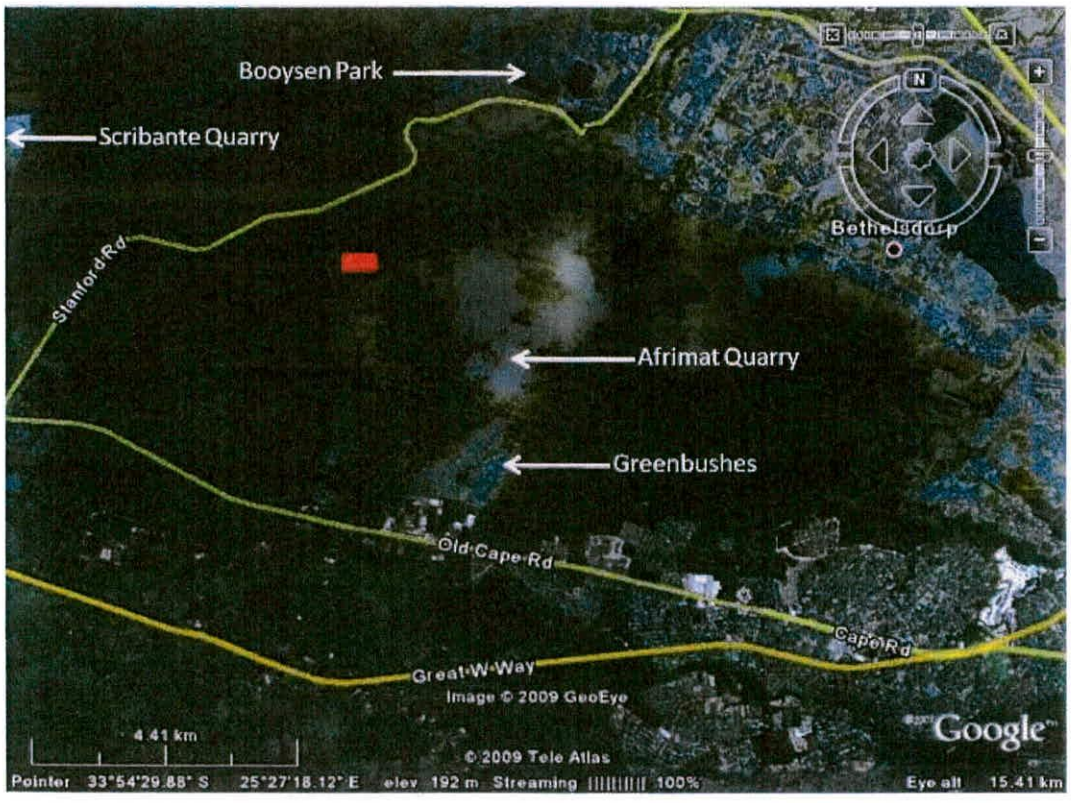

Figure 1: Mining area and surrounds

There is an existing access road to the site and it links up with Standford Road and will not result in any inconvenience to any property owner. The property will be fenced and a gate put in place to secure the site. The existing road does needs to be upgraded. If water is required for rehabilitation purposes it will be bought from the Municipality and brought to site via a mobile water cart. No labour accommodation or campsite will be established on site.

No fixed infrastructure on site will be erected but two mobile screens, powered by a generator will be on site as well as a mobile crusher. A chemical toilet will be positioned at the mine area to prevent the surrounds being used for ablutions. The material will be screened and crushed and carted to the markets. All vehicles will be parked overnight at the designated crushing site.

PRESENCE OF SERVITUDES

There are no servitudes registered in the proposed quarry area.

EXISTING LAND USES THAT IMPACT ON THE ENVIRONMENT IN/OUTSIDE THE PROPOSED MINING AREA

- Residences on smallholdings/farms causing limited visual interference and loss of aesthetic value.
- Extensive transformation of land through grazing causing low-medium loss of terrestrial ecological integrity.
- Extensive cultivation activities causing total loss of terrestrial ecological systems.
- Old Cape Road and Standford Road that carry low traffic volumes causing increased air pollution and noise levels.
- Extensive spread of alien vegetation within the proposed mining area and surrounds causing extensive degradation of ecosystems.
- Extensive transformation from surrounding perimeters due to current and previous quarrying.

The proposed quarry area and the surrounds are severely transformed. At this particular site, the original ecosystem has been irreparably transformed by previous mining and alien infestation. However, through the proposed mining process, the applicant will ensure that the affected land is rehabilitated properly and restored to better-quality than the pre-mining status. As a contribution to environmental management in the area a number of indigenous trees will be established within the mine area to bind the soils more effectively. The mine area will be limited to 1,5 Ha.

NAME OF THE RIVER CATCHMENT IN WHICH THE QUARRY IS SITUATED.

The development site falls within the Swartkops River catchment. The Swartkops River catchment area is 1555km^2. The river system consists of two main (Elands and Kwazunga) and two subsidiary tributaries. The Elands River has two main tributaries, the Sand River in the north and the Bulk River further south, both originating in the Elandsberg.

One of the problems highlighted in the IFR report (2001) is the high sediment production in the catchment as a whole. In large part of the Elands River catchment there has apparently been a decrease in the depths of pools due to sedimentation. Several land use changes in the catchment could have contributed to increased sediment yields. The two dams in the Bulk Rivier and the Sand Rivier would have altered the flow regime and reduced the water volume of the river. The entire catchment has been infested with black wattle and pine plantations, which reduces the runoff while extensive cultivation of the hill slopes in the upper Elands catchment could have contributed to the aeolian sedimentation. In the KwaZung the Groendal Dam has only a small bottom release gate restricting flow. Extensive cultivation and urban development in the entire catchment would have contributed to sediment production.

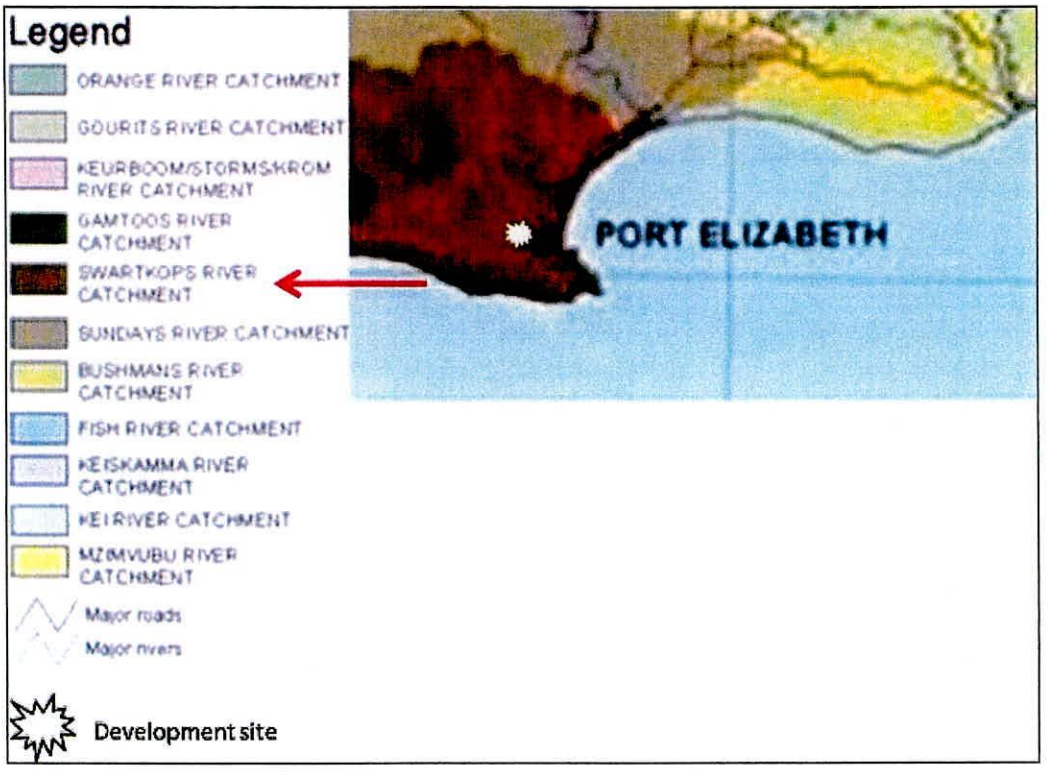

Figure 2: The Swartkops River Catchment

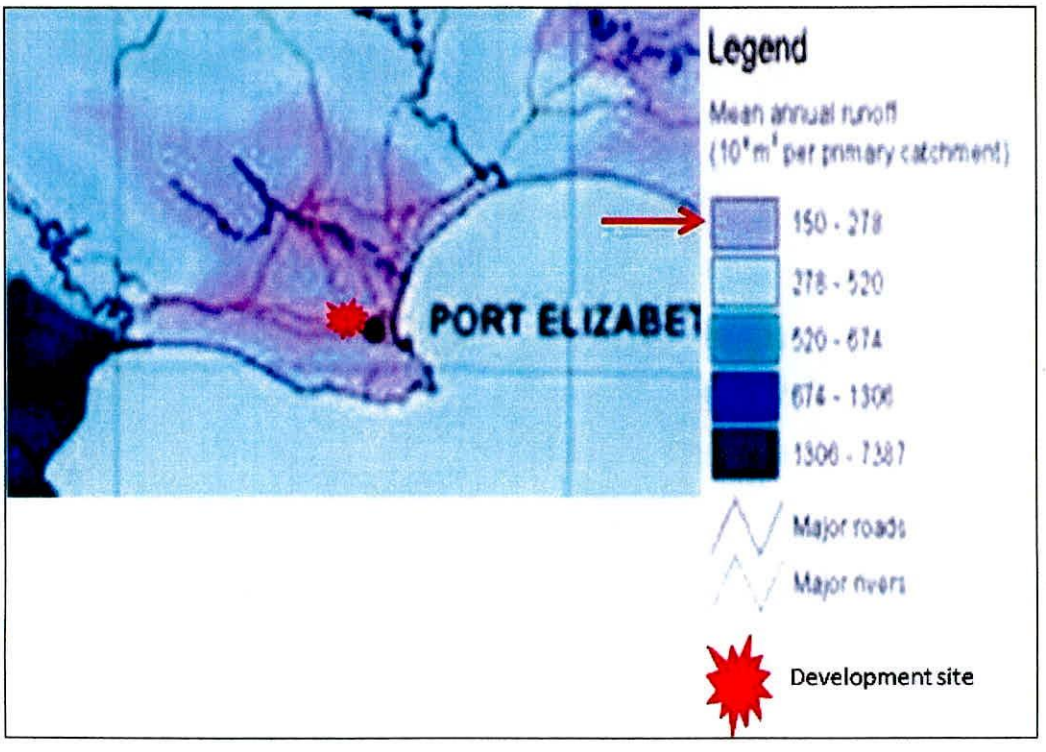

Figure 3: Primary Catchment runoff

The Swartkops River catchment area receives between 150-278 x10^5 m^2 mean annual runoff, see Figure 3.

ZONING

Current zoning is still agriculture and 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 replaced the provisions of the Physical Planning Act.

PROJECT DESCRIPTION

The proposed quarry will be a private concern licensed by the Department of Minerals and Energy. Quartzite would be extracted by means of excavator, after blasting, to a depth of approximately 10m, but will be mined in bench formation. Mining will commence as per mine development plan and will be executed in 2 phases which will be the establishment of the 2 benches of the quarry. Material will be crushed and carted directly to markets.

MINERAL DEPOSIT & MINE PRODUCT

Quartzite

ESTIMATE RESERVES

The potential of 150 000 cubic meters of quartzite would be extracted with an average production rate of approximately between 5 000 – 10 000 cubic meters (loose) per month, over a period of approximately 12-20 months.

PROSPECTING/ALTERNATIVES

Illegal mining occurred previously and was stopped, as well as property owners in the area have mined abutting areas extensively in the past and currently under both the Minerals Act 50 of 1991

and now the MPRDA 28 of 2002. Material from the area was extensively used in the constructing industry throughout the NMBM for the construction of the businesses, housing complexes, roads, Coega Harbour, Coega IDZ etc and should, from a quality point of view, meet building specifications.

MINING METHODOLOGY

A gravel access road to the proposed quarry will link up with Stanford Road. Since the access road cannot facilitate heavy vehicles in the current condition, it will be upgraded on a regular basis with material obtained from the site once approved. Where necessary it will be protected against erosion by means of cross and mitre drains. Access to the site will be controlled by means of property fences and gates.

Potable water will be obtained from the Municipality and brought to site daily. The workforce would not reside on the mine, but will commute to work every day. Due to the anticipated fairly small workforce involved, no waste disposal site is required. A container with a lid would be placed near easy accessible areas on the mining area for the storage of household waste. No sewage plant would be required; a chemical toilet will be provided at the entrance to the mine area.

A dust suppression system will be used to lower dust levels at the crushing plant at the designated area on the mine site. Water for this purpose could be trucked in to feed a raised water tank and connected reticulation system and sources of dust will be addressed. Newly rehabilitated areas will also be irrigated when necessary. In addition, topsoil stockpiles will be covered with vegetation or shade cloth when circumstances dictate.

No maintenance yard will be established since all vehicles will be maintained off site at the contractor's workshop. The proposed operation would be continuous and working hours will be from 7.30 am to 5 pm five days a week with cessation of activities at 1 pm on Saturdays if market demand requires mining over the weekend.

An average production rate of approximately between 5 000 – 10 000 cubic meters (loose) per month is anticipated over a period of

will be created and the second platform will be similarly established of 10 m wide. A second face of 5 m high will be created. The horizontal platforms of the benches will not be less then 10 m wide to ensure sufficient space for the profiling of the benches to reach a 1:2 gradient and retain a horizontal width of no less than 5 m. This will be sufficient to act as an energy breaker for water runoff and stabilize the slopes of the benches. Once the following bench is established, the previous bench will be covered with the topsoil that was removed and it will be re-vegetated with the prescribed seed mix. Each bench development can be seen as a phase development of the mining site. Mining will result in a box cut in the hill.

The total mine area comprises about 1.5 Ha and the average depth of the mine would be approximately 10 meters. The potential 150 000 cubic meters of quartzite sandstone would be extracted with the aid of frontend loader and dumper trucks. After extraction, material will be screened, crushed and carted directly to the relevant markets. Only a small stockpile will be created within the excavation. All extracted material would be utilized and no residue would be generated.

As mining progresses and the disturbed area become larger, water runoff will increase from the edges, which could result in erosion and increasing the silt load of runoff. To curb this problem, the drainage pattern of the study area will be slightly altered by diverting upslope runoff with a berm to the east and west of the mining site, into well vegetated areas. This berm will require maintenance over the medium term until disturbed areas has regained its stability and thereafter it can be removed to facilitate normal surface drainage.

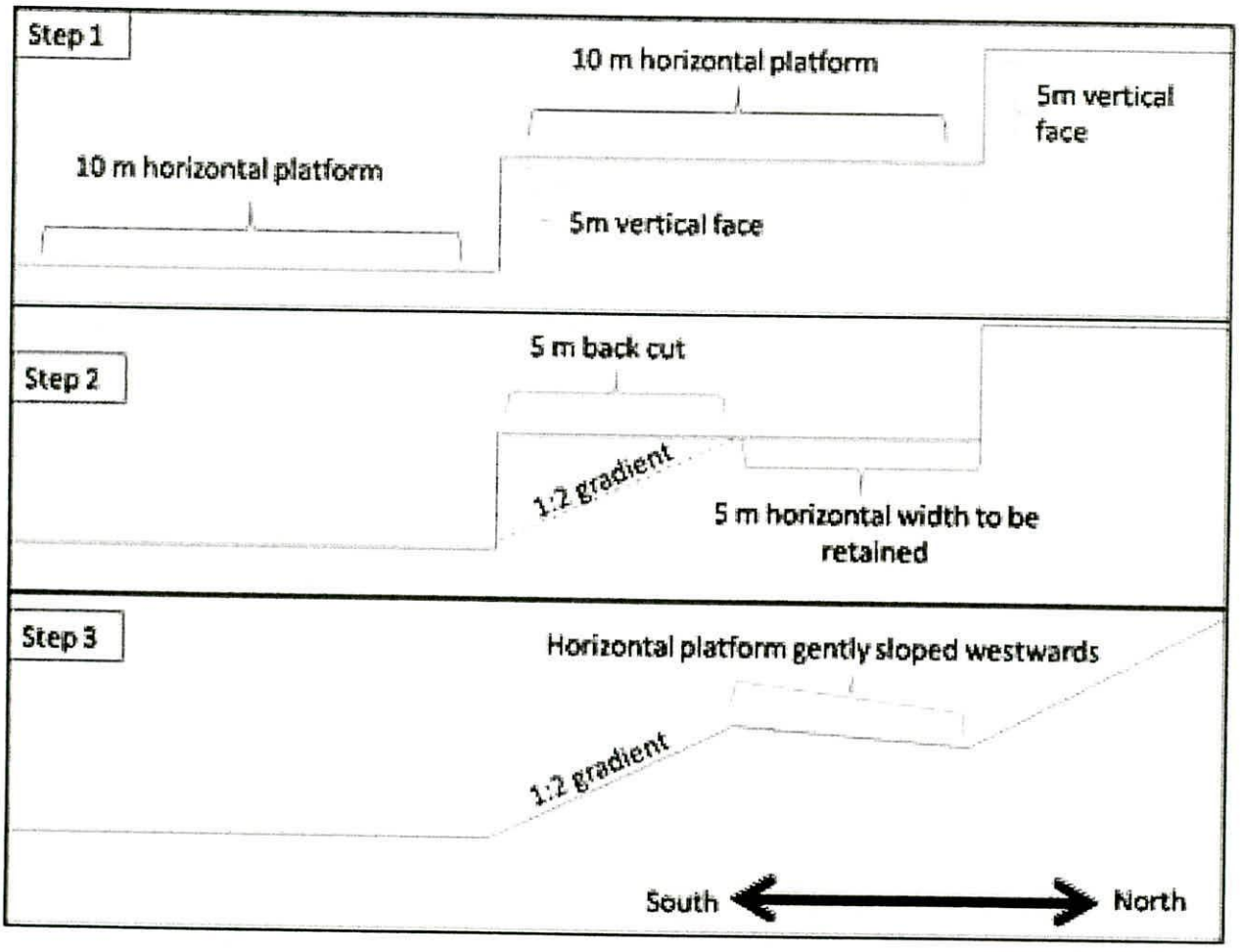

Figure 4: Bench development: Bench development will start at Step 1, cutting into the face and creating a 5 m high face. Step 2 will entail profiling the bench to create a 1:2 gradient. Step 3 will be the final profile at closure.

Topsoil stockpiles will be cleared in a south-northerly direction ahead of each bench and stored on the northerly boundary of each bench (see Figure 5). Topsoil will be used to rehabilitate the mined bench will proceeding unto the next bench.

Mining will be restricted to a production face of approximately 50m long at any given time. This will reduce the visual impact and facilitate in concurrent rehabilitation. Once a bench is established and the development continues towards the next bench, the previous bench will be profiled and rehabilitated. This will facilitate concurrent rehabilitation.

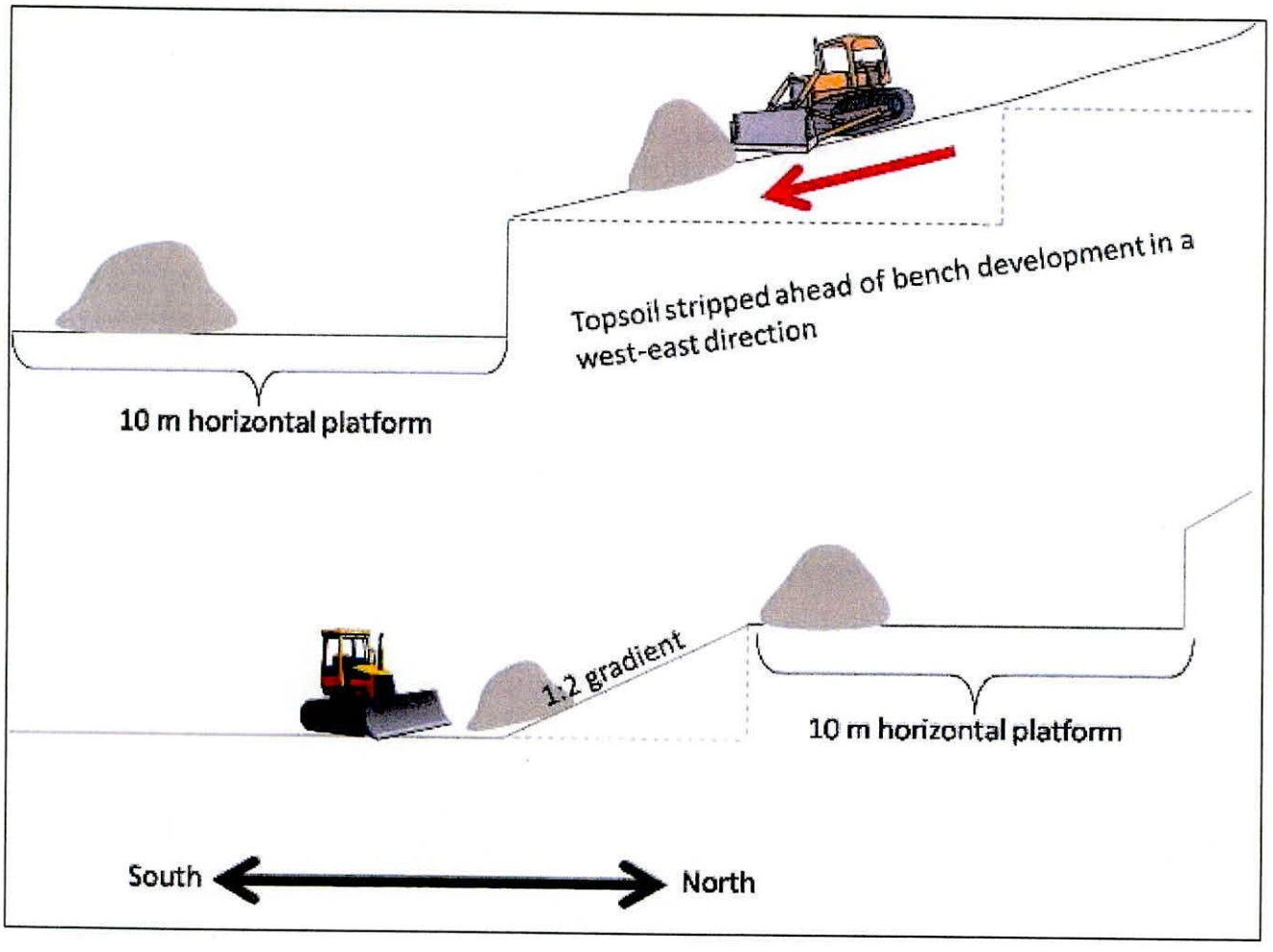

Figure 5: Schematic diagram of stripping the topsoil.

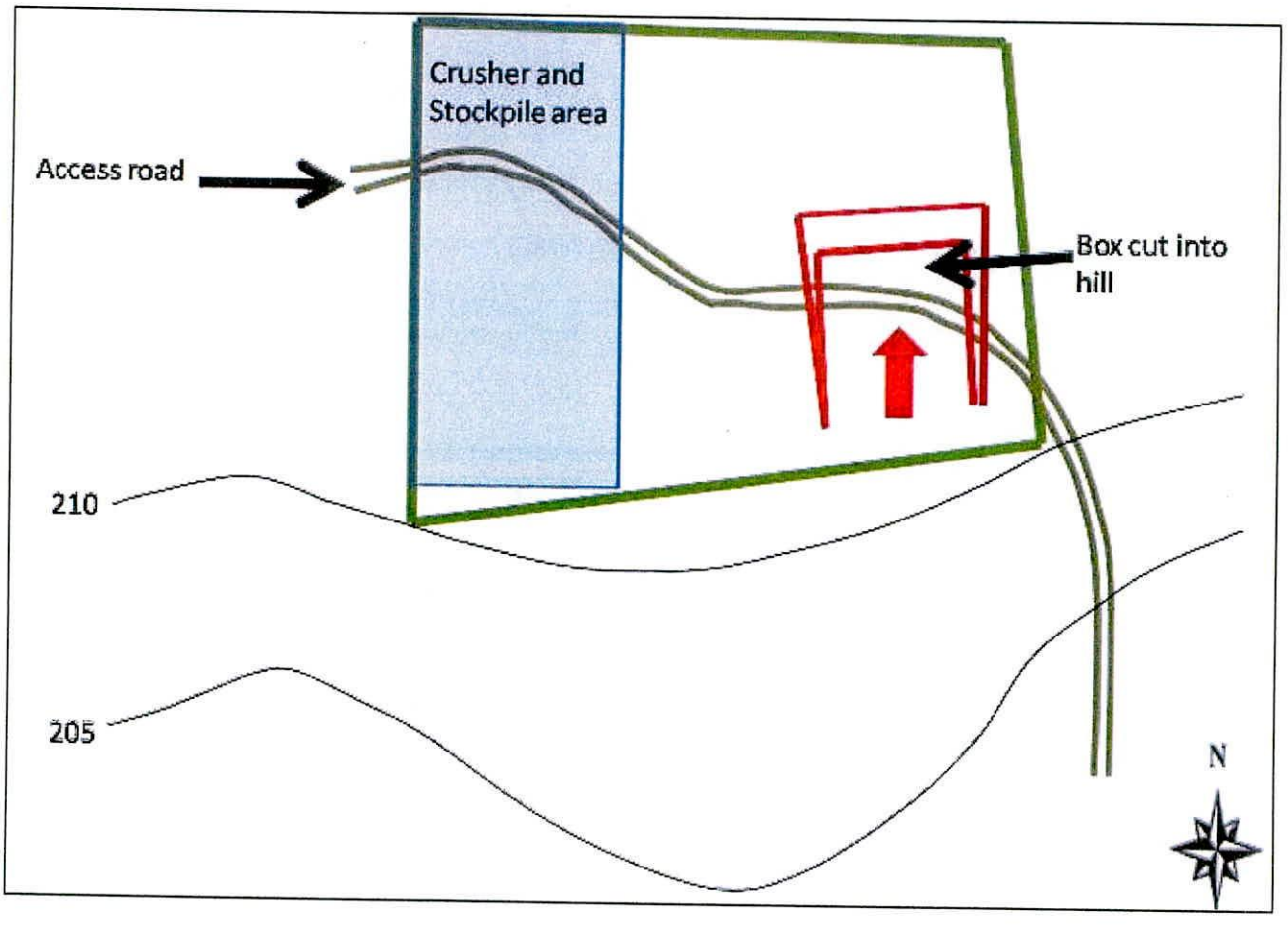

Figure 6: Mine layout plan

MINERAL PROCESSING

The crushing plant will consists of a primary jaw crusher, secondary crusher and two cone crushers and a number of vibrating screens and will produce a range of aggregate products. The crushed and screened material will be stockpiled in the allocated area. Materials from the stockpiles will be loaded with front-end loaders on tipper trucks and transported to the relevant markets.

PLANNED PRODUCTION RATE

A conservative initial production rate of approximately between 5 000 – 10 000 cubic meters (loose) per month is anticipated over a period of approximately 12-20 months.

PLANNED LIFE OF MINE

At the proposed production rate the life expectancy of the quarry is approximately 24 months.

CONSTRUCTION PHASE

Since the existing access road will be used and the quarry site will house a mobile screen and crushing plant a construction phase is not anticipated, other then the construction of the weighbridge.

The temporary office will be used. Hydrocarbon storage facilities will be constructed on the property. No construction activities will take place that could result in littering, cement mixing and generation of building rubble. Household waste disposal will be through depositing waste in strategically positioned containers fitted with scavenger proof lids. Littering on site will be marginal. No Eskom and Telkom service points are required.

TECHNICAL COMPETENCY

The following equipment will be provided for this mining operation:

- 250 KVA generator
- Nissan Tip Trucks ($5m^3$)
- Jaw crusher (14 x 24) and/or Mobile crusher
- Vibrating feeder & Vibrating Screens x 2
- Gyro crushers (24)
- Conveyers and spares
- Diesel tanks
- Komatsu Excavator
- Volvo TBL BL71
- Water reticulation network
- Water pumps
- Container (Mobile Workshop)

In order to address environmental matters and demarcating the mine area the applicant appointed Stellenryck Environmental Solutions to compile the EMP and perform the required survey plans. Through the EMP and continued assistance to the applicant the site will be developed in a sustainable manner. The mining area hosts mainly alien trees and it is important to perform concurrent rehabilitation. However, taken the background of the applicant into consideration, restoring the site would be well in his ability and would satisfy the requirements of the DME.

ECONOMIC SUSTAINABILITY AND FINANCIAL COMPETENCY

An extensive market for construction materials has developed due a substantial increase in construction activities in the Nelson Mandela Metropole, IDZ and Coega Harbour. This demand is ever increasing due to the continuous urban growth as well as by the boom in formal housing schemes that is interlinked with new employment opportunities in the mentioned areas. The mining area could potentially produce 150 000 cubic meters of aggregate over the next two years and would be easily absorbed by the growing market. Currently the construction materials demand is in excess of a million cubic meters per annum and a monopoly occurs in Port Elizabeth with only limited mining companies providing these construction materials; creating no competition and increased price hikes.

An amount of R220 000 will be made available to cover initial rehabilitation costs.

The proposed concern has limited Health and Safety considerations and finances available are more than adequate to cover any such costs.

ENVIRONMENTAL COMPETENCY

It is important that the applicant disposes of adequate environmental knowledge to ensure that an environmentally friendly concern is established that complies with current legislation and poses limited post closure impacts. The proposed concern will require good housekeeping, which will be within reach of the applicant's abilities since he will be on site on a daily basis. The applicant must be devoted to the establishment of this concern in an environmentally sustainable manner and through the guidelines of the Environmental Management Plan; it will be achievable.

Re-vegetation of disturbed areas will be easily achieved by seeding the area, a practice, which is understood by the applicant. If needed an environmental control officer will be appointed to assist in the environmental management and rehabilitation of the site. Visual and social impacts will be addressed through the rehabilitation of the site and curbing noise generation.

In conclusion the environmental impacts associated with the proposed mining concern is restricted to noise, limited silt transport, erosion on slopes, visual impact, dust, loss of vegetation cover, loss of soil fertility and limited social impact in terms of hauling material on public roads.

Since the concern could have a good product turnover, the rehabilitation fund can be managed properly and the applicant will be able to effect the amendment of the guarantee as required by the MPRDA, which in turn will reduce the environmental risk.

Through the conditions of this EMP, the applicant will ensure that the important environmental considerations applicable to this particular mining site are executed. The applicant will also submit a bi-annual performance assessment reports reflecting on his ability to manage the environment. Should it be required an ECO will be appointed to oversee the project

JOB CREATION

The proposed mining concern will created at least 3-5 new job opportunities without including downstream employment in terms of hauling of material and construction activities. Casual labour opportunities will be created during the re-vegetation stages. The current unemployment rates for the NMBM is currently better due to increased development activities but still ranges between 30 % and 35%, therefore every job opportunity created, is important.

Furthermore, this mining concern will provide fair competition with the aim to stabilize price control over construction material in the Port Elizabeth area. This will definitely benefit other trade industries and eventually the consumers.

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 Southern Temperate Climatic Zone and can therefore be considered mild with strong winds and occasional periods of high humidity during the high summer months.

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 northeasterly winds. Spring rains may also be associated with the passage of cold fronts drifting in from the west. Thunderstorm activity is common along the coast in late summer and autumn and result in intense cycles of rain and wind. This is illustrated by the fact that the maximum rainfall recorded in a 24h period for any month is almost double the monthly average. 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 T3L and receives between 700-800mm per annum and precipitation is mostly restricted to the autumn and spring, which will stimulate plant growth and reduce dust generation to some extent. Hail, frost or snow is not common phenomena in this area. The highest monthly historic rainfall occurred in July 1983, when 197mm of rain was experienced. The highest 24-hour historic rainfall occurred on 1 September 1968, when 149mm of rain was experienced.

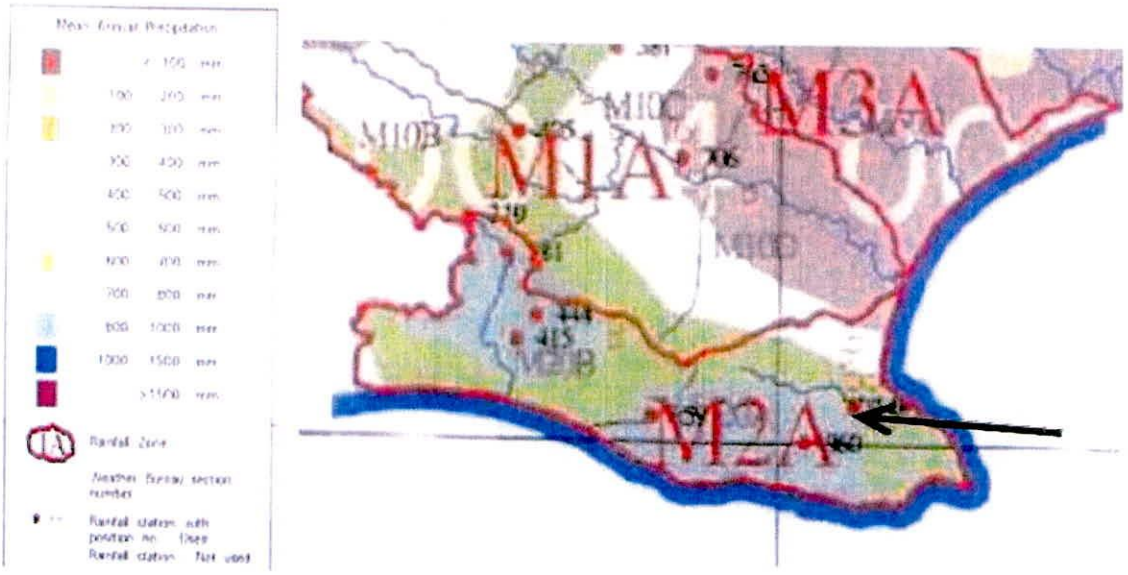

Figure 7: Mean Annual Precipitation

TEMPERATURE

The area experiences warm to hot summers with maximum temperatures in February and minimum temperatures July. Hot north-westerly berg winds may occur in winter and may last for a few days, usually preceding cold fronts. The area falls within evaporation zone M20A and annual evaporation of the area totals approximately 1500-1600mm with the highest evaporation rates associated with the summer months resulting in a negative water balance. In this area, chemical weathering dominates over mechanical weathering and the Weinert's climatic N number is 3.

Groendal Dam

	Main Rainfall (mm)	Min °C	Max °C
Month			
January	**57**	17	23
February	**44**	**17**	**23**
March	**68**	**16**	**22**
April	**67**	**14**	**21**
May	37	13	**20**
June	31	11	19
July	33	10	18
August	**54**	11	18
September	**52**	**12**	**18**
October	**52**	**13**	**19**
November	**59**	**14**	**20**
December	45	17	22

Number of days with (Uitenhage 1961-1990)			
	Fog	Hail	Thunderstorms
January	0,4	1	1
February	0,7	0,1	2,4
March	2	0	1,6
April	2	0,1	1
May	2,5	0	0,7
June	1,4	0	0,5
July	2,2	0	0,3
August	1,5	0	0,1
September	0,8	0,1	0,7
October	0,2	0,4	1,1
November	0,4	0	1,2
December	0,4	0	1,2
Annual Average	***14***	***1***	***12***

Figure 8: Mean Annual Evaporation

WIND REGIMES

The prevailing wind directions are predominantly west and south-east but with significant easterly and south-easterly components during the summer months. Strong winds above 5m/s occur in more than 30% of the year with calms approximately 20% of the year. The calms are mostly restricted to the summer months and then well to nighttime. The average wind speeds are moderate with 50% of the winds reaching speeds between 1.5-5.5m/s. The calms can for example result in the concentration of dust near ground level at night.

ENVIRONMENTAL IMPACT ASSESSMENT

The impacts of the proposed quarry on environmental parameters are assessed in this section in accordance with the criteria of the Minerals and Petroleum Resource Development Act 28 of 2002 and section 21, 22 and 26 of the Environmental Conservation Act. It should be noted that all the impacts have already been experienced in the past since mining was prevalent on the property for more than ten years. The process will highlight the impacts and emphasized the importance of remedial measures over the short term as well as post extraction. Impacts were assessed according to the criteria listed below:

Extent	Whether the impact will occurs on a scale limited to the immediate site of the proposed activity, local area and immediate communities and settlements, sub-regional (municipal), regional (provincial) or national scale
Duration	Whether the time span of the impact will be short term (0-5 years), medium term (5-15 years), long term (in excess of 15 years) or permanent where natural processes or mitigation processes cannot eliminate the impacts.
Intensity (Magnitude)	Whether the size of the impact is low, medium, high or negligible.
Probability	The probability of the impact actual occurring as either unlikely, probable, likely or definite

These criteria are evaluated in terms of

- Significance (Insignificant-low-moderate-high)

- Status (positive-negative-neutral)
- Confidence (based on academic information, specialist knowledge, site evaluations, applicants approach)

The significance of the impact on the parameters of the affected environment is rated as:

Low Significance	The project will not cause any major adverse or beneficial changes to the biophysical, social or economic environment. Impacts experienced will abate almost immediately after cessation of activities and the biophysical, social or economic system should recover and return more or less to the natural state. No expensive mitigating measures will be needed to address any of these impacts. Ecological functions will continue undisturbed and no complaints from Interested and Affected Parties (I&APs) are anticipated. No rare and endangered species or sensitive areas exist in the area.
Moderate Significance	The project will induce moderate short to medium term changes to the biophysical, social or economic environment. The impact would be induced outside the development area and also possibly on a sub-regional level. Over the medium term the impacts could fade away but the implementation of mitigation measures are normally required to eliminate these impacts. The impacts would be experienced for some time after cessation of activities but would not affect the biophysical, social or economic environment severely. With mitigation the biophysical, social or economic system should recover but the return to the natural state would be very slow and in some instances may not be achieved. I&APs might express some concerns and complaints may be received on an *ad hoc* basis. Rare and endangered species or sensitive areas may exist in the area and could be marginally affected.
High Significance	The project will induce extensive long-term changes to the biophysical, social or economic environment. The impact would be induced outside the development area and also possibly on a regional to national level. The possibility of secondary impacts arising from the project is high. Over the long term the impacts could fade away but the

implementation of expensive mitigation measures are normally required to eliminate or mitigate these impacts. These impacts would be experienced after cessation of activities and could affect the biophysical, social or economic environment severely. With mitigation the biophysical, social or economic system could possibly recover but the return to the natural state would be or normally not be achieved. Ecological functions will be permanent disturbed and major complaints from Interested and Affected Parties (I&APs) could be expected. Rare and endangered species or sensitive areas exist in the area might be critically affected.

Should the impact assessment as a minimum reflect 2-3 impacts of high significance and 2-3 impacts of moderate significance the project shall be viewed as a potentially flawed and continuation of the project should be seriously reconsidered or special engineering or biophysical/social intervention must be implemented.

**** The below assessment is done with the presumption that the Hopewell Conservation Project (HCP) will either adapt their development strategy or will not continue to develop until the mining permit period has expired. These presumptions are based on:***

1. ***Although HCP has obtained approval for their development; they have failed to apply to the DME for the sterilization of the minerals in accordance with Section 53 of the MPRDA. Therefore, Hopewell Quarries still have every right to apply for a mining authorization at this site. Since the mining site is situated on the exact same location as some of the designated residential development, HCP will have to either move or postpone this phase of their development.***
2. ***From an economical point of view, HCP will struggle to sell plots located close to the quarry.***
3. ***From a social and environmental point of view, the impacts related to the mining of aggregate will highly increase if situated so close to a residential area and HCP will be held accountable for developing so close to a mining concern.***

Therefore, the below ratings are only applicable should the residential NOT proceed for whatever reason. However, it is deemed necessary to assess impacts should the HCP continue, but will be dealt with separately from the below section.

TOPOGRAPHY

Morphology or the Topography of an area can be described as the form and structure of the landscape. The structure is given by the underlying geology, and the form is given by erosion factors such as the rivers cutting through the geology to form valleys, or the wind eroding the tops of the mountains and filling in the valleys to form rolling hills and plains. The Eastern Cape is known for its parallel hills and incised rivers.

The development site falls in an area classified as Hills and Lowlands. At the site the region is characterised by a fairly hilly terrace and can be described as undulating. A weakly defined valley runs to the south of the site.

In the study area, signs of disturbance are clear. Depressions are clearly noticeable on the top of the site where previous red-gravel quarrying activities have disturbed the surface of the site. Material stockpiles and mined out depressions characterise this area.

The impact on the topography of this development is rated as moderate-low., considering the nature of the development; change to the topography is expected.

The proposed mining contemplates a box cut into the northern hill. Mining would cause a bench structure into the hill with a slope gradient of 1:2. This area of land is currently mostly covered with alien vegetation which mainly consists of Rooikrans trees. Cutting into the hill and clearing of vegetation would be noticeable, but with profiling and rehabilitation after mining; it would be a pleasant improvement on the area. With the necessary mitigation and the correct mining approach, the visual disturbance expected, could be effectively mitigated. Changing the topography would not change run-off patterns.

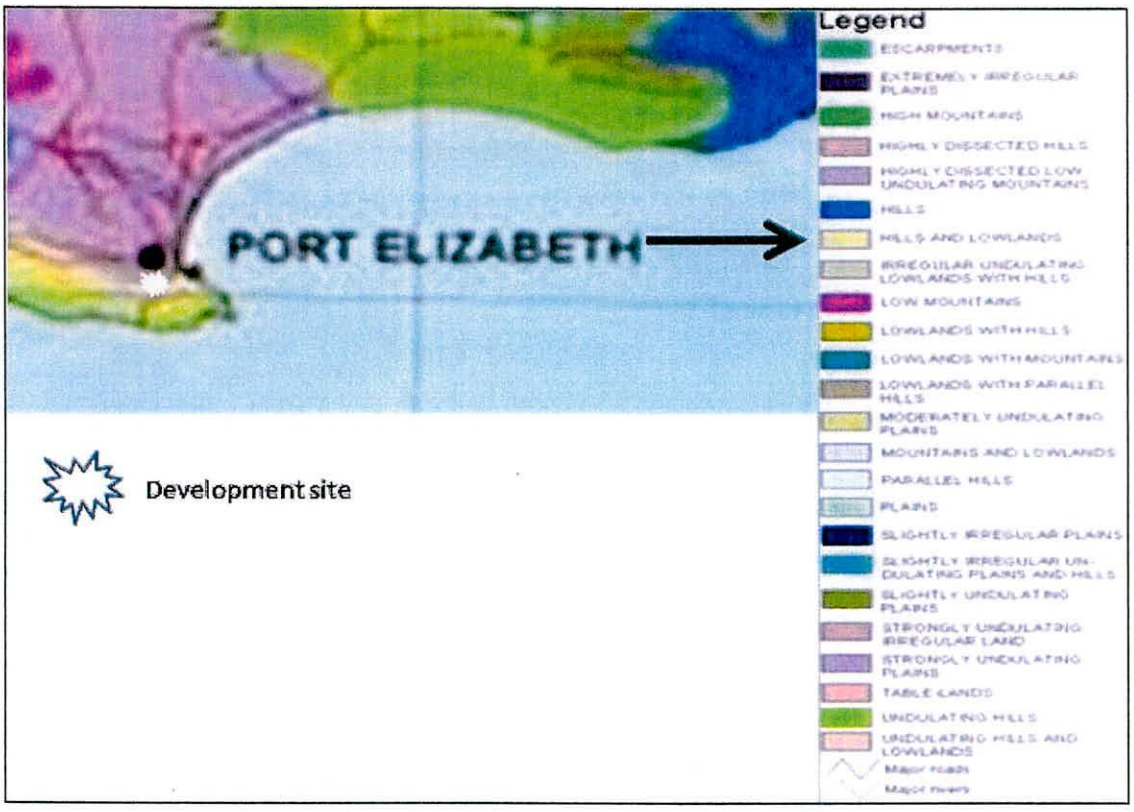

Figure 9: Topography of general area of the mining site

The placement of permanent infrastructure within the mining area would not be permissible and from this perspective, no impact on the topography will take place. Since an existing access and internal haul road will used it would not cause any additional visible changes to the landform.

Upon rehabilitation of the area, it would entirely blend in with the surrounding area provided it is re-vegetated properly with a grass cover and indigenous trees through infill planting.

Currently the land concerned displays disturbed land because of previous mining and the mainly alien tree cover and little grass cover that colonizes it. There are no prominent environmental features in the immediate surroundings. Mining would change the topographical appearance of the area, but with infill planting it could display a rougher texture, which would fit in with the surrounding environment. A number of residences and other structures on the surrounding farms had to some extent, affected the topographical appearance of the greater area.

Considering the nature of the mining process envisaged, no unacceptable changes to the area are expected, should the necessary precautionary measures contained in this document be

implemented. The slight topographical changes brought about would, however be irreversible but with proper mitigation measures implemented will blend in well with the surrounding environment. The impact is rated as low.

With the proposed mitigation anticipated visual disturbance could be reduced extensively. However, erosion on the slopes could cause a severe impact on the topography if the benches are not stabilized.

Impact on the topography.

	OPERATIONAL (no mitigation)	**OPERATIONAL (with mitigation)**	**CLOSURE**
Extent	Local	Site Specific	Site Specific
Duration	**Medium Term**	Short Term	Short Term
Intensity	**Moderate**	Low	Very Low
Probability	**Definite**	**Definite**	**Definite**
Significance	**Low-Moderate**	Low	Low
Status	Negative	Negative	Negative
Confidence	High	High	High

REMEDIAL MEASURES

- The impact on the topography of worked out areas will be remedied by means of profiling and stabilizing production faces.
- Mining shall not progress beyond the approved mine area.

- The production faces to be profiled to a minimum slope of 1:2 in such a way that sharp angles are prevented but that flowing curves are formed instead that blend with the surrounding landscape.
- Each area shall be fully profiled within 14 days after mining in a particular phase ceased and will be fully vegetated within 9 months.
- No areas outside the authorized mine area will be disturbed.
- A photographic record must be kept and complemented six monthly and must accompany the six-monthly performance assessment report.
- The depth of the excavation will be restricted to 10 m to ensure adequate sponge capacity.
- No stockpiles shall remain at closure.
- Stockpiles will be kept as small as possible and must be inside the mine area.
- The post rehabilitation topography will result in a box cut into the hill with a gentle overland flow with no evident erosion processes that could scar the land and cause changes to the topography.

GEOLOGY

In general the site falls in an area which is underlined with Arenite. More specifically, according to the 1:250 000 Geological Map (3324 Port Elizabeth) published by the Geological Survey of South Africa, the site under investigation is underlain entirely by quarzitic sandstone of the Peninsula Formation. Rock in the region dips fairly steeply towards the far north. The bedrock profile has, however, been flattens and terraced during the Miocene, by marine action.

The Peninsula Formation forms part of the Table Mountain Group, of the Cape Supergroup, and comprises quarzitic sandstone with minor conglomerate and shale. This formation has a thickness of up to 2 700 metres in the Eastern Cape Province, and is regarded as the basal unit of the Cape Supergroup in this region. Extensive tectonic deformation of the quarzitic sandstone has resulted in weaker fault and thrust zones, which encourage the formation of joint-controlled valleys and gorges.

Previous mining activities have already permanently impacted the geology at this site, as most of the red gravel has been removed. Considering the abundant extent of quartzite reserves around the city; the impact of the removal of this deposit low. Also, considering the nature of the development the impact is unavoidable. Considering the limited nature of the mining process and the low-key activity envisaged a relative small amount of material would be permanently removed hence the impact on the geology is permanent. The material does not constitute a strategic mineral and the site a geo-site therefore the impact is rated as low.

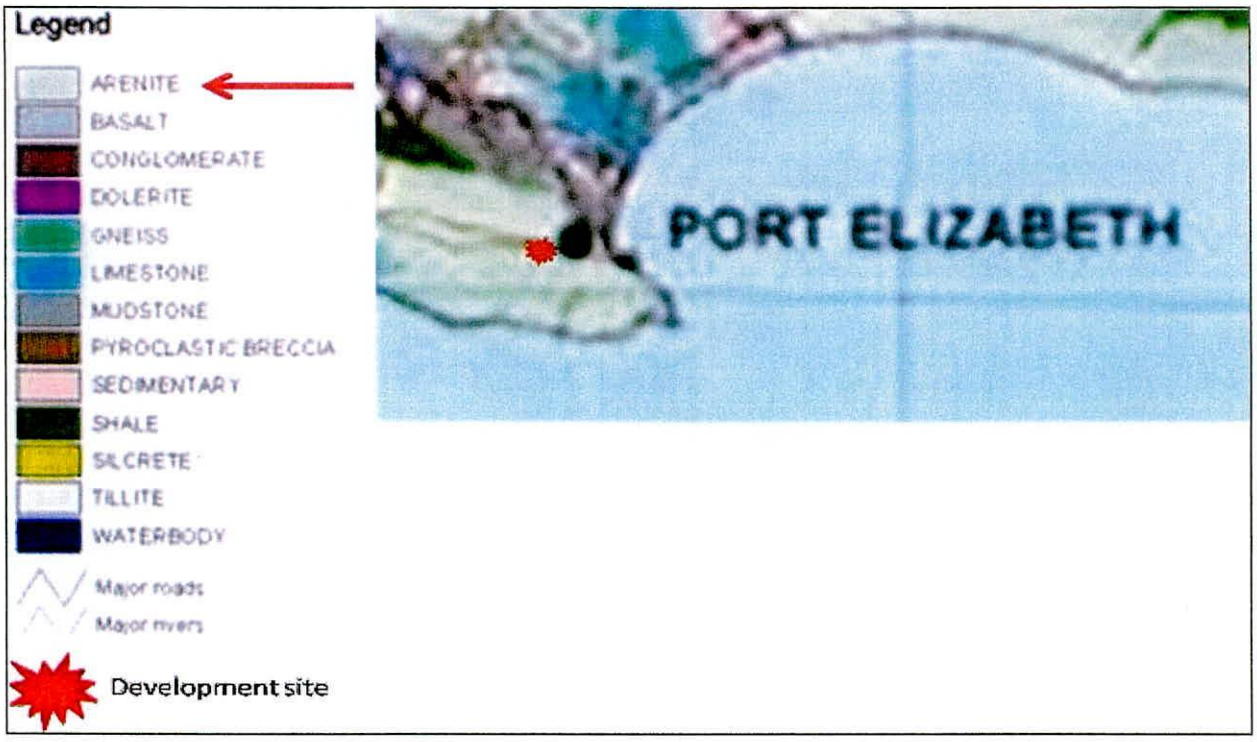

Figure 10: Geology of the area

Impact on geology

	OPERATIONAL (no mitigation)	**OPERATIONAL (with mitigation)**	**CLOSURE**
Extent	Local	Site Specific	Site Specific
Duration	**Long Term**	**Long Term**	**Long Term**
Intensity	Low	Low	Low
Probability	Definite	Definite	Definite
Significance	Low	Low	Low
Status	Negative	Negative	Negative
Confidence	High	High	High

- The minimum working area for an efficient and effective operation should be utilized and demarcated prior to the start of mining activities and the excavator operator must be informed in this regard.
- No mining will be undertaken in areas where reserves have not been adequately proved in order to avoid unnecessary/wasteful mining.
- No activities will be permitted outside the approved mine area and demarcated phase.
- All oversize stones will be returned to the excavation or used in profiling the production faces. In such case this material will be neatly stacked, covered with sand and gravel, compacted and vegetated if possible.
- Quarry development will take place with final rehabilitation objectives in mind.

SOILS

Soil is a complex mixture of eroded rock, mineral nutrients, decaying organic matter, water, air and billions of organisms, most of them microscopic decomposers. Soil forms when life-forms decay, when 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. A cross-sectional view of the horizon in a soil is called a "soil profile". Most mature soils have at least three horizons.

Colour indicates a lot about how useful a soil is for growing crops. For example, dark brown or black topsoil is nitrogen rich and high in organic matter. Grey, bright yellow or red topsoil's are low in organic matter and will need enrichment to support most crops.

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.

Calcarious 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.

SOIL PROPERTIES

Topsoil is a very precious, non-renewable resource with high conservation importance and 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 where it occurs it be preserved and protected and if necessary obtained from outside sources to effect proper rehabilitation of disturbed areas.

The topsoil in this mining area is limited, between 450 mm – 750 mm deep. Most of the topsoil was removed and stockpiles in the mining area and will be reinstated as mining progresses as per the mine plan. Incorrect stockpiling thereof will most definitely cause 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. Since most of the topsoil has been stockpiled already, it will be important to fertilize it and if possible irrigate it as soon as possible.

Figure 11: Soil at the site

Table 1: The typical soil horizon encountered at the site

Material Type	Description
Colluvium	Includes topsoil, gravel with clayey sand matrix, and gleyed clays collvium.
Ferricrete	Poorly, moderately and well cemented ferricrete.
Quartzitic Sandstone	Completely weathered residual clayey sand, becoming moderately to slightly weathered quartzitic sandstone rock with depth.

COLLUVIUM

Various types of colluvium could be encountered in the study area, namely: topsoil, gravelly colluvium and gleyed clayey colluvium. Colluvium refers to soil which has been deposited by normal gravitationally related processes.

Most of the study area is was blanketed by a layer of topsoil before previous mining, but has been removed and stockpiled at the site. This material is mottled grey, red-brown, orange-brown, and dark-brown in colour, and comprises loose to moderately dense, clayey sand with quartzitic sandstone gravel. Roots (occasionally very dense root mats) are also common. Topsoil displays an average depth of about 0.4 m in the undisturbed areas.

Gravelly colluvium with Fe/Mn (ferricrete) stained quartzitic sandstone clasts (up to 100 mm in size) and ferricrete nodules, usually beneath the topsoil. This material is sought after for road-building purposes.

Mottled, gleyed clayey material usually proved to be fairly thin in this area.

FERRICRETE

Ferricrete (iron and manganese concretions – Fe/Mn) is formed as a result of the precipitation of iron and manganese from the ground water to form hard concretions and nodules, which are frequently

cemented together. This pedogenic process usually occurs between fluctuating water table minimum and maximum levels. This horizon displays an average thickness of 0.4 m in the area. The yellow-brown, red-brown, and orange brown ferricrete is moderately dense to dense in consistence, and ranges from poorly cemented ferricrete gravel in a clayey sand matrix in some areas, to moderately and well cemented ferricrete in other areas. This material was not sampled, due to its rock-like nature. Some of the colluvial horizons could also contain a fair percentage of ferricrete material.

QUARTZITIC SANDSTONE

Residual quartzitic sandstone comes forth at shallow (0.15 m) to moderate (1.30 m) depths below surface. The yellow-orange-brown quartzitic sandstone may display moderately dense to dense consistencies, with occasional very loose to loose lenses in evidence. The residual quartzitic sandstone can vary from completely weathered clayey sand becoming highly weathered soft rock to moderately weathered rock with depth.

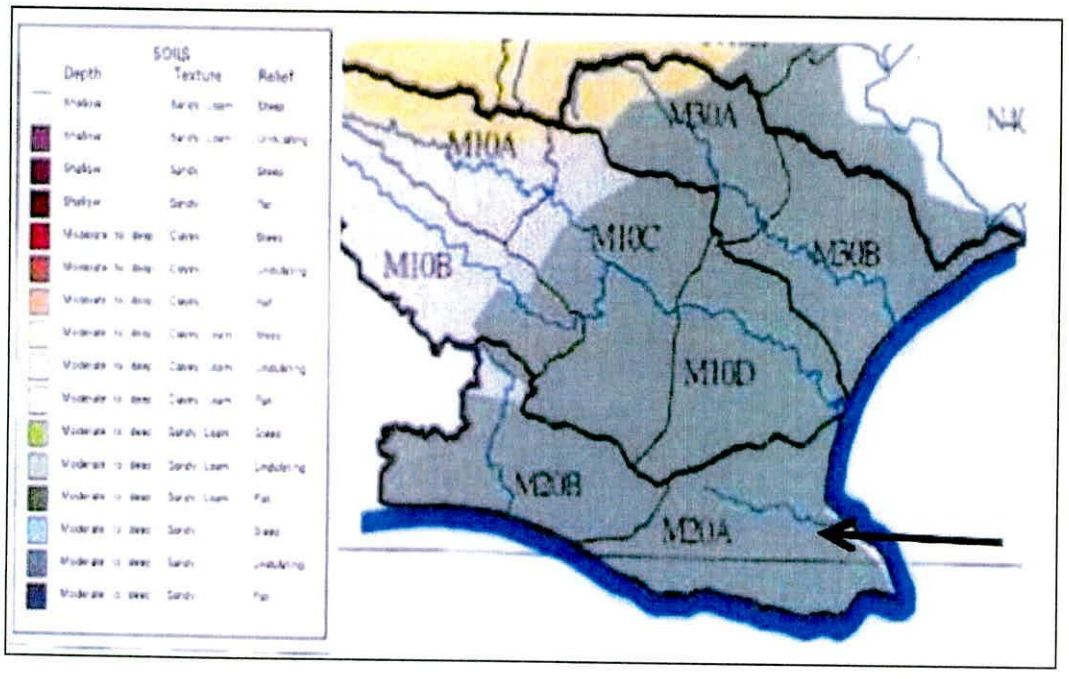

Figure 12: Soil of the area

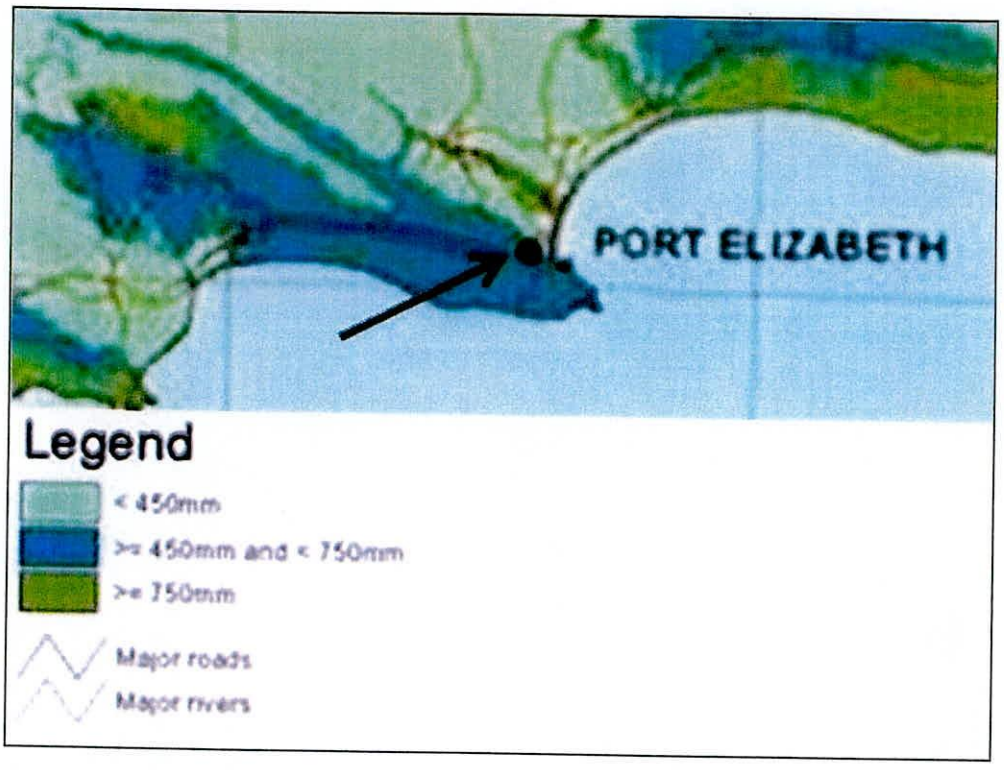

Figure 13: Soil Depth

Impact on soil properties

	OPERATIONAL (no mitigation)	**OPERATIONAL (with mitigation)**	**CLOSURE**
Extent	**Local**	Site Specific	Site Specific
Duration	**Medium Term**	Short Term	Short Term
Intensity	Low	Low	Low
Probability	**Definite**	Likely	Possible
Significance	**Moderate**	Low	Low
Status	Negative	Negative	Negative

Confidence	High	High	High

SOIL EROSION

Soil erosion is a natural process, which, without disturbance, would balance itself with the formation of new soil. Any development that destroys the natural protective canopy of vegetation speeds up the process of soil erosion. Soil properties determine the erodibility of soils and their ability to support vegetation and this need be understood in assessing the potential for erosion and the suitability for rehabilitation. Soils susceptible to water erosion are normally silty, are weakly structured, have low organic contents and have poor internal drainage.

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 (soil and slope), mean annual rainfall and broad land use patterns.

Naturally, the top layer soils on the developing site are gravelly, have low organic content and high leaching capacity. This will render the soil not to be highly erodible and this statement is supported by the erodibility index (Figure 14). The topsoil (A horizon) of the mining area less than 15% clay content (Figure 15) and can be generally described as a gravelly soil with a low erodibility factor of between 16-17 (Figure 14). At the site most of the red gravel material (top soil layers) was removed by previous mining and the remaining quartzite is very hard and thus highly resistant to erosion. Replacing the topsoil will therefore be at risk from sheet wash during high rainfall periods, therefore it is of the utmost importance to slope the benches to appropriate gradients and replace a sufficient amount of sub-layer- and topsoil with immediate re-vegetation program in place.

Thus, even in natural state the potential of erosion during major rain falls is relatively low at the study site. The slopes of the excavation will be mostly exposed to erosion, but considering that the area will be benched, sloped and covered with topsoil and re-vegetated, the impact on soil erosion is predicted to be low. A proper re-vegetation strategy is of however of the utmost importance.

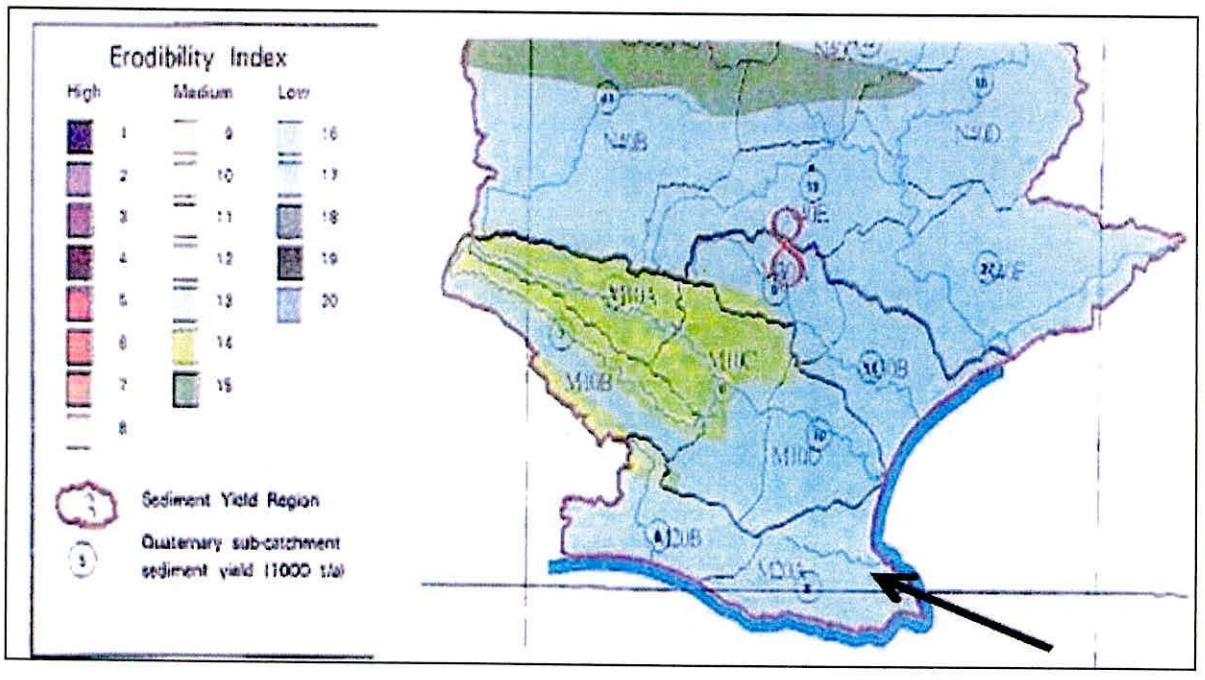

Figure 14: Erodability Index

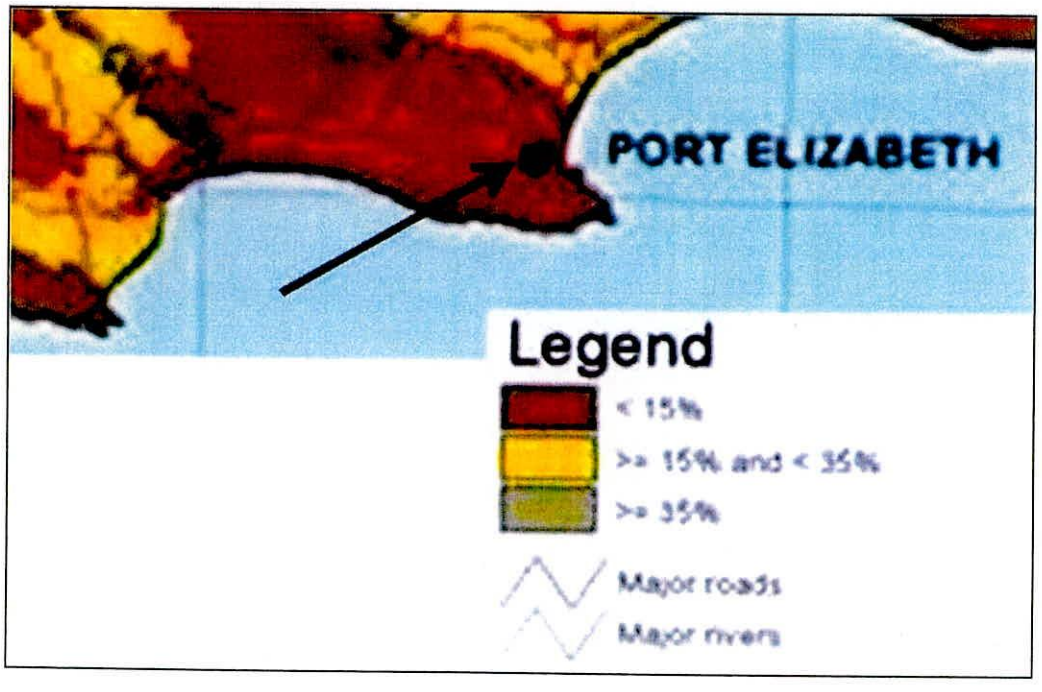

Figure 15: Clay Classes of the topsoil

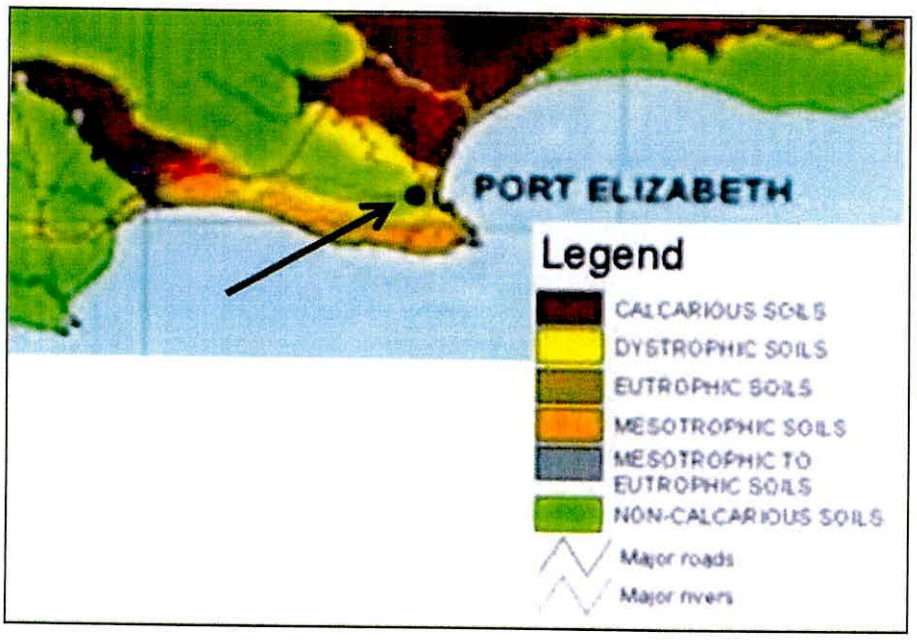

Figure 16: Soil Leaching status classes

The existing haul roads leading to the mine area will be used and due to the gentle gradient thereof erosion would not be a consideration. Over the long term, it should be protected with a proper wearing course and the necessary cross drains.

To reduce any potential surface flow within the mining area it is important that removal of vegetation ahead of the production faces is limited to the minimum.

Topsoil of the study area is susceptible to wind erosion and wind will have an effect on the proposed re-vegetation strategy. If necessary, should be protected by windbreaks. It should be mentioned that the surrounding alien trees provide some protection against wind erosion.

Impact on soil stability

	OPERATIONAL (no mitigation)	OPERATIONAL (with mitigation)	CLOSURE
Extent	Local	Site Specific	Site Specific
Duration	**Long Term**	Medium Term	Short Term
Intensity	**Moderate**	Low	Low
Probability	**Likely**	Possible	Unlikely
Significance	**Moderate-Low**	Low	Low
Status	Negative	Negative	Negative
Confidence	High	High	High

SOIL POLLUTION

Soil pollution can only occur should hydrocarbon spills occur or when 1) used oils and lubricants are purposefully drained into the alluvium, 2) storage facilities are destabilized or 3) if ablution facilities contaminate soils. At the quarry, none of these impacts is anticipated since trucks and earthmoving equipment will be well maintained. Servicing of vehicles, fuel storage or establishment of a sewage system will not take place at the proposed quarry area. No other chemicals or hazardous substances will be used or stored at the site.

The high penetration capabilities and low absorption capacity of the soil structure could cause pollution plumes to be migrating vertically and laterally, but since most of the red gravel material has been removed from site, the remaining quartzite has a very low penetration capability and low absorption capacity, thus the impact is rated very low.

HYDROCARBONS

Storage of all oils and lubricants as well as servicing of vehicles will be restricted to the offsite workshop of the contractor. Only emergency repairs will be done over drip trays within the soil environment hence no impact on alluvium is anticipated. Bulk diesel fuel, oils and lubricants will be stored at the offsite workshop of the contractor.

Due to the limited amount of vehicles that will be used on the site the worst case scenario would lead to very small hydrocarbon spills that will penetrate the soil immediately and will percolate to lower levels. Gravely soils will result in a more extensive but less concentrated plume and with the higher oxygen levels (less compacted and more air space) characteristic to these soils, will result in accelerated bio-degradation of hydrocarbons. Quartzite layers however has a high un-penetrable profile thus any hydrocarbon spill could be easily scoped up. Use of fertilizers could assist in breaking down limited spills in short space of time but the extent of sub-layer soil would preclude it from reaching ground or surface water. If a major spill in some way or another manner has to occur it will lead to extensive soil pollution and in such case a specialist approved by DWAF will be called in to remedy the impact.

The generator to be used for operating the screen will be mounted within a steel tray. Destabilizing the diesel tank of the generator and spilling the entire contents will result in low-medium adverse impacts especially during dryer periods. It will severely affect soil fertility through impaired nutrient imbalances and pH values as well as reduced water retention capacity and will affect soils and vegetation over longer periods and needs to be bio-remedied. For this purpose, a specialist will be called in or the sand affected will be scooped up immediately and disposed of at a hazardous waste site.

The impact is rated low under worst-case scenario conditions and insignificant under normal circumstances due to the limited spills anticipated in the quarry area.

SEWAGE

A chemical toilet will be provided within the excavation. Due to the small number of people (2-3) that will be onsite, limited soil pollution will therefore take place and a similar impact on the coliforms count in the soil and water is anticipated. The system must be maintained according to specifications stipulated by Municipal by-laws or by a local health inspector. Due to the absence of ablution facilities no effluent will be generated that could affect soils and groundwater sources inside

or outside the study area. The anticipated soil pollution risk is rated low under worst-case scenario conditions and insignificant under controlled conditions.

WASTE

Domestic waste will be produced at the quarry but the waste streams (tins, paper, food) will be rather limited (0,5-1m^3 per month) and will be removed to the nearest approved waste facility. Even in limited amounts, uncontrolled storage of waste could lead to littering of the surrounds through wind action, which could affect livestock and the surrounding environment. Therefore, provision for waste receptacles with scavenger proof lids must be made. Handling of waste will be included in an environmental awareness programme to be developed for workers but it should be noted that this is not a requirement for mining permit applications.

Vegetation will be removed from the quarry areas but will later on be reintroduced to disturbed areas as mulch.

Waste production will be limited at the quarry site and the impact on soils and surrounds is rated very low.

Impact of pollution on soils

	OPERATIONAL (no mitigation)	**OPERATIONAL (with mitigation)**	**CLOSURE**
Extent	Site Specific	Site Specific	Site Specific
Duration	Short Term	Short Term	Short Term
Intensity	Low	Low	Low
Probability	Likely	Probable	Unlikely

Significance	Low **(Hydrocarbons – Moderate)**	Low-moderate	Very low
Status	Negative	Slightly Negative	Neutral
Confidence	High	High	High

REMEDIAL MEASURES

- All remaining *in situ* soils (at least 30cm) will be removed and conserved during future development stages and will not be sold. It will be stored along the perimeter of each phase and it will be piled to a maximum height of 1,5m. Once removed it will be seeded with the specified seed mixture, upgraded with inorganic fertilizer, irrigated if possible and lightly covered with some of the available grass cuttings removed from development areas.
- Topsoil must be removed ahead of the production face and be reinstated as soon as possible once extraction has been completed to limit the erosion potential. All stored topsoil must be reinstated and used for rehabilitation.
- Where needed topsoil stockpiles will be protected from wind action by erecting shade cloth screens (1,8mhigh) across the wind path or cover it with Hessian. To reduce the impact of wind, each phase will be developed in slots as wide as the reach of the excavator to facilitate quick return of topsoil.
- If topsoil from other development areas is sourced it must come from areas with zero alien plant infestation.
- Removed topsoil will not be mixed with sub-soils.
- All stored sub-soils will be spread first and covered by topsoil before fertilized.
- Topsoil will be reintroduced to disturbed areas, keyed-in slightly with lower horizons by ripping it lightly along the contour and fertilized as follow:
  1. Initially at a rate of 200kg 2:3:2 (22) Zn and 150kg 4:1:1 per hectare before seeding.
  2. Once the grass seedlings has reached a 15cm height applications of super phosphate at a rate of 150kg per hectare twice per annum (March & September) will be effected. Seeding will coincide with the rain season or when soil moisture regimes are good. The application of manganese and boron will also be investigated if re-vegetation does not progress satisfactorily.
  3. All vegetation removed from the mine area will be stockpiled, protected against wind erosion and re-introduced as mulch to seeded areas.
  4. In the event that the removed vegetative material is deficient the applicant undertake to obtain all available manure/chipped vegetative matter (without alien seed) and introduce it to profiled areas to improve the fertility and micro-climate of the soil, which in turn would facilitate improved germination and percentage soil cover.
- Upgrading of soils and re-vegetation of disturbed areas will be done concurrently with mining.

- If needed soils will be analysed by a competent laboratory and the nutrient requirements determined.
- Any erosion on the mine area would immediately be filled in and compacted.
- All erosion gullies on the faces would immediately be filled in and compacted and erosion-monitoring programme will be implemented as a cradle to grave process.
- A storm water cut-off berm must be constructed at the top (north) of the mine area to divert storm water run-off away from the exposed benches and hence to prohibit sheet wash flow as much as possible. The outlet of the berm must divert water into a well established vegetated area and if needed, energy breakers must be erected. Storm water run-off may not impact negatively on the surrounding area. The applicant will take full responsibility to restore any disturbances caused outside the mine area, if the diverted water causes damage.
- The inside of each berm will be properly stabilized and seeded. The production faces must be protected against runoff by constructing a berm ahead of the face. Diverting runoff to both the western and eastern side would reduce the risk of erosion at the spill areas. The slope thereof will not exceed 1º and the spill areas will be on a well-vegetated area. The spill area must be protected by semi buried v-shape gabion structures with dimensions of at least 1m x 0,5m x 0,3m.
- The storm water control measures described under the headings 'Soil & Surface water will be strictly implemented.
- Storm water control structures, if any, will be retained and maintained until closure. If needed a soil conservation officer or expert will be employed to assist in constructing storm water control structures.
- Storm water, if any, shall not drain freely from the excavation but shall be retained in the excavation to reduce erosion potential.
- The quarry will be developed in such a manner that slopes are smooth to prevent concentration of surface water on them that could stimulate erosion.
- Should erosion on the slopes become problematic:
  1. Any erosion rills or gullies that develop will be filled in with subsoil, compacted but upper layer to be scarified to bind with topsoil, top dressed with soil, fertilized and seeded.
  2. Such areas will be provided with a mulch/manure layer of at least 5cm thick.
  3. Trunks/branches of trees removed (non seed-bearing alien trees) from other undisturbed properties and to be negotiated with such landowners will be placed in rows along the contour 5m apart and pegged to the ground to reduce water speed and curb erosion.
  4. In worst case scenario geofabric or Soil Saver (natural organic sheet material with seeds) will be pegged onto the slopes after spreading of topsoil and seeding was effected. A soil conservation officer or expert will be appointed to oversee the process.
  5. If wind erosion becomes a problem, shade cloth screens will be erected (north-south direction) across the wind path every 20m. Shade cloth will be properly attached to 2,5m (1m sub-surface) wooden poles and shade cloth will stretch to the ground surface.
- Once the quartzite is removed and the topsoil replaced, the disturbed area must be seeded with the specified seed mixture.
- The amount of vegetation removed ahead of the production face will be reduced to the minimum required for optimal development.
- Mining will take place progressively from south to north as per the mine plan provided.
- The mining areas will be developed and rehabilitated in 2 phases/benches as proposed in the development plan to reduce the extent of the disturbed area and prevent erosion of the environment.

- Only existing haul roads to the quarry area will be used and vehicles would not deviate from it. Movement of vehicles in the quarry area will be limited to what is necessary to reduce potential impact on areas outside mine boundary.
- Disturbance of the soil and vegetation zones around the quarry will be prohibited.
- Portions of production areas will be profiled and vegetated as an integral part of mining.
- When needed, soil could be irrigated using water obtained from the Municipality.
- Vehicles will not drive over rehabilitated areas to prevent dieback of established vegetation.
- Any erosion that develops will be filled in with gravel and sand, compacted, covered with topsoil and seeded.
- No fuel, oil and lubricants will be stored onsite.
- Emergency repairs will be done over drip pans.
- Maintenance of vehicles will be done at the offsite workshop to a leak free condition.
- Hydrocarbons shall not be drained into the soils nor shall used filters and hydrocarbon-contaminated parts be buried at the site, but will be removed to an approved waste site or recycling facility.
- Making use of bio-remediation facilitated by a specialist company will negate larger spills whilst smaller spills could be treated with fertilizer to break it down or be scooped up by front-end loader to a hazardous waste site, which is located at Koedoes Kloof outside Despatch.
- Peatsorb or sawdust will be used to contain larger spills and some of this material must be on site as a contingency measure.
- No other hazardous chemicals will be used at the site.
- The chemical toilet will be maintained according to Municipal bylaws or specifications issued by a local Health Inspector.
- In case of emergencies used oils and lubricants will be siphoned in receptacles with proper lids and be disposed of at a registered recycling facility immediately.
- For emergency cases, a receptacle will be provided for used filters and oil contaminated vehicle parts and will be respectively dispose of at a registered waste facility and scrap yard immediately.
- The diesel tank of the generator, if required, will be leak-free and the generator and fuel receptacle will be placed inside a steel tray that will provided for 110% capacity of volume stored.
- All quarry/plant debris must be removed before topsoil is re-introduced to disturbed areas.

LAND USE AND LAND CAPABILITY

The land is zoned agricultural and is used for grazing, since it is too poor soil quality for crop farming.

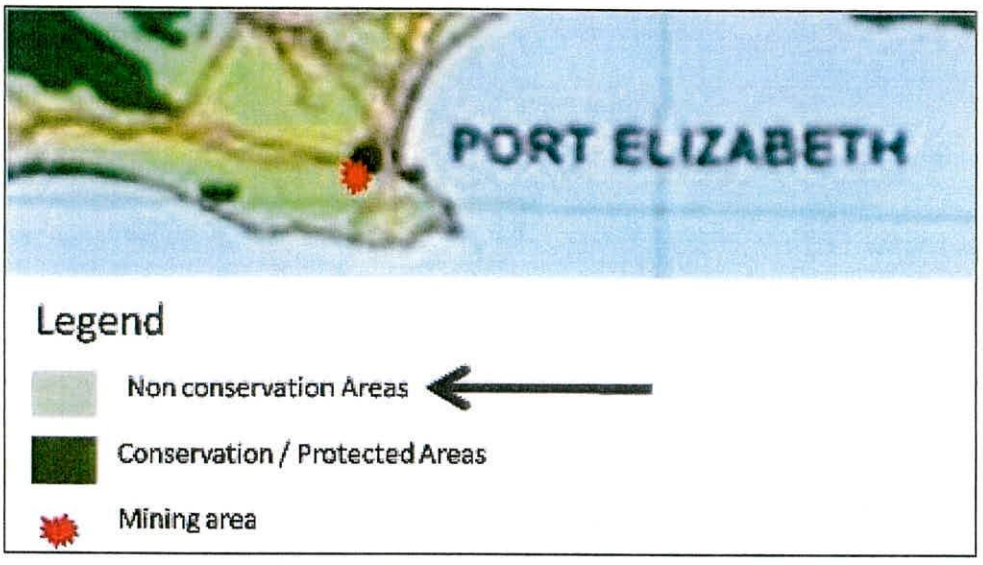

Figure 17: Conservation status of the general area

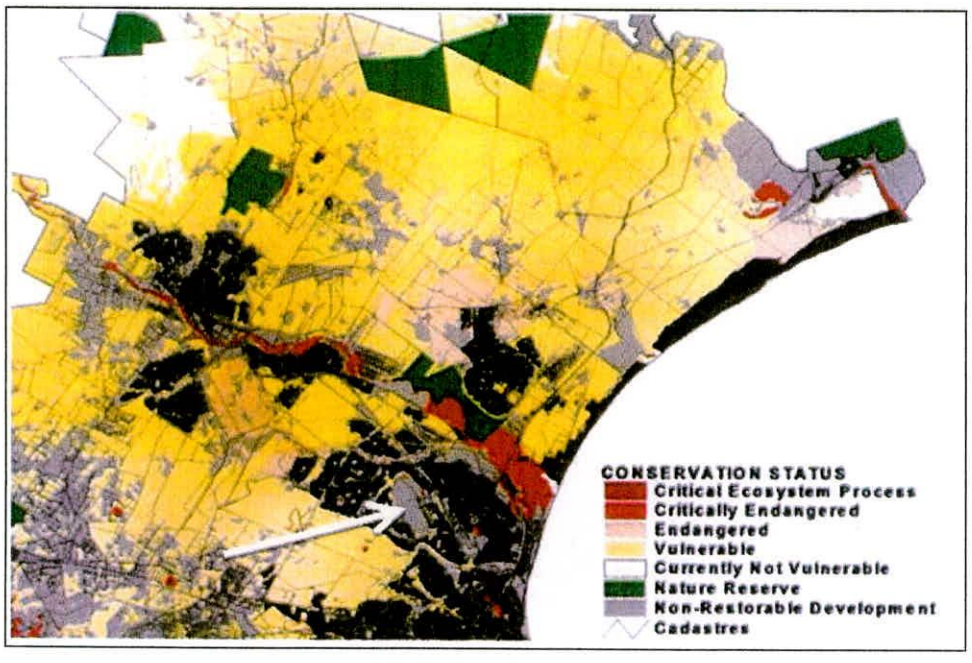

Figure 18: Conservation status of developing area

The very limited secondary grass cover and alien vegetation infestation and the fact that there are no definite plans in place to restore this environment back to its natural potential; contributes to the low conservation value of this site. Through the proposed re-vegetation process, there is a chance to restore the original ecology to some extent hence it would focus on restoring a portion of the natural environment. It is the intension to restore all the land disturbed to an acceptable degree and in line with the previous vegetation types occurring in the undisturbed surrounding environment. It is

anticipated that 10% of the original species diversity in the mining area could be restored over a two year mining period and up to 30% at the end of the two year aftercare period.

The potential end use of an area disturbed by development is determined most of the time by the capability of the land before development, which in turn is defined by the soil types, climate and topography in that particular area. Agricultural potential of the soil in the study area is very low and mining will reduce this potential over the short term due to lower soil fertility (impaired nutrient cycles) and reduced organic content therefore all topsoil will be conserved. Biological activity in the soils would be affected slightly and thus also the nutrient cycle, which could result in a less speedy re-vegetation process. Considering the long period in which the topsoil has already been stored; most of biological processes within the soil have been lost but can be regained through the proposed upgrading thereof will further assist in attaining original soil fertility.

It needs to be recognized that the mining area must be re-vegetated properly to restore in some sort, this small grazing unit and improve the capacity that has been lacking for so many years. Replaced topsoil will act as a seed bank due to the limited time that it will be stored and it is anticipated that a large portion of the vegetation will grow back, however no complete remedy is anticipated over the short term. Since this is not a conservation area, the need to maintain biodiversity is not a prerequisite.

Mining the area according to the principles set out in the EMP, would not only improve the grazing potential of the mining area, but would restore grazing value back to the area that has been lost for so many years. Taking into account the small area and the aggressive rehabilitation strategy that will be followed, this impact can be rated overall as low and short term. In terms of the topography, the development will result in similar flat areas for grazing purposes and potentially the grazing capacity will improve on the mine areas due to the establishment of certain grass species and the application of fertilizers. The area would therefore be profiled correctly to ensure proper slope stability and sufficient soil depth for re-vegetation.

Since the affected areas have not fully served as the ecological niche, forage areas and nesting places for avian species are very limited and the remaining few wild animals are found in the surrounding areas. The loss of this niche to wild fauna is deemed of low significance considering the poor status of the ecology and in light of the proposed restoration of this habitat to a much-approved status. Considering the low conservation status of the property, mining would not detrimentally affect the economical or ecological value of any property concerned. The ecological status of surrounding land is rated as non-restorable. It is the applicant's view that this particular development can be

integrated with the surrounding land uses, which currently is farming without endangering sensitive natural and cultural resources or abutting land uses. Development of the quarry would also not compromise the needs and the well being of future generations and with the proposed rehabilitation strategy it will to some extent meet the aspirations that the NMBM and future generations might have. Since this habitat is not sensitive, it is from an economical and ecological point of view the correct strategy to develop it and not the areas with high ecological status or cultivation potential.

The proposed mining will not have any impact on the land capability or land use of abutting properties. Anticipated minor increases in dust levels will not affect vegetation on abutting land due to decreasing photosynthetic rates since most of the dust will be filtered out by surrounding alien vegetation. The proposed site is far from residential areas and will therefore not largely affect the ambiance that residents of the area enjoy in this rural area.

Required mining infrastructure will consist of a mobile screening and crushing plant, which will be positioned in the quarry and no impact on land capability and land-use is anticipated. Considering the ecological and agricultural status of the mine area the impacts on land use and land capability could be rated as negligible during mining but low positive once rehabilitated.

Impact on land capability and land use.

	OPERATIONAL (no mitigation)	**OPERATIONAL (with mitigation)**	**CLOSURE**
Extent	Local	Site Specific	Site Specific
Duration	**Medium Term**	Short Term	Short Term
Intensity	Low	Low	Low
Probability	Likely	Possible	Probable
Significance	Low	Very Low	Low
Status	Nega[illegible]	[illegible]	[illegible]

REMEDIAL MEASURES

- Mining will be restricted to the approved mine area.
- All available *in situ* topsoil removed shall be conserved and handled as prescribed under 'soil remedial measures'.
- The quarry will be seeded with the prescribed seed mixture to ensure a surface cover that will stimulate the return of other plant species.
- Alien plant infestation will be prevented through an alien eradication programme .
- Rehabilitation will be done concurrently with mining and in Areas as proposed by the mine plan as soon as the floor has been lowered by the proposed 10 meters. Progress will be monitored and audited against proposed rehabilitation schedule to improve land use options and land capability.
- The slopes shall be profiled to such an extent that the area could be used for grazing and recreational purposes/semi-wilderness land. Rehabilitated areas would not be grazed by any domestic animals within two years after closure was granted. These will be fenced off.
- No fslgrPgsRceRno
-
-

FLORA

The original vegetation of the area is classified according to Acocks as false fynbos. Most of this veld type is indistinguishable from the true Fynbos, but there are indications that in its natural condition it would have been transitional from the Dohne Sourveld to the Fynbos, and much resembling the veld of the summits of the Amatolas and Katberg. Wetter southern aspects would have has a transitional forest climax.

Asteraceae (*Othonna, Euryops, Ursinia,* etc) dominate this northern veld after burning, which may be taken to foreshadow the dominance of Asteraceae in the derived non-succulent Karoo.

Fynbos is characterized by the presence of the following three elements:

1. A restioid component, belonging to the Restionaceae or the Cape Reed Family. Some definitions require a mere 5% cover of restiods in an area to classify it as a Fynbos vegetation type. The Restionaceae have been described as shrubby grasses, and replace grasses on nutrient-poor soils where there is a strong winter component to the annual rainfall. Sedges and many grasses within Fynbos also share the "restioid" characters of reduced or absent leaves and tough, wiry stems.

2. An ericoid or heath component. By far the majority of plant species - and the greatest cover after restioids comprise plants with small, narrow, rolled leaves with thick-walled cells on the upper leaf surface and a channel containing hairs on the lower surface. Although the Heaths (Ericaceae) feature prominently, the Daisy (Asteraceae), Blacktip (Bruniaceae), Pea (Fabaceae), Jujube (Rhamnaceae) and Thyme (Thymelaeaceae) Families also have structurally similar leaves. Many of these plants are wispy and insubstantial, although some form quite dense bushes.

3. A proteoid component. These plants, almost exclusively of the Proteaceae, have broad, isobilateral (both surfaces similar) leaves. They are the dominant overstorey in Fynbos. Although some members occur in ecotones and some occur in Renosterveld, by far the majority are confined to Fynbos.

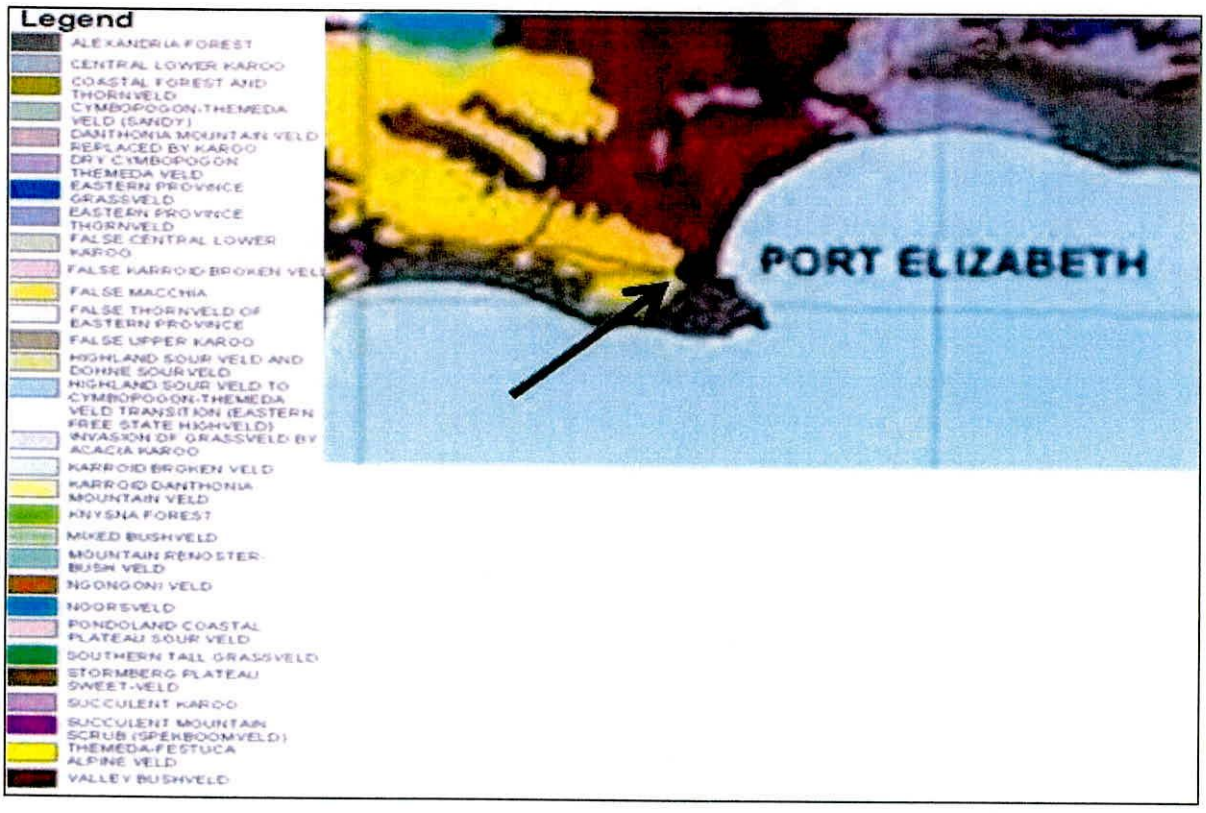

Figure 19: Vegetation: False Macchia (Grass Fynbos).

SITE SPECIFIC VEGETATION

In the study area, a large proportion of the indigenous vegetation has been removed to facilitate red gravel quarrying. No rehabilitation occurred on site and since no alien control management plan was implemented, most of this is invaded by alien vegetation. Mostly secondary grassy fynbos vegetation occurs and some grass species occurs. On areas that have not been disturbed by mining, some indigenous grass species occurs.

Figure 20: Vegetation on the mining area

For the most part, the area previously mined is invaded by alien trees, of which the Port Jackson, Rooikrans and Black Wattle are the most common. Very conspicuous, but isolated clusters of *Pinus* and *Eucalyptus* were also noted in the study area.

The mine area is due to previous mining and alien infestation not a vocal point in the landscape anymore and therefore the area is not rated as a site of high visual character. However, a proper rehabilitation of the disturbed mine area is still important and as much as possible species will be reintroduced to the area.

In order to achieve effective re-vegetation of the mine area infill planting should be done with plants obtained from a local indigenous nursery. This will improve the stability of the mined out area. It is imperative that a phased approach be followed to ensure that environmental degradation is restricted to the minimum. Lack of soil structure will be a major consideration. In order to protect disturbed areas and to prevent unnecessary visual impact the minimum vegetation must be removed at any given time.

According to land classification the invasion potential of the land concerned is rated medium-high and disturbed land should be treated with utmost care. Rooikrans, the most dominant invader in the study area, is native to Western Australia, and was actively used for dune-binding purposes in South Africa. Unfortunately, this plant forms dense, impenetrable strands of tall shrubs or short trees with interlocking crowns. Germination and growth of the indigenous vegetation is soon suppressed in areas where Rooikrans becomes established, and natural flora frequently disappears.

Once re-vegetation of disturbed areas starts the impact of alien vegetation infestation could emerge as a significant impact and the necessary control measures need to be implemented. Should it not be put in place, the objective of re-establishing a portion of the original vegetation will not be reached and the proposed mining venture could be rated as unsustainable. This scenario must be prevented at all cost.

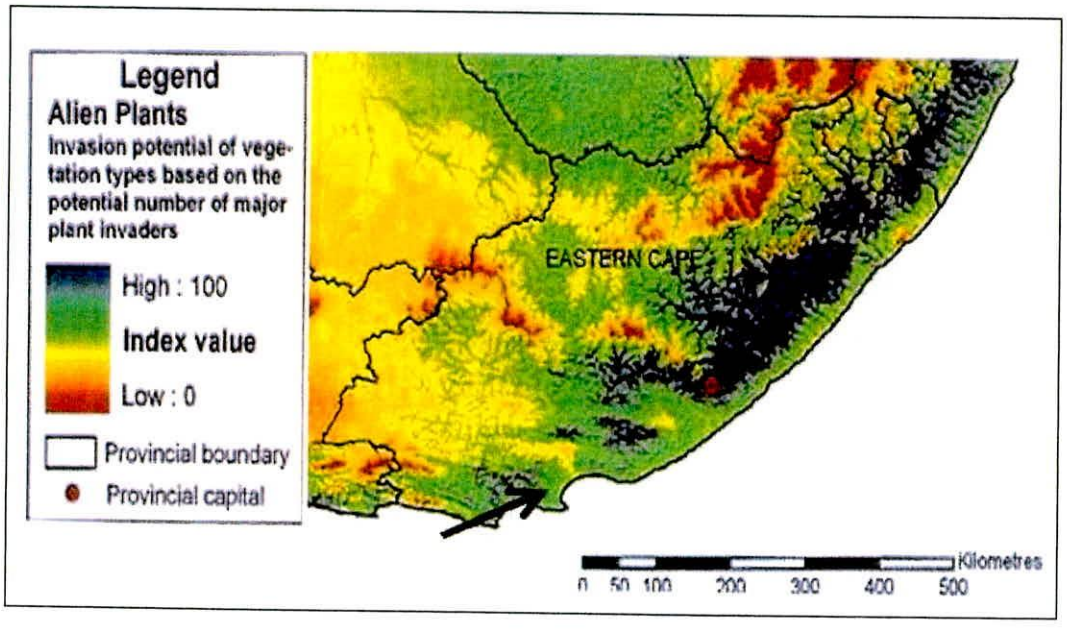

Figure 21: Alien vegetation invasion potential

ALIEN CONTROL MEASURES

Although herbicides exist that can kill almost any plant invader, it is not always possible to use them. The use of herbicides in South Africa is strictly controlled, and chemicals must be tested and registered for use against particular plants of groups of plants before they can be recommended (Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act of 1974 with Regulations and

Amendments). No herbicides are registered for the chemical control of Rooikrans and Port Jackson plants, but glyphosata (2,4,5-T in diesel oil for stem treatment) is registered for chemical control of manure Black Wattle trees.

The choice of control method is influenced by many factors including the age of the invader plant, its ability to propagate, habitat, season, and the availability of labor. Mechanical control of invaders is recommended in the study area. This technique comprises slashing, and removal or stumping of plants. For all of the invader species that were identified in the study area, seeding plants should be hand-pulled. Immature plants should either be ring-barked, dug out, or the stems should be cut as near as possible to the ground. The bark on the remaining stem stub must be peeled off into the ground, once the stem has been cut. Mature plants and trees should be ring-barked, or the stem cut off as close as possible to the ground, as described above.

Rooikrans rarely coppices after intense burning and effective cutting. Mechanical eradication is thus an effective method of control as long as the stems of older plants are severed as low as possible, thereby ensuring that no buds will re-sprout. Similar mechanical eradication techniques are recommended for the Black Wattle and Port Jackson plants.

The removal of invader species, results in exposed soil, which can encourage soil erosion under certain conditions. The sudden destruction of large strands of exotic vegetation is, therefore, not recommended, but controlled clean-up and gradual return of the veld to its natural state is advocated.

In South Africa the Plant Protection Research Institute of the Department of Agricultural Technical Services has an active programme on biological control and is researching and investigation the control of invader species, including the Australian's *Acacia's*. Certain biological techniques have been introduced into Eastern Cape Province to control both Rooikrans and Port Jackson infestations, but success appears limited to date.

Considering the low conservation value of the vegetation to be removed during the mining process and the limited area to be affected, the impact is rated of low significance. If the proposed re-vegetation strategy is implemented, the impact can be rated of low-moderate positive significance over the proposed mining and after care term (4 years).

Impact on flora

	OPERATIONAL (no mitigation)	OPERATIONAL (with mitigation)	CLOSURE
Extent	Site Specific	Site specific	Site Specific
Duration	Long Term	Short Term	**Medium Term**
Intensity	Negligible	Low	Low
Probability	Definite	Likely	Definite
Significance	Low	Low	Low-moderate
Status	Insignificant	**Positive**	**Positive**
Confidence	High	High	High

REMEDIAL MEASURES

It will not be possible to restore the original vegetation but through infill planting certain species could be introduced once a grass cover was established. A negative factor is that the mine is abutted by heavily infested areas that could act as a seed bank for infestation of newly rehabilitated areas. With a vigorous re-vegetation programme, certain species might re-colonize rehabilitated areas and the specie composition and diversity will slowly improve but will never revert back to the original status again. The success rate of re-vegetation will however, depends on concurrent rehabilitation and post closure eradication programme being followed.

- Mining would be restricted to the areas demarcated by the mine plans and no vegetation outside the demarcated mine boundaries will be removed.
- The rehabilitation plan will be implemented in accordance with the time frames set. A phased re-vegetation programme as discussed under 'mine development' will be followed to ensure timeous rehabilitation of disturbed areas in order to increase control over the process and to limit irrigation required.

- Indigenous vegetation outside the mine boundary shall not be affected by mining activities. Furthermore, no vegetation outside the mine areas will be removed and spread of alien vegetation will be prevented.

- All indigenous plant species that can be transplanted will be removed from mine areas, potted and be used during the rehabilitation phase.

- Only the approved haul road will be used and vehicles will not traverse virgin land or in the buffer area between the stream and mine.

- All slope areas will be properly stabilized through compaction to ensure proper establishment of false fynbos vegetation.

- The mining area will be reclaimed to a grass cover supplemented with indigenous trees through infill planting. Disturbed areas will be re-vegetated with a grass cover by seeding with:

Eragrostis curvula	*Themeda trianda*	*Sporobolus africanus*
Digitaria eriantha	*Panicum maximum*	

- None of these grasses poses any threat of proliferation. Seeding would take place in the spring from August to October and in autumn from March to middle April at an application rate of 3-5kg/ha of each specie mentioned. It could also path the way for reintroduction of some of the other plant species.

- Seed will be broadcasted by hand and areas will be raked to cover seed and protect it from birds feeding in the area. Seeding, germination and surface cover will be monitored on a continuous basis. This vegetation cover would require the minimum maintenance and will within a short time improve the visual appearance of the site. Maintenance will be carried out until closure was granted.

- Juvenile alien trees will be pulled and removed onto an area cleared where it will be burnt when it is dry.

- Once the areas have been vegetated, a continuous alien control programme will be implemented by pulling any seedlings on a weekly basis. Specific attention will be directed pine trees, *Acacia longifolia,* and *Acacia saligna* (Port Jackson). No tree will be left until it reaches seed bearing age.

- Once an area is vegetated, no traffic will be permitted in such area, except for on the approved haul road. Driving in non-mining areas will be prevented.

- Veld fires will be prevented since it could affect the vegetation as well as impacts on soil stability and fertility. No fires will be permitted in the mining and the required fire extinguishers will be made available.