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Reference: EC30/5/1/2/3/2/1(0208)EM
Date: 19 August 2009

South African Heritage Resources Agency
P.O. Box 759
EAST LONDON
5200

Case ID: 2397

ATTENTION: MR. T. LUNGILE

Sir

CONSULTATION IN TERMS OF SECTION 40 OF THE MPRDA OF 2002: ENVIRONMENTAL MANAGEMENT PROGRAMME (EMP); GRAVEL AND SAND (GENERAL) MINING ON PORTIONS 7, 8, 9; PORTIONS 23 UP TO 40; PORTIONS 59, 68, 70, 71, 74, 79, 80, 82, 96, 111 AND 114 OF THE FARM ZWARTKOPS RIVER WAAGENSDRIFT NO 567, DIVISION OF UITENHAGE

1. Attached herewith, please find a copy of an EMP received from Sandman Quarries cc.
2. Please forward any written comments or requirements your department may have in this regard, to this office not later than **17 October 2009.** Failure to do so, will lead to the assumption that your department has no objection(s) or comments with regard to the said document.
3. Consultation in this regard has also been initiated with other relevant State Departments.
4. Please use the reference number (EC) 30/5/1/2/3/2/1(0208) EM in all future correspondence.
5. Your co-operation is appreciated.

Yours faithfully

REGIONAL MANAGER
EASTERN CAPE

SA HERITAGE RESOURCES AGENCY
RECEIVED
18 MAY 2010

SANDMAN QUARRIES cc

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SANDMAN QUARRIES

ENVIRONMENTAL MANAGEMENT PROGRAMME

This Environmental Management Programme forms part of a mining right application for a proposed opencast mine in the Swartkops Valley, owned by Sandman Quarries and describes the mitigating and management directives. This report is undertaken in compliance with Regulation 51 and Section 39 of the Minerals and Petroleum Resources Development Act, Act 28 of 2002.

August 2009

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SANDMAN QUARRIES cc

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1. EXECUTIVE SUMMARY

Sandman quarries has undertaken to apply for mining rights for gravel and sand on portions 7,8,9, portions 23 to 40, portions 59, 68, 70, 71, 74, 80, 82, 96, 111 and 114 of the farm Zwartkops River Waagens Drift no. 567 in the division of Uitenhage. This document details the environmental management programme which will be implemented to minimise the impact of the mining on the environment.

The project is located to the East of Dispatch, North of the Swartkops River. Sandman quarries currently have an operation close to the R75 Bridge over the Swartkops River. The entire area is 234.3 ha in extent, of which 84.8 ha has been identified as having the targeted minerals of sand and gravel.

The area is characterised by the presence of the Swartkops River, forming the southern boundary of the flood plain on which mining is proposed to take place.

Most of the proposed mining area lies on the upper river terraces which are subject to flooding on approximately a 1 : 5 year basis.

Some of the proposed mining area, in the South Eastern corner is proposed within the Swartkops River terraces, where deposition of sands and gravels occurs after flooding.

Sunday's Thicket occurs within the proposed mining area, though its occurrence is limited to clayey soils which are not being targeted in this mining rights application. Most of the vegetation in the mining rights area is pastures, riparian vegetation and secondary Acacia Karroo Thicket.

In terms of aquatic fauna, within the Swartkops River system, only Fresh Water Mullet (*Myxus Capensis*) is listed as a Red Data Book species. The species feeds and grows in fresh water but reproduces at sea.

The sand and gravel deposits, targeted for mining, would supply markets of the construction industry which seek specifically construction sand, plaster sand and construction stone.

Mining will be undertaken in two different manners depending on whether the mining takes place on river terraces or with the river banks.

Mining on the terraces will involve mining excavation between 2.5 and 4.5m deep, depending on location. Generally mining will be done in one strip to depth. Stripping of soil and vegetation will be done using a bulldozer. Extraction will be done using a crawler mounted hydraulic excavator loading into articulated dump trucks. Once mining is completed landscaping of area will take place to create slopes with angles of less than 18°, soil will be replaced and the area will be rehabilitated into pastures, for grazing of cattle, where possible.

The second type of area sought for mining lies is within the river banks or terraces. This mining will involve mining of the flood prone zone, between the river bank full zone and the river banks or terraces. This will involve creation of berms against river bankfull zone to prevent impacts on the river itself. After mining is complete landscaping the area will be done by creating shallow excavations with sloped side walls (35°) with berms at intervals of 25m.

Mining will be done in phases, as shown in the regulation 2(2) plans, such that assurances can be given for complete rehabilitation of one phase prior to commencement with the next phase. The phased mining approach will involve mining and rehabilitating the areas with the best quality sand and gravel deposits in the initial phases, and leaving areas which are regarded as having less potential both economically and environmentally for the later stages. Mining will take place on these remaining sand reserves within the mining right depending on future environmental considerations as well as farming needs. These later stages are seen to be less than ideal for mining due to location but are retained for mining needs when all others are depleted.

The most significant environmental impacts have been found to be the impacts on soil, surface water and those resulting from airborne dust. Those which pose insignificant risk have been found to be impacts on vegetation, birds and ground water. Impacts for

which environmental management programmes must be created are impacts on soil, vegetation, surface water and airborne dust.

Surface water will be protected by creation of a berm around the mining area to divert storm water away from the mining area. Water within the mining area must be channelled into a settling pond which in the case of this mining will take the form of part of the pit with the lowest elevation within each mining area.

Sensitive areas will not be mined in accordance with the mining right application because the occurrence of sensitive vegetation (Sunday's Thicket) is associated with the underlying soils and in this case, where areas are underlain by clayey soils, which are not listed as the targeted minerals in the mining right application.

All alien invasive species will be removed during mining and monitored during and after mining has ceased.

The mining creates an opportunity to remove alien vegetation such as Eucalyptus Species and Cactus species. Alien trees will be stripped from the area prior to mining and species such as jointed cactus will be eradicated when bull dozed with the soil prior to mining.

Storm water will be managed by minimising ingress from run-off into pits by diverting clean water system away from mining area. Water which is trapped within the mining area will be allowed to evaporate and to seep through the underlying sand and gravel back into the ground water system, as far as possible.

The mining of sand and gravels from a water course or estuary is regulated under the National Water Act, 1998. When mining close to the Swartkops River, the pit must be mined from above and loaded from above allowing the pit to flood. A buffer and berm will be left against the stream flow area, such as to prevent disturbance of the river itself.

Sandman Quarries overall, poses a good recipe for success in terms of environmental rehabilitation, in that the owner intends fully to use the land for cattle farming once mining has ceased as currently is being done. Thus the closure plan is not overly

ambitious, but represents the owner's business needs. The owner also has a good understanding of the river behaviour and has knowledge of the risks pertaining to flooding. The owner has already undertaken successful rehabilitation of mined out areas and as it is in the owners interests to rehabilitate, there is no reason why this would not continue in with subsequent mining areas.

2. INTRODUCTION

Sandman quarries has undertaken to apply for mining rights for gravel and sand on portions 7,8,9, portions 23 to 40, portions 59, 68, 70, 71, 74, 80, 82, 96, 111 and 114 of the farm Zwartkops River Waagens Drift no. 567 in the division of Uitenhage. This document details the environmental management programme which will be implemented to minimise the impact of the mining on the environment.

In principle, the excavations created during the mining process will be rehabilitated by the applicant, who currently farms much of the land in question. The sand mining operations are planned to be undertaken in such a way that risk to all third parties is minimised. Where possible, with environmental issues such as invasive alien species and degradation of the flood plain, attempts will be made to use the mining process to correct the situation. This may take the form of removal of alien species or "landscaping" of eroded or degraded river banks.

2.1.Contact details

Sandman quarries cc is represented by Mr. Hein Potgieter.

Sandman Quarries Registration No.:	2002/063801/23
Postal address:	P.O. Box 313 Uitenhage 6230
Applicant telephone no.:	(041) 933 2792
Applicant Facsimile:	(041) 933 4959
Cell No.:	082 787 9975

Email: sandmanquarries@telkomsa.net or nwpotgieter@mweb.co.za

3. TERMS & DEFINITIONS

Aquatic fauna means fauna which habitat streams, rivers and wetlands only

Bankfull zone means the area in which the river flows during its natural seasonal fluctuation excluding periods of flooding

Berm means a robust impediment to flow of water which function is to divert water in a direction other than the natural tendency

Catadromous fish species refers to fish which lay eggs in estuarine environments after which juveniles migrate upstream to fresh water and then repeat the process once mature

Clean water means water which is uncontaminated by any mining or mineral processing

Dirty water means water which has accumulated or passed through a mining or plant area which may have accumulated chemical or mineralogical contaminants and is not fit for disposal into natural water resources

DME means "Department of Minerals and Energy"

EMP means "Environmental Management Programme"

EMPR means "Environmental Management Programme Report"

Endemic species means species which occur in an area prior to any human alteration or development or invasion by alien or extra-limital species

Extra-limital species means species which are indigenous species but did not occur in an area prior to human alteration or development of the area

Flood prone zone or area means the area between the terraces on either side of a river, which is subject to flooding on a 1 in 5 year basis

Groundwater means water which occurs below the ground surface above impermeable rock or substrates

Hydrocarbons means substances such as diesel, petrol, oil, lubricants, grease, brake fluids and hydraulic fluids

Indigenous species means species which has evolved in Southern Africa

Seepage means water which enters an excavation due to hydraulic head which is not groundwater, for example water flowing through sandy ground from an elevated water resource to a lower one

Stream flow area means "Bankfull" zone

Topsoil means the ground or earth near surface which contains biological nutrients and organisms and functions as a growth medium for plants

Riparian vegetation means vegetation which grow only in saturated soils such as adjacent to streams and wetlands

Riparian zone means "Flood prone" zone

River banks means "Flood Prone" zone or area

River channel means "Bankfull" zone

River terraces means the area above the river banks which is only subject to flooding on more than a 1 in 5 year basis

4. PROJECT LOCALITY

The project is located to the East of Dispatch, North of the Swartkops River. Sandman quarries currently have an operation close to the R75 Bridge over the Swartkops River. This locality is further east opposite the Perseverance Quarry as well as the old wool pullery. The mining right area includes the current plant area as well as areas which contain the sand and gravel resources. The entire area is 234.3 ha in extent, of which 84.8 ha has been identified as having the targeted minerals of sand and gravel. The area is shown below as indicated in the regulation 2(2) plans contained in annexure 2.

Figure 1: Site locality taken from regulation 2(2) plan showing aerial photograph with the proposed mining right boundary. The town of Despatch can be seen on the West (left), with the Swartkops River to the South of the proposed mining operation.

5. PRE-MINING ENVIRONMENT

5.1.Biophysical Environment

The area falls between terrestrial Sunday's thicket and riparian vegetation along the fringes of the Swartkops River system. Some of the proposed mining area, in the South Eastern corner is proposed within the river terraces, where deposition of sands and gravels occurs after flooding. Most of land consists of farming area, some of which is used for crop growing and some for grazing lands. Much of the area targeted for mining is invaded by alien or extra-limital species.

5.1.1. Climate

The climate in the area has been described as moderate with rainfall between 400 and 440mm per year. The average surface run-off values for the area are between 50 and 100mm. The average maximum temperature is 28° C and the average winter maximum temperature is 17° C. The average minimum temperature in summer is 22° C and the average minimum in winter is 6° C. The prevailing wind is from the west and south west but dominating east and south east during summer months. The mean annual evaporation is between 1500mm and 1600mm per annum.

A summary of the climatic conditions from the South African Weather Service for the area in terms of temperature and precipitation are presented in the table below:

Table 1: Summary of the weather experienced at Sandman Quarry.

Port Elizabeth Climate													
Month	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Year*
Highest recorded temperature (°C)	39	38	41	39	35	32	33	34	39	39	36	36	41
Average daily maximum temperature (°C)	25	25	25	23	22	20	20	20	20	21	22	24	22
Average daily minimum temperature (°C)	18	18	17	14	12	9	9	10	11	13	15	16	14
Lowest recorded temperature (°C)	10	11	8	4	2	-1	-1	2	2	3	6	9	-1
Average monthly precipitation (mm)	36	40	54	58	59	62	47	64	62	59	49	34	624
Average number of rain days (>= 1 mm)	9	9	10	9	9	8	8	10	9	11	11	9	112

The strongest wind (>40km/hr) dominates from the West South Westerly, Westerly and Easterly directions with the most occurrences from the West South Westerly direction. Moderate winds of less than 25km/hr come from all directions.

5.1.2. Topography

The area is relatively flat, and forms part of the upper reaches of the Swartkops River floodplain. Very gentle south-easterly gradients (less than 1°) occur throughout. The study area drops from about 10m above sea level in the North and North West to about 3m above sea level in the South and South East. A river channel gradient of about 1:200 often prevails in these parts of the Swartkops River system.

5.1.3. Hydrological Environment

Surface water resources

The area is characterised by the presence of the Swartkops River, forming the southern boundary of the flood plain on which mining is proposed to take place. Mining is planned for the river terrace as well as the flood prone area as shown below:

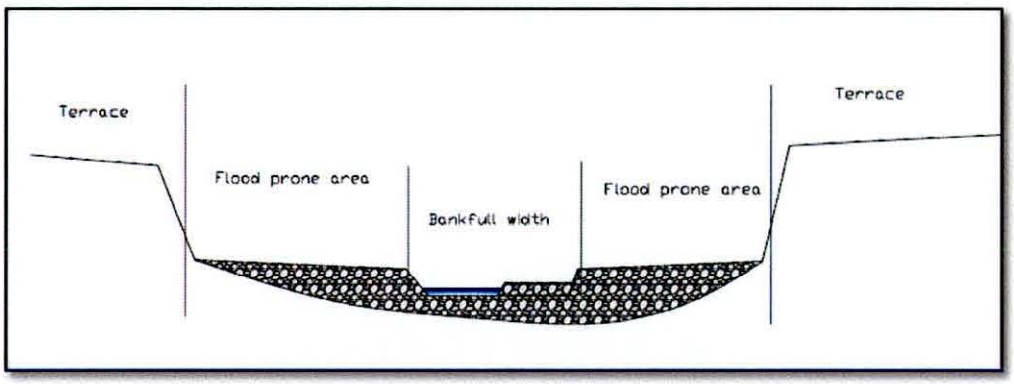

Figure 2: Illustration of cross section through floodplain zones for definition purposes (not to scale)

The entire mining area is subject to flooding on approximately a 1 in 5 year cycle. This problem appears to be worsening as more urban development takes place in the catchment area upstream, where Uitenhage and Kwanobuhle occur. Terraces of the river are relatively flat, with a slight depression between the river itself and the ridge of the Northern side. The implication of this is that the flood waters tend to take time to subside. There are natural channels which the water flood waters use when subsiding. These natural channels will not be disturbed, principally to avoid creating gulleys and to avoid encouraging erosion.

The opposite bank of the river (southern bank) has been subject to erosion in recent years. It is clear that failed attempts have been made to support the banks through placement of gabions as well as through tipping of reddish clay material. It has been suggested that the growth of alien vegetation, such as *Eucalyptus sp.* has resulted in the silting up of the Northern bank, narrowing the flood prone zone, which results in increased hydraulic pressure on the Southern bank during flooding, which has resulted in increased erosion. Landowners on the Southern banks have reportedly called for mining of the Northern bank, with the justification that this will relieve hydraulic pressure on southern bank by diverting flows northwards and by widening the channel. It has also be seen that the natural riparian vegetation such as reeds and vlei vegetation do not cause silt build up to the same degree as the alien invasive species, the net effect of this is better erosion control in the channel overall, where aliens have been removed.

Groundwater resources

Shallow seepage is encountered within the mining rights areas, where clay is predominant, in sandy areas, no seepage of water was found at a depth of 2.5m. It is expected that the a seepage type flow will occur at a varying height and at times will be less than 2.5m below surface, and water will seep into excavations. This water is expected to be brackish and thus will be allowed to seep towards the Swartkops River.

The mudstone underlying the Sundays River formation is not a good source of potable groundwater and generals reveals very poor reserves of brackish water due to its marine origin. The weathering of this mudstone creates an impervious layer below the mining and agricultural land uses, preventing any contamination of deeper groundwater.

5.1.4. Vegetation

A study of the vegetation has been undertaken by Prof. Eileen Campbell of Nelson Mandela Metropolitan University for the purpose of the scoping study. This study includes investigations into sensitive species as well as the alien invasive species. The study is included under Annexure 3 : Specialist study on vegetation. This study highlighted the Sunday's Thicket as a sensitive vegetation type within the proposed mining area, though its occurrence is limited to clayey soils which are not being targeted in this mining rights application. In addition 14 exotic problem plants were identified. This report sites most of the vegetation in the mining rights area as pastures, riparian vegetation and secondary Acacia Karroo Thicket. The endemic vegetation type being Albany Alluvial Vegetation but this vegetation type has largely disappeared from the area due to previous land uses.

5.1.5. Mammals

128 of the 292 terrestrial mammal species in Southern Africa occur in the Eastern Cape. The mammals which have documented ranges within the mining footprint are listed below:

Table 2: List of mammals which may occur within mining right area

Common name	Scientific Name	Conservation status
Blue Duiker	*Philantomba monticola*	Vulnerable
Brown Hyena	*Hyaena brunnea*	Near threatened
Honey badger	*Mellivora capensis*	Near threatened
Lesser long fingered Bat	*Miniopterus fraterculus*	Near threatened
Schreibers Long-fingered Bat	*Miniopterus shreibersii*	Near threatened
Temminck's Hairy Bat	*Myotis tricolor*	Near threatened
Cape Horseshoe Bat	*Rhinolophus capensis*	Near threatened
Geoffrey's Horseshoe Bat	*Rhinolophus clivosus*	Near threatened
Hottentot's Golden Mole	*Crocidura cyanea*	Data deficient
Reddish-grey Musk Shrew	*Poecilogale albinucha*	Data deficient
Greater Musk Shrew	*Crocidura flavescens*	Data deficient
Forest Shrew	*Myosorex varius*	Data deficient
Least Dwarf Shrew	*Suncus infinitesimus*	Data deficient
Woodland Mouse	*Grammomys dolichurus*	Data deficient

"Vulnerable" – refers to a species where the best available evidence indicates that it meets all the criteria for endangered animals and is therefore facing a very high risk of extinction in the wild.

"Near Threatened" – refers to species that have been evaluated against criteria but do not qualify for critically endangered of vulnerable levels now but are close to qualifying for such a category in the near future.

"Data deficient" – refers to species where there is inadequate information to make direct or indirect assessments of its risk to extinction based on present distribution or population status.

5.1.6. Reptiles and Amphibians

The herptefauna in the region include about 140 taxa of which 31 are restricted (endemic) to the Eastern Cape Province. No reptile or amphibians were noted during field investigations. Red Data Book species which occur in this area is limited to Yellow-bellied House Snake (*Lamprophis fuscus*). This snake is associated with mountainous and grassland areas of the Eastern Cape Province. It is an olive pale colour with a light yellow belly. The snake is secretive and nocturnal occurring only in termitaria and beneath stones.

5.1.7. Birds

A rich avifaunal population exists in the Eastern Cape Province. Recent records indicate that about 500 bird species occur in the region, of which some 300 species breed. Twenty of these breeding species are listed as rare and endangered in South Africa. Of the 500 species in the area, only the European Starling (*Sturnus vulgaris*), House Sparrow (*Passer domesticus*) and Feral Pigeon (*Colomba livia*) occur as exotic species in the Uitenhage/Dispatch area. The major factor determining current bird distribution in the region is man's modification of the habitat.

Avifaunal adaptations to survive in built-up residential areas are frequently complicated by artificial predation such as domestic cats and dogs. Anthropogenic features such as clear window panes and overhead cables also have a negative impact on urban bird populations.

Regionally extinct birds include the Egyptian Vulture (*Neophron percnopterus*) and African Skimmer (*Rynchops flavirostris*).

Vulnerable species that occur in the area include Martial Eagle (*Polemaetus bellicosus*), African Marsh Harrier (*Circus ranivorus*), Lesser Kestrel (*Falco naumanni*), Blue Crane (*Anthropoides paradiseus*), Stanley's Bustard (*Neotis denhami*) and Knysna Warbler (*Bradypterus Warbler*). These species are deemed vulnerable as available scientific evidence indicates that they are facing a high risk of extinction in the wild.

Near threatened species, whose ranges occur in the study area include the Black Stork (*Ciconia nigra*), Secretary Bird (*Sagittarius serpentarius*), Crowned Eagle (*Stephanoaetus coronatus*), Black winged Plover (*Vanellus melanopterus*), Half collared Kingfisher (*Alcedo semitorquata*), Knysna Woodpecker (*Campethera notata*) and Melodious Lark (*Mirafra cheniana*). Near threatened species are species that are close to becoming vulnerable in the near future if the prevailing conditions remain unchanged.

5.1.8. Fish

According to Bok, 2008, within the Swartkops River system, numerous isolated ponds and cut-off channels occur, which are only connected during flood events when the floodplain and channel environments are underwater. Fish species occur within these isolated water bodies in the river channel (bankfull zone) and floodplain environments. Only about ten indigenous fresh-water fish occur in the Eastern Cape Province.

Bok states that of the Red Data Book Species, only Fresh Water Mullet (*Myxus Capensis*) is listed in for the Swartkops River system. This species is considered rare and vulnerable. The species feeds and grows in fresh water but reproduces at sea.

The Swartkops is an important estuary system as it provides habitat for estuarine fish and micro-invertebrates. The estuary is also very important for catadromous fish species (Bok, 2008). These species which lay their eggs in salt water environments

and the juveniles migrate into freshwater environments; finally after spending years in a freshwater environment they migrate downstream to repeat the cycle. This is particularly relevant to mining activities which may create a barrier to juvenile fish migrations upstream. Below is a list of catadromous species found in the Swartkops estuary which has been put together by Bok, 2008.

List of catadromous species in the Swartkops estuary

Species name	Common Name	Status
Myxus Capensis	Freshwater mullet	Species of concern in Eastern Cape, endemic to the region
Mugil cephalus	Flathead mullet	Common widespread
Mondactylus falciformis	Cape Moony	Common widespread
Anguilla mossambica	Longfin eel	Common in coastal rivers
Anguilla marmorata	African mottled eel	Common in coastal rivers
Anguilla bicolor bicilor	Shortfin eel	Common in coastal rivers
Glossobius callidus	Freshwater goby	Common in coastal rivers
Gilcgrestella estuaria	Estuarine round-herring	Wide spread in coastal rivers and upper estuaries

According to Anton Bok, two other indigenous freshwater fish species, the Cape Kurper (*Sandelia capensis*), the threatened Eastern Cape Redfin (*Pseudobarbus afer*), are present in Swartkops River, but are largely confined to the undisturbed tributaries and are not found in the main channel within the lower reaches. Their absence is due to poor water quality and presence of fish predators introduced by man. These predatory fish include the alien largemouth bass *Micropterus salmoides* (from North America), as well as the non-endemic catfish or barbel (*Clarias gariepinnus*). The alien common carp, *Cyprinus carpio*, introduced from Europe, is also found in the lower Swartkops River.

Importance of secondary channels as migration corridor

Fish frequently undertake upstream migrations during high flow and flood conditions, and utilize the secondary channels with lower water velocities that become active under these conditions. If the flood is confined to a single deep channel with little in stream

structure or hydraulic shelter, the high velocities currents could impede these upstream migrations. Strong currents are particularly problematic for small fish, such as the catadromous mullet and eels that would migrate from the estuary to freshwater zones in the Swartkops River. This is because small, juvenile fish which have relatively limited swimming ability compared to large fish. Studies have shown (Bok, 2008) that freshwater mullet (*Myxus capensis*) of < 40mm in length are unable to swim against currents of over about 1.2 to 1.4 m/s.

5.1.9. Soil Conditions

The soil type is determined by the underlying alluvial sediment. Towards the north this tends to be more clayey whereas to the south, closer to the Swartkops River the conditions are more sandy. The maximum soil thickness of about 40cm was encountered though soil was almost non-existent at times. In all areas the soil was not significantly distinct from the sub-soil layers.

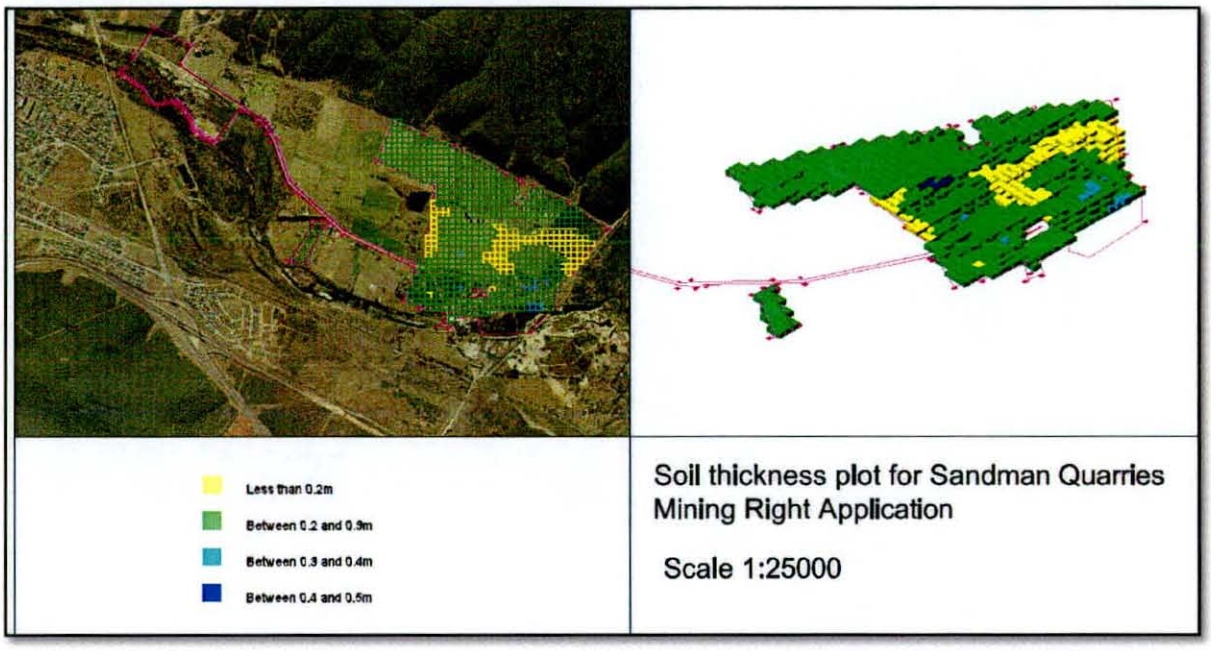

Figure 3: Plot over mining right application area of estimated soil depth.

6. GEOLOGICAL DESCRIPTION

The geomorphology is determined by the perennial Swartkops River System, which has significantly molded the terrain during cyclical fluvial events in the geological past.

The regional geological environment is dominated by weathered mudstone (residual clay) of the Cretaceous Uitenhage Group, to reveal soft malleable sub-soil conditions. The soft conditions have been eroded by palaeo flood events of the Swartkops River to reveal the very wide floodplain landscape in the area.

According to the 1 : 250 000 geological map (3324 Port Elizabeth) published by the Council for Geoscience, the study area is underlain by undifferentiated fluvial terrace gravels with the Sundays River formation at depth throughout.

The fluvial terrace gravel has been deposited by the perennial Swartkops River and comprises clast-supported sub-rounded and well-rounded quartzitic sandstone boulders and gravel with a fine-grained sandy and clayey matrix. These clastic sediments are usually poorly sorted with clast types frequently determined by the availability of material from parent sources. These gravel deposits reflect changing sea-levels during quaternary and are occasionally cemented by lime, silica and iron oxide. Calcareous cover is also frequently associated with these deposits.

The overlying fluvial gravel and sand is the sought after material for the mining right application. The Sundays River formation underlying this formation will not be mined as the clays will reduce the quality of the final product.

6.1.1. Geology results from Prospecting Programme

The prospecting was undertaken by excavation of 2.5m deep pits from which data was captured. This data revealed the following general geological data:

- The shallow material is formed from transported alluvial sediments
- The alluvial sediments are made up of fine grained sand, alluvial pebble beds and layers with higher clay percentage

The areas where higher clay percentages were found are on the Northern side of the prospecting area with the deposited material becoming finer grained and with lower clay fraction toward the south, which is closer to the Swartkops River.

The sandy areas are dominated by Sundays Doringveld vegetation cover. The fine sand tend vary from 2.2 to 2.5m thick, sometimes with inter-bedded pebble beds mostly consistent sand. In most areas pebble beds occur below circa 2.3m. The water table is found to the north in the clayey soils at a depth of 2.2 to 2.4m and to the South in the sandy areas which are targeted for mining it was not intersected at a depth of 2.5m.

7. SOCIO-ECONOMIC STATUS OF THE AREA

7.1.Demographic Data

The data from Census 2001 shows that the population for the ward in which the mining is proposed (ward 60 Nelson Mandela Bay Municipality) to be 12,480 people. 37% of the population has some secondary education with 38% having completed matric. 14% of the population has a higher education.

7% of households reported no income with 22% reporting an income of less than R19, 200 per annum (about R29, 000 at 2008 value). 46% of the households had an income of greater than R76, 000 (about R120, 000 in 2008 value). In South African terms this is upper middle class dominating ward.

8. MOTIVATION

Currently sand for the construction industry in the Nelson Mandela Bay Municipality is sought from windblown sand reserves, for example sand mines in the coastal dune areas in the South West of Port Elizabeth. These reserves tend to be formed from fine grain sand, less than 70μm. For larger construction projects and especially civil projects such as bridges, stadiums, road reinforcement, dams etc, where high strength of concrete is required (greater than 40MPa), a courser grain size for the sand is required. Currently this is sourced from the mines in the Perseverance and Dispatch area, within the floodplain of the Swartkops River system. Despite the construction boom experienced prior to 2008 having subsided to a large extent, there are still large scale civil projects in the Nelson Mandela Bay Area, including Coega Industrial Development Zone and the soccer stadium.

Should the construction industry recover, driven by factors such as lower interest rates and lower inflationary pressures then a shortage of quality building sand is expected. In addition, the Coega Industrial Development Zone is only in its infancy, and should the expected developments take place, then a source of quality sand close-by will be needed.

Some of the projects that will require higher strength concrete and thereby higher grade sand are:

1. Railroad infrastructure especially sidings.
2. Coega refinery
3. Breakwater infrastructure (ongoing)
4. Proposed metallurgical industry

Many of the projects will take some time to develop and as such strategically the allocation of resources required for such projects must be considered for the entire life of the development.

9. DESCRIPTION OF THE PROPOSED PROJECT

The project proposes to mine sand and gravel reserves found with the mining right area a shown in Annexure 2: Regulation 2(2) plans. The mining will take place to depth of up to 4m, completely extracting all material.

9.1.Mineral Reserves

The mineral reserves have been calculated for the purpose of the mining rights application as shown below:

Table 3: Volume, tonnage and life of mine calculations for sand and gravel in the mining blocks as shown in annexure 1 Mine Design Plan

Tonnage and life of mine estimates												
	Area		GU	Vol. Sand	Vol. Gravel	Gravel %	Tonnage sand	Tonnage gravel	Life of mine sand		Life of mine gravel	
Mining areas	m^2	ha	conf. factor	m^3	m^3	%	Tonnes	Tonnes	M	Y	M	Y
Block 1	101294	10.1	15%	384913.0	118719.00	30%	769826	237438	147	12.2	27	2.2
Block 7	60437	6.0	15%	175274.0	74462.00	39%	350548	148924	67	5.6	17	1.4
Block 9	58575	5.9	15%	99587.5	35450.00	34%	199175	70900	38	3.2	8	0.7
Block 4	15249	1.5	15%	8068.6	16124.50	33%	16137	32249	3	0.3	4	0.3
Block 5	112357	11.2	15%	43931.1	230039.50	57%	87862	460079	17	1.4	52	4.3
Block 2	89828	9.0	15%	118362.5	637.50	1%	236725	1275	45	3.8	0	0.0
Block 3	72068	7.2	25%	104702.0	3400.00	3%	209404	6800	40	3.3	1	0.1
Block 8	38036	3.8	25%	24723.4	32330.60	57%	49447	64661	9	0.8	7	0.6
Block 10	57975	5.8	25%	37683.8	49278.75	57%	75368	98558	14	1.2	11	0.9
Side block	48297	4.8	25%	31393.1	41052.45	57%	62786	82105	12	1.0	9	0.8
Block 6	224593	22.5	25%	129141.0	303200.55	54%	258282	606401	49	4.1	68	5.7
Proven Reserves	**878709**	**88**	**0.20**	**1157779.93**	**904694.85**	**0.38**	**2315560**	**1809390**	**441.9**	**36.8**	**204.4**	**17.0**
Probable Block 11	94261	9.4	30%	78550.8	53414.57	40%	157102	106829	30	2.5	12	1.0
All other probable	488069	48.8	30%	115729.2	78695.83	40%	231458	157392	44	3.7	18	1.5
Probable Reserves	**582330**	**58**	**0.30**	**194280.00**	**132110.40**	**0.40**	**388560**	**264221**	**74.2**	**6.2**	**29.8**	**2.5**
Total Reserves	**1461039**	**146**	**0.21**	**1352060**	**1036805**	**0.39**	**2704120**	**2073611**	**516**	**43.0**	**234**	**19.5**

9.2.Markets

The market for the materials includes:

- Construction sand
- Plaster sand
- Construction stone
- Road stone
- Gabion stone
- Filling material

9.3.Proposed Mining Method

Mining will be undertaken in two different manners depending on whether the mining takes place on river terraces or with the river banks.

9.3.1. Mining on Terraces

This will involve mining excavation between 2.5 and 4.5m deep, depending on location. Mining will only be done to a depth of 4.5m where material is suitable and where this will not create dangerous slopes or threaten stability of infrastructure. Note that deeper mining means that more sand and gravel can be won with less disturbance of the current ground surface. It is justifiable that if an area needs to be disturbed for mining, the best utilization should be made from that area so that areas of higher sensitivity can be left intact.

Generally mining will be done in one strip to depth. The steps will be as follows:

1. Stripping of soil and vegetation using bulldozer. Note that all vegetation will be stripped with soil. This improves fertility of stockpiled soil and it will help to kill alien species. Soil will be stripped as minimally as possible, for cost and environmental reasons.

2. Mining will subsequently take place using hydraulic crawler mounted excavator loading into articulated dump trucks.
3. Once mining is completed sloping and landscaping of area will take place to create slopes with angles of less than 18°.
4. Soil will be replaced
5. Seed for end use will be applied (likely to be for establishment of pastures for grazing of cattle). The area will be fertilized and irrigated if necessary.

9.3.2. Mining within River Banks

The second area being mined is within the river banks or terraces. This mining will involve mining of the flood prone zone, between the river bank full zone and the river banks or terraces. A berm will be created adjacent to the river, to ensure integrity of the riparian zone. These flood prone areas are likely to be subject to deposition of sand and gravel during flooding of the river. For that reason mining in these areas is ongoing as long as there is material. Mining will be shallow (less than 2m deep) and will involve the following steps:

1. Removal of vegetation (no soil cover occurs in these areas)
2. Creation of berms against river bankfull zone to prevent impacts on the river itself
3. Mining to a depth of 2m with a hydraulic excavator loading articulated dump trucks
4. Landscaping the area after mining by creating shallow excavations with sloped side walls (35°) with berms at intervals of 25m.
5. Allowing re-growth of riparian vegetation and removal of aliens

9.4.Vegetation and Soil Removal

Vegetation will be removed along with the soil, in a manner which will ensure that the stockpiled topsoil will have increased organic carbon content. In other words the stripped vegetation will be mixed with the stripped soil which will add vegetative matter to the stripped soil as well as seeds from the vegetation. Only the areas which are to be mined within a period of three months will be stripped to prevent dust and to preserve soil properties.

10. POST MINING REHABILITATION PLAN

10.1. Rehabilitation objectives

The rehabilitation aims are to achieve the following:

A: In areas 100m away from the Swartkops River (currently farmed by owner), the ground will be rehabilitated in a manner which will create pastures for cattle to graze. Involving:

1. Replacement of topsoil stripped prior to mining
2. Enable growth of vegetation which will:
    a. Stabilise the soil
    b. Reduce visual impacts
3. Prevent invasion by alien species

B: In areas adjacent to Swartkops River, will involve establishment of riparian habitats for aquatic fauna, involving:

1. Re-establishment of riparian vegetation on banks of disturbed channels
2. Establishment of robust main channel and smaller secondary channels for migratory fish species
3. Removal and control of invasive alien species

10.2. Targeted specifications for rehabilitation

Objective	Specifications
A	0.2m soil depth Pasture species as determined by needs of farming operation Irrigation at 10000l/day Eradication of alien species
B	Berm of 1m high against stream flow area Secondary channels level with river "bank full" zone Eradication of alien species

10.2.1. Rehabilitation procedures on blocks more than 100m from Swartkops River (Blocks 1,2,3,6,7,8,9,10)

General procedure:

1. Flatten steep slopes
2. Create berm against stream flow area
3. Place topsoil if available
4. Sow seed
5. Plant seedlings
6. Monitor

10.2.2. A1 Landscaping

Task	Parameters
Use of bulldozer to flatten irregular landscapes	No slope angle more than 10°

10.2.3. A2 Topsoil replacement

Task	Parameters
Replace topsoil with excavator	2000 m^3 per ha
Spread topsoil to even out	0.2m topsoil depth
Prevent erosion by creating contours	0.3 m depth contour for every 2m of height change
Reduce dust	Irrigate topsoil
Increase fertility of soil	Apply nitrogen and other fertilizers as needed

10.2.4. A3 Vegetation

Task	Parameters
Hydroseed with pasture grass seed (*Panicum sp.)*	25kg/ha

10.3. Rehabilitation procedures on blocks away more than 100m from Swartkops River (Blocks 4,5,11)

General procedure:

1. Flatten steep slopes
2. Place topsoil
3. Contour topsoil
4. Sow seed
5. Plant seedlings
6. Irrigate
7. Monitor

10.3.1. A1 Landscaping

Task	Parameters
Use of bulldozer to flatten irregular landscapes	No slope angle more than 10°
Create berms against river	Height 1.5m
Create secondary channels between berms and river channel	Shallow channels (less than 0.1m)

10.3.2. A2 Topsoil replacement

Task	Parameters
Replace topsoil on banks and areas where topsoil was removed with excavator	1000 m^3 per ha
Spread topsoil to even out away from berm	0.1m topsoil depth

10.3.3. A3 Vegetation

Task	Parameters
Hydroseed with pasture grass seed (*Panicum sp.)*	25kg/ha

Rehabilitation once mining has ceased will be done as shown in the figure below:

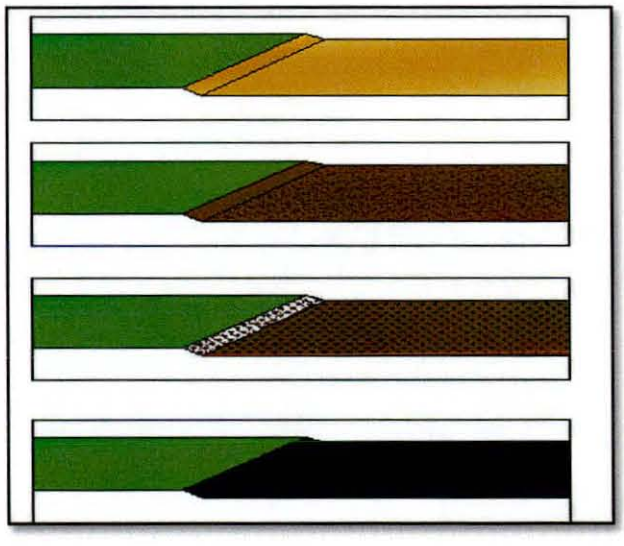

Figure 4: Rehabilitation sequence. The first image shows the mine pit after mining has progressed to pit limits or limits of the mineral reserve. The next image shows the placement of soil in the mined out area. After that planting happens which ultimately results in a targeted scenario where vegetation grows the desired state as illustrated in the final image.

11. MINE CLOSURE PLAN

The mine closure plan will start at the beginning of the operation, in the sense that the rehabilitation undertaken throughout the life of mine, will be done to support the targetted closure plan. Once mining is completed the final mining blocks mined will be rehabilitated in accordance with the rehabilitation plans detailed above. The land will either be rehabilitated to pastures for grazing cattle or wetland areas, where water accumulates. An impression of this is shown in section 26 Annexure 4 : Mine closure plan. After the final rehabilitation is done, a two year period of monitoring will be started to ensure that:

1. The health of the vegetation is monitored after areas are left, to ensure that a stable ecology is created
2. Alien species are eradicated as they emerge after mining
3. Problems are managed as they arise which may include:
    a. Erosion of rehabilitated areas
    b. Low soil fertility

After this period an assessment will be undertaken of the degree of success of the rehabilitation and closure plans. If successful rehabilitation is achieved, closure will be applied for.

12. MINING PHASE DESCRIPTIONS :

The mining phases described here are based on the production figures for 2008. Due to the economic slowdown during 2009, the current production is expected to be less than the 2008 figure, however should construction in the area increase in the near future, demand for the products may start to increase again and for that reason the production output has not been temporarily adjusted. The period of the mining phases is based on the volume of material expected in each block, calculated as part of the accepted life of mine plan. This has been done as accurately as possible to ensure that the rehabilitation scheduling is accurate and the financial guarantees will suffice. It should be noted that some degree of error in estimation is expected due o the nature of the business and that on a two yearly basis this should be re-assessed, as per requirements of the MPRDA.

12.1.1. Phase 1a and 1b:

Duration: 13 Years

Active mining blocks: 1, 4 and 5 Financial provision: R 337 346

This will involve the mining of blocks 1a from the East where more stone is expected and 1b from the West for sand and such that a settling pond is created in the Eastern most corner, where floods have been observed to flow out of the proposed mining area, in a naturally formed channel. Block 5 will be mined for stone and mining may take place in block 4 towards the end of this period.

Rehabilitation will be done on mined out areas as part of Sandman Quarries mining permit, as well as mined out areas starting from the East and working west. The area will be rehabilitated as grass land and where water accumulates it will be rehabilitated

as a wetland or a lake. The sides will be sloped with to create an angle of not more than 18°.

12.1.2. Phase 2:

Duration: 4 years

Active mining blocks: 2 and 5 Financial provision: R 253 601

Mining will be done in block 2, mining from the South West to the North East starting where mining left off in block 1a mining North Eastwards towards block 3.

Rehabilitation will be completed in block 1b as well as block 4 and started in block 2. The area will be rehabilitated as grass land and where water accumulates it will be rehabilitated as a shallow wetland or a lake. The sides will be sloped with to create an angle of not more than 18°.

12.1.3. Phase 3:

Duration: 3 Years

Active mining blocks: Block 2 and 5 Financial provision: R 411 674

Mining will be undertaken in block 3 and 5 and mining will begin in block 6, where mining of stone will be done.

Rehabilitation will be done on mined out areas in block 2 starting on the South Eastern side. The area will be rehabilitated as grass land. The sides will be sloped with to create an angle of not more than 18°.