START

GSCID: 1505

mineral resources

Department:
Mineral Resources
REPUBLIC OF SOUTH AFRICA

Sent report on (Phase 2) 08 04 2011

Private Bag X6093, Kimberley, 8300, Tel: (053) 807 1700, Fax: (053) 8325 631
First Floor. Liberty Corner, 29-31 Curry Street, Kimberley 8301

From: Directorate: Mineral Regulation: Northern Cape **Date: 11 February 2011**
Enquiries: Mrs R.F Sekepane **E-mail:** raisibe.sekepane@dmr.gov.za
Ref No.: NC 30/5/1/2/3/2/1/177 EM

The Director
South African Heritage Resources Agency
PO Box 4637
APE TOWN
00

SA HERITAGE RESOURCES AGENCY
RECEIVED
21 FEB 2011

Attention: Mary Leslie

CONSULTATION OF AN AMMENDEMNT OF THE ENVIRONMENTAL MANAGEMENT PLAN SUBMITTED IN TERMS OF SECTION 102 OF THE MINERAL AND PETROLEUM RESOURCES DEVELOPMENT ACT 2002, (ACT 28 OF 2002) IN RESPECT OF GROOT RIETFONTEIN 234, LIME 1 AND LIME 2 OF THE FARM KLEIN RIETFONTEIN 215, DIE PUTS 217, PORTION 3 (BERGVILLE) OF THE FARM HONDEFONTEIN 216, HARRISON (A PORTION) OF DELPORTSHOOP COMMONAGE., THE REMAINDER OF VOGELFONTEIN 176, DONDERBOSCHFONTEIN 147 AND ZONONDER 175, SITUATED IN THE MAGISTERIAL DISTRICT OF BARKLY WEST. APPLICANT: AFRISAM PTY LDT ULCO OPERATION.

Attached herewith, please find a copy of an EMP received from the above-mentioned applicant, for your comments.

It would be appreciated if you could forward any comments or requirements your Department may have to this office and to the applicant 11th **March 2011** as required by the Act

Consultation in this regard has also been initiated with other relevant State Departments. In an attempt to expedite the consultation process please contact **Mrs Raisibe Sekepane** of this office to make arrangements for a site inspection or for any other enquiries with regard to this application.

Your co-operation will be appreciated.

.....

REGIONAL MANAGER: MINERAL REGULATION
NORTHERN CAPE REGION

DMR Reference No. NC 177 MR

Environmental Impact Assessment & Environmental Management Programme

Report compiled in accordance with the
Minerals and Petroleum Resources Development Act, Act No. 28 of 2002:
Environmental Impact Assessment - in accordance with Section 39 and Regulation 50
Environmental Management Programme - in accordance with Section 3 and Regulation 51

PROJECT COMPILED FOR: AFRISAM (SOUTH AFRICA) (PTY) LTD - ULCO CEMENT OPERATION

PROPERTY DESCRIPTION: GROOT RIETFONTEIN NO. 234, LIME 1 AND LIME 2 OF THE FARM KLEIN RIETFONTEIN 215, DIE PUTS 217, PORTION 3 (BERGVILLE) OF THE FARM HONDEFONTEIN 216, HARRISON (A PORTION OF DELPORTSHOOP COMMONAGE), THE REMAINDER OF VOGELFONTEIN 176, DONDERBOSCHFONTEIN 147 AND ZONONDER 175.

DIKGATLONG MUNICIPALITY
NORTHERN CAPE PROVINCE

REPORT NUMBER: AFS-ULC_001-10 REV 0.1

DATE: JANUARY 2011

REPORT COMPILED BY: UMHLABA ENVIRONMENTAL CONSULTING CC
Andrew Nicholson

ACKNOWLEDGEMENTS

Umhlaba would like to acknowledge the following people who assisted in providing the information required for the compilation of the report:

- Hlengani Ndindani
- Naomi Williams

AUTHOR'S CONTACT DETAILS

Umhlaba Environmental Consulting CC
Tell: (011) 795 3636 P.O. Box 731504
Fax: (011) 795 3336 Fairland, 2030
E-mail: umhlaba@telkomsa.net

EXECUTIVE SUMMARY

History and background Information: The AfriSam South Africa (Pty) Ltd (AfriSam) Ulco Cement Operation has been operating in the Northern Cape since 1936. Mining of the secondary limestone reserves began in 1936, when Union Lime mined it for lime, using two Beckenbach shaft kilns and nine Spencer kilns for burning the limestone. In 1949, it was decided to mine the low grade limestone material for cement and the company built two wet process kilns (Kiln 1 and Kiln 2) and cement mills for the cement manufacturing process. Subsequently in 1964 two further kilns (Kiln 3 and Kiln 4) were added on to increase the production capacity. In 1985, Union Lime Company was purchased by Anglo Alpha.

In 1985, Anglo Alpha began mining primary limestone reserves and commissioned a fifth kiln (UK5), with a capacity to produce a maximum of 4400 tons of clinker per day. The old lime kilns and cement kilns were decommissioned in 1992. In 1995, Anglo Alpha changed name to Alpha (Pty) Ltd, which has subsequently changed its name to Holcim (South Africa) (Pty) Ltd in February 2004 and finally to AfriSam (South Africa) (Pty) Ltd in June 2007.

In addition to limestone, shale and dolerite is also mined on-site. The limestone and secondary components are all mined in multi-bench opencast quarries. Primary and secondary limestone is blended together through selective mining and crushing operations to ensure the correct chemical mix of limestone for cement production. Crushed limestone, shale and dolerite is stockpiled on blending beds and reclaimed for further processing through the cement kiln and cement mills, as required.

The cement product generated at Ulco is dispatched from site via road and rail both in bulk and in bags.

The mine has gone through the conversion process in terms of the transitional arrangements of the Minerals and Petroleum Resources Development Act, Act 28 of 2002 (MPRDA). The Department of Minerals and Resources (DMR) reference number is **NC 177 MR**.

Environmental management at is currently taking place in accordance with the approved (November 2005) Environmental Management Programme Report (EMPR) which was compiled in line with the requirements of the MPRDA and the successfully implemented environmental management system ISO 14001. The legally required biennial environmental performance audit completed in June 2010 highlighted that an amendment is required to the approved EMPR. This document serves as the amendment.

Description of Receiving Environment

As Ulco has been operating since 1936, the receiving environment on-site is largely dominated by mining infrastructure, existing open cast quarries and a cement plant. The pertinent aspects of the baseline environment have been provided below:

- **Climatic condition**: The regional climatic conditions are representative of those of a typical Karoo climate, with a high daily maximum temperature throughout the year and a low minimum temperature at night the winter months. The rainy period runs from November through to April with the months with the highest rain days being December through to March. The annual average rainfall (1940 to 2005) is 387mm. The predominant wind direction is from northern sectors (frequency of occurrence >20% throughout the year).
- **Topography**: The area can be described as being flat with two prominent base levels, one below an escarpment, which lies West of Ulco, and the Ghaap Plateau above. The edge of the scarp trends in a North-east South-westerly direction and reaches a maximum exposed height of 100 m some distance South of Ulco. At Ulco and its surroundings, the height of the scarp averages 75 to 80 m.
- **Geology**: The geology is suitable for the mining of primary and secondary limestone and shale. All of which is ideal for cement manufacturing requirements.
- **Soil**: Nowhere on the site or in the surrounding land is there an abundance of soil. The soil depth varies from 0 cm to a maximum of 30 cm. Over the area of interest, pockets of windblown sand, sometimes with a limited amount of plant material, constitute the only soil. According to the regional soil map the area falls under the soil type described "lime generally present in the entire landscape".
- **Surface Water:** The main mining area falls within the C33C quaternary catchment while the Gorrokop mining area falls in the C92A quaternary catchment. The main mining area lies 9 km North-west of the confluence of the Vaal and Harts Rivers and 3.5 km north of the non-perennial Steenbok River, which flows over the Ghaap escarpment at Grootkloof. The Gorrokop mining area is approximately 2.5 km south-west of the Steenbok River and 9.2 km North-west of the Vaal River. There are a number of seasonal stream beds in the vicinity of the mine, which flow during the "rainy

season" after a heavy downpour, but only for a short period of time. The main Ulco mining area falls within a local endoreic area which is an area where no runoff normally reaches the river system.

- **Ground Water:** The average depth of the water table in the vicinity of Ulco is 23 m. Groundwater is used for gardening and the wetting of the roads for dust suppression. The quality of the water abstracted from the boreholes is not used for continuous human consumption as it is hard and has a high electro-conductivity. Ulco monitors the quality of 6 boreholes. These boreholes are located near the waste sites and downstream of the coal stockpile area and the quarry dam.
- **Fauna**: In the ravines on the edge of the escarpment, extending to the actual active quarry areas, a diversity of fauna can still be found, such as Kudu and smaller buck such as duiker. Jackal also frequents this area and possibly caracal. These predators most probably live on the population of rodents that also live in this terrain. In and adjacent to the mining areas there is a large population of dassies, while baboons are often seen frequenting the waste dump. A great variety of birdlife is also encountered including raptors such as the Goshawk and Black Eagle.
- **Flora**: Ulco lies on the boundary (transitional zone) between the Kimberley Thorn Bushveld (from the Ghaap escarpment Eastwards) and the Kalahari Plateau Bushveld (Ghaap escarpment and plateau). The Ghaap plateau and escarpment is physiographically and geomorphologically distinct from the plains, therefore flora composition of these areas is distinct. According to a specialist survey conducted in 2006 a number of red data plants occur in the area, however fortunately none were identified within the area demarcated for current mining. The mining area is infested with a number of alien vegetation species.
- **Air Quality**: Ulco is located in the arid Kalahari / Karoo region and the base line air quality at Ulco (excluding impacts resulting from the operation) can be considered good, given that there are very few sources of pollution in the vicinity of Ulco. The primary source of atmospheric pollution is dust, particularly during the dry windy periods. The source of dust is both natural, due to the sparse natural vegetation covering, and as a result of human activities, such as diamond digging along the Vaal River and vehicle entrained dust from unpaved roads.

  Ulco represents a source of atmospheric pollution, in the form of dust from both the mining operation and the cement plant. Other gaseous emissions from the stacks are also a source of atmospheric pollution.
- **Noise:** The results of a noise survey in 2008 indicate that the environmental noise levels recorded on the boundary of Ulco are acceptable for mining operations which can be classified as an industrial activity.
- **Sites of Archaeological or Cultural Interest:** An archaeological and cultural survey was carried out by the McGregor Museum in August 1999.
  - Gorrokop area: Later Stone Age and Middle Stone Age material was found on the surface in the general vicinity of two springs at the crest of the escarpment. This spring is located 3 km from the current active mining operation. The grave of Adam Jonkers, dated 1894 is also close to the springs in question.
  - Grootkloof: Stone artefacts were found on the slopes of the escarpment in the vicinity of the hut built by the mine manager in 1963. On the Southern side of the kloof, which is conserved by the mine as a nature reserve, three localities containing finger paintings of exceptional quality have been identified. These painting have been described as "the best preserved in the area" and are amongst the most elaborate of their kind along the Ghaap escarpment.
  - Present Mining Operation: Surface areas adjacent to and up-slope from the existing quarries were inspected for traces of archaeological material and no significant findings were identified.
- **Regional Socio-economic Structure**: In summing up the baseline socio-economic conditions within Dikgatlong Local Municipality the following points are apparent:
  - according to Statistics South Africa there has been a population decline in Dikgatlong Local Municipality between 1996 and 2001; however consultations with community members estimate the population to have risen to approximately 60 000 in 2005;
  - much of the land in Dikgatlong Local Municipality is undisturbed which opens up opportunities for eco-tourism;
  - unemployment is high (up to 94%) and lack of employment opportunities fuels the high unemployment rate;
  - there are large numbers of children attending school with few opportunities available for them once they leave school; and
  - basic services such as housing, water, electricity and sanitation have been improving in the area however there is still need for continual improvement.

Mining Method / Process Description

The following minerals are being mined at Ulco through traditional open cast drilling and blasting methods:

- Primary and secondary limestone,
- Shale, and
- Dolerite.

The following additional minerals must be transported to the site for successful manufacturing of the product (cement).

- Iron ore,
- Coal, and
- Gypsum.

- **Mining activities:**

Primary and secondary limestone is mined in multi-bench open cast quarries using modern drilling and blasting techniques. The chemical composition of the limestone throughout the quarry area is known. Limestone is then mined in such a way (approximately 70% secondary limestone and 30% primary limestone) so as to ensure that the correct chemical composition of limestone is stockpiled, resulting in the correct quality of the final product. The limestone is crushed to less than 75 mm and transferred from the primary crusher via a conveyor and stacked onto homogenising limestone stockpiles.

- **Raw milling:**

Depending on the chemical composition of the limestone, additives of iron ore, shale and / or dolerite are added to the milling process to obtain the correct chemical composition. The limestone, iron ore, shale and / or dolerite are milled until they are fine enough to be conveyed by air to a homogenising raw meal silo.

- **Clinker production:**

The raw meal is transported to the cyclone pre-heater where the temperature of the material is raised to 900°C by the time the material passes through the calciner. In the calciner, limestone (predominantly $CaCO_3$) breaks down and releases carbon dioxide (CO_2), $CaCO_3$ + heat → CaO + CO_2.

The heated material is then passed through the coal fired rotating kiln, where the temperature is raised to 1 400°C. At this temperature, various minerals start to fuse together to form calcium silicate crystals, known as clinker. This semi molten material is cooled as rapidly as possible in a cooler and stored either in the clinker silo or on the open-air stockpile.

- **Cement Milling:**

Clinker, gypsum and additives are combined in the two cement ball mills (rotating tubes filled with steel balls). The amount of gypsum added to the cement alters the cements setting time, with the setting time increasing with the increase in gypsum. The purpose of the additives included at this stage is to reduce the clinker factor of the final product, thereby reducing the CO_2 emissions per ton of cement produced. At Ulco, limestone is the additive. The clinker factor during 2003 was 81.2%. Once milled, the cement is stored in homogenising silos to obtain the most consistent products possible.

- **Packing and dispatch:**

Depending on the requirements of the customer the final cement is either loaded into road or rail bulk tankers, or is packeted in 50kg bags and palletized. The palletized material is wrapped in plastic to prevent moisture contamination of the cement.

The supporting infrastructure required to ensure the manufacturing of cement includes:

- Storerooms
- Workshops
- Quality assurance laboratory
- Administration offices
- Railway lines and sidings
- Security structures
- Waste dump
- Housing and recreational areas
- Sewage plant
- Water purification plant

Public Participation
This EIA/EMP amendment has been compiled for an existing operation and represents an upgrade to the existing document. There have been no major changes in the operational activities since the approval of the existing EMP which may have resulted in a change to the impacts associated with the operation. Hence no specific public participation process has been implemented for this EIA/ EMP upgrade.

As Ulco is an on-going concern, consultation processes have been established and remain on going to ensure that interested and affected parties are kept informed on environmental matters and have an opportunity to raise any concerns

Knowledge Gaps
The following knowledge gaps have been identified which should be rectified.
- The possible presence of faunal red data species

Should mining extend beyond the current fenced area and north of the R31, then additional specialist studies will be required, namely:
- Additional investigation into the presence of red data flora species
- Additional investigation into the presence of heritage resources
- Additional investigation into the impact of mining on the endoreric pan.
- Additional investigation into the impact of additional mining on surrounding water users

Summary of impacts and associated management measures:
Below is a description of the main impacts associated with each department of the operation and a summary of the applicable management measures proposed to mitigate the impacts:

MINING:

MAIN IMPACTS	SUMMARISED MANAGEMENT MEASURES
Removal of geological resources	• Optimise mineral extraction through the implementation of effective mine planning and the blending of low and high grade resources to minimise the potential for geological waste.
Dust	• Watering of roads. • Screens, housing and dust suppression at both the transfer points and within the crushing plants at the crushing operations.
Impacting on natural flora / habitats	• Implement concurrent rehabilitation behind the mining face. • Rehabilitate historically disturbed areas.
Fuel usage	• Implement speed limits. • Maintain all vehicles. • Keep haulage routes as short as possible.

PROCESSING:

MAIN IMPACTS	SUMMARISED MANAGEMENT MEASURES
Dust	• Maintain and ensure the use of all dust suppression equipment including; electrostatic precipitators, water sprays, bag filters, and enclosed transfer points. • Recycle all spills.
Carbon dioxide emissions	• Reduce coal use through the use of alternative fuels. • When economically viable implement new technology that reduces energy requirements of the kiln. • Blend the clinker with extenders to reduce the amount of clinker per ton of cement.
Other off gases	• Monitor gas output and implement reactive management measures when emissions levels are exceeded to bring the emission levels in line with permit specifications. • Ensure that the raw material fed into the process is of suitable quality. • Maintain equipment to reduce the amount of off gases.

PACKAGING AND DISPATCH:

IMPACT	SUMMARISED MANAGEMENT MEASURES
Dust	• Use of dust suppression equipment such as bag filters. • Recycle all spills back into the process
Traffic logistics	• Ensure no overloading of vehicles.

SUPPORTING SERVICES:

IMPACT	SUMMARISED MANAGEMENT MEASURES
Quality Assurance – Water / Fumes	• Implement quality assurance tests of raw materials and products through out the cement life cycle. • Dilute chemicals to a point where the disposal into the water system has no significant impact. • Monitor the quality of the water disposed into the sink by testing sewage discharge water. Implement measures based on the results of the monitoring. • Use of fume cupboards.
Engineering – Water pollution	• Through committing and implementing preventative maintenance activities, the engineering department is reducing the probability of impacts occurring.
Administration / Stores – Water pollution	• All chemicals are stored, handled and disposed of in line with the requirements stipulated in the material safety data sheet. • Fuel reconciliations to be performed
Human Resources – Socio-economic impacts	• Implement the commitments stipulated within the approved social and labour plan for the operation. • Implement management measures within the Ulco villages.
Safety, Health and Environmental Department	• Ensure environmental compliance forms part of a risk assessment for any new (or change to old) activity at the mine. Document additional management measures to manage any additional environmental impacts as a result of the new activity. • Ensure environmental compliance of contractors. • Implement an effective waste management system which correctly handles and disposes of domestic and hazardous waste generated on the site. • Ensure legal compliance through undertaking legal audits. • Implement the environmental management system (ISO 14001:2004) • Ensure the management of water resources. • Implement storm water management • Implement effective environmental monitoring campaigns

Summary of the environmental monitoring that will be implemented:

Ulco have committed to implementing the following environmental monitoring programmes:

- Water use
- Surface and ground water quality
- Ground water depth
- Dust fall-out monitoring
- Stack emissions monitoring
- Monitoring of success of concurrent rehabilitation
- Consumption monitoring of fuels, electricity and waste generation
- Occupational health and safety monitoring.

In addition to environmental monitoring, the following environmental auditing / reporting will be performed:

- Legal audits

- ISO 14001 internal audits
- Environmental performance assessment reports in terms of the Minerals and Petroleum Resources Development Act, Act 28 of 2002
- Financial provision reviews
- Reporting on compliance with the social and labour plan
- Reporting on the integrated water use license
- Reporting on the condition of the Air Pollution Prevention Act Permit.

Environmental Awareness Pla
Environmental awareness of the employees at Ulco will be provided by implementing the environmental awareness training through the following five methods:
- Green area meeting (*monthly*)
- Induction courses (*annually*)
- Environmental Management Programme Training (*annually*)
- Environmental training from head office environmental officer (*as and when available*)
- External environmental courses (*as and when available*)

Closure options:
It is important to appreciate that Ulco has a life of mine of approximately 30 years within its current mining environment. This life of mine can be extended through the implementation of mining activities to the north of the R31. Hence there could potentially be limestone reserves to sustain Ulco for over 100 years.

Due to the long life of mine remaining, no detailed closure planning has been completed. Before mining took place, the land was suitable for low intensity grazing. Due to the rural location of the site, much of the surrounding land is undisturbed and represents what Ulco would have looked like if it were not for the mining operation.

Ulco will close the mine whereby all infrastructure and basic services that have been developed by the mine, which will continue to be of benefit to the local / provincial community after the mine has closed, will be left. All buildings / infrastructures that have been determined as having no socio-economic benefit after the life of the mine will be demolished and the rubble buried in old excavations within the mining area.

The aim for all disturbed land created as a result of the Ulco operations will be to rehabilitate the land back to a state to where it blends in with the surrounding land (grazing land) and is acceptable to all relevant interested and affected parties.

Financial Provision
The financial provision calculation was calculated making use of the Department of Minerals and Resources (DMR) guideline document for financial provision. The guideline document dated January 2005 was utilised. Two calculations have been performed;
- The first provides a value based on the closure cost as of July 2010 if the mine needed to be rehabilitated by a third party.
- The second provides a present day value, based on the closure cost as of July 2015 presuming the concurrent rehabilitation activities which have been committed to by Ulco are successfully implemented.

The financial provision values determined are;
- Present day value for closure: **R 52, 721 839**
- Present day value, based on successful implementation of concurrent rehabilitation commitments: **R 45, 653 274**

Financial provision will be provided by means of both an allocation within the AfriSam Trust Fund and through provision of a bank guarantee.

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ABBREVIATIONS

ASTM	American Standard for Testing and Materials
BATNEEC	Best Available Technology Not Entailing Excessive Cost
CAPCO	Chief Air Pollution Control Officer
CARA	Conservation of Agricultural Resources Act, Act No. 43 of 1983
CFC	Chlorofluorocarbon
CMA	Catchment Management Agency
DMR	Department of Minerals and Resources
DWA	Department of Water Affairs (previously DWAF)
DWAF	Department of Water Affairs and Forestry
EAP	Environmental Assessment Practitioner
EIA	Environmental Impacts Assessment
ECA.	Environment and Conservation Act, Act No. 73 of 1989
EMP[1]	Environmental Management Programme
EMPR[2]	Environmental Management Programme Report
GPS	Global positioning satellite
HDSA	Historically disadvantaged South African
I&AP:	Interested and affected party
ISO	International Standards Organisation
IWULA	Integrated water use licence application
LED	Local economic development
LOM	Throughout the life of mine
MPRDA	Minerals and Petroleum Resource Development Act, Act No. 28 of 2002
MSDS	Material Safety Data Sheet
NEMA of 2008	National Environmental Management Act, Act No. 62 of 2008
NEMA of 1998	National Environmental Management Act, Act No. 107 of 1998
NEM: AQA.	National Environmental Management: Air Quality Act, Act No. 39 of 2004
NEM: WA	National Environmental Management: Waste Act, Act 59 of 2008
NWA.	National Water Act, Act No. 36 of 1998
PCB	Polychlorinated Biphenyls
PPE	Personal Protective Equipment
SAWS	South African Weather Services
SANS	South African National Standard
SANS 1929:	Ambient Air Quality – Limits for Common Pollutants.
SANS 10103	Noise level
SHE	Safety Heath and Environment
SLP	Social and Labour Plan
SPL	Spent Pot Lining
SSC	Shared Service Centre (Head Office)
SWMP	Storm Water Management Plan
ROSE	Recycling Oil Saves the Environment Foundation
USBM	United States Bureau of Mines

[1] Compiled in accordance with the requirements of the Minerals and Petroleum Resource Development Act, Act No. 28 of 2002.
[2] Compiled in accordance with the Minerals Act, Act No. 51 of 1991.

1 INTRODUCTION

1.1 DETAILS AND EXPERTISE OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

Legal Reference MPRDA:
NEMA of 1998: **Regulation 32(2)a**

COMPANY DETAILS:	
Company:	Umhlaba Environmental Consulting CC
Registration Number:	2004/002962/23
Contact Details:	**Tel:** 011 795 3636 **Fax:** 011 795 3336 **E-mail:** umhlaba@telkomsa.net
Company Profile:	Umhlaba Environmental Consulting CC company profile is attached in **Appendix 1**. Included in the profile is a list of the services offered by the company and the projects undertaken since 2004.
DETAILS AND EXPERTISE OF EAP:	
Name:	Andrew Nicholson
Qualifications:	BSc Honours in Biological sciences Post Graduate Diploma in Natural Resource Management
Work experience:	9+ years in the field of environmental consulting to limestone mining and cement operations. Andrew Nicholson has compiled +/- 25 Environmental Management Programmes in accordance with the requirements of the Minerals and Petroleum Resources Development Act, Act 28 of 2002 (MPRDA).

1.2 HISTORY AND BACKGROUND INFORMATION

The AfriSam South Africa (Pty) Ltd) Cement Operation has been operating in the Northern Cape Province since 1936. Mining of the secondary limestone reserves began in 1936, when Union Lime mined it for lime, using two Beckenbach Shaft kilns and nine Spencer kilns for burning the limestone. In 1949, it was decided to mine the low grade limestone material for cement and the company built two wet process kilns (Kiln 1 and Kiln 2) and cement mills for the cement manufacturing process. Subsequently in 1964 two further kilns (Kiln 3 and Kiln 4) were added on to increase the cement production capacity. In 1985, Union Lime Company was purchased by Anglo Alpha.

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Although the EMPR was approved in 2005, it was compiled in 2004 and hence is currently 6 years old. Overall it is fair to confirm that the approved EMPR is outdated due to that natural progression of mining and processing operations. The outdated aspects include:

- *Sections of the baseline environmental can be updated using recent specialist studies.*

- *Description of the activities taking place on site needs to be updated. An example includes aspects such as the use of Spent Pot Liners (SPL) as an alternative fuel and although the use of alternative fuels is a commitment of the EMPR, specific details are not documented.*
- *The impact assessment tool used in the old EMPR is no longer deemed effective.*
- *The management measures are out dated.*
- *Specific sections on environmental monitoring is required*
- *The current environmental awareness training should be captured within the document.*

Overall it is recognised that the EMPR needs an update.

This document represents the required updated EMP for Ulco. In order to be proactive Ulco will ensure that this amended EMP also complies to both the requirements of the MPRDA and to the National Environmental Management Act, Act No. 107 of 1998 (see Section 1.4).

1.3 CONTACT INFORMATION AND LOCATION OF THE OPERATIONS

Legal Reference *MPRDA*:
NEMA of 1998: **Regulation 32(2)c**

1.3.1 Contact Information

Operation Name:	AfriSam (South Africa) (Pty) Ltd – Cement Plant
Responsible Manager:	Quarry Manager / SHE Manager
Telephone:	(053) 562 9100
Fax:	(053) 562 9133
Postal Address:	Ulco Private Bag X1 8390
Physical Address:	The mine is located 80 km north-west of Kimberley, 42 km north-west of Barkley West, 17 km north-west of Delportshoop and 24 km south-east of Koopmansfontein. The Mine and all the towns mentioned above are accessible along the **R31** between Kimberley and Kuruman. See **Figures 1.1** and **1.2**.

Shared Service Centre (Head Office)

Company Name:	AfriSam (South Africa) (Pty) Ltd
Company Reg. Number:	2006/005910/07
Environmental Officer:	Environmental Manager
Telephone:	011 767-7231
Fax:	011 767-7031
E-mail:	Claudene.Moorgas@za.afrisam.com
Postal Address:	P.O. Box 6367 Weltevredenpark, 1715
Physical Address:	AfriSam Building Corner of 14th Avenue and Hendrik Potgieter Street Weltevredenpark, 1715

1.3.2 Location

The mine is located 80 km north-west of Kimberley and 42 km north-west of Barkley West, See **Figures 1.1** and **1.2**. **Table 1.1** describes the farm portions over which the mining right extends which totals and area of **16 366.5** hectares.

Table 1-1: Farm portions over which the mining right extends

1.	The Farm 234 (Groot Rietfontein) consisting of the remainder and Portion 1
2.	The Farm 215 (Klein Rietfontein) consisting of Portion 3 Lime (Lime 1) and Portion 2 Lime (Lime 2)
3.	The Farm 217 (Die Puts) consisting of the remainder , remainder of Portions 6 and 11 and Portions 2, 4, 7 -10, 14-16, 19-22 and 24
4.	Portion 3 (Bergville) of the farm Hondefontein 216
5.	Harison (a portion of Delportshoop Commanage) now known as the Remainder of Erven 1and 2 and 561 and 1500
6.	The Farm 176 (Vogelfontein) consisting of the remainder of the farm
7.	The farm Donkerboschfontein 147
8.	The Farm 175 (Zononder)

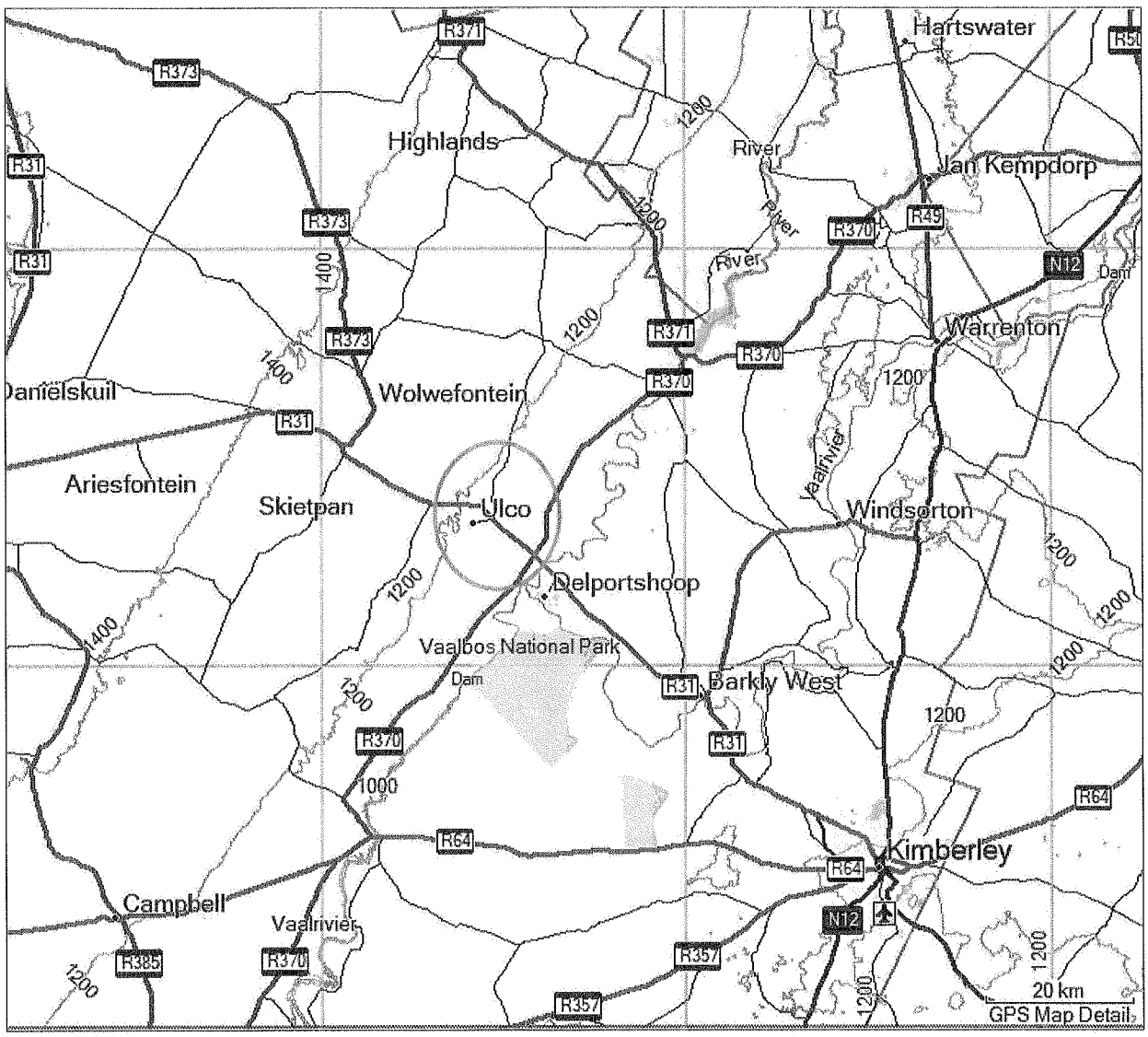


Figure 1-1: Regional locality map showing the mining site in relation to major roads.

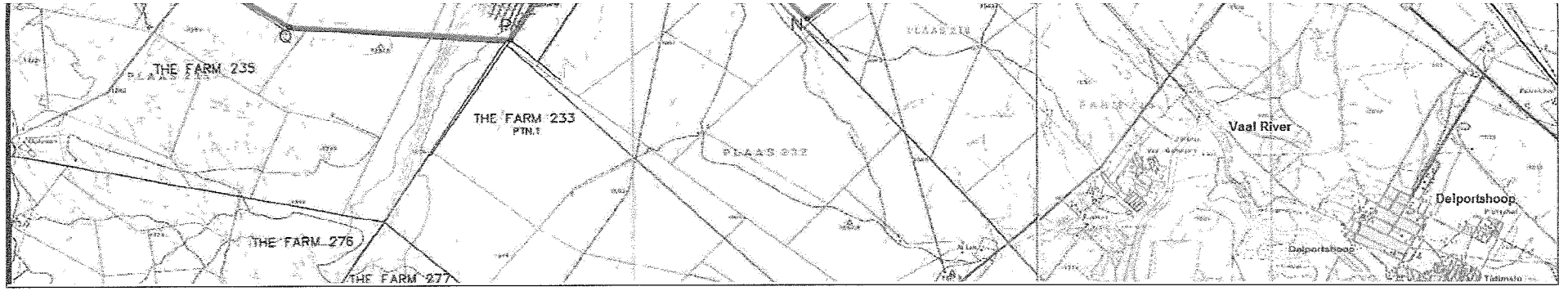


Figure 1-2: Map showing the mining right boundary

1.4 REPORT OUTLINE

Legal Reference *MPRDA*:
NEMA of 1998: **Regulation 34(a)**

The National Environmental Management Act (NEMA), Act No. 62 of 2008 commenced on the 1st May 2009. This Act amends the National Environmental Management Act of 1998 to inter alia further regulate environmental authorisations and to align environmental requirements in the MPRDA with the National Environmental Management Act, Act No. 107 of 1998.

Although the NEMA of 2008 has commenced, the implementation of this Act in respect to mining is being phased in. Based on consultation with the Department of Minerals and Resources (DMR), amendments to approved Environmental Management Programmes (EMP) must still be undertaken in accordance with the requirements of MPRDA. However, as the requirements of NEMA will become mandatory in the long term, the amendment of this EMP includes the requirements of the MPRDA and those of the NEMA of 2008.

The requirements for the Environmental Impact Assessment (EIA) and EMP are outlined in both legislations. As there are many similarities between the requirements for these two documents and the information in each documents feeds into the other. Therefore, the documents have been combined into one report. In order to facilitate the authority's review of this document an outline of the report is presented below (Table 1-2) including reference to the applicable Sections and Regulations of the relevant legislation.

Table 1-2: Outline of the combined EIA and EMP.

	DESCRIPTION OF THE SECTIONS OF THE REPORT	APPLICABLE SECTION OR REGULATION[3] OF NEMA[4]	APPLICABLE SECTION OR REGULATION OF THE MPRDA[5]
ENVIRONMENTAL IMPACT ASSESSMENT	**(EXCLUDING THE MANAGEMENT AND MONITORING MEASURES AND TECHNICAL APPENDICES)**		
1	**Introduction**. This section will provide the basic information regarding: • The details and expertise of the Environmental Assessment Practitioner (EAP). • The location and contact information for the mine. • The outline of the report.	Regulation 32(2)(a) Regulation 32(2)(c) Regulation 34(a)	
2	A **description of the receiving environment** will be provided in order for the reader to gain an understanding of the receiving environment in which the mine is located. As per NEMA, this description will include the physical, biological, socio-economic and cultural aspects of the environment that may be affected by the mine.	Regulation 32(2)(d)	Section 39(3)(a) Regulation 50(a) & (b)
3	Although a **process description** is not required in terms of the MPRDA, it is required in terms of NEMA. It is vital to an EIA and EMP as it is necessary to have an understanding of the basic activities that will be conducted by the mining operation in order to determine the impacts.	Regulation 32(2)(b)	
4	As this is an existing operation, the public participation will not be conducted as described in NEMA (detailed for proposed developments). Instead, the **public participation** section will provide a description of the ongoing consultation with the public, including reference to any recent comments / concerns received by the mine and an indication as where they are addressed in this report.	Regulation 32(2)(e)	Regulation 50(f)
5	In order to have an understanding as to how impacts have been evaluated in this EIA, a **description of the methods used to undertake the impact assessment** has been described (implemented in the following Section). The factors used to evaluate the impacts have been determined based on the requirements of the MPRDA, NEMA & ISO 14001.	Regulation 32(2)(g), incorporating Regulation 32(2)(k)	
6	The **impact assessment** has been structured to accommodate the requirements of both MPRDA and NEMA. All environmental impacts (including the environment, socio-economic and heritage resources) are identified and the potential significance of each is determined (assessed and evaluated). The impacts are identified and ranked for each activity. (The extent to which issues can be addressed by mitigation measures is indicated by the re-evaluation in Section 11 – Management and Monitoring.)	Regulation 32(2)(j) & (k)	Section 39(3)(b) Regulation 50(c)
7	Based on the outcomes of the impact assessment, the EAP has provided **an environmental impact statement** which contains a summary of the key findings of the impact assessment and a comparative assessment of the positive and negative implications of the mining operation. This section also includes the **EAP's environmental opinion** as to whether the mining operation should or should not continue.	Regulation 32(2)(n)	
8	The **alternative land uses and developments considered** for the site are listed and evaluated. This section also includes the evaluation of the "no project" option.	Regulation 32(2)(f) & (h)	Regulation 50(d)

[3] Regulation 385 in terms of Chapter 5 of the National Environmental Management Act, Act No. 107 of 1998.
[4] National Environmental Management Act, Act No. 62 of 2008
[5] Minerals and Petroleum Resource Development Act, Act No. 28 of 2002

	DESCRIPTION OF THE SECTIONS OF THE REPORT	APPLICABLE SECTION OR REGULATION[3] OF NEMA[4]	APPLICABLE SECTION OR REGULATION OF THE MPRDA[5]
9	Based on the information presented in the EIA, the known **knowledge gaps** have been listed including the reasoning as to why the information is not available in this report.	Regulation 32(2)(l) & Regulation 32(2)(m)	Regulation 50(g)
	ENVIRONMENTAL MANAGEMENT PROGRAMME (INCLUDING THE MANAGEMENT AND MONITORING MEASURES AND TECHNICAL APPENDICES)		
10	The **environmental objectives and specific goals** of the proposed operation are presented.		Regulation 51(a)
11	The proposed mitigation measures, including **management and monitoring** have been outlined in this Section. In order to link the impact evaluation with the proposed management measures, the management measures will be presented in the same sequence as the impact assessment (Section 6).	Regulation 32(2)(j) & (o) Regulation 34(b) to (f)	Section 39(3)(d) Regulation 50(e) & (h) Regulation 51(b)(i) - (iv)
12	An **environmental awareness plan** for the operation is presented.		Section 39(3)(c) Regulation 51(b)(vi)
13	An indication of current **mine closure options** is presented		Regulation 60
14	The estimated **financial provision** for the operation will be calculated. This will include both present day closure costs and end of life closure costs.		Regulation 51(b)(v)
15	An **undertaking** signed by the applicant.		Regulation 51(b)(viii)
16	This Section will include a reference list of all material referenced to or consulted with during the compilation of this report.		
17	All **technical / specialist reports and supporting information** as well as specific information that has been requested by the competent authority is included.	Regulation 32(2)(p) & (q) Regulation 32(2)(i) Regulation 33(2)	Regulation 50(i) Regulation 51(b)(vii)

All efforts have been made to include all information required in terms of NEMA and the MPRDA. However, the requirements specified in Regulation 32(2) of NEMA are assuming the EIA and EMP are being compiled for a new development, not for an existing operation. Therefore, there are some requirements in Regulation 32(2) of NEMA that are either not included, or have not been addressed in great detailed. These are:

- Regulation 32(2)(f) "a description of the need and desirability of the proposed activity and identified potential alternatives to the proposed activity, including advantages and disadvantages that the proposed activity or alternatives may have on the environment and the community that may be affected by the activity;"
- Regulation 32(2)(h) "a description and comparative assessment of all alternatives identified during the environmental impact assessment process;"

2 DESCRIPTION OF RECEIVING ENVIRONMENT

Legal Reference	*MPRDA:*	**Section 39(3)(a), Regulation 50(a)** and **(b)**
	NEMA of 1998:	**Regulation 32(2)d**

Much of the baseline environmental information has been extrapolated from the existing EMPR (approved in November 2005) which included information from specialist studies, which remains applicable. Where possible the baseline information from the existing EMPR has been supplemented with additional desktop information, specialist studies completed since November 2005 and feedback from on-going monitoring programmes.

2.1 STATUS / AESTHETICS OF THE SITE / SURROUNDING LAND USE

Refer to **Figure 1.3** above for a visual indication of the surrounding land use. **Figure 3.2** should be consulted, for a detailed indication of the status of the environmental area impacted by the activities associated with Ulco.

It is **important** to note the following;

- The mining right area covers an area of 16366 hectares shown in red in **Figure 1.3**. The mining environment area which is the area over which could be impacted by the current mining activities is approximately 460 hectares and is shown in blue.

  It is important for the reader to note that this **EMP amendment covers the environmental requirements of the mining environment area** and not the full mining right area. Should Ulco wish to extend their mining environment beyond the current borders, then an amendment / addendum to the EMP will be required.

Mining commence in 1936 and continues today, hence the mining environment is currently representative of a limestone open cast mining operation and a cement plant. For an indication of the location of the different aspects of the mine being briefly described below, refer to **Figure 1.3** above and **Figure 3.2** below. Ulco has 2 mining areas, these include:

- Main mining area:

This is the active mining area, which extend over approximately 270 hectares. Within this mining area, the majority of the area is disturbed by the mining of secondary limestone, with a smaller area (~50 ha) disturbed through the mining in the primary limestone quarry. There is also an area where shale / dolorite is mined. The limestone and shale is blended together to ensure the correct blend (chemical composition) for optimal cement manufacturing qualities and to ensure mining has the minimal impact on land.

- Gorrokop mining area:

This secondary limestone quarry is located approximately 6 km south of the main Ulco mine and extends over approximately 75 hectares. It was previously mined for its high grade limestone. There is no infrastructure at this quarry and currently no active mining is taking place. The area has be fenced off and left in a dormant safe state.

The following infrastructure and disturbance occurs adjacent to the main mining area. For a visual indication of the relative locations of the infrastructure, see the **Aerial Photographs in Section 3.** The following infrastructure is used for the manufacturing of cement:

- Haul roads
- Primary Crusher
- Conveyors
- Stockpiles
  - Limestone
  - Coal & Char
  - Gypsum
  - Iron ore
  - Emergency stockpiles of all of the above
- Cement plant
- Clinker silo and open-air clinker storage
- Cement Mills
- Cement silo's
- Packing plant
- Dispatch facilities for road and rail

The supporting infrastructure required to ensure the manufacturing of cement includes:

- Storerooms
- Workshops
- Quality assurance laboratory
- Administration offices
- Railway lines and sidings
- Security structures
- Waste dump site
- Housing and recreational areas
- Sewage plant
- Water purification plant

- Grootkloof Nature Conservation Area:

The mine has demarcated a 70 hectare piece of land to conserve.

The following servitudes are available;

- Roads: The R31 which runs between Kimberley and Kuruman runs past Ulco. There are a number of haul roads within the main mining area. There is a 30m wide haul road running in a south-westerly direction from Ulco to the Gorrokop mining area.

- Water pipeline: In addition to the internal water pipeline network, there is a water pipeline and an access road of 10 m in width running from the mine to the Vaal River which is approximately 9 km south-east of the mine. There is also a pipeline from the 3 boreholes on the farm Bergville which runs to the storage reservoir located at the old plant area.

- Sub stations and power lines: There are various incoming and outgoing power lines to one of 3 sub-stations. Two sub stations are located adjacent to the waste dump. The smaller one of these is no longer in use and has been decommissioned while the other is currently being used by Eskom. The Harrison area sub station supplies electricity from Eskom to Ulco plant.

- Ulco has an aircraft landing strip.

- The railway branch line is 16 m wide and runs from the mine siding to Ulco station.

- Sewage pipelines: The domestic drain and sewage system from the factory and the majority of the township is drained to the sewage plant by gravity. Sewage from the western part of the township is fed to the sewage plant via one intermediate sewage pump station.

Ulco is located within a rural area of which the surrounding land is predominantly used for grazing purposes. Approximately 15% of the surrounding landuse can be classified as wilderness. The closest built up area is which is not associated with the mine is Delportshoop which lies approximately 17km south east of Ulco. There is a village adjacent to the cement plant which is used to house the employees of Ulco.

2.2 CLIMATOLOGY

The following climatic data presented below has been obtained from a number of different sources;

- The weather station at Ulco. This station has rainfall information dating back to 1940. Daily temperature and wind speed and direction has been recorded at this weather station since July 2003. Due to the short monitoring period of these parameters, additional weather information has been included to provide a comparison.
- Koopmansfontein AGR II Weather Station (Station No. 0323102 6). This is the closest weather station to Ulco, located approximately 20 km north-west of the mine. Historical data is available from 1961 to 1990. All data for this station has been obtained from BSES, 2002.
- Kimberley Weather Station. As no wind data were available from Koopmansfontein, information had been obtained from the South African Weather Services station in Kimberley. As the general topography between Ulco and Kimberley is flat, it is fair to presume that the wind data recorded at Kimberley will represent a similar pattern for Ulco. Wind field data recorded at since July 2003 has been compared with the Kimberly data.

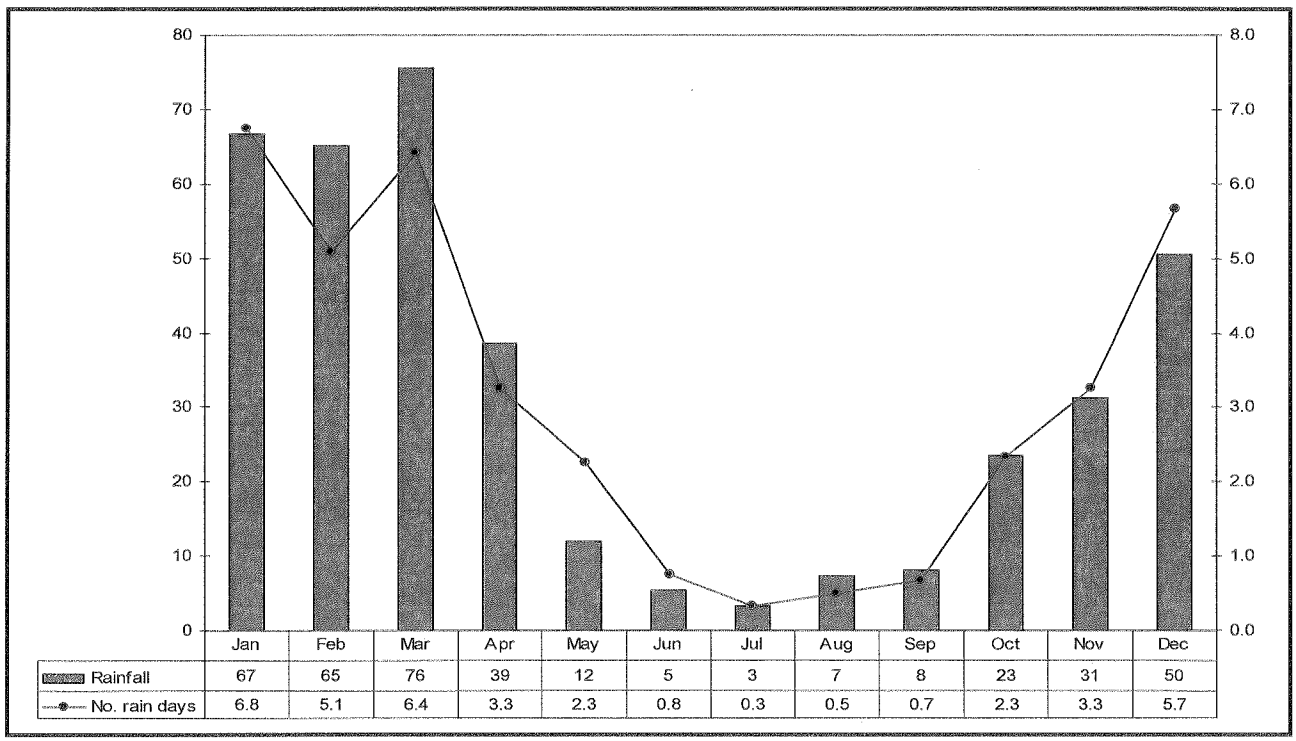
Emphasis has been placed on presenting data which is useful to the mine when considering concurrent rehabilitation options. As the mine has no major dams and is not intersected by any permanent streams or rivers, flooding at the mine is highly unlikely.

2.2.1 Regional Climate

The regional climatic conditions are representative of those of a typical Karoo climate, with a high daily maximum temperature throughout the year and a low minimum temperature at night during the winter months. The rainy period runs from November through to April with the months with the highest rain days being December through to March.

2.2.2 Mean Monthly and Annual Rainfall.

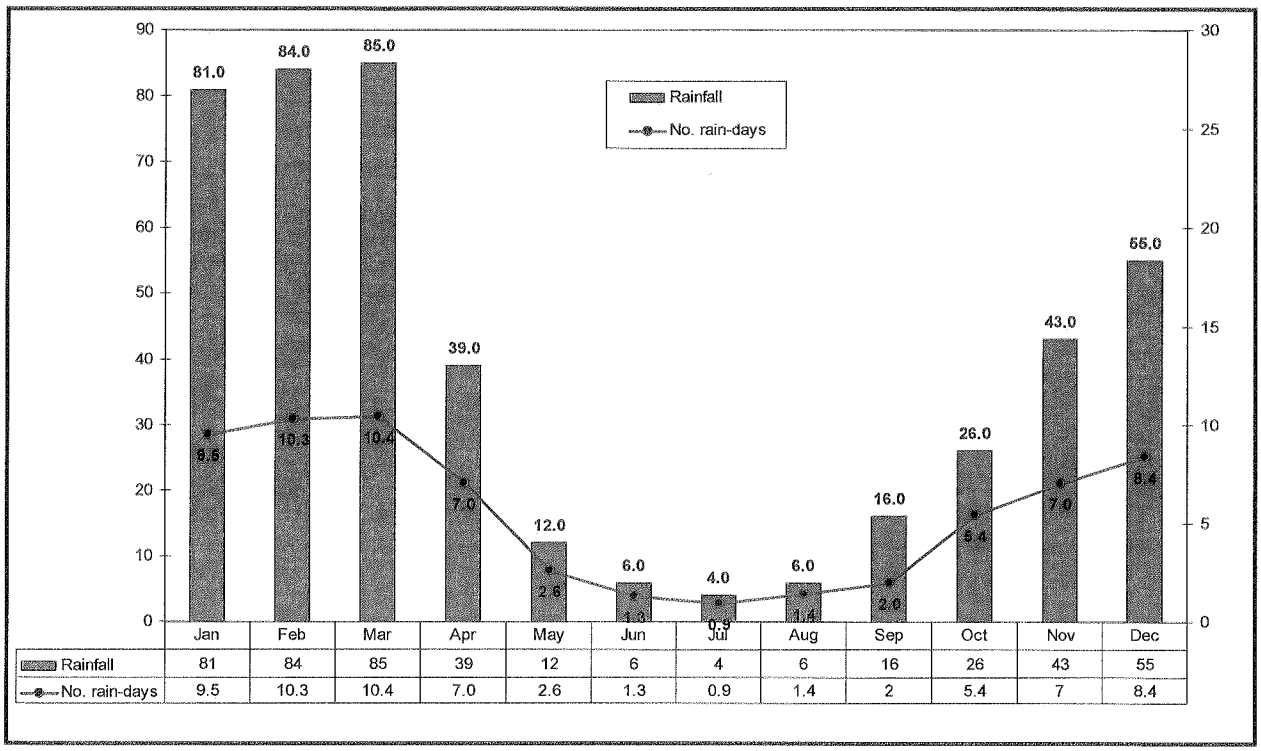
Figure 2.1 below gives an indication of rainfall data from Ulco Weather Station. The monthly rainfall average has been generated from data collected from 1940 to 2005 (65 year period). The average number of rain-days per month is calculated using data from 1994 to 2005 (12 year period). The annual average rainfall (1940 to 2005) is **387mm**. The "rainy season" occurs from November through to April.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall	67	65	76	39	12	5	3	7	8	23	31	50
No. rain days	6.8	5.1	6.4	3.3	2.3	0.8	0.3	0.5	0.7	2.3	3.3	5.7

Figure 2-1: Rainfall data from Ulco Weather Station.

Figure 2.2 provides an indication of the rainfall patterns recorded at the Koopmansfontein Weather Station. Data from this station has been gathered between 1961 and 1990. The annual average rainfall at this station is **457 mm** per annum.



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall	81	84	85	39	12	6	4	6	16	26	43	55
No. rain-days	9.5	10.3	10.4	7.0	2.6	1.3	0.9	1.4	2	5.4	7	8.4

Figure 2-2: Rainfall data from Koopmansfontein Weather Station.

Both the annual average rainfall and the average number of rain-days are higher at the Koopmansfontein Weather Station. Although a similar weather pattern is obvious, Ulco receives less rain and over fewer rain-days than Koopmansfontein.

2.2.3 Maximum Rainfall Intensities per Month

Table 2.1 below provides the highest and lowest monthly rainfall records for Ulco, recorded between 1940 to 2004. Since the daily recording of rainfall from 1996 (when daily rainfall data were recorded), the three highest rainfall events within 24 hours include:

- January 19th 2005 – 69 mm; March 5th 1997 – 72mm; March 21st 2003 – 72mm

Table 2-1: Monthly rainfall records for Ulco.

Month	Highest monthly rainfall (mm)	Lowest monthly rainfall (mm)
Jan	263	2
Feb	320	0
Mar	332	0
Apr	162	0
May	74	0
Jun	66	0
Jul	49	0
Aug	108	0
Sep	90	0
Oct	128	0
Nov	117	0
Dec	264	0

The closest weather station, where the estimated maximum 24 hourr rainfall to occur once within 100 years, 50 years and 20 years, is Kimberley.

- 1 in 100 years: 136mm; 1 in 50 years: 115mm; 1 in 20 years: 92 mm

2.2.4 Monthly Mean, Maximum, and Minimum Temperatures

Temperature data has been recorded at Koopmansfontein since 1961, with the long-term average calculated for the period 1961 to 1990. The monthly mean, maximum and minimum temperatures for the latter station are presented in **Table 2.2**.

Table 2-2: Monthly mean, maximum and minimum temperatures recorded at Koopmansfontein.

Month	Temperature (°C) - 1961 to 1990		
	Max	Min	Mean
Jan	31.6	15.7	23.7
Feb	30.0	15.1	22.6
Mar	27.9	13.1	20.5
Apr	24.5	8.8	16.7
May	21.3	3.8	12.6
Jun	18.1	0.3	9.2
Jul	18.6	-0.3	9.2
Aug	21.1	1.7	11.4
Sep	25.2	6.0	15.6
Oct	27.6	9.4	18.5
Nov	29.8	12.2	21.0
Dec	31.4	14.2	22.8

From **Table 2.2** it can be seen that the hot summer months are between October and March and the cooler winter months between May and August.

2.2.5 Mean Monthly Evaporation

Monthly evaporation data has been obtained from the weather station located at Koopmansfontein. Evaporation has been measured by the Class-A-Pan Evaporation method. The mean annual evaporation is **2 553mm**. This figure exceeds the mean annual rainfall (457mm) by **2 096 mm**. This emphasises the fact that the area is very dry. Monthly evaporation data is provided in **Figure 2.3** below.

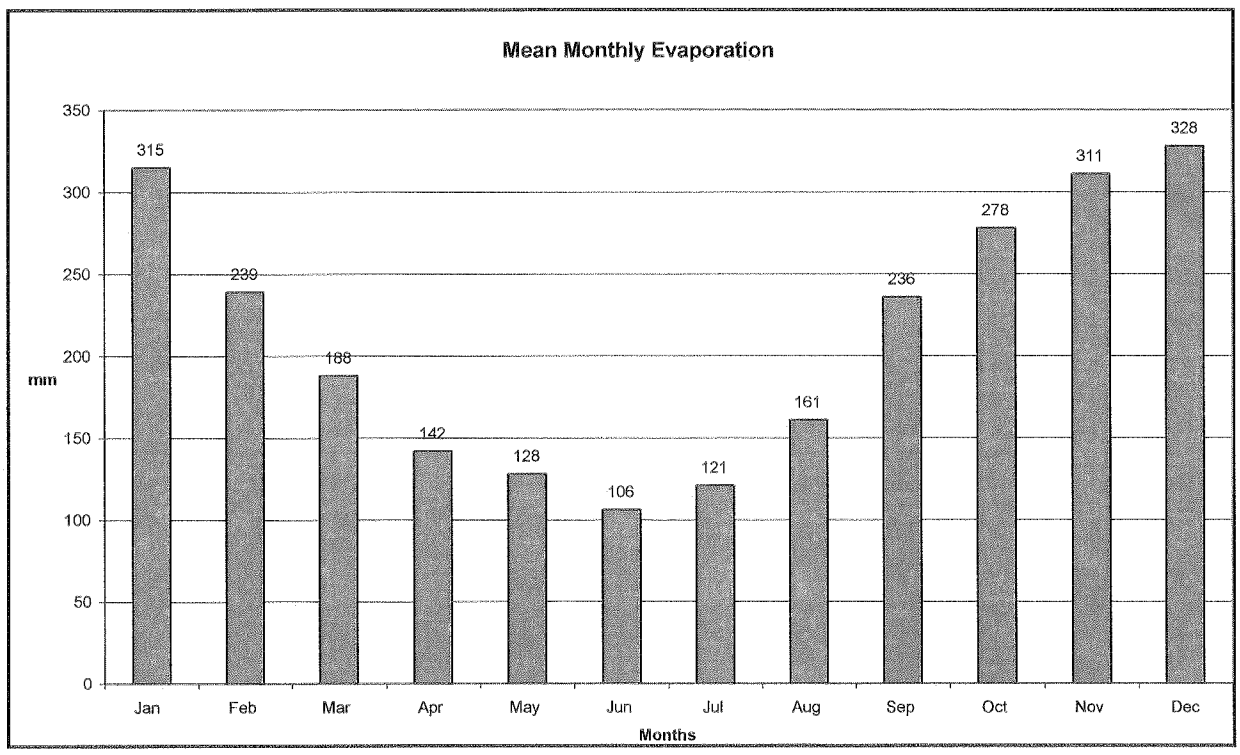


Figure 2-3: Mean monthly evaporation.

2.2.6 Incidence of Extreme Weather Conditions

The extreme weather conditions in this area are limited to extremes in temperature variations, thunderstorms and hail. In Koopsmanfontein, thunderstorms are experienced on average 39 times per year mainly between October and April. Hail occurs on average 1.6 times a year.

2.2.7 Monthly Mean Wind Direction and Wind Speed

The following wind roses have been obtained from the South African Weather Services (SAWS), for the Kimberley Weather Station (**Figure 2.4 & 2.5**). The wind roses represented below indicate the wind frequencies for the 16 cardinal wind directions. The frequency of occurrence of winds within each direction is indicated by the length of the shaft compared with the dotted circles, representing a 5% frequency of occurrence. At the bottom of each wind rose are wind speed classes. These illustrate the frequencies of occurrence of winds in each category, for each wind direction. The frequency of calm periods, wind speeds are below 1 m/s, are indicated as a percentage value in the centre of each wind rose

Due to the relatively flat topography between Kimberley and , although this weather station is over 80 km away, it can provide an indication of the predominant wind direction and speed experienced in the area.

As is apparent in all the annual average (**Figure 2.4**) and monthly wind roses (**Figure 2.5**), the predominant wind direction for Kimberley is from the North (frequency of occurrence >20% throughout the year). The frequency of northerly winds increase between mid-autumn (April) and late-winter (August), occurring most frequently during June and July (>25%). Corresponding to the decrease in frequency of Northerly winds between September and December, an increase in winds from the South-west to Western sectors becomes evident. During this winter to summer transition period, the occurrence of gusts (>10.7 m/s) increases from the North-western and South-western quadrants.

Throughout the year, winds seldom arise from the East-north-eastern to south-south-eastern sectors, with frequencies of occurrence of less than 5% being recorded throughout the year. No wind is recorded for 7.4% of the time

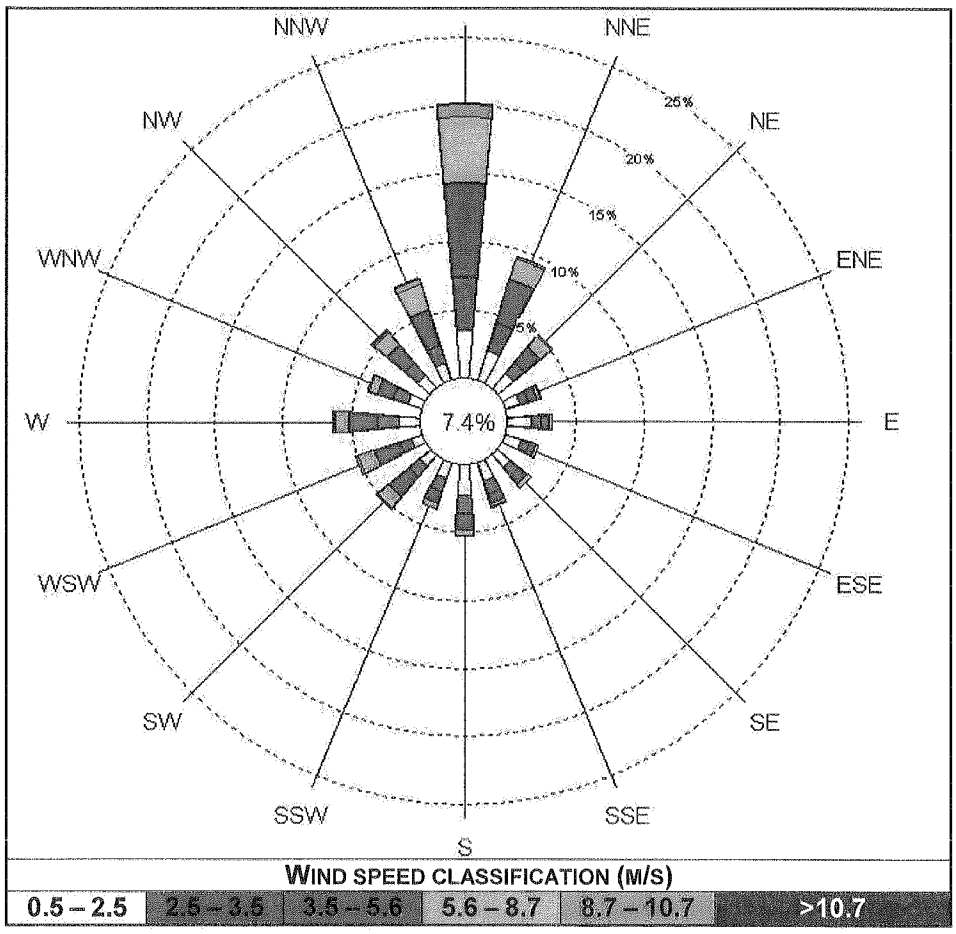
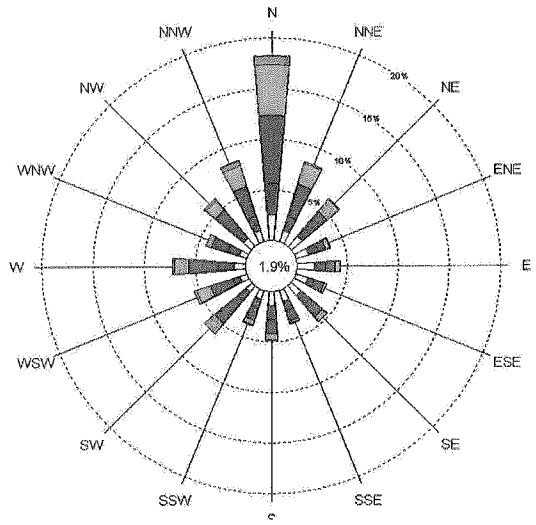
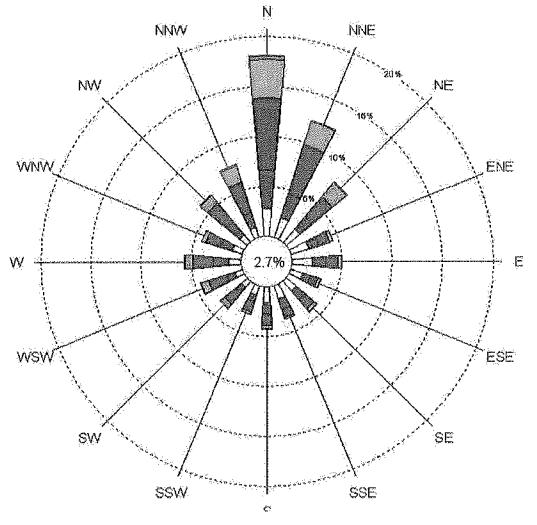


Figure 2-4: Annual Wind Rose for Kimberley Weather Station.

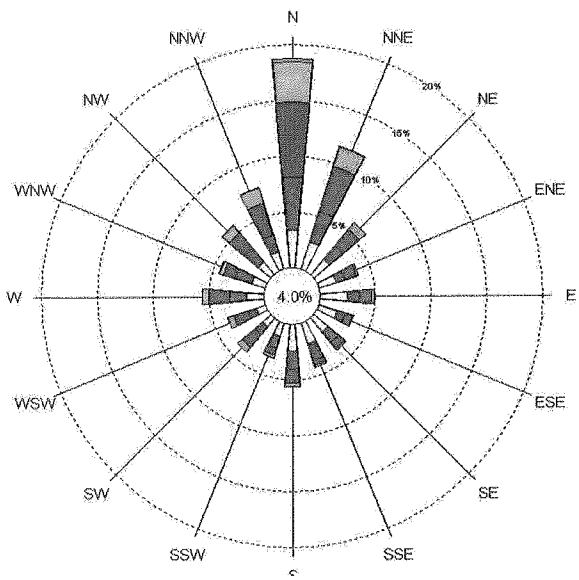
January 1993 – 2004



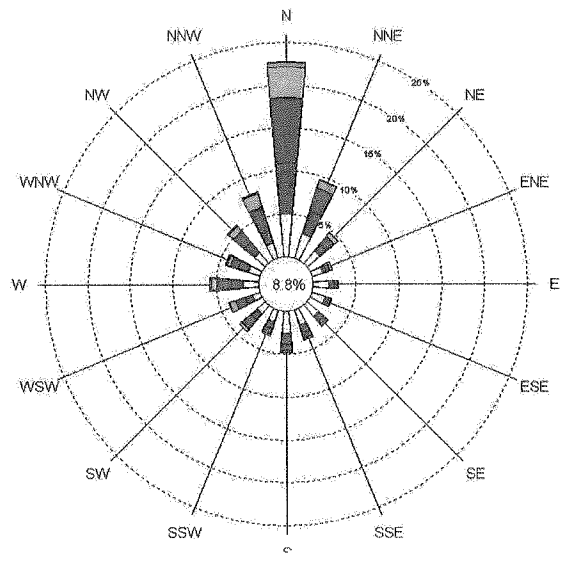
February 1993 – 2004



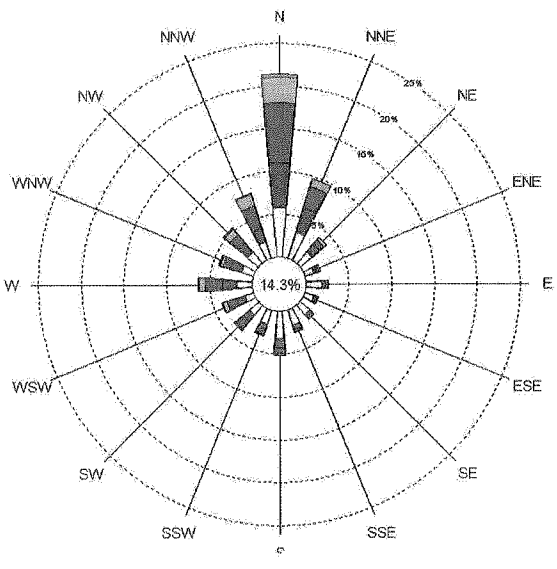
March 1993 – 2004



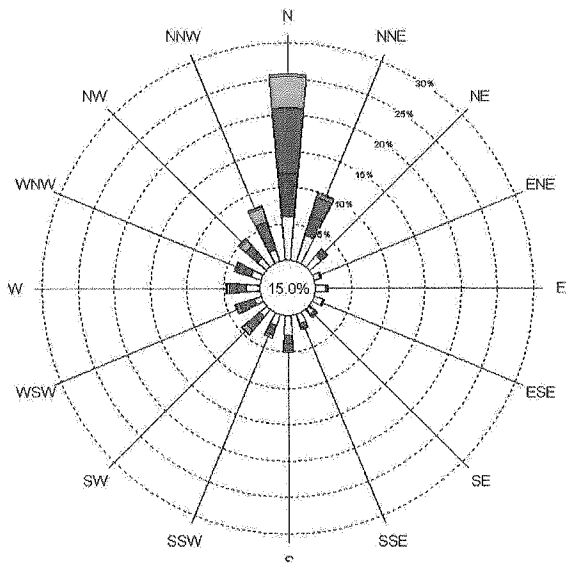
April 1993 – 2004



May 1993 – 2004



June 1993 – 2004



Wind speed classification (m/s)

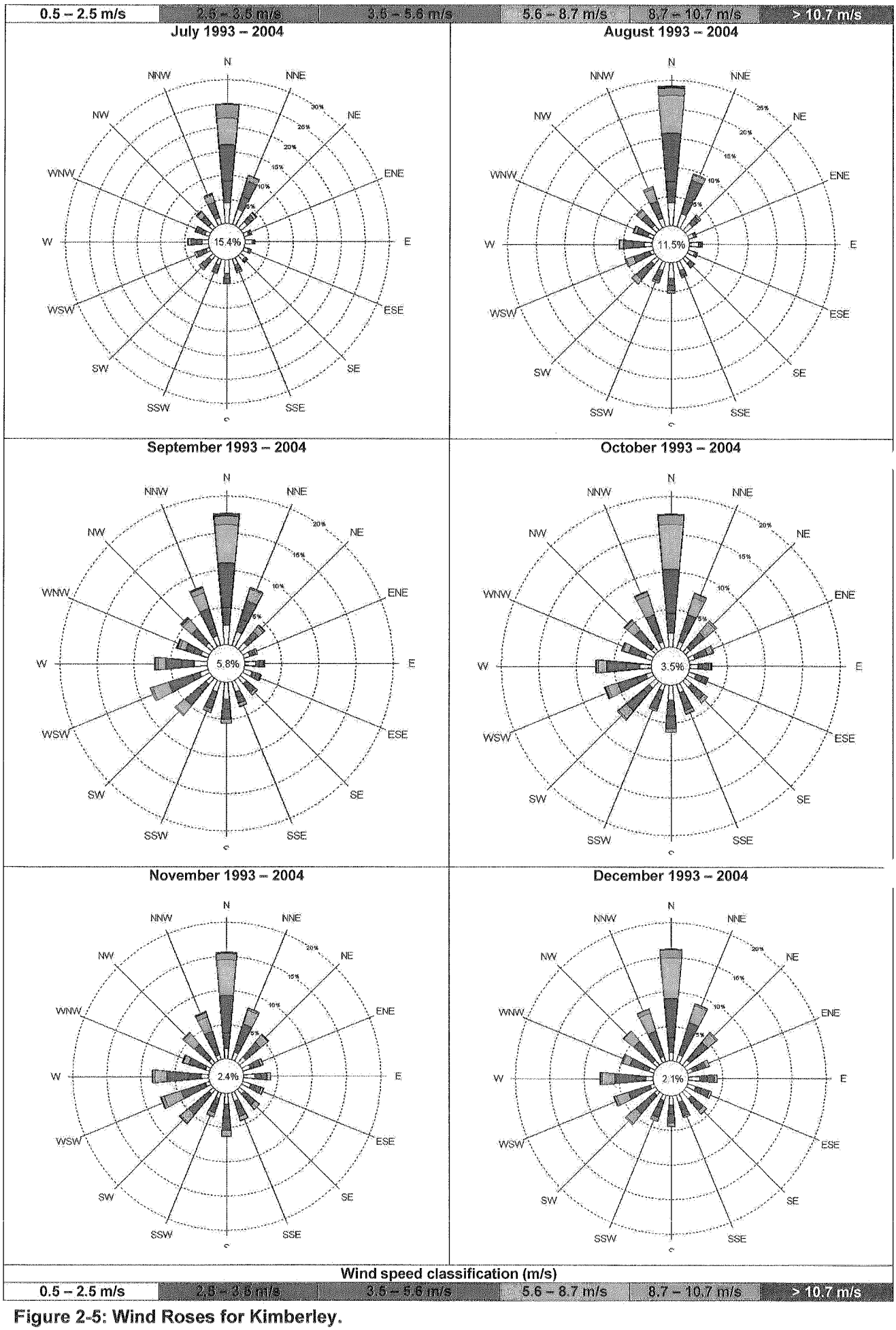


Figure 2-5: Wind Roses for Kimberley.

Ulco weather station has been recording wind direction and wind speed data for the period July 2003 to May 2004. Using this data, the following wind frequency graph has been generated (**Figure 2.6**) for comparison with the wind field data recorded for Kimberly (**Figure 2.4**).

From the 11 month data set, it is evident that the dominant wind direction experience at Ulco is from the west-north-west to north-western sector (300°). Gusts of more than 8.8 m/s were also recorded from these sectors (300° and 310°). Overall, the wind speeds recorded at Ulco are lower than those recorded at Kimberly, with wind speeds greater then 5.7 m/s not being recorded from the north-eastern sector, through the south-eastern quadrant to the south-south-western sector.

The primary difference between the wind field data recorded at Kimberly and Ulco is the dominant wind direction. Although this may be a variation between the two sites, given Ulco's proximity to the escarpment to the West, it must be noted that the wind field data for Ulco has only been recorded for an 11 month period. Over an extended monitoring period, the dominant wind direction may vary. Overall, the frequency and strength of the winds recorded at both stations show similar trends.

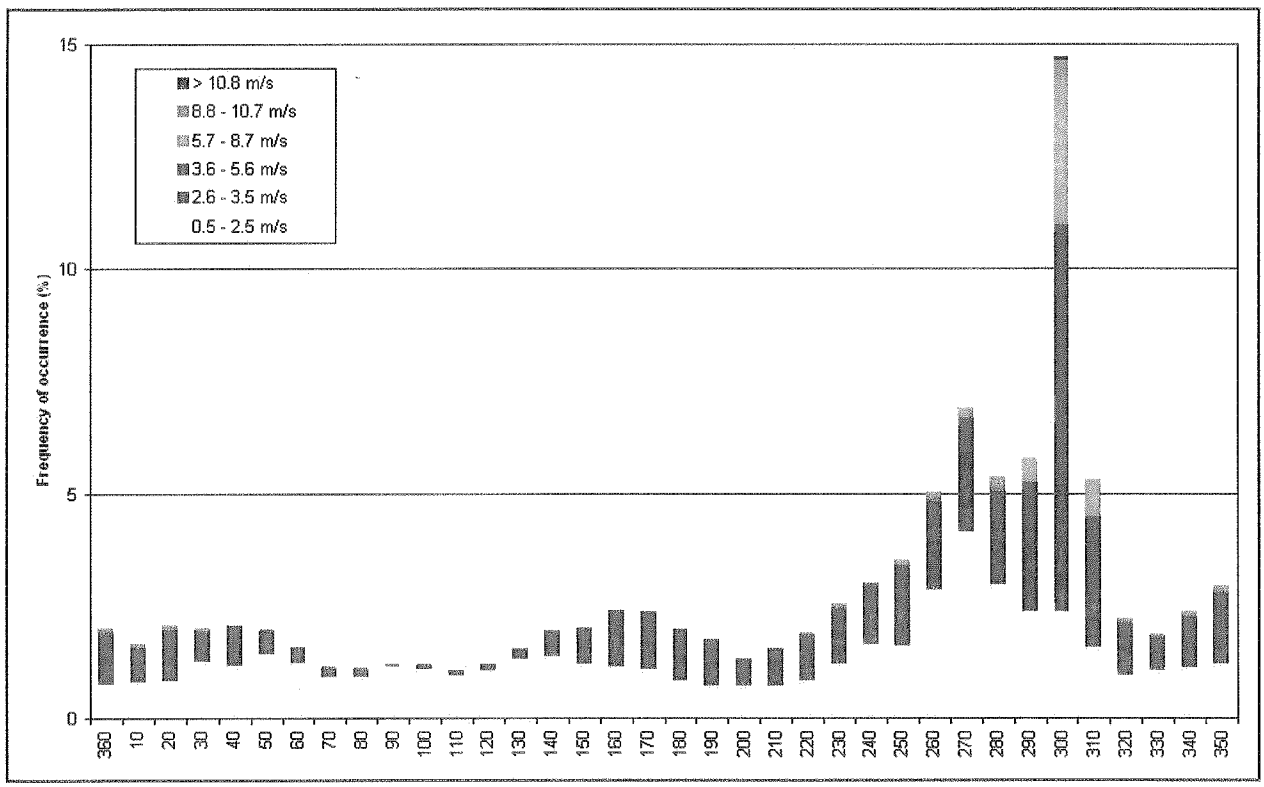


Figure 2-6: Wind frequency graph calculated using wind field data recorded at Ulco Weather Station.

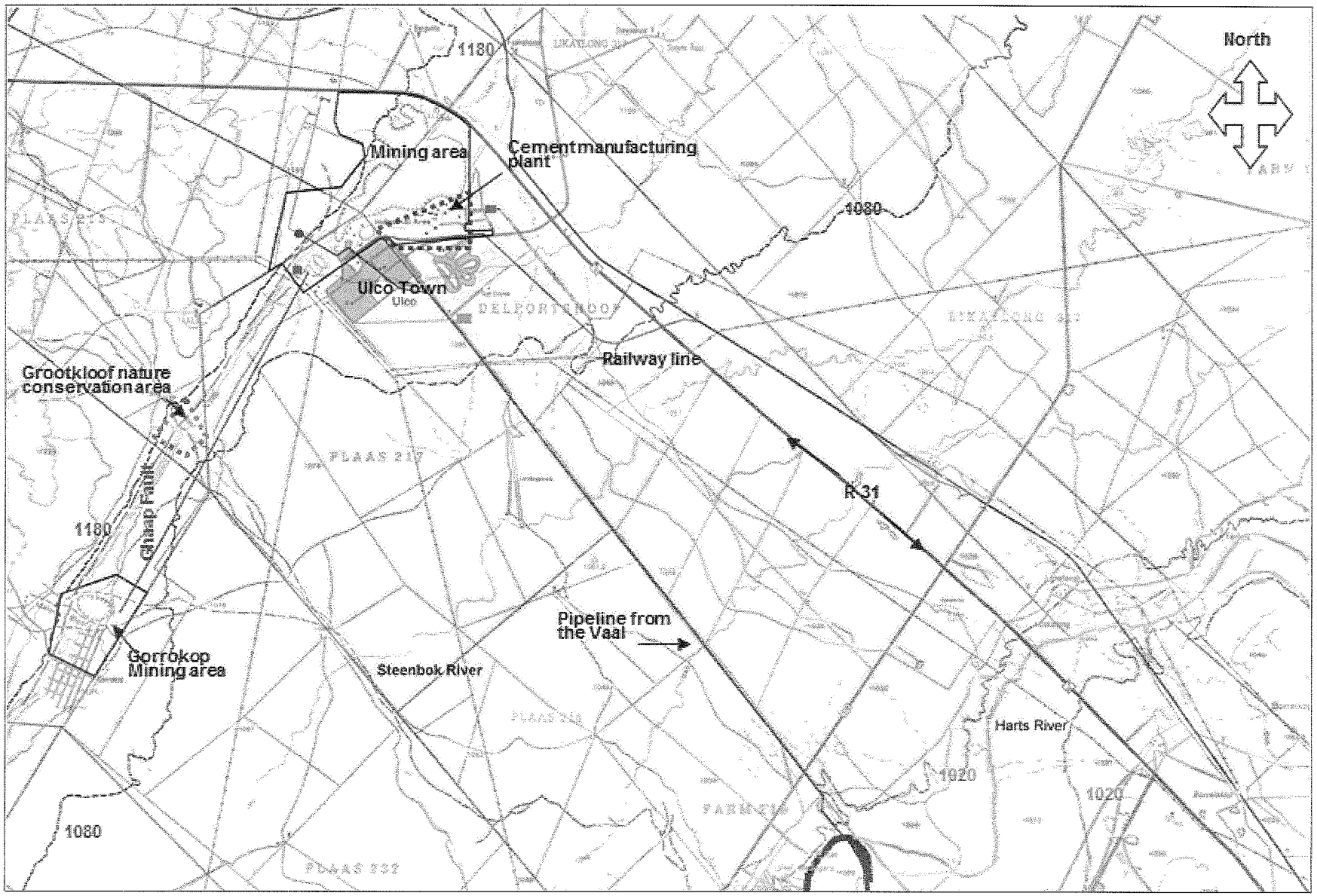


Figure 2-7: Topographical map of the mining environment area

2.3 TOPOGRAPHY & VISUAL CONSIDERATIONS

The area can be described as being essentially flat with two prominent base levels, one below the escarpment, which lies West of Ulco, and the Ghaap Plateau above. The edge of the scarp trends in a North-east South-westerly direction and reaches a maximum exposed height of 100 m some distance South of Ulco. At Ulco and its surroundings, the height of the scarp averages 75 to 80 m, being near vertical except where secondary limestone deposits drape over it such as the Bergville-Harrison quarry area and Gorrokop as well as North of the main tarred road traversing the area.

Beneath the escarpment the land drops gently away from the Ulco township / factory area at a gradient of ± 1:110 (i.e. 90 m over 10 km) eastwards down to the confluence of the Harts and Vaal Rivers. West of the Ghaap Plateau the land rises at an average gradient of 1:60 (122 m in 7 km) in a westerly direction. Small gently rounded hillocks of up to 15 m in height do occur on the escarpment which is incised by many intermittent streams, especially at the escarpment edge.

The natural topography of the area has been altered by the surface infrastructure associated with the Ulco Operation and the mining activities have lowered the topography of mined out areas. See **Figure 2.7** above for an indication of the topography of the area, the contour lines above and below the Ghaap Plateau have been highlighted. **Figure 2.8** below provides a visual indication of the natural topography of the area.

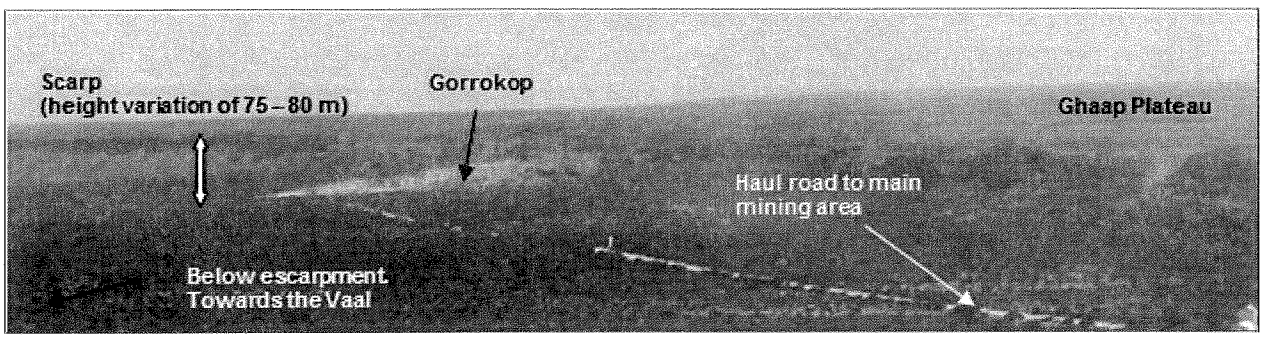


Figure 2-8: Natural topography of the area.

2.4 GEOLOGY

A visual indication of the regional geology can be seen in **Figure 2.9** below. Stratigraphically the area surrounding Ulco is underlain by rocks of the Transvaal, Ventersdorp, and Karoo Supergroups which are tertiary to recent secondary deposits. Lithologically mainly carbonate rocks predominate together with surficial deposits, lavas, and sub-ordinate shale's and dolerites.

Dominating the western portion of the area under review is the Griqualand West Sequence of the Transvaal Supergroup which discordantly overlies the uneven paleofloor of the Ventersdorp lava. Two stratigraphic units, the Campbell Group and Vryburg Formation of the Griqualand West Sequence outcrop in the area in which Ulco is located.

Outcropping prominently in the Western to North-western portion of the area under review, forming the prominent Ghaap Plateau, is the rock sequence comprising the Ulco member of the Ghaap Group. (Transvaal Supergroup – Campbell Rand Sub-Group). The Ulco member is estimated to comprise some 220 m thickness of the estimated 900 to 1 600 m total thickness of the Ghaap formation. This member is comprised of fine, crystalline dolomite with limestone lenses occurring prominently at the base of it. Thin, often highly irregular layers and lenses of chert occur in the Ulco member as well as prominent, highly developed and characteristic, stromatolytic layers.

The Ghaap Plateau formation rests comfortably on the Schmidtsdrift Sub-Group. However, this Sub-Group does not outcrop in the area under review, probably because of the extensive cover of Karoo rocks and in particular calcretes/tufas. However, the formation is known to exist as it has been intersected by boreholes. Shale sequences dominate the Schmidtsdrift formation. It is also characterised by facies changes and great variations in thickness of member units.

The lithologically transitional Schmidtsdrift formation rests on the underlying Vryburg formation which represents a beach deposit on an uneven floor of Allanridge lava. These rocks outcrop in "windows" in the Delportshoop allotment area relatively close to the course of the Vaal River. It is made up mainly of quartzites, grits, siltstones and shales and is highly variable and subject to rapid facies changes.

Subordinate lenses of limestone occur towards the top of this sequence increasing in frequency, extent and persistence as one goes higher in this sequence. The thickness of this formation varies between 30 to 40 m in this area.

Exposed in the quarry excavations at Ulco is a thick sequence of Dwyka shales which have been intruded by various irregular dolerite intrusions. This shale sequence exceeds 65 m in thickness. The dolerites outcrop in the northern to north-eastern portions of the area surrounding Ulco. Shale together with dolerite outcrops a little further North-east.

Ventersdorp lava outcrops increase in prominence towards the south-east of Delportshoop. It should be noted that because of the highly alkaline nature of the limestones, that this material will not have an acid leachate impact on the water quality.

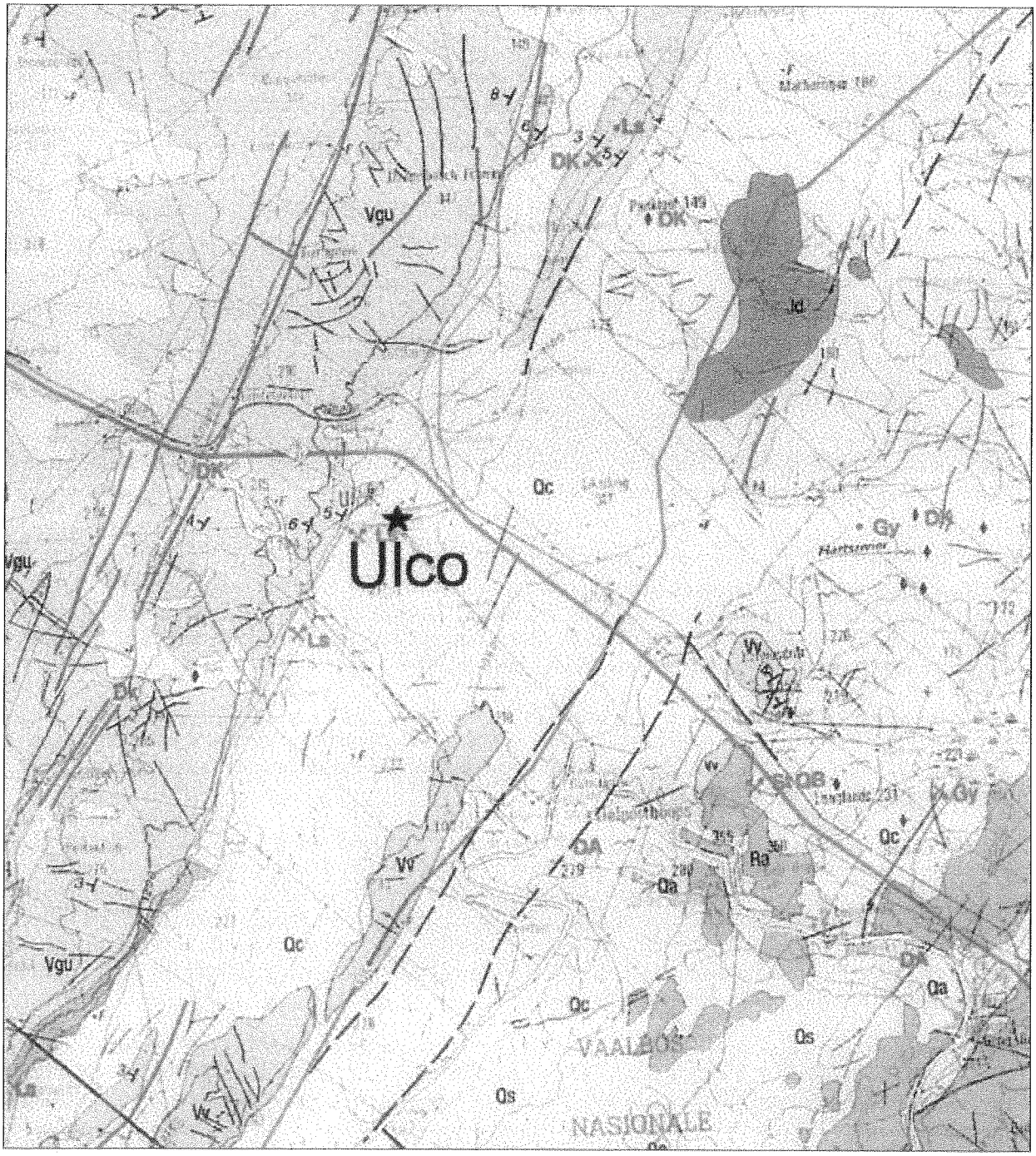


Figure 2-9: Regional Geology (Legend provided in Figure 2.10).

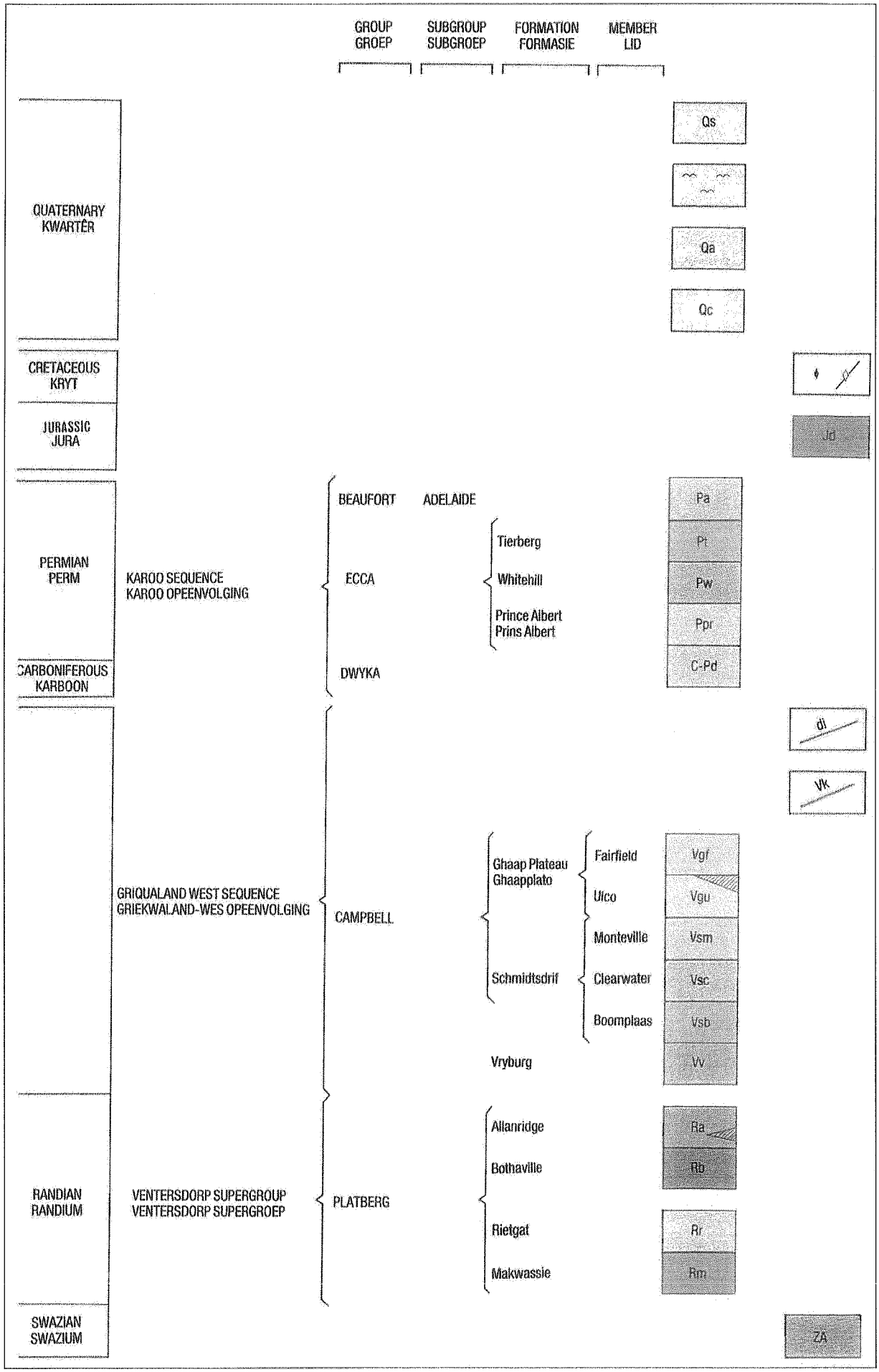


Figure 2-10: Legend for Regional Geology.

2.4.1 Local Geology

A diagrammatic indication of the geology in the area of Ulco can be seen in **Figure 2.11** below. The largest proportion of the limestone deposit being exploited at Ulco for clinker and cement production are of secondary origin. They are geologically very young and occur as a successive pile of relatively steeply dipping irregular overlapping lenses and tongue-like lobes collectively constituting a number of coalescing 'fan-deltas'. These ± 31 000 to 21 000 year old (C^{14} dating on calcite) 'fan-deltas' abut against the north-south trending dolomite scarp of the Ghaap Plateau and rest on what appears to be down faulted Karoo (Dwyka) shales which themselves are irregularly intruded by dolerite sills and dykes.

The surficial 'fan-delta' type calcareous tufas were formed by evaporation and chemical precipitation from shallow wandering surface running streamlets emanating from springs on the edge of the Ghaap Plateau. Besides these, some of the limestone, particularly at the base of the deposit, occurs as a limestone replacement of the decomposed dolerite which formed the paleo-topography at the time of deposition. The calc-tufa carapaces have bedding dips of 40° to 70° (towards the east).

The highest grade secondary limestone exploited is usually porous in habit, commonly displaying the imprints and casts of leaves, reeds, grass and more rarely water fauna such as crabs. Besides the porous limestone there is a compact type which often tends to have wind-blown reddish coloured Kalahari silica sand grains incorporated into it.

Lenses of brecciated limestone, formed by the cementing together of what is believed to be frost-wedged fragments (usually of secondary limestone but also sometimes of primary dolomite and / or shale), and wind-blown silica sand by limestone, occurs throughout the deposit at varying levels as well as infillings in younger paleo-solution cavities. At some localities within the limestone deposit there are fairly thin lenses of uncemented and unconsolidated silica sand, mainly associated with karst features.

The tufa has broadly been subdivided into three units, the first (tufa III) being related to the initial valley incision into the Ghaap Escarpment. The second tufa (tufa II) unit is more impure with much quartz sand and rests upon the first. A prominent breccia terrace separates the second from the overlying third tufa (tufa I) unit which tends to be the most extensive and economically important.

The chemical distribution ($CaCO_3$ and $MgCO_3$ in particular) is related to the structure of the deposit which reflects the mode, intensity and direction of deposition. The limestone tends to be more calcic closer to the source springs and progressively more magnesium rich progressively further (distal to - eastwards) from the springs arising at the upper edge of the Ghaap Plateau.

Primary limestone makes up approximately 30% of the limestone mined for current cement production at Ulco. It is mined in the Ghaap Plateau immediately adjacent to the Secondary limestone quarry. Currently 4 levels are being exploited, one being of intercalated shale which, being relatively high in alkali's, is discarded. The primary limestone is relatively low in silica content but somewhat marginally high in magnesium content for cement production. A judicious mix of the primary and secondary limestone produces a near perfect combination for the production of cement clinker. The following diagram (**Figure 2.11**) summarises the geological situation at Ulco.

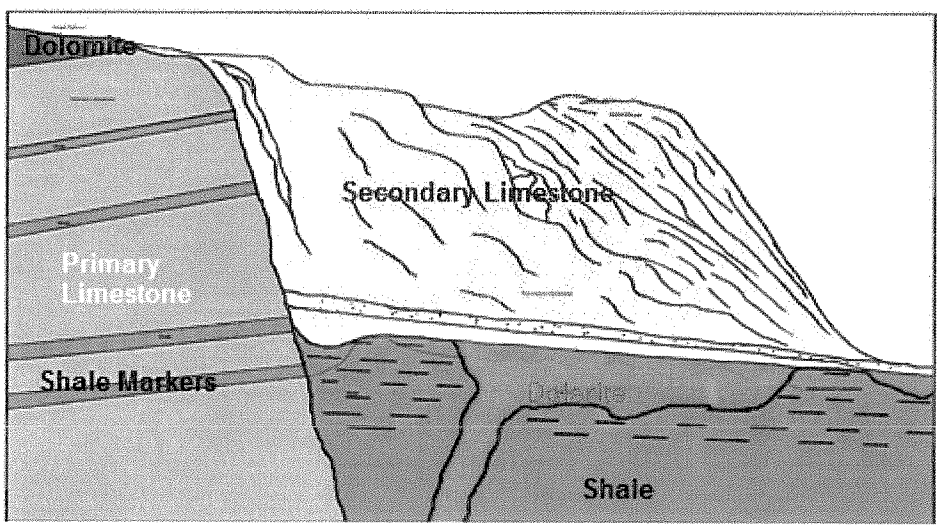


Figure 2-11: Simplified Geological Section through Deposit.

2.4.2 Presence of dykes, sills and faults

Only one fault has been recorded that intersects the quarry and extends beyond the property boundary, and that is the fault that follows the Ghaap Escarpment.

2.5 Soil, Agricultural Potential and Pre Mining Landuse

Nowhere on the site or in the surrounding land is there an abundance of soil. The soil depth over the area varies from 0 cm to a maximum of 30 cm. Over the area of interest, pockets of wind blown sand, sometimes with a limited amount of plant material, constitute the only soil. According to the regional soil map, the whole area falls under the soil type of **Fc.** Soils designated as **Fc** are described as "*lime generally present in the entire landscape*".

Over the secondary limestone, the soil is often limited in occurrence to depressions caused by karst features. Soils forming over this area are from the Etosha Form (**Figure 2.12**) and the Ulco family. See below for a definition of Orthic A, Neocatanic B and Soft Carbonate horizon.

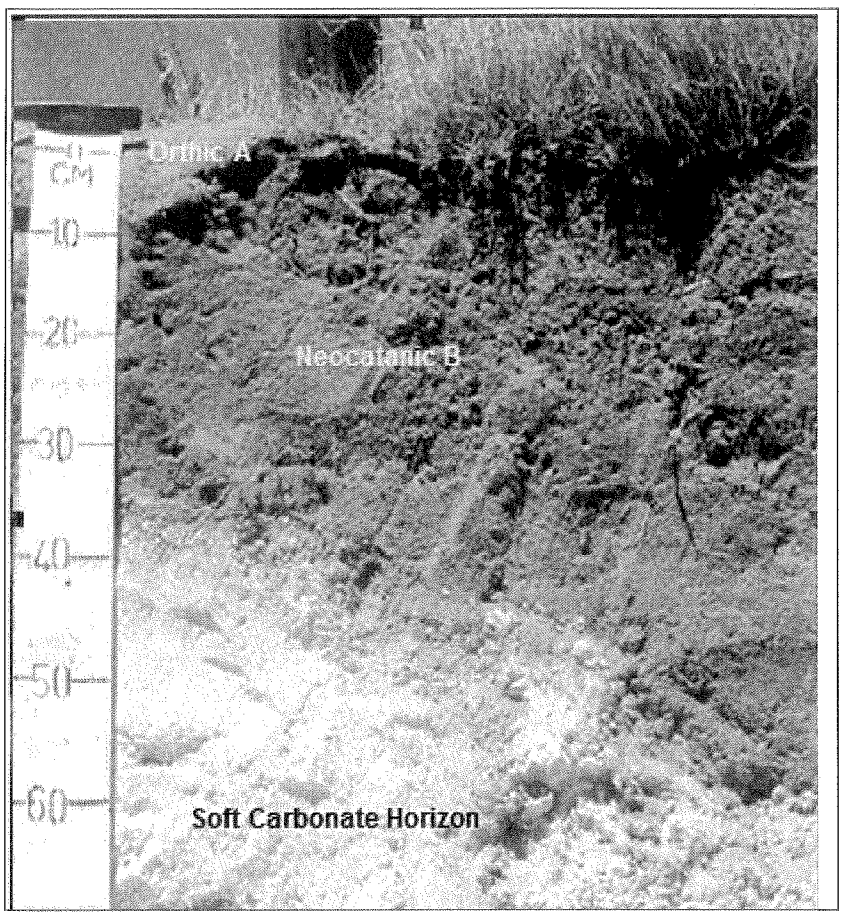


Figure 2-12: Etosha soil form.

Over the primary limestone and dolomites comprising of the Ghaap Plateau and escarpment edge, where soil exists, the soils are mainly derived from Kalahari sands containing some humus. These soils are of the Gamoep Form (**Photo 2.13**) and the Ghaap family. See below for a definition of Orthic A, Neocatanic B and Soft Carbonate horizon.

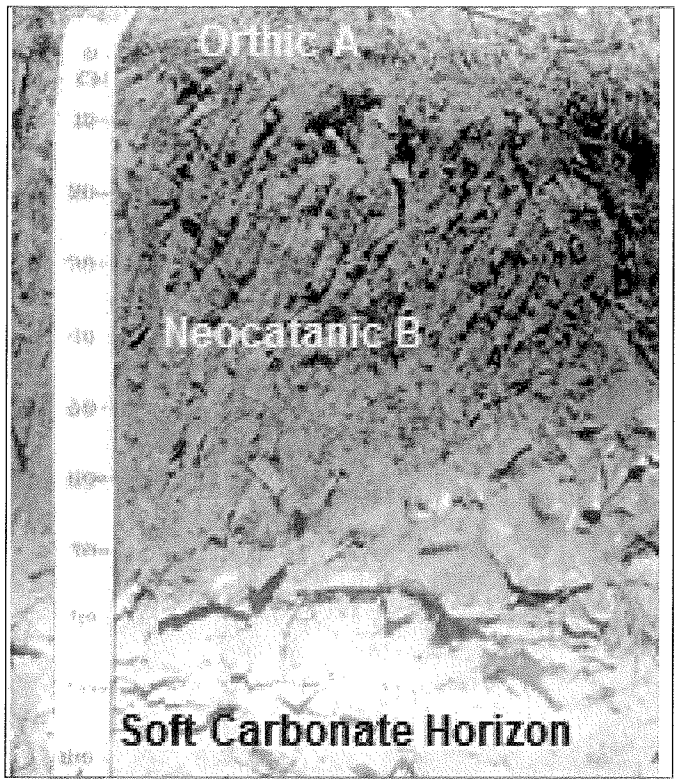


Figure 2-13: Gamoep soil form.

The following definitions of the different soil layers has been extrapolated from the *"Soil Classification – A taxonomic system for South Africa" 1991. By the soil classification working group.*

Orthic A horizon:
A surface horizon that does not qualify as an organic, humic, melanic or vertic topsoil although it may have been darkened by organic matter.

Neocutanic B horizon:
Neocutanic character is recognized when soil formation in unconsolidated materials has not progressed sufficiently far to produce one or another distinctive diagnostic horizon but has brought about a certain amount of reorganization of the material (most frequently there is evidence of an incipient illuvial horizon), and obliterated any depositional stratifications that may originally have been present. Soil formation has been minimal and the horizon is marked by rather weak structural development, the presence of cutans indicating pedogenic reorganization of materials such as clay, aggregation of particles to the extent that the material is no longer single grained (presumably its condition at the time of deposition), or cementation by weathering products and the development of hardness or massiveness.

Soft carbonate horizon:
- Has a morphology which is largely that of the calcium and/or calcium-magnesium carbonates present, whether in powder (here the colour of the carbonates dominates the colour of any non-carbonates present), nodular, honeycomb, or boulder form;
- Unless exposed by erosion, occurs beneath a melanic or orthic A, a red apedal B, a yellow-brown appeal B, a neocutanic B or a neocarbonate B horizon;
- Does not qualify as a diagnostic neocarbonate B horizon, as diagnostic dorbank or as a diagnostic hardpan carbonate horizon.

For the purpose of this document a soil sample was taken of the soil removed ahead of the mining face of the secondary limestone quarry (**Figure 2.14**). This sample was analysis by the Agricultural Research Council. The results of this analysis are presented below in **Table 2.4**.

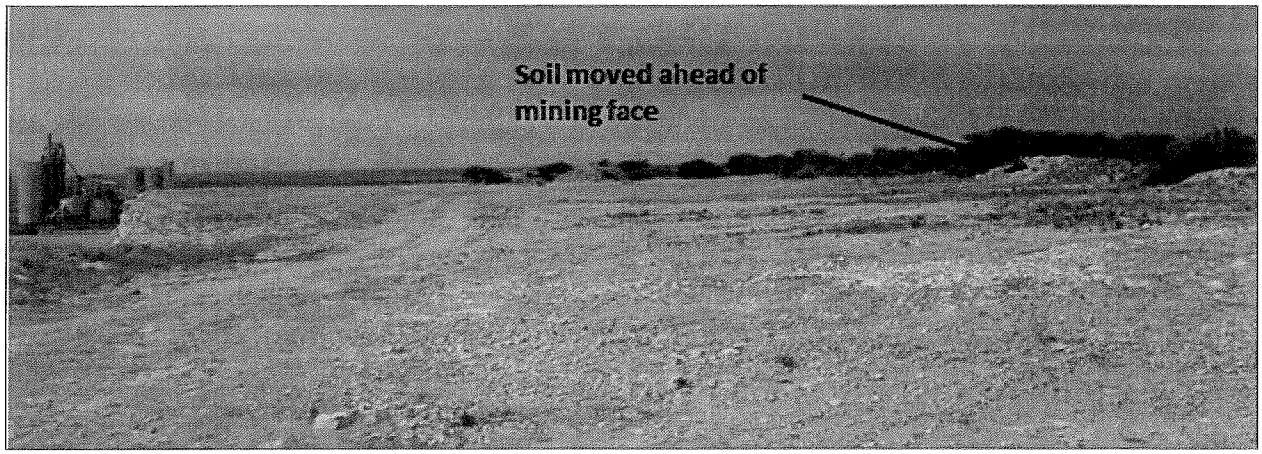


Figure 2-14: Soil moved ahead of working face.

Table 2-3: Soil analysis of the material removed ahead of the mining face.

	Elements										
Sample Number	P mg/kg	K mg/kg	K me/100g	Ca mg/kg	Ca me/100g	Mg mg/kg	Mg me/100g	Na mg/kg	Na me/100g	R ohm	Water pH
S1	0.61	120	0.3069	4407	21.99	188	1.5473	51	0.2218	1600	8.09

The results of the analysis indicate that the natural soil is very low in phosphorus, low in potassium and sodium, high in magnesium and very high in calcium. The water pH of the soil is alkaline. A copy of the results and the recommendation for improving the soil condition for the planting of grass is available at Ulco. It must be highlighted that natural soil of the area, which influence the vegetation type present on the soil, is of poor agricultural quality. Any attempts to alter the chemical and physical properties of the natural soil will encourage vegetation growth which is not endemic to the area.

Based on the analysis results, the report recommends treatment of any soil to be used in rehabilitation.

2.5.1 Pre mining land use:

Historically the area around Ulco was used by San inhabitants for resources such as water and food. (A detailed archaeological assessment is available at the mine) In the past century, before mining took place in the area, the land was used for grazing of cattle, goats and sheep. Since the start of mining in the area in 1936, the predominant use of the surrounding land (6 km radius from) remains as grazing (± 85%) with the Ghaap plateau been demarcated as a wilderness area, which accounts for approximately 15% of the surrounding land.

Figure 2.15 below provides a visual indication of the land use surrounding the mining area.

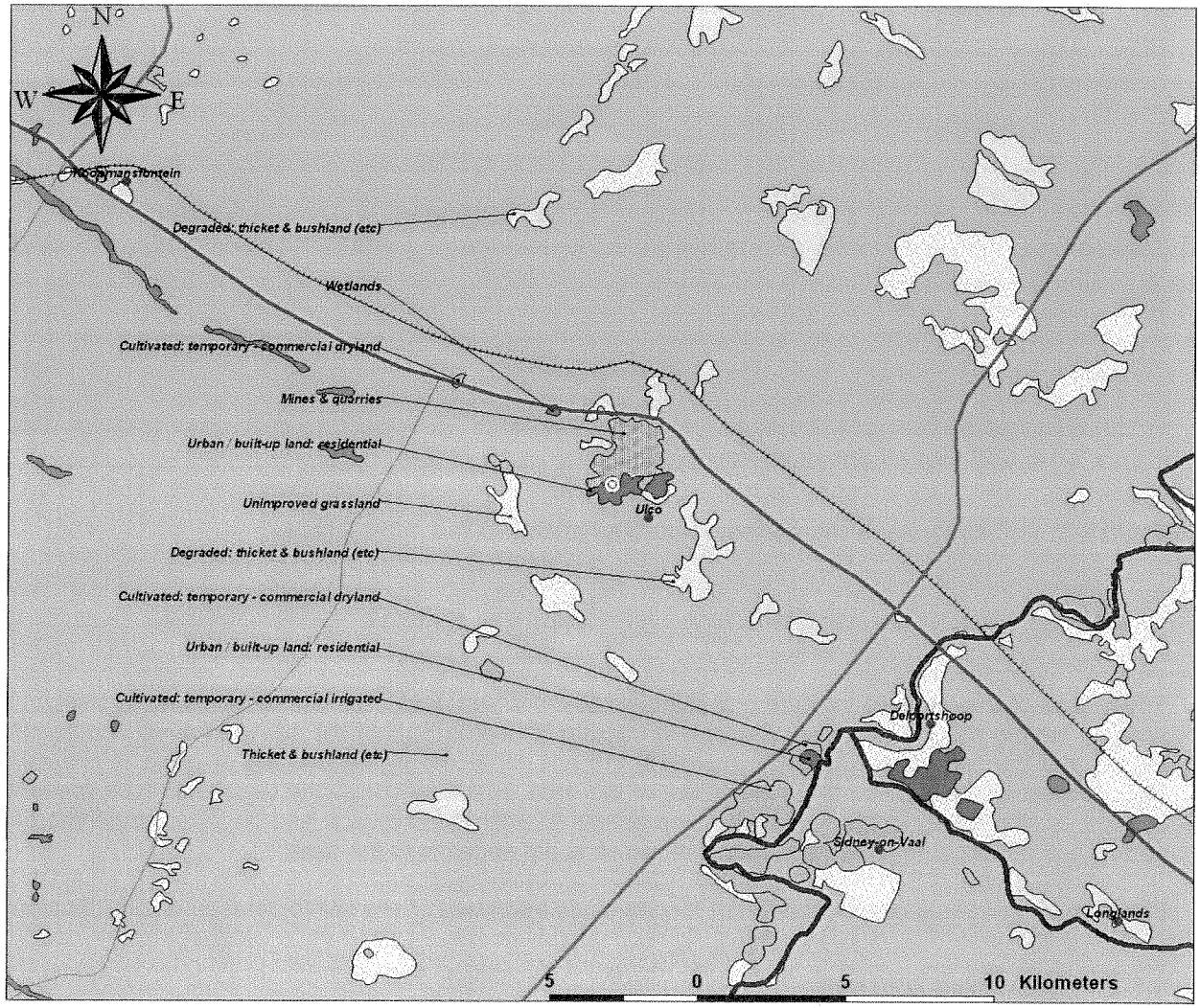


Figure 2-15: Land capability and land cover

2.6 SURFACE WATER

Information concerning surface water has been extrapolated from both the old EMPR and the 2009 Draft Water Use License Application Report (IWULA).

2.6.1 Catchment Characteristics

According to the IWULA the main mining area falls within the **C33C** quaternary catchment while the Gorrokop mining area falls in the **C92A** quaternary catchment. See **Figure 2.16** below. The C33C drainage area comprises an area of 4,147 km^2 and the C92A drainage an area of 3,919 km^2.

The main mining area (Ulco) lies 9 km North-west of the confluence of the Vaal and Harts Rivers and 3.5 km north of the non-perennial Steenbok River, which flows over the Ghaap escarpment at Grootkloof. The Gorrokop mining area is approximately 2.5 km south-west of the Steenbok River and 9.2 km North-west of the Vaal River.

There are a number of seasonal stream beds in the vicinity of the mine, which flow during the "rainy season" after a heavy downpour, but only for a short period of time. **Figure 2.7** above provides an indication of the seasonal rivers and pans in the vicinity of Ulco. According to the WRC (1990) the main Ulco mining area falls within a local endoreic area. A local endoreic area is an area where no runoff normally reaches the river system. Hence it is not expected that any run-off from Ulco would ever reach the Vaal River.

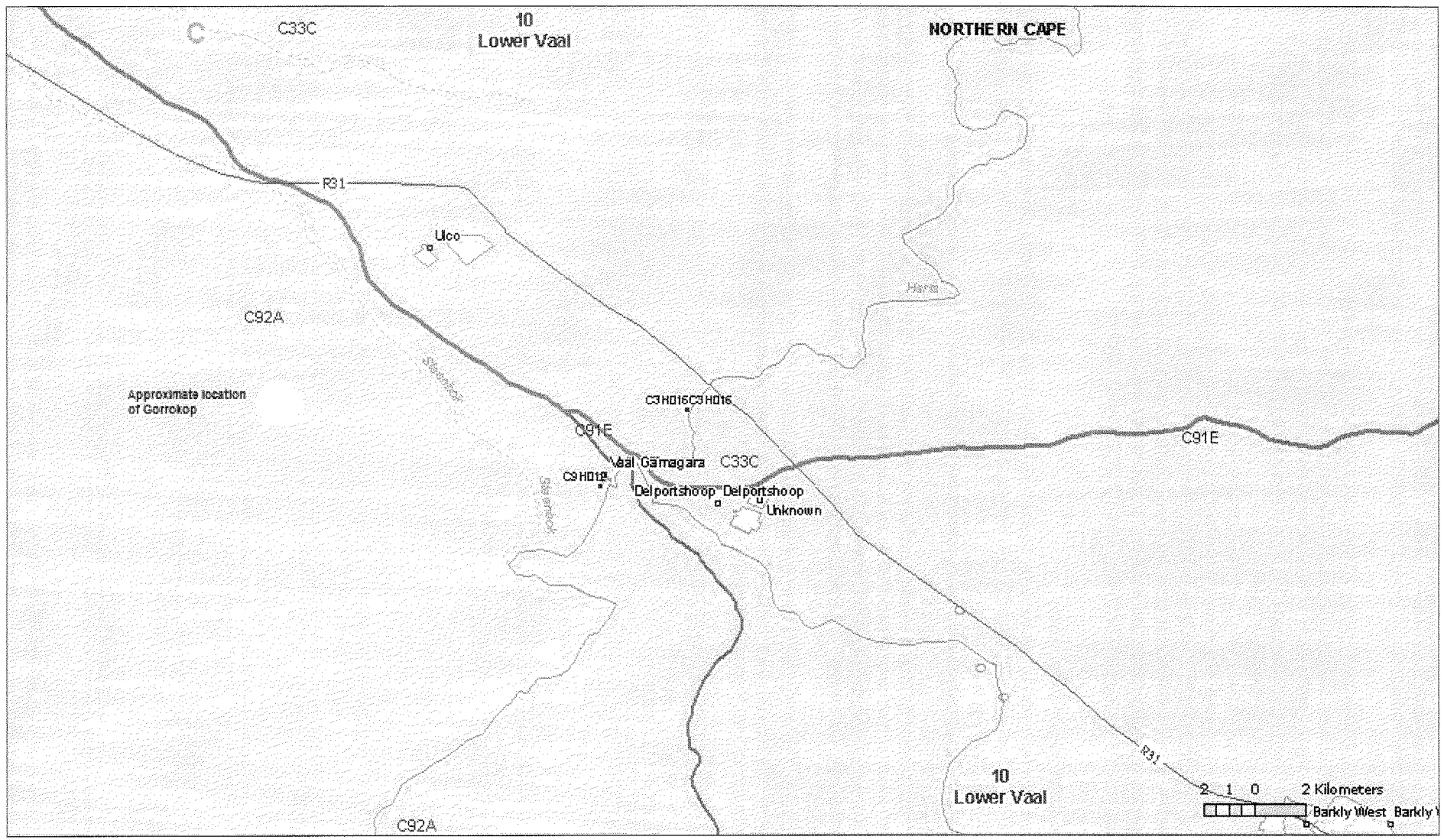


Figure 2-16: Surface Catchment Area.

2.6.2 Main mine sub-catchment characteristics:

Within the main mining area, all surface water is channelled either naturally or by storm water channels to one of two sumps. Sump 1 collects water in the old quarry below the conveyor belt from the primary crushers to the stockpiles. Sump 2 collects water in the south-western corner of the Harrison area.

A berm has been constructed close to sump 2 to ensure that no water from the mining area flows into the plant area. Water from the plant area is directed by a number of storm water drains off the site into the adjoining land. Visual inspection of the vegetation within and surrounding the storm water drains, as they leave the site, shows that the vegetation is comparable to off-site vegetation and has not been affected by the surface runoff from the plant area.

All of the water used by the mine comes from one of two permitted sources. The majority of the water comes from the Vaal River and is purified at the on-site water purification plant. The purified water is used for processing purposes and for portable use. Ground water is extracted from 3 boreholes and used for gardening and watering roads. All sewage is processed at the sewage plant and then the treated water is discharged to the adjacent landowner to use for irrigation purposes.

2.6.3 Storm water delineation

Rainfall on the property is allowed to flow freely again from the property. In general, water flows in a north-west to south-east direction over the property. Three distinct areas (see **Figure 2.17**) can be identified, namely:

- Mainly old working areas that was previously rehabilitated. This area is considered to be clean, and all rainfall falling, and running over this area is allowed to run into the natural veldt.
- The active working quarry areas, including the subsided old quarry area. Due to the topographical layout, most of the rainfall on this area is collected within the one open quarry, or flows towards a dam known as the quarry dam, where it is collected. This water is currently not used, and is allowed to evaporate. This water in general is relatively clean, but does contain suspended solids during flow conditions.
- The operational area. Rainfall in this area is canalised into a formal storm water system to remove it from the operational area. This water is mainly contaminated with suspended solids, and the water is allowed to run into the natural veldt.

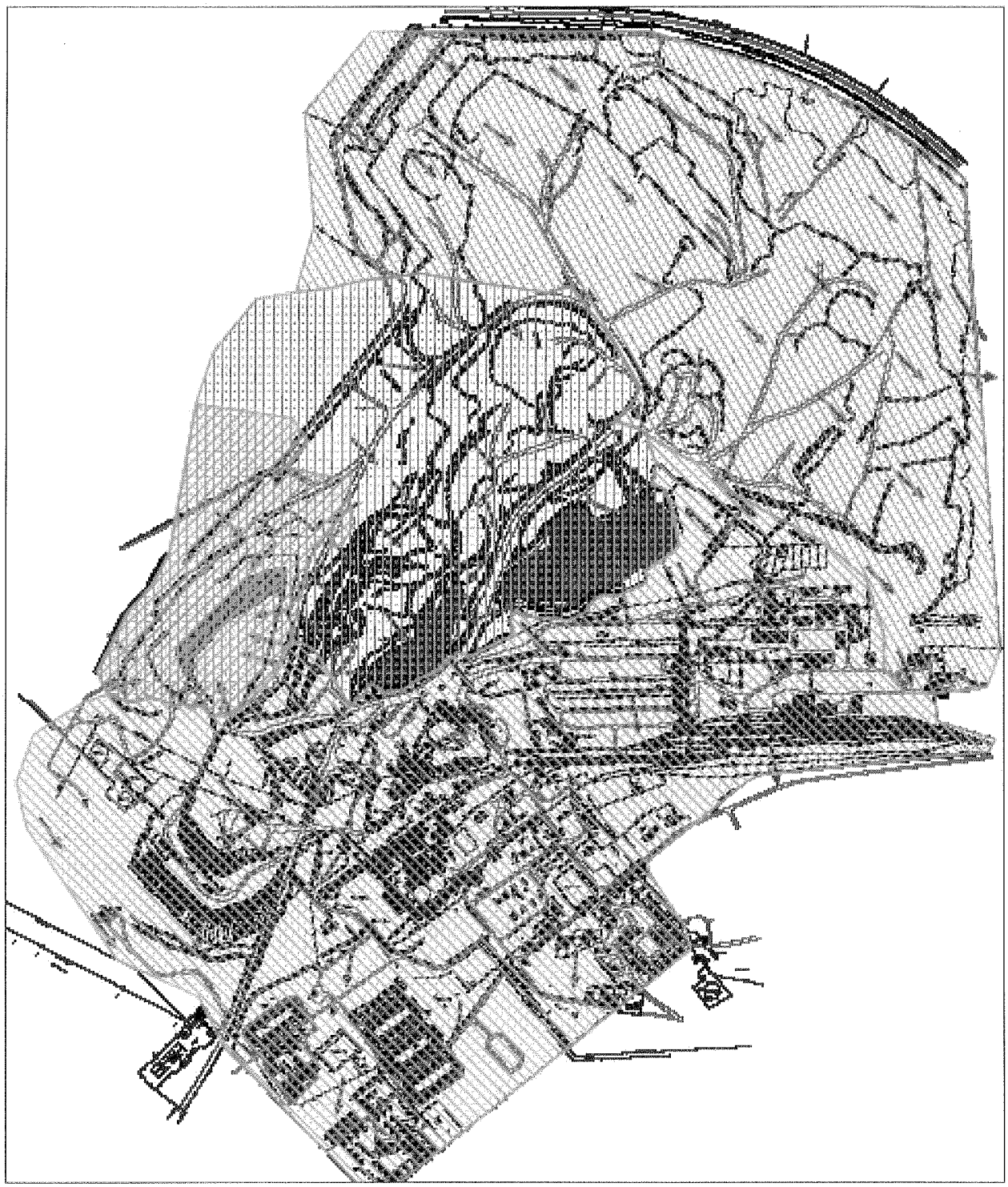


Figure 2-17: Storm water delineation areas within Ulco

2.6.4 Surface Water Quantity

According to the WRC (1990) the area in which Ulco falls experiences between 5 to 10 mm of run-off per year, with none of the run-off reaching any rivers or permanent streams. This is known as an endoreic area. Due to the negligible amount of surface run-off in the area, to date the surface water run-off from Ulco has not been calculated.

The mine however recognises that due to the removal of vegetation and geology over the mining area, the quantity of surface run-off from the mining area increases. For this reason, the mine has created berms along the perimeter of the mining area to ensure that all surface run-off from the mining area runs into one of 2 sumps as described above.

2.8.1.2 Mean Annual Runoff
Since water is not discharged into a river the mean annual run-off is not measured.

2.8.1.3 Normal Dry Weather Flow
During normal dry weather, Ulco has no permanent rivers or streams impacted by the mine. The closest river which flows through out the year is the Vaal River which is situated approximately 9 km South-east of Ulco.

2.8.1.4 Flood Peaks and Volumes
Not applicable. There are no permanent rivers in close proximity to the mine.

2.8.1.5 River diversions
Not applicable

2.6.5 Drainage Density of Areas
The drainage density of the areas disturbed has not been measured. All storm water from the quarry areas is directed to and collected in 2 sump areas, which prevent the water from leaving the mining areas and allows silt and sediment to settle out of the water. Storm water from the plant area flows onto the land between the plant and the township. Storm water from the old plant and waste dump area flows out into the adjacent farm, De Puts, as sheet flow water.

2.6.6 Surface Water Quality
No analysis of the quality of water leaving the mining site has been conducted. The mine does however conduct the following water quality test:

- Every month E. coli and total coliform is tested on the water extracted from the Vaal River, the clear (potable) water after purification and the water discharged from the sewage plant to the adjacent farm land. Results from the latest two months are presented in Table 2.5.

Table 2-4: Bacterial test on water.

Monthly Water Sample Report - 2009									
	River Water			Potable Water			Sewage Effluent		
	Standard Agar Plate Count cfu/ml	Total Coliform Count per 100 ml	Escherichia Coli Type 1 per 100 ml	Standard Agar Plate Count cfu/ml	Total Coliform Count per 100 ml	Escherichia Coli Type 1 per 100 ml	Standard Agar Plate Count cfu/ml	Total Coliform Count per 100 ml	Escherichia Coli Type 1 per 100 ml
January	Innumerable	9	5	0	0	0	Innumerable	0	0
February	Innumerable	118	10	0	0	0	2	1	0
March	300	51	21	0	0	0	0	0	0
April	Innumerable	>201	14	0	0	0	0	0	0
May	Innumerable	816	6	46	0	0	Innumerable	83	31
June	0	41	11	0	0	0	0	0	0
July	34	0	0	104	27	1	16	0	0
August	160	95	3	0	0	0	4	0	0
September									
October									
November									
December									

- Quarterly a full review of the sewage system is conducted. As part of the review a full chemical analysis of the water discharged from the sewage plant is conducted.
- Periodically the drinking water (potable water) from the purification plant undergoes a full chemical and bacteriological analysis to ensure that its quality is within the acceptable quality for portable water as defined by SABS 241.

2.6.7 Surface Water Use

Water for consumption by the mine comes mainly out of the Vaal River and partially from boreholes above the quarry. The operation is permitted to extract ***946 669 m^3*** from the Vaal River and ***192 796 m^3*** from the boreholes per annum. See **Appendix 2** for a copy of the relevant licenses. The quantities of water use by the mine can be seen in the Water Balance Diagram in **Section 3**.

2.6.8 Water Authority

The authority to abstract water from the Vaal River comes from the Lower Vaal Government Water Scheme, however the Vaal-Gamagara Government Water Scheme also abstract water from the Vaal River at a point approximately 1.5 km below the factory pump site.

2.6.9 Wetlands

The only wetland occurring within the areas defined in Ulco's Mining Right is an endoreic pan located approximately 1 km north of the current primary limestone quarry (**Figure 2**). According to Davies and Day (1998), a **pan** is a South African vernacular term for a flat sediment-filled depression (closed basin) that holds water after rain. The pan in the Ulco mining right area can be described as a terminal water body of an endoreic or inwardly draining drainage systems (also known as playas in arid areas). Pans of this nature accumulate salts, and in the case at Ulco, form calcareous pans which support plant species (often range restricted endemics) especially adapted to survive in pan habitats, such as *Ruschia lawsonii*.

There are no natural wetlands occurring in the area demarcated for mining within the next two years. However, as a result of the mine channelling surface water from the secondary limestone quarry into the lowest point within the Harrison area, a man-made wetland has established at this point. The wetland supports a reed-bed, which acts as a natural filter, trapping sediments within the surface run-off generated in the mining area, before the water either seeps out of the mining area or infiltrates.

2.7 GROUND WATER

In 1997 a groundwater flow model was developed for Ulco by the *Institute for Groundwater Studies at the University of the Free State* in Bloemfontein. This report describes the ground water parameters in the vicinity of Ulco and is available at the mine. The purpose of the commissioned research was to:

- To determine the impact of abstraction of water from boreholes in the Bergville area.
- To determine the safe yield of the aquifer.
- To perform a risk analysis on the proposed extraction rates.

During this survey, 10 boreholes around the property were used to provide the necessary information. The location of the boreholes and aquifers in the region are provided in the full report. The mine only extracts water from the 3 boreholes on the Bergville farm.

The study also revealed that the Weltevreden and Kneukel Dykes traversing the region dam up the water behind the escarpment and are responsible for the springs in the area.

Figure 2.18 below provides an indication of the location of both monitoring boreholes and the boreholes on the Farm Bergville used for groundwater extraction.

2.7.1 Depth of Water Table

The average depth of the water table in the vicinity of Ulco is 23 m. The boreholes are labelled BG1 (East), BG2 (Central) and BG3 (West). In all three boreholes, the rest water level and the pump water level has decreased since January 1995 and hence the ground water study was commissioned (*Ground Water Flow Model for Ulco, 1997, Gerrit van Tonder & Riaan Grobbelaar*).

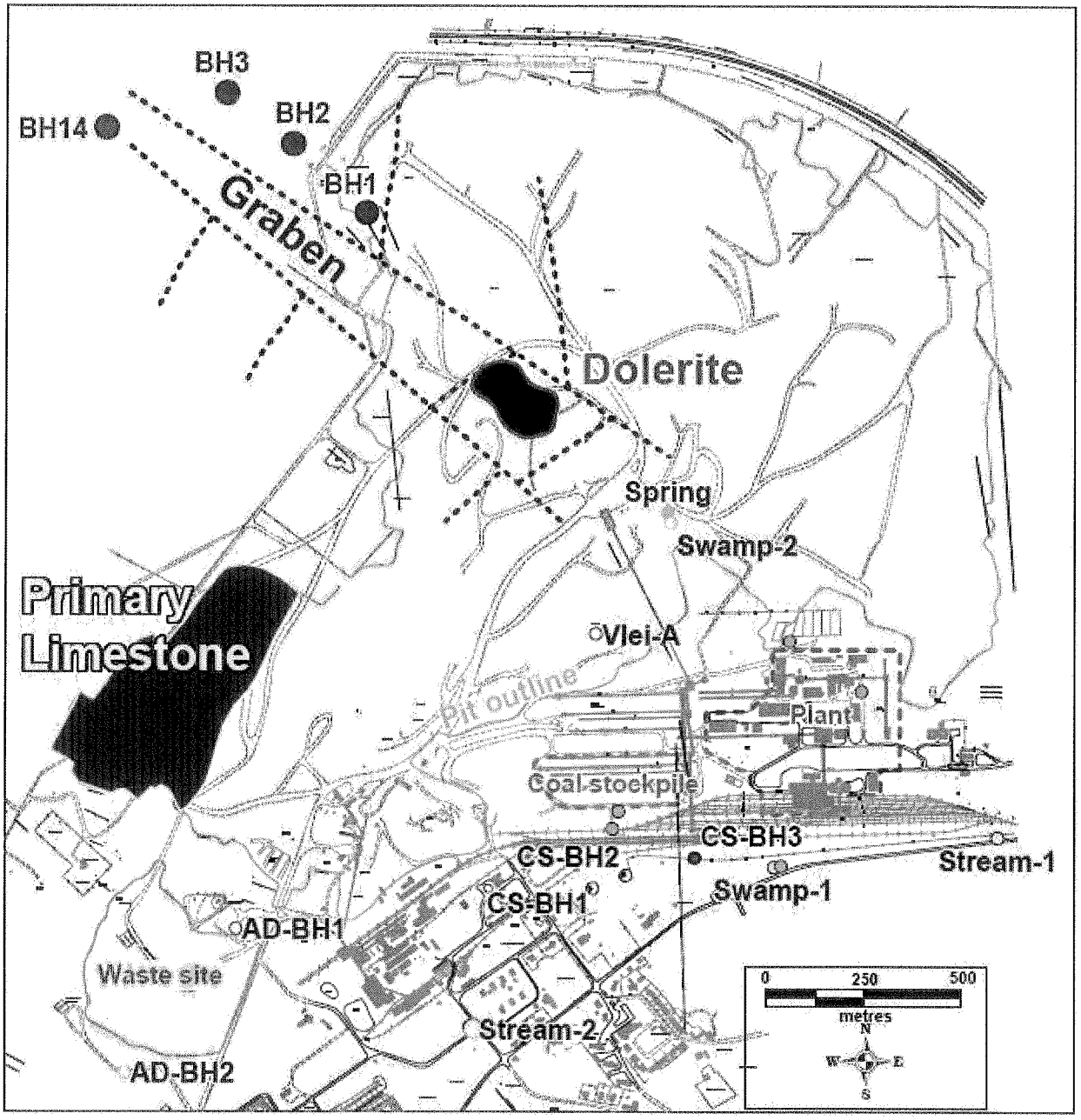


Figure 2-18: Location of both extraction boreholes and monitoring boreholes

2.7.2 Proposed Borehole Yields and Ground Water Use

The predicted safe yield (extraction rate) from the Bergville boreholes is approximately 1 100m^3 / day. For a limited period of time (i.e. one year) water could be extracted at a rate of 3 000m^3 / day.

During 2003, the mine abstracted 417 495 m^3 of ground water, which is an average abstraction of 1 144 m^3 / day. This water is used for gardening and the wetting of the roads for dust suppression. In 2005 the mine has reduced its consumption of ground water to minimal and is mainly making use of the water obtained from the Vaal River.

2.7.3 Ground Water Quality

The quality of the water abstracted from the boreholes is not used for continuous human consumption as it is hard and has a high electro-conductivity. It is for this reason that borehole water is only used for gardening and dust suppression purposes. The quality of the water test is shown in **Table 8**.

Ulco monitors the quality of 6 boreholes, these boreholes are located near the waste sites and downstream of the coal stockpile area and the quarry dam.

Table 2-5: Chemistry of the six boreholes tested for water quality (Feb 2008 – May 20010)

	EC							
	Sample Location						Drinking water standards:	
Date	CS-BH-1	CS-BH-2	CS-BH-3	AD BH-1	AD BH-2	Vlei (Qry Crusher Dam)	Class I (Recommended operational limit)	Class II (Max. allowable)
Feb-08	84.3	86.8	117	118	185		150.0	370.0
May-08	90	87	120	211	104	28	150.0	370.0
Feb-09	88.1	105	125	188	88.1	27	150.0	370.0
Aug-09	93.2	87.7	118	99.8	202	49.4	150.0	370.0
Feb-10	95.3	85.9	95	75.1	199	23	150.0	370.0
May-10	122	85.3	86.5	196	76.9		150.0	370.0

	PH							
	Sample Location						Drinking water standards:	
Date	CS-BH-1	CS-BH-2	CS-BH-3	AD BH-1	AD BH-2	Vlei (Qry Crusher Dam)	Class I (Recommended operational limit)	Class II (Max. allowable)
Feb-08	7.25	7.47	7.34	7.05	6.91		5.5 tot 9.5	<4 en >10
May-08	7.10	7.34	7.13	6.77	7.00	9.20	5.5 tot 9.5	<4 en >10
Feb-09	7.22	6.84	7.19	6.78	7.33	8.63	5.5 tot 9.5	<4 en >10
Aug-09	7.26	7.58	7.3	7.34	7.1	9.21	5.5 tot 9.5	<4 en >10
Feb-10	6.95	7	7.19	6.95	6.78	8.45	5.5 tot 9.5	<4 en >10
May-10	7.11	7.1	6.92	6.79	6.87		5.5 tot 9.6	<4 en >11

	Sulphate							
	Sample Location						Drinking water standards:	
Date	CS-BH-1	CS-BH-2	CS-BH-3	AD BH-1	AD BH-2	Vlei (Qry Crusher Dam)	Class I (Recommended operational limit)	Class II (Max. allowable)
Feb-08	54	57	155	143	283		400	600.0
May-08	51	56	193	399	132	23	400	600.0
Feb-09	145	401	211	388	73	33	400	600.0
Aug-09	65	75	224	134	328	66	400	600.0
Feb-10	182	62	70	94	289	19	400	600.0
May-10	204.7	67.3	61.9	274	69		400	600.0

	Nitrate							
	Sample Location						Drinking water standards:	
Date	CS-BH-1	CS-BH-2	CS-BH-3	AD BH-1	AD BH-2	Vlei (Qry Crusher Dam)	Class I (Recommended operational limit)	Class II (Max. allowable)
Feb-08	23.2	23.64	6.15	37.18	9.21		44.27	88.53
May-08	22.94	24.2	3.34	33.9	13.9	0.92	44.27	88.53
Feb-09	51	0.3	1.9	1.21	25.6	2.2	44.27	88.53
Aug-09	4.88	5.19	0.46	9.48	0.1	0.14	44.27	88.53
Feb-10	1.15	5.14	4.97	5.76	0.32	1.97	44.27	88.53
May-10	1.36	4.69	4.66	0.05	0.83		44.27	88.53

	Iron							
	Sample Location						Drinking water standards:	
Date	CS-BH-1	CS-BH-2	CS-BH-3	AD BH-1	AD BH-2	Vlei (Qry Crusher Dam)	Class I (Recommended operational limit)	Class II (Max. allowable)
Feb-08	0.007	0.025	0.012	0.018	0.009		0.2	2.0
May-08	0.017	0.018	0.013	0.010	0.016	0.055	0.2	2.0
Feb-09	0.016	0.009	0.017	0.017	0.018	0.119	0.2	2.0
Aug-09	0.022	0.019	0.015	0.014	0.027	0.039	0.2	2.0
Feb-10	0.02	0.018	0.026	0.082	0.019	0.024	0.2	2.0
May-10	0.016	0.014	0.017	0.022	0.023		0.2	2.0

	Manganese							
	Sample Location						Drinking water standards:	
Date	CS-BH-1	CS-BH-2	CS-BH-3	AD BH-1	AD BH-2	Vlei (Qry Crusher Dam)	Class I (Recommended operational limit)	Class II (Max. allowable)
Feb-08	0.018	0.036	0.359	0.046	0.303		0.1	1.0
May-08	0.016	0.020	0.388	0.053	0.015	0.030	0.1	1.0
Feb-09	0.024	0.319	1.044	0.29	0.014	0.023	0.1	1.0
Aug-09	0.007	0.007	0.114	0.038	0.37	0.018	0.1	1.0
Feb-10	0.388	0.037	0.04	0.028	0.388	0.005	0.1	1.0
May-10	0.176	0.02	0.026	0.025	0.299		0.1	1.0

	Calcium							
	Sample Location						Drinking water standards:	
Date	CS-BH-1	CS-BH-2	CS-BH-3	AD BH-1	AD BH-2	Vlei (Qry Crusher Dam)	Class I (Recommended operational limit)	Class II (Max. allowable)
Feb-08	185	188	233	335	460		150.0	300.0
May-08	80	75	112	205	108	9.0	150.0	300.0
Feb-09	113	218	115	215	78	16	150.0	300.0
Aug-09	86.3	74	98.4	105.8	193.4	14.7	150.0	300.0
Feb-10	95.3	67.7	83.4	93.1	172.9	17.7	150.0	300.0
May-10	99.7	69.1	71.1	173.7	107.3		150.0	300.0

	Magnesium							
	Sample Location						Drinking water standards:	
Date	CS-BH-1	CS-BH-2	CS-BH-3	AD BH-1	AD BH-2	Vlei (Qry Crusher Dam)	Class I (Recommended operational limit)	Class II (Max. allowable)
Feb-08	271	262	283	233	529		70.0	100.0
May-08	68	63	76	152	66	11	70.0	100.0
Feb-09	71	148	89	147	69	13	70.0	100.0
Aug-09	69.6	67.3	73.2	67.9	138.9	27	70.0	100.0
Feb-10	63.4	58.8	55.7	24.8	112.5	10.8	70.0	100.0
May-10	70.5	56.8	61.6	119	27.7		70.0	100.0

Due to the quality of the water (hard with a high Electrical Conductivity) the ground water is not suitable for continuous human consumption.

2.8 FAUNA

In the ravines on the edge of the escarpment, extending to the actual active quarry areas, a diversity of fauna can still be found, such as Kudu and smaller buck such as duiker. Jackal also frequents this area and possibly caracal. These predators most probably live on the population of rodents that also live in this terrain. In and adjacent to the dumps there is a large population of dassies, while baboons are often seen frequenting the dumps. A great variety of birdlife is also encountered including raptors such as the Goshawk and Black Eagle. The common mammal species, occurring in the area, include:

- Kudu, (*Tragelaphus strepsiceros*)
- Steenbok, (*Raphicerus campestris*)
- Common Duiker, (*Sylivcapra grimmia*)
- Rock hyrax, (*Procavia capensis*)
- Cape Hare, (*Lepus capensis*)
- Scrub Hare, (*Lepus saxatilis*)
- Spring Hare, (*Pedetes capensis*)
- Porcupine, (*Hystrix africaeaustralis*)
- Suricate, (*Suricta surica*tta)
- Slender Mongoose, (*Galerella sanguinea*)
- Small Grey Mongoose, (*Galerella purverulenta*)
- Aardvark, (*Orysteropus afer*)
- Black-backed Jackal, (*Canis mesomelas*)
- Bat-eared Fox, (*Otocyon megalotis*)
- Ground Squirrel, (*Xerus inauris*)
- Chacma Baboon, (*Papio ursinus*)

A variety of rats, mice, gerbils, and bats are also found in the area.

The common reptile species, occurring in the area, include:

- Puff adder, (*Bitis arietans arietans*)
- Cape cobra, (*Naja nivea*)
- Boomslang, (*Dispholidus typus*)
- Geometric tortoise

A few of the common bird species, occurring in the area, are:

- Black Eagle, (*Aquila verreauxii*)
- Pale Chanting Goshawk, (*Melierax canorus*)
- Rock Kestrel, (*Falco tinnunculus*)
- African Hoopoe, (*Upupa africana*)

Many other bird species, such as Weavers, Bishops, Wagtails, Finches, Bulbuls, etc. also occur in vast numbers in the area.

2.8.1 Endangered or Rare Species

No survey has been conducted to determine the presence of any endangered or rare species at Ulco. Due to the nature of mining acting as a deterrent toward the habituating of faunal species, it is unlikely that any endangered or rare species exist on the site.

2.9 FLORA

A detailed survey of the mine was conducted by the Botany Department of the McGregor Museum in August 2000 which identified 162 plant species at Ulco. A copy of this report is available at the mine. In February 2006 a flora specialist was commissioned to identify the protected plant species and the alien vegetation at Ulco. A copy of the 2006 report is available at the mine.

The following extracts have been taken from both the reports. For a complete understanding of the vegetation on the site and within the surrounding area, the reports must be read.

2.9.1 Dominant Species

Ulco lies on the boundary (transitional zone) between the Kimberley Thorn Bushveld (from the Ghaap escarpment Eastwards) and the Kalahari Plateau Bushveld (Ghaap escarpment and plateau). The Kalahari Plateau Bushveld covers 233 909 km^2, and is not represented in any conservation area. The Kimberley Thorn Bushveld, of which 3.1% is conserved covers, 271 026 km^2. The summer rainfall for these vegetation types varies from 250 – 550 mm per annum, with Ulco experiencing an annual average rainfall of 385 mm. The Ghaap plateau and escarpment is physiographically and geomorphologically distinct from the plains, therefore flora composition of these areas is distinct.

Kalahari Plateau Bushveld

The vegetation of the Kalahari Plateau Bushveld of the Ghaap plateau grows on calcareous tufa, dark brown to red sands and acid gravels, underlain by dolomite. Calcareous pans or shallow depressions support plant species especially adapted to survive in pan habitats, a number of which are range restricted endemics such as *Ruschia lawsonii.*

The vegetation is composed of a fairly dense bushveld consisting of shrubs with some tall trees and tree clumps, in mixed grassland. The dominant shrubs are *Tarchonanthus camphorates* (Camphor Bush), *Grewia flava* (Raisin Bush), *Ehretia rigida* (Puzzle Bush) and *Gymnosporia buxifolia.* Common trees often growing together in thickets include *Rhus lancea* (Karee), *Ziziphus mucronata* (Buffalo Thorn) and *Olea europaea ssp. Africana* (Wild Olive). These thickets often include shrubs such as *Acacia mellifera ssp. Detinens* (Black Thorn), *Rhus ciliate* (Fringed Karee) and *Asparagus retrofractus.* Scattered trees of *Acacia tortilis* (Umbrella Thorn), *Boscia albitrunca* (Shephard's Tree) are found, with pure stands of *O. europaea spp. Africana* (Wild Olive) occurring in places. Karoo dwaf shrubs are present. Mostly tall grasses predominate, such as *Themeda triandra* (Red Grass), *Aristida diffusa* (Copperwire Grass) and *Stipagrostis uniplumis* (Silky Bushman Grass).

Kalahari Plateau Bushveld to Kimberley Thorn Bushveld transition

Along the escarpment there is a transition from the Kalahari Plateau Bushveld of the Ghaap plateau to Kimberley Thorn Bushveld, with elements of both vegetation types present. The dominant trees and shrubs are *Acacia tortilis* (Umbrella Thorn), *Acacia mellifera ssp. detinens* (Black Thorn) and *Rhus burchelli* (Kuni Bush). The kloofs are composed of dense woodlands, with characteristic plant species associated with sheltered habitats. These include certain lichens and mosses, a number of herbs, and large shrubs and trees such as *Celtis Africana* (White Stinkwood), *Buddleja saligna* (False Olive), *Ficus cordata* (Namaqua Fig), *Plumbago zeylanica*, and *Melianthus comosus.* Dominant grasses are *Cenchrus ciliaris* (Blue Buffalo Grass), *Heteropogon contortus* (Spear Grass) and *Setaria verticillata* (Bur Bristle Grass).

Kimberley Thorn Bushveld

The vegetation of the Kimberley Thorn Bushveld of the plains is found on sandy to loamy sands underlain by calcrete. It is an open savannah to closed woodland dominated by *Acacia tortilis* (Umbrella Thorn), with *Acacia erioloba* (Camel Thorn Trees) occurring on deep red sands, and scattered individuals of *Boscia albitrunca* (Shephard's Tree) and *Acacia karroo* (Sweet Thorn). Shrubs include *Acacia mellifera ssp. detinens* that forms dense stands in places, as well as *Grewia flava* (Raisin Bush) and *Lycium hirsutum* (Wolwedoring).

Common grasses of the fairly well developed grass layer are *Enneapogon cenchroides* (Nine-awn Grass), *Themeda triandra* (Red Grass), *Eragrostis sp.* (Love grasses) and *Cymbopogon plurinodis* (Turpentine Grass). Dwarf shrubs are common on the dolerite hills.

2.9.2 Endangered or Rare Species

The botanical survey completed in February 2006 concentrated on identifying sensitive species. For a full feedback of the survey refer to the report available at the mine. The following information concerning the various areas surveyed has been extracted from the survey.

S1 - Gorrokop

Populations of three protected species were recorded at Gorrokop, on the escarpment above the quarry.

- Vleilelie, *Nerine laticoma* (family Amaryllidaceae) - S 28°22'24.1", E 24°09'51.7"
- Gifbol, *Ammocharis coranica* (Amaryllidaceae) – S 28°22'19.9", E 24°09'46.5"
- Shepherd's tree *Boscia albitrunca* grow scattered along the escarpment and in the kloofs, and some individuals occur in the mapped sensitive habitat S1.

- The endemic *Rhus tridactyla* (endemic to the Ghaap plateau, Asbestos Hills and Langeberg mountain areas) grows on the top of the escarpment and individuals occur in S1.

S2 - Grootkloof

The Ghaap plateau escarpment kloofs and watercourses are sensitive habitats, as they comprise a small component of the escarpment and support species, such as White Stinkwood *Celtis africana,* mostly confined to these habitats in this region. These habitats form less than 10% of the transitional zone (escarpment) between Kalahari Plateau Bushveld and Kimberley Thorn Bushveld. At a broader scale, if the kloofs are included as habitats of the Kalahari Plateau Bushveld or the Kimberley Thorn Bushveld, they only comprise approximately 0.05% of these vegetation types. These kloofs, with moderated climates, could provide a refuge for plant species during climate changes. Such refugia buffer regions against loss of species and act as isolating mechanisms, promoting the evolution of new species. Therefore, from an ecological perspective it is important to continue conserving the Grootkloof area, and it can form part of an offset area to compensate for habitat loss due to mining at Ulco.

Populations of the following species of conservation importance are present:

- *Adenia repanda* (Red data listed) - S 28°20'57.7", E 24°10'51.8".
- *Boscia albitrunca* (scattered individuals).
- *Rhus tridactyla* (endemic) grows on the top of the escarpment.

Airfield

A small population of *Nerine laticoma* (vleilelie) was recorded on the northern side of the runway. This area needs to be protected from mowing or clearing to protect the species.

S4 – Water pipeline servitude

Approximately 3 km along the servitude a population of *Nerine laticoma* (vleilelie) grows between the fence and the water pipeline (mapped as S4 in Figure 2). A few *Aloe grandidentata* were recorded near this area. Other scarce species such as *Bulbine frutescens* also grow at intervals next to the pipeline. The servitude, running along a topographic gradient from the higher plains below the Ghaap escarpment to the Vaal River at the pump station, forms a reserve for sensitive plant species that may be lost due to overgrazing and habitat loss on either side of the servitude.

Veld next to church in village east

This patch of veld is in a good condition and supports a few protected species, namely:

- *Boscia albitrunca* (a few scattered individuals).
- A few individuals of *Sarcostemma viminale* (melktou).
- *Aloe grandidentata* – S 28°19'35.9", E 24°13'03.5". This aloe is also found in the open central areas of circles 2 and 4 in village east, as well as on the golf course. When the invaders such as *Opuntia* spp. are cleared in these areas, the teams must be made aware that these aloes are not to be removed or cleared and are not invaders.

Veld to north-east of village petrol station

A small population of *Aloe hereroensis* is present in this portion of natural veld, at S 28°19'32.2", E 24°12'49.2". If this area needs to be developed, these aloes can be relocated to other areas with identical habitat and soils.

Fortunately none of the above areas are within the area demarcated for future mining.

To avoid or minimise the loss of biodiversity, it is recommended that sensitive habitats containing species of conservation importance are adequately protected and not impacted upon. However, if there is no alternative but to relocate or destroy the listed species, permits are necessary.

2.9.3 Invader or Exotic Species

Twenty three (23) invasive plant species were recorded at during the survey of which the dominant invaders includes *Prosopis glandulosa* (Mesquite), *Salsola Kali* (Russian Tumble Weed), *Nicotiana glauca* (Wild Tobacco), *Pennisetum setaceum* (Fountain Grass), *Eucalyptus camaldulensis* (Red River Gum) and *Schinus molle* (Pepper Tree). A full list can be found in the report available at the mine.

The report at the mine provides an indication of priority invasive plant species required for future eradication. The recommendations in this report should be implemented by the mine.

2.10 AIR QUALITY

Ulco is located in the arid Kalahari / Karoo region and the base line air quality at Ulco (excluding impacts resulting from the operation) can be considered good, given that there are very few sources of pollution in the vicinity of Ulco. The primary source of atmospheric pollution is dust, particularly during the dry windy periods. The source of dust is both natural, due to the sparse natural vegetation covering, and as a result of human activities, such as diamond digging along the Vaal River and vehicle entrained dust from unpaved roads.

Ulco represents a source of atmospheric pollution, in the form of dust from both the mining operation and the cement plant. Other gaseous emissions from the stacks are also a source of atmospheric pollution.

2.10.1 Dust

Environmental dust monitoring campaign is guided by the requirements of SANS 1929. According to this standard the dust fallout within the boundaries of Ulco should be within the "industrial band" and fallout off site should fall within the "residential band". See **Table 2.6** below for an indication of the band levels.

Table 2-6: Four band scale and evaluation criteria for dust deposition - SANS.

CLASSIFICATION	DUSTFALL RATE (30 DAY AVERAGE)	COMMENT
"Residential"	Less than 600 mg/m^2/day	Permissible for residential and light commercial.
"Industrial"	600 – 1 200 mg/m^2/day	Permissible for heavy commercial and industrial.
"Action"	1 200 – 2 400 mg/m^2/day	Requires investigation and remediation if two sequential months lie in this band, or more than three occur in a year.
"Alert"	More than 2 400 mg/m^2/day	Immediate action and remediation required following the first incidence of this dustfall rate being exceeded. Incident report to be submitted to the relevant authority.

Ulco has for a number of years implemented a dust monitoring campaign through the recording of dust fallout levels making use of dust buckets. Historically 8 locations were used however due to the fact that the fallout levels have consistently been below "residential" levels, the number of dust buckets has recently been reduced to 5. See **Figure 2.19** for an indication of the location of the dust buckets.

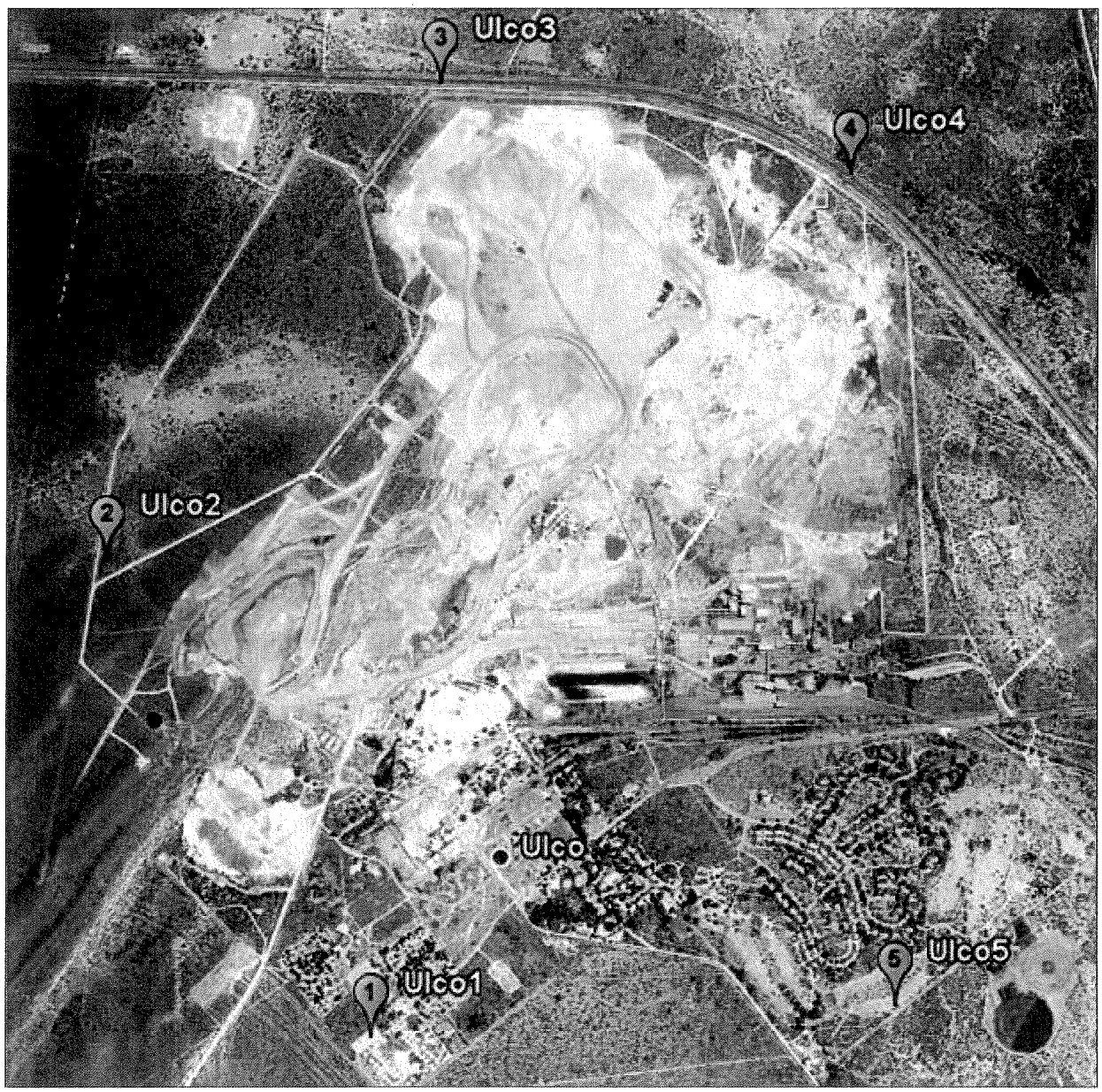


Figure 2-19: Location of dust buckets

2.10.2 Other Emissions

As recognition of the potential impact from other gaseous emissions, Ulco commissioned research into its impact on air quality. *"Alpha Cement – Ulco air emissions and air quality impact assessment near Kimberley"* has been developed by Airshed Planning Professionals (Pty) Ltd. A full copy of the report is available at the mine. The following insert has been taken from the executive summary of the report (APP, 2003).

CONCLUSIONS

The main conclusions may be summarised as follows:

1. The inhalable particulate concentrations (PM10) were below the daily and annual average current DEAT guidelines and proposed South African limits with highest offsite concentrations at 60 µg/m³ and 14 µg/m³ respectively. Highest daily predicted concentrations however, exceeded the EC limit by 20%;
2. Gaseous concentrations for nitrogen oxide did not exceed the current DEAT guidelines with highest predicted offsite concentrations measured at 430 µg/m³, 120 µg/m³ and 18 µg/m³ for highest hourly, daily and annual averaging periods respectively;
3. Predicted nitrogen dioxide ground level concentrations were below the current DEAT guidelines, proposed South African limits and EC limits with highest levels measuring 22 µg/m³, 6 µg/m³ and 0.9 µg/m³ for highest hourly, daily and annual averaging periods respectively;
4. Highest predicted hourly carbon monoxide ground level concentration was 0.43% and 0.57% of the current DEAT guideline and proposed South African limits respectively;
5. The highest predicted benzene ground level concentration (0.08 µg/m³) for current operating conditions was within the proposed South African limit and EC limit of 10 µg/m³ and 5 µg/m³ respectively;
6. Predicted lead concentrations were insignificant when compared to the current guidelines and EU and proposed South African limits;
7. From the predicted trace metal concentrations, all carcinogenic pollutants were predicted to cause less than 1 in 100 000 chance of cancer with the exception of chromium VI (giving a risk of 1 in 606 000 to 1 in 51 300) when compared to the WHO unit cancer risk. An acceptable risk is regarded to be 1 in 100 000.;
8. Dioxins and furans were below the relevant guidelines.

2.11 Noise

An environmental "Perimeter Noise Survey" has been completed for the Ulco in 2008. **Figure 2.20** provides an indication on where the noise measurements were taken from. **Table 2.7** provides an indication of the acceptable levels of noise for the various categories of areas.

Table 2.8 below provides an indication of the results of the survey. A full copy of the report is available at the mine on request.

The results indicate that the environmental noise levels recorded on the boundary of Ulco are acceptable for mining operations which can be classified as an industrial activity.

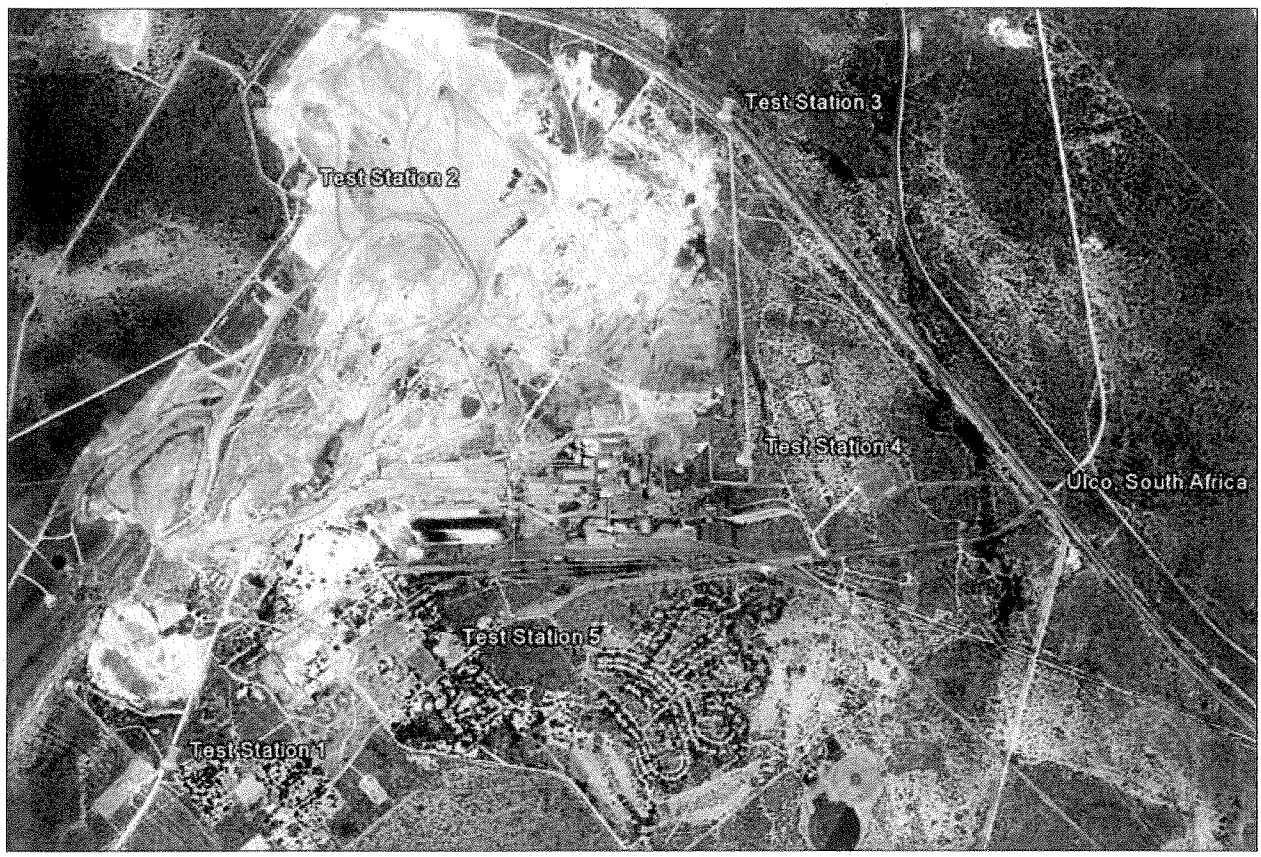


Figure 2-20: Noise monitoring points

Table 2-7: Typical rating levels for ambient noise levels

Type of district	Outdoors		
	Day	Evenings /weekends	Night
Rural	45	40	35
Suburban with little road traffic	50	45	40
Urban	55	50	45
Urban with some workshops, business premises and main roads	60	55	50
Central business	65	60	55
Industrial	70	65	60

Table 2-8: Feedback from environmental noise survey (2008)

TEST STATION	DAY TIME NOISE LEVEL	EVENING NOISE LEVEL	NIGHT TIME NOISE LEVEL
Test Station 1	49.8 dBA	55.8 dBA	48.1 dBA
Test Station 2	56.0 dBA	46.8 dBA	43.4 dBA
Test Station 3	46.6 dBA	54.8 dBA	40.8 dBA
Test Station 4	51.1 dBA	46.0 dBA	40.8 dBA
Test Station 5	56.3 dBA	43.0 dBA	47.0 dBA

2.12 SITES OF ARCHAEOLOGICAL OR CULTURAL INTEREST

An archaeological and cultural survey was carried out by the McGregor Museum in August 1999. The full report is available at the mine. The following information has been extrapolated from the report. Three separate areas were assessed for archaeological importance, namely:

- Gorrokop:

Later Stone Age and Middle Stone Age material was found on the surface in the general vicinity of two springs at the crest of the escarpment. This spring is located 3 km from the current active mining operation. The grave of Adam Jonkers, dated 1894 is also close to the springs in question.

- Grootkloof:

Stone artefacts were found in fair profusion on the slopes of the escarpment in the vicinity of the hut built by the mine manager in 1963. On the Southern side of the kloof, which is conserved by the mine as a nature reserve, three localities containing finger paintings of exceptional quality have been identified. These painting have been described as "the best preserved in the area" and are amongst the most elaborate of their kind along the Ghaap escarpment (Morris, 1999).

- Present Mining Operation:

Surface areas adjacent to and up-slope from the existing quarries were inspected for traces of archaeological material.

2.13 REGIONAL SOCIO-ECONOMIC STRUCTURE

The information concerning the socio-economic information has been extrapolated from the social and labour plan for Ulco.

Ulco operation is located within the Northern Cape Province, the Frances Baard District Municipality and Ward 6 of Dikgatlong Local Municipality. The majority of the labour used by Ulco is sourced from Dikgatlong Municipality (79%) and more specifically the towns of both Ulco and Delportshoop. Due to the rural location of Ulco and the fact that the majority of labour is sourced locally, all the focus of this socio-economic information is focused in the Dikgatlong Local Municipality. There are 7 different wards in Dikgatlong of which Ulco falls within Ward 6. The background information provided below concentrated on providing an indication of the socio-economic status of both Dikgatlong Municipality and Ward 6 of Dikgatlong. Dikgatlong Municipal building is situated in Barkley West.

Figure 2.21 below provides a visual indication of the location of Ulco in respect to the Dikgatlong Municipal area.

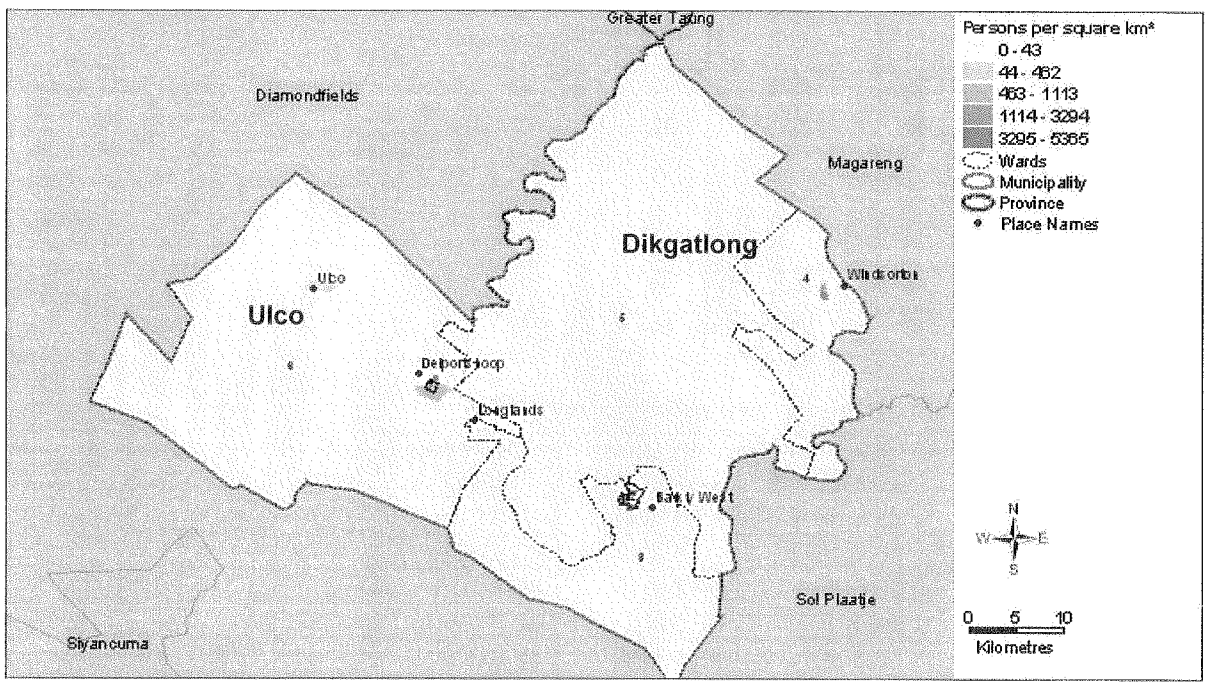


Figure 2-21: Dikgatlong Municipality

2.13.1 Population

The Dikgatlong Local Municipality covers an area of 2 377.6km^2 and according to the 2001 census has a population of 35 765 which equates to a population density of approximately 15 persons per km^2. Ward 6 covers an area of 814km^2 and in 2001 it had an estimated population of 6 982 which equates to a population density of 8.5 persons per km^2. Ulco village has a population of approximately 1 500.

Table 2.9 compares the official population figures for Dikgatlong Local Municipality as a whole and of Ward 6 from the 1996 and the 2001 censuses.

Table 2-9: Population statistics for Dikgatlong Local Municipality

DIKGATLONG LOCAL MUNICIPALITY	1996	2001	% Change
African	29 195	21 562	- 26.0
Coloured	12 864	11 632	- 9.5
Indian	58	36	- 37.9
White	2 437	2 535	+ 3.4
Total Population	**44 554**	**35 765**	**-19.7**
WARD 6	**1996**	**2001**	**% Change**
African	2 623	2 438	-7.1
Coloured	4 496	3 547	-21.1
Indian	5	3	-40.0
White	1 008	995	-1.3
Total population	**8 178**	**6 982**	**-14.6**

Of the population in Dikgatlong Local Municipality, just over 60% are African, 32.5% are Coloured, 7% are White, and 0.5% are Indian. In Ward 6 in 2001, the Coloured population group was predominant (3 547 persons), followed by Africans (2 438 persons). The population of Ward 6 is concentrated in Delportshoop and Ulco. Afrikaans (49%) and Setswana (48%) are the most prominent spoken languages in the area.

According to the census information, there has been a decline of 19.7% in the population of the area between 1996 and 2001. The decline in population is probably linked to the decline in employment opportunities in the area between 1996 and 2001, which will be discussed below. Unofficial feedback from the LED Manager for Dikgatlong Local Municipality (Mr George Damoense) indicated that the population has increased over the last few years and may be as high as 60 000.

The main communities which fall into the Ulco area of influence include:

- Delportshoop;
- Tidimalo;
- Proteahof;
- Rooikoppies;
- Sydney-on-Vaal;
- Longlands; and
- Vaal Gamagarra.

According to the IDP the land cover in Dikgatlong Local Municipality is as follows:

- agriculture – 83.9ha;
- mines and quarries – 6.23ha;
- residential – 7.4ha;
- water bodies – 15.5ha; and
- other – 2264.5ha.

Other land, which includes undisturbed land, forms the majority of the land cover within the municipal area.

2.13.2 Employment

Table 2.10 provides census information regarding employment in the Dikgatlong Local Municipality.

Table 2-10 Employment statistics for Dikgatlong Local Municipality

DIKGATLONG LOCAL MUNICIPALITY	1996	2001	% Change
Employed	6 534	5 923	-9.4%
Unemployed	5 280	5 576	+ 5.6%

Not economically active	11 931	11 251	- 5.7%
Total labour force	**11 814**	**11 499**	**-2.66**
WARD 6	**1996**	**2001**	**% Change**
Employed	1 639	1 356	-17.3
Unemployed	961	987	+ 2.7
Not economically active	2 684	2 142	-20.2
Total labour force	**2 600**	**2 343**	**-9.8**

According to the census information, between 1996 and 2001 employment in Dikgatlong Local Municipality decreased by 9.4% and unemployment increased by 5.6%. In Ward 6 the decrease in employment between 1996 and 2001 was 17.3%, resulting in 283 additional unemployed people.

The survey commissioned by the Company in 2003 and conducted by Ayanka Development Agency presents a far worse picture regarding employment in the Delportshoop area – unemployment in the area is estimated in this survey to be between 94% and 98%. The reasons behind the high unemployment rates have been documented as follows:

- illiteracy - most people cannot be hired due to the standards set by the employers;
- lack of training;
- retrenchment from the diamond mining industry;
- lack of transport denies people the opportunity to seek employment; and
- lack of job opportunities.

The higher unemployment figures in the survey compared to those provided by the census figures have been verbally confirmed by a number of community representatives in the area.

2.13.3 Housing

Table 2.11 below provides census information regarding the housing situation within Dikgatlong Local Municipality

.

Table 2-11 Housing statistics for Dikgatlong Local Municipality

DIKGATLONG LOCAL MUNICIPALITY	1996	2001
Formal	4 428	6 793 (71.9%)
Informal	2 203	2 081(22.1%)
Traditional	743	545 (5.8%)
Other	124	20 (0.2%)
Total	**7 498**	**9 439**
WARD 6	**1996**	**2001**
Formal	1 349	1 551
Informal	144	210
Traditional	38	93
Other	17	3
Total households	**1 615**	**1 857**

According to Census 2001 the number of houses in Dikgatlong and Ward 6 has increased by 25.9% and 14.9% respectively, despite the decrease in population. From 1996 to 2001 formal housing increased by 53.4% in Dikgatlong Local Municipality and by 14.9% in Ward 6. The IDP indicates that each household has on average 3.8 people.

A site visit to the area revealed that housing standards vary. There is a high concentration of formal houses in Delportshoop; RDP housing is prevalent in Protehof, Timimalo, Rooikoppies; and there is informal housing in Longlands. The IDP Review for 2005/2006 identifies construction and provision of housing as priority number 5.

All Ulco employees and contractors, who are based at Ulco, are provided with housing at Ulco. It should be noted that in 2005, Ulco won the Cleanest Mining Town Award for the Northern Cape.

2.13.4 Education

Table 2.12 provides information on the highest educational levels attained by persons over the age of 20 for Dikgatlong Local Municipality. This information is taken from both the 1996 and 2001 censuses.

Table 2-12 Education statistics for Dikgatlong Local Municipality

DIKGATLONG LOCAL MUNICIPALITY	1996	2001
No schooling	30.3%	23.8%
Some primary schooling	25.9%	26.1%
Complete primary schooling	9.4%	8.1%
Some secondary schooling	24.9%	27.0%
Grade 12	7.1%	11.6%
Higher education	2.3%	3.4%
WARD 6	**1996**	**2001**
No schooling	27.0%	24.4%
Some primary schooling	20.1%	22.5%
Complete primary schooling	9.5%	7.5%
Some secondary schooling	30.4%	27.5%
Grade 12	8.9%	10.8%
Higher education	4.1%	7.2%

Between 1996 and 2001 there was a 72.5% increase in the overall number of people receiving schooling in the Dikgatlong Local Municipality. Various site visits to the communities revealed a high number of school-going children within the local area. The IDP states that there are 27 schools in the municipal area, of which 14 are farm schools. The following schools operate within the area of influence of Ulco:

- Delportshoop Primary School – currently 861 learners up to Grade 7;
- Dikgatlong Secondary School – currently 982 learners in Grade 8 – 12;
- Francis Mohapanele Primary School – currently 549 learners up to Grade 7;
- G.N. Pressly Primary School in Longlands – currently 562 learners up to Grade 7;
- Hoërskool Delportshoop – currently 443 learners in Grade 1 – 12; and
- Primary School – currently 73 learners up to Grade 7.

In addition Ulco has three pre-primary schools and there are a further three pre-primary schools in the communities.

2.13.5 Water Supply

Table 2.13 shows water supply to the communities of Dikgatlong Local Municipality.

Table 2-13 Access to water in Dikgatlong Local Municipality

DIKGATLONG LOCAL MUNICIPALITY	1996	2001
Dwelling	31.3%	24.0%
Inside yard	30.3%	48.4%
Community stand	25.8%	10.7%
Community stand over 200m	0.0%	8.6%
Borehole	3.1%	0.7%
Spring	0.4%	0.0%
Rain tank	0.0%	0.1%
Dam/stream/stagnant water	0.0%	0.6%
River/stream	6.9%	2.7%
Water vendor	2.1%	0.2%
Other	0.0%	3.9%
WARD 6	**1996**	**2001**
Dwelling	42.3%	40.1%
Inside yard	17.3%	37.2%
Community stand	14.4%	7.3%
Community stand over 200m	0.0%	4.2%
Borehole	6.2%	0.2%
Spring	1.0%	0.0%
Rain tank	0.0%	0.2%
River/stream	11.4%	2.8%
Water vendor	7.4%	0.5%
Other	0.0%	7.6%

Within Dikgatlong Local Municipality, 48.4% of people receive water inside their yard, 24% into their dwellings and 10.7% from community stands. In Ward 6, 40.1% of the households receive water in their dwellings, 37.2% inside their yards and 7.3% from a community stand. Water availability to households

has improved greatly since 1996. The IDP Review in 2005/2006 states that 15.2% of the households in Dikgatlong Local Municipality are still using unacceptable water sources.

The Ulco village receives 100% of its water from its own purification works, which is maintained by the Company.

2.13.6 Power supply

More than half (62.5%) of the total number of households in Dikgatlong Local Municipality use electricity as a source of lighting. Of the remainder, 32% use candles and 5.5% use either solar power, gas or paraffin. In Ward 6, 30.4% of households use candles as a source of light.

2.13.7 Sanitation

Table 2.14 provides an indication of the change in sanitation facilities between 1996 and 2001.

Table 2-14 Sanitation statistics for Dikgatlong Local Municipality

DIKGATLONG LOCAL MUNICIPALITY	1996	2001
Flush toilets	2 328	3 243
Flush septic tank	-	1 049
Chemical toilet	-	210
Ventilated improved pit (VIP)	-	393
Pit latrine	1 038	1 024
Bucket latrine	1 578	1 828
None	1 700	1 693
WARD 6	**1996**	**2001**
Flush toilets*	663	915
Flush septic tank	-	174
Chemical toilet	-	54
Ventilated improved pit (VIP)	-	15
Pit latrine	396	162
Bucket latrine	276	261
None	286	279

**Ulco village has 100% flush toilets.*

It is apparent from **Table 2.14** that in Dikgatlong Local Municipality as a whole, and in Ward 6 specifically, flush toilet sanitation systems have increased dramatically since 1996 – by 39.3% and 38% respectively. At the same time there has been a decrease in households using pit latrines and bucket latrine. There has been a strong drive by the Local Municipality to eradicate the bucket latrine toilet system in the past few years and since 2001 a total of 3 816 flush toilets have been constructed in Dikgatlong Local Municipality.

2.13.8 Waste

The waste management system within the local municipality has been outlined in the integrated waste management plan. **Table 2.15** summarises the waste situation.

Table 2-15 Waste management in Dikgatlong Local Municipality

Focus area	Status quo
Population statistics	Municipal population: 62 627 Serviced population: 57 328
Waste generation rates	Barkly West: 14 t/day Delportshoop: 7 t/day Windsorton: 3.6 t/day Unserviced area: 500 kg/day
Service delivery	Barkly West: 1 950 weekly plastic bags Delportshoop: 600 weekly plastic bags Windsorton: 950 weekly plastic bags
Waste minimisation strategies	No formal strategy Reclaimer on the Barkly West and Windsorton landfill sites
Illegal dumping	Large volumes collected through local municipal area

Garden refuse	Collected on request Grass cuttings mixed with domestic waste
Personnel	Vacant post in collection and landfill management
Equipment	Barkly West: 12m^3 REL – good condition Delportshoop: tractor trailer – poor condition Windsorton: tractor trailer – poor condition
Landfills	3 landfill sites Barkly West: not permitted – poor management Delportshoop: not permitted – poor management, but improving Windsorton: not permitted – poor management

The landfill site in Delportshoop is in a poor condition. There is no proper security at the site, settling ponds for sewage are easily accessed and the waste is not dealt with in an acceptable manner.

2.13.9 Summary

In summing up the baseline socio-economic conditions within Dikgatlong Local Municipality the following points are apparent:

- according to Statistics South Africa there has been a population decline in Dikgatlong Local Municipality between 1996 and 2001; however consultations with community members estimate the population to have risen to approximately 60 000 in 2005;
- much of the land in Dikgatlong Local Municipality is undisturbed which opens up opportunities for eco-tourism;
- unemployment is high (up to 94%) and lack of employment opportunities fuels the high unemployment rate;
- there are large numbers of children attending school with few opportunities available for them once they leave school; and
- basic services such as housing, water, electricity and sanitation have been improving in the area however there is still need for continual improvement.

3 PROCESS DESCRIPTION

Legal Reference *MPRDA*:
NEMA of 1998: **Regulation 32(2)b**

As this report serves as an amendment to the approved Environmental Management Programme Report (EMPR) of an existing operation, there is no construction phase.

Although this section is not required under the MPRDA, it has been included to provide the reader with an overview of the activities that take place on-site. The purpose of this is to facilitate the undertaking of the impact assessment (Section 6) and the compilation of management measures (Section 11). This section is not intended to be a manual into limestone mining and cement manufacturing operations.

This section has been sub-divided into manageable activities which are undertaken at Ulco. The descriptions of the activities are linked to the organisational flow of the mine. The organisational flow includes the core processes which are:

- Mining
- Production
- Packaging and Dispatch

In addition to the core processes Ulco have the following supporting processes:

- Quality Assurance
- Maintenance & Engineering
- Administration & Stores
- Human Resources
- Safety Health and Environmental

The description of the activities has been provided in a chronological order from the mining of the mineral resources through to the dispatch of the clinker and cement from the plant followed by a description of the supporting services to ensure the smooth operation of the mine. Where practical, photographs have been used in the description.

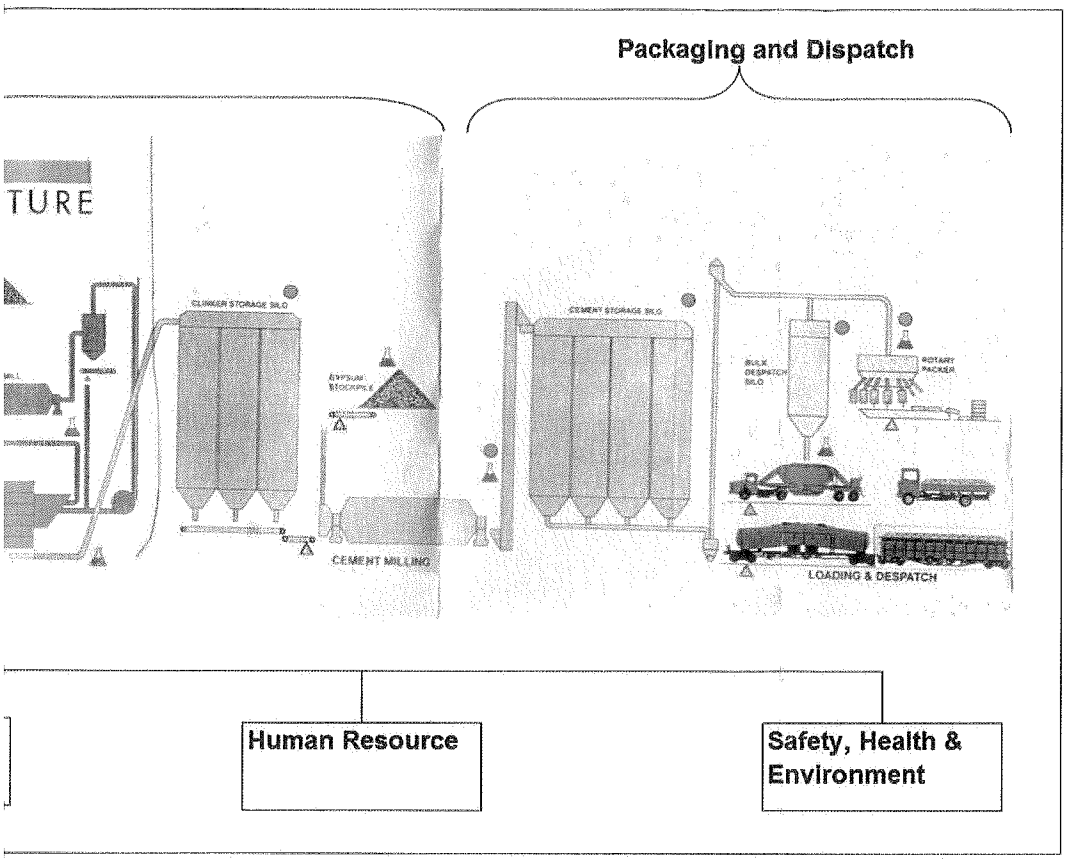
The following figures have been provided to assist in the readers understanding of the description of the activities that take place on the site;

Figure 3.1 provides a diagrammatic indication of the overall process that take place on the site. This diagram is interlinked into the organisational flow at Ulco.

Figure 3.2 provides an aerial photograph of the whole site which shows the various quarries used by the mine, the crushing plant, the limestone stockpiles and the plant.

Appendix 2 provides a general site layout plan of the mine and a copy of the latest life of mine plan.

The above mention figures should be consulted when reading the description of the activities taking place at Ulco.


Packaging and Dispatch
TURE
CLINKER STORAGE SILO
GYPSUM STOCKPILE
CEMENT MILLING
CEMENT STORAGE SILO
BULK DESPATCH SILO
ROTARY PACKER
LOADING & DESPATCH
Human Resource
Safety, Health & Environment

1 - Primary Limestone Quarry
2 - Secondary Limestone Quarry
3 - Dolorite and Shale Quarry
4 - Slough area
5 - SAQ dump as Agricultural Lime
6 - Topsoil storage
7 - Primary Crusher
8 - Conveyor to Stockpiles
9 - Historic SPL Storage Area
10 - Quarry Offices
11 - explosive magazines
12 - Waste Dump
13 - Water purification
14 - Stockpiles
15 - Cement plant
16 - Packing & Dispatch plant
17 - Vehicle parking area
18 - Main office
19 - Old plant
20 - Hisotirc Vehicle Workshops
21 - Sewage plant
22 - Ulco Viallge
23 - New SPL Store
24 - New Vehicle Workshop

3.1 MINING PROCESS DESCRIPTION

Ulco has three active open cast quarries (Primary Limestone Quarry, Secondary Limestone Quarry and Shale / dolorite quarry), (See **Figure 3.2**) from which normal limestone of varying quality, high quality limestone, shale and dolomite are extracted.

It is estimated that the current known limestone reserves at Ulco will last approximately 30 years (See long term mine plan in **Appendix 2**). Mining currently occurs over two shifts, namely 06:00 to 14:00 and 14:00 to 22:00. If demand requires, mining activities will be increased to take place 24 hours a day. Illumination at night is provided by the headlights of the mining equipment used.

The mining process is outlined in **Figure 3.3** below and described in the following text.

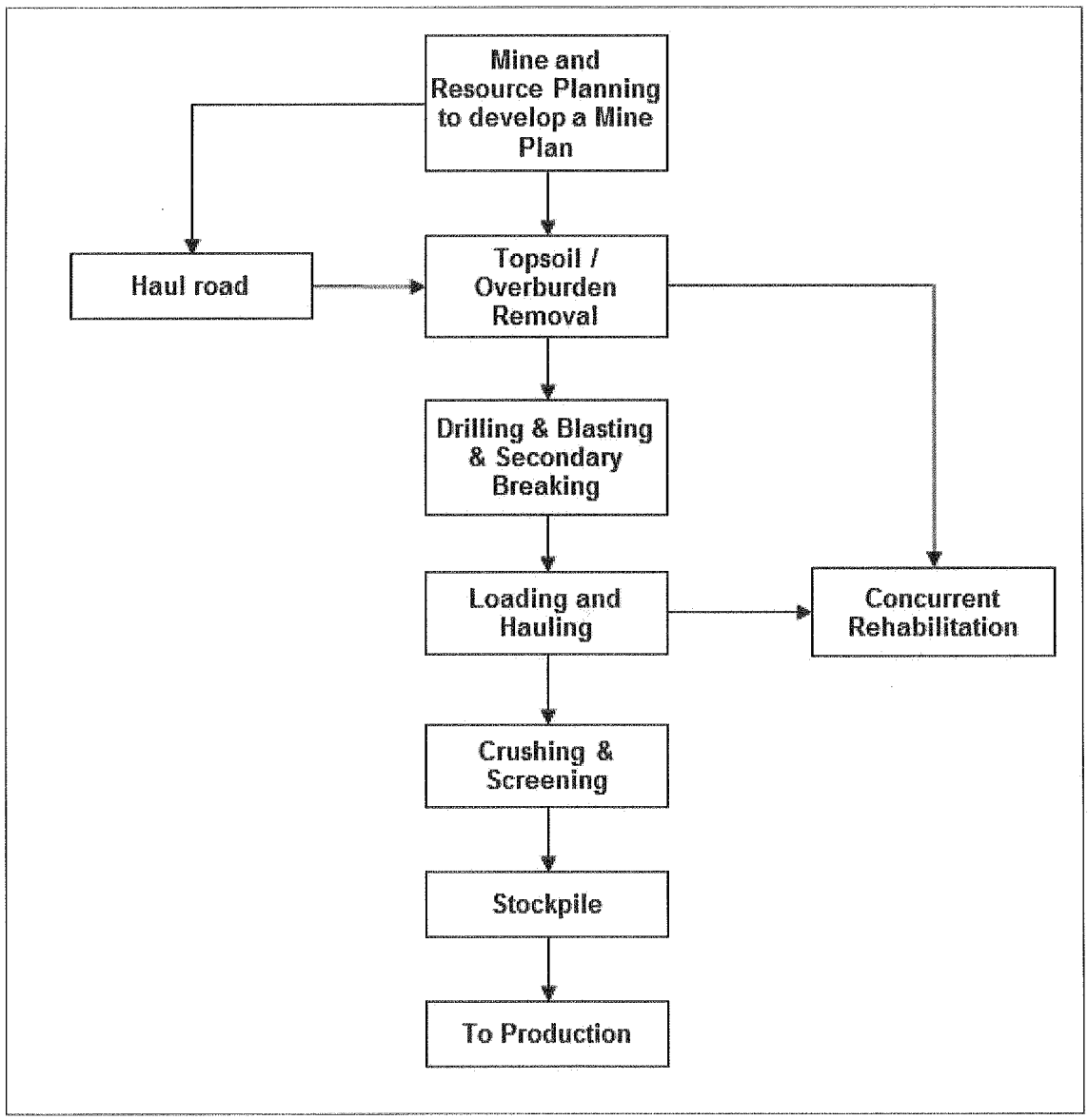


Figure 3-3: Mining process.

3.1.1 Mine and Resource Planning

Once the limestone distribution, depth and quality of the deposit has been established by means of an in-depth prospecting programme, a mining strategy is developed. The main objective is the economic extraction of chemically consistent limestone. This means working different quarry faces simultaneously.

Quarry planning meetings are held during the year to ensure that mine planning is a continuous part of the on-going life of mine. Current mine plans are provided in **Appendix 2**.

Before any blast, the Quarry manager can obtain the quality of the limestone of a particular face in the quarries, by taking a composite of the fines from the drill holes (required for blasting) and then sampling them as per the "drill hole sampling" works instruction. It is used by the quarry manager to ensure optimal ore body extraction and to ensure that suitable quality limestone is being stockpiled for clinker production.

Prospecting activities are to be implemented in the area to the North of the R31. This activity is required in order to determine the limestone resource beyond the next 30 years.

3.1.2 Haul Road Construction

Haul roads are developed to ensure continued access to limestone reserves. Haul roads are developed both on the natural surface and on the quarry floors in order to access the various quarries and the quarry faces. Where haul roads are developed on the surface, topsoil and overburden is stripped from the areas planned for the surface haul road construction. Where necessary, storm water culverts are provided under haul roads to allow for the free flow of rain water.

Planning of haul roads forms an integral part of long term mine planning, whereby the route of the haul roads is positioned with a view to access the required mineral reserves, in the shortest possible route and not to go through sensitive environmental features.

3.1.3 Stripping of Topsoil and Overburden

Vegetation and topsoil is stripped ahead of the mining face. This mix of topsoil and vegetation is moved to the designated topsoil dump. At Ulco there is little to no overburden over the mining area.

As and when overburden is encountered, it is stripped separately to the topsoil and used immediately as fill material for concurrent rehabilitation requirements on the mine.

3.1.4 Drilling, Blasting and Secondary Breaking

Mining at Ulco is undertaken through shallow open cast quarries using modern drilling and blasting techniques. There are 3 main quarries, namely the primary quarry, the secondary quarry and the dolorite / shale quarry.

The drilling operations required for the blasting activity is currently subcontracted to a drilling company which make use of a drill rig fitted with a dust extraction unit. The current contractor delivers the explosives as and when required. Ulco has registered explosive magazines used to store accessories. Explosives are delivered on site on the day of the blast.

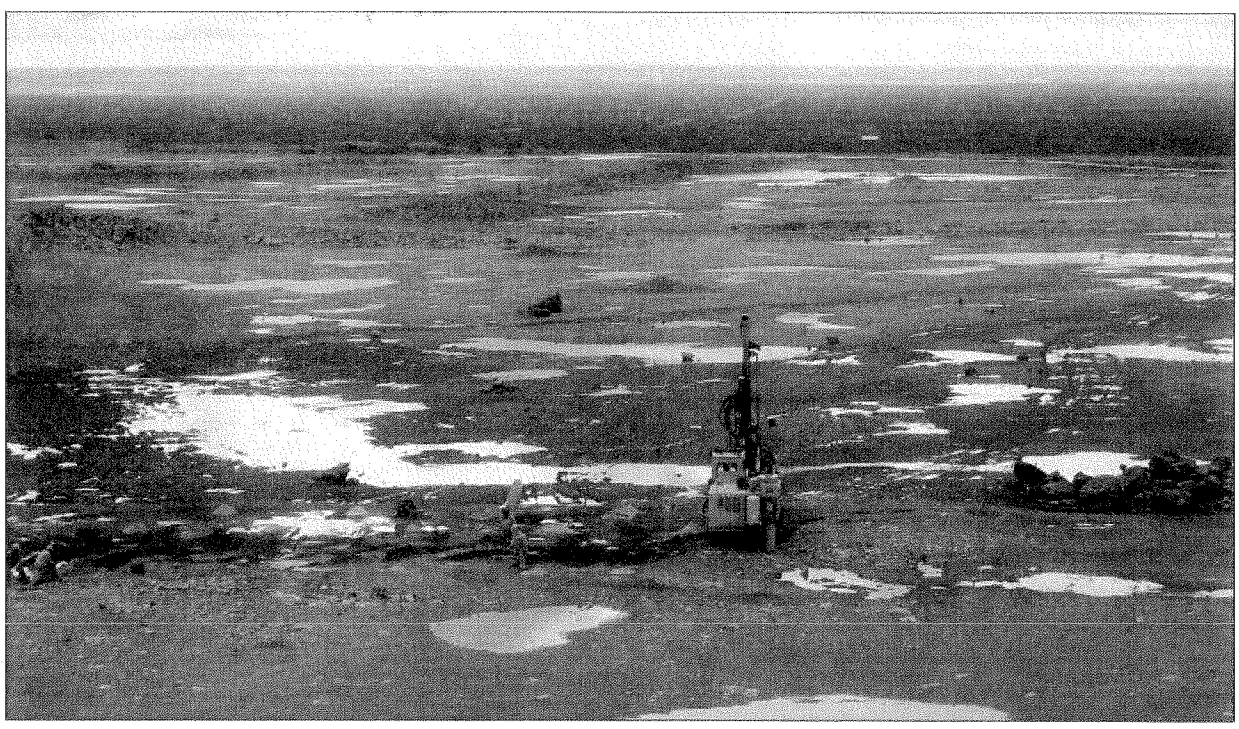


Figure 3-4: Example of drilling activities within the Secondary limestone Quarry

Blasting takes place on average once every 2 weeks depending on demand, if demand increase the frequency could increase too weekly. The Ulco quarry will blast enough material to achieve a production rate of approximately 2.2 million tons of mineral resources per annum.

Only material less than 750mm in diameter can be placed into the primary crusher. Larger boulders (which are few and far between) are moved aside of the mining face and broken up by a hydraulic hammer (secondary breaking) before been transferred to the crusher.

3.1.5 Loading and Hauling

The blasted material (less than 750mm) is loaded by a front end loader (FEL) into a dumper truck. These transport the blasted / loosened material to the primary crusher. Prior to each shift the vehicle operators have a checklist to complete to ensure that their vehicles are in a suitable condition to carry out their intended activities.

Dust suppression on active haul roads is achieved through the use of a water truck spraying the roads.

3.1.6 Crushing and Screening

Material, less than 750mm, is loaded to the primary crusher from the haul vehicles and crushed to less than 75mm. The dust generated during the tipping action is suppressed by manual mist sprays. The crushing plant is enclosed.

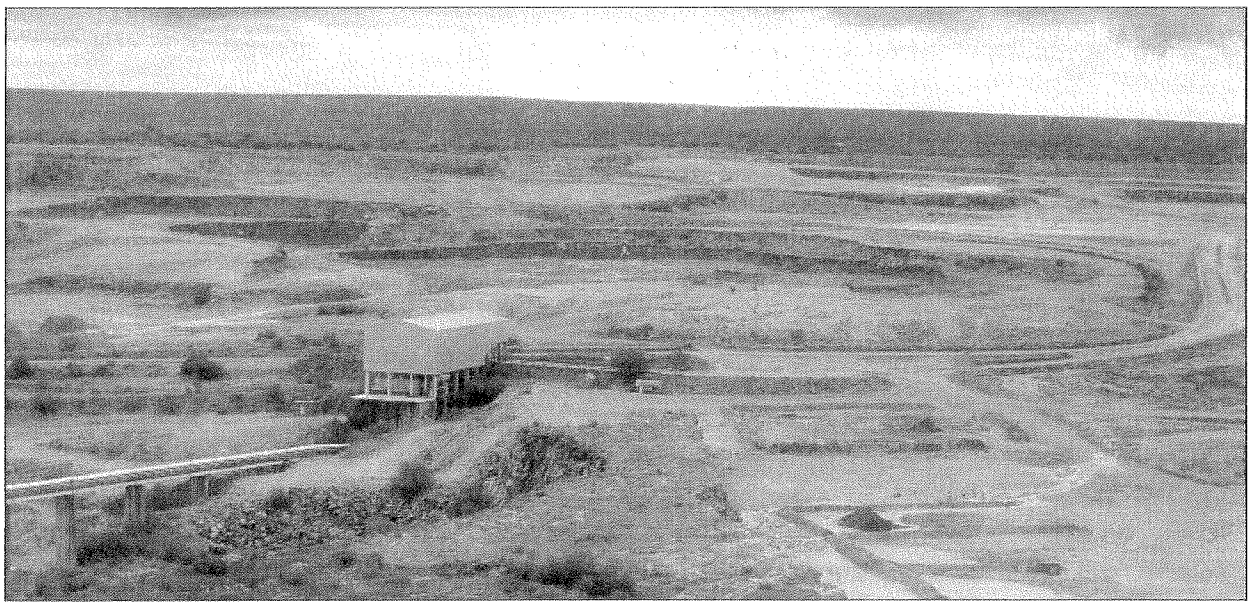


Figure 3-5: Crusher

3.1.7 Conveying and Stockpiling

Crushed material is transported to the stockpile yard by means of an enclosed overland conveyor and deposited onto the respective stockpiles via a stacker. In order to minimise dust emissions during stacking of raw materials to stockpiles, all stackers are fitted with a sensor that prevents the conveyor (stacker) from lifting more than 1m above the height of the stockpile, thereby reducing the drop height.

In order to avoid any interruptions to the manufacturing process, Ulco maintains emergency stockpiles of all raw materials.

3.1.8 Mining of the SAQ dump

The SAQ Dump (See **Figure 3.2**) is mined by an excavator and placed in a screening plant to produce a product used as agricultural lime. There is a separate entrance through the Ulco village for the trucks used to dispatch the agricultural lime from the site.

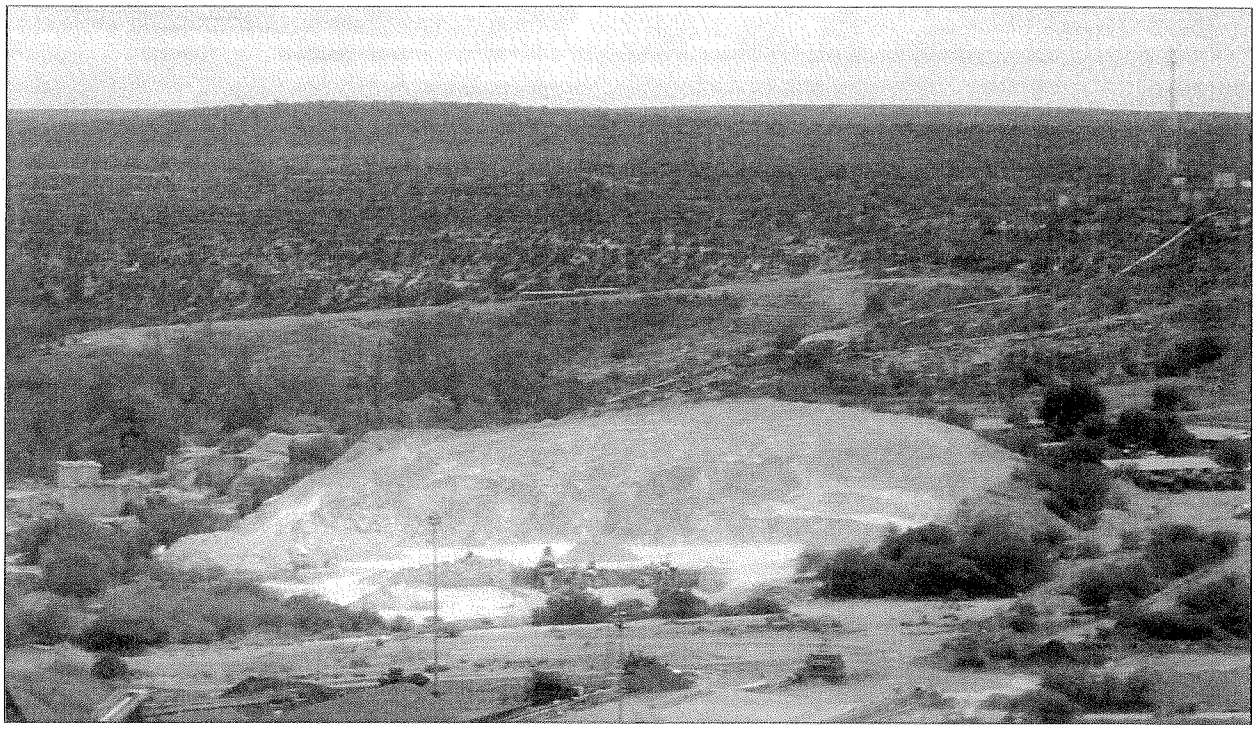


Figure 3-6: Mining of the SAQ dump

3.1.9 Concurrent Rehabilitation

The mining department is responsible for concurrent rehabilitation of the mine. Aspects of the mine that are subjected to concurrent rehabilitation include;

- The old plant
- The slough area
- Gorrokop mining area
- Alien vegetation removal
- The waste dump
- Old limestone quarry

Full details concerning current concurrent rehabilitation commitments for the next 5 years are included within **Appendix 4**.

3.1.10 Mining Supporting Services

In order to successfully implement the mining activities described above, there are a number of supporting services dedicated to the mining department which are described below. (See Figure 3.2 for the location of infrastructure)

Vehicle parking: When not in operation, the quarry vehicles are parked the packing bays next to the quarry offices.

Fuel tank: There is an 80 000 litre diesel tank close to the vehicle parking area to provide the diesel needs of the haul trucks.

Mining administration: All quarry administration requirements are performed from the quarry office.

Waste Dump: The mining department is responsible for the access and management of the authorised waste dump.

Vehicle maintenance in the workshop: The mine is responsible for the vehicle workshop. The workshop is responsible for the maintenance of all mine vehicles. All vehicles are on a maintenance schedule and serviced every 250 hours of use.

The workshop is concreted and has both a new oil store and an old oil store for oils drained from the vehicles. The old oil is recycled through the ROSE foundation. Wash bays and oil separation systems are established at the workshop.

3.2 PRODUCTION PROCESS DESCRIPTION

The production department is responsible for the handling of the raw material from the stockpiles, followed by the processing of the raw material through the kiln to generate clinker. The permit allocation for Ulco is the generation of **4 000** tons of clinker per normal day and **4400 tons** of clinker per peak day. **Figure 3.7** provides an overview of the processing activities that take place at Ulco.

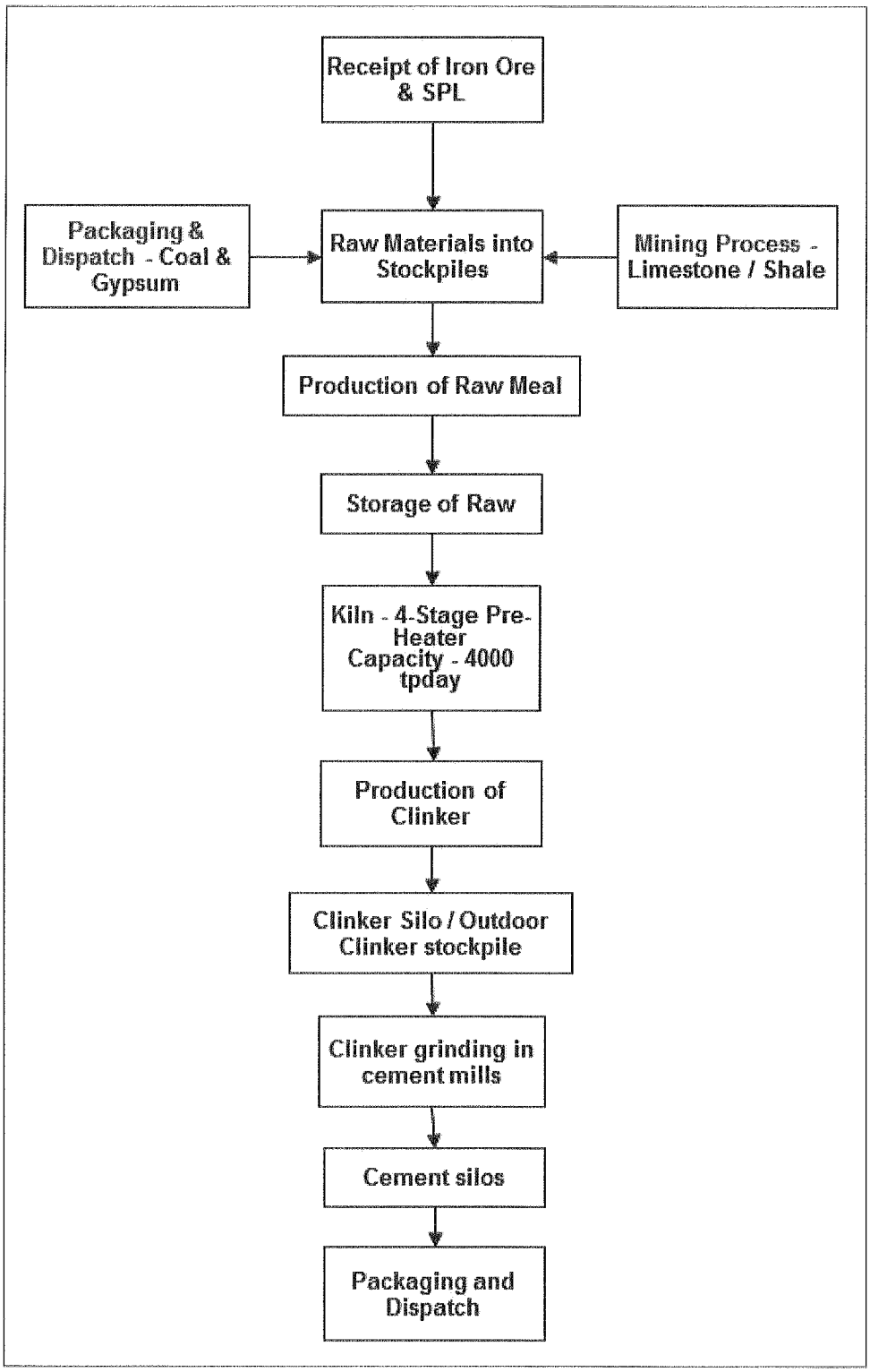


Figure 3-7: Production process.

Figure 3.8 provides a visual indication of the various buildings associated with the cement plant.

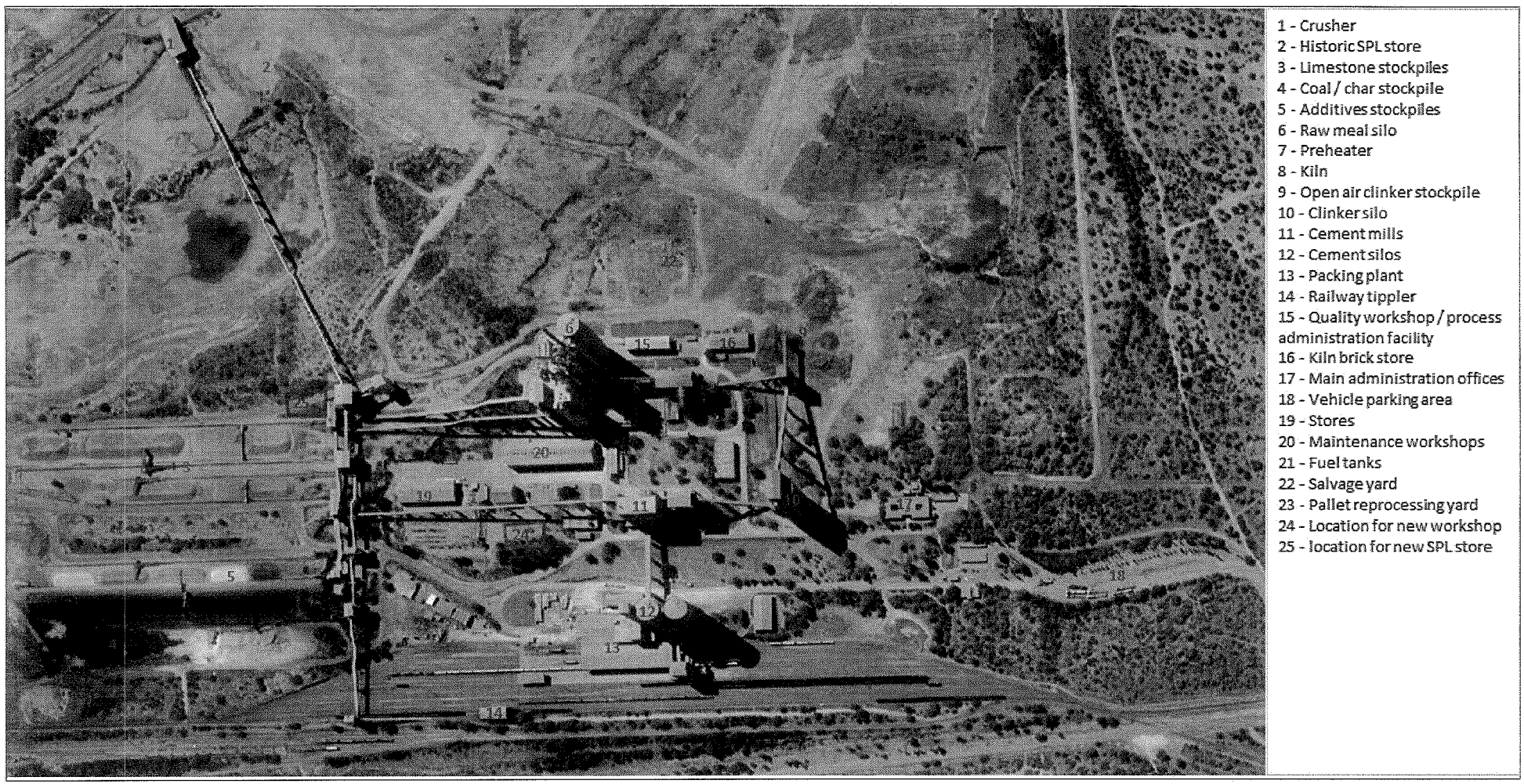


Figure 3-8: Buildings associated with the cement plant

3.2.1 Raw Material Deliveries and Stockpiles

Table 3.1 provides an indication of the raw material delivered and used in the cement manufacturing at Ulco. The table has been sub-divided into the material required for each aspect of the cement manufacturing process. Note that the processing department is specifically responsible for the receipt of the iron ore / magnetite and the Spent Pot Liners (SPL). The raw materials are stored within respective open air stockpiles.

Table 3-1: Raw material used in cement manufacturing

RAW MATERIAL	RESPONSIBLE DEPT FOR RECEIPT	TRANSPORT	AVERAGE USAGE FOR CLINKER PRODUCTION
Raw Meal and Clinker production			
Secondary Limestone	Mining	Conveyor system	65%
Primary Limestone	Mining	Conveyor system	25%
Shale	Mining	Conveyor system	3% - 9%
Crushed carbonaceous SPL	Processing	Road	Alternative fuel source.
Iron ore / magnetite	Processing	Rail	0.2 – 1.4%
Coal / Char (for the coal mill)	Packaging	Rail and road	+/- 20 000 tons per month used as a fuel source.
Cement Production			
Clinker	Processing	Conveyor system	+/- 80%
Gypsum	Packaging	Rail	1 – 3%
Secondary Limestone (Limestone extension)	Mining	Conveyor system	17 -19%
Strength Enhancer's	Processing	Road	

3.2.2 Raw Milling and Storage of Raw Meal

In the raw milling process, the input material (see **Table 3.1** above) is ground to a fine powder to generate raw meal. The raw material is conveyed from the stockpile areas into a proportioning plant. Within the proportioning plant, the material is fed through bins equipped with weigh feeders to ensure that the correct weight of material is mixed for the generation of the raw meal. Once proportioned correctly the material is fed into the raw mill. The raw mill is a ball mill fitted with an electrostatic precipitator (ESP) to control dust emissions.

The mill operates in a closed circuit, which means that the milled product is passed to a separator where the material, which is fine enough, is separated from the coarse particles. The latter are returned to the mill for further grinding whilst the product (fine material) is transferred to a silo as raw meal. The raw meal is stored within one raw meal silo.

The raw meal from the raw meal silo is transferred by compressed air to the pre heater tower of the kiln for the production of clinker.

3.2.3 Coal Milling

Coal and / or char is transferred from the stockpile by a conveyor by to a coal mill. The milled coal is drawn off in an air-stream through a dust filter (de-dusting system) to a pulverised coal silo.

The dust created as a by-product of the coal milling is controlled through use of a bag filter.

The fine coal is the fed into the kiln where it is burnt to give the necessary heat for the kiln. The coal mill is constantly measured for temperature and is fitted with explosive disc which would restrict the impact in the unlikely event of an explosion of the coal in the coal mill. This is covered as an emergency procedure.

3.2.4 Alternative Fuel Source

Ulco have permission to make use of the following materials as an alternative fuel source;

- Spent Pot Liners (SPL)
- Waste wood
- Paint sludge

- Sewage sludge
- Tyres and rubber waste
- Waste oils
- Spent solvents.
- Bag filters

The SPL is currently stored adjacent to the primary crusher, but will before 2012 be stored within a designated storage shed. The introduction of alternative fuel sources into the kiln is carefully recorded by the process department.

3.2.5 Clinker Production

Ulco has one operating kiln:

- **Kiln 5 (UK5)** This kiln line has a 4-stage preheater and is 72m long. The kiln can produce a maximum of 4 000 tons of clinker per normal day (4400 tons of clinker per peak day). It is fitted with a multi-channel burner. Its emissions are drawn through an electrostatic precipitator (ESP) which is fitted with a water injection system to further reduce the emissions levels.

Preheaters use hot kiln exhaust gases to preheat the raw meal entering the kiln. This makes effective use of the kilns' energy.

The raw meal from the raw meal silo is fed via compressed air into the preheater towers. While the material passes through the preheater, the raw meal is dried and partial calcinations takes place at approximately 900°C. During calcination, limestone (predominantly $CaCO_3$) breaks down and releases carbon dioxide (CO_2):

$CaCO_3$ + heat → CaO + CO_2.

The heated material is then passed through the **coal fired rotating kilns**, where the temperature is raised to 1 400°C. At this temperature, various minerals start to fuse together to form calcium silicate crystals, known as clinker. The coal is burnt through multi-channel burners.

Clinker Cooling

Once clinker has been formed and leaves the kiln, it must be cooled. The kiln has a grate cooler which is fitted with a bag filter for reducing dust emissions. The clinker is broken into a manageable size for storage and cement milling by use of a hammer mill.

The air used to cool down the clinker is transferred to the preheater tower to assist in the preheating requirements of the raw meal. By using this heated air energy efficiency is maximised.

Cooled clinker is then conveyed via an armoured plated conveyor to either the clinker silo (50 000 tons) or the open air clinker storage area. Clinker is then further processed via cement mills to generate cement.

Emissions Monitoring

Table 3.2 below provides an indication of the pollutant limits allowed as per the permit issued in terms of the Air Pollution Prevention Act, Act No.45 of 1965 (APPA) for the coal mill stack, the kilns stack, the cooler stack and the Cement mill.

The kiln stack is fitted with OPSIS online continuous monitoring equipment. Annually dust samples from the various filters are sampled iso-kinetically. Monthly emission reports are compiled by the environmental department which are available for submission to the relevant authorities. Any permitted limits which have been exceeded are explained within the emission report.

Table 3-2: Emissions limits for the various stacks

STACK	LIMITS
Coal mill	Emissions not to exceed – 150mg / Nm^3
Raw mill / Kiln	Emissions not to exceed – 150mg / m^3
Cooler	Emissions not to exceed – 200mg / m^3
Cement Mill	Emissions not to exceed – 150mg / Nm^3

3.2.6 Clinker Milling and Cement Storage

Ulco can generate "all purpose", "high strength" and "rapid hard" cement. The approximate percentage of the raw materials for cement production is presented in **Table 3.3**.

Table 3-3: Percentage of material for generating various cement products

	ALL PURPOSE	HIGH STRENGTH	RAPID HARD
Limestone extender	+/-18%	+/-15%	0%
Gypsum	+/-4%	+/-4%	+/-4%
Clinker	+/-78%	+/-81%	+/-96%

The raw materials required to make cement (clinker, limestone extender), gypsum and a strength enhancer (liquid grinding media)] are fed into one of 2 cement mills. Cement mills are ball mills, consisting steel balls and cylindrical grinding media which rotate around an axes. On entering the mill, the steel balls first crush the clinker particles and then, by attrition the cylindrical grinding media grinds the clinker to a fine powder. The closed circuit mill provides full control over the particle size distribution of the cement.

Particulate emissions from the cement mills are controlled through the use of an ESP.

The purpose of gypsum is to retard the setting of the cement and the purpose of the strength enhancer is to improve grinding efficiency and strengthen development of the cement.

The cement is conveyed to the cement silos to store the different cement products. There are three cement silos, one for each product produced, viz.:

- All purpose cement (32.5mpa) stored in a 25 000t silo,
- High strength cement (42.5mpa) stored in a 25 000t silo, and
- Quick / Rapid hard cement (52.5mpa) stored in a 2 500t silo.

After entering the various silos the continued responsibility of the cement shifts to the Packaging and Dispatch Department.

3.2.7 Processing Supporting Services

Fuel tank: The production department have a diesel / oil tank with a capacity of 30 000 litres which is required for the initial start up of the kiln flame after a shut down event.

Grinding aid: The production process has a designated area adjacent to the cement mills for the offloading and storage of grinding aid.

Kiln Shutdown / maintenance: During maintenance of the kilns, sections of the lining of the kilns (kiln bricks) need to be replaced. There is a store for the new kiln bricks and old kiln bricks are crushed and used into the process. There is one planned stop for each kiln for maintenance per year.

Electricity usage: Cement manufacturing is an energy intensive process specifically the various mills and the kiln. Electricity is obtained from an Eskom dedicated line to Ulco. Ulco measure their energy use for each major energy utilizing equipment.

Water requirements: Water is used for cooling purposes of the equipment

3.3 PACKAGING AND DISPATCH

As and when the cement enters the various cement silos, it becomes the responsibility of the Packaging and Dispatch Department for the dispatch in either bulk or in bags. For an indication of the various buildings associated with this department **Figure 3.8** must be viewed.

The cement is transferred from silos through air slides, screw conveyors and elevators for both packaging and final dispatch. Below is a brief description of the activities associated with the packaging and dispatch department.

3.3.1 Receipt of Coal and Gypsum via the Tippler

The packaging and dispatch department is responsible for the receipt of coal and gypsum which are transported to Ulco by rail and road. When transported by rail, the raw material is offloaded from rail wagons via a tippler and then conveyed to the appropriate stockpile location.

3.3.2 Bulk Loading

Bulk loading is where cement is loaded into bulk tankers for distribution. Trucks have up to two bulk containers and trains can transport numerous bulk containers.

Bulk loading is controlled by weighers and sensors to ensure that when the bulk container has either reached its correct weight or full, bulk loading automatically stops to reduce the chance of spillage. All scales are calibrated on an on-going schedule to ensure the correct weight is dispatched into bulk containers.

3.3.3 Packing / Palletising Plant – Loading of bags

Cement from the storage silos is transported to the packing plant through enclosed pipes. Cement is packed into bags via one of three automated rotary packing machines.

The packing plant is SANS 1841 certified which aims to guarantee the correct weight within the bags. This is achieved through daily checks of all scales, ongoing in house calibration and every 24 months external calibration of all scales. Any bag of a weight of 49.5kg or less is classified as under weight.

From the packer, the bags of cement are transferred via conveyor belts to a palletising plant which stacks 40 bags of cement onto one pallet. Some of the pallets are shrink or stretch wrapped with stretch plastic to be able to allow customers to store the product outside. Pallets of cement bags are stored within the holding bays until they are loaded by a forklift onto haulage trucks or train wagons for final dispatch.

The packing plant is an enclosed building fitted with extractor fans, removing the dust generated during the packing process. This air stream is filtered through a bag filter before being released to the atmosphere. Dust concentrations of air leaving the bag filter may not exceed 100mg/Nm^3. An alarm sounds should the emission levels be exceeded.

Broken bags are collected, recorded and taken to the Ulco waste dump site where they are disposed with the domestic waste.

3.3.4 Railway Activities

Ulco has a private rail siding that services the plant. Cement is distributed from siding from where freight diesel or electrical locomotives are used to distribute around Southern Africa. The railway activities are audited by the railway safety regulator against the SANS 3000-1 standard.

Shunting / tippler: Some of the raw materials such as coal and gypsum is brought to the site by rail. Off loading of rail containers takes place via a tippler.

3.3.5 Road Activities

All road transport vehicles have to report to the security gate before being allowed into the Ulco premise. Vehicle numbers and movement within the plant are controlled. Vehicles are weighed prior to being loaded with cement and on exiting the site to ensure that the correct amount of cement is being sold.

3.3.6 Vehicle Parking Area

Ulco have a dedicated vehicle parking area outside the main security gate for vehicles to wait prior to entering the plant area.

3.3.7 Supporting Services

The following supporting activities are associated with packaging and dispatch:

Pallet repair & Wood chipper: Ulco have an area set aside for the repair and repainting of broken pallets. Irreparable pallets are disposed of through a wood chipper. The wood chips created are used in the Ulco concurrent rehabilitation programme.

Waste Pit: There is a waste pit available to capture the waste arriving on the rail wagons before they can be loaded with pallets of cement. Waste from the wagons is temporarily stored within the waste pit before been disposed of at the Ulco waste site.

Forklift maintenance: Forklifts are on a maintenance plan through the supplier of the forklifts. Servicing by an external service provider takes place on site.

Bag Store: There is a bag store available for the storage of the cement bags.

SUPPORTING PROCESSES:

In order to ensure the smooth operation of the cement manufacturing plant, there is a requirement for supporting departments. Although the services of the supporting department will often be required for all three core processes (described above), individual departments resume responsibility for the individual supporting processes.

3.4 QUALITY ASSURANCE

The quality assurance department is responsible to ensure that the quality of the clinker / cement manufactured by Ulco complies with the relevant standards and specification. This involves the taking of samples through the entire cement manufacturing process, testing them and providing information for quality and process control.

Samples are forwarded to the quality assurance laboratory for inspection and testing.

The most frequently used chemicals in the analysis process are Ethylene Glycol, Methanol and general acids. All chemicals are stored in a locked chemical store and the bulk chemicals are stored in a Flammable Store.

Pellets are generated during the sampling preparation process, which are then analysed by an XRF machine to determine chemical composition. The analysed pallets get disposed into the cement manufacturing process in a controlled manner.

The Ulco cement plant is ISO 9001 certified.

3.5 ENGINEERING / MAINTENANCE

The engineering department is responsible for all maintenance at Ulco including, the infrastructure at the quarry, the cement plant, the packaging and dispatch department, the laboratory, the village and the water management systems.

Ulco has an extensive computerised scheduled maintenance system which is implemented to manage all maintenance activities to ensure overall equipment efficiency. Scheduled maintenance is vital to reduce and control incidents causing environmental impacts such as oil spills or uncontrolled dust emission etc. The maintenance process also reduces or prevents the risk to man or machine regarding safety.

Maintenance activities can be broken down into the following:

Maintenance – Preventative / planning
All maintenance is scheduled through detailed planning. A detailed description of the maintenance required on each piece of equipment, are in place for equipment at Ulco. The planning department directs all the maintenance needs of the operation and they produce short term schedules for on-going maintenance. The scheduling of plant maintenance is based on risk of equipment failure. This includes the planning requirements for kiln shut downs.

Maintenance – Support
The support sub-department is responsible for the maintenance of the on-site locomotives and rail lines. Ulco have a dedicated workshop for the maintenance of the diesel locomotives used on the Ulco private rail line. Maintenance of the railway lines includes maintaining the ballast and the rail lines.

The support sub-department is also responsible for maintenance associated with large projects and setting applicable maintenance standards.

Maintenance – Mechanical
The mechanical sub-department is responsible for all the fitting and boiler making requirements of the plant and the railway line. This includes aspects such as conveyor systems, mill liners etc.

Maintenance – Electrical
The electrical sub-department is responsible for all maintenance activities on all electrical and control equipment from the Eskom connection point for the complete plant including transformers.

It is also responsible for the managing of the radioactive sources located on the mine.

Maintenance – Civil
The civil sub-department is responsible for the maintenance and upkeep of all infrastructure including services (e.g sewage, water reticulation, storm water control structures, air conditioners etc).

3.6 ADMINISTRATION DEPARTMENT

Administration department is responsible for the following:

- Finance
- Information Technology (IT)
- Ordering of spares and parts
- The storage of spares
- The management of diesel requirements

Ulco has a dedicated section within the administration department responsible for the buying, receiving, storage and issuing of all stock items required for the on-going maintenance / running of the operation.

The materials management section manages and stores oils, lubricants, gas cylinders, chemicals and spares used for the mining, plant, packaging and dispatch operations. These substances are all stored behind a locked fence and in accordance with the requirements stipulated in each product's Material Safety Data Sheets (MSDS). All oils and chemical are stored within bunded concrete covered areas.

As and when new stock items are delivered by suppliers, they are captured on a financial system and then moved to the appropriate bin location within the stores for storage. Hazardous chemicals are labelled when received. The storage area has enough capacity to handle the chemicals required for scheduled shut down maintenance events. The materials management section has access to all the MSDS for all chemicals used by the operation. All items issued are signed for by the person receiving the item.

All ordering of the petrol and diesel requirements for Ulco is managed by the administration department. There is an underground fuel storage facility opposite the stores.

3.7 HUMAN RESOURCE MANAGEMENT

The human resource department is responsible for the aspects described below.

3.7.1 Training Requirements

Each employee is subjected to training requirements and one of the functions of the HR department is the coordinating of the training requirements for each of the employees. Detail of environmental training is provided in the Environmental Awareness Training section of this report (**Section 11**).

3.7.2 Socio-Economic Benefits

Ulco has complied a social and labour plan (SLP) that details the socio-economic activities which will be implemented by the mine. The HR department is responsible for the implementation of the SLP.

3.7.3 Village:

The Ulco village is specifically associated with the mine. The upkeep requirement for the village is managed through the HR department. This includes the gardens and the guest house.

The following infrastructure / amenities and services are available in the Ulco Village:

Ulco East:
Ulco East is the residential area for employee level PG12 (Artisan 8) and upwards.

- The sewage plant is in the southern section of Ulco East
- The Ulco golf course borders onto the Ulco East.
- Church
- All houses have electrical connection, Telkom connection, potable water and a flush toilet. At minimum these houses are 2 bedroom, bathroom, kitchen, dining room and garage.

Ulco Central:
The main purpose of Ulco central is to provide amenities to residents of Ulco and the surrounding areas. Although there are a number of houses in the area, these houses are no longer used for residential purposes. The following amenities are in Ulco central:

- Creche for pre-primary children
- Ulco Academy School from pre-primary to Grade 12
- Ulco recreational hall / bar
- Sports fields
- Swimming pools
- Library and internet café
- Guest house for guest of Ulco
- Restaurant for guests of Ulco
- Offices for Custoda (an NGO)
- Churches
- Gardening services company
- Security company
- A petrol station is located in Ulco for use by all employees.
- A small supermarket (café) which provides essential household items, a post office, butcher shop, a liquor store, a hardware store and an ATM.
- A clinic which is open 4 times a week.

Ulco West:
Ulco West is the main residential area for employees level PG 11 and downwards. This includes housing for contractors.

- All houses have electrical connection, potable water, stoves and a flush toilet. At minimum these house have a bedroom, bathroom, kitchen and living room.
- Hostels used in the past are in the process of been converted to family houses.
- Ulco pre-school
- The Ulco primary school is situated in Ulco west.
- Churches
- Sports fields

- All roads in Ulco village are paved with appropriate storm water control along the road sides.
- All domestic waste is collected and recycled at the waste separation site on the Ash Dump
- All gardens are maintained by gardener contractors
- All garden refuse is collected and used for concurrent rehabilitation of the ash dump.
- Potable water is available at all times to all the houses.
- All houses have electrical connections.
- All houses have flush toilets which are linked to the Ulco sewage plant
- All houses are renovated / painted in a 10 year cycle.
- Ulco maintain all infrastructures in houses for a nominal fee.

3.8 SAFETY, HEALTH AND ENVIRONMENTAL DEPARTMENT

The Safety Health and Environmental Department (SHE) at Ulco are responsible to ensure that the health, safety and environmental requirements for the mine are implemented. This section of the report focuses on the environmental aspects that fall under the control of the SHE Department.

Some of the activities described below is not the sole responsibility for the SHE Department to manage, but have been placed in this section in order to ensure that the flow / structure of the document. An example is that all the water aspects of the mine have been described in this section; however, the responsibility for the upkeep of storm water structures falls under the Maintenance Department.

3.8.1 Health, Safety & Environmental Training & Occupational Monitoring

Each employee and sub-contractor whom works for and on behalf of Ulco is subjected to appropriate health and safety training. The SHE Department is responsible for the implementation of the health and safety training.

In order to ensure that occupational exposure limits are not exceeded, occupational health and safety monitoring is implemented by the SHE department. Monitoring includes:

- Noise induced hearing loss
- Heat stress
- Personal dust monitoring
- Ventilation
- Illumination

3.8.2 Risk assessments:

As and when a new activity is implemented at Ulco or there is a change to an existing activity the SHE Department is responsible to undertake a risk assessment on that activity. Part of the risk assessment includes environmental risks and environmental legal requirements.

3.8.3 Documentation Control / Environmental Legal Compliance

All environmentally required documentation such as environment applications, permits, permissions and result of monitoring campaigns is reviewed and maintained by the SHE Department.

The SHE Department resumes the responsibility for the implementation of the ISO 14001: 2004 environmental management system.

3.8.4 Water Management

Full detail concerning the water requirements at Ulco should be obtained from the integrated water use license documentation. The SHE department resumes overall responsibility for water management issues which include;

Legal requirements: Ensuring that all water use on the mine is legal. For an indication of the current legal requirements the integrated water use license should be reviewed.

Potable & Process water: The water supply at Ulco is provided from two sources; i) water from the Vaal River is used as industrial and potable water, and ii) borehole water is used to irrigate the gardens and sports fields. A description of the extraction of water from each source and the water purification plant is given below.

River Water Supply and Water Purification Plant: Both domestic and industrial water is obtained from the Vaal River, located approximately 10km south-west from the Mine. There is a pipe line between the Vaal River pump station and the Mine. The details of the pumps and reservoirs are as follows:

River water is pumped from the Vaal River into a settling reservoir by two river pumps. From the settling reservoir the water is pumped onto two intermediate pump stations. These stations can act as an emergency storage facility of water. From the intermediate reservoirs the water is then transferred to the Ulco Water Treatment Works.

Ulco Water Treatment Plant: This water treatment works has been permitted as a Class E Works. Water is initially pumped to the raw water reservoir. From here, the purification process begins by passing the water through two classifier tanks, with an automatic flush system. The water is then fed through two sand filters with an automatic backwash system. This "backwash water", containing suspended solids removed from the river water, is used for dust suppression on the quarry roads. The filtered water is then treated with chlorine gas and finally flows through the clean treated water system.
Using the force of gravity, potable water flows from the clean water reservoir to the Ulco Township and the plant.

Borehole Water Supply: Borehole water is obtained from three boreholes located on the farm Bergville and used to provide water for the township gardens, sports fields and to supplement the back wash water for road dust suppression.

Water for dust suppression: Water for dust suppression purposes can be obtained from either raw water from the Vaal River, backwash water from water purification plant or water captured in sumps within the quarries.

Upkeep of the Water balance diagram: The SHE Department is responsible for the upkeep of the water balance diagram. See **Figure 3.9** below for an indication of the water flow through out the mine.

Storm water: Overall planning and implementation of storm water management controls falls under the responsibility of the SHE department

Oil traps: It is the responsibility of the SHE Department to ensure that all oil traps are working effectively and oily water is not released into the environment.

Sewage works: The sewage treatment facility at Ulco is registered as a Class C Works. All houses, recreation buildings, offices and factory facilities are connected to the domestic sewage treatment plant capable of handling 540m^3 of domestic sewage per day. The sewage plant consists of:

- A primary settling tank,
- A secondary settling tank,
- Two bio-filters,
- An anaerobic sludge digester (new digester was built and commissioned in June 2003),
- A sand filter, and
- A chlorinator.

The location of the sewage plant was selected to ensure that the domestic drains and sewage system from the factory and the majority of the township is drained to the sewage plant by gravity drain. Only one intermediate sewage pump station is required for the western part of the township.

The discharge water from the sewage plant is used by the neighbouring farmer as irrigation water. The E. *coli* and coliform content of this water is tested on a monthly basis, with full chemical tests being undertaken quarterly.

Waste sludge is pumped to one of three drying ponds at the sewage treatment plant. Once the sludge has dried, it is either:

- Mixed with garden refuse and re-used as compost for rehabilitation, or
- Given to a local nursery for use as part of a compost mix.

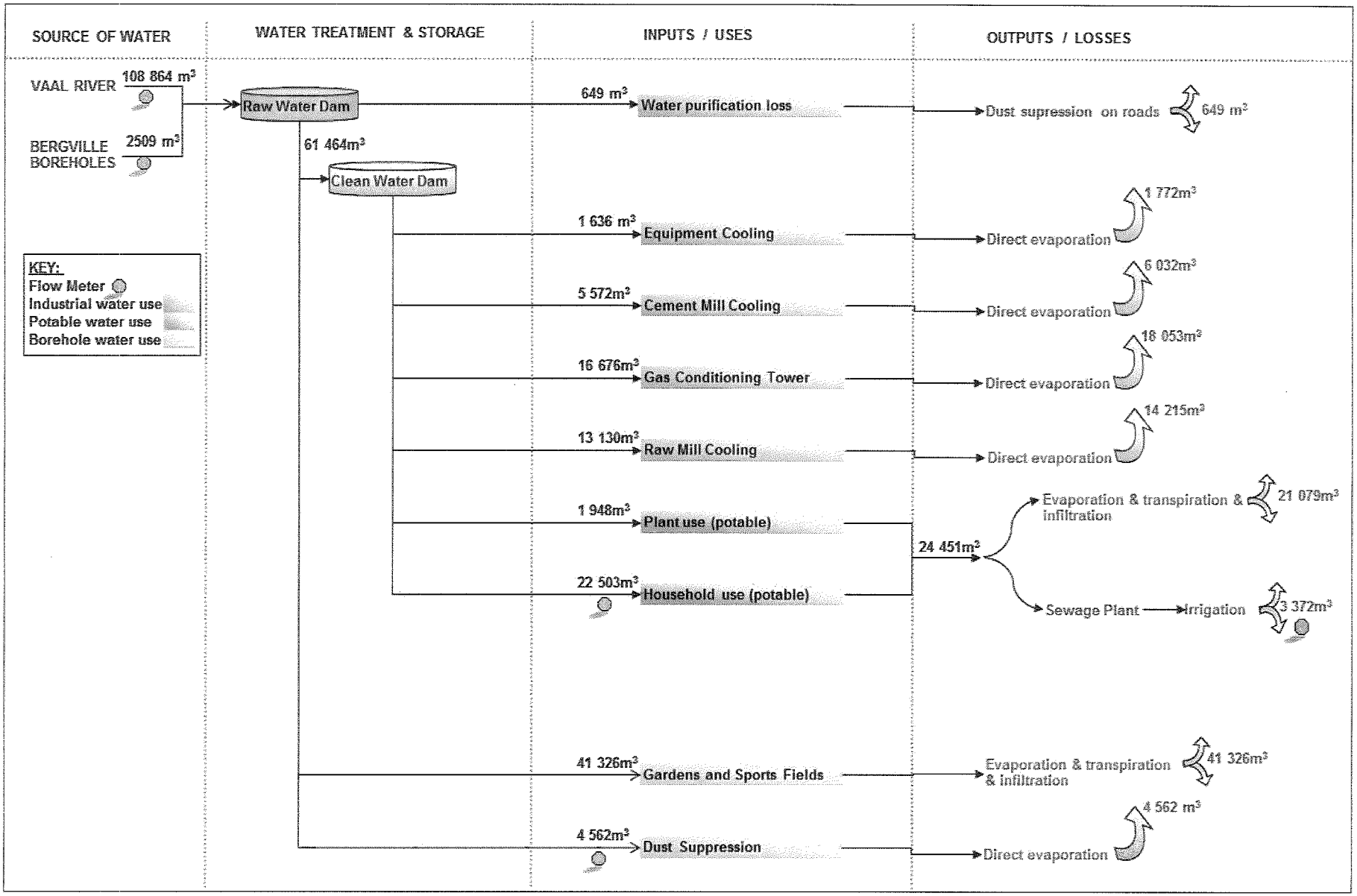


Figure 3-9: Water flow diagram

3.8.5 Waste Management

The SHE Department is responsible for the implementation of effective waste management measures throughout the operation. Ulco have submitted an application for a waste license. See **Appendix 5** for a copy of the designated waste storage facilities at Ulco and a copy of the current waste management procedure which details the specific waste management requirements.

Quarry Waste

Very little waste is generated during mining operations in the quarry and includes wood, paper, packing and sawdust contaminated with hydrocarbons. The sawdust is used to clean up hydrocarbon spills and is therefore generated in very small quantities. The methods of disposal are given in the waste management procedure captured within **Appendix 5**.

Any overburden created during mining activities is used in concurrent rehabilitation processes.

Plant Waste

Waste streams generated from production and other sections of the Ulco operations are listed in tables captured in the Waste management procedure in **Appendix 5** below. The shaped and unshaped refractory are all bricks used in to line the kiln. The information in the tables provides the estimated volumes of waste generated, if it is an erratic or continuous source, the current treatment or disposal methods, the chemical composition and if it has a calorific value. All spillages of cement and clinker are recycled back into the process.

Scrap metal – Stored next to the salvage yard and sold when sufficient scrap metal (metal that cannot be salvaged for any purpose) has been collected (**Figure 3.10**).

Figure 3-10: Salvage yard.

Waste Disposal Site

Domestic waste and garden refuse generated from Ulco township and sports fields is collected separately by a contractor, on a weekly basis.

Domestic waste. Since 2005, the mine has initiated a recycling programme for its domestic waste. All domestic waste is collected and brought to the waste dump. At the waste dump, glass, tins, paper and plastic is separated into separate storage areas. As and when the storage areas are full of the individual waste streams, the material will be transported to a recycling depot in Bloemfontein. All waste left after separation is covered on a weekly basis. A list of the waste and the quantities received at the dump site are given in **Appendix 5**. The pit where waste is tipped and covered is fenced on all sides, with a single