

Table 10.3 Historical Safety Statistics – LTIFR^{(1), (2), (3), (4)}

Operation ^{(1), (2), (3)}	2001 (No.)	2002 (No.)	2003 (No.)	2004 (No.)	2005 (No.)
LTIFR:					
Iron Ore					
Sishen Mine	NR	0.85	0.48	0.53	0.29
Thabazimbi Mine	NR	0.42	0.36	0.29	0.19
Coal					
Grootegeeluk Mine	NR	0.40	0.20	0.20	0.40
Leeuwpans Mine	NR	0.70		0.40	0.30
Tshikondeni Mine	NR	0.40	0.30	0.70	0.50
Arnot Colliery	NR	2.60	5.10	4.90	4.80
Matla Colliery	NR	1.70	2.50	6.10	5.10
New Clydesdale Colliery	NR	0.70		3.70	1.50
North Block Complex	NR	3.80	1.90	3.60	1.20
Heavy Minerals					
Hillendale Mine	NR		0.10	1.19	0.40
Tiwest JV	NR	NR	NR	2.45	3.15
Base Metals					
Rosh Pinah	NR	0.63	0.63	0.35	0.41
Zincor	NR	0.80	0.71 0.68	0.82	
Chifeng Phase II	NR	NR	NR	NR	NR
Chifeng Phase III Project	NR	NR	NR	NR	NR
Industrial Minerals					
Glen Douglas	NR	0.50	4.62	1.37	
Kumba FerroAlloys	NR		1.71		2.52
Total	–	13.5	18.6	26.5	21.6

⁽¹⁾ LTIFR = Lost Time Injury Frequency Rate.

⁽²⁾ LTIFR rates are all measured per million man-hours worked.

⁽³⁾ Totals are estimated from weighted TECs as presented in Table 9.1.

⁽⁴⁾ NR = Not Reported.

11. ENVIRONMENTAL MANAGEMENT

11.1 Introduction

The following section includes discussion and comment on the environmental management aspects of the Material Properties. Specifically, comment is included on the status of environmental legislation applicable to the Material Properties; compliance with legislation and environmental authorisations; environmental policies and management at the sites; key liabilities and risks over the life of the operation for each site; and decommissioning and closure liabilities and risks. This section of the report is based on: discussions with relevant staff at the site; review of environmental and social documentation; closure liability documentation; and site visits to inspect surface infrastructure at key sites. For the purposes of this section a liability (refer to Table 11.1) and risk are defined as follows: a liability can be assigned a monetary value to be included in the financial model (e.g. costs associated with new storm water containment) and a risk involves too much uncertainty to enable cost predictions to be made (e.g. possibility that more stringent requirements will be imposed by the regulator in the future). Risks or liabilities that would generally be addressed in terms of accepted environmental practice and that do not have significant cost implications have not been discussed. Comments are made relating to the nature of the risk/liability, the level of uncertainty and the manner in which it has been addressed. In some instances, SRK has suggested a sensitivity contingency for items that are not clear liabilities but where a preliminary cost estimate can be given to the potential risk. Without a detailed costing exercise, these values should be used to test the sensitivity of the financial model only and not taken as firm liabilities. For the purposes of this study, the criteria used for assessment purposes are those required by relevant host country legislation and generally accepted practice in the mining industry of the host country. In line with the Sustainable Development concept of the triple bottom line, social and economic issues have also been discussed, where relevant.

11.2 Legislation

11.2.1 South Africa

National Environmental Management Act (107 of 1998) is regulated by the Department of Environmental Agriculture and Tourism (“DEAT”). This overarches South African environmental legislation and lays down basic environmental principles including: Duty of Care, Polluter Pays and Sustainability.

Mineral and Petroleum Resources Development Act (“MPRDA”) as regulated by the Department of Minerals and Energy (“DME”). Replacing the Minerals Act, 1991, it aims to provide for equitable access to, and sustainable development of, the nation’s mineral and petroleum resources. Regulations provide procedures for undertaking environmental impact assessments (“EIA”), including public involvement and development of environmental management programmes (“EMP”) for the construction, operation and closure of mines. The DME must ensure other regulatory authorities with an interest in the environment are consulted. In summary, the EMP contains the environmental conditions of authorisation for the development, operation and closure of a mine. Existing mines should have an approved environmental management programme report (“EMPR”) in terms of the Minerals Act, 1991. The MPRDA provides transitional arrangements for converting old order mining rights to new order mining rights by the 31 April 2009. A key requirement for new mines or for the conversion process is the need for a social and labour plan, a mining works plan, proof of technical and financial competence, as well as an approved EMP.

Mine Health and Safety Act (Act 29 of 1996) as regulated by the DME: This Act deals with the protection of the health and safety of persons in the mining industry but has some implications for environmental issues due to the need for environmental monitoring within mine operations and maintenance of mine residue deposits.

National Water Act (36 of 1998) (“NWA”) as regulated by the Department of Water Affairs and Forestry (“DWAF”): The Act stipulates that water uses (abstraction, storage, waste disposal, discharge, removal of underground water and alternation to watercourses) must be licenced. The Act also has requirements relating to pollution control, protection of water resources (specifically for mines, there is a specific regulation known as GN 704), dam safety and water use tariffs.

Atmospheric Pollution Prevention Act (45 of 1965) (“APPA”) as regulated by DEAT. This Act allows for emissions from scheduled processes to be controlled by means of a registration certificate. Examples of such processes would be smelters, furnaces, acid plants or roasters. The Act is outdated and will be replaced shortly with the National Environmental Management: Air Quality Act (39 of 2004), which has not yet been brought into effect.

Environment Conservation Act (73 of 1989) (“ECA”) as regulated by the DEAT, DWAF and relevant provincial departments. In most cases the Act’s requirements are covered by the MPRDA, however, this must be agreed with the relevant authorities and general legal consensus is that both Acts must be complied with, though a single EIA process can be used. Certain beneficiation operations that are separate from working mines may fall under this Act. Section 24 of NEMA and associated new regulations will shortly replace the ECA provisions. The ECA also requires domestic or industrial waste sites to be permitted.

National Heritage Resources Act (25 of 1999) as regulated by South African Heritage Resource Agency or Provincial Authorities. This Act controls sites of archaeological or cultural significance. Such sites must be investigated and, if necessary, protected for the nation. Procedures for the relocation of graves are also given.

Hazardous Substances Act (15 of 1973) as regulated by the Department of Health. The Act deals with the declaration of hazardous substances and control of declared substances. It allows for regulations relating to the manufacturing, modification, importation, storage, transportation and disposal of any grouped hazardous substance including asbestos, hydrocarbons, PCBs, etc.

ECA, Forest Act (84 of 1998), Provincial Nature Conservation Acts and other Ordinances as regulated by Provincial conservation authorities. The Act ensures protection of certain species of animals and plants. Permissions to move protected species are required in certain cases.

National Nuclear Regulator Act (46 of 1999) as regulated by the National Nuclear Regulator (“NNR”). Certificates of Registration (“COR”) are required for radiation sources above a certain threshold. The COR will specific monitoring, assessment and reporting requirements.

Mining practices in South Africa are such that whilst individual operations are usually materially compliant, strict legal compliance can seldom be demonstrated and is rarely enforced by the relevant regulatory authorities. Where minor/nominal non-compliance occurs, this is generally not considered material to the

continuation of future operations. In cases where regulatory authorities are concerned about particular non-compliance issues, a negotiated realistic way forward is usually agreed upon.

Environmental liability provisioning in the South African mining industry is a requirement of the MPRDA and must be agreed with the relevant regulatory authorities (mainly DME and DWAF). Based on South Africa's requirements, and for existing mines (different for new mines), monies are accrued annually in a trust fund based on the estimated environmental rehabilitation cost should the mine have to close immediately divided by the operating life of a mine. The South African Revenue Services approves such contributions as there is a tax benefit. For new mines and some older mines, additional bank guarantees, corporate guarantees or insurance policies may be required.

11.2.2 Australia

Mining operations on tenements in Australia must be developed and operated in compliance with Commonwealth and their respective State or Territory environmental legislative requirements. Within Australia's federal system of government, both the regulation of mining operations and the protection of the environment are principally State responsibilities. The principal environmental regulatory documents are detailed below.

The powers of the Commonwealth to regulate mining and other activities concerning the environment are primarily contained in Section 51 of the Commonwealth Constitution. Importantly, where any law of a State or Territory is inconsistent with a Commonwealth law, the Commonwealth law prevails and the Commonwealth therefore has the ability to over-ride State laws should it choose to do so in areas within its legislative competence.

Australian Commonwealth

Environmental Protection and Biodiversity Conservation ("EPBC") Act, 1999, as regulated by the Department of the Environment and Heritage ("DEH"). This is applicable where Commonwealth approval is considered necessary due to matters of national significance, which includes presence of migratory birds, federally listed rare flora or fauna, Commonwealth land, nuclear actions and marine areas. Unless there are exceptional circumstances, DEH will delegate the approval process and day-to-day administration of the mines back to State and Territory governments.

Western Australia

Mining Act, 1978, as regulated by the Department of Industry and Resources ("DoIR"). Before commencement of any mining operation, the proponent is required to submit a Notice of Intent ("NOI") to the DoIR. The NOI (similar to a Scoping Report) describes the proposed project, surrounding environment, potential environmental impacts and proposed prevention and mitigation measures. Commitments made within the NOI are binding for any future operations unless a request for an amendment is accepted.

Environmental Protection Act, 1986, as regulated by the Environment Protection Authority ("EPA"). The DoIR, as the decision making authority for mining projects, is required to refer mining projects to the EPA if it considers them likely to have a significant effect on the environment. A Memorandum of Understanding exists between DoIR and the EPA whereby projects are considered automatically to have significant effects on the environment if they satisfy certain criteria. All projects referred to the EPA are assessed on a case-by-case basis. On receipt of a referral, the EPA assumes responsibility for determining the appropriate level of assessment for the project. The Department of Environment ("DoE") provides technical assistance to the EPA. An environmental assessment document will be prepared in accordance with EPA guidelines following setting of the formal level of assessment by the EPA. Stakeholder consultation will be carried out. If the project is formally assessed at a Public Environmental Review level or above, then the assessment document must be publicly reviewed. Responses to all public comments received must be prepared and submitted to the EPA. An EPA bulletin is prepared and submitted to the Minister for Environment for approval and issue of a Ministerial Statement. If activities to take place during operations are listed as Scheduled Activities under the Act, a Works Approval will be required from the DoE. Typically, Works Approval documentation is submitted concurrently with the NOI. On completion of construction of such infrastructure, completion certificates must be submitted to DoE to confirm the infrastructure has been constructed in accordance with approved design criteria. Subsequent to this, an Environmental Licence is required prior to operation of such infrastructure. Environmental licences are typically renewed on an annual basis. Recent changes in vegetation clearance legislation have seen authority for granting clearing activities for mining projects change from DoIR to DoE. As such, the Native Vegetation Protection section of DoE is assessing proposals involving vegetation removal.

Contaminated Sites Act, 2003. The Act was passed in November 2003, and proclaimed in 2004. Since proclamation, new environmental investigation and reporting requirements are required by mining operations.

Rights in Water and Irrigation Act, 1914, as regulated by the Water and Rivers Commission (“WRC”) (a department within DoE). Groundwater licences (“GWL”) and licences to construct or alter wells (“CAW”) are issued by WRC.

Other relevant legislation includes: Conservation and Land Management Act, 1984; Wildlife Conservation Act, 1950; Aboriginal Heritage Act, 1972; Heritage of Western Australia Act, 1990, and Mining on Private Property Act, 1898.

11.2.3 Namibia

Environmental Assessment Policy (1994); Namibia’s Environmental Assessment Policy is to be legislated through the Environmental Management Act, which is currently in its final draft phase. The spirit of this policy is, however, currently legislated in the Minerals Act, 33 of 1992. The Act requires that an application for a Mining Licence shall contain particulars of: the condition of the existing environment; an estimate of the impacts and the proposed mitigation measures; and details regarding pollution control, waste management, rehabilitation, and minimisation of impacts on adjoining land.

Namibian Legislation includes: Constitution of the Republic of Namibia (1990); Labour Act (1992); Regulations relating to the Health and Safety of Employees at Work, promulgated in terms of the Labour Act, 6 of 1992 (GN 156, GG 1617 of 1 August 1997); Health Act (1999); Namibian Water Corporation Act, 12 (1997); Minerals (Prospecting and Mining) Act, 33 (1992); Petroleum Products and Energy Act, 13 (1990); Electricity Act, 2 (2000).

Namibian Policies and Draft Legislation: Environmental Assessment Policy for Sustainable Development and Environmental Conservation (1994); Policy for the Conservation of Biotic Diversity and Habitat Protection (1994); National Water Policy, White Paper (2000); Draft Minerals Policy for Namibia (2001); Policy for Prospecting and Mining in Protected Areas and National Monuments (1999) and Draft White Paper on the Energy Policy of Namibia (1998).

South African Legislation still in force since Namibian Independence in 1990: Nature Conservation Ordinance (1975); Nature Conservation Amendment Act (1996); Forestry Act (1968); Water Act (1956) and Atmospheric Pollution Prevention Ordinance (1976).

Pending Namibian Legislation (due to be promulgated within the next few years): Environmental Management Bill (1998); Draft Parks and Wildlife Management Bill (2002); Draft Pollution Control and Waste Management Bill (1999); Draft Mine Health and Safety Regulations (10th draft, 1999) and Draft National Heritage Bill (1999).

International Laws signed or ratified by the Namibian Government: Convention on International Trade and Endangered Species of Wild Fauna and Flora (“CITES”) (1973); Vienna Convention for the Protection of the Ozone Layer (1985); Montreal Protocol on Substances that Deplete the Ozone Layer (1987); Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal (1989) and Convention on Biological Diversity (1992).

11.3 Exxaro and Kumba Iron Ore corporate sustainability

Corporate responsibility is governed by a sustainable development framework. Twenty elements were identified as being of crucial importance to minimise the negative impacts of Kumba operations on its environment as well as enhancing the positive contributions it makes to local community development.

11.4 Iron Ore – Sishen Mine

11.4.1 Introduction

Iron ore is mined by means of extensive open pits extending approximately 12km in length. Sishen Mine, located in an arid region of the Northern Cape, receives a relatively low rainfall of 350mm/annum. Three towns have developed around the mine, primarily for the housing of mine employees. A number of small mines are located in this part of the Kalahari. The aridness of the region limits surrounding farming activities to sheep and cattle farming. The area behind the town of Kathu is one of the largest remaining populations of the camel thorn tree and is considered an area of natural heritage. The Gamagara River is located to the south of the mine, however, it has been more than 20 years since this river flowed.

11.4.2 Environmental Compliance

The Mine operates under an approved EMP (July 2002), with four approved addenda for the expansions or operational changes recently made. The DME has not requested that the Mine converts the EMP to meet requirements of MPRDA. Existing water uses on the mine have been registered. An application for a water use licence was made at end of 2004, however DWAF keeps requesting additional information and appears unable to make a decision on the information to be included in the application. The SEP has not been included in the application, however, DWAF has indicated that this can be addressed through a "letter type" report. The mine is currently operating under the Water Act, 1956, permit that has no expiry date. The Mine operates a certified ISO 14001 (certified 2001) EMS. Historically, the Mine has undergone external bi-annual surveillance audits however, the Mine has determined that this is too frequent and is moving to annual audits, with ongoing internal audits through out the year. The Mine undertook an enviro-legal audit during 2004. The aspects identified were rated from 1 to 4 with 1 being low risk and 4 being high risk. The aspects that have not yet been closed out and have a rating of 4 include: the impacts that dewatering of groundwater has on stakeholders and the effect of increasing de-watering impact in future on alternative land uses; non-compliance with GN 704; the impact of dust pollution on air quality and non-compliance with waste management legislation.

11.4.3 Environmental and Social Management

Sishen Mine employs a number of personnel whose key performance area is environmental management. The primary person responsible for management is the environmental manager who reports to the SHEQ manager. The environmental manager has a technician, an ISO 14001 co-ordinator and a professional in training who report to him. The Mine also employs two other ISO 14001 co-ordinators who report to the engineering and mining managers, respectively. Social management is the responsibility of the Manager Sustainable Development.

The operational environmental budget for the facility is approximately ZAR14mpa. This includes a contribution of ZAR6m to the rehabilitation trust fund, ZAR3.5m for ongoing soil remediation, approximately ZAR0.5m for HQ SHEQ costs and the remainder utilised for rehabilitation experiments, monitoring, ISO audits, etc. SRK is of the opinion that the budget (ZAR4m) for the daily environmental management of the Mine is sufficient.

11.4.4 Environmental Issues

Rehabilitation of waste rock dumps: The waste rock contained in the 39 large waste dumps is inert, non-acid forming, and other than suspended solids, does not produce a contaminated seep. Historically, dumping was by end-tipping resulting in the creation of slopes at a natural angle of repose (37°). This slope is difficult to rehabilitate as vegetation cannot easily traverse this slope. The DME may also consider them to be potentially unstable. Furthermore, water runoff from the slopes leads to significant erosion. This has been partially rectified via an internal directive to construct the dumps with a series of benches. Originally bench widths were 20m, however this was increased to 30m in the 1990s and 45m in 2000. This has reduced the overall slope angle, but slopes between benches are still at 37°. Low rainfall limits vegetation growth, further hampering rehabilitation efforts. The Mine is currently experimenting with various rehabilitation options including reducing slope angles and the inclusion of various soil ameliorants. Early indications are that the difference in successful vegetation cover between a slope of 18° and 30° is minimal but the latter is impractical as plants still have difficulty taking root on the slopes. Therefore, if the DME indicates that stability is a problem, the Mine will re-profile the slopes to 24°. This slope angle allows vegetation to comfortably take root, provide for adequate cover and reduce risks associated with stability. However, it still does not increase the plant footprint to the extent that would occur if slopes were re-profiled to 18°. Currently, the Mine has no provision for dump rehabilitation in its closure budget, as it is still awaiting the results of the vegetation experiments. If it is determined that the slopes need to be cut back from the angle of repose, SRK estimates that the rehabilitation will cost the Mine in the region of ZAR150 – 200m.

Backfilling of Pits: The EMPR commits the Mine to returning 50% of the waste rock to the pits at the end of the life of mine. While the Mine is partially compliant with this commitment, a backlog has developed as grade control dictates that the pit remains open as long as possible. This gives the Mine three options for ongoing management: firstly, the mine plan will need to be revised to optimise ongoing operational backfilling; secondly, motivation will need to be made to the DME on why backfilling is not practicable; or thirdly provision in the order of ZAR100 – 150m will need to be included in the closure liability to backfill and rehabilitate the final surface. As a final decision on how this will be managed has not been made, SRK has included this provision as a sensitivity contingency.

Hazardous Material Handling: Historically, hydrocarbon housekeeping management has been poor resulting in the contamination of the soils around the workshops, service and fuel stations and around the High Energy Fuel ("HEF") plant. To date the Mine has spent ZAR3m on rehabilitating the soils and it estimates

that rehabilitation of the remaining contamination will amount to ZAR12m. It is expected that this will be a once-off cost as oil handling has been improved through the implementation of new housekeeping procedures.

Radioactive Sources: Some of the instrumentation in the plant is radioactive. These instruments are managed by an operator licenced to handle radioactive sources. At the end of the life of the equipment, the radioactive sources are disposed of by the Nuclear Energy Corporation (of South Africa). It is understood that a provision for disposal has been made in the closure costing.

Water Contamination: No contamination, other than suspended solids is evident around the waste rock and tailings dumps. Although, the Mine produces a relatively high sediment load, the lack of surface water in the vicinity of the Mine means that the sediments drop onto surface where the runoff evaporates. The use of explosive has led to slightly elevated nitrate levels around the waste rock dumps, however SRK understand that these do not pose a significant risk. The plant utilises approximately 1Mm³/year of treated sewage effluent during the washing process resulting in an effluent containing residual nitrates that is disposed on the tailings dams. This has also resulted in a non-significant increase in nitrates in the groundwater above background but still within DWAF's drinking water guidelines. Groundwater in the vicinity of the hydrocarbon spills is contaminated with hydrocarbons, however, migration of this plume is limited by groundwater extraction ahead of mining. As the dewatering boreholes supplying town are a significant distance from the source of contamination, there is a low risk that the town's water supply will be contaminated.

Water Management: Sishen Mine is partially GN 704 compliant and has implemented infrastructure to separate clean and dirty water, where practical. Where not compliant, the Mine has either requested exemption or is implementing management practices to become compliant. The majority of process water is sourced from the dewatering boreholes with make up obtained from the sewage plant. When necessary, water is abstracted from the Vaal – Gamagara pipeline. If there is a surplus, historically the Mine has discharged the portion not supplied to the local towns, into a canal which flows towards the Gamagara River (Mine has permit to discharge to the river). However, the water typically evaporates before it reaches the river. As the contamination load in this water is low, it is not expected that the area where evaporation occurs has led to significant soil contamination. The Mine has recently reached an agreement with DWAF, that any surplus groundwater will be pumped to the Vaal – Gamagara pipeline.

De-watering: It has been determined that the Mine has created a de-watering cone that has extended approximately 10km to the south of the Mine, impacting on local farmers water supply. This has resulted in the Mine now being required to supply one farmer with a tank full of water on a daily basis and to pay the difference in costs between abstracting groundwater and pumping water from the Vaal – Gamagara pipeline for another farmer. The Mine has an agreement that it will assist the remaining three farmers "as and when required" (although, there does not seem to be a definition of 'as and when required'). The Mine is investigating whether a dewatering plume has developed on the northern and western side of the Mine (studies indicate that there is no de-watering cone on the eastern side as it is limited by a significant dyke). Given that the groundwater in the vicinity of the Mine is relatively compartmentalised, the geology of the northern and western side indicates a low potential for the development of a significant dewatering cone.

Soil Contamination: Aside from the areas contaminated by hydrocarbons, the Mine reports that the soils around the ammonia nitrate stores have been contaminated during product handling and from spills and accidents. The area is relatively small and does not represent a significant liability.

Sinkhole Formation: The dolomites underlying the ore body have the potential to form sinkholes. Mining activities have opened a large sinkhole in the South Pit that requires backfilling during the mining process. The Mine has not undertaken any geotechnical investigations to determine areas of potential sinkhole formation, however, Sishen is aware of exploration drilling core losses indicative of potential sinkhole formation. These potential sink holes are relatively small and are all within the mining area. Therefore, aside from a safety risk, these sinkholes do not pose a risk to the surrounding communities.

Waste Handling: Historically the Mine has operated a domestic waste dump in the Mikrogolf area. This dump has recently been permitted by DWAF, however, the Mine is in the process of closing the dump, as the space is needed for the disposal of waste rock. It is not foreseen that there will be any problems with this closure plan, although the Mine will have to obtain closure in terms of Section 20 of the ECA.

Air Emissions: Dust emissions from the Mine are currently a nuisance to the local community with dust being generated in the pit, on haul roads and in the plant. The Mine has implemented dust control measures, such as the use of hydrophilic chemicals at the crushers and Dust-a-Side on the haul roads. With appropriate management this does not pose a significant risk.

Community Relationships: Sishen has finalised its social and labour plan. The Mine operates two community development projects that are expected to become sustainable in time. The first is the employment

of redundant farm workers to remove an intruder plant from the Mine and the surrounding Ferroland farms. Sishen has supplied equipment and training to the farm workers. The wood is used to manufacture charcoal, while the wood chips are sold to the Mine for use as organic material during the rehabilitation of the dumps. The second project is the establishment of the Tshipi development centre in conjunction with the Department of Labour. Tshipi focuses on equipping members of the local community (as well as members of the Defence Force and Correctional Services) with a trade skill. A portion of the profits generated by those trained is channelled back to the centre.

Closure Planning and Costing: Closure planning is limited to that covered by the EMPR. The Mine has estimated its liability for immediate closure to be ZAR196m. SRK is of the opinion that the provision is adequate for the work for which it is allocated. This does not allow for any provision for rehabilitation of the waste rock dumps, nor for backfilling 50% of the pit (see above).

11.5 Iron Ore – Sishen South Project

11.5.1 Introduction

The Sishen South project is located south west of Postmasburg on land that has previously been under extensive agricultural production involving small stock grazing on natural veld. To date, the only infrastructure on site is that associated with exploration drilling (offices, core shed and old drill sites). Observations on site indicate that all old drill sites have been well-rehabilitated by ensuring that all visible surficial hydrocarbons have been removed and vegetation re-established in the disturbed areas.

11.5.2 Environmental Compliance

As the operation is still in the planning stage, limited authorisations have been received. These are limited to permission for:

- Construction of a water pipeline and pump station;
- Construction of a railway line and service road;
- Construction of a new road to Witsand and access road to Kameelhoek.

It is understood a scoping report, an EIA and an Environmental Management plan in accordance with the requirements of the MPRDA are currently being prepared. It is SRK's opinion that this is in compliance with the requirements necessary to get the environmental authorisations required to continue with the project. It must be noted that although the correct process is being followed, it does not necessarily guarantee that authorisation will be granted, as the granting of the authorisation is dependent on the findings of the EIA and the commitments made in the EMP.

11.5.3 Environmental and Social Management

Environmental and social management is currently the responsibility of a project team consisting of Kumba personnel and various environmental consultants. A provision for Environmental rehabilitation to the value of ZAR11.9m was made at the end of the first year of the mining operation. An additional allowance to the value of ZAR0.72/t of final product, which equates to ZAR2.2mpa has been allowed for. A total amount of ZAR59m for environmental rehabilitation has been provided for. An amount of ZAR0.5mpa has been allowed for social investment projects in the community around Postmasburg. An amount of ZAR0.5mpa has been allowed for in order to monitor and assess environmental compliance.

11.5.4 Environmental Issues

Surrounding Landscapes: The Sishen South project is located south west of Postmasburg on land that has previously been under agricultural production involving small stock grazing on natural veld. To date, the only infrastructure on site is that associated with exploration drilling (offices, core shed and old drill sites). Observations on site indicate that all old drill sites have been well-rehabilitated by ensuring that all visible surficial hydrocarbons have been removed and vegetation re-established in the disturbed areas. Although, the site has been impacted on to some degree by agricultural activities, the Postmasburg area falls within the Griqualand West centre of endemism and therefore is ecologically sensitive. The proposed mine is also located on the western edge of the Ghaap Plateau which has been identified as a priority area of conservation by the Northern Cape Nature Conservation. The pans occurring in the area have been described as part of the western Ghaap lime panveld. The vegetation of these pans differs significantly from pans of the eastern part of the Ghaap. These pans have thus been regarded as having high ecological importance since they form part of unique ecosystems or ecological units. The pans within the mining area however, were not found to support any flora or faunal species of conservative importance although, several plant and animal species of conservation importance are known to occur within the proposed mining area.

Mining of the area could result in the loss of a large proportion of the eastern Ghaap lime panveld and there could be the destruction of habitats that support plant and animal species of conservation importance. This could necessitate the adjustment of pit layout to maximise the protection of pans and habitats of conservation importance. Furthermore, plants of conservation importance could need to be relocated where practical. As the requirements to undertake the above will only be determined once the EMP has been completed, it is not possible to allocate a cost to the above and it is seen as a risk.

Groundwater: The project area is located in a groundwater rich area, although groundwater levels do vary significantly across the project site as a result of aquifer morphology. Although adjacent mines have lowered the water table in the region, it is expected that dewatering of the aquifers will be necessary to allow mining to proceed. This could further lower the aquifer and there is a risk that adjacent water users could be impacted.

Contamination: As the minerals to be mined are relatively chemically inert, there is a low probability that soil and water contamination will occur as a result of mining, creating overburden stockpiles or mineral processing. However, if proper maintenance and environmental controls are not implemented around hydrocarbon management, there is a risk that both soils and groundwater could become contaminated.

Closure planning: Sishen Mine is currently undertaken rehabilitation trials to determine final waste rock rehabilitation requirements in terms of slope angle and thickness of topsoil cover. The results of this assessment will only be available in 2007. In the absence of these results it has been assumed that the waste rock dumps that will be created at Sishen South will be grade down to 18° from the angle of repose (30°). Based on this assumption it has been calculated that the rehabilitation costs associated with the dumps that will be created will be ZAR35.5m (assuming a 3Mtpa output). The demolition costs for the proposed infrastructure have been assessed to be ZAR9.5m. Additional costs (monitoring and maintenance; owners costs and contingency) have been assessed to be ZAR10.8m. The total closure liability at the feasibility stage of the project is therefore ZAR55.8m. It must be noted that this does not make any provision for hydrocarbon cleanup in the event that there are spills during the operation of the mine, or does it make any provision for the backfilling of opencast pits. Provisions have not been made for the backfilling of the pits as it is assumed that they will remain open at the end of the life of mine. If the authorities require that EMP commits to backfilling the pits at the end of the life of mine, it is estimated that these costs could range between ZAR50 – 100m. This money is therefore seen as a sensitivity analysis cost to the project.

11.6 Iron Ore – Thabazimbi Mine

11.6.1 Introduction

The Mine, constructed in the mountains surrounding the town of Thabazimbi, extracts iron ore from a series of open pits excavated into the mountainside. Waste rock is disposed of on the mountain slopes adjacent to the pits. The area surrounding the town is relatively arid and is primarily used for game farming activities. The Mine is the only significant industry in the area.

11.6.2 Environmental Compliance

The Mine, currently operating under an EMP approved in 1995, is busy compiling a new EMP as part of its MPRDA conversion. The driver of the conversion was originally to include the proposed Phoenix Project, however the Mine has taken a decision to include the entire operation in a single submission. A SLP is also under development. Water uses on the Mine have been registered and the Mine is in the process of applying for a water use licence (second draft submitted end of July 2005), including an integrated water and waste management plan.

Thabazimbi is ISO 14001 certified (November 2004). A single surveillance audit has been conducted since certification and did not report any major non-compliances. The Mine undertook an enviro-legal audit in September 2004. The aspects identified were rated from 1 to 4 with 1 being low risk and 4 being high risk. The aspects that have not yet been closed out and have a rating of 4 include: the lack of documentation relating to safe disposal of waste sent off-site; lack of formal documentation relating to the closure of the Mine's domestic waste dump; the requirement for further monitoring at the domestic waste dump; the potential for pollution during handling of SANS 10228 listed substances (hydrocarbons); hydrocarbon contamination of soil, surface and groundwater; inadequate separation of clean and dirty water (GN 704); and the potential that groundwater supplied to the town as drinking water may become contaminated. A programme is being followed to close out on these issues.

11.6.3 Environmental and Social Management

Environmental management is the responsibility of the environmental manager, who is assisted by a local contractor on an ad hoc basis. The primary responsibility of the contractor is to reduce the backlog of un-rehabilitated waste rock dumps. Where necessary, the Mine employs consultants on a project basis. Social

management is the responsibility of the Regional Manager – Sustainability (Limpopo). The operational environmental budget for the facility is ZAR7mpa. This includes a ZAR2m contribution to the Mine's closure fund, with the remainder utilised for waste rock dump rehabilitation, specialist studies, ISO audits and environmental monitoring. SRK is of the opinion that the operational budget is insufficient to meet the Mine's requirements, particularly with regard to addressing the rehabilitation backlog on the waste rock dumps and suggests an additional ZAR1.5mpa would be appropriate.

11.6.4 Environmental Issues

Waste rock dumps: The waste rock dumps, constructed on the mountain slopes adjacent to the pits, are constructed by end tipping the waste, creating a dump at the angle of repose 37°. The current remediation strategy (as per the EMPR) is to re-profile dump crests to 20°, excavate small excavations (approximately 2m x 2m) in the re-profiled areas into which various grasses and trees are hand planted. DME has indicated a concern with regard to dump stability, which may require the re-profiling of the entire dump to a less steep angle (no angle has as yet been specified by the DME). Re-profiling may be impractical, as there are space limitations on increasing the footprints. Should there be a requirement to re-profile the dumps, existing vegetation would be destroyed, resulting in the need to re-vegetate all re-profiled surfaces. SRK proposes a sensitivity contingency of between ZAR50 and ZAR75m for the civil work and the vegetating costs.

Hazardous material handling: The waste rock and tails from the plant are reported to be inert and there is no evidence of significant chemical contamination. Hazardous waste in the form of used hydrocarbons and associated containers is generated by the Mine. These are collected and stored on site until they are removed for recycling by a third party. The storage facility, which is on hardstanding, surrounded by a bund, appears to have insufficient capacity to contain the material generated. It is estimated that the cost to increase capacity is between ZAR0.1m and ZAR0.25m. Fluorescent tubes are crushed and are stored on site as there is currently no suitable pathway for the Mine to dispose of this material. It is estimated that the disposal cost at a hazardous waste site would be ZAR0.1mpa.

Water contamination: Although the waste rock and tails are inert, there is sometimes a problem with the suspended solid load that reports to the Crocodile River, via the Beerspruit. It is also reported that the nitrate levels in the groundwater near town are slightly elevated, but still within the DWAF drinking water guidelines. The primary source of nitrates is suspected to be treated sewage effluent that is used in the washing process. Monitoring data indicates that there have been instances when the soaps, oil and grease concentrations in the Crocodile River have been elevated, indicating hydrocarbon contamination from the Mine. Although there are instances of hydrocarbons being detected in the groundwater in boreholes adjacent to the workshop area, it is reported that hydrocarbons are not detected in the Mine's groundwater supply boreholes providing town with water.

Possible decant: Dewatering of the aquifer around the Donkerspoort West pit is currently undertaken and the Mine is currently not sure what the rebound level in the pit will be after mining and de-watering has stopped. Although, there is a possibility that the rebound level could be such that there is decant to the surrounding environment, this is not seen as a liability as the quality is expected to be acceptable for discharge.

Soil contamination: Limited soil contamination has arisen through poor hydrocarbon containment at a number of areas on the Mine (particularly around the workshops). Neither the closure cost nor the operational budget appears to have a provision for cleanup of these areas. It is estimated that cleanup will cost between ZAR1 – 5m.

Land degradation: The various pits and waste rock dumps that make up the Mine are likely to be permanent features in the landscape as there are no plans to backfill the pits. Sinkholes have formed through the collapse of underground workings. These sinkholes pose a safety risk to the Mine with the result that access to these areas has been limited. Either permanent access control will be required (thereby preventing a walk away solution) or backfilling may need to be considered, although potentially impractical. As this has not been fully considered in the closure liability (see below), there is a risk that major costs could be incurred.

Air emissions: Dust is a nuisance to the local community, resulting in some complaints. The Mine hopes to reduce dust through the application of a coating (Dust-a-Side) to the haul roads. The Mine is also investigating dust reduction mechanisms at the plant and crusher. There was a claim that mine workers were getting sick as a result of exposure to dust, however, medical tests indicated that the workers were being affected by emissions from the adjacent andalusite mine. Limited dust monitoring is undertaken on the Mine, with the monitoring program still in its infancy. With appropriate management, the risk is considered to be small.

Community relationships: The Mine's philosophy is to supply expertise to the local community as and where required, as part of its "Volunteerism" project, to assist the community with preventative maintenance on the town's infrastructure. It is estimated that the key role players on the Mine invest up to 10 hours a month assisting the community. The Mine has created a skill development centre, where the local community are trained in a trade that can be utilised in the area. Besides the development of a trade skill, the community members are given basic life skills (computer literacy, basic accounting and basic marketing). The Mine is also investigating the feasibility of developing a company that will allow small scale miners to recover high grade ore, by hand, that cannot be mechanically mined.

Closure planning and costing: The Mine has not developed a closure plan, although there are various commitments in the EMPR regarding closure requirements. Based on these, the Mine has assessed its immediate closure cost (June 2005) to be ZAR64m. This includes ZAR26m for demolition costs and ZAR38m for rehabilitation costs. The primary expense associated with rehabilitation appears to be the downsloping of the upper portions of the dump, the excavation of depressions for vegetation and the planting of grass.

There does not seem to be an allowance for any restoration of the footprints where infrastructure is removed, nor does there appear to be an allowance for the remediation of areas where hydrocarbons have been spilled. Assuming that no re-profiling of the dumps is indicated, SRK is of the opinion that the rehabilitation costs are insufficient, with there being a shortfall liability of ZAR13 – 37m to complete the rehabilitation as planned. SRK has therefore increased the environmental costs associated with closure by some ZAR22m. Based on the information available, SRK is of the opinion that the ZAR26m for demolition is sufficient. If the Mine is required to re-profile the waste rock dumps, it is expected that the costs incurred will be approximately R50 – 75m over and above the ZAR64m budgeted.

11.7 Coal – Grootegeluk Mine

The Mine has an approved EMPR dated 2006. In addition it has an approved addendum to the EMPR, dated 13 October 1999, which deals with changes in the water management system. The EMPR was considered to be out of date and in 2003 the DME requested a new EMPR. This has been compiled and submitted to DME for approval. A draft social and labour plan has also been compiled. These documents will be used as part of the Mine's MPRDA conversion to new order rights (submission expected before the end of 2005). Grootegeluk has a mining licence No. 17/2002 issued in terms of the Minerals Act, 1991.

The Mine has an exemption granted in terms of the Water Act, 1956, in respect of the disposal of purified or treated water including water recovered from any effluent. The Mine's own internal Water Management Report shows that the Mine is in compliance with the conditions of its water permit. In 2004, an Integrated Water and Waste Management Plan was prepared as a first step towards the Mine's application for a water use licence. A technical report in support of the water use licence application is now being compiled and is expected to be submitted to DWAF before the end of 2005.

An audit conducted in 2004, in terms of GN 704, found a number of areas of non-compliance. The Mine has an intensive programme aimed at rectifying all these issues within the next few years.

A Health, Safety and Environmental Legal Compliance Audit was undertaken by external consultants in October 2004 and an EMPR Compliance Audit was undertaken by external consultants in April 2005. Both audits noted certain non-compliances, however the Mine was complimented on high standards of management and environmental performance and continuous improvement. The issues identified by these audits are being addressed as part of the ongoing environmental management plan. Issues requiring attention include upgrading surface water management facilities, management of hydrocarbon spillages, industrial waste disposal practices and various housekeeping issues.

11.7.1 Environmental and Social Management

Grootegeluk has a comprehensive Safety, Health, Environment and Quality ("SHEQ") policy and a Certificate of Registration confirming that it operates an Environmental Management System that complies with the requirements of ISO 14001: 1996. The Mine has a comprehensive emergency response plan covering all aspects of the operation including environmental aspects.

The Mine has an environmental team consisting of a Head, Environmental Control, who assisted by a Project Leader Environmental Control and an ISO 14001 Co-ordinator. The Head Environmental Control reports to the Manager SHEQ who reports to the Mine Manager.

SRK is satisfied that the Mine's operational environmental budget of ZAR1.5m is adequate. Rehabilitation of the dumps is part of the mining budget. Some twenty capital projects dealing with water and environmental issues have been identified for the next three years. These projects are budgeted for as part of the Engineering budget. SRK believes that this programme will probably adequately address all the outstanding operational environmental issues. No specific environmental department capital projects have been identified for the next few years.

Grootegeeluk participates in the Lephalale Environmental forum, which meets every three months. A public participation process was conducted as part of the water use licence application process. The issues recorded are largely issues that are receiving attention and there were no issues of material concern identified. The Mine has a formalised system for recording and dealing with any environmentally related complaint from either the public or the authorities.

The Mine has a Corporate Citizenship Department with four members of staff focussing on social issues and the Mine's relationship with the community. They are working together with the Municipality and other role players to identify and address community needs. The Department has a budget (excluding salaries) calculated as 1% of pre-tax profits based on rolling three-year results.

11.7.2 Environmental Issues

Surface water: Polluted water is directed to a number of pollution control dams where it is stored for use in the various mining and process operations. A large new storage dam is being developed at the base of the pit (below the coal Seams), which will serve as the final storage dam in the system. A number of issues pertaining to surface water management have been identified as requiring attention and are being dealt with as part of the Mine's ongoing programme. In this regard it should be noted that some significant improvements have been implemented over the last few years. Since 1998 water from clean water sources has reduced from 70% of all water used to 30%, with the remainder made up from pit water and re-cycled water. There are some 20 water projects scheduled for the next three years to further improve water management on site.

Ground water: Potential operational groundwater impacts appear to be adequately managed. However, there is uncertainty as to what the post-closure impacts will be and how these may need to be managed. The large quantities of discard, which will be placed in the pit could possibly give rise to a pollution problem that will need to be managed. It is also not known whether seepage from the surface discard dumps could be an issue that may require post-closure management. There is a risk that post-closure ground water management costs, which have not yet been budgeted for, could be significant. SRK proposes that an amount of ZAR0.5m be provided for a groundwater study to assess this risk.

Discard dumps rehabilitation: The Mine has a number of discard dumps (total surface area of 770Ha) containing different mixtures of material some of which is carbonaceous in nature and burning (see below). In pit disposal is now being practiced on a small scale. A significant amount of research was conducted to determine the best way of doing this to prevent spontaneous combustion. The waste is being disposed of in cells protected by material not susceptible to spontaneous combustion. It will however be several years before there is sufficient space in the pit for all the material to be disposed of in this way. A rehabilitation method has been devised for the surface dumps whereby they will be clad with non-combustible material. They will then be topsoiled and grassed. Trials are being conducted to find the most cost-effective method. There is a risk that the final cost of rehabilitation of the discard dumps could be significantly more costly than currently budgeted for.

Slimes dam rehabilitation: There is a slimes (fine coal discard) dam facility consisting of a number of different dams. Some of this material is currently being recovered and sold. An investigation is underway into the feasibility of recovering more material. At this stage it is not possible to determine how much of the material will ultimately be recovered and what the final status of the site will be. As a result it is not possible to confirm what the actual rehabilitation requirements of this site will be. There is a risk that the final cost of rehabilitation of the slimes dam facility may exceed the current estimate.

Spontaneous combustion: Burning waste dumps are a long standing problem at Grootegeeluk and was identified in a recent public participation exercise as one of the main issues of concern. Grootegeeluk has both short and long-term solutions for dealing with this problem. In the short term the dump is constructed in such a manner that surfaces remain exposed for as short a time as possible and then covered with a temporary sand cover. In the longer term a more permanent cover is planned. It would appear that the public complaints are primarily a result of inadequate maintenance of the short-term measures. These complaints can most probably be rectified at little cost provided sufficient cover material is available in the long-term plan.

Soil utilisation: A significant quantity (probably in excess of 1 million m³) of soil will ultimately be required for rehabilitation purposes. In addition, other cover and insulation materials will be required in large quantities. A recent soil survey has shown that there is only a limited supply of suitable material. The Mine does not have a comprehensive materials balance and it is not possible to determine whether there will be sufficient materials for all the proposed requirements. There is therefore a risk that significantly more costly measures may have to be employed.

Closure planning and costs: The Mine's closure plan is incorporated in the EMPR. Mining is expected to continue for many years and hence no separate closure plan has yet been compiled. The Mine does not have

a formal plan for dealing with social aspects on closure. However consideration will be given, among other things, to re-deployment to other Kumba mines and to re-training. Grootegeluk has a detailed and comprehensive closure cost assessment. The estimated closure cost is ZAR243.8m. SRK proposes that a sensitivity contingency of between ZAR30m and ZAR50m be allowed for various uncertainties regarding the actual closure requirements in respect of the waste dumps, slurry dams, groundwater and the adequacy of the supply of soil and other materials for rehabilitation.

11.8 Coal – Leeuwpan Mine

Leeuwpan Mine has a Mining Licence No. 32/2003 issued on 18 November 2003, which is valid until 18 November 2007. This licence applies to various portions of the farms Kenbar 257 IR, Leeuwpan 246 IR, Moabsvelden 248 IR and Witklip 229 IR. The mine operates in accordance with its EMPR Addendum No. 2 (approved on 17 November 2003).

A regional road diversion was constructed in 2004 to enable the Mine to access certain reserves. The construction of the road diversion and associated infrastructure was addressed in a scoping report, dated May 2003, which was prepared for the Department of Public Works, Roads and Transport. Subsequently, EMPR Addendum No. 3 has been compiled and submitted for approval, however, this addendum has not been approved. Apparently, the mine's mineral rights on the farm Wolwefontein were not included in Addendum No. 2 and hence Addendum No. 3 cannot be approved with these rights included. This gives rise to a legal complication that will need to be addressed in a legal investigation. There may be a risk that the Mine could theoretically lose these rights.

An EMPR audit was conducted by an external party during 2003 and the Mine plans to have another audit done this year. This audit identified a number of areas of non-compliance, however, none of these were of any material concern. A draft SLP and mine works plan have been compiled. As soon as these are finalised (expected this year), the mine intends to submit these together with EMPR Addendum No. 3 to apply for its MPRDA conversion to new order rights. This exercise could prove to be a complex issue as the EMPR Addendum No. 3 has not been approved for the reasons discussed above. The Conversion could possibly be finalised with the Wolwefontein reserves excluded. However, since the non-compliance issues are not of material concern, it is likely that the new order rights will be granted.

The Mine has various water registration certificates, issued in 2002. A draft water use licence application has been submitted and has been returned to the Mine for certain amendments. The revised version is expected to be submitted during August 2005. The Mine has a permit, dated 4 August 1998, issued in terms of the Water Act, 1956, to permanently alter the course of an unnamed tributary of the Bronkhorstspuit.

11.8.1 Environmental and Social Management

Leeuwpan has a comprehensive SHE policy, which aims at continual improvement. The Mine has recently applied for certification in terms of OHSAS 18001 and ISO 14001. The initial audit has been completed and once the Mine's Action Plan has been submitted, the Mine expects to receive its certification.

Previously all environmental responsibilities rested with the Resource Manager. Recently a SHE Systems Co-ordinator, reporting to the SHE Manager, was appointed. This post is now responsible for most of the environmental duties. The environmental staff compliment therefore appears to be adequate. However, at this stage, the Resource Manager remains responsible for certain of the environmental activities. The Mines planned SHE budget for 2006 amounts to ZAR2m, which appears adequate. In addition to safety and health costs, this includes environmental monitoring, auditing and revegetation of rehabilitated areas. The actual earthworks costs for rehabilitation are included as a mining cost.

The Mine participates in the local Municipal Future Forum, as well as in the Delmas Development Forum. The Mine's socio-economic commitment programme is aimed at education, skills training and general poverty alleviation.

11.8.2 Environmental Issues

Surface water: Surface water management facilities are intended to recycle all contaminated water and contain it in a closed circuit. Significant fluctuations in volumes of water can occur, particularly during the rainy season and as the need to de-water various pits arises. Twice, Leeuwpan has had to obtain special permission to discharge water at the peak of the rainy season. Recently, Leeuwpan has improved its water management system with filter presses introduced to replace the slurry dams. Despite these improvements, it would appear that water management problems can still occur. During SRK's visit at the peak of the dry season, the settling dams at the plant were overflowing despite the fact that there was spare capacity in the Witklip pollution control dam. There is a risk that additional operational phase water management facilities and/or improved management procedures may be required. SRK proposes that a sensitivity contingency of between ZAR0.1m and ZAR2m be allowed to cover this eventuality.

Ground water: Hydrogeological studies and the groundwater monitoring programme indicate there is presently no significant impact with respect to contamination and de-watering of the regional dolomitic aquifer. This may, however, change as mining progresses. The possible future hydrogeological impacts from the Mine relate to increased inflow, de-watering of the dolomitic aquifer, deterioration of the water quality and the possible contamination of the regional dolomitic aquifer on closure. However, it is considered unlikely that any long-term contamination of groundwater will be significant. There is a small risk that, post-closure, groundwater management could be a lot more costly than is currently provided for.

Waste disposal: Coarse waste is returned to the base of the pit at a level that will be below the future ground water level. Pockets of waste are isolated by clay barrier walls and covered with overburden. This practice will help reduce the potential for the formation of acid mine drainage, as well as limiting the potential movement of such contamination away from the pit.

Rehabilitation: It is planned to develop each of the final mining voids into large evaporation dams designed to draw in water from the adjacent aquifer and prevent flow of contaminated water away from the site. However, the Mine does not have a detailed plan showing how this will be achieved. This is considered a serious oversight, as it is necessary to conduct mining operations in a manner to ensure the material, which is currently being moved, is replaced in such a way that the final required shaping of the pit can be achieved. Lack of adequate planning, design, management and control during the mining stage is likely to lead to greatly increased final rehabilitation costs. If this issue is not addressed it could lead to a contravention of the MPRDA, which requires mines to consider closure issues during all phases of the mine development.

River diversion: The Mine has a permit to permanently alter the course of an unnamed tributary of the Bronkhorstspuit. From a visual inspection of this diversion two significant issues are apparent. The cross-sectional dimensions of the canal appear to be significantly less than those stipulated in the permit. Secondly, significant erosion has occurred, most probably as a result of the diversion not complying with a suitable design. Money has been budgeted in the closure cost assessment to rectify this.

Closure planning and costing: The Mine does not have a separate closure plan but has calculated costs on the basis of the closure plan stipulated in the EMPR. Leeuwpan has a detailed and comprehensive closure cost assessment. However, as noted above, there is a lack of a proper materials balance and the volume of material that will have to be moved could greatly exceed the estimate. Leeuwpan has estimated the cost of closure at ZAR51.3m. This includes a 10% allowance for P&Gs and contingency. In the light of the uncertainty surrounding the final rehabilitation plan and the potential for additional groundwater costs SRK proposes a sensitivity contingency of between ZAR5m and ZAR10m be applied.

11.9 Coal – Tshikondeni Mine

Tshikondeni is an underground coal mine that started operations in 1984. The Mine is situated in the north eastern corner of the Limpopo Province, approximately 100km east of Tshipise and adjacent to the Levuvhu River and the Kruger National Park. The coal field is geologically very complex with the result that coal has been extracted from a number of small isolated areas. Four incline shafts are currently being operated and a further one is planned for the future. Three old areas have already been closed. Coal is delivered to a central processing plant.

11.9.1 Compliance

Tshikondeni has an approved EMPR (23 December 1998), however, this EMPR only covers the old (now demolished) plant, the Nyala underground workings, the residential area and associated infrastructure. Subsequently an addendum of the EMPR (approved 15 August 2000) was compiled for the satellite blocks. During 2004, the Mine compiled an EMPR amendment for the new co-disposal waste dump however this has not yet been approved. The Mine has initiated the process of undertaking an EIA and compiling an EMP for the proposed new Goni shaft with a public meeting held in October 2004. None of the EMPRs, comprehensively address all of the Mine's operations and none address the Unwa Dam or the Duiker and Makuya shafts. An amount of ZAR0.7m should be budgeted for this exercise. Tshikondeni has a mining licence No. 11/2002, reference No. 5/3/2/172, dated 2 July 2002, and a mining permit No. 19/2001, reference No. 5/3/2/460, dated 6 August 2001.

The Mine is in the process of compiling all the necessary documentation for MPRDA conversion. A draft SLP is being compiled (due for completion in August 2005). However, as none of the EMPR documents cover all the operations, it is expected that a comprehensive EMP for all current and planned operations will be required before new order rights can be obtained. This would need to include closure commitments on those facilities no longer in operation.

There appears to be a potential dispute regarding the boundary between the Mine and the Makuya Park. In the vicinity of the proposed new Goni shaft workings, a section of the game park fence is reported to have been incorrectly erected to incorporate some of the Mine land within the park. A legal investigation will be required to determine what the implications of this are.

The Mine has all the necessary water registrations and is in the process of compiling an application for a water use licence for all the operations. The Unwa Dam has been registered as a Category 1 Dam with a safety risk (dated 23 October 1998). A water use licence application has been submitted for the new co-disposal site and the Mine has temporary authorisation to continue with the waste dump pending the approval of the licence. The Mine has a Permitted Class G domestic waste disposal site (Permit No. 16/2/7/A900/C6/Z1/P277, dated 17 October 1997). An ISO 14001 audit has recently been completed. The Mine undertakes periodic internal environmental audits, however, no independent EMPR performance assessment audit has been conducted in recent years.

11.9.2 Environmental and Social Management

The Mine has an integrated Health, Safety and Environment Policy Statement and has a "Certificate of Registration" confirming that it operates an environmental management system that complies with the requirements of ISO 14001. Induction training includes environmental aspects. Daily "Toolbox Talks" are held and these regularly include environmental topics. The Mine has an emergency response plan that includes environmental aspects and there is a programme of scheduled emergency response practices.

Tshikondeni has recently appointed a SHE Manager reporting to the Mine Manager. The environmental responsibilities are therefore being re-structured and the Environmental Officer now reports directly to the SHE Manager. Tshikondeni has an annual environmental department budget for 2005 of ZAR0.5m, which caters largely for salaries and sundry related office costs. The costs of environmental monitoring and consulting, etc. are currently adequately catered for under the Technical Department budget. In future these will fall under the SHE budget.

Tshikondeni also has a Social Investment Manager who reports directly to the Mine Manager. The Mine has a community interaction programme and a formalised system for recording and dealing with any environmentally related complaints from either the public or the authorities. Annual interested and affected party meetings are held.

11.9.3 Environmental Issues

Surface water management: Surface water from Tshikondeni drains into the Mutale River that confluences with the Levuvhu River, which flows into the Kruger National Park. The water management strategy is based on a closed circuit in which effluent is recycled. To maximise water re-use and reduce handling and pumping costs, the Mine has recently upgraded the water management system. However, this system is currently not being managed in accordance with its design and unless changes are made there is a risk of spillages, particularly during the rainy season. From water monitoring results it is clear that the Mine is having some effect on the quality in the Mutale River, although this impact does not seem to be measurable in the Levuvhu River. The source of this contamination has not been identified. Some costs may have to be incurred to rectify the current water management system, however, it is not possible to predict these costs without detailed further investigation. SRK proposes that an amount of ZAR0.1m be allowed for a study to define requirements.

Groundwater: A number of groundwater studies have been undertaken and a limited groundwater monitoring programme has been implemented. Groundwater issues are currently considered to be adequately managed. The latest EMPR estimates that the mining areas will in all likelihood not decant into the shallow aquifer or adversely affect surface waters of the area. It is, however, noted that the complex geology and aquifer structure at Tshikondeni combined with highly variable ambient groundwater quality makes it difficult to predict potential impacts. Further groundwater studies are planned. There is currently a risk that post-closure groundwater management measures could be significantly more costly than what has been allowed for. SRK proposes that ZAR0.4m be allowed for a groundwater study.

Waste residue disposal: Coarse waste is compacted and the sides of the dump are being covered with soil and will be revegetated. Because of the steep nature of the sides of the dump there is a risk of severe erosion. There is therefore a risk that additional measures may have to be implemented at significant cost.

Water management at the dump: Water management is adequately provided for at this site with a seepage collection trench around the dump. All seepage and rainfall runoff from the dump flows to a lined return water dam, from where it is recycled for use as industrial water.

Surface subsidence: Extensive areas of the Mine have been stooped and surface subsidence has occurred in a number of areas. Subsidence is monitored and cracks filled where necessary. The management of these areas is in hand and subsidence does not appear to present any significant problems.

Noise and visibility: Due to the presence of the adjoining Makuya and Kruger National Park game reserves, noise and visibility are considered to be significant environmental issues. However these issues appear to be adequately managed.

Closure planning and costing: A closure plan has been produced and Tshikondeni has estimated the closure cost of the mine at ZAR31.9m. SRK proposes a sensitivity contingency of between ZAR5m for evaporation and ZAR50m for desalination be allowed for treatment of possible decanting groundwater.

11.10 Coal – Arnot Colliery

11.10.1 Compliance

Environmental authorisations: Arnot Colliery has approved EMPRs for its operations, updated in 2000 (No. 8 Shaft) and 2004 (No. 10 Shaft). The Department of Minerals and Energy (“DME”) has recently confirmed its approval (2005) for Arnot to mine its Mooifontein mini-pit, although this has not yet started. Water management has been identified as the main environmental risk and has received detailed attention from consultants. On that basis, the Integrated Water Use Licence Application for the site was compiled and submitted to the Mpumalanga regional offices of the Department of Water Affairs and Forestry in September 2004, but to date no comment has been received from the regional authorities. Audits on compliance with the EMP have been carried out.

Conversion of mining rights: Arnot holds old order mining rights (Section 9 mining licences) which are in the process of undergoing conversion to new order rights (Section 22). The outlines of the social and labour plans required in terms of the MPRDA in support of conversion to new order rights are in preparation by the Eyesizwe Head Office, but aspects and details specific to Arnot will be included by the mine before submission. No date for submission has been advised. With regard to gender equity, Arnot had set a target of 10% of the workforce being women by 2008. This target was comfortably exceeded in 2005.

11.10.2 Environmental Issues

Water: A recent assessment of environmental risks facing Arnot identified water management as the highest ranking risk. Three issues are identifiable:

There is a periodic/seasonal excess of water, spilling from the pollution control dam that is generally unsuitable in terms of quality for unrestricted discharge to the watercourse (Rietkruil Spruit). However, this water could theoretically be utilised selectively by the adjacent Eskom Power Station, but no agreement on this has yet been concluded. DWAF has on occasion permitted Arnot to discharge excess water to watercourse in terms of its Managed Release Scheme.

The pollution control dam spills on occasion, indicating that its capacity to contain dirty water does not comply with the requirements of Regulation 704, which requires that capacity is adequate and an 800 mm freeboard is maintained for the 1-in-50-year storm event. Compliance with Regulation 704 requirements in terms of separation of clean and dirty water is concerned is currently receiving attention and is expected to be resolved effectively.

Post-closure decant of polluted water contaminated by the neutralised oxidation of sulfides is expected from both No. 8 and No. 10 Shafts. It is expected that this water will require treatment to improve its quality for discharge to watercourse and use by downstream users. In the case of both mines, ground water users have been identified as potentially affected, and the EMPRs for both the No. 8 Shaft (2000) and the No. 10 Shaft (2004) record the mine’s commitment to provide affected users with an alternative water supply if necessary.

Noise, vibration and dust: Arnot has received a small number of complaints relating to noise, vibration and dust from blasting and traffic. These issues have apparently been resolved satisfactorily and Arnot describes its relationships with its IAPs as “very good”.

11.10.3 Occupational Health

No data has been made available on numbers of employees affected either by occupational noise-induced hearing loss or by loss of lung function due to exposure of to silicate-laden dust.

11.10.4 Land claims

Land claims have been lodged with respect to the following farms within the Arnot Mining Licence area:

- Mooifontein 448 JS;
- Klippan 452 JS;
- Grootpan 456 JS (to be confirmed); and
- Rietkuil 491 JS.

The implication of the lodging of these land claims is unknown.

11.10.5 Environmental and social funding

Funds for new and on-going environmental remediation work are provided by Eskom on motivation, in terms of its contract with Eyesizwe in respect of the Arnot operations. Arnot currently allocates funding amounting to 2% of its payroll value to human resources development and a further 1% of after-tax profits to social investment.

11.10.6 Closure planning and costing

In terms of the coal supply contract between Arnot and Eskom, Arnot will undertake the closure planning activity and Eskom will manage and fund the closure and rehabilitation of the site as well as the post-closure monitoring and maintenance commitments.

The closure and rehabilitation cost for the Arnot site has been estimated in 2004 on the basis of rates and quantities at ZAR115m.

Approximately R60.9m of this cost has been allocated to the treatment of contaminated decant water. It is understood that Eyesizwe has no liability for closure and rehabilitation costs.

On this basis, SRK has not made an assessment of the adequacy of the closure provisions.

11.11 Coal – Matla Colliery

Matla Colliery is the largest of the Eyesizwe assets in Mpumalanga and therefore acts as a resource centre for the smaller mines in the province. It is operated in terms of a “Cost Plus” contract with Eskom. In terms of this contract, at the end of the life of the mine (currently forecast as 2031), the contract with Eskom includes the undertaking that Eskom will pay the closure and post-closure costs of the operation and manage residual risks and liabilities associated with the decommissioned asset.

11.11.1 Environmental and Social Management

Matla Colliery has its environmental policy displayed widely within its premises. The policy focuses on compliance with guidelines, standards and legislation, effective monitoring of the environment, communication on environmental matters with stakeholders, encouraging commitment to environmental protection from employees, minimising the impacts of mining operations, implementing performance standards and promoting sustainable development. Day-to-day environmental management at the colliery is overseen by a well-qualified, recently-appointed Senior Environmental Officer who reports through the Technical Manager to the General Manager. Consultants are being used to investigate potential ground water issues and to update the EMPR to meet the requirements of the MPRDA. Matla is currently developing an EMS in line with the requirements of ISO 14001 and expects ISO 14001 certification in 2006. Social management is the responsibility of the Human Resources Manager. Comprehensive training programmes are provided not only in safety, first aid and technical skills but also in literacy and career development. Community services and social investment are actively developed in the areas of small business development, schooling and housing.

11.11.2 Compliance

Environmental authorisations: Matla Colliery has an approved EMPR (1995) for its operations, which is currently being updated to include more recent developments and the requirements of the MPRDA. No Integrated Water Use Licence application (“IWULA”) has yet been compiled for the operations on the site, although certain water uses have been registered. (SRK has been advised subsequently that work on compiling an IWULA has been initiated.) Compliance with Regulation 704 is lacking in some respects: Subsequent to the audit in August 2005, work has commenced on a water balance study which is anticipated to finish in December 2005. Storm water management and clean and dirty water separation need further development and this work is reportedly on-going. At the time of the due diligence audit, no document could be shown to indicate that Audits on EMP compliance have been carried out.

Conversion of mining rights: Matla Colliery holds old order mining rights (Section 9 licence) which are in the process of undergoing conversion to new order rights (Section 22). The outlines of the social and labour plans required in terms of the MPRDA in support of conversion to new order rights are in preparation by the Eyesizwe Head Office, but aspects and details specific to Matla are being developed between the Human Resources Manager and the Senior Environmental Officer. No date for submission has been advised.

11.11.3 Environmental Issues

Water: As is typical for many coal mining operations water management at Matla remains a significant environmental issue:

- Surface subsidence has taken place above areas mined by total extraction. Subsidence has left depressed areas that tend to collect storm water resulting in enhanced infiltration and contamination of water collecting in mine workings. Water discharged from Mine 1 generally has water quality acceptable for most use categories, but water from Mines 2 and 3 is characterised by high sulfates resulting from neutralised sulfide oxidation. Excess water is pumped from underground workings into a pollution control dam. There is a periodic/seasonal excess of water spilling from the pollution control dam that is generally unsuitable in terms of quality for unrestricted discharge to the watercourse (Rietspruit). However, this water could theoretically be utilised selectively by the adjacent Eskom Power Station, but no agreement on this has yet been concluded. DWAF has on occasion permitted Matla to discharge excess water to the Rietspruit in terms of its Managed Release Scheme. Matla is considering different water management options for its excess water to ensure that it could discharge to the watercourse when required.
- The following options will be investigated further based on the water balance:
 - Storing UG;
 - Recycling;
 - Pipeline;
 - Wetland; and
 - Treatment Plant.
 - Occasional spillages from the pollution control dam indicate that its capacity to contain dirty water does not comply with the requirements of Regulation 704, which requires that capacity is adequate and an 800mm freeboard is maintained for the 1-in-50-year storm event. Compliance with Regulation 704 requirements in terms of separation of clean and dirty water requires further attention.
 - Post-closure decant of polluted water contaminated by the neutralised oxidation of sulfides is not expected to occur although there are differences of opinion on this matter. Provision has been made in the closure costing budget to treat a water volume of about 750m³/d to improve the quality for discharge to watercourse and subsequent use by downstream users. A number of neighbouring ground water users have been identified as potentially affected and may need to be provided with a suitable alternate water supply for the long term.

Air quality: There is no spontaneous combustion of discard material that may affect air quality. No complaints have been reported from neighbours with respect to air quality.

11.11.4 Occupational Health

No data has been made available on numbers of employees affected either by occupational noise-induced hearing loss or by loss of lung function due to exposure of to silicate-laden dust.

11.11.5 Land claims

Land Claims have been lodged with respect to the following farms within the Matla Licence area:

- Rietvlei 62 IS and Vaalpan 68 IS;
- Haasfontein 85 IS;
- Grootpan 86 IS;
- Moedverloren 88 IS;
- Schaapkraal 93 IS; and
- Eskom Power Station 141 IS.

The implication of the lodging of these land claims is unknown.

11.11.6 Environmental and social funding

Funds for new and on-going environmental remediation work are provided by Eskom on motivation, in terms of its contract with Eyesizwe in respect of Matla.

11.11.7 Closure planning and costing

In terms of the coal supply contract between Matla and Eskom, Matla will undertake the closure planning activity and Eskom will manage and fund the closure and rehabilitation of the site as well as the post-closure monitoring and maintenance commitments. The closure and rehabilitation cost for the Matla site was initially estimated in 2001, but updated annually. The closure and rehabilitation costs for 2005 are estimated to be ZAR88m on the basis of rates and quantities. The costs for water management include provision for the evaporation or release of 0.5 Ml/d of excess water. Although decant of contaminated

water after closure is not foreseen according to recent hydrogeological investigation, further provision has been made for the desalination of limited decant of up to 0.75 Ml/d and treatment for ten years at an estimated cost of ZAR14.7m. On this basis, SRK has not made an assessment of the adequacy of the closure provisions, other than to note that despite the understanding that Eskom would buy environmentally affected property, there does not appear to be provision for property purchase in the closure cost estimate.

11.12 Coal – New Clydesdale Colliery

11.12.1 Compliance

Environmental authorisations: New Clydesdale Colliery has an approved EMPR (October 1998) for many of its operations, but updates are needed for the more recent developments. No Integrated Water Use Licence application has yet been compiled for the operations on the site but underwent registration of all its water-uses. Compliance with Regulation 704 is lacking in some respects: water balances, storm water management and clean and dirty water separation need further development. Surface water quality monitoring is carried out monthly. Ground water monitoring is carried on a quarterly basis on quality and monthly on water levels. No water quality reports that define corrective actions were available at the time of the audit. Internal audits on EMP compliance have been carried out and outstanding actions defined accordingly.

11.12.2 Conversion of mining rights

New Clydesdale Colliery holds old order mining rights (Section 9 licence) which are in the process of undergoing conversion to new order rights (Section 22). The outlines of the social and labour plans required in terms of the MPRDA in support of conversion to new order rights are in preparation by the Eyesizwe Head Office, but aspects and details specific to New Clydesdale Colliery will be developed with the assistance of the Human Resources Manager. No date for submission has been advised.

11.12.3 Environmental issues

Water:

- Plant runoff water quality has total salt concentrations of up to 2,500mg/l, of which about 1,500mg/l is sulfate. New Clydesdale Colliery is in the process of constructing a lined pollution control dam for plant runoff.
- New Clydesdale Colliery straddles a water divide with flow both to the Olifants River in the north-east and the Steenkoolspruit in the south-west. The quality in these rivers is adversely affected both by ground water flow and surface water flow emanating from mines in the catchment area. Integrated management of water is complicated by the wide distribution of mining operations. Improvement of surface water management is required to bring the mine into compliance with Regulation 704 aimed at separating clean and dirty water.
- The quality of ground water in the mining areas is adversely affected by the open cast and underground operations as a result of acid generation from sulfide oxidation, followed by in-situ neutralisation. In time neighbouring farmers, who use ground water for domestic purposes and livestock watering, may be affected, as projected in the groundwater section of the EMPR.
- Post-closure decant of polluted water contaminated by the neutralised oxidation of sulfides is expected to occur.

Air quality: New Clydesdale Colliery has initiated a programme to improve the air quality by means of attention to dust caused by heavy earth-moving equipment and vehicles and by attention to burning stockpiles. Ambient air sampling has been initiated.

Waste: Oil spillages around the workshops have added to the soil contamination. New Clydesdale Colliery has appointed contractors to manage and remove the waste materials associated with its workshops, and to recycle waste oil and other recoverable materials.

11.12.4 Occupational Health

No indications have been made available on numbers of employees affected either by occupational noise-induced hearing loss or by loss of lung function due to exposure of to silicate-laden dust.

11.12.5 Land Claims

Two Land Claims have been lodged with respect to the following farms within the New Clydesdale Colliery Mining Licence area: Enkeldebosch 20 IS and Haasfontein 28 IS.

These Land Claims are expected to have little effect on New Clydesdale Colliery because the farms in question have been mined out and rehabilitated.

11.12.6 Environmental and social funding

Funds for new and on-going environmental remediation work are provided from coal sales revenue. The budget for environmental monitoring, investigations by consultants and social expenditure in 2006 appears to be about ZAR357kpm. It is assumed that the ground water investigations, the works required in terms of Regulation 704 and the compilation of EMP reports and IWULAs for the various mining areas under the control of New Clydesdale Colliery will be funded under the normal environmental operating budgets.

11.12.7 Closure planning and costing

Most of the land affected by mining is owned by Eyesizwe. The stated intention would be to purchase land that is owned by other parties if it were considered affected by mining, although there is no item identifiable in the closure cost budget for land purchase. The closure and rehabilitation costs for the site were most recently updated in 2004.

The closure and rehabilitation costs were estimated at ZAR49.5m excluding VAT, of which only ZAR14.5m has been provided or allocated to a trust fund, leaving an Eyesizwe liability of ZAR35.0m outstanding. The provision for water management of ZAR4.2m does not include desalination. Although decant of contaminated water after closure is expected according to the most recent hydrogeological investigation, no further provision has been made for treatment. Aspects of water management are currently under investigation.

11.13 Coal – North Block Complex, Glisa Colliery

11.13.1 Environmental and Social Management

As a relatively small mine, Glisa relies to an extent on input and resources from the Eyesizwe Corporate office as well as from Arnot and Matla with regard to environmental and social matters. It subscribes to the environmental policies of Eyesizwe and receives regular visits and input from Lucas Nengovhela, the Corporate Environmental Manager. Consultants have been used to monitor water quality and investigate dust arisings and to produce an EMPR for the mining of Portion 24 of Paardeplaats 380 JT (previously owned by Duiker). Social management at Glisa is the responsibility of the Human Resources Manager. Glisa currently employs about 116 personnel; labour is supplied on contract. Induction and training are outsourced. Glisa maintains close ties with Belfast Municipality and receives applications from the community for assistance in small business opportunities, painting of schools, provision of computers and short-term job opportunities around the mine.

11.13.2 Compliance

Environmental authorisations: Glisa Colliery has an approved EMPR (2001) for its operations on Portions 1 – 5 of Paardeplaats 380 JT, and a further approved EMPR (2004) for the operations on Portion 24. An Integrated Water Use Licence application was compiled for the operations on the site, but this may need to be supplemented with additional information normally required by the Department of Water Affairs. Certain water uses have been registered. Compliance with Regulation 704 is lacking in some respects: water balances, storm water management and clean and dirty water separation need further development. Audits on EMP compliance have been carried out.

Conversion of mining rights: Glisa holds old order mining rights (Section 9 licence) which are in the process of undergoing conversion to new order rights (Section 22). The outlines of the social and labour plans required in terms of the MPRDA in support of conversion to new order rights are in preparation by the Eyesizwe Head Office, but aspects and details specific to Glisa will be developed with the assistance of the Human Resources Manager. No date for submission has been advised.

11.13.3 Environmental issues

Water: As is typical for many coal mining operations the management of excess water at Glisa remains a significant environmental issue:

- Dirty pit and stormwater is diverted to a pollution control dam for settlement, evaporation and limited reuse, for dust suppression and particularly by the neighbouring Hadeco bulb nurseries. Spillage into the watercourse that feeds the downstream Belfast Dam, used for potable water supply periodically occurs, resulting in the downstream sulfate concentrations rising to around 100mg/l from a background level of about 10mg/l. It is believed there is no water quality impact for existing users of the Belfast Dam water. Other informal users include livestock, particularly cattle, which should remain unaffected by the water quality reported.

- Spillages from the pollution control dam indicate that its capacity to contain dirty water does not comply with the requirements of Regulation 704, which requires that capacity is adequate and an 800mm freeboard is maintained for the 1-in-50-year storm event. Compliance with this regulation in terms of separation of clean and dirty water requires further attention.
- Improvement of surface water management has been prioritised as an urgent issue in the 2006 environmental budget, where focus will be put on creating water and salt balances and defining the works required to meet the requirements of Regulation 704.
- Post-closure decant of polluted water contaminated by the neutralised oxidation of sulfides is expected to occur. Initial indications are that if the pits and workings are flooded the rise in sulfate concentrations will be limited to a maximum of 1,000mg/l. Provision has been made in the closure costing budget to construct three 15Ha evaporation areas to minimise the spillage of contaminated water to the watercourse.

Air quality: Glisa has initiated annual dust fallout monitoring, largely in response to complaints from neighbouring farmers. Open-cast operations entail the use of heavy motorised earth-moving equipment which raises dust from the workings, although road spraying is practised on all haul roads. Product is removed from site by road transport. Although there are no discard dumps, there are isolated outbreaks of spontaneous combustion within ore stockpile material that may affect air quality.

Noise and vibration: Glisa has received repeated complaints from local farmers and through the Escarpment Environmental Protection Group about noise and vibration from blasting and operations, to the extent that blasting is restricted by Glisa to certain times and days.

11.13.4 Occupational health

No indications have been made available on numbers of employees affected either by occupational noise-induced hearing loss or by loss of lung function due to exposure of to silicate-laden dust.

11.13.5 Land Claims

A number of Land Claims have been lodged with respect to the following farms within the Glisa Coal Mining Licence area and the Belfast resource area (the implication of the lodging of these Land Claims is unknown):

- Paardeplaats 380 JT (Glisa);
- Wintershoek 390 JS (Belfast) and Zoekop 426 JS (Belfast); and
- Leeuwbank 427 JS (Belfast) and Blyvooruitzicht 383 JT (Belfast).

11.13.6 Environmental and social funding

Funds for new and on-going environmental remediation work are provided from coal sales revenue. A sum of ZAR12.4m has been budgeted for environmental and social expenditure in 2006. Of this, ZAR1m is earmarked for Sustainable Development Projects and a further ZAR6.8m for development of the Wonderfontein Siding.

11.13.7 Closure planning and costing

Most of the land affected by mining at Glisa is owned by Eyesizwe. The stated intention would be to purchase land (under operating costs) that is owned by other parties if it were considered affected by mining, although there is no item identifiable in the closure cost budget for land purchase.

The closure and rehabilitation cost for the Glisa Colliery site was most recently updated in June 2005. The closure and rehabilitation costs were estimated at ZAR16.5m, on the basis of rates and quantities. The costs for water management include provision of ZAR900k for the evaporation of excess water. Although decant of contaminated water after closure is expected according to the most recent hydrogeological investigation, no further provision has been made for treatment. The provision for 2 – 3 years of maintenance and aftercare does not appear to include ongoing water quality monitoring, which SRK would expect to be needed for at least 10 years, post-closure.

11.14 Coal – North Block Complex, Strathrae Colliery

11.14.1 Environmental and Social Management

As a relatively small mine, Strathrae relies to an extent on input and resources from the Eyesizwe Corporate office as well as from Glisa, Arnot and Matla with regard to environmental and social matters. It subscribes to the environmental policies of Eyesizwe and receives regular visits and input from Lucas Nengovhela, the Corporate Environmental Manager. Consultants have been used to update the approved

EMPR, to carry out a hydrogeological investigation to determine the potential for contaminated underground water to decant to surface after closure.

Social management at Strathrae is the responsibility of the Glisa Human Resources Manager. Labour is supplied partly on contract. Induction and training are outsourced.

11.14.2 Compliance

Environmental authorisations: Strathrae Colliery has an approved EMPR (2004) updated from the previous 1997 version. No Integrated Water Use Licence application has yet been compiled for the operations on the site. Compliance with Regulation 704 is lacking in some respects: water balances, storm water management and clean and dirty water separation need further development. Audits on EMP compliance have not been carried out.

Conversion of mining rights: Strathrae holds old order mining rights (Section 9 licence) which are in the process of undergoing conversion to new order rights (Section 22). The outlines of the social and labour plans required in terms of the MPRDA in support of conversion to new order rights are in preparation by the Eyesizwe Head Office, but aspects and details specific to Strathrae will be developed with the assistance of the Glisa Human Resources Manager. No date for submission has been advised.

11.14.3 Environmental issues

Water: As is typical for many coal mining operations the management of excess water at Strathrae remains a significant environmental issue:

- Dirty stormwater is diverted to a pollution control dam for settlement, evaporation and limited reuse such as dust suppression. Spillages from the pollution control dam are currently flowing to local tributaries and to Grootpan. The pollution control dam is heavily silted from discard and sediment. The discard dump, adjacent to the pollution control dam, is currently being reclaimed and will be reconstructed with new discard on the same footprint and will form the final discard dump, funded by operating costs.
- The spillages indicate that the capacity of the pollution control dam to contain dirty water does not comply with the requirements of Regulation 704, which requires that capacity is adequate and an 800mm freeboard is maintained for the 1-in-50-year storm event. Compliance with Regulation 704 requirements in terms of separation of clean and dirty water requires further attention. Once the discard dump has been moved steps are planned to remove silt from the pollution control dam.
- The quality of ground water can potentially be affected by the mining operations as a result of acid generation from sulfide oxidation, followed by in-situ neutralisation. At present, it is reported that there is no water quality impact on neighbouring ground water users.
- Post-closure decant of polluted water contaminated by the neutralised oxidation of sulfides is expected to occur. Initial indications are that decant from the underground workings will occur in about 40 years after closure at rates of up to 60m³/d and sulfate concentrations of up to 500 mg/l.

Air quality: Strathrae uses water sprays to help control dust from conveyors and road traffic. There are isolated outbreaks of spontaneous combustion within the discard and ore stockpile material that may affect air quality. No complaints appear to have been received from neighbours.

11.14.4 Occupational health

No indications have been made available on numbers of employees affected either by occupational noise-induced hearing loss or by loss of lung function due to exposure of to silicate-laden dust.

11.14.5 Land Claims

It is not known whether Land Claims have been lodged in respect of the farms covered by the Strathrae mining licence.

11.14.6 Environmental and social funding

Funds for new and on-going environmental remediation work are provided from coal sales revenue. No information has been made available on the expenditure budgeted for 2006 in respect of environmental and social issues relating to Strathrae.

11.14.7 Closure planning and costing

The stated intention is that Eyesizwe would purchase land owned by other parties if it were considered affected by mining. There is no item identifiable in the closure cost budget for land purchase.

The closure and rehabilitation cost for the Strathrae Colliery site was most recently updated in June 2005. The closure and rehabilitation costs were estimated at ZAR14.5m excluding VAT, of which all has been provided.

The provision for water management totals ZAR30k for cleaning out existing dams at the plant. Although decant of contaminated water after closure is expected according to the most recent hydrogeological investigation, no further provision has been made for treatment. In the view of SRK, this provision is unlikely to be adequate. The provision for 2 – 3 years of maintenance and aftercare does not appear to include ongoing water quality monitoring, which SRK would expect to be needed for at least 10 years, post-closure.

11.15 Heavy Minerals – Hillendale Mine

11.15.1 Compliance

An EMPR for Hillendale and Fairbreeze Project mining operations was approved by the DME on 10 March 1998. This approval includes an addendum to the EMPR dated 9 March 1998. An EMP performance assessment undertaken in 2004 indicated that the Hillendale component of the EMPR needed to be updated but that the Mine was generally compliant with its EMPR commitments. A revised EMP was submitted to the DME before the end of 2005. In addition to the revised EMP, a social and labour plan and mine works programme was prepared. The MPRDA conversion application was submitted to the DME before the end of 2005.

No registrations for existing water uses have been submitted to DWAF, as the water uses generally commenced in 2001 so do not fall under the NWA definition of existing uses. The Water Act, 1956, permit for the use of industrial water was obtained for Hillendale in 1998. An application for a water uses licence was submitted to DWAF in December 2004. To date no water use licence has been received from DWAF so the Mine is theoretically operating illegally in terms of the NWA. As it is recognised that few water use licences have been issued by DWAF for mining operations and an application has been submitted, the lack of licence is not considered a major risk.

Due to the radioactivity associated with some of the mineral sands being extracted, the NNR has issued COR 43 to cover radiation protection and monitoring at the CPC and Hillendale sites. The relevant reporting requirements are being met.

There is an exemption from Section 20 of the ECA issued by DWAF, dated 8 June 2001, that allows for the disposal of CPC wastes at Hillendale. This includes the gypsum deposited with slimes on the residue deposit and the MSP and wet scrubber dust deposited in the mining void. Other disposal at Hillendale is covered by the COR and the legal compliance audit (see below) indicates that clarity on the waste disposal controls is required (this is currently being addressed by Ticor).

A legal compliance audit was undertaken in December 2004 for the Hillendale and CPC sites. It identified a number of potential legal non-compliances. Kumba applied its risk rating criteria to the results of this audit in June 2005 to identify the most serious legal risks, which included the water/EMP issues discussed above and non-compliance with GN 704 (discussed further below). Ticor has set actions, responsibilities and budget to address all the high level risks identified by Kumba. No additional risks or liabilities of a material nature were identified during this review.

11.15.2 Environmental and Social Management

Environmental management at Ticor's South African assets is handled by the Technical Services Department. The Environmental and Radiation teams, reporting to the Technical Services Manager, comprise five people. These teams handle environmental and radiation issues at both the Hillendale Mine and the CPC at Empangeni. In addition, there is a rehabilitation officer who reports to the Hillendale Mine Manager. Ticor SA has established an integrated quality control, environmental and occupational, health and safety management system in accordance with the requirements of ISO 14001, ISO 9001 and OSHAS 18001. Certification was obtained in December 2004. Ticor SA has a series of codes of practice relating to various environmental and OSH issues. These are supported by standard technical procedures for specific activities. All documents are electronically controlled using a document management system.

Community liaison and labour relations are generally managed by the Human Resources Department, though some aspects may fall under the External Relations Manager. Ticor SA participates in a number of community and environmental forums that are held either quarterly or six-monthly.

The operational environmental budget for Hillendale, CPC and some aspects of Fairbreeze Project is ZAR1.0mpa, which covers environmental monitoring, consultancy fees, consumables and donations/subscriptions to various organisations. The radiation department has a budget covering the

same aspects of ZAR0.5mpa. The five year plan sees the budgets extending to ZAR1.7mpa and ZAR0.8mpa, respectively. These are considered appropriate for the work being done. Remediation budgets are covered elsewhere.

11.15.3 Environmental issues

Water management: The legal compliance audit expressed concern over compliance with GN 704 and the water use licence application has not motivated for exemption from the requirements of these regulations. To verify compliance and identify necessary actions, Ticor has appointed an external consultant to undertake a detailed GN 704 audit (during September 2005). As ongoing water quality/biological monitoring does not appear to indicate any significant impacts, it is expected that motivation can be made for exemption from compliance with some of the regulations.

Rehabilitation: Ticor has committed to returning the land back to its previous status of sugar cane and some subsistence farming. Currently, relatively large areas are disturbed (135Ha) though temporary vegetation has been established to help in dust control (see below). A research project to determine how best to re-establish the soil structure has recently been completed and the results are about to be field tested. The test work is being done in consultation with stakeholders (e.g. South African Sugar Research Institute) and will be externally monitored (a steering committee is being set up and will meet quarterly to assess results). Once the optimal method has been determined, rehabilitation of the currently disturbed areas will take place. Currently Ticor is setting aside ZAR100kpm for rehabilitation purposes, but this may need to be increased once the test work is complete.

Dust: A number of complaints have been received from the surrounding communities regarding dust arising from the exposed areas of the mine workings. A number of measures have been recently (2004/2005) implemented to minimise the dust impacts, including planting of sugarcane or grass on the kidney storage area, dune coating areas of the pit that are not actively being mined and use of sprinklers/dust suppression chemicals in topsoil stripped areas. Ticor has indicated that dune coating can result in 90% control efficiency of dust. Ongoing monitoring will indicate the effectiveness of these measures, with daily monitoring taking place adjacent to the closest residential areas.

Radiation: Radiation management at the Mine falls under the requirements of COR 43, which is shared with the CPC site (discussed further below). The level of radioactive material being deposited as a waste material into the mine void is reportedly less than that being removed, resulting in an overall reduction in radiation levels so no significant risk is envisaged. However, ongoing monitoring is taking place to confirm this and it is recognised that radiation is an emotive issue to interested and affected parties.

Closure planning and costing: The EMPR includes some basic closure objectives and actions and closure cost estimates have been prepared in the past. The most recent estimate (October 2004) used the DME Financial Provision Guidelines as the basis for costing to give a closure cost of ZAR31.3m (includes owner costs, contractors costs and 10% contingency). However, this assumes that only the final 40Ha footprint will need to be rehabilitated as the rest will have been done as part of operational costs (see above). It therefore does not necessarily reflect the cost to close the Mine with immediate effect. SRK has concern that the DME Financial Provision Guidelines are generic in nature and do not reflect the specific nature of individual operations. It is understood that Ticor SA will prepare a detailed closure plan and cost estimate by the end of 2005. It is expected that the final closure cost will increase slightly but not make a material difference to the operation.

11.16 Heavy Minerals – CPC

11.16.1 Compliance

Although not considered a mine, an EMPR process was undertaken for the operation in 1996/7, however, as the relevant provisions of the ECA had not yet come into force, no environmental authorisation was obtained from the Provincial Department of Environment. Ticor SA applied for condonation in July 2005 of the process followed in terms of Section 24G of NEMA. Confirmation that the process was acceptable in terms of current legislation has not yet been received.

An application for a water use licence was submitted to DWAF in August 2004 but no licence has been issued to date. Water uses associated with disturbing watercourses have not been included in the application and may need to be applied for. Current water abstraction is covered by the Water Act, 1956, permit 1509N (this will be replaced once the licence is issued).

COR 43 has been issued for the CPC site and Hillendale Mine (see above). The only controlled area is the MSP.

The CPC operates a number of scheduled processes in terms of APPA and has received a provisional certificate A2205/1 for the ilmenite processing plant dated 14 October 2003 that is valid for 24 months.

Ticor SA is currently negotiating with DEAT for a full registration certificate to cover all scheduled processes. Emission monitoring of the stacks has indicated occasional non-compliances of emission limits during start up. Remedial measures have reportedly been successful in most cases but the roaster has had to cease operations until upgrades to the bag house are complete.

11.16.2 Environmental and Social Management

Refer to Section 11.15.2 for proposed operational management.

11.16.3 Environmental issues

Air quality: Dust from roads and stockpiles and emissions from the stacks have given rise to complaints from the community. Dust bucket monitoring is taking place but does not allow for directional assessment, and emission monitoring is looking at total dust rather than respirable dust. Upgrades to the monitoring systems are included in the 2006 capital budget and should minimise the risk posed by third party claims by providing a better understanding of the sources and health implications of dust from the site. Most emission complaints arise from the flare stacks, which are not being monitored and are highly visible. The registration certificate stipulates time limits for flaring on raw gas but these have been exceeded on occasion as reported to CAPCO annually (report indicates measures to remedy problem or provides justification for the exceedences).

Water management: 'Dirty' storm water drains via a series of channels and sumps to Dam 2. At present some process water is entering the dam. As the dam is being used for supply to the plant, the operating philosophy is to keep it at least 25% full. In addition, the CPC is not yet at full capacity so the water demand is not as high as originally predicted. This has resulted in excess poor quality water, which discharges to Logan's Dam in response to rainfall (a clean water dam located on a tributary of the Nseleni River). Monitoring indicates increased sulfate levels in the dam but no apparent impact on the downstream river. Although the discharge has been included in the IWULA, ongoing and historical discharges pose a risk to the company should significant contamination build up. There is a risk that DWAF will require additional 'dirty' water containment facilities to ensure no process water enters the natural environment and possible remediation of any residual contamination in the dam.

Waste management: The legal compliance audit indicated concerns over the management of waste at the CPC site. Ticor SA has recognised this as a critical risk area and is currently preparing a waste management plan. Risks relate to inappropriate storage and handling of waste. The ad hoc disposal around the site without proper containment facilities may have resulted in soil or ground water contamination. Ongoing monitoring will confirm if there is an ongoing liability.

Material transport/handling: There have been complaints and incidents relating to dust from improperly covered vehicles, spills along the roads and inappropriate disposal of waste material. In one instance potentially radioactive MSP waste was sold by the transport contractor as a building material. Ticor SA has undertaken a survey of the area to identify where the material was used and has removed/demolished structures with appropriate compensation, where necessary. A close out report for this incident, including an assessment of residual radioactive risk, is currently being prepared. Although some residual risk remains, it is considered that Ticor SA has done all that is reasonable in the circumstances to minimise this risk.

Radiation: In terms of COR 43, Ticor SA submits worker dose and public dose assessments to the NNR. Radiation associated with dust and emissions is monitored regularly and there are a number of radiation management procedures that form part of the document management system. During the life of the operation, indications are that all potentially radioactive waste can be decontaminated sufficiently for disposal off-site (e.g. baghouse dust bags, high tension brushes). It is expected that there will be some residual radiation contamination associated with the stockpiles and plant at the end of life of operation but that remediation is possible to ensure NNR acceptable radiation levels after closure. Radiation issues are therefore not considered a major risk.

Closure planning and costing: Although the CPC is considered an industrial site and does not have to have a closure plan/cost in terms of South African legislation, Ticor SA has prepared a preliminary closure cost estimate using the DME's Financial Provision Guidelines. This gives an immediate closure cost of ZAR20.8m and an end of life of mine closure cost of ZAR13.7m. As the CPC is unlikely to close in the immediate future, this is considered adequate however a detailed estimate based on accurate bills of quantity will need to be prepared at least five years before predicted closure.

11.17 Heavy Minerals – Fairbreeze Project

The proposed heavy minerals sand mine is located immediately to the south of Mtunzini and adjacent to the Umlalazi Nature Reserve. The Mine will comprise two ore bodies: Fairbreeze Project C (which Ticor SA holds an

old order mining right) and Fairbreeze Project C Extension (with a new order prospecting right; the mining right application is currently pending). In addition, there will be a PWP and residue disposal site (two alternatives are currently being considered). Construction is expected to commence in 2006.

11.17.1 Compliance

EMPR amendments for Fairbreeze Project C Extension and the alternative residue disposal site have been prepared but not yet submitted. The latter was submitted in September 2005 but the Fairbreeze Project C Extension cannot be submitted until the conversion to new order rights is completed.

A water use licence application for Fairbreeze Project C and Fairbreeze Project C Extension was submitted to DWAF in July 2005 (this included both residue disposal options).

It is expected that the licence will take at least six months to be approved. The water supply required for the site is covered by the Water Act, 1956, Permit issued in May 1998 (this will be replaced by the licence once issued). A new COR application in terms of the National Nuclear Regulator Act is being prepared. The radiation baseline assessment is currently underway.

11.17.2 Environmental and Social Management

Although not yet operational, the Technical Services Department are looking after most of the environmental aspects at the site, including attendance of the community environmental meetings. Baseline environmental monitoring is currently underway and, where relevant, existing Hillendale procedures are being used.

11.17.3 Environmental Issues

Community sensitivity: Mtunzini is a small coastal village, popular as a retirement/holiday place but becoming increasingly popular with younger professionals who commute to Richards Bay/Empangeni. The Nature Reserve and scenic beauty of the area are major attractions. The residents are concerned about the overall impact of the Mine on the sense of place with particular concerns discussed further below. Many residents are actively involved as stakeholders and a Mtunzini Ticor Communication Forum meets quarterly to discuss issues relating to the proposed mine.

Proximity of mining to residential areas: The proposed Fairbreeze Project C Extension will extend to 100m of the edge of town. This has resulted in concerns over dust, noise, visual disturbance, etc. Ticor has planted an indigenous tree screen and developed the mine plan to minimise disturbance. However, this issue is still contentious and residents are using whatever opportunities arise to pressurise Ticor to move the border back. Although the specialist studies indicate that the expected impacts can be managed, the high level of community resentment remains an ongoing risk to the project.

Hydrological changes: The ground and surface water systems have been significantly depressed in the past due to agricultural and silvicultural practices, which in turn has affected the ecology of the wetland/estuarine systems dependent on these water resources. Detailed hydrogeological and hydrological investigations were undertaken to look at the cumulative impact of mining, backfilling and residue disposal on the water resources of the area. The studies predict that the temporary loss of plantations combined with backfilling will increase the groundwater level in the vicinity of mining, resulting in an increased baseflow contribution to the surface systems. This increase is expected despite the loss of runoff due to rainfall capture within the mining void and residue disposal sites. The implications of this are discussed under wetland/ecological systems.

Changes to wetland/ecological systems: Although the expected increase in flow is only temporary in nature, it is considered a potential benefit to the wetland/ecological systems in the area. There are concerns that excessive flows could result in increased frequency of estuarine breaching and that uncontrolled erosion from mining areas could result in sediment build up in the ecologically sensitive areas. There is a risk that if not actively and effectively managed, the Mine could result in significant negative impacts on a sensitive ecological system within a designated nature conservation area.

Closure planning and costing: Closure objectives and measures are included in the EMPR and EMPR amendments. A closure cost estimate of ZAR37.2m was determined in February 2005 (assumes the mine is operational). The cost is based on the DME's Financial Provision Guidelines and on the feasibility study design information (includes owner costs, contractors costs and 10% contingency). This is considered adequate but it will require revision once the site is operational and once the ongoing rehabilitation work is further refined.

11.18 Heavy Minerals – Tiwest JV

11.18.1 Environmental Management Systems

Each of the three Tiwest JV sites has an environmental management system certified to ISO 14001. The environmental management systems of each site have been developed to meet the individual requirements of the particular site to which it applies, though all seek to achieve continual environmental improvement through similar processes.

Furthermore, the Kwinana site has its quality management system accredited to ISO 9001 standard. Environmental targets are agreed to by the site management teams in order to meet policy commitments, mitigate assessed risks, fulfil legal requirements, meet community expectations and improve performance within the bounds of available resources. Targets are achieved through the implementation of improvement projects in combination with an ongoing programme to improve operational procedures, workforce awareness and commitment, accountability and emergency preparedness.

Performance is tracked through formal monitoring of emissions, audits, inspections, and incident analysis. Opportunities for improvement are recognised and progressed through a formal action tracking system.

11.18.2 Legislative Environment and Compliance

Commonwealth Approvals: Commonwealth approval is required if matters of national significance, as defined in the Environmental Protection and Biodiversity Conservation Act, 1999, are triggered. The Commonwealth Department of Environment and Heritage (“DEH”) is responsible for administering the Act. Matters of national significance include presence of migratory birds, federally listed flora or fauna of conservation significance, Commonwealth land, nuclear actions and marine areas. If matters of national environmental significance are considered likely to be impacted, the project may be designated to be a “Controlled Action” and Federal authorities will require formal environmental impact assessment to be undertaken. The Commonwealth has entered into a Bilateral Agreement with the State of Western Australia whereby State formal impact assessment procedures under the Western Australia Environmental Protection Act, 1986, are accredited by DEH and the Commonwealth will not conduct a separate impact assessment.

Western Australian Approvals: Within Western Australia, the Environmental Protection Act, 1986, and the Mining Act, 1978, are the principal statutes defining the environmental management approval processes and operating strategies of extractive activities and environmental protection within the State. The Environmental Protection Act, 1986, makes provision for the establishment of the Environmental Protection Authority (“EPA”), for the prevention, control and abatement of pollution and for the conservation, preservation, protection, enhancement and management of the environment. The Act also provides for the control and licensing of potentially polluting activities, land clearing, and is the Act under which the State environmental approvals process operates.

Projects located on tenure granted under the Mining Act, 1978, are regulated by the Department of Industry and Resources (“DoIR”). With regards to environmental management, the Act allows DoIR to play an important role in the assessment of exploration and mining proposals, consultation with stakeholders on environmental issues, and environmental compliance monitoring.

Environmental Approvals: Before commencement of any mining operation, a proponent is required, under provisions of the Mining Act, 1978, to submit a Notice of Intent (“NOI”) to the DoIR. The NOI describes the project, surrounding environment, potential environmental impacts and proposed prevention and mitigation measures. Commitments made within the NOI are binding for any future operations on these tenements unless a request for an amendment to the relevant government authorities is accepted.

Commitments typically relate to:

- Rehabilitation practices (topsoil removal and spreading);
- Closure criteria (waste dump slope angles, vegetation establishment success);
- Environmental management practices (dust control, chemical storage and handling);
- Environmental monitoring.

The DoIR, as the decision making authority for mining projects, is required under Part IV of the Environmental Protection Act, 1986, to refer mining projects to the EPA if they consider them likely to have a significant effect on the environment. A Memorandum of Understanding exists between DoIR and the EPA whereby projects are considered automatically to have significant effects on the environment if they satisfy the criteria listed in Part IV (Environmental Impact Assessment) of the Environmental Protection Act, 1986.

EPA Approval: All projects referred to the EPA under Part IV of the Environmental Protection Act, 1986, are assessed on a case-by-case basis. Once the EPA has received a referral, they assume responsibility

for determining the appropriate level of assessment for the project. The Department of Environment (“DoE”) provides technical assistance to the EPA to assist with this process. The level of assessment set by the EPA will depend on environmental effects and the level of public interest associated with the operation. Levels of assessment available to the EPA include nonassessment, informal review or formal assessment. Differences between these levels of assessment relate to the public review period and the detail of documentation required. The EPA may determine that no assessment is necessary if the referred proposal is considered to have environmentally insignificant effects. Proposals considered not to warrant assessment under the Environment Protection Act, 1986, are referred back to DoIR, who assess and assign environmental conditions to the proposal’s tenement conditions upon approval of the environmental documentation. The Water and Rivers Commission (“WRC”) (a department within DoE) administers statutory processes of the Western Australia Rights in Water Irrigation Act, 1914. Groundwater Licences and Licences to construct or alter wells are issued by the WRC.

DoIR Approval: If DoE makes no formal assessment, DoIR will issue approval on assessment of NOI documentation. If DoE has made a formal assessment, DoIR will accept the assessment document without the need for NOI documentation, although tenement conditions are likely to reference the document and unconditional performance bond levels increased.

11.18.3 Existing approvals

Approval for all three sites for the Tiwest JV Joint Venture were granted through the Mineral Sands (Cooljarloo) Mining and Processing Agreement Act, 1988. This Act essentially required prior owners of the operations to submit a development proposal that included commitments and plans to safeguard the environment (environmental management plan).

Amendments to each site have been made since the original approval. These have been gained by submitting development proposals to the Minister for State Development. The Office of Major Projects (“OMP”) has facilitated such proposals through the necessary regulatory authorities. Copies of these development proposals have generally been submitted to authorities in the form of Notices of Intent (“DoIR”), formal assessments (“DoE”) and Work Approvals (“DoE”).

Since July 2004, land clearing approvals are required to be obtained under the Environmental Protection Act 1986 prior to any land clearing occurring. This change to legislation is likely to have significant impacts on the ability to develop future mining operations in the Cooljarloo area as the area is characterised by high biodiversity values. Key regulatory requirements for the mining and processing operations include:

- The Mineral Sands (Cooljarloo) Mining and Processing Agreement Act, 1988.
- Ministerial Statements of Environmental Approval issued under Part IV of the Environmental Protection Act, 1986, including:
 - Statement 37: Mine and Dry Separation plant (3/10/1988).
 - Statement 50: Dry Separation Plant (12/12/1988).
 - Statement 59: Synthetic Rutile Plant (28/2/1989).
 - Statement 67: Dry Separation Plant – amendment to statement 50 (4/4/1989).
 - Statement 412: Synthetic Rutile Plant – increased production to 200,000 tpa (4/4/1996).
 - Statement 452: Pigment Plant (6/1997).
- Environmental Licences 5519/8 (Cooljarloo), 5939/8 (Chandala) and 5320/8 (Kwinana).
- Works approvals for significant process upgrades or modifications issued under Part V of the Environmental Protection Act, 1986.
- Lease conditions on mining tenements ML268SA (Cooljarloo), M70/1010 (Cooljarloo).
- G70/165 – 168 (Chandala) and G70/88 – 90 (Chandala) issued under the Mining Act, 1978.
- Groundwater well licences issued under the Rights in Water and Irrigation Act, 1914.

11.18.4 Environmental compliance

Compliance with regulatory requirements is closely monitored by all sites. A programme whereby environmental personnel from each site audit compliance of other sites has been implemented. Regulatory inspections are undertaken by DoE and DoIR personnel. No serious non-compliances have been reported as a result of these inspections. No non-compliances have occurred at the Cooljarloo mine site in recent years. The volume of process wastes disposed of in onsite landfills if measured as wet weight tonnes did exceed the licenced volume, however this was reported to regulatory authorities and an increase in the licenced disposal volume was granted. Clarification is being sought by Tiwest JV to determine if the licenced volume refers to wet or dry weight tonnes. The larger volume of waste resulted from excavation of historically deposited materials in ponds at Chandala and Kwinana.

No non-compliances have occurred at the Chandala or Kwinana sites in recent years. One reportable incident occurred at Kwinana during 2004 where loss of containment of sulphuric acid occurred from a storage bund. The incident was investigated by DoE however no regulatory action was taken. Four level 2 air emissions incidents occurred during 2004 with each reported in compliance with regulatory requirements.

11.18.5 Environment, Closure and Rehabilitation Budgets

Cooljarloo: The operating budget for environmental management at the Cooljarloo site was AUD1.1m for 2005. A breakdown of this budget was reviewed and it appears suitable for requirements under the site environmental licence.

In addition to this operating budget, allowance has been made within the life of mine physical and financial plan for costs associated with vegetation clearing, topsoil clearing, land forming and rehabilitation on an annual basis. Costs have been allocated until 2026 and vary in accordance with annual development and rehabilitation rates. Forecast vegetation and topsoil stripping costs total AUD1.7m and AUD10.2m for the period 2005 to 2026. Forecast land forming and rehabilitation costs total AUD17.1m and AUD26.1m, respectively, for the period 2005 to 2026.

A rehabilitation provision account has been established for the operations with the provision currently totalling AUD20m. The provision is increased by a predetermined rate per hectare of disturbance on a monthly basis as areas are disturbed. Similarly the account is drawn down as areas are rehabilitated. A separate closure provision of AUD3m has been established to address historic legacies. The financial model includes allowances for rehabilitation and closure.

No rehabilitation bonds have been lodged for the Cooljarloo site. This is a direct result of the operations being governed under a State Agreement Act. Discussions with regulatory authorities indicate that placement of bonds on operations governed by State Agreement Acts is under review. Bonds may be required to be lodged in line with DoIR guidelines in the medium to long term. Bonds are typically lodged in the form of bank guarantees.

Kwinana: The operating budget for environmental management at the Kwinana site was AUD437,000 for 2005, and has been raised to AUD463k for 2006 (excluding salaries). A breakdown of this budget was reviewed and it appears suitable for requirements under the site environmental licence. In addition to the operating environmental budget, a waste management budget is set at between AUD1.7m to AUD1.8m. This budget is for tipping fees for filter cake solid waste disposal at the Cooljarloo mine site under licence. A provisional site closure and decommissioning plan has been completed and is estimated at AUD12m. This figure is likely to rise as the budget has not been broken down to any level of detail as yet. Financial provision for closure costs are the responsibility of the Joint Venture partners and Ticor has provided for this in their financial statements in accordance with AIFRS.

Chandala: The operating budget for environmental management at the Chandala site in 2005 was AUD86,000, including salaries. A breakdown of this budget was reviewed and it appears suitable for requirements under the site environmental licence. In addition to the operating budget, Chandala had a budget of AUD2.5m for solid waste disposal from the dry separator to the mine site, and AUD4.7m for waste disposal from the synthetic rutile plant to the mine site. Waste volumes allowed for disposal are limited by the mine site environmental licence, and determined by product throughput and grade. At present, Chandala is operating at close to capacity and has no significant expansion plans, other than debottlenecking improvements. The mine site recently had its landfill licence increased to accommodate an additional 150ktpa, which is unlikely to be met under normal operating conditions at Kwinana and Chandala. Chandala has recently developed a conceptual site closure and decommissioning plan, which apparently includes a detailed cost estimate. This plan is presently being audited by a third party and SRK were not granted exposure to it. As a result, SRK is unable to comment on the closure plan and associated costs. As with the Cooljarloo Mine, Ticor has provided for this in its financial statements.

11.18.6 Environmental Issues and Risks

Cooljarloo: Rehabilitation progress has been severely constrained in years prior to 1999 resulting in the operations having a larger amount of unrehabilitated land than would be desirable compared to industry standards and regulatory expectations. One of the reasons for the large area disturbed is a result of slimes management which requires large drying areas to be exposed. Rehabilitation is primarily required to return land to native vegetation, however small areas located on Mullering farm are required to be rehabilitated back to pasture. Discussions with site personnel indicate this has been recognised and additional funding has been provided in recent years to reduce the historic legacy. This has included decommissioning five of the six process waste cells present on site.

The amount of land disturbed, but not rehabilitated is expected to peak during 2005/2006 at about 1,700Ha and then decline thereafter. Required native vegetation closure criteria are presently being established in consultation with regulatory agencies. Tiwest JV have recognised the challenge in being able to establish criteria that are practical, achievable, measurable and acceptable to regulatory agencies.

Development in three new areas is being considered, namely Dongara, Jurien and Falcon.

Environmental approvals will need to be obtained prior to development commencing in these areas. Review of information available for each of these areas indicates that approvals for mining in the Falcon and Dongara areas are likely to be difficult due to high biodiversity values and presence of conservation reserves. Formal assessment under the Environmental Protection Act, 1986, at a high level (Public Environmental Review or Environmental Review and Management Plan) is considered the most likely approval path. Difficulties have already been experienced in gaining land clearing approvals necessary to allow further exploration. Extensive baseline studies will be required prior to development of environmental impact assessment documentation.

Tiwest JV personnel are aware of the degree of difficulty likely to be experienced, the financial and technical resources required and lengthy timelines likely to obtain approvals. Significant volumes of water are required for dredging and ore processing operations. Difficulties have been experienced in sourcing adequate water without causing adverse environmental impacts. Abstraction in the north mine borefield caused unanticipated drawdown of the superficial aquifer and this in turn caused death of vegetation in 2000. Since dewatering of this aquifer ceased, water levels have returned to almost pre-abstraction levels and vegetation has reportedly recovered.

To ensure similar incidents do not reoccur, Tiwest JV has commissioned extensive groundwater modelling studies and installed two 600 metre deep bores in late 2004 to supply water for the north mine area. As operations progress, the importance of reliable groundwater modelling will increase to ensure sufficient water can be safely abstracted. Ongoing abstraction costs for the operation are likely to be high as a result of the need to develop very deep bores.

A number of environmental monitoring programs have been developed and implemented for the operations. These appear to address all potential environmental issues, are consistent with industry best practice monitoring techniques and satisfy regulatory requirements. Results of monitoring are reported annually in a publicly available report.

Chandala: The Chandala site undertakes a range of environmental monitoring programmes under its Ministerial environmental licence (5939/8). The site is audited annually by DoE staff, and to date, has not received any licence breaches. The site was next due for audit by DoE officials in November 2005. Notwithstanding the DoE inspections, SRK believe that several issues should be brought to attention. The dry mill stack on site is not licenced with the EPA. Tiwest JV are aware of this issue and are in the process of addressing it. It is unlikely Tiwest JV will be held in breach of conditions and it appears the issue is a simple oversight that both parties are presently rectifying.

There are two main environmental issues on site that pertain to potential and definite ongoing risk and therefore liability. The first is the existence of several groundwater plumes beneath the site. There are currently three distinct plumes from three separate sources. Two plumes are presently being managed while the third is still being defined. A brief description of each groundwater plume is presented.

Plume 1 is located beneath the process liquor storage ponds adjacent to the waste water treatment plant to the north of the plant. The plume was discovered in 1994, with the contaminants being ammonium and sulphate. The plume source has largely been removed with decommissioning of one pond and double lining of two others. Small leaks have since been detected on the relined ponds, though these are being managed. The plume is being pumped and treated through extraction wells and sulphate and ammonium levels have decreased from approximately 650 mg/L in 1994 to approximately 100 mg/L in 2004. It is therefore reasonable to conclude that the plume has been captured and is presently under control, though a leak remains and contamination remains in the groundwater.

Plume 2, which was discovered in 1996, is located below the synthetic rutile plant and is the result of poor bunding and housekeeping methods. Tiwest JV are aware of the cause of the plume and are actively managing it. The plume contains ammonium, sulphate (reduced from 4,000 to 1,000 mg/L since 1996) and also has a low pH value of approximately 2.4 due to sulphuric acid leakage from the plant. Capital works have been implemented to reduce point source contamination, in addition to remediating the groundwater by pumping and treating through recovery bores and the waste water treatment plant. As with plume 1, it is fair to say this plume has been contained and poses no immediate threats to off site waterways, however, it remains in place and will therefore require remediating. In this sense the plume must be considered a financial liability and risk. SRK believe that Tiwest JV are managing plumes 1 and 2 adequately, though current management methods must essentially be considered an operating cost. Once plant is removed from site, the plumes should be relatively simple to remediate.

Plume 3 is located adjacent to, and down hydraulic gradient from the Brambles sub-contractor compound near the site entry. It consists of low level hydrocarbon contamination from an unknown source. Tiwest JV have received specialist advice suggesting they monitor, rather than treat the plume at present. Contaminant levels are relatively low (<3.6 mg/L), though aquifer transmissivity is high, due to the sandy nature of the soil and Chandala Brook is located relatively close to the plume. Tiwest JV are continuing to receive advice in this regard and may commission an interception trench in due course.

Kwinana: The Tiwest JV Kwinana Pigment Plant is a designated major hazard facility due to the use of chlorine on site. The plant is an aggregate of six smaller plants that each provides a stage in the transformation of the synthetic rutile feedstock to the final product. The major environmental challenge at Kwinana is arguably managing the chemical feedstock on site, which include chlorine, sodium hydroxide, and natural, oxygen and nitrogen gases. Other environmental issues include managing waste products from the various process stages. Hazardous gases produced on site are managed via flue gas incineration and scrubbing, while waste water is treated and released under licence.

The plant operates under DoE environmental licence number 5320/8 and various legal Acts and regulations. Licence 5320/8 allows the plant to expand to produce 180ktpa, up from the current 110ktpa, if deemed viable. SRK identified the following as potential environmental issues and risks on site:

Managing operational incidents resulting in fugitive emissions of titanium tetrachloride ("TiCl₄") and chlorine gas has been an historic issue on site. When exposed to water vapour present in the air, the TiCl₄ hydrolyses releasing hydrochloric acid, titanium dioxide (TiO₂) and heat. Tiwest JV have an incident management plan in action for chlorine gas and TiCl₄ release, with a level 3 incident being when a release violates the site perimeter. Tiwest JV had no level 3 releases at Kwinana in 2003 or 2004, though it remains a risk management issue should the plant expansion occur, simply as a function of increased throughput and the proximity of industrial and residential premises.

An historic groundwater plume containing phenols is located immediately below the site footprint in a relatively shallow aquifer (<20m). While Tiwest JV were not the source of this plume, rather, it originated from a source offsite, a potential environmental liability may exist should draft Western Australian Contaminated Lands legislation become law. It would be prudent for Tiwest JV to establish their legal position in this regard. A second groundwater plume is located below the waste water treatment ponds on site and is migrating towards Cockburn Sound. Tiwest JV are aware of this plume and believe that due to the nature of the contaminants (sodium, sulphate and chloride), it is not an issue, as concentrations are below those found in seawater.

Atmospheric emissions in the Kwinana industrial zone are managed under the Environmental Protection (Kwinana) (Atmospheric Waste) Policy and Regulations (1999), whereby release volumes of individual gases are established for each industrial facility. Relative newcomers to the Kwinana area have traditionally found themselves with lower emission quotas than older, more established sites. In this regard, Tiwest JV remain beneath their sulphur dioxide (SO₂) limits, and are therefore not in breach of their environmental licence. Tiwest JV have identified however, that the availability of their low sulphur (<1.5%) feedstock petroleum coke is tightening, and therefore the price is likely to rise. Depending on management decisions regarding the price sensitivity of low sulphur feedstock to their operations, a substitute option may include higher sulphur (up to 5%) coke, at lower cost. This in turn, may at best result in increased caustic consumption in post-emission incineration scrubbing units, and at worst, potentially increase SO₂ emissions; depending on the efficiency of the vent stacks over time. These effects would be greater should Tiwest JV choose to expand production at Kwinana.

These issues remain hypothetical at present, though ones that require consideration through appropriate stoichiometric calculations. A solid waste product presently on site which is returned to the Cooljarloo mine site for licenced, encapsulated disposal, contains low (<600 parts per billion) concentrations of uranium and thorium. Presently, these concentrations are below threshold values in Western Australian legislation that would otherwise deem the waste 'radioactive'. As such, Tiwest JV are suitably licenced to handle this product. If however, international standards that contain lower trigger values for both elements are introduced into Australia, there is a risk that the products would become 'radioactive'.

Implications should this occur include licensing, transport, and disposal. Furthermore, radioactive material (albeit the same material presently located on site) is traditionally a sensitive community issue and there may be community relations issues also involved. Again, this issue remains a hypothetical, however, Tiwest JV would be best prepared by establishing contingencies and manage the risk accordingly.

As noted in the budgetary section of this environmental review, Kwinana has recently completed a provisional site closure and decommissioning plan, with a budget estimated at AUD12m. Tiwest JV recognise that this figure is likely to rise as more levels of detail are added to the plan. Financial provision for the Kwinana site closure is provided for in Tigor's accounts in accordance with AIFRS. Overall the environmental staff at the Tiwest JV Kwinana site are pro-active and aware at managing their environmental responsibilities suitably so that not only do they maintain an environmental licence, but continually improve environmental management on site in accordance with ISO 14001 principles.

11.19 Rosh Pinah

The underground zinc and lead mine is located in an arid region of the southern portion of Namibia. The ore is concentrated and refined to produce metal oxides. The region receives 70 mm/yr of rainfall on average. The aridness limits surrounding farming activities to game farming. The town of Rosh Pinah is located adjacent to the mine and includes the new portion recently constructed to house the employees of Skorpion Zinc. An informal settlement adjacent to the hostel, the "Sand Hotel", has developed at the foot of the western waste rock dump and extends over the hill adjacent to the dump. The area where the mine is located has been included in the recently proclaimed Ais Ais National Park. The Orange River, located approximately 30km to the east of the mine, is the only significant water course in the region.

11.19.1 Compliance

Components of environmental legislation in Namibia are fragmented into different Acts and there is a lack of overarching legislation. In addition, several of the South African laws in practice at the time of Namibia's independence in 1990, remain in force by virtue of Article 14 of the Constitution of Namibia however these are often outdated and not necessarily enforced. Much of Namibian legislation is in draft form and there is uncertainty if and when several of the draft Acts will be promulgated. The Environmental Management Bill is due to be promulgated in 2005 and will legislate the requirements of Namibia's Environmental Assessment Policy. Uncertainty exists with authorities requirements and how the current legislation is administered. As the legislation is fragmented and not formalised, compliance is difficult to assess. However, Rosh Pinah has begun to develop an environmental management plan. As part of this process, the mine has undertaken an "environmental audit of current and past mining practice to determine impact with the objective to design an environmental management plan".

11.19.2 Environmental issues

Waste rock dumps stability: Waste rock is disposed on two dumps. These dumps have been constructed by end tipping, resulting in slopes at the natural angle of repose, which are inherently unstable, leading to slumping in various areas. The low rainfall conditions have resulted in a lack of a rehabilitation strategy for the waste rock dumps, as vegetation growth is limited. SRK is of the opinion, that the dumps are a safety hazard and as a minimum will have to be cut back to reduce the slope angle with a liability of about ZAR10 – 20m.

Potential for acid rock drainage: No information is available on the geochemistry of the waste rock dumps, however, considering that the ore that is mined is sulfidic there is a high probability that some sulfides are present in the waste rock. This could potentially lead to the production of acid rock drainage but the potential is probably minimal given the low rainfall in the area. Furthermore, no signs of acid seep were observed at the base of the dumps. SRK, therefore, does not consider ARD a significant risk.

Water contamination at the tailings dam: A single tailings dam, divided into a number of compartments, is present at the mine. Testing has not yet been undertaken to determine sulfide concentrations in the tails, however, relatively low concentrations would be expected as the bulk of the sulfides would be removed during mineral processing. Acidity is therefore not expected to be a significant problem at the tailings dam. Salinity is unlikely to be a significant problem at the tailings dam, as background water quality is poor. Geochemical testing did indicate that the dam is enriched with the heavy metals mercury, zinc, cobalt, barium, lead, selenium and cobalt. Initial groundwater monitoring has indicated the presence of a heavy metal plume below the tailings dam, moving in a southerly direction, however the lack of receptors below the dam would imply that exposure to this contamination is minimal. Therefore, the risk associated with this plume is also considered minimal and SRK is of the opinion that at closure it is unlikely that any groundwater remediation measures would be required around the tailings dam.

Informal settlement sewage: A seep below the toilet facilities of the informal settlement was observed. It is suspected that this is generated by sewage effluent from the toilet facilities daylighting on surface. While the informal settlement is not strictly the mine's responsibility, the mine constructed the toilets on mine property. Therefore, the mine may be required to implement some form of remedial measures once the informal settlement is removed. To cover this, SRK proposes a sensitivity contingency of ZAR1 – 1.5m.

Hazardous material handling: Historically, hydrocarbon housekeeping management has been poor, resulting in soil contamination around the workshops over an area of approximately 1Ha. It is reported that hydrocarbons have not been detected in the groundwater. It is SRK's opinion that this lack of hydrocarbons in the groundwater is an artefact of the lack of appropriately placed boreholes, rather than an indicator that the groundwater has not been contaminated. However, the lack of receptors downgradient minimises the risk. Asbestos has been used extensively as a construction material on the mine with offices, shops

and the school constructed from asbestos. The pipeline from the Orange River to the mine (300 mm OD) is also constructed from asbestos. At closure, disposal could represent a significant cost. The mine believes that all PCB contaminated oils have been removed however, they are still awaiting receipt of the final clearance certificate. Used oil is collected for recycling.

Waste disposal: All other waste from the mine, including grease, oil filters, redundant plastic and rubber components from the plant and vehicles and domestic rubbish generated by the mine, is transported to the mines waste site on the waste rock dump where it is burned on a daily basis. Closure of this dump represents a liability as it is expected that the mine will be required to ensure that seepage from the area is minimised. It is SRK's opinion that this could cost in the region of ZAR1 – 4m.

Saline water management: Given the low rainfall of the region, storm water management is not an issue, however, discharge from the aquifers results in an accumulation of water underground. Underground water is stored in an underground sump and recycled back into the mining process. More recently and prior to the construction of the underground sump, the underground water was pumped to the tailings dam where it was allowed to evaporate. In addition, water within the plant that has become too saline from recycling is bled to the thickener for disposal on the tailings dam. Historically, underground water and excess plant water was discharged from the mine into the veld or it was used for irrigation of the golf course. This may have led to soil contamination due to the naturally high groundwater salinity and the salinity arising from the plant, however no monitoring has been undertaken to assess the situation. SRK are of the opinion that an investigation into potential contamination is required (estimated cost of ZAR0.25m)

Land degradation: Land degradation has primarily been caused by the construction of the waste rock dumps and the tailings dam. The construction of a small open pit at the foot of the mountain has also resulted in some land degradation. As there is little natural vegetation in the area, the presence of un-vegetated waste rock dumps does not have a significant visual impact, as the waste rock blends into the surrounding landscape.

Air emissions: The tailings dam is a significant source of dust and has resulted in numerous complaints from the local community. Limited remediation is possible with vegetation establishment difficult. SRK is therefore of the opinion that the practicable closure strategy will be to rock clad the dump. Operationally, the mine has applied Dust-a-Cide to the northern slope, adjacent to the village as a means of dust control. The mine also attempts to operate the tailings dam so that the horizontal surfaces are kept wet. It is reported that although some dust is generated from the waste rock dumps, the volumes generated are insignificant. The mine undertakes regular dust monitoring.

Community relationships: The "Sand Hotel" is a safety risk, as it encroaches on the waste rock dump. Furthermore, the presence of the community is reportedly unsettling the residents of the hostel, as the noise from the community is excessive. Rosh Pinah and Skorpion have apparently come to an agreement with the community that each mine will provide a ZAR1m to relocate the settlement to a flat area to the west of the Rosh Pinah town. It is reported by the mine that the community are eager to move.

Social issues: Should the mine close in five years' time, the implication is that the work force will be made redundant. This will impact on the mine workers and their dependants as there is little employment opportunity in the region. It is expected that at closure, there will be a significant departure of people from the town. This would impact significantly on the town's economy. The mine is however, of the opinion that the area could be developed for tourism and are investigating, on an ad hoc basis, potential tourism opportunities. Lack of planned and appropriate management of these social issues could result in a significant risk to Exxaro's reputation. The modified focus exploration strategy aims to increase mine life to beyond ten years to ensure the sustainability of Rosh Pinah mine's workforce and that of the region.

Closure planning and costing: There is currently no closure plan in place but it is understood that a closure risk assessment is to be undertaken shortly. It is assumed this will be followed by the development of a closure plan. The mine has estimated its liability for immediate closure to be ZAR45m. Of this ZAR45m, ZAR7m is allocated to demolition costs and ZAR38m is allocated to restoration costs. It is SRK's opinion that this estimate is insufficient to cover potential remediation at closure, particularly if the slimes dams require rock cladding and the asbestos on site requires disposal as hazardous material. It is estimated that the shortfall is some ZAR45m. It must also be noted that the incorporation of the mine into a national park may result in stringent closure requirements being applied to the mine. At this stage it is not possible to quantify this risk, as the requirements of the Park has not been defined. As there have been no legislative requirements in Namibia requiring the mine to establish a closure fund, no closure capital is available. There is however, a provision of ZAR35m in Mine budget to address closure.

11.20 Zincor

The refinery is constructed on the banks of the Blesbokspruit and is downstream of a Ramsar Wetland. The refinery has been constructed on a historical gold mine, with two old gold slimes dams remaining on which current waste is deposited. The remainder of the surrounding area is currently utilised for light industrial purposes, gold mining and residential uses. Zincor produces zinc ingots, with cadmium and cobalt oxide as saleable by-products.

11.20.1 Compliance

An Environmental Management Master Plan (“EMMP”) has been prepared to manage environmental impacts (an EMPR is not required as this is not a mining site). EIA's have been completed for new infrastructure and Records of Decision (“RoD”) received from the Provincial Department of Environment. All water uses have been registered and Zincor has submitted its water use licence application. The refinery undertook an enviro-legal audit in August 2004. The aspects identified were rated from 1 to 4 with 1 being low risk and 4 being high risk. The aspects that have not yet been closed out and have a rating of 3 or 4 are: pollution of surface and groundwater, *ad hoc* disposal of waste, a lack of registration with the NNR regarding the ionisation radiation present on site, potential impact on the Blesbokspruit as a result of activities on site and the lack of a provision in the event of unexpected closure.

A letter received from DWAF (June 2005) indicates that the diffuse seep discharging to the Blesbokspruit is illegal. Zincor indicated to DWAF plans to be implemented to treat the discharge to an acceptable quality and to reduce it. Remediation options are currently being investigated. The refinery then has until 31 December 2007 to implement the plan. Although a detailed study is required to identify the best practicable method of intercepting the seepage and managing the water collected, it is estimated that the cost of implementing an interception system and treatment facility will be between ZAR5 – 10m.

Zincor operates a small borrow pit where fill material is obtained. This pit is less than 1Ha in extent and therefore does not require a mining licence from the DME, however, it is understood that the pit is illegal in terms of the requirements of the Department of Agriculture. Zincor are exploring means of meeting the requirements of the department. As this is a small excavation, it is not seen as a significant risk to Zincor.

Zincor has a certificate of registration for its scheduled process stipulating emission limits.

11.20.2 Environmental and social management

Environmental management is the responsibility of the environmental manager, who is assisted by an environmental scientist. The refinery is fully ISO 14001 compliant (received 2002), and undergoes 6 monthly surveillance audits. The environmental operational budget for the facility is ZAR0.6mpa and includes monitoring, audits and any specialist studies that may be required. This budget is also utilised for any *ad hoc* remediation around the periphery of the plant (e.g. clean up of soils contaminated by dumping concrete, etc. around the tailings dam). SRK is of the opinion that this budget is insufficient to meet the refineries requirements, as significant improvements are required to improve water management and improve materials storage. Social management is the responsibility of the human resources department who are responsible for maintaining community relationships and implementing projects to uplift the community.

11.20.3 Environmental Issues

Process waste disposal: The waste material generated by the refinery classifies as H : H (according to DWAF's Minimum Requirements) indicating that the material should be disposed of at a properly engineered hazardous disposal facility where seepage to groundwater is minimised as far as is practicable. Currently the two disposal facilities (old decommissioned gold slimes dams 7L3 and 7L4 for which Zincor are liable) do not meet the criteria for hazardous waste as no impermeable layers have been constructed at the base of the facilities. The planned new facility, due for commissioning in 2007, will be designed and constructed to comply with DWAF's requirements. It is currently expected that the solid component of 7L3 will be reprocessed (excluding the gold slimes) to extract residual zinc. While this could potentially remove contaminants associated with refinery's tails, the remaining gold tails may still release contaminants to the environment. There are currently no plans to reprocess the material in 7L4. To minimise ongoing contamination, it is expected that the two tailings facilities will require capping with an impermeable layer at closure. It has been determined that uranium is present in the toe paddocks in concentrations above DWAF's guidelines, however, the radiation associated with the uranium is below the NNR guideline. The radiation is not seen as a significant risk.

Water contamination: Contamination plumes have developed below the 7L3 and 7L4 tailings dams. Cut-off trenches have been constructed around a portion of 7L3, however, no trenches are present around 7L4. A wet patch, indicative of seep, is evident at the base of 7L4, which is approximately 250m away from the Blesbokspruit, indicating potential contamination of the spruit and which DWAF has stated is illegal.

Pollution control around 7L3 is inadequate, with the result that the Vlei Dam has become contaminated with groundwater daylighting in the dam area, as well as solids washing from 7L3 and collecting behind the dam retaining wall. There is a risk that groundwater remediation, at a high cost, may be required by DWAF to ensure control of the pollution plumes.

Storm water management: Spills and storm water originating from the plant are initially collected in a concrete lined channel that drains to a Plant Storm and Water Retention Dam from where it is pumped back into the plant. It appears that the capacity of this dam is currently not sufficient to handle the water from the plant and regularly overtops via an earthen channel to the Emergency Dam System. From here the water is pumped to the Penstock Return Water Dam of the 7L3's tailing dam. This increases the risk of contaminated process water reaching the spruit. However, this will be addressed once the storm water drains and bundling upgrade project are completed in 2006.

Soil contamination: Various sources of soil contamination are present. These include: seepage to surface and sediment laden runoff from the tailings dams; pipe burst in tailings delivery line; overtopping of the sumps collecting water from the cut-off trench around 7L3; *ad hoc* disposal of smelter waste around the tailings dams; temporary storage of sediments removed from the silt trap (prior to disposal of the sediments on the tailings dams); temporary storage of product (particularly the cadmium and cobalt oxides stored outside of dedicated bunded areas); storage of raw materials; storage of intermediates during the process; and spills from the process. Historical soil contamination could also have resulted from gold mining activities. It is assumed that the areas of the soil currently requiring remediation will require disposal at the hazardous waste landfill with the risk of high disposal costs. To quantify the potential liability a soil contamination investigation will be needed at a cost of ZAR1m.

Sinkhole formation: The existence of dolomite within 20m of the surface could lead to the formation of sinkholes on the property. To minimise sinkhole formation, the refinery attempts to prevent water ponding on surface. None of the current operation is reportedly at risk from sinkhole formation, however it is suspected that there is the potential that sinkholes could form in the vicinity of the new hazardous waste dump. It is understood that cognisance of this will be taken during design and construction of the dam.

Air emissions: Arsine and sulphur dioxide are chemicals potentially emitted to the atmosphere. Although the gaseous levels are generally within the registration certificate condition, there have been periods when concentrations have exceeded the conditions. Exceedances normally occur at start-up after planned shutdowns. Zincor has recently implemented control measures to minimise emissions. It is noted that the radon is not generated directly from the refineries operations but is an artefact of the geology and the presence of the gold slimes on surface.

Community relationships: A number of small scale improvements have been made in the local community, including teaching the community to grow vegetables and regular rubbish removal and disposal. Zincor also insists that all contractors source unskilled labour from the local community. Zincor is currently in negotiations with local and international donors to establish a Base Metals Initiative, where members of the local community are equipped with trade skills in the redundant buildings on the plant. Zincor views this project as sustainable, as the business plan indicates that proceeds from the initiative will be utilised to maintain infrastructure. The remainder of the proceeds will go to those involved in the trade activities.

Closure planning and costing: No closure assessment has been undertaken for the refinery as there are no legislative requirements to do so. Therefore, no provision has been made for closure. SRK estimate that the likely closure costs would be in the region of ZAR75m to ZAR100m. This will need to be confirmed in a detailed closure planning and costing exercise (at a cost of about ZAR0.5m). It must be noted that the ZAR75 – 100m does not include the ZAR5 – 10m that is potentially required to upgrade water management to minimise diffuse seep to the Blesbokspruit, as this capital needs to be spent before closure to comply with DWAF's instructions. Furthermore, the ZAR75 – 100m does not include the ZAR1m required for the soil study, as this needs to be undertaken prior to closure so that a remediation strategy can be developed. A rehabilitation provision liability of ZAR191m was raised in the Company's financial statements at 31 December 2005.

11.21 Industrial Minerals – Glen Douglas

The mine, where dolomite is mined from 3 open pits (2 of which are operational), is constructed on the banks of the Klipriver, adjacent to the town of Henley-on-Klip and upstream of the industrial area of Vereeniging. The area around the mine is utilised by farmers, many of whom abstract water from the Kilpspruit for irrigation. The defunct A-pit has been converted into a recreational facility where various adventure activities occur (scuba diving, quad biking and 4 x 4 routes).

11.21.1 Compliance

The mine is currently operating under an EMPR approved in 2002, however the mine expects to submit a MPRDA conversion by the end of the year. A SLP is currently being developed in support of this process. The process has, however, been hampered by the potential sale of the mine. Water uses on the mine have been registered, with the exception of removal of ground water inflow from A-pit. The north east waste rock dump is built within the 1-in-50-year floodline of the Klipriver and clean runoff the surrounding catchment is not adequately diverted through the mine. DWAF is aware of these problems and is negotiating with the mine regarding exemption from GN0 4, which the the mine currently convenes with these activities. The plans are to make the necessary submissions by the end of the year. DWAF has not yet requested the mine to submit a water use licence application. The mine is currently operating under the Water Act, 1956, permit with no expiry date on the permit. There are instances when the alkalinity of the discharge water exceeds the permit conditions. The mine maintains that this is a result of geological interactions with groundwater and not a result of mining activities. To this end, the mine has agreed with DWAF to undertake a regional groundwater study to determine background conditions.

The dump, where domestic waste from the mine was historically disposed, has been made redundant and the bulk of the waste lifted and disposed of at the local municipal dump. There is no groundwater monitoring around the dump so there is no information regarding the potential development of a pollution plume. Although the dump is no longer utilised, the mine will still need to close the area in terms of Section 20 of the ECA. The mine undertook an enviro-legal audit during 2004. The aspects identified were rated from 1 to 4 with 1 being low risk and 4 being high risk. The aspects that have not yet been closed out and have a rating of four include the water and waste aspects discussed above and failure to undertake rehabilitation of the surface of the land as an integral part of the operation and pollution of groundwater via hydrocarbon spills. The mine is ISO 14001 certified (2004) and undergoes bi-annual surveillance audits.

11.21.2 Environmental and Social Management

Environmental management falls within the portfolio of the Technical Services Manager. He is aided by a secretary who is responsible for the ISO 14001 documentation. Social management is the responsibility of the Human Resources Manger. SRK is of the opinion that the mine requires an environmental manager, whose key performance area is solely environmental management. The operational environmental budget for the facility is approximately ZAR0.6mpa, ZAR0.2m of which is contributed to the mine's closure fund, with the remainder being utilised for specialist studies, ISO audits and environmental monitoring. The mine reports that the rehabilitation of the dumps is funded from a mining budget. SRK is of the opinion that the operational budget is insufficient to carry out ongoing environmental management and should be in the order of ZAR1mpa.

11.21.3 Environmental Issues

Waste rock dumps: The mine is currently focusing on vegetating the dumps on the mine's perimeter that are visible from the town of Henley-on-Klip. The mineralogy of the waste rock dumps will not produce acid rock drainage, with seepage reported to be alkaline and enriched in calcium and magnesium. Although, the waste rock dumps are at the angle of repose, the dumps are not high (less than 20m) and do not pose a stability risk. Therefore, it is not expected that the dumps will require re-profiling to a lesser slope.

Tails disposal: Tails from the plant are pumped to temporary storage facilities, where it is allowed to dry. Once dry, these tails are sold to farmers as agricultural lime. It is reported that minimal dust is generated, as the product sold to the farmers still contains approximately 10% moisture.

Hazardous material handling: Historical hydrocarbon housekeeping management has resulted in the contamination of soil adjacent to the plant and workshop area (approximately 2 – 3Ha). The area has been ripped and fertilised to stimulate microbial activity that should degrade the hydrocarbons. Although monitoring boreholes have been drilled in this area, these boreholes have not yet been sampled. Therefore, information on plume development is absent. SRK is of the opinion that groundwater contamination is unlikely to be significant, as it is expected that the groundwater will daylight in the pit where it will be sufficiently diluted.

Asbestos: Some of the older buildings still contain asbestos in the form of ceiling boards (100 – 200m³) that ultimately will require disposal at a hazardous waste site (approximate cost (ZAR0.1m). The mine report that the majority of PCB contaminated oils have been removed from electrical installations with only residual PCB levels remaining. SRK does not consider this a significant liability.

Water contamination: Groundwater inflow to the pits is returned to the plant (68%), discharged to the Klipspruit (22%) and the remainder used for dust suppression. The geology of the area results in an enrichment of calcium, magnesium and alkalinity in discharge water, however, it is only alkalinity that

sometimes exceeds permit conditions. The mine is to embark on a baseline survey to determine whether the enrichment is natural or a result of mining activities. Periodically, nitrates (blasting residues) accumulate in the pit water, with the result that the nitrate concentrations in the discharge to the Klipspruit are slightly elevated (15% – 30% above DWAF drinking water guideline). This should improve with the change in blasting procedures.

Water management: The mine is not compliant with GN 704 with clean storm water runoff from the land surrounding the mine flowing through a culvert under the access road to the mine and then through the plant area, where it becomes contaminated with sediments and sometimes alkalinity. It then enters a diversion around the pit and is release into the Klipriver. The mine has investigated the problem and discovered that, due to the topography of the area, there is no other flow path for the water. SRK considers this a risk, as the mine might be forced by DWAF to collect the water in a retention dam and then pump it to the Klipspruit, to prevent the clean water being contaminated. SRK therefore proposes a sensitivity contingency of ZAR1 – 2m.

Sink hole formation: Water accumulating on surface has lead to the formation of sinkholes. Currently, this is not a significant problem and it is managed by ensuring that there is minimal surface water accumulation. No predictive geotechnical work has been undertaken to identify zones of high sinkhole formation potential so the future risk is not known. The mine are, however, aware of potential sinkhole formation and regularly monitor this area.

Air emissions: Dust emissions from the mine are currently a problem for the local community with dust being generated in the pit, on haul roads and in the plant. The mine has implemented dust control measures, however there are still occasions when the DEAT action level guidelines are triggered at three of the boundary monitoring points. Assuming appropriate management is implemented, this is not considered a major risk.

Community relationships: The mine built a school for the local community in 1997. There were plans to extend the school, however, the Department of Education never applied for permission to rezone the 13 stands on which the school was located, so Phase II never started. The mine has submitted its Social and Labour Policy, which contains plans to uplift the surrounding community. The mine does however, make ad hoc donations to the community as and when required, with each request for donations being individually evaluated.

Decommissioning and closure liability: The mine has no closure plan, however, closure costing is based on commitments made in the EMPR. The mine has assessed its immediate closure cost (June 2005) to be ZAR9.8m. This includes ZAR6.9m for demolition costs and ZAR1.9m for rehabilitation costs. The primary expense associated with rehabilitation appears to be the re-vegetation of the waste rock dumps. There does not seem to be an allowance for any restoration of the footprints where infrastructure is removed. SRK is of the opinion that the rehabilitation costs are insufficient, with there being a shortfall of ZAR13 – 17m. Based on the information available, SRK is of the opinion that the R6.9m for demolition is sufficient.

11.22 Dormant Operation – Hlobane Colliery

The defunct colliery, situated in Northern Natal, stopped production in 1998, having operated since 1898. Limited contract mining is still being undertaken, however, this will cease at the end of 2005. Mining on three Seams was undertaken by accessing the different Seams through a series of adits excavated into the side of a steep mountain and through a series of 29 open pits located at the foot of the mountain. A number of watercourses are present around the base of the mountain, with the streams on the southern side draining into the White Umfolozi River and those on the north draining into the Pongola River. The area to the east of the mine has been extensively mined out, while the surrounding area is being utilised for cattle farming.

11.22.1 Environmental Issues

Water management: The nature of the underground mining has resulted in the propagation of extensive cracks to surface. These cracks create a preferential flow path for water into the mine, resulting in significant decant from the adits. Hlobane is in the process of sealing the cracks along the stream on the top of the mountain. The mine has predicted that this will reduce ingress into the mountain and by implication decant, by about 50%. It is not expected that any significant acidity will be produced underground, however, the decant is saline with sulfate, calcium and sodium being the major contributors. Currently, decant is not treated and discharges straight to a watercourse. Evaporation control dams have been constructed on the northern side of the mountain, however, these have insufficient capacity to handle water made, resulting in a discharge to a watercourse. The open pits have been backfilled and the surface rehabilitated, however, uncontrolled decant is evident at the pits, particularly those lower down the slopes. Existing water uses have been registered and an application for a water use licence was submitted to DWAF in 2002. To date there has been no indication from the authorities as to when the licence will be issued.

Waste disposal: Three of the four discard dumps have been rehabilitated by capping with a clay layer, followed by top-soiling and vegetating. This rehabilitation has reduced seepage, however, saline water still emanates from the dumps. Although this is not treated, Hlobane has made a provision for water treatment. The provision made is for the construction of passive treatment reactors at each location requiring treatment. The fourth dump (Gus dump) is still operational and is being utilised by the contract miner for waste disposal. This is being operated as a co-disposal facility, with coarse discard used to contain the fines. During deposition, some compaction of the coarse fraction is undertaken to limit oxygen and water ingress. At closure this dump will require clay capping, top-soiling and vegetating. It is expected that this dump will decant, also requiring treatment. SRK is of the opinion that an adequate provision has been made for the closure of the dump.

Water treatment: The mine expects to implement passive water treatment, to remove the sulfates and iron from decant water. This technology is still in the development phase (bench and small pilot scale) and has not yet been tested on a large industrial site. Therefore, there is a potential risk that treatment may not successfully be converted to the large pilot and industrial scale. Should passive water treatment not prove successful at the industrial scale, there is a risk that Hlobane could be required to implement already proven technology for water treatment. It is estimated that if this is required, the costs would be in the order of ZAR150 – 200m for the volumes required.

Closure planning and costing: A closure plan has been submitted, however, approval has not been granted by the DME. It is understood that the lack of approval is due to internal bureaucracy, rather than the DME having a material concern with the plan. Although, no approval has been given, Hlobane is currently being closed, with closure activities being undertaken over the last seven years. It is expected that closure work will be completed by 2015. Assuming that passive water treatment proves to be successful on the industrial scale, the closure provision of ZAR49m for the mine is sufficient for the work for which it has been allocated.

11.23 Dormant Operation – Durnacol Colliery

The defunct colliery, situated in Northern Natal, stopped production in 2000, having operated for 75 years. Underground mining was undertaken by accessing the different Seams through two access shafts (for men and materials) and 10 ventilation shafts. The mine is located on the Steenkoolspruit, upstream of the dam previously known as Chelmsford Dam. The land around the mine is utilised for cattle farming and crop growth.

11.23.1 Environmental Issues

Water management: Limited groundwater modelling has been undertaken around the underground workings and initial indications suggest that these workings could begin decanting after approximately 75 years (2080). This has not been confirmed and the model is currently being refined. Decant is not expected to be acid, however, it is predicted that it will be saline with sulfate, calcium and sodium being the major ions. As the model has not yet been completed, Durnacol has not formulated plans to treat a potential decant. If the underground decants, there is a risk that the mine will be required to implement treatment (cost discussed under water treatment). Durnacol has not registered its existing water uses under the NWA, nor has it submitted a water use licence application.

Waste disposal: Six of the eight discard dumps have been rehabilitated by shaping, compacting, capping, top-soiling and vegetating. As the two remaining dumps are burning, progress on rehabilitation has been slow. The mine has now discovered a means of rehabilitating the dumps while they are burning and is currently busy on Dump 7. Seepage from the dumps is expected following rehabilitation, albeit at significantly reduced volumes. This seepage is not expected to be acid, however it will be saline. The mine has made a provision for the implementation of passive treatment, once the technology has been commercially developed (see discussion for Hlobane). Should passive water treatment not prove successful at the industrial scale, Durnacol could be required to implement already proven technology for water treatment. It is estimated that if this is required, the costs would be in the order of ZAR100 – 150m for the volumes required.

Closure planning and costing: Durnacol is currently being closed, with closure activities being undertaken over the last three years, although no closure plan has yet been submitted to the DME. It is expected that closure work will be completed by 2015. Assuming that passive water treatment proves to be successful on the commercial scale, the closure provision of ZAR81m for the mine is sufficient for the work for which it has been allocated.

11.24 Liabilities

The identified liabilities for the various assets have been summarised in Table 11.1. The table indicates the following: the life of mine; the immediate closure liability as assessed by Kumba; the shortfall in this closure liability as assessed by SRK during this review with a low and high estimate given; trust fund balance at 30 June 2005; outstanding liability to be covered over remaining life of operation and an indication of the sensitivity contingency that should be used to determine if possible risks could affect the overall resource model.

Note that certain risks could not be given a monetary value until such time as they have been more adequately evaluated. These risks have been identified in the text above. Generally, these risks relate to uncertainties regarding need for post closure water treatment, reshaping of slopes and success of rehabilitation strategies.

The closure liabilities do not take into account the socio-economic closure liabilities such as retrenchment packages, retraining costs or ongoing community involvement. There are also a number of socio-economic risks such as degradation in infrastructure in mine dominated areas (due to lack of tax income and general community pathos) and increased social pathologies due to unemployment.

Table 11.1 Environmental Liabilities as at 31 December 2005 in ZARm

Asset	LoM Scenario I	LoM Scenario II	Immediate closure costs	SRK Assessed shortfall		Total assessed closure cost		Trust Fund at 31 December 2005	Outstanding liability		SRK Sensitivity Contingency	
				Low (ZARm)	High (ZARm)	Low (ZARm)	High (ZARm)		Low (ZARm)	High (ZARm)	Low (ZARm)	High (ZARm)
Iron Ore												
Sishen Mine (including Sishen South Project)	20	25	196			196	196	56	140	140	250	350
Thabazimbi Mine			64	13	37	77	101	21	80	80	50	75
Coal												
Grootegeeluk Mine	20	40	244		1	244	244	40	204	204	30	50
Leeuwpan Mine	21		51			51	51	15	36	36	5	10
Tshikondeni Mine	10		32		1	32	32	14	4	28	5	50
Arnott Colliery ⁽¹⁾	13											
Matla Colliery ⁽¹⁾	26											
New Clydesdale Colliery	7		50			41	41	41			20	25
North Block Complex	7		17			39	39	39			15	20
Hlobane ⁽²⁾			50			50	50	0	50	50	150	200
Dumaco ⁽²⁾			81			81	81	16	16	65	100	150
Other								8				
Heavy Minerals												
Hillendale Mine, Fairbreeze Project and Block P	10	11	69			69	69	10	59	59	150	200
Tiwest JV	21		141			141	141		141	141		
Base Metals												
Rosh Pinah	5		46	12	24	69	92	0	92	92	1	2
Zincor	28			82	112	82	112	0	112	112		
Chifeng	56		14	140	156	140	156		156	156		
Industrial Minerals												
Glen Douglas	30		10	13	17	23	27	5	22	22	1	2
Kumba FerroAlloys ⁽³⁾	30											
TOTAL			1,065	260	348	1,335	1,432	265	1,112	1,185	777	1,134

⁽¹⁾ Environmental liabilities underwritten by Eskom.

These numbers have been incorporated into the TEPs in Section 12 and the FMs in Section 14.