# 8 WASTE MANAGEMENT AND CLASSIFICATION

## 8.1 INTRODUCTION

This Section identifies the different types of waste that will be generated during the construction, operation and decommissioning phases of the Project. These waste types are classified and various 'preferred' and 'alternative' management options are provided for each.

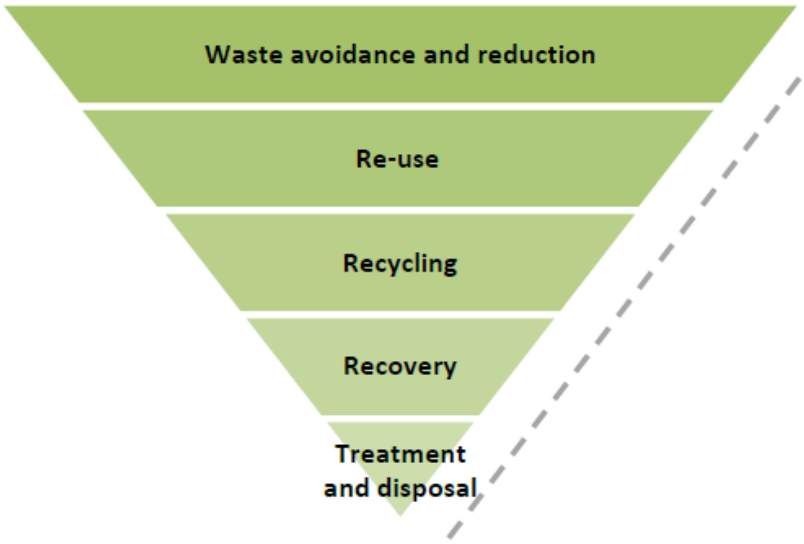
Following this, potential impacts that such waste streams pose to human health and the environment are assessed and presented in tabular format. Finally, a number of mitigation measures/recommendations are provided that seek to minimise/avoid the environmental and health impacts identified.

The concept of 'Waste Management Hierarchy', which is aligns with principles set out in terms of key National Waste Legislation, is applied throughout the Section. This approach is discussed in further detail in the following section. These recommendations are intended to inform final Waste Management Plans (WMPs) that will be developed as part of this process (refer to EMPr attached as *Annex D*) to ensure that all waste generated at the Project site is collected, handled, transported and disposed of in an environmentally sustainable manner.

## 8.2 APPLICATION OF A WASTE HIERARCHY APPROACH

The primary focus of the National Waste Management Strategy (NWMS) (DEA, 2011), which aims to meet the key objectives of the National Environmental Management: Waste Act (NEMWA) (No. 58 of 2008), is implementing the 'Waste Management Hierarchy', which is depicted in *Figure 8.1* below.

*Figure 8.1 Waste Management Hierarchy*




Source: NWMS, 2011.

The waste management hierarchy consists of options for waste management during the lifecycle of waste, arranged in descending order of priority. The foundation of this hierarchy and the first choice of measures in the management of waste are waste avoidance and reduction. In this regard, waste that cannot be avoided should be recovered, reused, recycled and treated (with recovery, re-use and recycling being preferred management options to the treatment of waste). Furthermore, waste should only be disposed of as a last resort.

The NEMWA and the NWMS also place an emphasis on Industry Waste Management Plans (WMPs), which are the central element in this co-regulatory system. These WMPs are expected to report on, amongst other things, how the site is going to manage its waste and to provide targets for achieving waste hierarchy issues, particularly with regard to waste reduction and recycling. As such, it is essential to introduce the principles of clean technology and the waste hierarchy during the design phase of the project.

*Table 8.1* below details the types of waste generated by the Project and provides some preferred management options that speak to the waste hierarchy concept as described above. Further application of the Waste Hierarchy is given in *Section 8.5.2* below, whereby specific recommendations to minimise, reduce, recycle and re-use certain types of waste generated by the Project are listed. These recommendations will inform the Waste Management Plan (WMP) developed as part of this process (refer to Annex D)

## *8.3 WASTE GENERATION AND CLASSIFICATION*

The Project will generate two primary waste streams, which can be categorised as *mineral* and *non-mineral* wastes.

*Mineral Wastes*

Mineral wastes that will be generated by Project activities will include waste rock (predominantly comprised of amphibole, quartz-muscovite-schist, silicified and spongy gossan, and white quartzite) and a waste stream generated from ore processing (tailings).

*Non-mineral Wastes*

Non-mineral wastes (domestic, non-hazardous and hazardous) are generated during construction works and mine operations, particularly at maintenance workshops, administrative offices, processing plants and staff housing facilities. Specific types of that will be generated as a result of the Project are listed in *Table 8.1* below.

In addition to listing the types of wastes generated, *Table 8.1* also provides 'preferred' and 'alternative' management options for each waste stream identified.

*Table 8.1 Types of Non-mineral Wastes that will be Generated by the Project and Possible Management Options*

| Unit / Source | Description | Waste Type/Composition | Preferred Management Option(s) | Alternative Management Option(s) |
|---|---|---|---|---|
| ***1.Construction Phase*** | | | | |
| Construction Wastes | Metal Scrap | Steel, wood, rubber & plastic & tyre scrap<br>Electrical cable scrap. | Recycle/Recover. | Dispose to General Waste Landfill. |
| | Building Rubble | Cement Bags, bricks, cut-offs, hardened cement etc. | Recycle, reuse, if possible. | Dispose to General Waste Landfill. |
| | Paint | Waste Paint, "Empty" Containers. | Recycle to "Collect-a-Can". | Dry out/Solidify and Dispose to General Waste Landfill. |
| | Fuels | Spillage, Contaminated Soil. | See Sections 6 and Below | |
| | Lubricating Oil and Grease | Used oil and grease, oil filters, oily rags, etc. | | |
| | Sewage Treatment | Activated Sludge. | | |
| | Health care risk waste | Used bandages, plasters, syringes, Sanitary Towels, and Pads etc. | | |
| | Hazardous Packaging: | Drums, Plastic and Paper Bags, "Empty" Containers of Cleaning Agents. | | |
| | Batteries | Vehicle Batteries.<br>Batteries from electrical equipment, eg cell phones, torches. | | |
| ***2. Mining*** | | | | |
| Waste Rock | Residue Rock, Soil, etc. | Natural material from the mining area. | Dispose to Rock Dump in accordance to Requirements. | Use to back fill open pit workings, if permitted. |
| Drilling Oils | Soluble petroleum oils | Soluble oil can be considered potentially hazardous if it enters the ground and surface water. | Temporary storage on-site followed by disposal at Vissershok, Cape Town. | Dispose any residual Oil and packaging to an HH Landfill. |
| Explosives | Ammonium Nitrate Fuel Oil (ANFO) | Classed as SANS 10228/GHS 10234 Class 1 Waste, Explosive, when not de-sensitized. | The spilled over explosives would be collected and used in the void bore hole (stemming) just above the ANFO fill. | Small amounts can be treated with water and disposed to hazardous waste landfill. |
| Crusher Dusts | Rock dusts | Spillage, Dust from extractors. | Process in flotation plant if possible. | Dispose to Tailings Dam. |
| Petroleum Wastes | Diesel, Petrol | Spillage, Contaminated Soil. | See Section Below | |

| Unit / Source | Description | Waste Type/Composition | Preferred Management Option(s) | Alternative Management Option(s) |
|---|---|---|---|---|
| Oil and Grease | Vehicle lubricants | Used oil, oil filters, oily rags, empty oil cans, etc. | | |
| ***3. Processing – Flotation Plant*** | | | | |
| *Carbon Flotation:* | | | | |
| Depressants | 1. Zinc Sulphate<br>2. Calcium Cyanide | Solid Residues and dissolved Zn and Cyanide. | The spillage will be transferred to PCD. Liquid will be recycled suitably and the solid part will be taken back into the circuit. | |
| Frothers | Anionic or non-ionic Detergents | Waste material, spillages, empty containers and tailings. | The spillage will be transferred to PCD. Liquid will be recycled suitably and the solid part will be taken back into the circuit. | See text. |
| *Lead Flotation* | | | | |
| Frother | Anionic or non-ionic Detergents | Waste material, spillages, empty containers and tailings. | The spillage will be transferred to PCD. Liquid will be recycled suitably and the solid part will be taken back into the circuit | See text. |
| Collector | Sodium ethyl xanthate | Waste material, spillages, empty containers and tailings. | The spillage will be transferred to PCD. Liquid will be recycled suitably and the solid part will be taken back into the circuit. | See text. |

| Unit / Source | Description | Waste Type/Composition | Preferred Management Option(s) | Alternative Management Option(s) |
|---|---|---|---|---|
| *Zinc Flotation and Zinc Concentrate Flotation* | | | | |
| Activator | Copper sulphate | Waste material, spillages, empty containers and tailings. | The spillage will be transferred to PCD. Liquid will be recycled suitably and the solid part will be taken back into the circuit. | See text. |
| pH Modifier - lime | Calcium oxide/hydroxide | Waste Lime, spillages, empty bags, etc. | Utilise to raise pH of tailings before discharge to dam. | High pH wastes, pH>12, should not be disposed to landfill. Can be used to neutralise acid wastes at an HH landfill. |
| Collector | Sodium ethyl xanthate | Waste material, spillages, empty containers and tailings. | Oxidise xanthate using hydrogen peroxide: Effluent to tailings dam and solid residues to HH Landfill. | |
| *Ore (in Open) and Concentrate (under Cover) Stockpile Pads* | | | | |
| Spillage and Sweepings?? | | The ore and concentrate both contain heavy metals and sulphides: spillages, sweepings, etc. | Recover values or dispose to Tailings Dam. | |
| **4. Flotation Plant - Other** | | | | |
| Chemicals | Redundant Chemicals, Reject Products, | Various – see above. | Recycle, if possible. | Dispose to Hazardous Waste Landfill, if permitted. |
| Laboratory | Laboratory Waste | Waste Samples.<br>Waste or redundant chemicals. | Dispose to HH Landfill. | See text. |
| **5. Maintenance including Vehicle Wash Bay** | | | | |
| Effluent Treatment System | Oily Sludge | Oily waste from Workshops, Maintenance Yard, Sludge from Vehicle Wash Bay. | Oil recovery – ROSE foundation. | Treatment/Disposal to Hazardous Waste |

| Unit / Source | Description | Waste Type/Composition | Preferred Management Option(s) | Alternative Management Option(s) |
|---|---|---|---|---|
| | | | Waste to Energy:<br>1) Cement Kiln; or<br>2) Dedicated On-Site Facility. | Landfill, if permitted. |
| | Oily Wastes | "Empty" oil cans, oily rags. | Oily Cans to Recycling, Oily Rags to Landfill, if permitted or alternatively to Vissershok. | |
| | Scrap Tyres and rubber waste | Scrap tyres from cars, trucks plus conveyer belt waste. | Utilise/Recover to manufacture rubber product.<br>Waste to Energy:<br>1) Cement Kiln; or<br>2) Dedicated On-Site Facility. | Landfill of tyres whole or quartered may be prohibited: see text. |
| Fuel Storage | Diesel, petrol | Spillage, Contaminated Soil. | Bio-remediate in-situ or Compost. | Dispose to HH Landfill, if permitted. |
| **6. Tailings Dam** | | | | |
| Tailings | Residues from flotation process. | Contains heavy metals, iron, cadmium, zinc, lead, copper, manganese, etc. plus high amount of sulphur as the sulphide. Classed as significant environmental risk. | Dispose to tailings Dam, ensure pH of 8 to 9 to minimise possibility of acid mine drainage. | |
| ***7. Effluent Treatment System*** | | | | |
| | Bio Sludge | Activated Sludge. | Agricultural Use. Compost. | Treatment/Disposal to Landfill, if permitted. |
| | Water Treatment Sludge | Mainly Inorganic Solids. | Could be used in the manufacture of clay bricks. | Treatment/Disposal to HH Landfill, if permitted. |
| ***7. Plant and Office Buildings*** | | | | |
| | Office waste | Non-hazardous Paper, packaging waste, plastics. | Recycle where possible. | Treatment/Disposal of Residues to General |

| Unit / Source | Description | Waste Type/Composition | Preferred Management Option(s) | Alternative Management Option(s) |
|---|---|---|---|---|
| | | | | Waste Landfill. |
| | Garden waste | Green waste from gardens. | Compost. | Excess and non-compostable material, dispose to General Waste Landfill. |
| | Empty Metal Containers | Soft drink cans, paint cans, empty oil cans, etc. | Recycle to Collect-a-Can. | Dispose to licensed to General Waste Landfill, if permitted. |
| | Batteries | 1) Lead-acid Batteries from Vehicles.<br>2) Dry Batteries, eg from cell phones, torches and other equipment. | 1) Lead-Acid Batteries recycle.<br>2) Dry Batteries recycle if possible. | Treatment/Disposal of Residues to Landfill, if permitted: see text. |
| | Waste Electric and Electronic Equipment (WEEE) | 1) Lamps.<br>2) Other, eg computers, Cell Phones. | Recycle through licensed WEEE management company. | Incinerate. |
| | Cleaning Materials | Hazardous Packaging: Drums, Plastic and Paper Bags, "Empty" Containers of Cleaning Agents, Aerosols, Pesticides, etc. | Clean and recycle if possible. Use principles of the Responsible Packaging Management Association of South Africa (www.rpmasa.org.za ). | Dispose to Licensed General or Hazardous Waste Landfill. |

## 8.4 ASSESSMENT OF POTENTIAL ENVIRONMENTAL IMPACTS

*Table 8.2* below provides an assessment of the impacts associated with the handling, storage and disposal of the different waste types identified above.

From this table, it is evident that there are a number of potentially significant risks (particularly related to human health, air quality, pests and fire) that may be associated with the handling, storage and disposal of waste, both on- and off-site. Furthermore, it illustrates how the use of innovative technology/designs can create instances where the management of a particular waste stream can result in a positive impact (eg recycling initiatives that create new job opportunities and composting which provides additional nutrients for the soil).

*Section 8.5* provides some important management approaches/activities to the mitigation of the environmental and health risks identified in this section. Furthermore, a number of best practice management options are provided for consideration. This specifically relates to the use of cleaner design and production options that relates to an improvement in a company's environmental efficiency and the subsequent improvement of their financial bottom line

As discussed before, these waste management measures/recommendations have been incorporated into Waste Management Plans (WMPs) developed for the construction, operation and decommissioning phases of the Project (refer to *Annex D*). These WMPs will then inform management procedures to ensure environmentally friendly and safe collection, transport, handling, storage and disposal of waste generated at the Project site.

*Table 8.2* ***Waste Management Impacts that May Occur During Construction, Operation and Decommissioning***

| Activity | Nature of Impact/Aspect | Intensity Potential | Extent | Duration | Probability | Impact significance |
|---|---|---|---|---|---|---|
| Collection of general non-hazardous waste. | Air - diesel/petrol fumes. | Low (-) | Local | Long Term | Likely | Moderate |
| Handling and storage of builders rubble, soil, etc. | Air – dust. | Low (-) | Local | Long Term | Likely | Moderate |
| Re-use of builders rubble. | Positive impact – reduction of waste to landfill. In line with government waste minimization policies.<br>Decrease in use of resources. | Low (+) | Local | Long Term | Likely | Minor |
| Handling and Storage of general waste, including office waste, garden waste and recyclable wastes including paper, tins, glass and plastics at Salvage Yard. | Possible contamination due to bulking at salvage yard.<br>Wind-blown litter | Low (-) | Site | Long Term | Likely | Minor |
| Recycling or re-use of packaging material and other recyclables. | Positive impact – reduction of waste to landfill. In line with government waste minimization policies.<br>Protection of a natural resource. | Low (+) | Site | Long Term | Likely | Minor |
| Handling and storage of scrap tyres and rubber waste. | Storage - fire hazard.<br>Storage – provide receptacles for the collection of rain water which stagnates. Provides receptacle for living and breeding of vermin. | Low (-) | Site | Long Term | Likely | Minor |
| Disposal to landfill of scrap tyres and rubber waste. | Difficulty in handling on landfill – non compactable, fire hazard, vermin breeding receptacles, damage to landfill equipment and do not remain buried. | Low (-) | Site | Long Term | Likely | Minor |

| Activity | Nature of Impact/Aspect | Intensity Potential | Extent | Duration | Probability | Impact significance |
|---|---|---|---|---|---|---|
| Utilisation of scrap tyres and rubber waste in a cement kiln or on site facility. | Positive Impact – energy recovery, decrease in use of natural resources, and reduction in amounts of solid waste disposed to landfill. | Low (+) | Site | Long Term | Likely | Minor |
| Recycling or re-use of scrap tyres and rubber waste. | Positive impact – reduction of waste to landfill/incineration. In line with government waste minimization policies. Decrease in use of resources. | Low (+) | Site | Long Term | Likely | Minor |
| Disposal to landfill of general waste. | Reduction in landfill airspace. | Low (-) | Site | Long Term | Likely | Minor |
| Disposal to landfill of general waste, including office waste, greens/garden waste and paper, tins, glass and plastic waste, scrap tyres and rubber waste. | Wind-blown litter. Production of leachate. | Low (-) | Site | Long Term | Likely | Minor |
| Composting of vegetation from site. | Positive – reduction of waste to landfill. In line with government waste reduction policies. Addition of nutrients to soil. | Moderate-Low (+) | Site | Long Term | Likely | Minor |
| Re-use of clean storm water run-off. | Positive impact – in line with government waste minimization policies. Protection of a scarce natural resource. | Moderate-Low (+) | Site | Long Term | Likely | Minor |

## *8.5 WASTE MANAGEMENT*

### *8.5.1 Hazardous and Non-hazardous Solid Waste Disposal*

Disposal is viewed as the last option in the management of waste and should only be undertaken if the avoidance, re-use or recycling of the waste in question is not practical. In such instances, only transport operators or companies that are licensed (by the competent authorities) shall be contracted to remove waste from the Project site. General waste which cannot be either re-used or recycled; shall be sent to a licensed landfill that may accept that category of waste. There are no licensed hazardous waste management facilities in Northern Cape Province. As such, all hazardous wastes shall be transported to EnviroServ's Vissershok HH Waste Management Facility Landfill in Cape Town. Removal of waste materials at end of mine will be handled as part of the mine rehabilitation closure plan.

### *8.5.2 Cleaner Production and Design*

Cleaner Production and design are possible mechanisms, which could be used to enhance the Projects efficiency particularly during the beneficiation of ores. This would assist any company in attaining an improved environmental efficiency and subsequent improved financial bottom line. The long-term objective for waste prevention, minimisation and recycling is to ensure that minimisation and recycling procedures and practices are adopted by all sectors of society as part of a broader initiative focusing on cleaner production. This includes measures to:

- Harness renewable materials and energy sources or reduce the use of natural resources by using them more efficiently and productively.
- Reduce or eliminate pollution and toxic wastes.
- Deliver equal or superior performance compared with conventional offerings.
- Provide investors, companies, and customers with the promise of increased returns, reduced costs, and lower prices.
- Create quality jobs in management, production, and deployment.

Clearly, for a project of this size and nature, the proponent has the opportunity to select the technologies for each part of the process that that would be more efficient, thereby minimising waste production.

### *8.5.3 Waste Management Infrastructure*

Certain waste management infrastructure will be required in order for waste to be appropriately managed throughout the lifecycle of the Project. Specific infrastructure and facilities that are applicable to the Project are detailed in

*Table 8.3* below. The waste storage facilities required for the Project will be housed within the confines of the Concentrator Plant (see *Annex H* for facility illustrations).

***Table 8.3 Potential Waste Management Infrastructure/Facilities Required***

| Waste Infrastructure/ Facilities | Description |
|---|---|
| Chemical and Waste Storage Facilities. | Storage facilities will be necessary for hazardous chemicals and any hazardous wastes used and generated during the construction, operation and decommissioning phases of the Project. Note that storage facilities will require either a basic assessment or possibly a full EIA assessment, although these can be included in the final authorisation for the whole facility: (Draft NEMWA Amendment, Government Gazette 33880, 14th December 2010).<br><br>Specific requirements that must be considered when designing such facilities include:<br><br>• They must be built in accordance with requirements from the Department of Environmental Affairs and will include linings, bunds, roofing (except for large stockpiles such as ore, rock and tailings).<br>• A hazardous chemical and waste storage facility should include a low permeability surface, preferably concrete, that is protected from the ingress of storm water from surrounding areas to ensure that accidental spillage does not pollute local soil or water resources.<br>• All storage areas must also be properly demarcated and, if the material is hazardous, there should be adequate labelling and security at the facility.<br>• A facility must provide for separate storage of incompatible chemicals or wastes (ie acids and bases; calcium cyanide and acid) and for flammable materials.<br>• The migration of spillage into the ground and groundwater regime around storage areas must be prevented. This is particularly important for temporary storage areas that may be required during construction.<br>• Flammable materials must be kept separate from other hazardous materials and be well ventilated in order to prevent build-up of explosive vapours and gases. |
| Licensed General Waste Site. | Note that there are two authorised (ECA permitted) general waste sites (GCB- Landfill) at the BBM site with sufficient capacity to accommodate the general waste generated by the Project. Should these facilities require expansion in future, the appropriate NEM:WA permits will be obtained. |
| A Disposal Facility for Uncontaminated Construction Waste. | Uncontaminated construction waste (Inert waste or very low risk waste) can be disposed of at a Class D site. Alternatively, the material could be used to landscape the Project area to ensure the correct run-off of rainfall from clean areas and its diversion from potentially contaminated areas to a holding dam. In addition, construction waste could be used as cover material in the General Waste Site or be crushed and used as backfill or building bunds, etc. |

| Waste Infrastructure/ Facilities | Description |
|---|---|
| Water Containment Dam(s). | Dams for storage of potentially contaminated water prior to analysis and discharge to water course; to the activated sludge water treatment facility or oxidation pond; or used as process water will be required. As indicated in the text the Facility will utilise significant amounts of water which will be stored in pollution control dams and reused in processing. |
| Activated Sludge Treatment Plant or Oxidation Ponds. | An activated sludge plant or oxidation pond for treatment of sewage, contaminated storm water and, possibly, selected plant effluents will be required. |
| Storage Areas for General Waste and a Central Recycling and/or Reclamation Yard. | Storage Areas for General Waste and a Central Recycling and/or Reclamation will be necessary. A Central Recycling area would recycle and recover general waste materials and possibly collect and store selected generic hazardous wastes such as used oil, fluorescent tubes, batteries and electronic wastes for bulking and final collection for recycling or possibly disposal. |
| Lubricating oils from workshops and other areas. | Lubricating oils from workshops and any other areas can be stored on-site and the waste collected for recycling by a company approved by the ROSE (Recycling Oil Saves the Environment) Programme. Up to 80% of South Africa's recoverable oil is already collected by this country wide programme. An area at the central recycling/reclamation yard would be required for storage. |
| On-site health care risk waste. | As the amount of health care risk waste, including sanitary waste generated at the proposed Facility, is expected to be very low, it is recommended that the licensed removal service be used to collect and remove this waste from the site. |
| Treatment Area for Potentially Contaminated Soil. | A Treatment Area for Potentially Contaminated Soil should be made available. Soil that is inadvertently contaminated with petroleum hydrocarbons, eg lubricating oil, can be treated by biodegradation technologies to a standard that would be acceptable for using as a fill, as landfill cover or even to bulk compost. A central facility is normally preferable to using in-situ technologies where less control can be maintained over the processing. Bioremediation of contaminated soil will be undertaken at the BMM facility unless quantities exceed the carrying capacity of the site, in which case, this soil will be transported to HH facility. |

### *8.5.4 Implementing the Waste Hierarchy*

*Methods to Minimise Waste Production*

- Specifications of construction material quantities for contractors are to be as accurate as possible to avoid the over-ordering of materials and the potential for excess waste.

- The ordering of stock during the operation of the mine will be regularly reviewed to ensure efficient stock control and to avoid wastage.

- The use of degreasers is regulated in workshop areas to ensure the efficiency of the oil-water separator.

- All waste areas are to be clearly identified and marked as waste storage areas. This includes bins and other receptacles for domestic waste, which would be marked according to the type of waste being accepted (eg scrap metal, oil filters and oily rages, other recyclables, general waste, etc.).

- Clear written instructions are to be erected at appropriate locations detailing recycling and waste separation information. There shall be no long term storage of any waste materials on the Project site.

*Recycling*

- Facilities should be provided for recycling paper and cardboard.

- Used metals should be stored for reuse or recycled as scrap metal and placed into large skip bins, which shall be collected by a metal recycler as sufficient quantities are available.

- Waste Oil should be collected within bunded fuel storage, refueling and maintenance areas and stored within waste oil bins once it has passed through an oil-water separator. The waste oil shall be removed from site by a licensed waste oil contractor for recycling.

- Batteries are removed from site for delivery to a facility able to despatch them to an appropriate recycling facility.

- The Environment Control Officer shall undertake regular inspections of waste storage locations to check that appropriate separation and collection of waste is being undertaken.

- BMM will maintain a register of recycled material at the Mine site.

*Reuse*

- Opportunities for the re-use of materials on site should be evaluated on a regular basis. Investigations shall be undertaken for the use of effluent from the site office, bathhouse and other amenities once treated to be re-used as irrigation water on rehabilitation and landscaped areas in accordance with relevant standards.

### *8.5.5 Other Recommendations*

*Training and Awareness*

- Waste management requirements are incorporated into existing induction and awareness training systems.

- Additional waste specific communication will be included in Tool Box Talks and rolled out across the site on an as required basis.

- The site requirements for waste management are displayed at prominent positions across the mine in the form of charts outlining the correct disposal methods for the different waste streams.

*Waste Inventory*

- A comprehensive waste inventory containing information on all wastes generated, handled and disposed of, whether on or offsite is maintained by the Environment and Community Officer. The waste inventory is a database that focuses on the procedures for safe storage, handling, treatment, recycling and disposal of non-mineral wastes. This inventory will be further developed and updated over the first year of mine operation.

*Monitoring*

- Waste handling and storage facilities shall be managed by operational staff within each department. Waste quantities, including hazardous materials (eg waste oil/grease), are monitored accordingly by operational staff and collection schedules are arranged as required.

*Facility Inspections and Audits*

- Onsite waste storage, treatment and disposal facilities are inspected on a regular monthly basis to ensure compliance with procedures. These facility inspections are incorporated into existing workplace inspections and carried out by the relevant area personnel.

*Emergency Response*

A suitable emergency response procedure must be in place (eg provision of appropriate absorbents) for the clean-up of any accidental spills. Note that spilled materials are classified as wastes.

With respect to this, the following should be noted:

- Nearly all processes in the ore beneficiation plant require the use of reagent chemicals, many of which are hazardous;

- Separation of incompatible materials (so that they cannot come into contact with one another) is essential (eg alkali and acid materials). The following standard is available - SANS 310-1:2007, Storage Tank Facilities for Hazardous Chemicals P1, Above Ground facilities for Non-flammable Substances; and

- SABS approved tanks should be utilised in all cases. These tanks should have installation certificates, as well as annual certificates when they are inspected.

*Complaints*

- Any complaints as to the management regarding waste generated at the site will be directed to the relevant Department Manager and the Environment Control Officer for investigation and rectification.

Complaints and actions arising from a complaint will be recorded in a complaints register to be maintained by the Environment Control Officer.

## *8.6 CONCLUSION*

From an environmental point of view, the Project could pose a significant risk to human health and the environment, if the wastes are not managed in an environmentally sustainable manner. Some key risks identified in terms of this Section include:

- Incorrect storage of hazardous waste could result in contamination of air, soil and water resources.
- Disposal of hazardous waste to landfill will result in a reduction in landfill airspace, the production of leachate and reduction in quality of leachate.
- Emissions from incinerator are likely to impact on air quality.
- Health risks associated with personnel exposure to hazardous, infectious and/or toxic wastes.

Although significant risks have been identified, these are generally associated with poor management practices and the absence of mitigation measures to reduce the chance of such impacts occurring. As such, should the prescribed mitigation measures, identified in the previous Section, be suitably implemented, the residual risk that waste streams generated at the Site would pose to the environment and human health should be dramatically reduced or avoided altogether. In addition to this, should BMM decide to employ/implement some of the innovative design/technologies presented in this Section (ie clean technologies, energy recovery measures, recycling practices etc), it is possible that a number of a positive impacts could stem from the Project.