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FIRST GENERATION INTEGRATED HAZARDOUS WASTE MANAGEMENT PLAN FOR GAUTENG (GHWMP) - G/DACE 07/2006

SITUATIONAL ANALYSIS AND BASELINE ASSESSMENT REPORT

03 DECEMBER 2007

DOCUMENT CONTROL SHEET

DOCUMENT: DEVELOPMENT OF A FIRST GENERATION INTEGRATED HAZARDOUS WASTE MANAGEMENT PLAN FOR THE GAUTENG PROVINCE (GHWMP): PHASE 3 & 4– SITUATIONAL ANALYSIS AND NEEDS ASSESSMENT/STATUS QUO REPORT

EXECUTIVE SUMMARY

The Gauteng Department of Agriculture, Conservation and Environment (GDACE) has embarked on a project which aims to develop and implement an integrated hazardous waste management plan for the province. In February 2007, GDACE appointed consultants Felehetsa Environmental, in association with Ozone Business Consulting, to prepare this First Generation Integrated Hazardous Waste Management Plan for Gauteng.

The intention of this project was to include all the major stages of the environmental planning process, namely a review of the existing baseline situation and legal environment, projection of future requirements, setting objectives, identifying systems components, identifying and evaluating alternative methods and approaches for meeting requirements and developing and implementing an integrated waste management plan. It was important for this project that all the elements of the waste management hierarchy were considered from integrated waste management planning, waste information systems, waste minimisation, waste recycling, waste collection and transport, waste treatment and through to waste disposal.

In February 2007 the consultants first report was submitted, the Inception Report, which outlined the basis of the project and the project plan.

In August 2007 the Literature Review Report was prepared which comprised a literature survey and a legal scan.

These earlier reports are referenced in this Status Quo Report and relied upon, but are not repeated *holus bolus* in this report, for the sake of brevity.

The results of the detailed interviews and market research are presented in market sectors in this report, as well as the analysis, gaps and recommendations, as was the requirement of the Department.

The total recurring and non-recurring hazardous waste generated in Gauteng is estimated at 446 200 tons per annum (tpa). Of these quantities, an estimated total of 102 580 tpa are from non-recurring waste streams which are generated as result of spillages and clean-up operations. Poisonous and toxic substances (Class 6), other substances (Class 9), flammable liquids (Class 3) and oxidising substances (Class 8)

collectively account for 95% of the hazardous waste streams generated. Only five sectors, namely, metallurgical, chemicals, pulp and paper, mining and manufacturing – other collectively account for 93% of the hazardous waste volumes generated. Four sectors, namely, commercial, food and beverage, chemical, manufacturing – other are the largest contributors of non-recurring waste.

Three sectors collectively contribute approximately 88% of total volumes of flammable liquids generated. The chemical sector is the biggest generator of identified volumes of flammable liquids at more than two-thirds (69%) of total. The metallurgical sector follows next with 12% and the manufacturing – other is the third biggest generator at 7%. A further three more sectors collectively contribute more than two thirds (approximately 68%) of total volumes of flammable solids generated. The non-metallic minerals sector leads with approximately 28% of the volumes generated, followed by the leather sector at 23% and plastics sector at 16%.

Four sectors collectively contribute approximately 96% of total volumes of poisonous, toxic and infectious substances generated. The metallurgical sector alone contributes about 65% of volumes generated, followed by the chemical sector with approximately 15% of volumes generated. The chemical sector is followed closely by the manufacturing - other sector with approximately 12% of the volumes generated and the commercial sector at approximately 5%.

Estimated total volumes of corrosive substances generated are dominated by only three sectors that collectively contribute approximately 96% of total volumes generated. The metallurgical sector is the largest generator at more than half (approximately 56%) of the volumes generated, followed by manufacturing – other at approximately 20%. The chemicals sector generates approximately 10%.

Estimated total volumes of other substances generated are dominated by only three sectors. These sectors collectively contribute approximately 94% of total volumes generated. The pulp and paper sector is the largest generator at more than half (approximately 52%) of the volumes generated, followed by the chemical sector at approximately 36% and the mining sector at 7%.

The only on-site (at the waste generators' premises) pre-treatment of hazardous waste streams identified in this investigation is chemical pre-treatment such as lime neutralisation. It should be noted that the waste streams that do not get pre-treated at

the generator's premises are usually pre-treated by ash blending at the landfill site before disposal.

Some operations like Scaw Metals in the metallurgical sector and Sappi in the pulp and paper sector have their own landfill sites. Waste volumes dumped by these operations on their own landfills have been excluded from the total volumes . Most of the waste streams produced by the generators are disposed of at landfill. Incineration is used almost exclusively by the pharmaceutical sector. There is a chronic shortage of off-site hazardous waste treatment facilities in the province. The end-result is that most of the hazardous waste produced by generators goes to landfill sites. Had there been treatment options available to the generators, some of the waste streams could be diverted to treatment facilities. This will result in relatively less volumes going to landfill.

With the Polokwane Declaration's focus to move progressively away from landfill more specialised treatment and recycling facilities are needed. The current regulatory process required for piloting and full scale facilities is perceived to be hampering development of such facilities because it takes too long. The government should also consider playing a coordinating role in order to eastablish and encourage waste exchange. Leaving this to industry is doomed to fail as industry associations operate mainly within their respective sectoral silos.

Waste solvent (approximately more than 1000 tons per annum), paint, oil (approximately more than 9000 tons per annum), grease are the most common waste streams that get recycled. Waste hydrochloric acid (approximately 17 000 tons per annum) in particular is also regenerated. Other commonly recycled waste streams are batteries, waste polymers and waste rubbers. In the paints and coatings sub-sector, most of the waste streams (particularly redundant paints and waste solvents) are recycled. There are also instances where some of the waste streams like empty containers and waste solvents are taken to recycling operations by the waste management services providers. This makes it difficult to account for volumes recycled since the generators record these waste stream volumes as being disposed of at landfill.

The portfolio of waste streams generated by industry is too diverse for all industries to be able to come together on their own and form a body (like the ROSE Foundation for used oil) outside of government initiatives.

There are instances where hazardous waste gets mixed up with general waste at the generator's premises. Fluorescent tubes in particular, are sometimes mixed with general waste. This could be attributed to lack of capacity to provide the necessary containers for this hazardous waste in particular. The generators are generally not well versed with the classification of hazardous waste. For instance some generators regard fluorescent tubes as low hazard waste while others regard them as high hazard waste. Also there are inconsistencies in the allocation of various waste streams to their respective classes.

Hazardous waste is likely to increase due to economic growth even with the implementation of waste minimisation activities. Therefore the current airspace usage of existing landfills is bound to increase resulting in reduced lifespan of the existing facilities. It is therefore imperative that processes that include waste minimisation or that lead to the erection of commercially viable incinerators and waste destruction and treatment facilities in particular are expedited. This should go hand in hand with facilitating and coordinating recycling and waste exchange ventures.

ACKNOWLEDGEMENTS

DEVELOPMENT OF A FIRST GENERATION INTEGRATED HAZARDOUS WASTE MANAGEMENT PLAN FOR THE GAUTENG PROVINCE (GHWMP)".

The Project Management Team responsible for this project consists of the following persons:

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Mr Lehlohonolo Michael Lesemane	Gauteng Department of Agriculture, Conservation and Environment
Mrs Babsi Solomon	Gauteng Department of Agriculture, Conservation and Environment
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LIST OF ACRONYMS

GHWMP	Development of a First Generation Integrated Hazardous Waste Management Plan for the Gauteng Province
GDACE	Gauteng Department of Agriculture, Conservation and Environment
DEAT	Department of Environmental Affairs and Tourism
DWAF	Department of Water Affairs and Forestry
ECA	Environment Conservation Act 73 of 1989
IWMS	Integrated Waste Management Strategy
NEMA	National Environmental Management Act 107 of 1998
NWMS	National Waste Management Strategy
WIS	Waste Information System
SoE	State of the Environment
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
HCW	Healthcare Waste
HCRW	Healthcare Risk Waste
IP&WM	Integrated Pollution & Waste Management
IWM	Integrated Waste Management
IWMP	Integrated Waste Management Plan

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CHAPTER 1: INTRODUCTION

The Gauteng Department of Agriculture, Conservation and Environment (GDACE) has embarked on a project which aims to develop and implement an integrated hazardous waste management plan for the province. In February 2007, GDACE appointed specialist consultants Felehetsa Environmental, in association with Ozone Business Consulting, to prepare this First Generation Integrated Hazardous Waste Management Plan for Gauteng.

1.1 Terms of Reference

The intention of this project was to include all the major stages of the environmental planning process, namely a review of the existing baseline situation and legal environment, projection of future requirements, setting objectives, identifying systems components, identifying and evaluating alternative methods and approaches for meeting requirements and developing and implementing an integrated waste management plan. It was important for this project that all the elements of the waste management hierarchy were considered from integrated waste management planning, waste information systems, waste minimisation, waste recycling, waste collection and transport, waste treatment and through to waste disposal.

In February 2007 the consultants first report was submitted, the Inception Report, which outlined the basis of the project and presented how the consulting team planned to proceed.

In August 2007 the Literature Review Report was drafted, which comprised

- a literature survey and
- a legal scan.

The purpose of the literature review that was conducted was for GDACE to be able to consider current initiatives and strategies in hazardous waste management nationally and internationally. This would then enable GDACE to establish the success of these initiatives in countries with similar socio-economic conditions as Gauteng Province. In addition, the aim of the literature review was to identify initiatives for replication in Gauteng Province if possible, after considering past experience in waste minimisation

and associated targets, cleaner technology and waste stream prioritisation. The literature review would also inform further phases of the First Generation Integrated Waste Management Plan for the Gauteng Province.

As an introduction to this phase of situational analysis and needs assessment/ status quo, the findings and the recommendations from the literature review were considered before the recommendations on the way forward were made. It is not the intention of this report to repeat what has already been mentioned in the Literature Review. However, reference should be made to the Literature Review report.

1.2 Introduction & Background

In order to improve hazardous waste management planning within South Africa, the National Waste Management Strategy (NWMS), which aims to give practical effect to the White Paper on Integrated Pollution and Waste Management (IP&WM), identified a number of priority initiatives. Action Plans for the implementation of the short-term high priority strategic initiatives, including integrated waste management planning, were developed in 1999 and represents the optimum approach to the implementation of integrated waste management planning in terms of resource allocation, time schedule and responsibilities.

Paragraph 5.2.3 of the White Paper on IP&WM sets as one of its primary goals the development of mechanisms to ensure that integrated pollution and waste management considerations are effectively integrated into the development of *inter alia* all spatial and economic development planning processes. The Provincial Environmental Department must, according to the guidelines, develop a hazardous waste management plan.

The objective of Government is to move away from fragmented and uncoordinated waste management to integrated waste management (IWM). Such a holistic and integrated approach extends over the entire waste cycle, from cradle to grave, covering the avoidance, reduction, generation, collection, transport, recovery, recycling, reuse, treatment and final disposal of waste, with an emphasis on waste avoidance and minimisation.

Gauteng, as the Province with the greatest industrial and population density, inherently generates the greatest amount of waste, including hazardous waste, and consequently

has a significant need to develop, and apply, an appropriate IWM plan that will ensure that waste is recognised as a serious problem and is managed in an effective and integrated manner to preserve human health and the environment, both presently and for the generations to come

The hazardous waste management planning process incorporates all the major stages of the environmental planning process, namely a review of the existing baseline situation and legal environment, projections of future requirements; setting objectives; identifying system components; and developing and implementing a hazardous waste management plan. It is important that any plan, once implemented, is evaluated and reviewed to ensure that the respective objectives are being met.

For this GHWMP to be developed and implemented, the Department first has to conduct a situational analysis and needs assessment in order to establish the status quo with regard to hazardous waste generation and management in the province. This analysis will also address the problems and key issues relevant to hazardous waste generation and management in Gauteng.

Felehetsa Environmental (Pty) Ltd in association with Ozone Business Consulting (Pty) Ltd has been appointed to develop and submit a First Generation Integrated Hazardous Waste Management Plan for the Gauteng Province, focusing on the management of hazardous industrial waste for the Gauteng area. The scope of this project specifically excludes infectious and other hazardous waste from health care institutions and sewage.

1.3 Scope of work for the overall project

The intention of this project is to include all the major stages of the environmental planning process, namely a review of the existing baseline situation and legal environment, projection of future requirements, setting objectives, identifying systems components, identifying and evaluating alternative methods/ approaches for meeting requirements and developing and implementing an integrated waste management plan. It is important for this project that all the elements of the waste management hierarchy be considered (i.e. integrated waste management planning, waste information systems, waste minimisation, waste recycling, waste collection and transport, waste treatment and waste disposal).

Thus, Integrated Waste Management (IWM) hierarchy involves the following, in order of preference:

- Waste Avoidance;
- Waste Recycling, Re-use, Utilisation;
- Waste Treatment; and
- Waste Disposal.

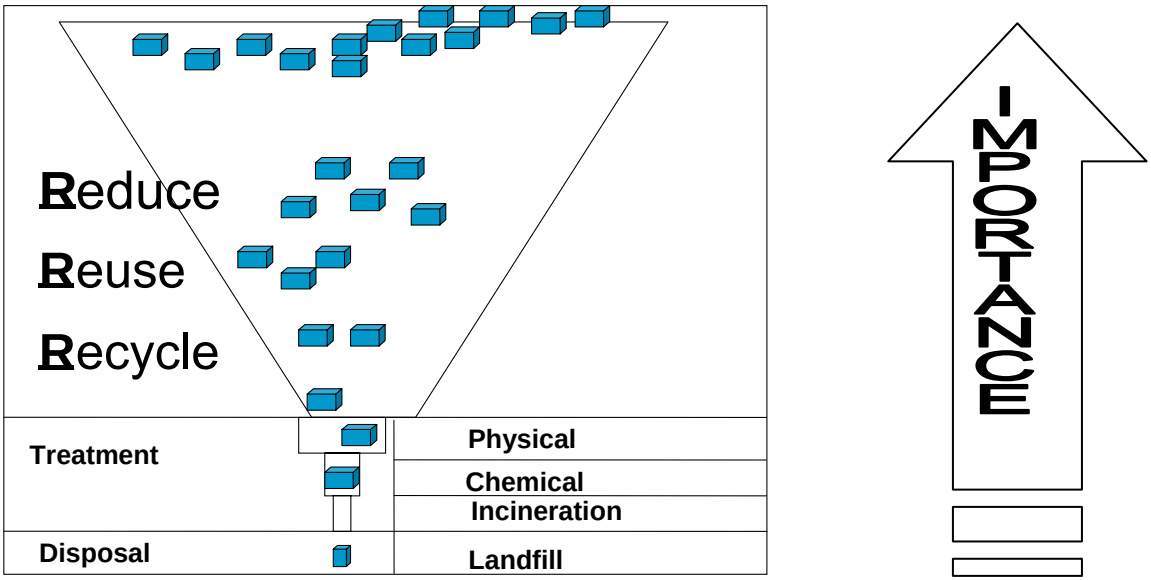

Figure 1.3: The Integrated Waste Management Hierarchy

IWM maintains that waste management can be planned in advance because the nature, composition and quantities of waste generated can be predicted. Advanced planning means that an orderly process of waste management can ensue. This includes:

- Waste Prevention: The prevention or avoidance of the production of wastes.

- Waste Minimisation: The economic reduction of the volume of waste during production, by means of different processes, or uses, or the use of "clean technologies".

- Resource Recovery: Recycling of wastes of one process as raw materials for a second.

- Waste Treatment: The reduction of the hazardous characteristics of waste, or a reduction in waste volume, to ease environmental or human health risks and impacts.

- Waste Disposal: The environmentally safe disposal of waste. This has traditionally been to landfill sites.

The following activities are envisaged for this project:

- Literature review of current national and international trends in hazardous waste management
- Situational analysis and needs assessment
- Stakeholder identification and engagement
- First Generation Integrated Hazardous Waste Management Plan for Gauteng (GHWMP)

The Action Plan for Integrated Waste Management Planning identified the following activities with respect to the preparation of hazardous waste management plans:
It says the Provincial environmental departments must:

- Determine the provincial status quo of hazardous waste generation and management and prepare provincial situational analysis and needs assessment reports in close liason with the relevant provincial structures and stakeholders.

- Develop, based on the findings of the provincial situation analysis and needs assessment reports, first generation provincial integrated hazardous waste management plans in accordance with guidelines prepared by national government and within the statutory framework of existing environmental legislation.

The scope of work for this project included among others the review of the existing baseline situation pertaining to the management of hazardous waste in the province. This document is a summary of the findings of the baseline situation pertaining to the transportation, treatment, disposal and incineration of hazardous waste in the province. This report has been compiled based on the responses received from the waste generators, waste management service providers, recyclers, industry associations and government departments.

1.4 Geographical Area of the study: Gauteng Province

Population distributions and densities are important as they largely determine the amount of hazardous waste expected from a particular waste generation area of Gauteng Province. This is important for planning.

Three factors have an impact on the amount of hazardous waste generated in a particular area, namely:

- The number of people residing in an area and how it is likely to change in the future;
- The per capita waste generation rate related to the income levels of the population;
- The types and number of industrial and commercial activities in an area.

The per capita waste generation rate typically increases as a person's socio-economic status improves. Demographic information provides the basis for estimating current and future hazardous waste quantities generated, and thus forms the basis for future planning.

According to the 2001 Census Data, the Gauteng Province has a total population of 8 837 178 people residing throughout the region. The Gauteng Province lies in the heart of the Republic of South Africa and has within its boundaries three of the six metropolitan (Category A municipalities) municipalities in the country. It consists of 3 District Municipalities and 9 Local Municipalities. The geographical area of the province is 16927.13682 square kilometres.

The Gauteng province has three metropolitan (Category A municipalities) which are:

i) Ekurhuleni Municipality Metropolitan
ii) City of Johannesburg Metropolitan
iii) City of Tshwane Metropolitan

The Gauteng province has a total of three district municipalities which are:

iv) Sedibeng District Municipality

v) West Rand Cross Boundary District Municipality
vi) Metsweding District Municipality

The major settlement areas within the local authorities are as follows:

vii) Bronkhorstspruit (Kungwini Local Municipality)
viii) Rayton (Nokeng tsa Taemane Local Municipality)
ix) Krugersdorp (Mogale City Local Municipality)
x) Randfontein (Randfontein Local Municipality)
xi) Westonaria (Westonaria Local Municipality)
xii) Vanderbijlpark (Emfuleni Local Municipality)
xiii) Meyerton (Midvaal Local Municipality)
xiv) Hiedelberg (Lesedi Local Municipality)

Table 1.4: Population Distribution for the Gauteng Province (2001)

Gauteng Province Population in 2001		
Description	**2001 population (number)**	**Percentage (%)**
District Municipality		
Metsweding	1 264 36	1.430728
West Rand	6 830 25	7.728994
Sedibeng	7 946 05	8.991615
Metropolitan area		
Ekurhuleni	24 802 77	28.06639
City of Johannesburg	32 258 12	36.50274
City of Tshwane	15 270 23	17.27953
Total	**8 837 178**	**100**

1.5 Approach

The development of the IWMP is guided by the principles contained within the National Waste Management Strategy (NWMS) for South Africa.

The project has been divided into the following main activities as per the Terms of Reference:

- Literature review of current national and international trends in hazardous waste management
- Situational analysis and needs assessment
- Stakeholder identification and engagement
- First Generation Integrated Hazardous Waste Management Plan for Gauteng (GHWMP)

1.6 Methodology: Situational Analysis and Needs Assessment

Understanding the Gauteng Province's hazardous waste management services and functions is crucial to the development of a relevant, comprehensive GHWMP. Therefore, the objective of the status quo / situational analysis and needs assessment is to qualify and quantify all aspects related to current hazardous waste management services and practices of the Province. This information will be used for future planning.

In order to obtain the necessary information for this investigation, in-depth discussions were held with the identified role-players in the various sectors that fit the scope of the project. These role-players were identified by means of a desk research exercise amongst unpublished information from Ozone's database.

The identified industrial sub-sectors included in this investigation are as follows:

- Mining
- Chemicals
- Metallurgical
- Pulp & Paper
- Manufacturing - Other
- Non-metallic Minerals
- Energy
- Textiles
- Food & Beverages
- Tanneries
- Plastic Products

- Rubber
- Commercial

It should be noted that the information provided by the responsive operations is of a confidential nature, and should therefore be treated accordingly.

All interviews and discussions were done by technically qualified and experienced Ozone staff members. The research project team was managed by Sam Matlala. The researchers who worked on this project are shown below with their respective qualifications and experience:

Moshoeu S. Matlala – Managing Director

B Sc Ed

B Sc (Hons) Science Education

M Sc (Biotechnology) Wits

3 years as Researcher/Advisor in natural sciences, film industry

3 years with Enzymes manufacturing company

8 years with CMCS/ O_3bc

Barbara Wetten

B Sc (Chem) Natal

2 years Teaching

2 years Chief Chemist, Fertiliser Company

16 years with CMCS/ O_3bc

Mari Botha

B Sc Industrial Chemistry

3 years Polymer Chemist and Plant Manager in the Paints/ Resins Sub-Sector

1 year Quality Assurance Supervisor in the Fine Chemicals Sub-Sector

6 years with CMCS/ O_3bc

Caroline Kiely

MSc Medical Biochemistry

6 years with Enviroserv as Waste Consultant

8 years as water treatment chemicals consultant

1 year with O_3bc

The methodology in which this was undertaken is as follows:

- Desk research exercise from available local information (including previous projects experience),
- Sampling,
- Questionnaire Design, and
- In-depth interviewing with various stakeholders.

The sample framework for the survey was based on the identified sub-sectors and their relative contribution to waste volumes for both recurring and non-recurring (e.g. spills) waste streams, as well as the number of major contributing companies. The sample was also based on the available information that was obtained by Ozone during previous study covering a larger area.

It should be noted that the focus was on industrial operations and that commercial and institutional operations that produce small volumes of hazardous waste were excluded. Estimates will however be made for these operations based on database information.

The Ozone team members conducted the in-depth interviews by filling in the Questionnaires (for the details of the questionnaires refer to Appendix A) in the following ways:

- The Ozone team members visited some of the premises of the identified stakeholders/ sample,
- Some interviews were conducted over the phone using the questions on the questionnaires,
- Were the respondent didn't have enough time for the interview, questionnaires been sent to them to fill and returned by E-mail and / or by facsimile.

Key personnel involved (e.g SHEQ officers, Environmental Managers, and other deligated personnell) in the hazardous waste management industries located in Gauteng Province were interviewed to provide information, reports and records relating to their hazardous waste management.

The interviews were done for the sub-sectors shown in table 1.6 below. The "completed" column shows the number of questionnaires that were returned by the closing date (30th June 2007).

Table 1.6: Identified Sample for the GHWMP study

Sector	Sample Size	Completed
Mining	12	4
Chemicals	52	50
Metallurgical	13	15
Pulp & Paper	3	3
Manufacturing - Other	57	48
Non-metallic Minerals	5	2
Energy	2	2
Textiles	4	4
Food & Beverages	15	15
Tanneries	2	4
Plastic Products	6	4
Rubber	1	1
Commercial	10	7
Total	**182**	**159**

CHAPTER 2: POLICY AND LEGISLA TION

Statutory requirements that govern hazardous materials (i.e. dangerous goods and hazardous substances) as well as the legislation that govern waste management in general are fragmented. As a result waste management requirements can often often be perceived as confusing, vague, contradictory and/or misinterpreted. The new National Environmental Waste Management Act: Waste Management Bill, once enacted, will address these concerns.

The Gauteng IWM Policy provides an overarching framework for the management of both general and hazardous waste in Gauteng and forms the foundation for addressing the waste issues, problems and needs of the Province and serves to inform the Gauteng public and government agencies (in the provincial sphere) of the objectives that the Gauteng Provincial Government (GPG) has identified for integrated waste management.

The Gauteng IWM Policy further serves as a means by which the objectives of the Constitution, 1996 (Act 108 of 1996), the NEMA, the National Water Act, the NWMS, the National Environmental Management: Air Quality Act, the forthcoming National IWM Bill etc. can be enabled in Gauteng. The detailed legal review scan has been conducted and included in phase 1 of this project, the literature review report.

CHAPTER 3: IDENTIFICATION OF GENERATORS, DIFFERENT HAZARDOUS WASTE STREAMS WITH ESTIMATED QUANTITIES

3.1 Introduction

Generation of hazardous waste in the province could be best understood by following the industry structure of the generators as well as their respective geographic locations around the province.

The identification of industrial operations in Gauteng is primarily based upon information in Ozone Business Consulting's database, which has been collected over the years as a result of private studies done for some of the local waste management services providers. This database has not been verified for purposes of this study and is therefore only indicative of the current actual total operations in each sector. It should also be noticed that the universe of operations is changing on nearly a daily basis, and to develop a total and accurate universe of such operations will require a dedicated and continuous effort.

Hazardous waste generation is described per sub-sector below with a brief background of the various sub-sectors.

3.2 Mining

3.2.1 Background to the Mining Sector in Gauteng Province

According to database information, there are around 33 operations in the mining sector based in Gauteng, most (15) of which are in the platinum group metals category. Four of these mining sector companies participated in this investigation.

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3.2.2 Identification and Quantification of Hazardous Waste Streams

The major types of waste streams identified in the mining sector are:

- Oxidizing Substances

- Flammable Liquids
- Flammable Solids & Substances
- Other

The estimated quantity of hazardous waste produced by operations in the mining sector is shown in Figure 3.2.2 (a) on the next page.

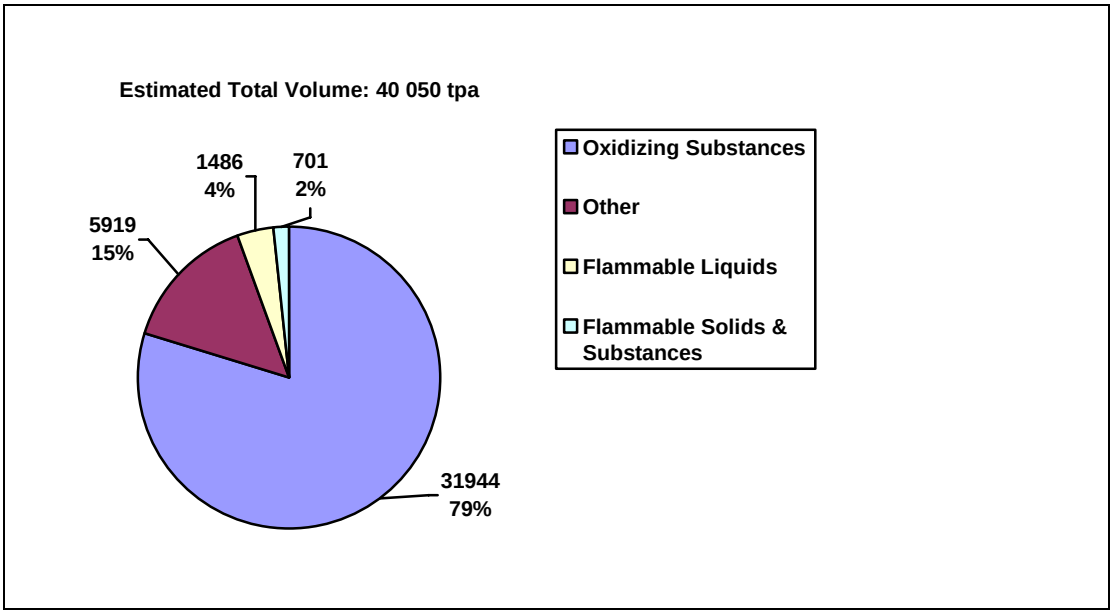

Figure 3.2.2 (a): Hazardous Waste Production in Gauteng Province: - Mining Sector[1]

Waste streams description: Weak and strong acids waste and alkali waste dominate the waste streams. Flammable solids are dominated by oily rags mostly and other absorbents as well as grease. The other category is dominated by filter bags and empty bags and containers of redundant chemicals.

Hazard rating of the waste streams: Two thirds of the identified waste streams are in the moderate hazard category. Such waste streams constitute mainly of weak acid waste and chemicals containers. The high hazard category of waste streams constitute mainly of strong acid waste and alkali waste, as well as asbestos to a less extent. All of the identified waste streams goes to landfill for disposal.

[1] The volumes shown exclude tailings.

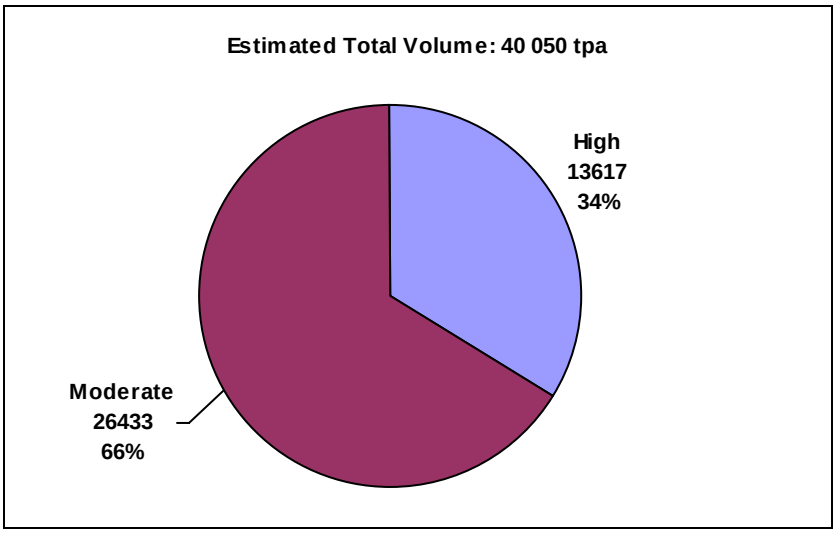

Figure 3.2.2 (b): Hazard Rating of Identified Waste Streams in Gauteng: - Mining Sector

On-site pre-treatment and disposal: Approximately 38% (more than 15 000 tons) of the total volumes identified, which constitutes of acids, gets pre-treated with lime for neutralization before being taken to landfill for disposal.

Recovery and Recycling: In the case of hydrochloric acid in particular, some of it is taken off-site for regeneration by a third party.

3.3 Chemicals

3.3.1 Background to the Chemicals Sector in Gauteng Province

There are more than 800 companies in the chemicals sector in Gauteng.

The chemical industry is divided into several sub-sectors, namely, commodity organic chemicals, commodity inorganic chemicals, fine chemicals, formulated specialities and functional chemicals, bulk formulated chemicals, pharmaceutical and consumer formulated chemicals.

The commodity organic chemicals sub-sector (about 10 companies) is concentrated mostly around the large industrial complexes located in the East Rand while the

commodity inorganic chemicals sub-sector (about 17 companies) is concentrated mostly around the large industrial complexes located in the Midrand and East Rand areas.

The industrial gasses sub-sector is dispersed all over the province. Production of fine chemicals is very concentrated amongst a few players. The formulated speciality and functional chemicals sub-sector is dispersed around the province. The formulated speciality chemicals are further sub-divided into various product categories, namely; adhesives and sealants (about 21 companies), building and construction chemicals (about 17 companies), flavours and fragrances (4 companies), industrial cleaning chemicals (about 18 companies), inks (about 15 companies), lacquer thinners, metal treatment chemicals, paints and coatings (about 83 chemicals), agrochemicals/pesticides (about 22 companies), pulp and paper chemicals, textile chemicals and water treatment chemicals. The bulk formulated chemicals (explosives and fertilizers) sub-sector (about 10 companies) is concentrated mostly in Modderfontein.

The pharmaceutical sub-sector (about 28 companies) is spread all around the province but it is concentrated mostly in the East Rand and Midrand areas. The consumer formulated chemicals (about 80 companies) is dispersed around the province. Products in this category include soaps, detergents, polishes, toiletries and cosmetics, and household products.

3.3.2 Identification and Quantification of Hazardous Waste Streams

The major types of waste streams identified in the chemical sector are:

- Poisonous, Toxic & Infectious Substances
- Oxidizing Substances
- Corrosive Substances
- Flammable Liquids
- Flammable Solids & Substances
- Other

The estimated quantity of hazardous waste produced by operations in the chemical sector is shown in table 3.3.2 (a) below.

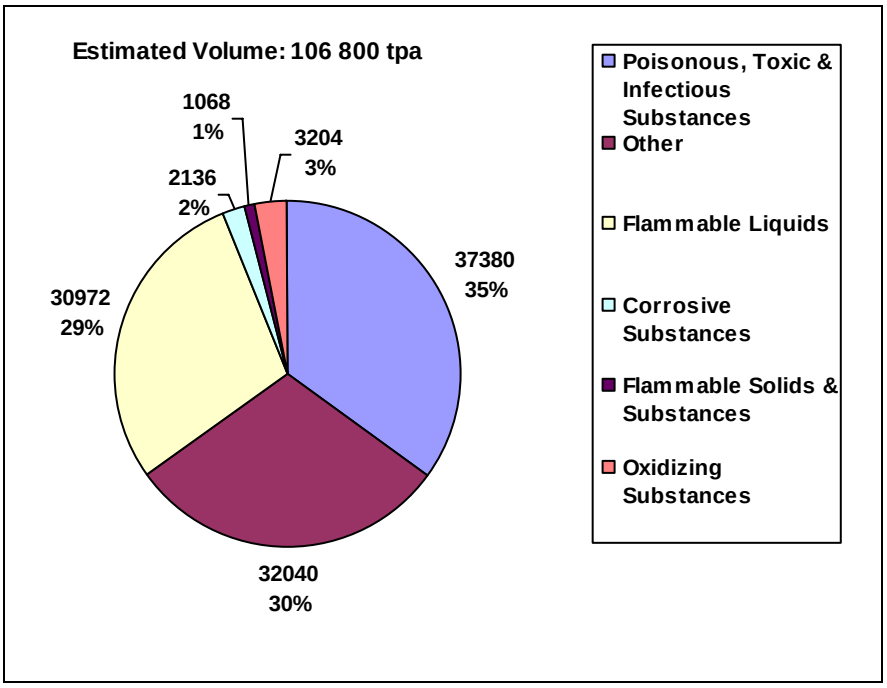

Figure 3.3.2 (a): Hazardous Waste Production in Gauteng Province:
- Chemical Sector

Waste streams description: In the explosives sub-sector the biggest waste streams by volume are various kinds of ground ash (Class 6) and safety fuse and lead sludges. Ground ash results from the burning of waste explosives.

Flammable liquids (Class 3) dominate waste streams produced by the paints sub-sector and adhesives manufacturers. Among the flammable liquids waste streams are 'solvents of concern' as defined by the Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste, like toluene and xylene. Production of hazardous waste from the paints and pesticides sub-sectors as well as from the resin manufacturers is seasonal; there is relatively more waste in warmer than colder months.

Consumer formulated chemicals sub-sector generates three classes of waste streams, flammable liquids (Class 3), toxic and infectious substances (class 6), and corrosive substances (class 8). Flammable liquids are in the form of waste solvents, toxic and infectious substances are mainly redundant aerosol products and corrosive substances are mainly redundant chemicals (acids).

The most common waste stream from the pharmaceutical is almost exclusively expired medication. The other common waste stream albeit at significantly lower volume is laboratory waste.

Hazard rating of waste streams: In the explosives sub-sector the various kinds of ground ash range from high to moderate in terms of hazard rating while the safety fuse sludge has a moderate hazard rating and there is a high hazard rating for lead sludge. Paint sludge has a moderate hazard rating while waste solvents have a high hazard rating. The hazard rating is low for expired tablets and liquid medication and moderate for aerosols and sludge.

The overall hazard rating of the identified waste streams in the chemicals sector is shown in figure 3.3.2 (b) on the next page.

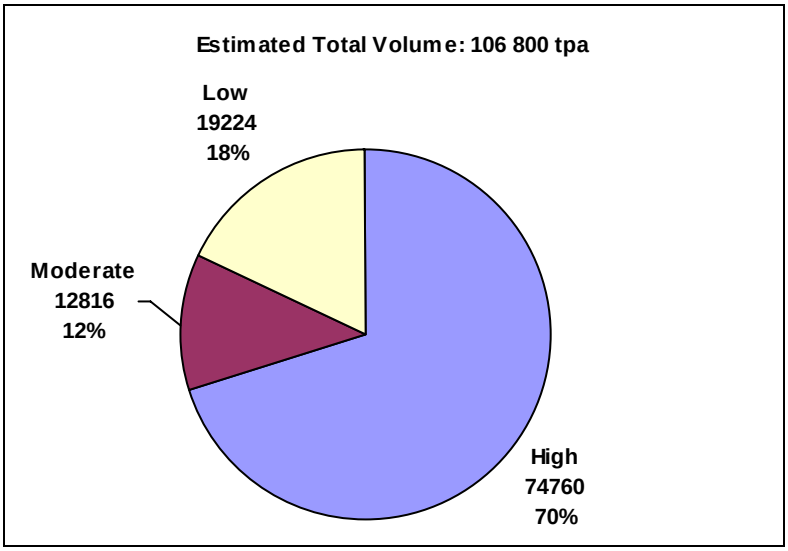

Figure 3.3.2 (b): Hazard Rating of Identified Waste Streams in Gauteng Province - Chemical

On-site pre-treatment and disposal: In the chemicals sector the only identified on-site pre-treatment is chemical pre-treatment (lime and ash blending) before the waste streams are taken to landfill for disposal. Waste adhesives, expired liquid medication and lotions as well as effluent sludge are taken to a landfill site for encapsulation without pre-treatment at source.

Incineration: The only incineration identified of the waste streams in the chemicals sector is for expired tablets and aerosols only. The incineration is done by a third party (off the generators' premises).

Recovery and Recycling: Solvent waste and paint sludge are recycled by third parties. Waste hydrochloric acid is also taken away for regeneration by a third party.

Most of the identified waste streams generated by the chemicals sector go to landfill as shown in Figure 3.3.2 (c). The incineration option is used almost exclusively by the pharmaceutical sub-sector while recovered and/or recycled waste streams are overwhelmingly waste solvents and hydrochloric acid to a relatively less extent.

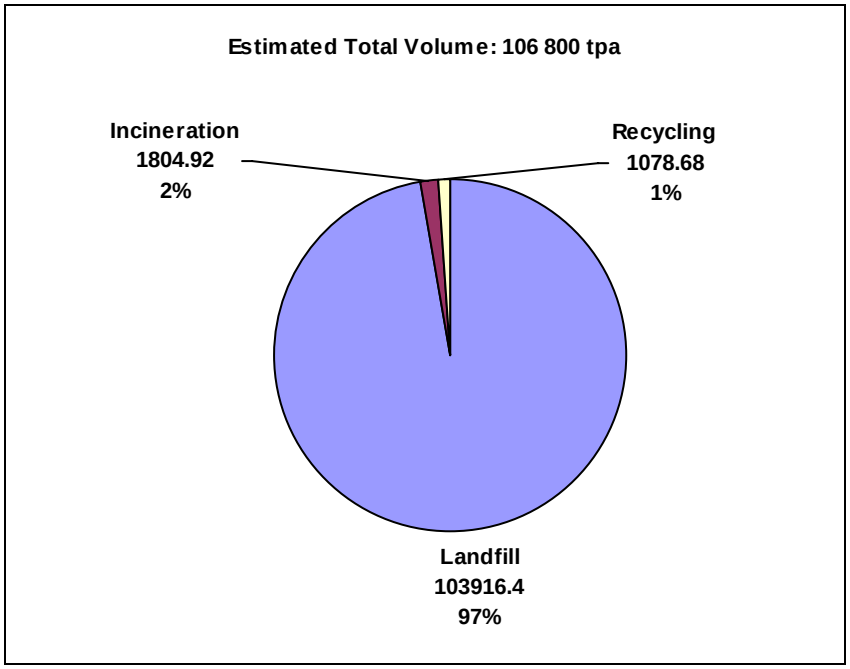

Figure 3.3.2 (c): Eventual Destiny of Identified Waste Streams in Gauteng Province: - Chemical

3.4 Metallurgical

3.4.1 Background to the Metallurgical Sector in Gauteng Province

This sector includes the manufacturing of metal products in the following sub-sectors, chrome, lead, foundries, manganese, steel and stainless steel. There are approximately 32 operations in Gauteng Province.

3.4.2 Identification and Quantification of Hazardous Waste Streams

The major types of waste streams identified in the metallurgical sector are:

- Poisonous, Toxic & Infectious Substances
- Flammable Liquids
- Corrosive Substances
- Flammable Solids & Substances
- Oxidizing Substances
- Other

The estimated quantity of hazardous waste produced by operations in the metallurgical sector is shown on figure 3.4.2 (a) below.

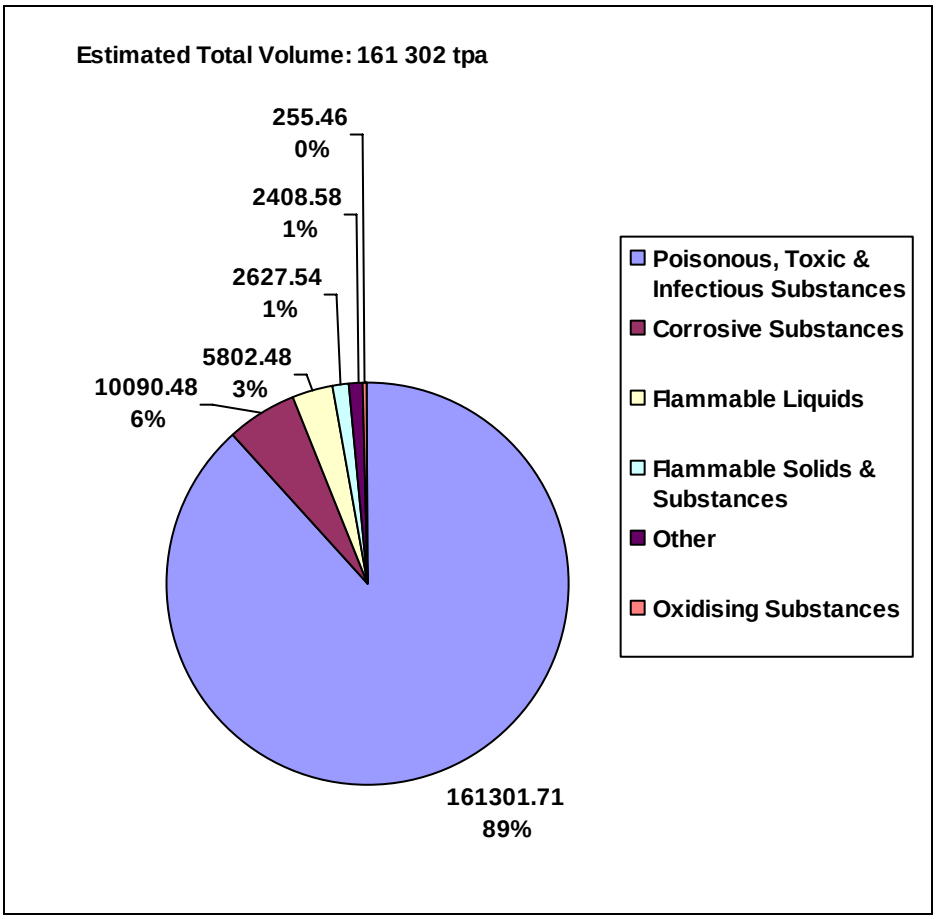

Figure 3.4.2 (a): Hazardous Waste Production in Gauteng Province:
- Metallurgical Sector[2]

[2] The volumes of hazardous waste shown exclude those dumped by operations on their own landfill sites.

Waste streams description: Poisonous, toxic and infectious substances are predominantly ashes of various kinds and acid sludge. Corrosive substances consist predominantly of redundant chemicals. The most dominant flammable liquids are waste oils and waste solvents. Among the flammable liquids waste streams are 'solvents of concern' such as toluene and xylene. The waste stream from electroplating operations is dominated by aluminium, chrome, nickel, zinc, cyanide, cadmium, copper and arsenic at varying concentrations.

Backlog waste: Backlog waste of 4 tons of filter cake and 10 000 litres of hexavalent chrome have been identified at one of the respondents. This waste is being reduced gradually by the respondent company. The hexavalent chrome is being converted periodically into the trivalent form on the premises and then disposed of by a service provider. Another backlog waste identified is 90 000 tons of magnetite and 16 000 tons of mill scale both of which are also in the process of being reduced gradually by selling them to third parties to use in various applications.

Hazard rating of the waste streams: The hazard ratings of the waste stream identified are high and moderate. The high hazard waste streams are mainly ash and dust, lead slag, filter cake and various kinds of sludge waste streams while the moderate hazard waste stream is dominated by the effluent sludge. For the hazard rating of the waste streams refer to figure 3.4.2 (b) below.

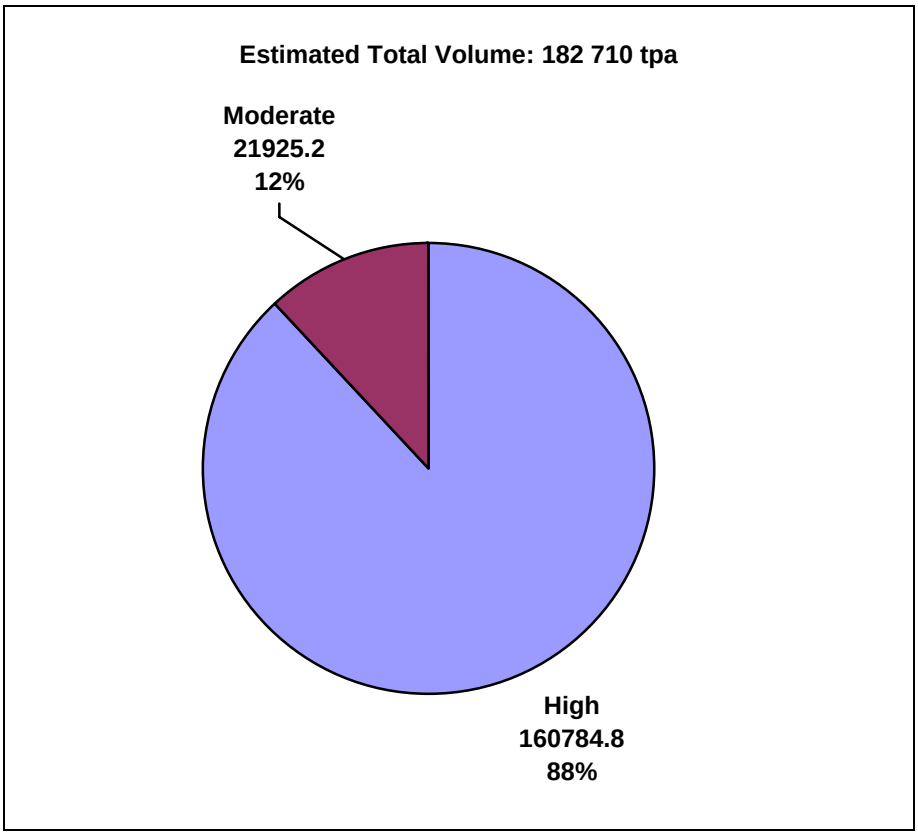

Figure 3.4.2 (b): Hazard Rating of Identified Waste Streams in Gauteng Province: - Metallurgical

On-site pre-treatment and disposal: The identified pre-treatment in this subsector is chemical pre-treatment of the metals containing effulent sludge, hexavalent chrome and cyanides. The metals containing effluent sludge undergoes some lime pre-treatment before being disposed of at a landfill site and the other waste streams, with the exception of hexavalent chrome and cyanides, go to landfill without pre-treatment. Hexavalent chrome undergoes sulphur pre-treatment while cyanides undergo some pH reduction treatment before being taken away to a landfill for disposal.

Recovery and Recycling: Waste solvents, oil and grease are taken away for recycling by third parties. This is estimated to constitute approximately 4% of total waste volumes generated in the sector.

3.5 Pulp and Paper

3.5.1 Background to the Pulp and Paper Sector in Gauteng Province

This sector includes the manufacturing of paper products and it is located in the Springs area. There are 5 pulp and paper operations in Gauteng Province.

3.5.2 Identification and Quantification of Hazardous Waste Streams

The major types of waste streams identified in the pulp and paper sector are:

- Flammable Liquids
- Flammable Solids & Substances
- Other

The estimated quantity of hazardous waste produced by operations in the pulp and paper sector is shown in figure 3.5.2.

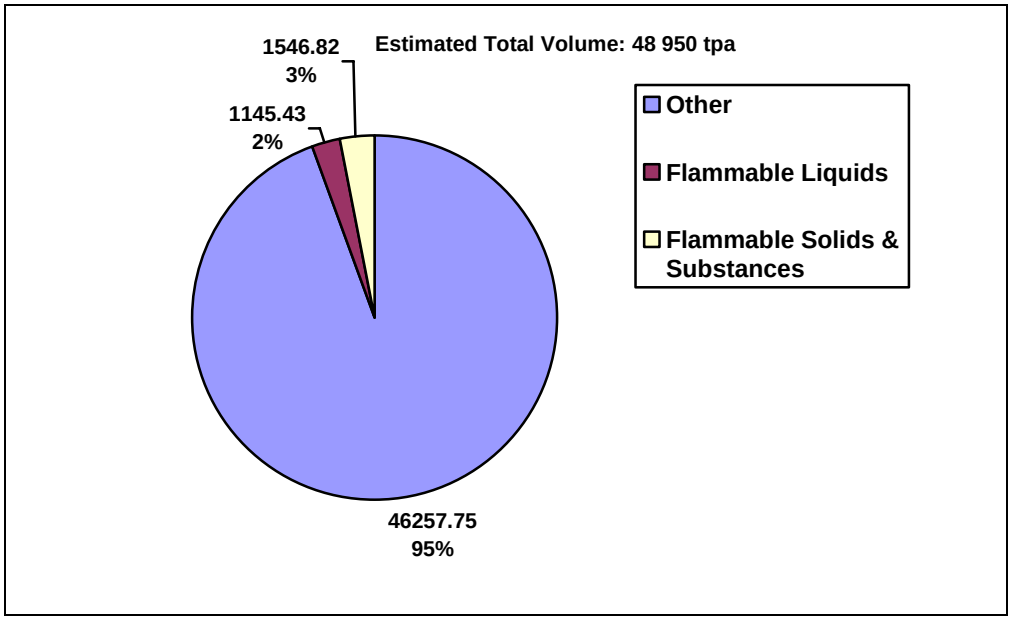

Figure 3.5.2: Hazardous Waste Production in Gauteng Province:
- Pulp and Paper Sector

<u>Description of waste streams:</u> The main waste stream is the pulp sludge as well as paper sludge, ash and plastics. The pulp sludge is contaminated with various chemicals.

<u>On-site and pre-treatment and disposal:</u> The pulp sludge is dewatered and the resultant sludge goes to landfill.

Recovery and Recycling: The paper sludge is re-used in the process until it has reached its re-usable cycle, when it is dumped at the landfill. The ash is used in other applications (brick manufacturing) while plastics are taken away to recycling by third parties.

Hazard rating of waste streams: The various identified waste streams identified in this sector all carry a low hazard rating.

3.6 Manufacturing – Other

3.6.1 Background to the Manufacturing - Other Sector in Gauteng Province

Other manufacturing includes various manufacturing activities like automotives, batteries, electrical products, engineering and workshops, packaging, welding, etc. There are approximately 230 operations in Gauteng.

3.6.2 Identification and Quantification of Hazardous Waste Streams

The major types of waste streams identified in the manufacturing - other sector are:

- Poisonous, Toxic & Infectious Substances
- Flammable Liquids
- Flammable Solids & Substances
- Corrosive Substances
- Other

The estimated quantity of hazardous waste produced by operations in the manufacturing – other sector is shown in figure 3.6.2 below.

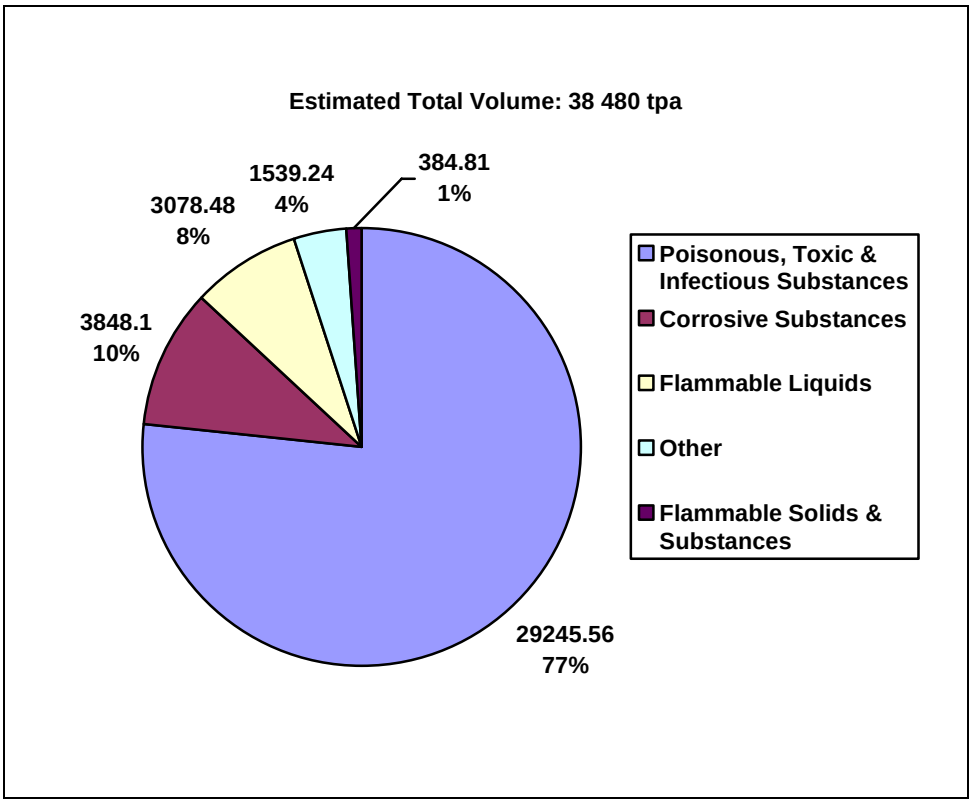

Figure 3.6.2: Hazardous Waste Production in Gauteng: - Manufacturing - other Sector

Description of hazardous waste streams: The waste stream produced by the automotive sub-sector consists of various sludge types, batteries, wax, waste plastic, waste oil and waste solvents. The most common waste streams from the batteries manufacturing sub-sector are lime sludge, lead slag and filter cake. The electrical products sub-sector produces three different classes of waste; flammable liquids are made up of waste solvents and oils; corrosive substances are made up of acid sludge and other substances are made up of oil contaminated waste. The waste stream from the engineering and workshop sub-sector consists mostly of waste oil, grease, wash bay sludge (containing oil and grease), oily rags and other absorbents, waste paint as well as electroplating sludge to some less extent.

On-site pre-treatment and disposal: All the waste streams sludge (effluent, wash bay and phosphate) and the paints sludge to some extent as well as wax, oily rags and filters, oil absorbents and waste plastic are taken to landfill disposal without pre-treatment. Lime sludge, lead slag and filter cake are also taken to landfill disposal without pre-treatment.

The other identified waste streams undergo chemical pre-treatment before disposal. Oil contaminated waste is pre-treated by ash blending, while the acid sludge is neutralized and crushed flourescent tubes undergo a sulphur treatment before disposal at a landfill site.

Recovery and Recycling: The batteries are re-used while the waste oil and solvents as well as some of the paint sludge are recycled. Waste hydrochloric acid in particular is taken for regeneration by a third party.

Hazard rating: All the various hazardous waste streams produced by the automotive and battery manufacturing sub-sectors that have been identified have a high hazard rating. The hazard rating of other identified waste streams range from extreme in the case of fluorescent tubes to moderate in the case of some waste solvents and oils, and low in the case of oil contaminated waste and acid sludge.

Most of the waste generated in this sector gets taken to landfill

3.7 Non-metallic minerals

3.7.1 Background to the Non-metallic Sector in Gauteng Province

The non-metallic minerals sub-sector encompasses cement and lime, bricks and glass manufacturing operations. There are approximately 14 operations in Gauteng.

3.7.2 Identification and Quantification of Hazardous Waste Streams

The major types of waste streams identified in the non-metallic sector are:

- Poisonous, Toxic & Infectious Substances
- Flammable Liquids
- Flammable Solids & Substances
- Corrosive Substances
- Other

The estimated quantity of hazardous waste produced by operations in the non-metallic minerals sector is shown in figure 3.7.2.

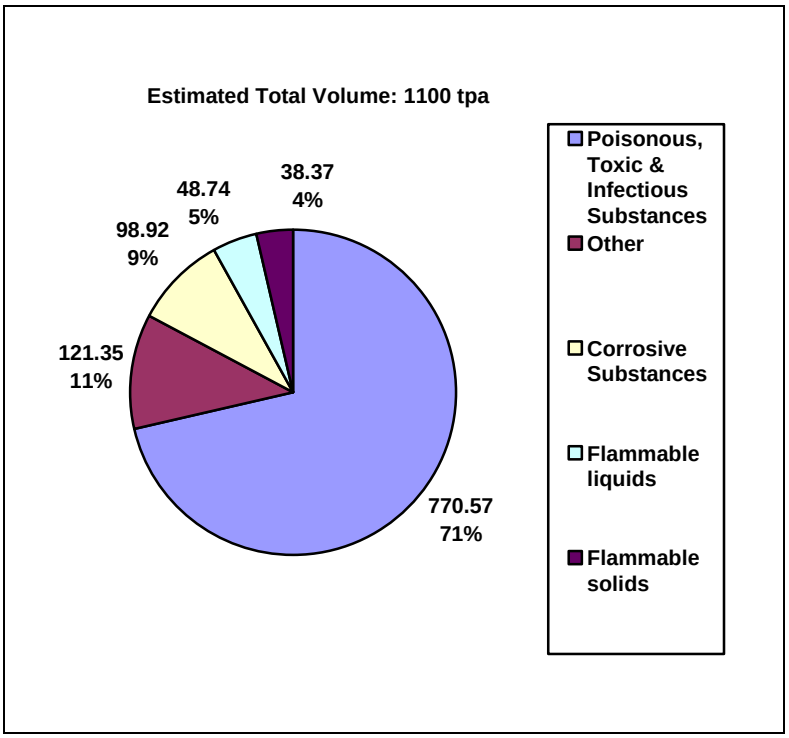

Figure 3.7.2: Hazardous Waste Production in Gauteng Province: Non-metallic minerals sector

Description of hazardous waste streams: The most common waste streams in the non-metallic minerals sector are poisonous and toxic substances (Class 6), other substances (Class 9) and corrosives (Class 8). Poisonous and toxic waste stream consists predominantly of coal tar and pitch, corrosives are predominantly chrome and aluminium silica sludges while other substances consist of asbestos slag.

On-site pre-treatment and disposal: None of the identified waste streams get pre-treated before disposal and all of it goes to landfill.

Hazard rating: The hazard rating of the various waste streams are low, moderate and high. The low hazard waste streams are the oil contaminated waste and oil sludge. Moderate hazard waste consists of empty containers while the high hazard waste stream consists of chrome and fluorescent tubes.

3.8 Energy

3.8.1 Background to the Energy Sector in Gauteng Province

The energy sector for this study is represented by only two operations, namely Eskom and Kelvin Power Station.

3.8.2 Identification and Quantification of Hazardous Waste Streams

The major types of waste streams identified in the energy sector are:

- Poisonous, Toxic & Infectious Substances
- Flammable Liquids
- Flammable Solids & Substances
- Corrosive Substances
- Other

The estimated quantity of hazardous waste produced by operations in the energy sector is shown figure 3.8.2 below.

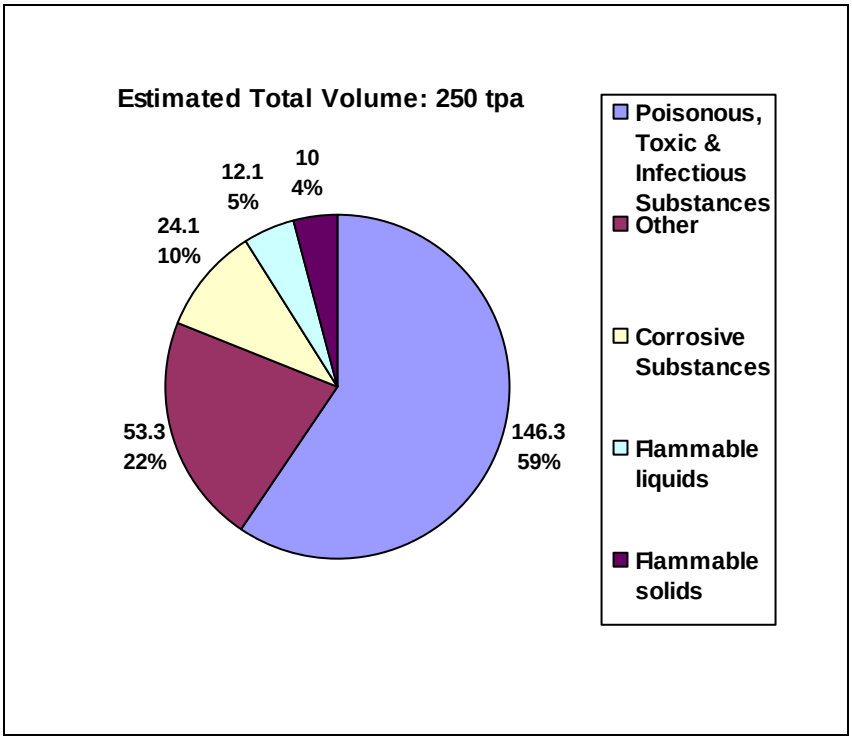

Figure 3.8.2: Hazardous Waste Production in Gauteng: - Energy Sector

Description of hazardous waste streams: The waste streams consist mainly of oily rags and other absorbents as well as oil filters and other oil contaminated waste. There are also corrosive substances which consist of acid waste.

Pre-treatment and disposal: All the identified waste streams with the exception of waste hydrochloric acid go to landfill for disposal

Recovery and Recycling: Waste hydrochloric acid is regenerated by a third party.

Hazard rating: The hazard rating of the various waste streams range from low to high. The low hazard waste streams are the oil contaminated waste and the high hazard waste stream consists of waste acids and solvents.

3.9 Textiles

3.9.1 Background to the Textiles Sector in Gauteng Province

Major operations in this sub-sector are located in the East Rand, Nigel and Rosslyn areas.

3.9.2 Identification and Quantification of Hazardous Waste Streams

Hazardous waste production from the textiles sector is relatively small in volume terms as most of their waste stream is effluent that is eventually discharged through the municipal sewage system. The major risks components of the filter cake sludge from their effluent plants are dyestuffs containing metals and caustic.

On-site pre-treatment and disposal: The filter cake sludge is taken to landfill for dumping. There are no identified pre-treatment (other than effluent) and recovery and/or recycling activities in the textiles sector.

3.10 Food and Beverages

3.10.1 Background to the Food and Beverages Sector in Gauteng Province

This sector includes the processing of foodstuffs and the manufacturing of both alcoholic and non-alcoholic beverages. The sector is spread all around the province and there are in excess of approximately 450 operations.

3.10.2 Identification and Quantification of Hazardous Waste Streams

The major types of waste streams identified in the food and beverage sector are:

- Poisonous, Toxic & Infectious Substances
- Flammable Liquids
- Flammable Solids & Substances
- Corrosive Substances
- Other

The estimated quantity of hazardous waste produced by operations in the food and beverage sector is shown in figure 3.10.2 (a) below.

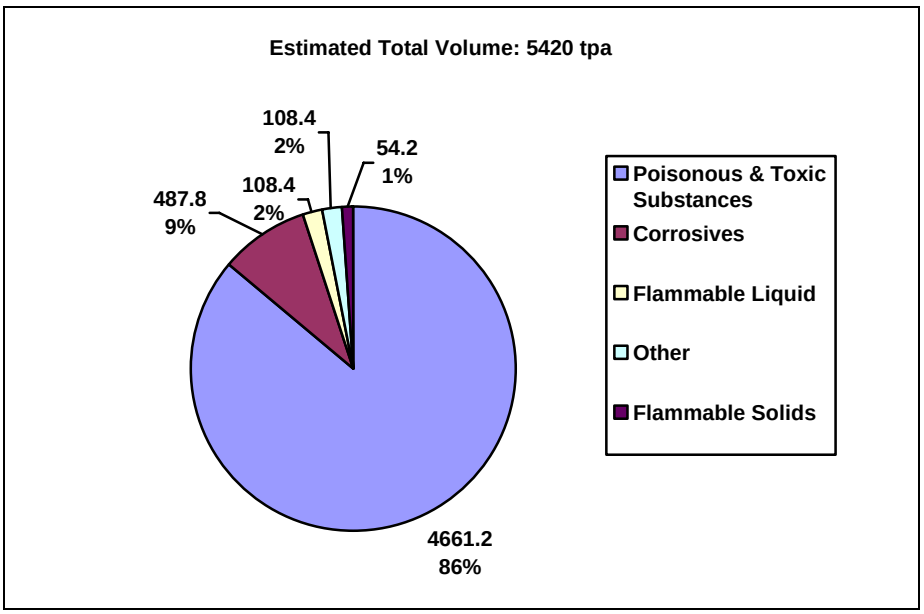

Figure 3.10.2 (a): Hazardous Waste Production in Gauteng: Food and Beverages

Description of identified waste streams

The poisonous, toxic and infectious substances are predominantly laboratory waste and expired chemicals and products while corrosive substances are made up of caustic sludge from cleaning activities. Flammable liquid waste consist of waste solvents and

oil sludge while other waste streams consist mainly of empty containers, and contaminated rags and gloves.

On-site pre-treatment and disposal

The waste streams identified are not pre-treated before disposal and all of it, including empty containers, goes to landfill disposal.

Hazard rating

The hazard ratings of the waste stream identified are low, moderate and high. The high hazard waste stream is waste solvents and empty and/or redundant chemicals containers while the moderate hazard waste stream is dominated by cleaning sludge.

The hazard rating of the waste streams is shown in figure 3.10.2 (b):

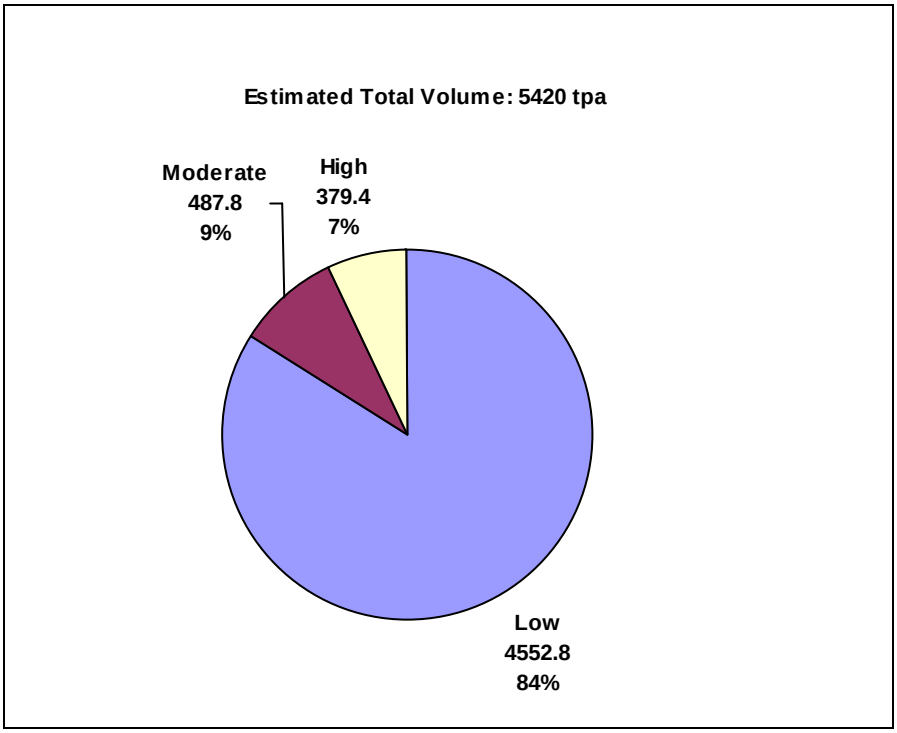

Figure 3.10.2 (b): Hazard Rating of Identified Waste Streams in Gauteng:
- Food and Beverage Sector

3.11 Leather

3.11.1 Background to the Mining Sector in Gauteng Province

The major leather tanneries are based in Bronkhortspruit, City Deep, Nigel and Rosslyn areas.

3.11.2 Identification and Quantification of Hazardous Waste Streams

The major types of waste streams identified in the leather sector are:

- Poisonous, Toxic & Infectious Substances
- Flammable Liquids
- Corrosive Substances
- Other

The estimated quantity of hazardous waste produced by operations in the leather sector is shown in figure 3.12.2.

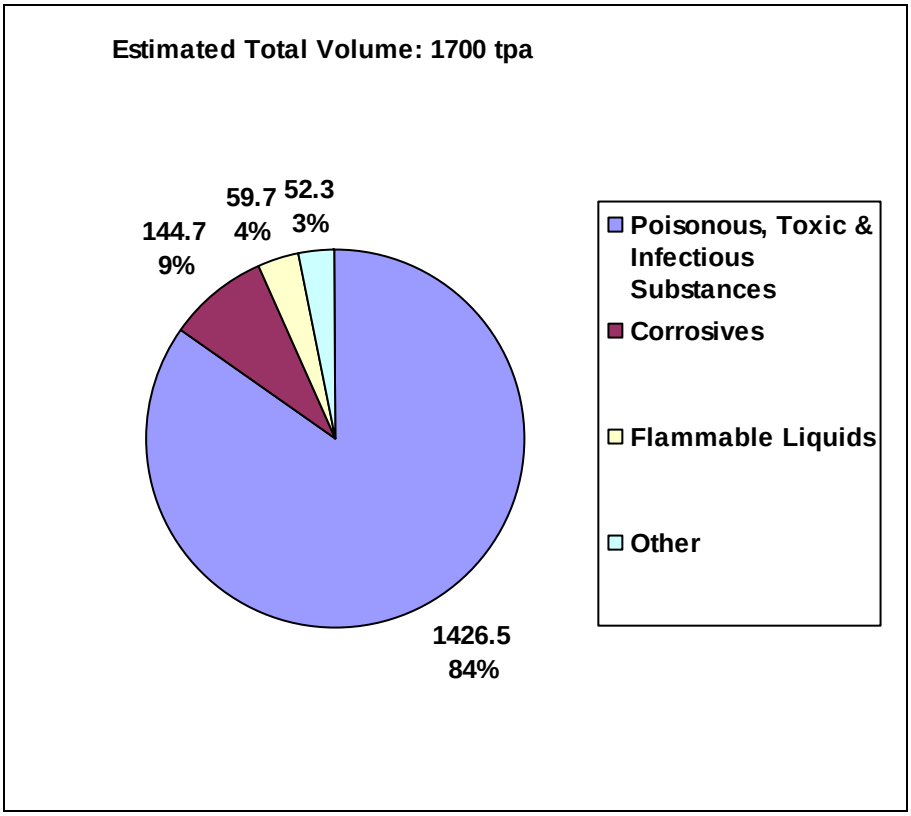

Figure 3.11.2: Hazardous Waste Production in Gauteng: - Leather

Description of identified waste streams

The poisonous, toxic and infectious substances waste streams consist mainly of filter cake and hide shavings sludge that contains chrome, acids and dyes.

On-site pre-treatment and disposal

The chrome and hide shavings sludge undergoes a lime pre-treatment before being taken to a landfill disposal site.

Recycling

Waste hydrochloric acid in particular is regenerated by a third party.

Hazard rating

The hazard rating of the chrome and hide shavings sludge is considered extreme.

3.12 Plastic Products

3.12.1 Background to the Plastic Products Sector in Gauteng Province

The plastic products sub-sector (polymer conversion) is concentrated mostly around the large industrial complexes in the East Rand and around Pretoria. There are more than 360 companies in this sector in Gauteng.

3.12.2 Identification and Quantification of Hazardous Waste Streams

The major types of waste streams identified in the plastic products sector are:

- Poisonous, Toxic & Infectious Substances
- Flammable Liquids
- Corrosive Substances
- Other

The estimated quantity of hazardous waste produced by operations in the plastic products sector is shown in figure 3.12.2.

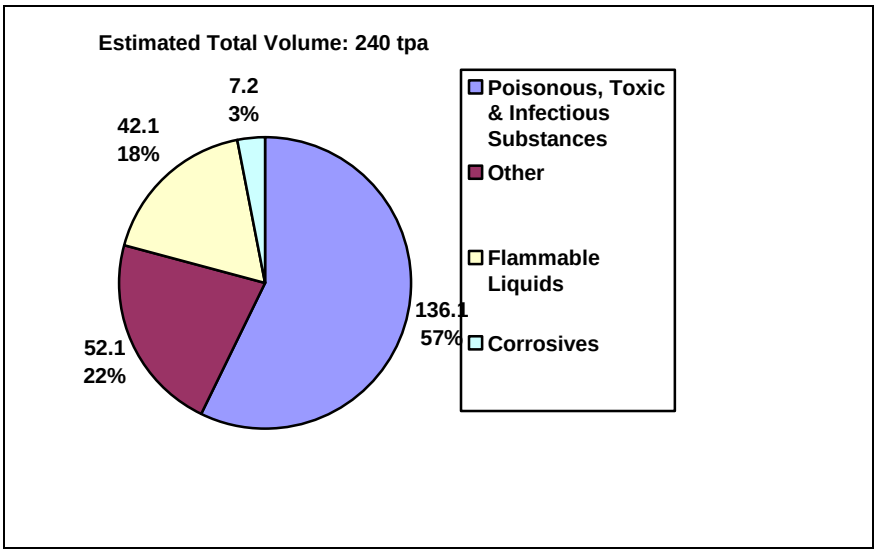

Figure 3.12.2: Hazardous Waste Production in Gauteng: - Plastic Products

Description of the identified waste streams

The waste streams consist mainly of boiler ash and sludge contaminated with various chemicals and degreasers, waste glue, waste solvents and oil, waste acids and waste polymers.

On-site pre-treatment and disposal

The waste streams like ash and contaminated sludge are taken to landfill for disposal without any pre-treatment.

Recovery and Recycling

The waste polymers in particular get re-used in the conversion processes or get taken away by third parties for recycling. The waste solvents, oil and acid are recycled by third parties.

3.13 Rubber Products

3.13.1 Background to the Rubber Products Sector in Gauteng Province

There are more than 50 identified operations in Gauteng.

3.13.2 Identification and Quantification of Hazardous Waste Streams

The major types of waste streams identified in the rubber sector are:

- Poisonous, Toxic & Infectious Substances

- Flammable Liquids
- Other

The estimated quantity of hazardous waste produced by operations in the rubber sector is shown in figure 3.13.2

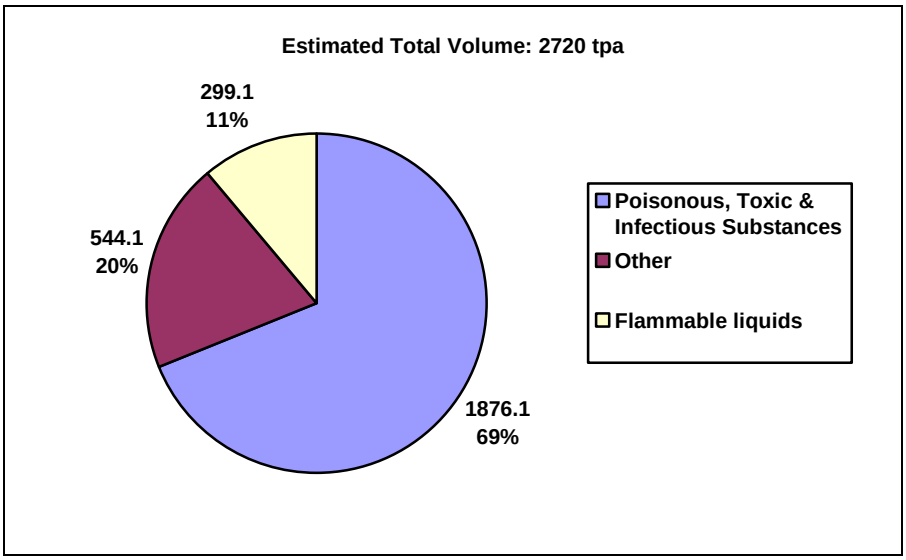

Figure 3.13.2: Hazardous Waste Production in Gauteng: - Rubber

Description of the identified waste streams

Poisonous and toxic substances consist mainly of rubber sludge and carbon water sludge that is contaminated with various chemicals such as sulphur, as well as redundant chemicals. Flammable liquids consist of waste solvents and oils while other waste consists mainly of waste rubber and plastics.

On-site pre-treatment and disposal

There is no identified on-site pre-treatment of the sludge waste streams and all of it is taken to landfill for disposal. Some of the waste rubber is also taken away to landfill.

Recovery and Recycling

The waste rubbers and plastics are taken away for recycling by third parties. These get granulated and re-used in conversion processes. There are efforts by operations in this sector to use waste rubbers that are presently being taken to landfill as energy source for cement kilns.

3.14 Commercial

3.14.1 Background to the Commercial Sector in Gauteng

This sector includes the transportation and storage as well as recycling and any other such related services and/or activities as well as printing. There are in excess of 250 such companies in Gauteng.

3.14.2 Identification and Quantification of Hazardous Waste Streams

The major types of waste streams identified in the commercial sector are:

- Poisonous, Toxic & Infectious Substances
- Flammable Liquids
- Flammable Solids & Substances
- Corrosive
- Other

The estimated quantity of hazardous waste produced by operations in the commercial sector is shown in figure 3.14.2.

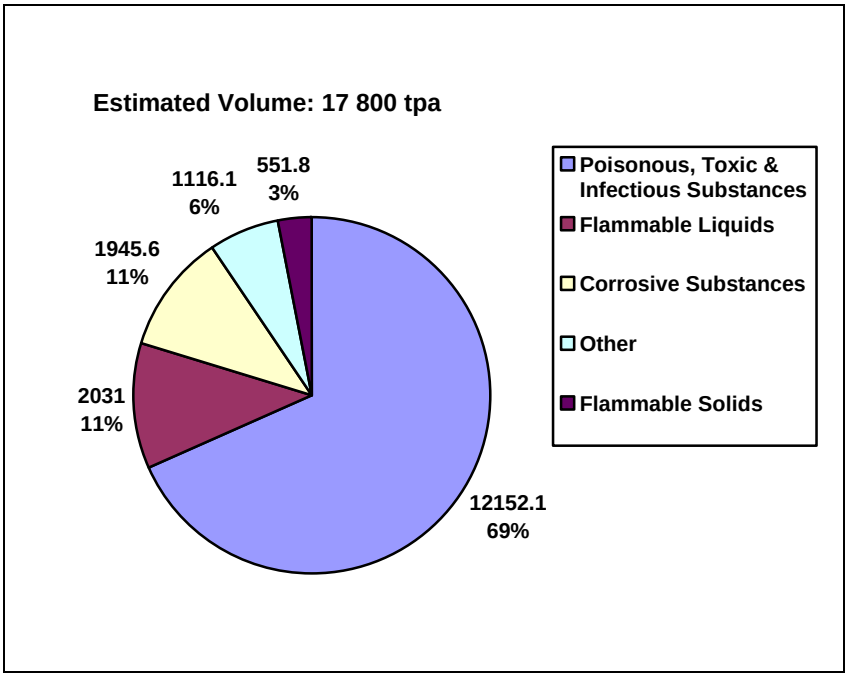

Figure 3.14.2: Hazardous Waste Production in Gauteng: - Commercial

Description of waste streams

This sector is different to the other sectors in that it is the largest generator of non-recurring waste. Most of the waste stream (approximately 76%) is generated as a result of spillages. The waste streams are as diverse as the products in storage facilities. Generally, the waste streams identified in this sector are oily rags, redundant chemicals, redundant products, acid sludge, waste solvents, filter cakes (of neutralized acids), grease and empty containers.

However, the recycling sub-sector has a relatively consistent waste stream in the form of oil sludge, effluent, sludge, weak caustic sludge and filter cakes. The same could be said of the printing sub-sector whose waste streams consist mainly of ink and paint stained rags, waste printing inks and various waste solvents.

On-site pre-treatment and disposal

Pre-treatment is done to neutralize acids in some instances and the resultant filter cake is taken to landfill. The rest of the waste streams identified are taken to landfill disposal.

Recovery and Recyling

The recycling sub-sector usually has a closed loop washing and rinsing facility, which means the caustic used for this purpose gets re-used. However, when this gets passed its re-usable cycle it gets taken away to landfill for disposal. The same applies to unusable oil sludge and solvent waste. Usually the waste oil, grease, and solvents are recycled by third parties.

3.15 Summary of the waste streams

The total recurring and non-recurring hazardous waste generated is estimated at 446 200 tpa. Of these volumes, an estimated total of 102 580 tpa is non-recurring waste streams which get generated as result of spillages and clean-up operations. Sectors that are the largest contributors of non-recurring waste streams are the commercial sector, food and beverage, chemical and manufacturing - other sectors. Non-recurring waste is generated usually as a result of clean-up activities which at best are unpredictable.

Poisonous and toxic substances (Class 6), other substances (Class 9), flammable liquids (Class 3) and oxidising substances (Class 8) collectively account for 95% of the hazardous waste streams generated.

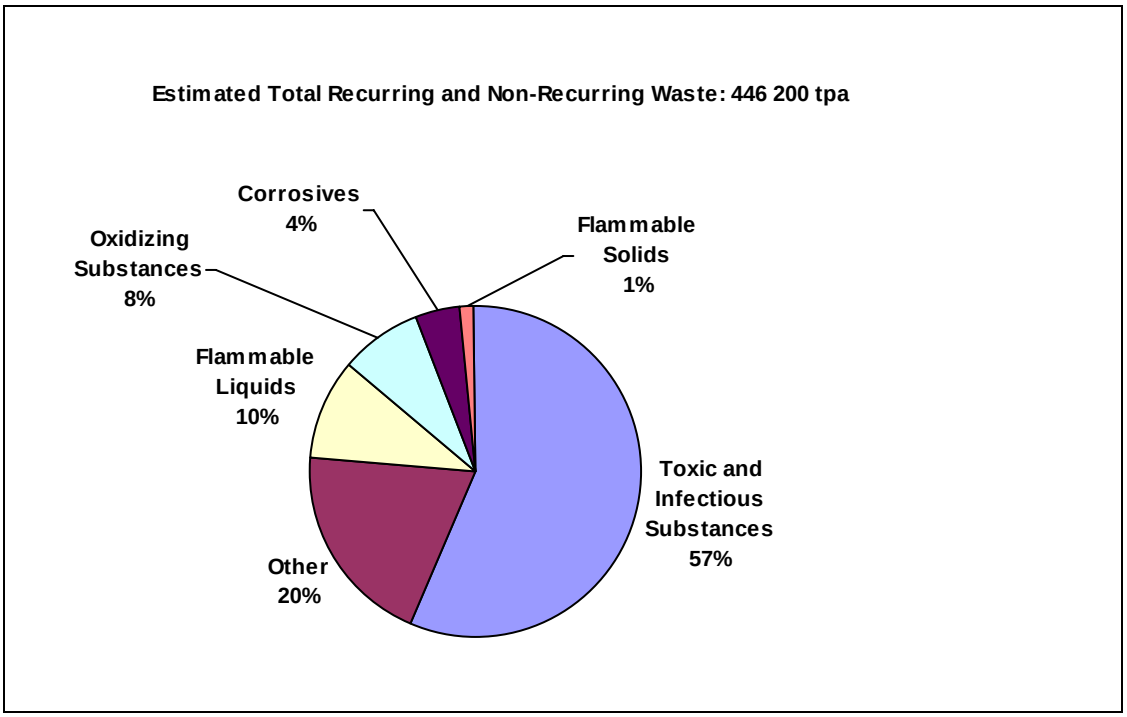

Figure 3.15 (a): Summary of hazardous waste production in Gauteng

Five sectors, namely, metallurgical, chemicals, pulp and paper, mining and manufacturing – other collectively account for 93% of the hazardous waste volumes generated.

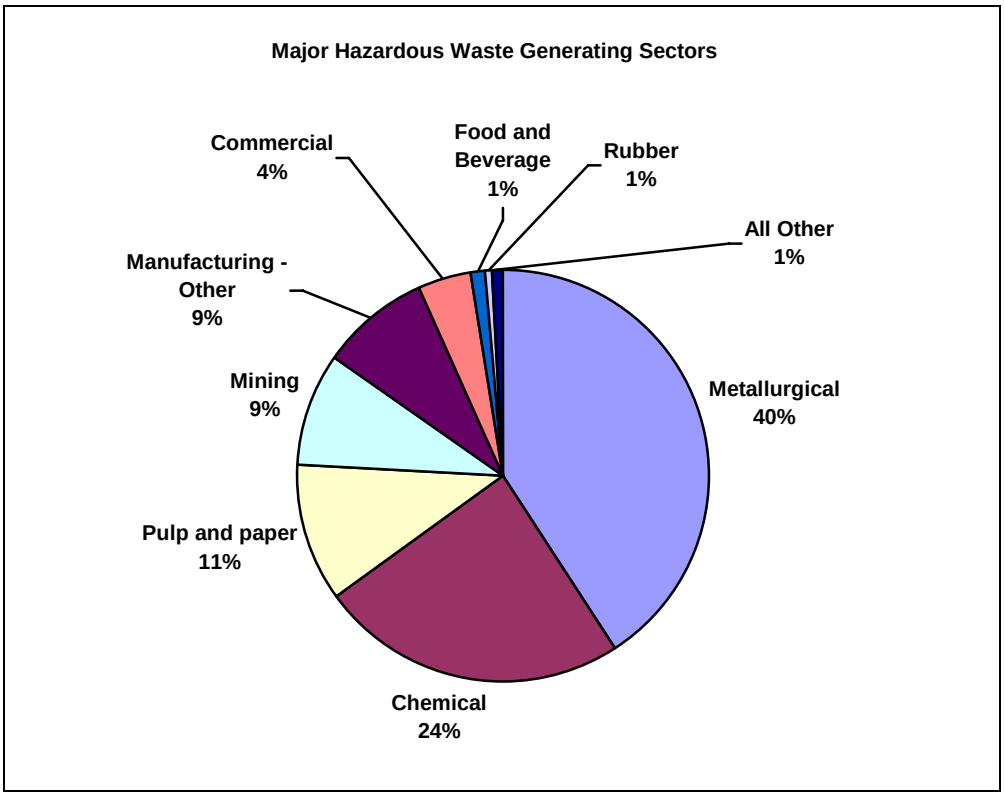

Figure 3.15 (b): Summary of major hazardous waste generating sectors

Waste streams description: Only three sectors collectively contribute approximately 88% of total volumes of flammable liquids generated. The chemical sector is the biggest generator of identified volumes of flammable liquids at more than two-thirds (69%) of total. The metallurgical sector follows next with 12% and the manufacturing – other is the third biggest generator at 7%.

Three sectors collectively contribute more than two thirds (approximately 68%) of total volumes of flammable solids generated. The non-metallic minerals sector leads with approximately 28% of the volumes generated, followed by the leather sector at 23% and plastics sector at 16%.

The pulp and paper sector alone contributes approximately 90% of volumes of oxidising substances.

Four sectors collectively contribute approximately 96% of total volumes of poisonous, toxic and infectious substances generated. The metallurgical sector alone contributes about 65% of volumes generated, followed by the chemical sector with approximately 15% of volumes generated. The chemical sector is followed closely by the

manufacturing - other sector with approximately 12% of the volumes generated and the commercial sector at approximately 5%.

Estimated total volumes of corrosive substances generated are dominated by only three sectors that collectively contribute approximately 86% of total volumes generated. The metallurgical sector is the largest generator at more than half (approximately 56%) of the volumes generated, followed by manufacturing – other at approximately 20% and the chemicals sector at 10%.

Estimated total volumes of other substances generated are dominated by only three sectors. These sectors collectively contribute approximately 94% of total volumes generated. The pulp and paper sector is the largest generator at more than half (approximately 52%) of the volumes generated, followed by the chemical sector at approximately 36% and the mining sector at 7%.

On-site pre-treatment and disposal: The only on-site pre-treatment of hazardous waste streams identified in this investigation is chemical pre-treatment, for example, lime and/or ash blending for neutralization purposes. Other forms of pre-treatment of the identified waste streams such as thermal and biological have not being identified during this investigation.

Most of the waste streams identified go to landfill for disposal.

Incineration: Expired tablets are aerosol products are the only identified waste streams that are incinerated. Incineration is used almost exclusively by the pharmaceutical sector.

Recovery and Recycling: Waste solvent, paint, oil, grease, are the most common waste streams that get recycled. The other waste streams that are constantly recycled are the waste polymers, rubbers and batteries as well as lead. Waste hydrochloric acid in particular is regenerated.

Waste oil recovery and recycling is the only recycling venture that has an organised body looking after it in the form of the National Oil Recycling Association through the ROSE Foundation. Other sectors like the paints and coatings (waste solvent), plastic conversion (waste polymers), rubber (waste rubber), and battery manufacturing

(batteries and lead) do not have an organisational body through which to handle their respective recycling activities.

CHAPTER 4: CAPACITY FOR TREATMENT AND DISPOSAL

4.1 Treatment

4.1.1 On-site treatment

On site treatment identified is mainly limited to pH control of the waste streams. Therefore other than this chemical treatment, neither heat nor biological treatments of hazardous wastes at the generators' premises were identified by this investigation. The waste generators generally leave out the responsibility of treating the various classes of hazardous wastes that they generate to the waste management services providers at the disposal facilities.

4.1.2 Off site treatment

There are only two identified waste treatment facilities that are operational in Gauteng, namely, Thermopower in Olifantsfontein and Tiger Chemicals in Germiston. The third identified treatment facility in Germsiton has not received their operational licence from the department yet.

4.1.2.1 Thermopower

Thermopower Process Technology received a permit to treat various types of hazardous waste in August 2004. Thermopower is currently the only commercial company in South Africa that has the capability to permanently dispose any type of hazardous waste (excluding health care waste). There are no alternative waste-treatment options available in South Africa. The Thermopower facilities are situated in Olifantsfontein. Waste streams are continuously fed into a rotary kiln. Wastes are heated in the kiln at a temperature of 650° C to volatize water and organic contaminants. Inside the kiln organic compounds are decomposed.

4.1.2.2 Tiger Chemical and Rechem Industries

Tiger Chemical Treatment and Rechem Industries hazardous waste treatment facility located in Germiston reclaims metals mainly from effluent generated by metal finishing industries and precious metals refineries. Products reclaimed from the effluent include precious metals, nickel, cobalt, zinc and copper. Tiger Chemical Treatment reclaming processes also use alkaline waste streams from other industries in their treatment processes to neutralise acids. Tiger Chemical Treatment and Rechem Industries is in the process of permitting their site.

The effluent collected by Tiger Chemical Treatment from waste generators include acids, alkalis, caustic scrubbing solutions, neutral sludges, rinse water and spent soluble oils. The facility also accepts waste streams brought by waste management companies. The classes of hazardous waste streams handled by Tiger Chemical Treatment are other substances (class 9). The hazard rating of the waste streams range from low to high hazard depending on the heavy metal content for the effleunt, and low to moderate for soluble oils.

The resulting saleable products from the treatment processes are metal hydroxide filter cakes which are nickel, copper, zinc and precious metal bearing. These products are sold to refineries locally and the export market too.

4.1.2.3 Other facilities

The other identified off-site treatment facility for hazardous waste is the non-operational Interwaste facility that is also situated in Germiston. The Interwaste facility can handle both liquid and solid waste. Interwaste is in the process of permitting their site.

The existence of only Thermopower and Tiger Chemical shows that there is a chronic shortage of off-site hazardous waste treatment facilities in the province. The end-result is that most of the hazardous waste produced by generators goes to the only H:H (Holfontein) landfill site. Had there been more treatment options available to the generators, some of the waste streams could be diverted to treatment facilities. This will result in relatively less volumes going to Holfontein as well as to the Goudkoppies, Rietfontein and Rosslyn landfills.

With the Polokwane Declaration's focus to move progressively away from landfill more specialised treatment facilities are needed. The current EIA process required for piloting and full scale facilities are perceived to be hampering development of such facilities because it takes too long.

4.1.3 Disposal

Holfontein landfill site, the only existing H:H site accessible to Gauteng-based hazardous waste generators currently receives on average 35 000 tons of waste per month. Of this volume, about 5 000 tons is in liquid form, but generally waste streams have about 80% moisture. According to the DWAF, the Holfontein site is expected to last until the next 40 years. The landfill site has available airspace of 7 300 000 m^3 and this airspace is being used up at a rate of 180 000 m^3 per annum.

Other than Holfontein, the other hazardous waste disposal sites available are one H:h (Rosslyn) and two GLB^+ sites (Goudkoppies and Rietfontein). Goudkoppies and Rietfontein are only permitted to receive delisted hazardous waste for co-disposal. Rietfontein has available airspace of 7 020 000 m^3 and this airspace is being utilized at a rate of 180 000 m^3 per annum. Rietfontein is therefore expected to last the next 39 years at this rate of airspace utilization. Goudkoppies has an even bigger airspace of 11 068 922 m^3, which is being utilised a relatively quicker rate of 357 335 m^3. This rate of utilization gives Goudkoppies an expected lifespan of 36 years.

The private ownership of Holfontein is problematic from cost and competition point of view. Monopoly on the hazardous waste site leads to astronomical costs for the waste generators and third party waste collectors. Furthermore, it also indirectly limits the choice of waste disposal company. There should be government backing for more properly licensed landfill hazardous waste sites and particularly incineration facilities. There is , however the perception that also, not enough is done to minimise the waste before landfilling,

As Holfontein is the only H:H landfill, should it be closed down temporarily because of unforeseen circumstances like sustained torrential rains, the consequence is that the waste generators premises will be used as *de facto* waste storage facilities even though they are not set up for this purpose.

Lack of alternatives for disposal is an important issue for hazardous waste management. As discussed previously there should be alternatives for waste generators of whether to use a treatment facility, incineration facility or landfill site to dispose of their hazardous waste.

CHAPTER 5: THE EXTENT TO WHICH CLEANER TECHNOLOGY AND WASTE EXCHANGE ARE BEING UTILIZED

5.1 Cleaner technologies

Cleaner technologies are largely employed already in most of the sectors. Existing cleaner technologies include waste minimization, recovery (re-use) and recycling activities. There are also other cleaner technologies that are more related with air quality like NO^2 emission abatement technology which is also being used in South Africa (none of the operations in Gauteng are using the technology). Practices that lead to cleaner effluent and air quality ironically lead to increase waste volumes.

The main reasons why other sectors have not implemented known cleaner technolgoies yet are related to costs. The commercial sector (excluding the recycling and printing sub-sectors) is the only sector where there is no use of cleaner technology. It should be appreciated that cleaner technologies that are process related are not easy to implement under circumstances where local companies are operating under licensed technology from multinational companies (which is more often than not).

It should also be noted that sectors that have employed cleaner technologies already or are still in the process of doing so, have achieved that by gradual phase-in as part of their brownfield expansions. Therefore, cleaner technologies are usually implemented as part of capacity expansions. The best and easiest way of implementing cleaner technologies at the process level is in greenfields investments because newly built manufacturing plants are always based on the newest and often cleanest technologies.

Therefore, it is expected that the relatively old manufacturing plants that we have in the province will continue phasing in cleaner production technologies gradually where this has not been achieved already.

5.2 Waste exchange

Waste exchange, defined as exchanging some operation's hazardous waste as raw material for another operation, is relatively non-existent at the moment. Examples of

processes that are related to waste exchange include the manufacturing of fertilizer from nitric acid waste as well as the proposed Holcim/Enviroserv flammable waste blending platform. Flammable waste for energy purposes is the most common waste stream cited for waste exchange activities largely because it does not involve further processing, and thus the risk associated with further processing is non-existend.

The major obstacle or problem associated with waste exchange is the issue of liability. There is a need for proper regulations to take care of quality control as there is a possibility that products manufactured from hazardous waste may be unsafe. Waste exchange could also be hampered by the commitment of the sectors to waste minimization.

CHAPTER 6: IDENTIFICATION OF ALTERNATIVE METHODS FOR MEETING REQUIREMENTS

This chapter identify alternative methods for meeting requirements (e.g. waste minimisation, re-use, avoidance).

6.1 Waste exchange

In North America, the chemical industry has already demonstrated progress in waste management protocols. For example, some chemical companies have made useful strides into better waste management by placing less reliance on unsustainable landfill disposal and greater emphasis on managing and treating waste in a more proactive and sustainable manner.

By beginning to adopt a more integrated approach to waste management producers have demonstrated that they can often reduce costs and lower their risk profile. It is not only legislation that is driving an increased focus on waste management. Risk management protocols often now require producers to manage the waste from strategic product lines through multiple disposal routes in order to avoid any potential threat of production interruption. In order to achieve a more integrated approach to waste management across their supply chain and end-to-end production process, many companies have begun to evaluate and implement waste management outsourcing.

There are many examples in the market of waste that currently go for waste treatment or incineration that could go for re-use as another product. One example is the innovative waste management partnership, which involves bringing together waste producers and product manufacturers, where the waste product of a producer could be potentially used by some product manufacturer. Innovative waste partnership has the potential to add real economic value to waste management (*The Chemical Engineer, August 2006).*

Chemical exchange programs can also be as effective as the innovative waste management partnership. In the case of the chemical exchange program, chemicals exchange hands from one user who has surplus to another who is in need before it

reaches its expiry period and thus before it is classified as waste. Chemical substitution, where a toxic or hazardous chemical is substituted with another non-hazardous or less hazardous chemical, can also be as effective (University of California, San Francisco; Office of Environmental Health and Safety).

In South Africa and Gauteng province in particular, the substitution of more hazardous chemicals with less hazardous ones is happening already in industry. In terms of recycling in the plastic sector in particular, already PET bottles are being turned into fibres for use in other applications (largely bedding).

Waste exchange is also possible in terms of using flammable waste as energy source. Efforts to use flammable waste as energy source are being hampered by the speed at which the government does their regulatory approval for this purpose. Another method of converting hazardous waste into energy is being developed in Canada between FuelCell Energy, Incorporated. and Ford Motor Corporation. By using a fuel cell it is possible to reduce paint solvent emanating from automotive painting operations by turning fumes from volatile organic compounds into energy. The fuel cell unit is expected to be up and running in 2008 (paintsandcoating.com – Industry Letter No. 267; September 4, 2007).

Gauteng province does not as yet have the necessary regulatory framework to do waste exchange for the manufacturing of new products outside of the recycling context. Policy guidelines are needed in this regard to guide such waste exchange activities.

6.2 Waste destruction

Waste destruction is typically based upon high integrity incineration plants. Past experience has shown that South Africa typically does not have volumes high enough to justify such an investment.

An alternative option is plasma waste conversion, a technology that is purported to produce no hazardous airborne emissions and no fly ash. The technology uses energised plasma to destroy hazardous waste and simultaneously allows for the recovery of commodities such as chemicals and fuel (Engineering News, July 14 – 20, 2000; Business Day 4/02/2003). A plasma waste conversion facility does not exist in South Africa yet.

An incineration option that may be more economically suitable for smaller waste volumes is the use of a glass oven to incinerate waste and then encapsulate the resultant ash in non-leachable glass pebbles that have use in road surfacing and other construction applications.

6.3 Bioleaching

Mintek has developed a technology in which bacteria are used to liberate valuable metals from refractory sulphide ores and concentrates. The technology is being used commercially for the recovery of copper from sulphides. A number of other base metals like zinc, nickel and cobalt could be recoverable using this technology in the metallurgical industry (Engineering News, November 9 – 15, 2001).

This technology could be applicable to the ash produced by the various operations.

6.4 Volume minimization by vaporization

According to the Holfontein site the waste streams received by them has got 80% moisture. The volumes of the waste streams taken for disposal could potentially be reduced if vaporization of the waste streams could be done by the waste generators.

CHAPTER 7: ESTIMATED COSTS TO INDUSTRY RELATED TO HAZARDOUS WASTE MANAGEMENT

Costs incurred by the industry in terms of waste management depend on the service needed. On an ongoing basis costs incurred usually relate to disposal and/or incineration as well as on-site pre-treatment to a lesser extent. Such costs are also related to the method of collection of the waste streams, which is whether drums or skips or sumps. The costs are therefore accordingly quoted per drum, skip, or ton and also vary depending on the type of waste stream. Under some circumstances there are also remediation costs that are incurred for the remediation of contaminated land caused by the generator.

Landfill disposal of 210 litre drum containing solvents on average costs R 1200.00; encapsulation of the same volume drum on average costs R 3100.00. Disposal of a $6m^3$ on average costs R 600.00 while disposal of coal ash costs R 600.00 per ton. Incineration is the most costly with an average cost of R 10 000.00 per ton. The estimated costs related to hazardous waste management by industry is approximately R 450 million.

It is difficult to get remediation costs that could be used for the GHWMP because of the nature of such activities. The only information available in this regard is publicly available information from corporations like AECI and Sasol. In the case of AECI, the company has budgetted an amount of R 170 million for the period 2000 to 2009. This amount relates to the remediation of contaminated groundwater and land at the group's older sites at Modderfontein, Umbongwintini, and Somerset West. In 2007 Sasol has reported a budget of R 1.4 billion for their Synfuels site remediation compared to R 443 million in 2004. It is not clear whether the 2007 amount is to be spread over several years or not.

CHAPTER 8: PROJECTION OF FUTURE REQUIREMENTS

Waste generators currently have use of only one H:H facility in the form of the Holfontein waste disposal facility. Other available landfills, namely, Goudkoppies, Rietfontein and Rosslyn (H: h) are not permitted to receive all classes of hazard rating. Goudkoppies and Rietfontein only receive delisted hazardous waste.

The Holfontein landfill site currently receives on average 35 000 tons of waste per month. Of this volume, about 5 000 tons is in liquid form, but generally all the waste stream has about 80% moisture. According to the DWAF, the Holfontein site is expected to last until the next 40 years. The landfill site has available airspace of 7 300 000 m^3 and this airspace is being used up at a rate of 180 000 m^3 per annum. Rietfontein has available airspace of 7 020 000 m^3 and this airspace is being utilized at a rate of 180 000 m^3 per annum. Rietfontein is therefore expected to last the next 39 years at this rate of airspace utilization. Goudkoppies has an even bigger airspace of 11 068 922 m^3, which is being utilised a relatively quicker rate of 357 335 m^3. This rate of utilization gives Goudkoppies an expected lifespan of 36 years. The rate of utilization and existing airspace of the Rosslyn facility could not be identified.

Based on the industry respondents that gave information for this status report, most of the generated hazardous waste goes to the H:H site. This means there is relatively less delisting taking place. However, reducing the usage rate of the H:H site by increasing delisting activities ironically has the potential of increasing the usage rate of other landfill sites and therefore reducing their lifespan at a faster rate.

Hazardous waste is likely to increase due to economic growth even with waste minimization activities. Therefore the quoted combined airspace usage 717 335 m^3 for Holfontein, Goudkoppies, and Rietfontein is bound to increase resulting in a reduced lifespan of the existing facilities. In the case of Holfontein site in particular, assuming the increased usage rate of 6% per annum that is based on the aspired economic growth reduces the expected lifespan of the facility by 2 years continuously. In other words, for every year that the usage rate increases by 6% the lifespan of the facility decreases by two years. It is therefore imperative that processes that lead to the erection of commercially viable incinerators/waste destruction and treatment facilities in particular are expedited. This should go hand in hand with facilitating and coordinating recycling and waste exchange ventures.

CHAPTER 9: THE USE OF GEOGRAPHIC INFORMATION SYSTEMS IN THE MANAGEMENT OF HAZARDOUS WASTE

A GIS of the generation of hazardous waste streams in Gauteng will provide strategic information related to where the various types of waste streams are produced (and by whom) as well as where the ideal location of treatment, recycling or disposal sites should be to minimise transportation risks.

The research results from this investigation can be used to develop such a GIS. For example, the study has identified the location of all known generators per sector, based primarily upon the O3bc database. By allocating estimated waste streams to non-respondent companies, based upon survey results from similar respondent operations, it is possible to develop a complete geographic estimate of waste stream production, categorised according to town/region, waste type and sector. This analysis will provide the input for a GIS. Over time accuracy can be improved by researching more operations.

CHAPTER 10: CHALLENGES, NEEDS AND KEY ISSUES

10.1 Duty of care obligation

Other than been given safe disposal certificates the waste generators generally do not ensure their waste stream was handled as indicated by the waste disposal certificate. There are also instances where the disposal certificates do not contain the correct relevant information. Therefore it seems that there is generally no connection between the waste generators and the waste management services providers in terms of the former's duty of care obligation. The cradle to grave principle needs to be supported by enforcement for it to be viable. Given the potential consequences of non-conformance to this principle, it is inadvisable to relegate this to self regulation.

10.2 Training

There is lack of knowledge by the waste generators in terms of the classification of hazardous waste streams they produce and consequently the disposal procedures of such waste. The same lack of knowledge applies to the hazard rating of the various waste streams. Waste generators also mentioned the apparent lack of specialist advice available from the DEAT regarding the correct disposal of hazardous waste. Apparently, in other countries like the USA there are websites available which you can draw this type of information from readily. It would therefore be helpful if there was an interactive website available which refers to waste disposal in the South African context.

Industry players seem to be confused in terms of the current legislation with regard to temporary waste storage on their premises, that is, whether they need to register and get a license for that or whether they need to apply for exemption. Temporary waste storage occurs as a consequence of the slack turnaround time of the waste removal services or warehousing in anticipation of the installation of treatment facilities at some stage in the future.

10.3 Environmental Impact Assessment Process

The current EIA process is perceived to be an impediment for operations that want to divert their waste streams to other applications than landfill disposal. The government must shorten significantly the time it takes to get EIA approvals. At the present rate, by the time approval is given the variables have changed significantly from the baseline and this makes investment decisions near impossible. Using some of the hazardous waste in furnaces and kilns is being put on hold by some operations pending approval from government, and meanwhile the waste gets taken away to landfill unnecessarily.

Some applicants, through their environmental consultants, do take too long to give the information that is required for the finalisation of waste EIAs. In some instances the insufficient information submitted necessitates requests for information several times by the authorities. The new National Environmental Management Act EIA regulations have tighter time frames. Due to these tighter time frames, any inadequate documentation submitted for decision making is rejected, thereby ensuring quicker decision making.

10.4 Co-ordination and facilitation

There are relatively few operations in recycling and they are generally also not well co-ordinated. To increase the number of recycling operations, government should assist prospective recycling companies to set up. Many such companies do not get off the ground as regulations are complicated and prohibitive due to delays associated with regulatory approval. Co-ordination of recycling by government will encourage more operations to consider recycling some of the waste streams that currently goes to landfill.

10.5 Compliance monitoring and enforcement

Regular inspections by the government are needed to ensure that the waste streams declared by the role-players are actually handled as per minimum requirements. This will create certainty on the part of government in terms of what interventions to take. At the moment inspections are not being done as needed because of lack of capacity of the environmental management inspectors. However, with the high profile inspections

being undertaken by the Green Scorpios compliance monitoring and enforcement can only get better.

CHAPTER 11: TRADE ANALYSIS OF HAZARDOUS WASTE INTO AND OUT OF GAUTENG

During the investigation there was no identified movement of waste generated in Gauteng that is transported to other provinces.

Constant sources of such waste streams that are being delivered into Gauteng are the industrial complexes of Sasolburg in the Free State and Secunda in Mpumalanga as well as KwaZulu-Natal where geological conditions of the area are unsuitable for an H:H facility. There are also individual operations in the North West like mines and rubber operations that get their waste streams transported into Gauteng for disposal. Operations based especially in the Brits industrial complex in the North West usually use the Rosslyn facility for landfill disposal.

According to Holfontein, of the total receivings of 420 000 tons, approximately 105 000 tons per annum of hazardous waste comes from outside the Gauteng province. The split of the waste streams per source or province was not available.

CHAPTER 12: DATA CAPTURE, ANALYSIS AND EVALUATION

The volumes of waste generated as received from the various industry respondents was escalated by using the figures supplied by the waste management service providers to arrive at the final figures shown in the report.

As mentioned previously, the data received can also be used to provide estimated input for a GIS. It should be noted however that the sampling for this investigation included only 189 respondents out of a total of more than 3000 operations. This clearly shows that further research would be required to improve the overall quality of the estimates.

CHAPTER 13: OTHER RELEVANT ISSUES THAT ARE IDENTIFIED

13.1 Waste manifest

According to the Minimum Requirements for the Handling, Classification and Disposal of Hazardous Waste (Second Edition 1998) an integrated waste management approach facilitates advanced waste management planning. This investigation has shown that advanced waste management planning is a major identified gap as far as generators are concerned.

There are also delays in receiving waste disposal certificates from service providers in some cases. Furthermore, certificates are not always properly filled in.

13.2 Transportation

Pick up service is sometimes unreliable and this results in waste generators being forced to store their waste on their premises. This means that the waste generating operations could temporarily become hazard waste storage facilities and thus they should be permitted to have the waste stored on their premises.

Better co-ordiantion between National Road Traffic Act regulations and Environmental Management Inspectors (EMIs) could assist in addressing issues regarding illegal transportation of hazardous waste.

13.3 Testing and analysis

Most if not all of the waste generators' facilities are equipped to do testing and analysis pertaining to their respective manufacturing processes only. There are no on-site facilities for the testing and analysis of the waste generated from such manufacturing processes. The waste generators rely on and pay the waste management services companies for this responsibility.

This is more an issue of no facilities rather than lack of skills. While it is the duty of the waste generators to generate a waste manifest for the waste they generate, there is no legal obligation on their part to have the testing and analysis facilities of their own and the turnaround time is not as quick as it should be. There is also a perception in the minds of the waste generators that the waste management services companies make the results look worse than they actually are so that they could charge the generators more money.

The government should consider establishing independent laboratories that the industry could use rather than every waste generator having their own in-house laboratories.

13.4 Resource recovery

For the sake of this report the term resource recovery is being used to encompass activities such as waste prevention, re-use and recycling, which has been covered already in the report. Measurement of waste prevention and minimization is difficult unless conducted continuously. What is clear though is that the waste generators are involved in waste prevention and minimization largely because of regulatory obligations and business optimisation measures.

In the case of recycling, the waste generators are not optimally involved. One of the reasons for this situation relates to non-adherence to the cradle-to-grave principle. Other than the use of waste as heating fuel (e.g. solvent and rubber waste used for cement kilns) and the recycling of batteries, metal and plastic drums there are no other known recycling ventures that the waste generators are involved in.

Other potential ventures like the use of salt streams in fertilizer manufacturing and aluminium dross in the cement industry are still being investigated by some role-players jointly with their respective waste management services providers. Efforts by the waste generators to use other types of waste streams (e.g. oil absorbents) as heating fuel are apparently being hampered by red tape from the government. The plastics and rubber as well as the transportation industries are the only sub-sectors that have industry-wide structured recycling taking place. Thanks largely to the relative homogeneity of their respective waste streams.

As a result of lack of testing and analysis facilities by the waste generators, the burden to research the feasibility of recycling more of the hazardous waste streams increasingly lies with the waste management services providers. Waste generators do not have the necessary skills and attitude to do this and it would benefit everyone if recycling of the waste streams could be evaluated jointly by both the waste generators and waste management services providers.

The focus on the use of waste for energy suggests that other recycling ventures may not be economically viable, hence no such activities have been identified. Not unless there are incentives for recycling the waste generators will continue to shun other recycling ventures. In some cases generators mix various hazard waste streams before disposal. A regulatory provision should be made to prevent mixing of different classes of hazardous waste streams. This will improve the potential to recycle or treat some of the waste streams.

Waste generators and recyclers mentioned that there is a lot of red tape involved in recycling and it is difficult to get authorization to recycle. In addition there seems to be not enough bins/containers available to the waste generators for collection of different types of waste in order to allow for separation per type of waste streams The fact that there are no government incentives for recycling could also be construed as one of the contributing factors to the scarcity of recycling activities.

CHAPTER 14: POTENTIAL OF ESTABLISHMENT OF HAZARDOUS WASTE RECYCLING CENTRES AND CLUBS

First and foremost a factor that could lead to the viability of any recycling venture is the separation of the waste at source. Currently there is little or none of this taking place at the waste generators side. Doing the separation at any other point in the value chain past the generators comes with significant risks. It is better to sort the waste stream before it leaves the generators' premises.

Waste minimization initiatives by hazardous waste generous will in the long run make waste exchange unviable as they will be little usable waste being produced by the generators.

The increase in car sales and earthmoving equipment as a result of big infrastructure project going on will result in an increase of used oil in the short term. However, in the long term improved engine technology that extends service intervals will reduce the production of used oil.

Solvents are usually the most feasible to recycle for cleaning applications. However, the reduction in the production and use of solvent based paint in favour of water based paints also mean that solvent reclamation from waste paint will no longer be feasible in the long run. Also, off-spec products are usually blended back into production. The waste solvent is usually reclaimed by distillation into cleaning thinners.

The government should also come to the party in terms of facilitating recycling ventures by serving the role of a broker between the various waste generating industry associations as the associations would not be able to achieve this on their own as well as providing incentives for recycling.

CHAPTER 15: STATUS QUO/ GAP ANALYSIS AND NEEDS ASSESSMENT

Government service is perceived to be too slack as the government does not react swiftly to applications for the establishment of recycling and treatment facilities. The same applies as far as delisting is concerned.

Waste treatment and recycling has got regulatory issues that may not be receiving the necessary attention as quickly as it is necessary. For example, any such facility would automatically become a hazardous waste storage facility due to a temporary breakdown for instance. It is therefore necessary to ensure that the handling and intermittent storage for these facilities is done according to sound principles. The same regulations that apply in terms of hazardous waste disposal sites (H: H) should apply for these treatment and recycling facilities.

While the government actively wants to reduce the volumes of hazardous waste going to landfill, it seem not to have the capacity to deal with the applications brought by operations that want to set up alternative (to landfill) hazardous waste handling facilities.

CHAPTER 16: REPORTED INCIDENTS

One of the largest sources of hazardous waste is the non-recurrent and incidental spillages that occur as a result of tanker accidents and other incidents and emergencies. Such accidents usually call for massive clean-up operations and sometimes the spilled cargo contaminates the environment before containment and clean-up operations begin. These incidents are unpredictable and therefore difficult to predict or quantify. The frequency of occurrence of such incidencts could not be verified for the purpose of this study since the Department of Transport does not keep historical data of such incidents. The Department mentioned that they only investigate the cause of such incidents.

The information that was available on the chemical spillages and/or incidents in/around Gauteng in the last two years is summarised below.

According to South African Press Association, on 30th July 2006, a toxic spill on the N1 hospitalised three people. 21 000 litres of nitric acid spilled from a tanker truck on the N1 north of Pretoria. The tanker truck had stopped at the Panorama Petroport and tollgate on the N1. The spill occurred at about 15:00 on Saturday. Three employees from the abovementioned companies were taken to Montana hospital after being affected by the fumes. Nitric acid is highly toxic and used for cleaning steel and metals. Roads were closed. The area was evacuated as a huge cloud of reddish smoke spread across the free way. The spill was neutralised with lime after which it was cleaned up. The possibility of sabotage was not ruled out as the valves of the truck were found to be open. According to the driver, the truck started leaking while on the N1. After consulting with his bosses he stopped at the Petroport where the massive leak happened. The driver was not harmed. The road was re-opened late on Sunday night. Article available on [http://iafrica.com/news/sa/390795.htm].

On the 20th May 2007, Don Robertson of Sunday Times wrote an articled called "Beware of an R10m fine if you rubbish new waste law"

The National Environmental Waste Management Bill which was tabled in parliament in July would have serious consequences for industry and landowners. If found guilty of non-compliance with the regulations, those could face a fine of up to R10-million or 10

years in prison, or both. An industry will no longer be able to claim that it is using a 'raw material' rather than 'waste' for the production of new products.

Recycling companies will be subjected to more stringent tests. To recover, re-use and recycle waste will be an offence, unless that procedure uses fewer natural resources than disposal would and less harmful to the environment than disposal would be. In addition, having 'contaminated land' will have serious effects on land owners. Previously, land owners who contaminated their property and later sold it, would not have been held responsible for future problems, but in terms of the new proposed legislation, owners of land having high-risk activities or land that has been contaminated will have to undertake the necessary steps to ensure that it is contamination free. The proposed Act is retroactive. If the land is declared as a 'redemption site' it will be placed on a register and can then only be sold with the permission of the Minister of Tourism and Environmental Affairs or alternatively the MEC of the province. 'Investigation areas' will be identified as those lands which have high-risk activities taking place or had taken place or that is merely suspected of as being contaminated. It is termed as retrospective as the contamination refers to the 'presence of a significant risk or harm'. This is applicable whether or not that risk occurred before the Act commences. The determination of 'significant risk' includes situations where harm in the future is reasonably foreseeable. The first discussions were held with major stakeholders and closed on April 12. The plan is to promulgate the Act in July, but it might take longer. The Act might implicate companies such as Mondi and Sappi (who use recycled paper) and Consol and Nampak (who use recycled glass). The Bill however does not clearly define what raw materials are and what waste is and as the Bill stands, the definition of waste is problematic.

Sunday Times May 20 2007 NEWS

Beware of a R10m fine if you rubbish

DON ROBERTSON

THE National Environmental Waste Management Bill, which will be tabled in Parliament in July, could have serious consequences for industry and landowners.

Those found guilty of non-compliance with the regulations could face a fine of up to R10-million or 10 years in prison, or both.

Glendyr Nel, of the Shepstone & Wylie attorneys environmental division, said an industry will no longer be able to claim it is using a "raw material" rather than "waste" for the production of new products.

Recycling companies will now be subjected to more stringent tests. It will be an offence to recover, re-use and recycle waste unless that procedure uses fewer natural resources than disposal would — and is less harmful to the environment than disposal would be.

In addition, the implications of having "contaminated land" will also have a serious effect on land owners, said Nel.

In the past, land owners who contaminated their property, and later sold it, would not be held responsible for future problems.

In terms of the proposed new legislation, owners of land on which high-risk activities have taken place — or land that has possibly been contaminated — will have to undertake the necessary steps to ensure it is free of contamination.

The proposed Act will also be retroactive.

If the land is declared a "redemption site" it will be placed on a register and can only be sold with the permission of the Minister of Tourism and Environmental Affairs or the MEC of the province.

"Land on which specified high-risk activities are taking place or have taken place, or land that is merely suspected of as being contaminated, may be identified as 'inves-

Figure 1: Don Robertson, May 2007, Sunday Times "Beware of an R10m fine if you rubbish new waste law"

South African Press Association, on the 19th July 2007 reported about ACSA: Dam water clean following 2006 fuel spill. Blaauwpan Dam near OR Tambo International Airport, which had been contaminated when jet fuel was spilled it, has been reported as clean by the Airports Company South Africa (ACSA). Chris Hlekane (General Manager at the airport) stated that tests conducted on the water samples indicated that the water is clean of any contamination. Fuel was spilled into the storm-water system that leads into the Blaauwpan Dam in November. Clean up steps that were taken, include the systematic removal from the water, soil and in between reeds. Plants that have had fuel trapped were completely removed. A soil-vapour survey, organic-content evaluation and soil sampling was used to determine the recovery extent and the requirements for the remediation process. ACSA has spent an estimated R6 million on clean-up operations as well as R50 million on systems to ensure that such incidents do not recur. ACSA has stated that they are committed to restoring the dam as close as its former state. Article available on [http://www.mg.co.za/articlepage.aspx?area=/breaking_news/breaking_news__national/&articleid=314444&referrer=RSS].

Gauteng Department of Agriculture, Conservation and Environment, on the 28th June 2007, published an article about the Green Scorpions shuting down a dangerous health waste facility. Green Scorpions shut down health waste treatment facility in Ekurhuleni. The closure of Aid Safe Waste was preceded by a lengthy process aiming at resolving the unacceptable operating conditions on site. The process comprised of onsite compliance inspection, official notice of intention too close the facility if the operating standards were not improved as well as direct interactions with officials in charge at the facility. The onsite inspection exposed unacceptable disregard for the permit conditions. This includes improper storm water management, which resulted in blood-contaminated water leaking into the soil and possibly polluting the groundwater. The inspection also exposed poor storage practices that lead to box containers of medical waste disintegrated and thereby exposing the contents. This includes human tissue. The facility was accepting more waste than it could handle and it led to waste being stored for unacceptably long periods of time. The facility failed to comply with pre-determined feed rates of the incinerator caused overloading. This lead to the emission of thick black smoke. As a result of media coverage, it was revealed that the local community was exposed to unacceptable risk of contracting diseases as a direct result of the improper health waste management system of the site. The Gauteng Department of Agriculture, Conservation and Environment have vowed to keep the

facility shut until all processes have been complied with. The Department has decided to take it upon itself to conduct a public participation process. Article available on [http://www.gdace.gpg.gov.za/html/News_Article_26_2007.htm]

Fourie on behalf of South African Press Association published an article on the 29th May 2007, called "Mittal Steel first on Green Scorpions' to-do list". An Inspection by the Green Scorpions of Mittal Steel's Vereeniging plant has started. They are aided by officials from the Water Affairs and Forestry Department and the Sedibeng municipality. They are checking whether the steel company complies with environmental legislation at its Vaal Triangle plant. The inspection marks the launch of a national environmental compliance campaign in the iron, steel and ferro-alloy industry. During the campaign ("Operation Ferro") about 40 sites in Gauteng, Mpumalanga, North West, Kwa-Zulu-Natal and the Western Cape will be inspected by the Green Scorpions. The government has prioritized the ensuring of environmental compliances in the sector, as industrial processes may contribute significantly to pollution if not managed appropriately. The article is available on [http://www.mg.co.za/articlePage.aspx?articleid=309780&area=/breaking_news/breaking_news__national/].

Reato of South African Press Association reported on the 19th July 2006 that Mittal Steel was guilty of 'dumping hazardous waste'. Mittal Steel Company contravenes environmental laws at their facility in Vereeniging. Some of the company's activities had been taking place without proper environmental authorisation. It includes the dumping of hazardous waste on a site without a permit despite repeated instructions from authorities as well as emissions into the air that cause, have caused or may cause significant and/or serious pollution of the environment. The furnaces on site are dust generators of hazardous waste. Surface and groundwater pollution with phenols, iron, oil, fluoride and other hazardous substances from the plant has been found. The area has been identified as an air-pollution hotspot by Environmental Affairs and Tourism Minister Mr Marthinus van Schalkwyk. Steps that are being taken against Mittal include a possible criminal investigation into the dumping of hazardous waste (furnace dust). Joanne Yawitch (deputy director-general) said that although Mittal has started with applying an environmental master plan, it was not enough and that they will have to spend time and capital to rectify the situation. The Green Scorpions have conducted a compliance inspection at the Vereeniging site on May 30. The article can be accessed on

[http://www.iol.co.za/index.php?set_id=1&click_id=14&art_id=nw20070719172115161C331535

On the 4th October 2007, Department of Environmental Affairs and Tourism published an article about serious environmental transgressions found at Highveld Steel.

The Green Scorpions found serious environmental problems at Highveld Steel's vanadium plant, which included excessive amount of Sulphur dioxide from the plant's processes (between 40 -60 tonnes are emitted every day). Serious exceedances of permitted emission limits for ammonia (till 15 times the limit) and dust (27 times the limit). Significant contamination of groundwater is linked to the unlined and unpermitted hazardous waste dump on site as well as the lack of separation of storm and process water on site. The articled can be accessed on: [http://www.environment.gov.za/NewsMedia/MedStat/2007Oct4/04102007.html]

On the 17 October 2007 the Department of Environmental Affairs and Tourism, reported Arcelor Mittal's Vereeniging plant In July 2007,Inspectors found on-compliances with the following, a series of unauthorized activities, continued dumping of hazardous waste on unpermitted site, despite repeated instruction to cease such activity, particulate emissions to air that cause, have caused or may still cause significant environmental pollution, serious pollution of surface and groundwater with phenol, iron, oil, fluoride and other hazardous waste substances, as well as the failure to lodge audit reports.

According to Chris Barron of Sunday Times, on the 24th October 2007, Archelor Mittal ceased Vaal dumping**.** Archelor Mittal ceased waste disposal at the Vaal site after being ordered to do so by government. Waste disposal has been halted as a result of air and water pollution occurring and the dumping of hazardous waste. The dumping was halted after the Green Scorpions shut down all operations at the Vaal site. The company has until end of December 2008 to remove the hazardous waste and to address the serious pollution resulting from its historical disposal.

At Assmang ferromanganese operation in Cato Ridge, Environmental Management Inspectors found non-compliances including significant uncontrolled dust emissions, containing manganese, serious non-compliances with a hazardous waste site permit and atleast one permitted hazardous waste site. Article available on: [http://www.environment.gov.za/NewsMedia/MedStat/2007Oct4/04102007.html

On the 11th October 2007, there were reports of sewage spills into Gauteng Rivers. It has been reported by the South African Broadcasting Corporation (SABC) that more than 200-million litres of raw sewage have spilled into three rivers in Gauteng. The rivers affected were the Apies, Hennops and Pienaars rivers. The spillage was reported to have been caused by power failures at sewage works as a result of Eskom's load-shedding programme. No official notification was sent to the SABC by Eskom about the load-shedding. Engineers from the Tshwane metropolitan council said that it could take up to three weeks to correct the system. The raw sewage did not contain any oxygen and the eggs of parasites in the water held severe health risks for animals and people. SABC, South African Press Association, September 2007.Article available on: http://www.mg.co.za/articlepage.aspx?area=/breaking_news/breaking_news__national/&articleid=321720&referrer=RSS

On the 17th October 2007, the south-bound lane of the N1 highway was blocked due to a toxic spill. A tanker transporting 98% sulphuric acid tipped over near the John Vorster offramp losing about 10 000ℓ litres of the toxic load. The clean up involved spreading a powerful product to soak up the spilt chemical that was swept up and loaded into containers. The stormwater drains were cleaned up and the sulphuric acid was covered with lime which is then recovered and then thrown into bins. The road surface is cleaned with clean water (Bateman, B & G Gifford, The Star October 2007).

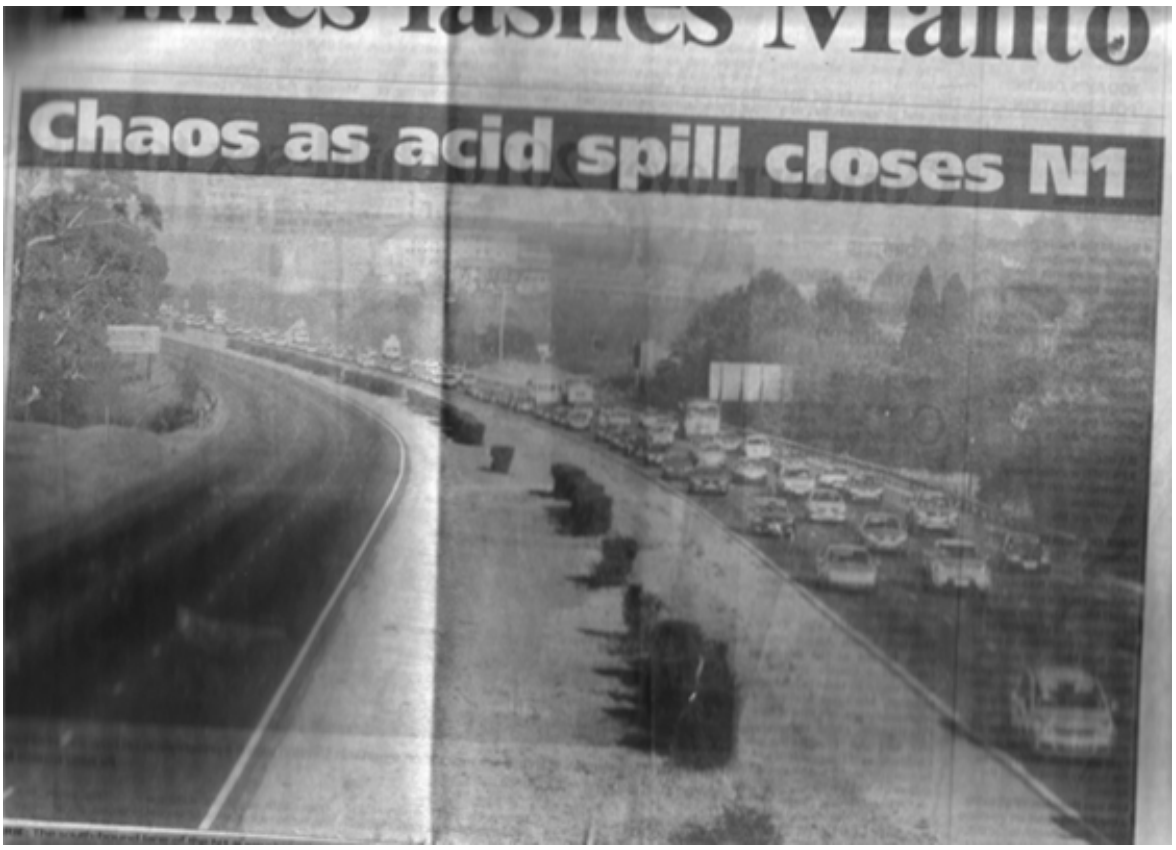

Figure 2: The south-bound lane of the N1 highway was blocked due to a toxic spill.

South African Press Association reported on the 4th September 2007 that 'cooking oil poses new risk to bird sanctuary'. Thousands of liters of cooking oil have leaked into a Bird sanctuary in Gauteng. It followed a burst in a tank at Nola. This is the second such spillage in seven years to affect the Con Joubert bird reserve. It has been reported that the oil was floating on top of the water and that it has seeped up to two- and –a half metres into the soil. The company could not be reached for comment. The oil was reported to have seeped into the soil and peat of the wetland and it would require extensive rehabilitation. The People for Wildlife organization had already started taking birds into a rehabilitation centre. It was reported that Nola was seeing to the problem and that they were doing their job, but that the damage was already done. Parliamentary records showed that Nola had cleaned up pollution caused by a chemical spill at the wetland in December of 2005. The article is available on: [http://www.iol.co.za/index.php?set_id=1&click_id=3045&art_id=nw20070903224540797C776259].

It was reported by the Citizen on Saturday the 27th October 2007 that Thousands has been evacuated after spill**.** A truck has overturned on the N3 highway. It was carrying sodium cyanide. The incidence took place between the R23 Balfour exit and the R24

Nigel exit at about 03:00. The truck driver died in hospital after inhaling the hazardous chemical. People in the surrounding areas were evacuated as a precaution. Due to the prevailing rain, the emergency services were unable to remove the highly toxic chemical and were forced to cover it up as when exposed to water it turns into a gas.

GAS MASKED. Emergency workers clean-up near Heidelberg as thousands of people were being evacuated from their homes along the N3. *Picture by CNS*

UNION QUESTIONS PLANT START-UP

THE Enterprise food plant where a gas explosion occurred should be shut down for three days, until an inspection into its cause was concluded, said the Food and Allied Workers Union (Fawu).

"Fawu is appalled the company is still doing business as usual in other departments.

It said an inspection by the departments of Labour and Health should first be completed.

"We are of the opinion that it's reckless to continue business while the reason for the explosion has

Thousands evacuated after spill

MICHAEL MENTZ

HEIDELBERG – A few thousand people, some of them primary school children, had to be evacuated after a truck containing deadly sodium cyanide overturned on the N3 highway early yesterday.

Chaos broke out when news of the spill reached the people in the area. Residents fled for their lives in the fear they might inhale the poten substance which killed the driver of the truck.

The incident took place between the R23 Balfour exit and the R24

Snip

Used in gold mining, sodium cynanide can render a person unconscious within ten seconds if inhaled, and is usually fatal.

reported.

Police drove around the Rensburg suburb in the south of Heidelberg warning people over loud-

their parents fetched them.

The spill caused massive traffic congestion on the highway, and vehicles had to be diverted along the R23 road.

Due to prevailing rain, emergency services were unable to remove the highly toxic chemical, and were forced to cover it as exposure to water results in the substance turning into a gas.

"The situation is under control as emergency services handled the chemical spill professionally," said Lesedi Municipality manager Piet van den Heever.

not to allow it access to the record of the SABC's enquiry into the blacklisting of certain commentators, but has vowed to fight on.

The decision was handed to the Independent Communications Authority (Icasa) this week by its own complaints compliance committee.

Institute director Jane Duncan said the decision denied all in SA the right to an explanation by the SABC as to what it had done to address blacklisting and other abuses exposed by the commission.

Duncan said the FXI would seek written reasons for the decision from the authority, then consider legal options. – *Citizen Reporter.*

NO LONGER ST LUCIA

■ FROM November 1 South Africa's first listed World Heritage Site will have a new name.

iSimangaliso Wetland park replaces the Greater St Lucia Wetland Park.

Reasons for the change include that the Caribbean island country of St Lucia with its own newly-listed World Heritage Site dilutes the brand value of the South African one, the Wetland authority said.

The name change also better reflects a park that is 220 000 ha in size against the 90ha St Lucia village after which it was named.

Environment Minister Marthinus van Schalkwyk said the change was necessary as the park had outgrown St Lucia. – *kimh@citizen.co.za.*

R2,4M FOR STADIUM

■ NELSPRUIT – Despite Mbombela Municipality's massive shortfall of funds to develop a central dumping site, the R2,4 million budgeted for the project will now be spent on the Cosafa U/20 Soccer Championship tournament.

The money will be used for the upgrading of the KaNyamazane and KaBokweni stadiums to meet the required Fifa standards for hosting the event from November 29 to December 10.

But the council needs R16,6 million of the budget allocation for the 2007/8 financial year for the new Tekwane West Central Waste Disposal Site. DA councillor Corn Boo

Figure 4: The Citizen, 27th October 2007. "Thousands has been evacuated after spill"

On the 27th October 2007, there were **Calls for Germiston meat factory to be investigated.** Sections of the Enterprise meat factory have been shut down after a major leak has been reported. Eighty two workers were hospitalised and a further 120 have been evacuted following the leak. A pipe carrying ammonia nitrate has been reported as being damaged. The area is being cleared of the potentially fatal gas. (The Food and Allied Workers Union's Katishi Masemola) the article is available on: [http://www.702.co.za/news/archives.asp?action=search&date=2007.10.27]

APPENDIX A: THE QUESTIONNAIRE

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VAT No. 4550208906

O_3bc™

MARKET SURVEY OF
HAZARDOUS WASTE STREAMS IN GAUTENG

~ Confidential Questionnaire ~

1. **Company Name** : _____
2. **Holding Company** : _____

3. **Telephone Number:** _____
4. **Fax Number** : _____
5. **Physical Address** : _____
   _____

6. **Name of Contact** : _____
7. **Position Held** : _____
8. **e-mail address** : _____

9. **Date** : _____

10. **Sites included in this quest** : _____
11. **Other sites excluded** : _____

12. **Market Sector** : _____
    Major Products : _____
    _____

13.1 Production of hazardous waste[1] streams (<u>excluding infectious and other hazardous waste from health care institutions)</u>:

Hazardous Waste Stream	Physical Form (Liquid, Solid, Sludge)	Hazard Rating (Extreme, high, moderate, low)	Production Volume (tons/month)	Process or method leading to waste stream production (e.g. spills)	Method of Collection	Chemical Composition (Contents and concentrations)

[1] Hazardous waste is defined as waste that has the potential, even in low concentrations, to have a significant adverse effect on public health and the environment because of its inherent toxicological, chemical and physical characteristics.

13.2 What is your current method of pre-treatment and and/or disposal for these waste streams?

Hazardous Waste Stream Class (1 to 9) e.g. flammable liquid/solid	Pre-treatment Method	Service Provider	Hazard Rating After Treatment	Disposal Method	Cost of Disposal	Service Provider

ADEQUACY OF EXISTING SERVICES AND FACILITIES AND CAPACITY FOR TREATMENT AND DISPOSAL

14.1 Do you have backlog hazardous waste streams on your site/s and why?

_____

_____

_____

_____

14.2 What would you regard as problems, needs and key issues relating to hazardous waste management in Gauteng particularly on aspects such as monopolies, competition, pricing, quality (ISO 9000, 14000 and 18000) and technology options?

14.2.1 Transport _____

_____

_____

_____

_____

14.2.2 Treatment _____

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14.2.3 Disposal _____

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14.2.4 Incineration _____

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FACTORS INFLUENCING WASTE PRODUCTION GROWTH

15.1 What is your expected growth or decline in production output at this site for the next 5 and 10 years? _____ 5 years; _____ 10 years

15.2 What are the major drivers for this anticipated growth or decline [e.g. planned capacity extensions, export growth, environmental pressures, etc.]

_____

15.3 How do you expect your waste and effluent volumes will grow or decline in relation to your production output? _____

_____

15.4 If your waste and effluent volumes are expected to grow or decline at a different rate to your production output at this site, what are the reasons for this? _____

_____

15.5 Do your company have an overall hazardous waste policy, and what are the major objectives (e.g. cleaner production)? _____

_____

15.6 Do you actively strive to minimise or recycle hazardous waste streams?

_____

15.7 What are the estimated sizes of the hazardous waste generating sites within your group that are not included in this questionnaire, compared to the sites that are included, in terms of hazardous waste production?

_____

_____

_____

_____

CLEANER PRODUCTION TECHNOLOGIES

16.1 Are there technologies that you are aware that you can implement in your processes to ensure waste reduction [cleaner production approach]?

_____

_____

16.2 Do you have definite plans to implement any of these technologies?

_____

16.3 What, if any, are the factors preventing implementation of cleaner production technologies? _____

_____

_____

WASTE EXCHANGE

17. If current waste streams are recycled and recycled products are sold or bought back:

17.1 Which waste streams and what volumes are recycled?

Waste streams recycled: _____

_____

Volumes recycled: _____

_____

17.2 What is the cost of the recycled products? _____

17.2 What is the recovery rate (%)? _____

17.3 What are applications of the recycled products? _____

_____

_____

_____

17.4 Do you handle any other hazardous waste streams outside of your own site/operations and/or outside of the province (Gauteng)? _____

_____

_____

_____

17.5 What government intervention would assist your company to have improved waste management.

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