

**Shongweni Hh Landfill Site,
KwaZulu Natal**

External Compliance and

Environmental Audit

April 2009

Report prepared for:

Clive Kidd
Manager
Shongweni Waste Management Facility
P O Box 15005
Westmead, 3608

D A Baldwin, Ph.D., Pr.Sci.Nat, MIWM, MSACI
Director, En-Chem Consultants cc
P O Box 10324, George, 6530
Tel: 044 874 3638; Fax: 086 689 7896

Executive Summary

In terms of its permit, the Shongweni Hh Landfill must be audited biannually by an independent external auditor. This audit was accomplished by Environmental and Chemical Consultants during an on-site visit on the 29th and 30th April 2009 and by a thorough review of all available reports from staff and consultants.

Two audit forms are used by the auditor. The first is the *Compliance Audit Form*, which is simply a listing of all the requirements of the Shongweni Landfill Site Permit and any subsequent amendments. The second audit form, the *Environmental Management Form*, is based on the ISO 14001, Environmental Management System. The latter is important as various management systems and requirements must be in place in a company to ensure that it can comply with not only its permit requirements but also the companies own internal policies and procedures.

The audit shows that the Shongweni Hh Landfill is meeting its permit conditions and is not having a significant impact on the environment, in terms of possible surface, ground water and even air pollution, although a number of complaints about odours have been received.

Of the 114 auditable conditions only one (1) was considered by the auditor to be in partial compliance and one (1) in non-compliance. Using the points system, 2 points for compliance, 1 point for partial compliance and 0 points for non-compliance, the Site is 98.7% compliant with its permit higher than the 98.4% obtained in the previous audit.

The conclusions and recommendations are:

- (i) No changes have occurred in the permit conditions since the last audit.
- (ii) The Department refused to give permission to stop the use of chlorinated lime to treat obnoxious wastes in a letter dated 9th December 2008 because of “insufficient evidence” that chlorinated lime reacts with waste and leachate had been provided. This is unfortunate as the evidence is overwhelming that chlorine chemicals react with waste and leachate.
- (iii) The staff at Shongweni has started to draw up the spreadsheets to determine the total load of various hazardous components that are accepted at the site as these are now required by the Department of Environment Affairs and Tourism. However, these calculations will probably take up to a year, as the site has to re-sample and analyse a large number of treated wastes. The auditor recommends that the top 10 or possibly 20 wastes in terms of volumes are analysed first.
- (iv) The average monthly amount of waste disposed at the site for the period April 2008 to March 2009 was 22596 tons. All the wastes meet the permit conditions.
- (v) The amount of sanitary waste accepted during March 2009 was 19.9 tons and is in excess of the 18 tons/m allowed by the permit, although the average amount for October 2008 to March 2009 was only 15.9 tons/m. If the amounts are expected to frequently exceed the 18 tons/m limit, then Department of Environment Affairs and Tourism should be requested to increase this limit, although this is the first time the auditor has noted an exceedance of this limit in at least 3 years.
- (vi) The average co-disposal ratio for the site for April 2008 to March 2009 was 7.23, i.e. in excess of the target value of 7.0.
- (vii) Jones and Wagener reported that the site stability is good.

- (viii) The storage of untreated health care risk waste on-site has been stopped due to an agreement with another waste company. It is recommended that the cold storage container be removed from site as soon as possible.
- (ix) According to the complaints register 20 vagrants/pickers were reported to be on-site on the 23rd April by a resident, Brian Cuniffie, who was on-site to dispose of some waste. The rapid action of both the staff at the landfill and the Security Company on learning of the incident is highly commendable.
- (x) As some organic samples that may result in volatile organic compounds, the issue of whether the refrigerator used for storing the samples is truly explosion proof was discussed during the audit. Alma Bowles will investigate this issue before the next audit in October 2009.
- (xi) The plans for upgrade the leachate collection into 3 closed plastic tanks have been submitted to Department of Environment Affairs and Tourism and have been approved: construction will start immediately. The use of closed tanks will reduce the odour emanating from the current open tank system as this area is one of the main odour producing areas of the site.
- (xii) The monitoring of the gas emissions and the possible impact on-site and at selected off-site locations by Margot Saner & Associates shows that the site is having a very low health and safety impact. The monitoring programme is running well and there appears to be no changes necessary. Ambient dust monitoring should be undertaken during this year.
- (xiii) The next annual Water Quality Monitoring Report by Jones and Wagener is only due in July 2009 and will be reviewed in the next audit. The water quality data obtained since July 2008 is the inorganic results for the 16th October 2008 and 9th January 2009 sampling campaigns were provided:
- The upstream and downstream water quality values for the EC are below the Domestic Water Quality target value and that the downstream surface water quality continues to improve.
 - The surface water quality continues to be good both upstream and downstream.
 - Sampling position SW 2 at the railway line has been dry since December 2004 and the analytical results on the sample obtained in January 2009 indicate that the water quality is very similar to that measured in 2003 and 2004.
- (xiv) Samples from the Mgoshongweni River were collected by Umgeni Water on 19th March 2009 and the results reported on the 16th April: the water is according to the results in good health.
- (xv) No incidents that could have resulted in contamination of the environment occurred during this audit period.



D A Baldwin, PhD, Pr.Sci.Nat

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1 Introduction

The Shongweni H:h Landfill Site is permitted in terms of section 20 (1) of the Environmental Conservation Act, 1989 (Act 73 of 1989) to accept hazardous waste of Hazard Groups 3 and 4 and delisted waste for co-disposal with domestic waste. The original permit for this site, B33/1/1920/P71, was revised and permit number 16/2/7/U602/B3/Y1/P270 was issued on the 28th August 1997. Subsequently, a major revision of this permit was issued on the 28th August 2005. In addition, amendments to condition 7.2.2.2 were made in a letter dated the 28th December 2005 and conditions 4.2.5, 4.5.3 and 11.2 in a letter dated 7th August 2007. No permit conditions were amended during this audit period. All the current permit conditions are listed in the Compliance Audit Checklist given in appendix 1.

The permit holder, EnviroServ Waste Management (Pty) Ltd., has appointed Dr David A Baldwin of Environmental and Chemical Consultants cc to undertake the external audits of all hazardous waste landfill sites owned by the company. This audit of the Shongweni Hh Landfill is the sixth undertaken by Environmental and Chemical Consultants and was accomplished by undertaking a site visit on the 29th and 30th April 2009, followed by an in-depth review of available reports from staff and consultants.

In terms of the permit conditions, the audit report must:

- Be submitted by the permit holder to the Director of the Department of Water Affairs and Forestry and the Monitoring Committee 30 days after completion of the audit in terms of section 11.2.2;
- Must specifically state that the conditions of the permit are being adhered to;
- Must include an interpretation of available data and test results regarding the operation of the site.

2 Approach to Audit

The audit was accomplished over a period of two days, 29th and 30th April 2009. Present at the audit was the lead auditor, Dr D A Baldwin of Environmental and Chemical Consultants, Ms Alma Bowles, Mr Clive Kidd and other staff, as required.

In addition to the Permit requirement that the auditor demonstrate that the Permit Holder complies with the conditions of the Landfill Permit, En-Chem Consultants also includes an evaluation of the Company's environmental management system. This is important as various management systems and requirements must be in place in a company to ensure that it can comply with not only its permit requirements but also the companies own internal policies and procedures. A simple example is that the Landfill Manager must receive the necessary support and funding from the company's Head Office to allow him/her to meet the Permit Conditions and operate the site correctly. The absence of such support would be an early warning sign that the site operations and infrastructure could deteriorate, hence leading to potential environmental problems in the future.

Two audit forms have been developed by the auditor, Dr D A Baldwin. The first is the *Compliance Audit Form*, which is simply a listing of all the requirements of the Shongweni Landfill Site Permit and any subsequent amendments. The second audit form, the *Environmental Management Form*, is based on the ISO 14001, Environmental Management System. Copies of the audit forms completed during the audit are included as Appendices 1 and 2 of this report.

In addition, a normal Monitoring Committee Meeting was held at the Assagay Hotel on the 30th April 2009. The auditor gave a presentation at the meeting that introduced the main findings of this audit: a black and white copy of the presentation is included as appendix 3. This meeting was preceded by a site visit that included EnviroServ staff, the Authorities and the Auditor; no residents attended the meeting.

3 Future Developments in Legal Requirements

This section is included in the audit to make interested and affected parties aware of developments in the legal requirements associated with the management of wastes that may have an impact on the future engineering and operational practices at the site.

3.1 Revision of the Minimum Requirements Documents

Department of Environment Affairs and Tourism's project to benchmark SA's classification procedures and the Minimum Requirements against international approaches started on the 9th March 2009 and is expected to be completed by the September 2010. The project will develop a

revised approach to the classification of hazardous waste. The auditor is one of the hazardous waste consultants on the project and will inform the monitoring committee and EnviroServ of the progress of the project.

3.2 Publication of the Waste Bill

The Waste Bill was passed during March 2009 and now becomes known as the Waste Act (59 of 2008).

3.3 Waste Tyre Regulations

The waste tyre regulations were published in February 2009, which has the purpose of regulating the management of waste tyres. It is expected that the regulations will generate a number of empowerment jobs, particularly in the collection of the tyres.

3.4 Globally Harmonised System for the Labelling of Chemicals

SA is in a period of transition from using the definition of 'Dangerous Goods' as "goods that are capable of posing a significant risk to the health and safety of people or the environment and that are listed in "The identification and classification of dangerous goods for transport", SANS 10228:2003, to using the definitions and requirements that are listed in "Classification and labeling of chemicals in accordance with the Globally Harmonized System (GHS)" SANS 10234: 2007. There will be a period of about 5 years during which South Africa will change over to the GHS, e.g. the current NEMA EIA Regulations (2006) use SANS 10228, whereas the newest proposed amendments to the EIA Regulations issued for public comment (Draft February 2009) use SANS 10234. One of the most important aspects of the GHS is that it also considers the environmental impact of a hazardous material or waste.

4 Main Audit Observations and Comments

The audit included extended discussions with Ms Alma Bowles, Mr Clive Kidd and other members of staff at the site, plus a review of documentation required to assess the status of the site, the compliance to permit conditions and the environmental management system. The results of the external audit are given in the audit checklists, copies of which are included Appendices 1 and 2. The weather was fine on the first day of the audit: see plates 1 to 6 for various views of the site during the audit. The overall impression of the site management was



Plate 1: View of Working Face on Day of Audit: note the area at the back has reached its permitted height (Day 1).



Plate 2: The Public and Small Contractor Disposal Area on Day 1



Plate 3: The Dust Being disturbed by an Ash Vehicle.



Plate 4: View of the Contaminated Storm Water Dam and the Leachate Storage Tank: note the silt in the dam.



Plate 5: Barrier that has been place near toe of site in another attempt to minimise damage due to heavy rain



Plate 6: View from the Top of One of the Leachate Storage Tanks above the Offices: the liquid in the bunded area is direct rainfall and run off from the road.

good:

- Site cover was adequate but a lot of ash was visible.
- Odour levels were acceptable at time of audit: the misting sprays were not operating.
- Fencing of the correct height and in reasonable condition.
- The HCRW storage unit is still on-site even though no waste is being stored.
- Ms Alma Bowles has replaced Ms Kas Govender as the health, safety and environmental officer at the site.

The site complies very well with the permit conditions, the operations on site are good, and this is reflected in the audit checklists. The following should be noted about the permit conditions:

- The current permit contains 132 “conditions”: see appendix 1;
- Eighteen (18) of the conditions are not applicable, i.e. they are conditions that will apply, when the Site is finally closed, on the storage of untreated health care risk waste or they are un-auditable statements. Note that the auditor decided to not count the 8 conditions pertaining to the storage of health care risk waste in this audit because doing so skews the results and makes the compliance seem higher;
- One (1) partial compliance was noted;
- One (1) non-compliance was noted and this is associated with not having a leachate treatment plant on-site;
- The site was 98.7% compliant: higher than the 98.4% obtained in the previous audit.

The landfill team must be congratulated on the very high level of compliance achieved and the additional actions that have been implemented to improve the environmental management on Site.

The most important issues identified in the audit and by the Monitoring Committee are discussed below in the approximate order used in the Compliance and Environmental Audit checklists in Appendix 1 and 2, respectively. The reader is referred to appendices 1 and 2 for a complete list of the conditions evaluated during the audit.

4.1 Legal Requirements and Company Standards

The site complies well with its permit requirements as can be seen by checklist in appendix 1.

The following issues should be noted:

4.1.1 Permit Conditions

- No changes have occurred in the permit conditions since the last audit.
- It is assumed that the permit will be amended to include Valley 2 and any required changes in the current audit conditions that are likely to be retained should be followed up at that time.
- As indicated in the previous audit, application was made for a revision of the condition that requires the use of chlorinated lime to treated obnoxious wastes. However, the Department refused to give permission in a letter dated 9th December 2008 because of “insufficient evidence” that chlorinated lime reacts with waste and leachate had been provided. It is very well known that chlorine reacts with organic compounds in water to produce both phenols and trihalomethane compounds, many of which are classified as extreme hazard compounds in terms of the Minimum Requirements – information on the chemistry is presented in the Department of Water Affairs and Forestry’s Water Quality Guidelines for Domestic Use, 2nd edition 1996. EnviroServ has, however, decided not to appeal this decision and to continue the use of chlorinated lime for treating HCRW and obnoxious wastes, even though this may be a safety risk and lead to higher amounts of chlorinated organic compounds in the leachate.

4.1.2 Load Calculations

In the past, the Department of Water Affairs and Forestry did not insist that H sites undertake total load calculations for the sites. This was at least partly due to the fact that many waste management consultants and companies have serious reservations about both the principles and scientific assumptions and used to develop the approach to load calculations. The opposition to the approach used in the Minimum Requirements to load calculations resulted, at least in part, to the draft 3rd edition not being finalised and the initiation of the project outlined in section 3.1.

However, as load calculation are in the current Minimum Requirements documents, they are a

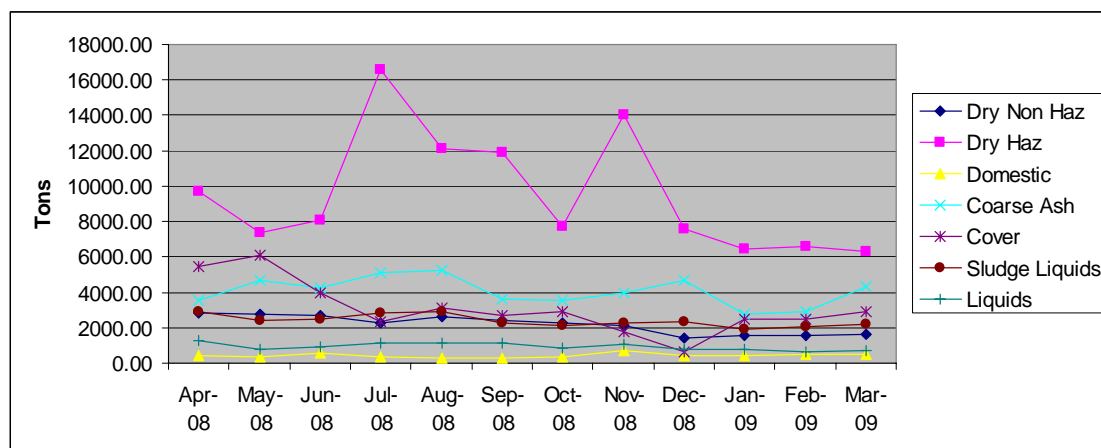
permit requirement and the Department of Environment Affairs and Tourism requires them to be done for each site. Shongweni has started to draw up the spreadsheets to undertake this task. However, these calculations will probably take up to a year, as the site has to re-sample and analyse a large number of treated wastes. The auditor recommends that the top 10 or possibly 20 wastes in terms of volumes are analysed first. This will allow initial calculations to be done to check the calculation procedure and the analytical results before attempting to analyse every hazardous waste accepted at the site. The higher volume wastes will be expected to have the highest load of the most important potential pollutants on the site.

4.1.3 Permissible Waste

Apart from general waste, the site can accept moderate and low hazard wastes plus wastes that have been delisted. Delisted wastes are those that may have originally been classified as extreme or high hazard but have been treated to reduce their impact on the landfill environment and, thus, fall into one of the three allowed classes.

4.1.3.1 Waste Quantities

The graph below gives a breakdown of the amounts of waste accepted at the landfill from April 2008 to March 2009.



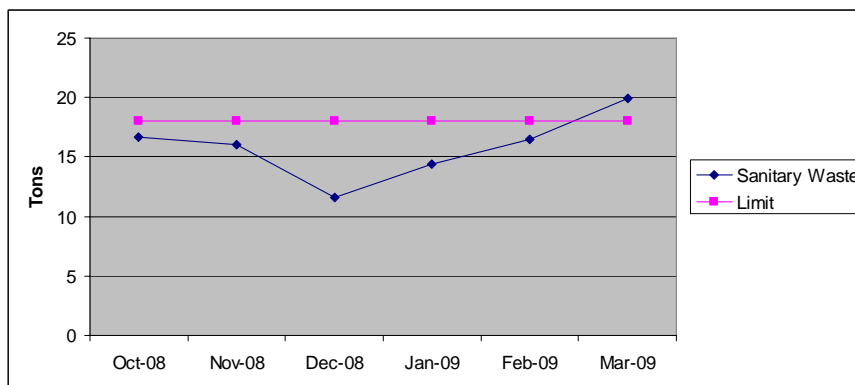
Note that:

- The average monthly amount of waste disposed at the site for this period was 22596 tons.
- Note the high amounts of dry hazardous waste disposed particularly in July to September

2008 and November 2008: this was due to a clean-up.

4.1.3.2 Sanitary Waste

In terms of condition 2.3.1, the amount of sanitary waste that can be disposed is 2.25 tons/ha/m, i.e. 18 tons/m as the Shongweni Landfill has an area of 8ha. The quantities of sanitary waste accepted at the site during the last six months are illustrated graphically above: the highest amount, 19.9 tons, being accepted in March 2009.



Note that the March figure is in excess of the amount allowed, although the average amount for this period is only 15.9 tons/m. If the amounts are expected to frequently exceed the 18 tons/m limit, then Department of Environment Affairs and Tourism should be requested to increase this limit, although this is the first time the auditor has noted an exceedance of this limit in at least 3 years.

4.2 Construction and Development

A number of possible construction and development project are expected at the landfill in the next 12 months, i.e.

- Proposed developments include an upgrade of the leachate collection tank near the contaminated storm water dam: this was mentioned in the last audit. The plans have been forwarded to Department of Environment Affairs and Tourism but approval has not yet been obtained.
- The Environmental Impact Control Report for Valley 2 has been submitted to DEAE and the plans have been approved with the designs for Valley 2 by Department of Water Affairs and Forestry and the Department of Environment Affairs and Tourism. Construction is expected

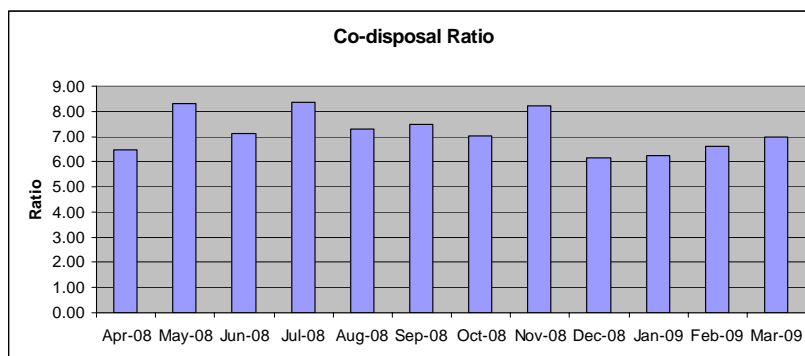
to commence in mid May 2009 and take about 9 months.

- The contaminated water dam has again silted up due to the heavy rains and will be cleaned out in the next month or so.
- The microbial preparation, Archea II has been used successfully in the Eastern Cape, to reduce the organic content of landfill leachate. Application has been made to the DAEA on the 27th February 2009 for permission to run a small scale trial at Shongweni. The results could be quite dramatic over three or four years if implemented, as the COD of the Eastern Cape leachate was reduced from about 10000mg/l to <2000mg/l.

4.3 General Impact Management and Operation of Site

4.3.1 Co-Disposal Ratio

The data given in the Jones and Wagener Report for the period April 2008 to March 2009 are shown below.



The target co-disposal ratio set by Jones and Wagener is 7.0 and a number of months are below this target value, while other values are well above. The average co-disposal ratio for the site for this period was 7.23, i.e. in excess of the required target value. This is acceptable because the co-disposal ratio depends significantly on the amount of rainfall and liquid and sludge wastes that are accepted. During a high rainfall month the co-disposal ratio tends to decrease considerably. April 2008 and December 2008 to February 2009 were particularly wet months with an average rainfall of over 173mm. The quantities should be monitored *monthly* and, if necessary, the amount of liquid waste accepted at the site reduced or, alternatively, more dry ash and cover material accepted on site to ensure that the average co-disposal ratio remains above

the target value of 7.0.

4.3.2 Stability of Site

Jones and Wagener reported that the site stability is good in their report dated 4th April 2009.

4.3.3 Storage of Untreated Health Care Risk Waste

The storage of untreated health care risk waste in accordance with the permit condition 4.5.3 has been stopped, although the cold storage container, which is still on site, should be removed soon as the administrative work can be completed.

4.3.4 Vagrants and Scavengers

According to the complaints register 20 vagrants/pickers were reported to be on-site on the 23rd April by a resident, Brian Cuniffie, who was on-site to dispose of some waste. The incident was immediately followed up by the management team. It was found that the guard had allowed these people into the site; he was immediately transferred off-site by the Security Company and replaced. The South African Police Service was also informed. The rapid action of both the staff at the landfill and the Security Company on learning of the incident is highly commendable.

4.4 Laboratory

As some organic samples that may result in volatile organic compounds, the issue of whether the refrigerator used for storing the samples is truly explosion proof was discussed during the audit. Alma Bowles will investigate this issue before the next audit in October 2009.

4.5 Water Quality Management

The management of the surface water and leachate was being carried out in accordance with the permit conditions.

4.5.1 Leachate Storage

As noted in section 4.2, the plans for upgrade the leachate collection into 3 closed plastic tanks were submitted to Department of Environment Affairs and Tourism and permission was obtained on 24th April with the Approval of the Valley 2 design. The use of closed tanks will reduce the odour emanating from the current open tank system as this area is one of the main

odour producing areas of the site. Some venting of the tanks must be allowed to occur and these may need to be fitted with the same carbon absorption system as the weir.

4.5.2 Discharge of Leachate to Sewer

Leachate is currently discharged to the Southern Wastewater Treatment Works in terms of a permit issued by Ethekwini Water and Sanitation, dated 28th June 2007 valid until 30th June 2008. The Municipality is currently reviewing the permit and have indicated by e-mail that the permission is still valid until the revised five year permit is issued.

4.6 Monitoring

4.6.1 Air Quality and Gas Monitoring

The Air Pathway Analysis System report by Margot Saner & Associates dated February 2009 was provided to the auditor plus reports on the occupational health and safety studies undertaken on site: a copy of executive summary of the first report is given in appendix 4. Andrew Dickson gave a presentation at the last monitoring committee meeting and a copy of this presentation was also provided to the auditor. The results show that:

- Methane concentrations in excess of DWAF Guideline Limit 1% were obtained at probes 5, 13, 14 and 15 and probe 17 was over the upper explosive limit of 15% during the October 2008 and January 2009 campaigns. However, Margot Saner & Associates state that “because of the site topography, it is unlikely that there would be any significant off-site migration of landfill gas – i.e. it poses a minimal risk to off-site receptors”.
- Probes 5, 13, 14, 15 and 17 also showed carbon dioxide concentrations above the guideline limit of 0.5%.
- The flow rates of gaseous emissions from all the probes were low during both sampling periods.
- During the January 2009 sampling period Probe No 13 yielded a result for H₂S marginally in excess of the odour threshold. The remainder of the probes yielded trace results (<1 ppm) or results below the detection limit of the recording instrument (<0.1 ppm)
- On-site and off-site measurements of ambient concentrations of non-methane organic

compounds, hydrogen sulphide, ammonia and formaldehyde were below the UK Environmental Assessment Levels (EALs) during four consecutive sampling periods from August 2008 to February 2009.

- Ambient concentrations of PM10 particulate matter were continuously monitored at an on-site location during a 2 1/2 month period between 2007-10-19 and 2008-01-28. Without exception, all of the results obtained were well below both the DEAT Annual Limit for PM10 ($60 \mu\text{g}/\text{m}^3$) and the proposed ambient air quality standard of $50 \mu\text{g}/\text{m}^3$.
- Margot Saner & Associates recommended that:
 - Real-time continuous dust sampling should again be performed on site during the course of 2009.
 - The locations of the ambient air sampling stations again should be reviewed for the 2009 sampling cycle. Sampling at Location A (on-site) should be reinitiated whilst the continued sampling at three off-site locations needs careful consideration.
 - The ambient air quality data from the Shongweni site will be input into a formal air dispersion model for the site by Airshed Planning Professionals.
- The occupational health and safety surveys undertaken by Margot Saner & Associates on the employees engaged on the Shongweni Waste Disposal Site were minimally exposed to airborne Non-Methane Organic Compounds, Heavy metals and Asbestos during the audit period.

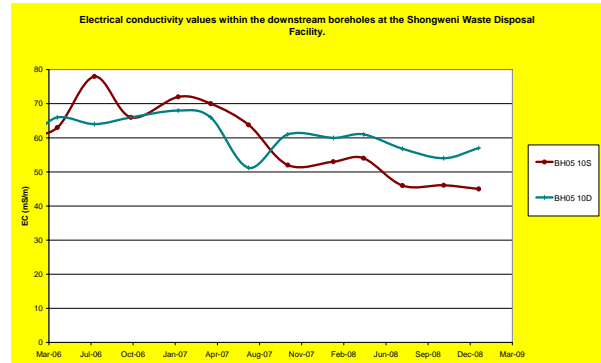
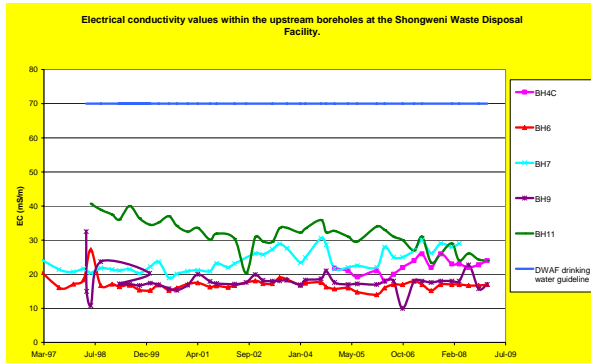
4.6.2 Water Quality Monitoring

The role of the external auditor is to assess the most recent Jones and Wagener report and results to indicate whether he/she agrees with the assessment plus review any additional data obtained since that report. The next annual Water Quality Monitoring Report by Jones and Wagener is only due in July 2009 and will be reviewed in the next audit. The data obtained since July 2008 is the inorganic results for the 16th October 2008 and 9th January 2009 sampling campaigns and these were provided to the auditor: the next set of organic analytical results will be obtained on the July 2009 samples.

The upstream and downstream Electrical Conductivity (EC) results until January 2009 are

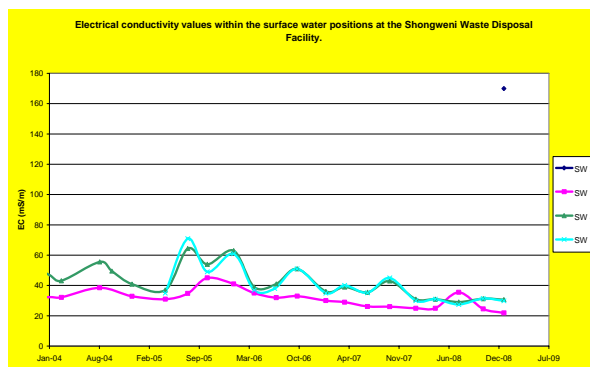
plotted in the two graphs provided by Jones and Wagener below.

The upstream and downstream water quality values for the EC are below the Domestic Water



Quality target value and that the downstream surface water quality continues to improve. The improvement is due to the upgrading of the capturing and pumping system of the sub-soil seepage from Cell 1, 2 and 3 and the Storm Water Dam.

A graph giving the EC results for the surface water quality is shown below. Note that the surface water quality continues to be good both upstream and downstream. Sampling position SW 2 at the railway line has been dry since December 2004 and the analytical results on the sample obtained in January 2009 indicate that the water quality is very similar to that measured in 2003 and 2004.



Samples from the Mgoshongweni River were collected by Umgeni Water on 19th March 2009 and the results reported on the 16th April. The results that were provided to the auditor showed the presence of invertebrate families that have a very low tolerance to pollution in both monitoring positions that show that the water is in good health; the water had no colour or odour

problems.

5 Incidents

Permit condition 12.1.1 requires that “The permit holder must within 24 hours, notify the Director of the occurrence or detection of any incident at the site or incidental to the operation of the site, which has the potential to cause or has caused water pollution, pollution of the environment, health risks or nuisance conditions or which is a contravention of this Permit.” No incidents that could cause an environmental risk occurred during this audit period.

6 Conclusions and Recommendations

The audit shows that the Shongweni Hh Landfill is meeting its permit conditions and is not having a significant impact on the environment, in terms of possible surface, ground water or air pollution. In addition, the site is showing continued improvement in its design, construction and operation, in line with its permit requirements and the environmental policy of the company.

Of the 114 auditable conditions only one (1) was considered by the auditor to be in partial compliance and one (1) in non-compliance: on the day of the audit, the site was complying with the other 112 conditions. Using the points system, 2 points for compliance, 1 point for partial compliance and 0 points for non-compliance, the Site is 98.7% compliant with its permit higher than the 98.4% obtained in the previous audit. Note that the auditor decided to not count the 8 conditions pertaining to the storage of health care risk waste in this audit because doing so skews the results and makes the compliance seem higher. However, it has been noted previously that the Site permit does not include conditions that are frequently included in a permit for a hazardous waste landfill, e.g. the standards and reporting requirements for landfill gas constituents, methane, carbon dioxide and possibly volatile components. Although a request to the Department of Environment Affairs and Tourism to update the permit was submitted more than two years ago, this has not been done. It can be expected that the whole permit will be rewritten because of the approval of the extension to valley 2.

The conclusions and recommendations are:

- (i) No changes have occurred in the permit conditions since the last audit.
- (ii) The Department refused to give permission to stop the use of chlorinated lime to treat

obnoxious wastes in a letter dated 9th December 2008 because of “insufficient evidence” that chlorinated lime reacts with waste and leachate had been provided. This is unfortunate as the evidence is overwhelming that chlorine chemicals react with waste and leachate.

- (iii) The staff at Shongweni has started to draw up the spreadsheets to determine the total load of various hazardous components that are accepted at the site as these are now required by the Department of Environment Affairs and Tourism. However, these calculations will probably take up to a year, as the site has to re-sample and analyse a large number of treated wastes. The auditor recommends that the top 10 or possibly 20 wastes in terms of volumes are analysed first.
- (iv) The average monthly amount of waste disposed at the site for the period April 2008 to March 2009 was 22596 tons. All the wastes meet the permit conditions.
- (v) The amount of sanitary waste accepted during March 2009 was 19.9 tons and is in excess of the 18 tons/m allowed by the permit, although the average amount for October 2008 to March 2009 was only 15.9 tons/m. If the amounts are expected to frequently exceed the 18 tons/m limit, then Department of Environment Affairs and Tourism should be requested to increase this limit, although this is the first time the auditor has noted an exceedance of this limit in at least 3 years.
- (vi) The average co-disposal ratio for the site for April 2008 to March 2009 was 7.23, i.e. in excess of the target value of 7.0.
- (vii) Jones and Wagener reported that the site stability is good.
- (viii) The storage of untreated health care risk waste on-site has been stopped due to an agreement with another waste company. It is recommended that the cold storage container be removed from site as soon as possible.
- (ix) According to the complaints register 20 vagrants/pickers were reported to be on-site on the 23rd April by a resident, Brian Cuniffie, who was on-site to dispose of some waste. The rapid action of both the staff at the landfill and the Security Company on learning of the incident is highly commendable.
- (x) As some organic samples that may result in volatile organic compounds, the issue of

whether the refrigerator used for storing the samples is truly explosion proof was discussed during the audit. Alma Bowles will investigate this issue before the next audit in October 2009.

- (xi) The plans for upgrade the leachate collection into 3 closed plastic tanks have been submitted to Department of Environment Affairs and Tourism and have been approved: construction will start immediately. The use of closed tanks will reduce the odour emanating from the current open tank system as this area is one of the main odour producing areas of the site.
- (xii) The monitoring of the gas emissions and the possible impact on-site and at selected off-site locations by Margot Saner & Associates shows that the site is having a very low health and safety impact. The monitoring programme is running well and there appears to be no changes necessary. Ambient dust monitoring should be undertaken during this year.
- (xiii) The next annual Water Quality Monitoring Report by Jones and Wagener is only due in July 2009 and will be reviewed in the next audit. The water quality data obtained since July 2008 is the inorganic results for the 16th October 2008 and 9th January 2009 sampling campaigns were provided:
- The upstream and downstream water quality values for the EC are below the Domestic Water Quality target value and that the downstream surface water quality continues to improve.
 - The surface water quality continues to be good both upstream and downstream.
 - Sampling position SW 2 at the railway line has been dry since December 2004 and the analytical results on the sample obtained in January 2009 indicate that the water quality is very similar to that measured in 2003 and 2004.
- (xiv) Samples from the Mgoshongweni River were collected by Umgeni Water on 19th March 2009 and the results reported on the 16th April: the water is according to the results in good health.
- (xv) No incidents that could have resulted in contamination of the environment occurred during this audit period.

Appendix 1: Completed Compliance Audit Form

SHONGWENI LANDFILL SITE, KWAZULU NATAL

EXTERNAL AUDIT for COMPLIANCE with PERMIT NUMBER, 16/2/7/U602/B3/Y1/P270 DATED 28/08/1997 and SUBSEQUENT AMENDMENTS

LEAD AUDITOR: Dr D A Baldwin: En-Chem Consultants cc, P O Box 10324, George, 6530

DATES: 29th and 30th April 2009

OTHER EXTERNAL AUDITORS: None

| Condition No. | Requirements | Permit Condition Applies (Y/N) | Compliance | | | Comments |
|---------------|--|--------------------------------|------------|---------|----|---|
| | | | Yes | Partial | No | |
| 2. | PERMISSIBLE WASTE | | | | | |
| 2.1 | Any portion of the Site, which has been constructed or developed according to condition 3 of this permit, excluding cell 0, may be used for the disposal of all waste types, which are classified according to the latest edition of the Minimum Requirements series of documents published by the Department as suitable for disposal to an Hh disposal facility, excluding those waste types listed in Annexure 1. | Y | | √ | | No site permit amendments were received since the April 2008 Audit. Presumably, the permit will be amended to include Valley 2 and any required changes should be followed up at that time. The work to do the load calculations for the site has been commenced and discussions have been held with DEAT. These calculations will probably take up to a year as the site has to re-sample and analyse a large number of treated wastes: see text. |
| 2.2 | The permit holder must also take all reasonable steps to ensure that:- | | | | | Amended 28/09/05 |
| 2.2.1 | No medical waste to be disposed of on the site, unless it has been incinerated at 800°C or higher for at least 1 second or unless the health care risk waste has been sterilised with a treatment technology supported by the Department to render the health care risk waste unrecognisable and sterile. By-products of the process must comply with the hazardous group 3 and 4 rating requirements. | Y | √ | | | See condition 4.5. |
| 2.2.2 | No scheduled pharmaceutical products higher than schedule 4 may be accepted and disposed on the Site. The acceptance must be subject to compliance with the hazard group 3 and 4 rating requirements. | Y | √ | | | |

| Condition No. | Requirements | Permit Condition Applies (Y/N) | Compliance | | | Comments |
|---------------|---|--------------------------------|------------|---------|----|---|
| | | | Yes | Partial | No | |
| 2.3 | The disposal of sanitary waste treated according to the approved Steiner Hygiene Technology will be allowed subject to the following conditions:- | | | | | |
| 2.3.1 | The amount of treated sanitary waste disposed shall not exceed 2.25 tons per hectare per month. | Y | √ | | | The site has a working area of 8ha and, therefore, can accept 18 tons per month: see text. The limit was exceeded in March 2009 (19.9 tons) but the average for the last six months was only 15.9 tons/m. |
| 2.3.2 | The treated sanitary waste shall be disposed of in previously constructed trenches and immediately covered with at least 2 metres of dry municipal waste and compacted. | Y | √ | | | |
| 2.3.3 | All workers coming into contact with the treated sanitary waste during transport and disposal shall be equipped with suitable protective clothing. | Y | √ | | | |
| 2.3.4 | Detailed records shall be kept of the quantity and type of treated medical waste that are disposed of on site. | Y | √ | | | |
| 2.4 | Asbestos waste may be disposed of on site in receptacles that will prevent the likelihood of exposure during handling and within a dedicated area away from the operational area and covered immediately. Precautions must be taken to ensure that fibres and dust are not dispersed into the environment during the disposal procedure. The permit holder must comply with the Asbestos regulations under the Occupational Health and Safety Act (Act 85 of 1993). Acceptance and co-disposal of Class D Cement Product Waste (ACPW) must be done in accordance to the "Operating Procedure" submitted to the Department and approved by an Approved Inspection Authority. | Y | √ | | | |
| 2.5 | The permit holder shall ensure that ship galley waste accepted onto the Site is immediately covered with chlorine lime, trenched and covered. | Y | √ | | | As indicated in the previous audit, application was made for a revision of this condition but the Department refused to give permission in a letter dated 9 th December 2008 because of "insufficient evidence" that chlorinated lime reacts with waste and leachate had been provided.: see text. |

| Condition No. | Requirements | Permit Condition Applies (Y/N) | Compliance | | | Comments |
|---------------|--|--------------------------------|------------|---------|----|--|
| | | | Yes | Partial | No | |
| 2.6 | Fluorescent tubes up to a maximum of 150 tons per month may be co-disposed after treatment to fix the mercury component to an immobile state. This treatment involves the addition of 50% sodium sulphide – 50% sulphur mixture in a 1:10 v/v ratio to the tubes crushed under controlled conditions and subject to the submission and approval of an appropriate handling and disposal procedure to eliminate risks to the environment and human health. The proposed treatment of the fluorescent tubes should take place on-Site. | Y | √ | | | |
| 2.7 | Treated sewage sludge may be disposed of on Site subject to the submission and approval of an operational plan as well as the proposed monitoring and control procedures to be followed during disposal of the treated sewage sludge. | Y | √ | | | |
| 3 | CONSTRUCTION | | | | | |
| 3.1 | Further development of the Site must be in accordance with the following approved plans: a) Plan numbers 8203.66/03; 8203.66/04, dated October 1996 b) Plan numbers 8203.66/05 Rev C; 8203/06; 8203.66/07; 8203.66/08, dated November 1996 c) Plan number 8203.66.12 Rev C dated February 1997 d) Plan number 8203.66/83 Rev B, dated April 2007 e) Further development of the site must be in accordance with drawing 8358/09 dated April 2004 prepared by Jones and Wagener approved by the Director, Civil design of the Department. | Y | √ | | | 3.1e inserted 28/09/05. |
| 3.2 | The further developments within the Site, which are not shown on the approved plans stated in condition 3.1 may only be undertaken by the permit holder after specified engineering plans have been provided to and approved in writing by the Director. | Y | √ | | | Proposed developments include an upgrade of the leachate collection tank near the contaminated storm water dam. The plans were sent to DEAT for approval and approved: construction will start immediately. The EICR for Valley 2 and the landfill design have been approved. Construction is expected to commence in mid May 2009 and take about 9 months. |

| Condition No. | Requirements | Permit Condition Applies (Y/N) | Compliance | | | Comments |
|---------------|---|--------------------------------|------------|---------|----|--|
| | | | Yes | Partial | No | |
| 3.3 | Further development within the Site must be carried out under the supervision of a Professional Civil Engineer, registered in terms of the Engineering Profession of South Africa Act, 1990 (Act 114 of 1990), proposed by the Permit Holder and approved by the Director. | Y | √ | | | Jones and Wagener are the registered professional engineers for the site. |
| 3.4 | Should a portion of the Site be further developed according to plans for which approval has been obtained under condition 3.2 and in accordance with condition 3.3, the Permit Holder must notify the Director of the estimated date of completion of the development. The completed development within the Site shall be inspected by a designated official of the Department and the person referred to in condition 3.3. Should the Director be satisfied with the development after the inspection is completed and has granted his written permission thereto, the Permit Holder may use that portion of the Site for the disposal of waste. | Y | √ | | | |
| 3.5 | Works constructed in compliance with condition 5 must be of such capacity as to maintain a freeboard of half a metre and to accommodate:- All stormwater runoff, which could be expected as a result of an estimated maximum precipitation of an average frequency of 50 years (hereinafter referred to as the "estimated maximum precipitation", and All expected leachate. | Y | √ | | | |
| 3.6 | Works constructed in compliance with condition 3.5 must, on a continuous basis, be properly maintained. | Y | √ | | | |
| 3.7 | The Site must be constructed in accordance with recognised civil engineering practice, with special consideration of stability. | Y | √ | | | Jones and Wagener reported that the site stability is good up to the last survey date of the 4 th April 2009. |
| 3.8 | The maximum height of the Site must not exceed 534 metres above mean sea level. | Y | √ | | | Amended 28/09/05 |
| 3.9 | The slope of the sides of the Site must be constructed and maintained in such a manner that occurrence of erosion is prevented. | Y | √ | | | |
| 3.10 | The permit holder must make provision for adequate sanitation facilities on-site. | Y | √ | | | |

| Condition No. | Requirements | Permit Condition Applies (Y/N) | Compliance | | | Comments |
|---------------|---|--------------------------------|------------|---------|----|--|
| | | | Yes | Partial | No | |
| 4 | GENERAL IMPACT MANAGEMENT AND OPERATION | | | | | |
| 4.1 | DISPOSAL OF WASTE | | | | | |
| 4.1.1 | Waste disposal and operation of the Site must be done in accordance with the latest edition of the Minimum Requirements, the Operational Plan, the conditions of the Permit and any other written direction issued by the Director to the Permit Holder. | Y | | √ | | All the Minimum Requirements are being adhered to except the requirement for total load calculations and this is being attended to: see text. |
| 4.2 | METHODS AND RATIO FOR CO-DISPOSAL OF WASTE | | | | | |
| 4.2.1 | The co-disposal ratio for the site must take place in accordance with the liquid management plan developed by Jones and Wagener for the site. This data must be presented to the Department on a monthly basis and, once the model has been calibrated, the co-disposal ratio must be approved by the Manager: Resource Protection and Waste. | Y | √ | | | Amended 28/09/05 The average co-disposal ratio for the site for the period April 2008 to March 2009 was 7.23, which is above the target value of 7.0 despite the relatively high rainfall in the period November 2008 to February 2009: see text. |
| 4.2.2 | A primary layer of general solid waste must be placed up to a minimum depth of 2.5 metres on the lining of the Site before co-disposal can take place. | Y | √ | | | |
| 4.2.3 | The volume of the primary layer must be kept in reserve for emergency conditions and may only be taken into account for the calculation of co-disposal ratios according to condition 4.2.1, after sufficient motivation has been provided to and approved in writing by the Director. | N | N/A | | | |
| 4.2.4 | The volume of water falling on the Site and of leachate sprayed according to condition 5.2.1.2 must be taken into account when calculating the co-disposal ratios according to condition 4.2.1. | Y | √ | | | No leachate is sprayed onto site, because it would lead to an increase in odour. |
| 4.2.5 | Co-disposal must be executed by mixing general waste and low hazard waste (this includes only Hazard rating 3, moderate waste; Hazard Rating 4, low hazard waste and delisted waste) at the working face, by spreading low hazard waste on the deposited waste prior to covering, or by mixing in trenches excavated in the <i>in situ</i> waste. | Y | √ | | | Amended 7 th August 2007 |
| 4.2.6 | Methods of pre-treatment, disposal or co-disposal must be carried out in compliance with the reports and in accordance with the latest edition of the Minimum Requirements. | Y | √ | | | Site complies with these requirements. |

| Condition No. | Requirements | Permit Condition Applies (Y/N) | Compliance | | | Comments |
|---------------|--|--------------------------------|------------|---------|----|--|
| | | | Yes | Partial | No | |
| 4.3 | BUFFER ZONE | | | | | Amended 28/09/05 |
| 4.3.1 | The Permit Holder must take all reasonable steps, for example suitable zoning and/or written agreements with adjacent landowners to establish and maintain an un-built area or "buffer zone", as specified in the Revised Air Quality Impact Assessment and Buffer Zone Study, dated August 2003, between the Site and the nearest residential or light industrial areas for the operative life of the Site. | Y | √ | | | |
| 4.3.2 | As specified in the Revised Air Quality Impact Assessment and Buffer Zone Study, the following buffer zone delineation from the boundaries of the Site must be maintained: | | | | | |
| 4.3.2.1 | 180 metres to the North | Y | √ | | | |
| 4.3.2.2 | 600 metres to the East | Y | √ | | | |
| 4.3.2.3 | 350 metres to the South and West | Y | √ | | | |
| 4.3.3 | The buffer zone may be amended to the satisfaction of the Manager should it be proven that there are any associated detrimental effects | Y | √ | | | |
| 4.3.4 | Appropriate air quality monitoring must be conducted on an annual basis to demonstrate that the levels are within the same range or below those referenced for the buffer zone delineation. | Y | √ | | | |
| 4.4 | GENERAL OPERATIONAL MEASURES | | | | | |
| 4.4.1 | Waste disposed of on the Site shall be compacted and covered on a daily basis with a minimum of 150 millimetres of soil or other material as approved by the Director. | Y | √ | | | |
| 4.4.2 | Waste disposed on Site may not be reclaimed. | Y | √ | | | |
| 4.4.3 | The Permit Holder must take all reasonable steps to ensure that the Site is operated in such a manner that nuisance conditions or health hazards, or the potential creation of nuisance conditions or health hazards, are prevented. | Y | √ | | | According to the results obtained up to February 2009 and presented by Andrew Dickson of Margot Saner and Associates at the last monitoring committee meeting, the site does not represent a significant health hazard. There has been 1 odour complaint from residents in the period July 2008 to January 2009, 1 in February 2009 and 1 in March 2009: see text. |
| 4.4.4 | The Permit Holder shall apply sufficient dust control measures to prevent wind-blown dust from causing nuisance or health hazard. | Y | √ | | | |

| Condition No. | Requirements | Permit Condition Applies (Y/N) | Compliance | | | Comments |
|---------------|--|--------------------------------|------------|---------|----|---|
| | | | Yes | Partial | No | |
| 4.4.5 | The Permit Holder must implement all necessary measures to control wind-blown waste. | Y | √ | | | |
| 4.4.6 | The measured concentration of flammable gas, amended for STP in the atmosphere inside the buildings on Site must not exceed 1% by volume in air. Should the atmospheric levels be between 0.1% and 1%, a higher frequency of monitoring must be instituted? Should levels above 1% be detected, the Permit Holder must submit a contingency plan regarding occupational safety to the Manager, which must be implemented on Site, after written approval of the Manager. | Y | √ | | | Amended 28/09/05 |
| 4.4.7 | The Permit Holder must implement adequate measures to the satisfaction of the Director, to:- a) Ventilate methane gas generated in the waste disposal area; and b) Prevent lateral migration of methane gas, In order to prevent the build up of dangerous concentrations within the Site. | Y | √ | | | |
| 4.4.8 | The Permit Holder must comply with the following provisos: | | | | | Inserted 28/09/06 |
| 4.4.8.1 | That first aid equipment is available on Site during all hours of business, | Y | √ | | | |
| 4.4.8.2 | That proper shower facilities are available to workers, | Y | √ | | | |
| 4.4.8.3 | That workers are medically examined, as prescribed by the medical officer, and | Y | √ | | | |
| 4.4.8.4 | That protective clothing is provided. | Y | √ | | | |
| 4.4.9 | Reject foodstuffs must be trenced and covered immediately upon arrival at the Site under supervision of the supervisor or a site manager. | Y | √ | | | Inserted 28/09/06 |
| 4.4.10 | The Permit Holder must only accept obnoxious industrial waste, i.e. waste which produces odours or that may give detrimental effects on the environment, between 08h00 and 14h00 during weekdays. Obnoxious waste shall be covered within 2 hours of disposal. No obnoxious waste shall be accepted on Saturdays, Sundays and Public Holidays, except during emergency conditions. The Permit Holder shall report the details of such emergency conditions to the Manager within 24 hours according to condition 12.1. | Y | √ | | | Inserted 28/09/06 Obnoxious wastes include galley waste and meat products. In the proposed changes to the permit conditions, obnoxious waste has been identified as galley waste, sewage sludge/screenings, and sanitary protection waste. |

| Condition No. | Requirements | Permit Condition Applies (Y/N) | Compliance | | | Comments |
|---------------|--|--------------------------------|------------|---------|----|--|
| | | | Yes | Partial | No | |
| 4.5 | STORAGE OF UNTREATED HEALTH CARE RISK WASTE (HCRW) | | | | | Inserted 28/09/05. This section is now not applicable to the site and should be removed from the permit. |
| 4.5.1 | The refrigerator storage container must be sealed and locked and placed on a trailer with a backup container in case of any leak/breakdown. | N/A | # | | | No health care waste is currently stored on site although the refrigerated unit is still in place, although it will be removed once the administrative requirements have been completed. |
| 4.5.2 | Cleaning of the floor of the refrigerator container must be done on a properly designed floor and water must be properly disposed on Site and provision must be made for ample waste absorption of liquid. | N/A | # | | | |
| 4.5.3 | Storage of health care risk waste is permitted for a period of two years after issuing of this permit amendment until alternative treatment technology has been permitted and approved by the Department. | N/A | # | | | Amended 7 th August 2007 |
| 4.5.4 | Once full, the refrigerator must be transported to an incinerator within 48 hours. | N/A | # | | | |
| 4.5.5 | A 24 hour security must be on Site to prevent scavengers for getting access to the stored HCRW. | N/A | # | | | |
| 4.5.6 | An accurate record of all health care risk waste stored in the refrigerated containers must be kept. | N/A | # | | | |
| 4.5.7 | A contingency plan must be put in place to address any emergency situation. | N/A | # | | | |
| 4.5.8 | A back-up generator must be available in the event of power failure and a refrigerator company must be on standby should there be a unit malfunction. | N/A | # | | | |
| 4.5.9 | The refrigerated containers must be locked at all times and must only be accessible to authorised landfill personnel. | N/A | # | | | |
| 4.5.10 | The health care risk waste must not be left without being refrigerated for a period exceeding 48 hours. | N/A | # | | | |
| 4.5.11 | There must be adequate signs demarcating the storage area for the health care risk waste. | N/A | # | | | |

| Condition No. | Requirements | Permit Condition Applies (Y/N) | Compliance | | | Comments |
|---------------|--|--------------------------------|------------|---------|----|---|
| | | | Yes | Partial | No | |
| 5 | WATER QUALITY MANAGEMENT | | | | | |
| 5.1 | RUN-OFF MANAGEMENT | | | | | |
| 5.1.1 | All run-off water (storm water) arising s a result of precipitation:- a) On land adjacent to the Site, and b) On the Site must be prevented from coming into contact with any substance, whether such substance is a solid, liquid, vapour or gas, or a combination thereof, which is produced, used, stored, dumped or spilled on the premises, including leachate, and must be diverted and drained from:- i) The Site, and ii) The working face of the Site, By means of works constructed by the Permit Holder in accordance with condition 3. | Y | √ | | | The contaminated storm water dam has been repaired since the last audit. The dam has once again silted up due to the good rains during this audit period and plans are in place to de-silt after it has been emptied. |
| 5.1.2 | In the event that run-off water referred to in condition 5.1.1 becomes contaminated, it must be regarded as leachate and must be dealt with according to condition 5.2 in this Permit. | Y | √ | | | |
| 5.1.3 | Run-off water arising from operational actions, for example the washing of vehicles and containers, must be regarded as contaminated run-off, and shall be treated according to condition 5.1.2. | Y | √ | | | |
| 5.1.4 | Uncontaminated run-off water must under no circumstances be used to dilute leachate from the Site, but must be diverted to the Mgoshongweni River and discharged into this river at a point up-stream of the point where the treated leachate will be or is being discharged. | Y | √ | | | |
| 5.2 | LEACHATE MANAGEMENT | | | | | |
| 5.2.1 | All leachate from the Site, including contaminated run-off water, must be:- | | | | | |
| 5.2.1.1 | Treated in works constructed according to condition 3, to comply with the quality requirements specified in the General Standard and Special Standard for Phosphate, as prescribed by the Minister in terms of section 21(1)(a) of the Water Act, Act 54 of 1956, as published in the Government Notice 991 of 18 May 1984, or such quality requirements as may time to time be determined by the Director; or | Y | √ | | | Leachate is currently discharged to the Southern Wastewater Treatment Works in terms of a permit issued by Ethekwini Water and Sanitation, dated 27 th July 2005. The permit was extended until 30 June 2008. The Municipality is currently reviewing the permit and have indicated by e-mail that the permission is still valid until the revised permit is issued. |

| Condition No. | Requirements | Permit Condition Applies (Y/N) | Compliance | | | Comments |
|---------------|---|--------------------------------|------------|---------|----|--|
| | | | Yes | Partial | No | |
| 5.2.1.2 | Sprayed over those portions of the Site, which comply with the requirements set in terms of condition 3, until such time that a leachate treatment facility is in operation and such a volume as to comply with conditions 4.2.1 and 4.2.4. | N | N/A | | | Leachate is not sprayed over the site, as it would lead to unacceptable odours. |
| 5.2.2 | Plans for the leachate treatment facility referred to in condition 5.2.1.1 must be submitted within four months from the date of this Permit to the Director for his approval. The approved works must be in operation within one year from the date of the Directors approval. | Y | | | √ | Tests have been completed using a membrane technology to give water that could be discharged to water course in terms of the requirements. It is planned to use the microbial preparation, Archea II, which has been successful in the Eastern Cape, to reduce the organic content of the leachate. Application has been made to the DEAT for permission to use this technology: see text |
| 5.2.3 | Treated leachate, which complies with the requirements of condition 5.2.1.1, may be discharged to the Mgoshongweni River at a point downstream of the point where the uncontaminated run-off water is being discharged as specified in condition 5.1.4. | N | N/A | | | An on-site treatment plant has not yet been approved; see comments on conditions 5.2.1.1 and 5.2.2. |
| 6 | ACCESS CONTROL | | | | | |
| 6.1 | Weatherproof, durable and legible notices in two official languages, namely English and Zulu, must be displayed at each entrance to the Site. These notices shall prohibit unauthorised entry and state the hours of operation, the name, address and telephone number of the Permit Holder and the person responsible for the operation of the Site. | Y | √ | | | According to the complaints register 20 vagrants/pickers were reported to be on-site by a resident, Brian Cuniffie, on the 23 rd April. Follow up showed that the guard had allowed these people into the site. The guard was transferred off-site by the Security Company and replaced. The SAPS was also informed. |
| 6.2 | The Site must be fenced to a minimum height of 1.8 metres, with gates of the same height at all entrances, to reasonably prevent unauthorised entry and curtail the spreading of wind-blown paper and plastic materials. | Y | √ | | | |
| 6.3 | Notices prohibiting unauthorised persons from entering the site, as well as an internationally accepted sign indicating the risks involved in unauthorised entry must be erected at intervals not exceeding 50 metres along the fence. | Y | √ | | | |

| Condition No. | Requirements | Permit Condition Applies (Y/N) | Compliance | | | Comments |
|---------------|--|--------------------------------|------------|---------|----|---|
| | | | Yes | Partial | No | |
| 6.4 | The Permit Holder shall take all reasonable steps to maintain service roads in a condition, which ensures unimpeded access to the site for vehicles transporting waste and to keep the roads free of waste. | Y | √ | | | The access roads on-site were in reasonable condition, but there are a large number of potholes in the provincial road leading to the site. |
| 6.5 | The Permit Holder shall ensure that all entrance gates are manned during the hours of operation and locked outside the hours of operation. | Y | √ | | | |
| 6.6 | The Permit Holder shall ensure effective access control. | Y | √ | | | |
| 6.7 | The Permit Holder shall take all reasonable steps to prevent the disposal of waste on the Site for which the Site has not been approved. | Y | √ | | | |
| 7 | MONITORING | | | | | |
| 7.1 | AIR QUALITY AND GAS MONITORING | | | | | |
| 7.1.1 | Air Quality and Gas Monitoring during the Normal Operative Lifetime of the Site | | | | | |
| 7.1.1.1 | The Permit Holder must within 60 days from the date of the Permit, submit a proposal for a comprehensive air quality and gas monitoring program for approval by the Director, which must address the following aspects: a) A monitoring procedure for the Site; b) On and off-site monitoring; c) Monitoring to determine the extent of the buffer zone, as required in condition 4.3.2; d) Monitoring of flammable gas as specified in condition 4.4.6; and e) Post Closure Monitoring | Y | √ | | | See text for discussion of results from Margot Saner and Associates and the presentation given to the monitoring committee by Andrew Dickson. Note that the permit does not set the air quality monitoring standards that the site is meant to achieve nor the reporting requirements. Changes were included in the proposed amended permit that was sent to DEAT nearly two years ago. The permit will have to be amended to cover the closure of Valley 1 and the operation of Valley 2, so hopefully these issues can be included in the permit conditions. |
| 7.1.1.2 | An air quality and gas monitoring network for the site must be according to the approved monitoring programme referred to in condition 7.1.1.1 within 4 months from the date of this Permit, and the implementation and maintenance of this network must be to the satisfaction of the Director. | Y | √ | | | |
| 7.1.1.3 | Until such time as the programme referred to in condition 7.1.1.1 is approved by the Director, an interim air quality monitoring programme must be implemented with immediate effect for the quantitative detection of the following volatile materials on the Site: total volatile organic carbon compounds and benzene. | Y | √ | | | |

| Condition No. | Requirements | Permit Condition Applies (Y/N) | Compliance | | | Comments |
|---------------|--|--------------------------------|------------|---------|----|--|
| | | | Yes | Partial | No | |
| 7.1.2 | Post-closure Air Quality and Gas Monitoring | | | | | |
| 7.1.2.1 | Air quality and gas monitoring, as described in the monitoring programme referred to in condition 7.1.1.1 must continue after closure of the Site for a period until the gas peak concentration of methane and carbon dioxide has been detected, or for any longer period, as may be determined by the Director. | N | N/A | | | The site is still operational but presumably this permit condition will become valid for the current valley, once it has been closed and the operations move to Valley 2. |
| 7.2 | WATER QUALITY MONITORING | | | | | |
| 7.2.1 | Locations and Specifications for the Water Quality Monitoring Network | | | | | |
| 7.2.1.1 | <i>General Requirements</i> | | | | | |
| 7.2.1.1.1 | Monitoring of groundwater, surface water and leachate must be conducted at the locations specified in conditions 7.2.1.2, 7.2.1.3, 7.2.1.4 and at any other location or locations that may from time to time be specified by the Director. | Y | √ | | | The next annual Water Quality Monitoring Report is due July 2009 and will be covered in the next audit. Data up to the 7 th January 2009 was provided to the auditor by Jones and Wagener. The results show no significant change in the ground and surface water quality since the annual report in July 2008. |
| 7.2.1.1.2 | The location of the monitoring points referred to in conditions 7.2.1.3.1, 7.2.1.3.2(b) and 7.2.1.4.1(b) as identified by the Director, as well as any other location or locations specified according to condition 7.2.1.1.1 shall be communicated in writing to the Permit Holder and shall be regarded as part of the Permit. | Y | √ | | | |
| 7.2.1.2 | <i>Groundwater Monitoring Network</i> | | | | | |
| 7.2.1.2.1 | Monitoring of borehole 4, as described in the Report and other boreholes, which are recommended in the Report, where the groundwater in the boreholes is at an expected higher hydraulic pressure level than the hydraulic pressure level of the groundwater under the Site, shall be considered as background monitoring for groundwater quality and must be conducted for each monitoring occasion specified in conditions 7.2.2.1, 7.2.3 and 7.2.4. | Y | √ | | | |
| 7.2.1.2.2 | A monitoring borehole network for the Site shall be maintained by the Permit Holder, to the satisfaction of the Director, so that unobstructed sampling as required in terms of this Permit can be undertaken. | Y | √ | | | |

| Condition No. | Requirements | Permit Condition Applies (Y/N) | Compliance | | | Comments |
|---------------|--|--------------------------------|------------|---------|----|---|
| | | | Yes | Partial | No | |
| 7.2.1.2.3 | The Permit Holder must construct all additional boreholes, as recommended in paragraph 6 on page 35 of the Report 96/122/GHR of the Reports, before the end of February 1998. | N | N/A | | | Superseded by condition 7.1.2.2.5; see condition 7.1.2.2.6. |
| 7.2.1.2.4 | Monitoring boreholes shall be equipped with lockable caps. The Department reserves the right to take water samples at any time and to analyse these samples or have them analysed. | Y | √ | | | |
| 7.2.1.2.5 | The Permit Holder must implement the recommendations of the Jones and Wagener report number JW 177/03/9064 as approved by the Department. | Y | √ | | | Inserted 28/09/06 |
| 7.2.1.2.6 | The Minister may dispense with the requirements of condition 7.2.1.2.3 of the Permit provided that the Permit Holder implements the recommendations referred to in condition 7.2.1.2.5. | Y | √ | | | Inserted 28/09/06 |
| 7.2.1.3 | <i>Surface Water Monitoring Network</i> | | | | | |
| 7.2.1.3.1 | Background monitoring of the surface water must be conducted in the Mgoshongweni River at the location identified by the Director, which shall be upstream of the Site and upstream of the point where uncontaminated run-off water is discharged into the river. | Y | √ | | | Biomonitoring of the Mgoshongweni River done by Umgeni Water in April 2009. The results that were provided to the auditor showed the presence of invertebrate families that have a very low tolerance to pollution in both monitoring positions that show good health; the water had no colour or odour problems. |
| 7.2.1.3.2 | Monitoring of the quality of the uncontaminated run-off water must be conducted at the following locations:- a) In the stormwater drains on and adjacent to the Site; and b) In the Mgoshongweni River downstream from the point where uncontaminated run-off water is being discharged, at a point which shall be identified by the Director. | Y | √ | | | |
| 7.2.1.4 | <i>Effluent Monitoring Network</i> | | | | | |
| 7.2.1.4.1 | Monitoring of treated leachate, including contaminated run-off water, which is discharged into the Mgoshongweni River must be conducted at the following locations:- a) At the point where the leachate exits the treatment facility; and b) In the Mgoshongweni River downstream from the point where the treated leachate and contaminated stormwater is being discharged, at a point which shall be identified by the Director. | N | N/A | | | No treated leachate discharged yet to Mgoshongweni River. |

| Condition No. | Requirements | Permit Condition Applies (Y/N) | Compliance | | | Comments |
|---------------|--|--------------------------------|------------|---------|----|------------------|
| | | | Yes | Partial | No | |
| 7.7.2 | Detection Monitoring | | | | | |
| 7.2.2.1 | <i>Frequency of Water Quality Monitoring and Variables for Analysis</i> | | | | | |
| 7.2.2.1.1 | Monitoring of the ground and surface water quality must be conducted according to the monitoring programme in the Jones and Wagener report number JW 177/03/9064 and the monitoring protocol report JW 200/04/9064, as approved by the Department. | Y | √ | | | |
| 7.2.2.1.2 | Monitoring of treated leachate and contaminated run-off water must be conducted at the locations specified in condition 7.2.1.4:- a) For the variables listed in Annexure II and any other variables, which are not covered in Annexure II but which are listed in Government Notice 991, referred to in condition 5.2.1.1, during the months of March and September; b) Monthly for the variables listed in Annexure III; and c) Quarterly for any other variables listed in Government Notice 991, but which are not covered by Annexure III. | Y | √ | | | |
| 7.2.2.2 | <i>Leak and Failure Detection Monitoring</i> | | | | | |
| 7.2.2.2.1 | The leachate detection system must be monitored monthly for the occurrence of leakages, and a higher frequency of monitoring, as approved by the Director, must be initiated should a leak be suspected or is identified. | Y | √ | | | |
| 7.2.2.2.2 | Annual inspection of all pipes and welds exposed to leachate must be conducted by a qualified inspectorate to ensure the integrity of all pipes and welds. | Y | √ | | | Amended 28/12/05 |
| 7.2.2.2.3 | Inspections of liners, where liners are accessible, must be conducted monthly. | Y | √ | | | |
| 7.2.2.2.4 | Regular liner compatibility testing of all the liners must be conducted at a frequency determined by the Director, according to the methods specified by him. | Y | √ | | | |
| 7.2.2.2.5 | Should a leak or failure be suspected or detected during monitoring, inspections or tests conducted in accordance with conditions 7.2.2.2.1 to 7.2.2.2.4, or at any other time, it must be regarded as an incident according to condition 12.1.1 and addressed according to condition 7.2.2.2.6. | Y | √ | | | |
| 7.2.2.2.6 | Liners must be repaired when possible or replaced when necessary and these corrective actions must be performed to the satisfaction of the Director. | Y | √ | | | |

| Condition No. | Requirements | Permit Condition Applies (Y/N) | Compliance | | | Comments |
|---------------|--|--------------------------------|------------|---------|----|--|
| | | | Yes | Partial | No | |
| 7.2.3 | Investigative Monitoring | | | | | |
| 7.2.3.1 | If, in the opinion of the Director, a water quality variable listed under the detection monitoring programme, as referred to in condition 7.2.2.1, shows an increasing trend, the Permit Holder shall initiate a monthly investigative monitoring programme for those water quality variables and monitoring points specified by the Director. | Y | √ | | | |
| 7.2.4 | Post Closure Monitoring | | | | | |
| 7.2.4.1 | Ground water, surface water and effluent monitoring by the Permit Holder, in accordance with conditions 7.2.2.1 and 7.2.3, shall continue after closure of the Site and be maintained for a period of 30 years, or for such period and/or frequency and/or location, as may be determined by the Director. | Y | N/A | | | Site is still operational. |
| 7.2.5 | Biomonitoring | | | | | Inserted 28/08/05 |
| 7.2.5.1 | Biomonitoring of the Mgoshongweni stream below the Site, up stream of the road crossing and located before the confluence with the tributary must be conducted bi-annually. | Y | √ | | | See condition 7.2.1.3.1 |
| 7.3 | FURTHER INVESTIGATIONS | | | | | |
| 7.3.1 | If in the opinion of the Director, groundwater, surface water and/or air pollution have occurred or may possibly occur, the Permit Holder must conduct, and/or appoint specialists to conduct the necessary investigations and implement additional monitoring and rehabilitation measures to the satisfaction of the Director. | Y | √ | | | |
| 8 | AUDITING | | | | | |
| 8.1 | INTERNAL AUDITS | | | | | |
| 8.1.1 | Internal auditing must be conducted:- a) Monthly by the Permit Holder; and b) Biannually by the Permit Holders Head Office On each audit occasion an official report must be compiled by the relevant auditor to report the findings of these audits, which must be available to the external auditor specified in condition 8.2.1 and the Department, according to condition 8.3.2 and 12.2.1. | Y | √ | | | 8.1.1b amended 28/09/05 A copy of the April 2009 Monthly Internal Audit undertaken Alma Bowles was provided to auditor and was found to be entirely acceptable. Biannual audits of the site undertaken by the Environmental Health and Safety. The last was on the 23 rd February 2009 and a report in new unfamiliar format was provided to the auditor. |

| Condition No. | Requirements | Permit Condition Applies (Y/N) | Compliance | | | Comments |
|---------------|--|--------------------------------|------------|---------|----|---|
| | | | Yes | Partial | No | |
| 8.2 | EXTERNAL AUDITS | | | | | |
| 8.2.1 | The Permit Holder must appoint an independent external auditor to audit the Site once every six months, and this auditor must compile an audit report documenting the findings of his audit, which must be submitted by the Permit Holder according to condition 12.2.3. | Y | √ | | | This audit by Environmental and Chemical Consultants fulfils the requirements of this permit condition: see text. |
| 8.2.2 | The audit report must specifically state conditions of this Permit are adhered to and must include an interpretation of all available data and test results regarding the operation of the Site and its impact on the environment. | Y | √ | | | |
| 8.2.3 | The audit report must contain recommendations regarding non-compliance or potential non-compliance and must specify target dates for the implementation of the recommendations by the Permit Holder. | Y | √ | | | |
| 8.3 | DEPARTMENTAL AUDITS AND INSPECTIONS | | | | | |
| 8.3.1 | The Department reserves the right to audit and/or inspect the Site at any time and at such a frequency as the Director may decide, or to have the Site audited or inspected. | Y | √ | | | |
| 8.3.2 | The Permit Holder must make any records or documentation available to the Director upon request, as well as any other information the Director may require. | Y | √ | | | |
| 8.3.3 | The findings of these audits or inspections shall be made available to the Permit Holder and the Monitoring Committee within 60 days of the end of the audit or inspection and shall not be treated as confidential. | Y | √ | | | |
| 9. | MONITORING COMMITTEE | | | | | |
| 9.1 | The Permit Holder must take all reasonable steps to maintain and ensure the continued functioning of the Shongweni Landfill Site Monitoring Committee (in this Permit referred to as the "Monitoring Committee") for the normal operative lifetime of the Site and for a period of at least two years after the closure of the Site, or such a longer period as may be determined by the Director. | Y | √ | | | Monitoring Committee meeting held on the 30 th April 2009 and a presentation was given by auditor: see text. |

| Condition No. | Requirements | Permit Condition Applies (Y/N) | Compliance | | | Comments |
|---------------|--|--------------------------------|------------|---------|----|----------|
| | | | Yes | Partial | No | |
| 9.2 | The Monitoring Committee shall be representative of relevant interested and affected persons and may consist of at least the following persons: a) Permit Holder and/or his appointed consultant(s) or advisor(s); b) Representative(s) of the Health, Environment and/or Waste Departments of the relevant local authority; c) Representative(s) of this Department; d) Representative(s) of the Provincial Government responsible for waste management and environmental functions; and e) At least 3 (three) persons/parties, or their representatives elected by the local residents. | Y | √ | | | |
| 9.3 | The Monitoring Committee shall meet at least once every four months and not later than 30 days after the external audit report specified in condition 8.2 has been submitted according to condition 12.2.3. | Y | √ | | | |
| 9.4 | The Permit Holder must keep minutes of all meetings of the Monitoring Committee and must ensure the distribution of these minutes to all members of the Monitoring Committee within 14 days after the meeting. | Y | √ | | | |
| 10 | ANALYSIS OF SAMPLES | | | | | |
| 10.1 | The Permit Holder must ensure that all samples, which were taken in accordance with condition 7, are:- a) Analysed by a laboratory accredited by the South African Bureau of Standards (SABS); and b) According to methods prescribed in terms of Government Notice 991 of 18 May 1984, or other method of analysis for which approval had been obtained from the Director. | Y | √ | | | |
| 11 | RECORDING | | | | | |
| 11.1 | The Permit Holder shall record all water monitoring data resulting from chemical analyses in the format depicted in Annexure V, as well as from air quality and gas monitoring in accordance with condition 7.1. | Y | √ | | | |

| Condition No. | Requirements | Permit Condition Applies (Y/N) | Compliance | | | Comments |
|---------------|--|--------------------------------|------------|---------|----|---|
| | | | Yes | Partial | No | |
| 11.2 | The Permit Holder must keep records of the following for all hazardous waste (this includes only Hazard Rating 3, moderate hazard waste; Hazard Rating 4, low hazard waste and delisted waste) deposited on the Site and must up-date all information referred to in Annexure IV on an annual basis: a) Type and composition of the waste, with a separate list of hazardous components where the composition is not evident from the name of the waste. b) Mass or volume of the specific wastes; c) Date and time of arrival of the waste at the Site; d) Any specified pre-treatment procedures to which the waste was subjected before its disposal was permitted on the Site; e) Method of disposal. | Y | √ | | | Amended 7 th August 2007 |
| 11.3 | Records must be kept of all tests and inspections conducted in accordance with condition 7.2.2.2. | Y | √ | | | |
| 12 | REPORTING | | | | | |
| 12.1 | REPORTING OF INCIDENTS | | | | | |
| 12.1.1 | The permit holder must within 24 hours, notify the Director of the occurrence or detection of any incident at the site or incidental to the operation of the site, which has the potential to cause or has caused water pollution, pollution of the environment, health risks or nuisance conditions or which is a contravention of this Permit. | Y | √ | | | Amended 28/09/05 No incident that would result in a possible environmental risk was reported during this audit period. |
| 12.1.2 | The permit holder must within 14 days or shorter period of time if specified by the Director from the occurrence or detection of any incident referred to in condition 12.1.1 submit an action plan which shall include a detailed time schedule to the satisfaction of the Director of measures taken to: a) Correct the impact resulting from the incident b) Prevent the incident from causing any further impacts and c) Prevent recurrence of a similar incident | Y | √ | | | |

| Condition No. | Requirements | Permit Condition Applies (Y/N) | Compliance | | | Comments |
|---------------|--|--------------------------------|------------|---------|----|------------------|
| | | | Yes | Partial | No | |
| 12.1.3 | In the event that measures have not been implemented to address the impacts caused by any incident referred to in condition 12.1.1, or measures which have been implemented are inadequate, the Manager may implement the necessary measures at the cost and risk of the permit holder, in accordance to section 9 of the National Water Act, 1998 (Act 36 of 1998). | Y | √ | | | Amended 28/09/05 |
| 12.1.4 | The permit holder must keep an incident report and complaints register, which must be made available to both external and Departmental auditors for the purpose of their audits. | Y | √ | | | |
| 12.2 | AUDIT REPORTS | | | | | |
| 12.2.1 | Baseline monitoring results as depicted in Appendix 7 of the Report number Ref: S/SLPEICRA, 797, which was obtained from monitoring prior to the commissioning of the Site extension, must be included in all audit reports and must be reported for each sampling occasion. | Y | √ | | | |
| 12.2.1 | All internal audit reports referred to in condition 8.1.1 must be made available to the external auditor referred to in condition 8.2.1, and internal audit reports resulting from audits conducted by the Permit Holder's Head Office, must be submitted to the Director within 30 days after the completion of the audit. | Y | √ | | | |
| 12.2.2 | Each external audit report referred to in condition 8.2 must be sent to the Director and the monitoring Committee within 30 days from the date on which the external auditor finalised the audit. | Y | √ | | | |
| 12.3 | OTHER REPORTS | | | | | |
| 12.3.1 | The information required in terms of condition 7 must be reported to the Director, in the format specified in condition 11.1, where applicable, within a period of 30 days following the analysis of the samples. The information must also be included into a trend report, which must contain a graphical presentation of all results obtained previously at any specific point, as well as an interpretation and discussion of the results of each monitoring occasion. | Y | √ | | | |

| Condition No. | Requirements | Permit Condition Applies (Y/N) | Compliance | | | Comments |
|---------------|--|--------------------------------|------------|---------|----|----------|
| | | | Yes | Partial | No | |
| 12.3.2 | The information required in terms of condition 11.2, as well as the solid to liquid ratio of waste accepted for co-disposal purposes for the period of the report, must be submitted to the Director within a period of one year from the date of this Permit and annually thereafter. | Y | √ | | | |
| 112.3.3 | The Permit Holder must submit a written report to the Director regarding any deviations from plans and/or operation procedures described in this Permit must obtain written permission from the Director before such deviations may be implemented. | Y | √ | | | |
| 13 | REHABILITATION AND CLOSURE OF SITE | | | | | |
| 13.1 | A rehabilitation plan for phase I (cell 0) of the Site must be submitted by the Permit Holder within 3 months from the date of issuing of the Permit to the Director for his approval. The implementation of the approved Rehabilitation Plan must commence within 30 days from the date of approval. | Y | √ | | | |
| 13.2 | The Permit Holder must rehabilitate the Site, or any portion thereof, in accordance with a rehabilitation plan, which must be submitted to the Director for approval at least one year prior to the intended closure of the Site or any portion thereof. | Y | √ | | | |
| 13.3 | The Permit Holder must, at least 90 days prior to the intended closure of the Site, or any portion thereof, notify the Director by registered mail of such closure and submit any final rehabilitation plan for his approval. | Y | √ | | | |
| 13.4 | Immediately following the cessation of operations with the intention to close the Site, the surface of Site shall be covered in such a way that - a) The formation of pools due to rain is prevented; b) Free surface runoff of rain-water is ensured; c) Contamination of storm water is prevented; d) No objects or materials which may hamper rehabilitation of the Site are present; e) Little or no erosion occurs, Until the approved rehabilitation plan referred to in condition 13.2 is completely implemented. | Y | √ | | | |

| Condition No. | Requirements | Permit Condition Applies (Y/N) | Compliance | | | Comments |
|---------------|---|--------------------------------|------------|---------|----|---|
| | | | Yes | Partial | No | |
| 14 | LEASING AND ALIENATION OF THE SITE | | | | | |
| 14.1 | Should the Permit Holder want to alienate or lease the site, he shall notify the Director in writing of such an intention at least 90 days prior to the said transaction. | Y | √ | | | |
| 15 | GENERAL | | | | | |
| 15.1 | This Permit replaces Permit B33/1/1920/P1 issued on 08/07/1993 in the name of the Shongweni Landfill Site. | Y | N/A | | | This is a statement and requires no action by EnviroServ. It is, therefore, not auditable. |
| 15.2 | This Permit will be completely reviewed by the Department within 5 years from the date of issuing, or at any time before or after that date. Based on the results of this review on compliance to permit conditions or recommendations from audit reports, the permit could be amended, withdrawn or extended. | Y | N/A | | | This condition was amended on the 28 th September 2005 and replaces permit conditions 15.4 and 15.5 of original permit dated 28 th August 1997. This is a statement and requires no action by EnviroServ. It is, therefore, not auditable. |
| 15.3 | The Permit must not be construed as exempting the Permit Holder from compliance with the provisions of the Health Act, 1977 (Act 63 of 1977), the Water Act, 1956 (Act 54 of 1956), the Occupational Health and Safety Act, 1993 (Act 85 of 1993) or any other applicable act, ordinance, regulation or by-law. | Y | N/A | | | This is a statement and requires no action by EnviroServ. It is, therefore, not auditable. |
| 15.6 | The Permit Holder must provide the Director with any information, which he may require to enable him to fulfil the objective of the Environment Conservation Act, 1989 (Act 73 of 1989) and the Environmental Conservation Amendment Act, 2003 (Act 50 of 2003) for waste disposal purposes. | Y | √ | | | Inserted 28/12/05 |
| 15.7 | The Permit Holder must inform the Manager of any agreements or contracts, which are entered into and which might affect any aspect of the Permit. | Y | √ | | | Inserted 28/12/05 |

Appendix 2: Completed Environmental Management Audit Form

SHONGWENI Hh LANDFILL SITE, KWAZULU-NATAL
EXTERNAL AUDIT: ENVIRONMENTAL MANAGEMENT

LEAD AUDITOR: Dr D A Baldwin: En-Chem Consultants cc, P O Box 10324, George, 6530

DATES: 29th and 30th April 2009

OTHER EXTERNAL AUDITORS: None

| CONDITION | QUESTION | RESPONSE | ADEQUATE | REMARKS |
|-------------------------------|--|---|----------|--|
| 1. POLICY AND STRATEGY | | | | |
| 1.1 | Is there a company environmental policy? | Yes | Yes | |
| 1.2 | Is the policy approved and supported by executive management? | Yes | Yes | |
| 1.3 | Are strategic goals and objectives spelled out in the policy? | Yes | Yes | |
| 1.4 | Are the goals and objectives comprehensive enough | Yes | Yes | |
| 1.5 | Is there an appropriate strategy to ensure implementation of the policy, e.g. ISO 14000, Responsible Care? | Yes | Yes | The Site has an accredited ISO 14001 system. No ISO audits were undertaken in this audit period. |
| 1.6 | Does the policy comply with that of the government? | Yes | Yes | |
| 1.7 | Are the policy and strategy and the compliance requirements sufficient to meet requirements of Hh site? | Yes | Yes | |
| 1.8 | Do the site managers receive the active support of other staff to implement the strategy? | Yes | Yes | |
| 2. ORGANISATION | | | | |
| 2.1 | Is there an organisation plan available? | Yes | Yes | |
| 2.2 | Is the plan appropriate for the management tasks to be accomplished? | Yes | Yes | |
| 2.3 | Have responsibilities, accountabilities and authority been assigned? | Yes | Yes | |
| 2.4 | Who is responsible for and are they suitably qualified for: a) Strategic function? b) Air quality management? c) Water quality management? d) Waste treatment? | M Havinga C Kidd C Kidd A Bowles | Yes | |

| CONDITION | QUESTION | RESPONSE | ADEQUATE | REMARKS |
|--|---|--|----------|--|
| | e) Waste disposal? f) Landfill equipment? g) Laboratory? h) Vehicle control? | C Kidd C Kidd A Bowles C Kidd | | |
| 2.5 | Are job descriptions available for the employees concerned? | Yes | Yes | Job descriptions reviewed previously by auditor. |
| 3. RESOURCES | | | | |
| 3.1 | Is there adequate manpower to accomplish all the management tasks on site? | Yes | Yes | |
| 3.2 | Is there a separate budget for environmental management expenditures? | Yes | Yes | |
| 3.3 | Are there adequate allocations for: a) Capital? b) Manpower? c) Running costs? d) Contracts? e) Other Expenses? | Yes | Yes | |
| 4. LEGAL REQUIREMENTS AND COMPANY STANDARDS | | | | |
| 4.1 | Is there a paper or electronic file containing a complete set of legal requirements? a) Relevant acts b) DWAF permits c) Consent use permits d) Other | Yes | Yes | A full set of all Acts pertinent to waste disposal is kept at Head Office in Johannesburg and a legal update service has been contracted to ensure the company is kept informed of any new developments. |
| 4.2 | How is the file kept current? | Legal Update Service | Yes | |
| 4.3 | Are there company guidelines for environmental performance? | Yes | Yes | |
| 4.4 | Are all staff members who have to contribute to environmental performance aware of the landfills/companies expectations? | Yes | Yes | |
| 4.5 | Does the site comply with all legal requirements and company standards? | See Compliance Audit | | |
| 5. SITE AND PLANT DESIGN | | | | |
| 5.1 | SITE | See Compliance Audit | | |
| 5.2 | BOREHOLE SYSTEM: | See Compliance Audit | | |
| 5.3 | LEACHATE MANAGEMENT: | See Compliance Audit | | |

| CONDITION | QUESTION | RESPONSE | ADEQUATE | REMARKS |
|------------------------------------|--|---------------------------------|---------------------------------|--|
| 5.4 | LANDFILL GAS MANAGEMENT | See Compliance Audit | | |
| 5.5 | WASTE TREATMENT PLANT | | | |
| 5.5.1 | 1. Is there a waste treatment plant at the site? | No | Yes | It is planned to use the microbial preparation, Archea II, which has been successful in the Eastern Cape, to reduce the organic content of the leachate. Application has been made to the DEAT for permission to use this technology: see text |
| 5.5.2 | 2. If yes, is the design adequate to treat the wastes for which it is designed? | N/A | | |
| 5.5.3 | 3. If no, are there plans to install a plant? | No | Yes | |
| 5.5.4 | 4. Are wastes treated on site | Yes | Yes | |
| 5.5.5 | 5. Which treatment procedures are used? a) Neutralisation with lime b) Ferrous sulphate reduction c) Oxidation: chlorine H ₂ O ₂ d) Sodium sulphide e) Ash blending | Yes Yes Yes Yes Yes | Yes Yes Yes Yes Yes | |
| 5.5.6 | 6. Are the chemical and waste storage facilities adequate? | Yes | Yes | |
| 5.6 | LABORATORY | | | |
| 5.6.1 | 1. Is there a laboratory on site? | Yes | Yes | |
| 5.6.2 | 2. Is its layout and design adequate? | Yes | Yes | The issue of the explosion proofing of the refrigerator was discussed. A Bowles to investigate. |
| 6. OPERATIONS AND PRACTICES | | | | |
| 6.1 | GENERAL | | | |
| 6.1.1 | Is there a designated responsible person? | Yes | Yes | Alma Bowles |
| 6.1.2 | Are there operational procedures in place for all operations on site particularly those dealing with: a) Air quality management? b) Water quality management? c) Site management? d) Occupational health management? | Yes Yes Yes Yes | Yes Yes Yes Yes | See text. |
| 6.1.3 | Have all operators been trained sufficiently in applying the procedures to ensure compliance. | Yes | Yes | |
| 6.1.4 | Do the operators comply with the procedural requirements? | Yes | Yes | |
| 6.2 | SITE OPERATIONS | | | |

| CONDITION | QUESTION | RESPONSE | ADEQUATE | REMARKS |
|-----------|--|--|---|---------|
| 6.2.1 | Aesthetics: a) Fenced and in good condition? b) Entrance Clean? c) Offices and guard hut adequate? d) Change rooms and ablutions clean? | Yes Yes Yes Yes | Yes Yes Yes Yes | |
| 6.2.2 | Are there adequate waste records? | See Compliance Audit | | |
| 6.2.3 | Access, is there: a) Adequate visitor control? | Yes | Yes | |
| | b) Adequate fencing, lighting and signage? | See Compliance Audit | | |
| 6.2.4 | Is there adequate landfill equipment on site: a) Landfill compactors? b) Bulldozers? c) FELs? d) Trucks? e) Scrapers? f) Water bowser? g) Pumps? | Yes Yes Yes Yes None Yes Yes | Yes Yes Yes Yes Yes Yes Yes | |
| 6.2.5 | Are there adequate personnel on site? a) Spotters? b) Drivers? c) General workers? d) Supervisors? e) Managers? | Yes Yes Yes Yes Yes | Yes Yes Yes Yes Yes | |
| 6.2.6 | Is there adequate: a) Cover material? b) Ash? c) Lime? d) Other chemicals? | Yes Yes Yes Yes | Yes Yes Yes Yes | |
| 6.2.7 | Is the waste: a) Compacted adequately? b) Covered daily? c) Being deposited according to plan? d) Working face adequate? e) Co-disposal adequate? f) Treated as required? g) Capable of disposal to wet weather cell? | Yes Yes Yes Yes Yes Yes Yes | Yes Yes Yes Yes Yes Yes Yes | |

| CONDITION | QUESTION | RESPONSE | ADEQUATE | REMARKS |
|-----------|--|----------------------------------|---------------------------------|---------|
| | h) Disposed in adequate trenches? | Yes | Yes | |
| 6.2.8 | Are the problem loads managed adequately? a) medical waste b) hazardous waste c) special/safe disposal loads d) tyres e) potentially radioactive loads | Yes Yes Yes Yes None | Yes Yes Yes Yes Yes | |
| 6.2.9 | Storm water control: | See Compliance Audit | | |
| 6.2.10 | Leachate control: | See Compliance Audit | | |
| 6.2.11 | Nuisance factors controlled adequately: a) Noise b) Dust c) Flies d) Litter e) Odours | Yes Yes Yes Yes Yes | Yes Yes Yes Yes Yes | |
| 6.2.12 | Is the site audited and are there adequate records? | See Compliance Audit | | |
| 6.3 | MONITORING PROGRAMMES | | | |
| 6.3.1 | Weather monitoring and data are available for: a) Rainfall b) Wind speed and direction c) Evaporation | Yes Yes Yes | Yes Yes Yes | |
| | d) Surface water quality e) Ground water quality f) Leachate quality g) Landfill gas h) Air quality (odour) i) Do the monitoring programmes indicate any pollution from the site? | See Compliance Audit | | |
| 6.4 | OCCUPATIONAL HEALTH AND SAFETY | | | |
| 6.4.1 | Is an audit report available from a registered professional? | Yes | Yes | |
| 6.4.2 | Is the personal protective equipment adequate? | Yes | Yes | |
| 6.4.3 | Is the PPE used properly? | Yes | Yes | |
| 6.4.4 | Is training given to staff and it is adequate? | Yes | Yes | |
| 6.4.5 | Is there regular training in health and safety? | Yes | Yes | |
| 6.4.6 | Are there trained first aiders and/or nursing sister on site? | Yes | Yes | |
| 6.4.7 | Are there adequate records of incidents/accidents? | Yes | Yes | |

| CONDITION | QUESTION | RESPONSE | ADEQUATE | REMARKS |
|-----------------------|---|--|--------------------------|---------|
| 6.4.8 | Emergency plan in place? | Yes | Yes | |
| 6.4.9 | Fire equipment adequate, checked regularly and readily available? | Yes | Yes | |
| 6.4.10 | A staff programme of medicals based on type of job in place? | Yes | Yes | |
| 6.4.11 | Are all contractors required to obey a site SHE policy? | Yes | Yes | |
| 6.5 | LABORATORY | | | |
| 6.5.1 | Is the laboratory clean and tidy? | Yes | Yes | |
| 6.5.2 | Are the procedures used clearly defined and readily available? | Yes | Yes | |
| 6.5.3 | Is all equipment required available? | Yes | Yes | |
| 6.5.4 | Are the laboratory records adequate? | Yes | Yes | |
| 6.5.5 | Are the monitoring methods designed to comply with the environmental legal and other requirements? | Yes | Yes | |
| 6.5.6 | Are the monitoring samples analysed by the company or under contract for: a) Air quality? b) Water quality: surface and ground? c) Waste? d) Land/soil? | Contract Contract Company Contract | Yes Yes Yes Yes | |
| 6.5.7 | Is all the on-site (or the contractor's) testing equipment regularly calibrated? | Yes | Yes | |
| 6.5.8 | How is the accuracy of measurement and results ensured? | Regular calibration and testing of equipment | Yes | |
| 6.5.9 | Do the methods of analysis comply with legal requirements in the case of water quality standards? | Yes | Yes | |
| 6.5.10 | To whom are the results reported: a) Management? b) Authorities? | Yes Yes | Yes Yes | |
| 7. MAINTENANCE | | | | |
| 7.1 | Is the maintenance policy and strategy focused on prevention or curative measures? | Prevention | Yes | |
| 7.2 | Is there a regular maintenance programme for all equipment on site? | Yes | Yes | |
| 7.3 | Have all technical staff members responsible for maintenance been trained adequately to ensure effective maintenance? | Yes | Yes | |

| CONDITION | QUESTION | RESPONSE | ADEQUATE | REMARKS |
|---|---|----------------------|----------|-------------------------------|
| 7.4 | Do technicians comply with environmental maintenance requirements? | Yes | Yes | |
| 8. CONTINGENCY MEASURES | | | | |
| 8.1 | Are there plans in place to cope with emergencies and contingencies in: <ul style="list-style-type: none"> • Air quality management? • Water quality management? <ul style="list-style-type: none"> Surface? Ground? • Waste management? • Land (site) management? | Yes | Yes | |
| 8.2 | Have the staff members who have the responsibilities for contingencies been appropriately trained? | Yes | Yes | |
| 8.3 | Do these staff members regularly exercise the contingencies and procedures related thereto? | Yes | Yes | |
| 8.4 | 4. Do you report emergencies to: <ul style="list-style-type: none"> • Management? • authorities <ul style="list-style-type: none"> - Air? - Water? • Neighbours? | Yes | Yes | |
| 8.5 | Do employees responsible for handling emergencies/ contingencies know the correct reporting procedures? | Yes | Yes | |
| 8.6 | Do employees dealing with contingencies have appropriate authority to cope? | Yes | Yes | |
| 9. INCIDENT REPORTING AND REMEDY | | | | |
| 9.1 | Do employees handling contingencies report to the correct authorities in compliance with legal requirements? | See Compliance Audit | | |
| 9.2 | Are written records kept to track progress with corrective actions or to record the results of measures instituted during contingencies? | Yes | Yes | |
| 9.3 | Is the experience gained in handling contingencies for operational improvements and/or training purposes? | Yes | Yes | |
| 9.4 | Any contingencies during the past year? | Yes | No | See text and compliance audit |

| CONDITION | QUESTION | RESPONSE | ADEQUATE | REMARKS |
|--|---|----------------------|------------|---------|
| 10. ENVIRONMENTAL MANAGEMENT TRAINING & AWARENESS | | | | |
| 10.1 | Are the personnel sufficiently environmentally aware: <ul style="list-style-type: none"> • Horizontally? • Vertically? | Yes Yes | Yes Yes | |
| 10.2 | Do you have environmental awareness training programmes presented? <ul style="list-style-type: none"> • Internally? • Externally? | Yes Yes | Yes Yes | |
| 10.3 | Is environmental management training appreciated and supported by executive management? | Yes | Yes | |
| 10.4 | Do you have programmes for formal in-house or university/technikon environmental management training? | External | Yes | |
| 11. CONTRACTOR SELECTION AND PERFORMANCE | | | | |
| 11.1 | Do you make use of outside contractors in environmental management in your company? | Yes | Yes | |
| 11.2 | Do you as a rule require of contractors to comply with environmental legal and company performance standards? | Yes | Yes | |
| 11.3 | Do you monitor the environmental performance of contractors? | Yes | Yes | |
| 11.4 | Do you keep records of contract performance? | Yes | Yes | |
| 11.5 | Do you take any form of action if contractors do not perform to the required standards or contractual agreements? | Yes | Yes | |
| 12. COMMUNICATION | | | | |
| 12.1 | Is there a complaints register and Monitoring Committee? | See Compliance Audit | | |

Appendix 3: Presentation to Monitoring Committee – 30th October 2008

SHONGWENI AUDIT April 2009

David A Baldwin, PhD
Environmental and Chemical Consultants cc

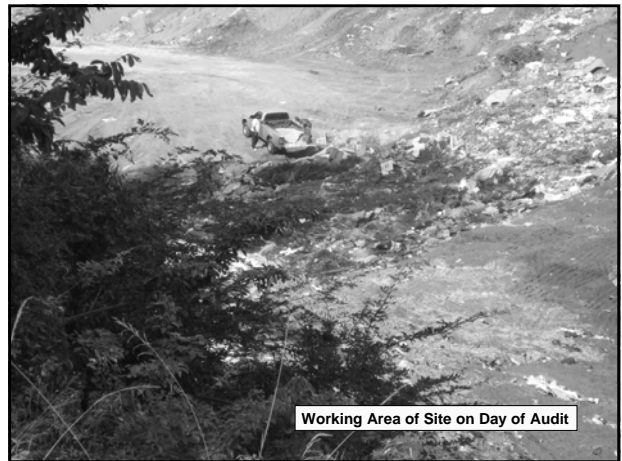
Approach to Audit

Site Visit and Audit: 29th & 30th April 2009

- Assess using Check Lists:
 - Compliance to Permit
 - Environmental Management System – important since compliance difficult without such a system.
- Evaluate Expert Reports, i.e. from
 - Jones and Wagener
 - Margot Saner and Associates
- Site Inspection
- Laboratory Inspection
- Waste Assessment and Acceptance Procedures



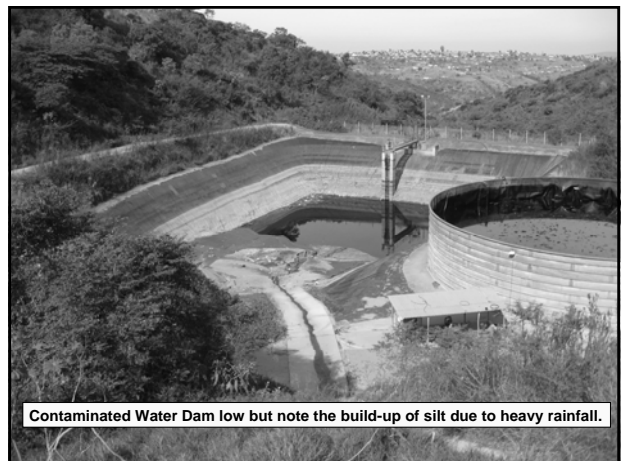
View of Site on Day of Audit



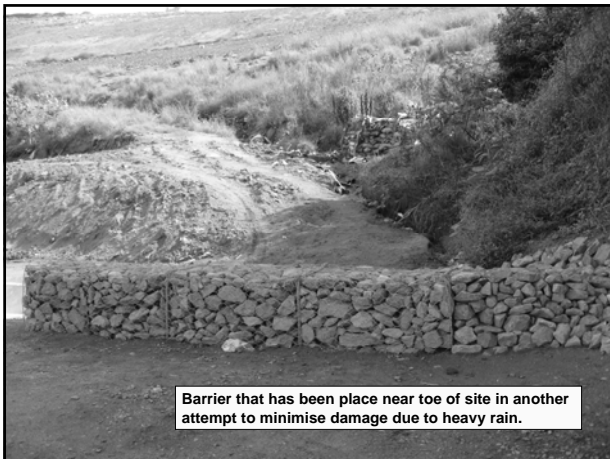
Working Area of Site on Day of Audit



Fine Dust kicked up by Vehicle transporting
Ash



Contaminated Water Dam low but note the build-up of silt due to heavy rainfall.



General Observations

- The weather was fine on the first day of the audit.
- Site cover was adequate and a lot of was ash visible.
- One area on site has reached maximum height above mean sea level.
- Odour levels were acceptable at time of audit: the misting sprays were not operating.
- Fencing of the correct height and in reasonable condition.
- The HCRW storage unit is still on-site even though no waste is being stored.
- According to the complaints register 20 vagrants/pickers were reported to be on-site by a resident, Brian Cuniffie, on the 23rd April. Follow up showed that the guard had allowed these people into the site. The guard was transferred off-site by the Security Company and replaced. The SAPS was also informed.

Permit Conditions

- No permit changes were made during this audit period.
- Presumably, the permit will be amended to include Valley 2 and any required changes should be followed up at that time.
- As indicated in the previous audit, application was made for a revision of this condition but the Department refused to give permission in a letter dated 9th December 2008 because of "insufficient evidence" that chlorinated lime reacts with waste and leachate had been provided.
- EnviroServ has decided not to appeal this decision.

Minimum Requirements

- The work to do the load calculations for the site has been commenced and discussions have been held with DEAT. These calculations will probably take up to a year as the site has to re-sample and analyse a large number of treated wastes.
- The load calculation requirement for landfills is highly controversial and it is extremely difficult for many landfills to comply:
 - The requirement is against national and international policies.
 - The 3rd edition of the Minimum Requirements was not published because of the opposition to the standards and load requirements it contained.

Construction

- Proposed developments include an upgrade of the leachate collection tank near the contaminated storm water dam. The plans have been forwarded to DEAT but approval has not yet been obtained.
- The EICR for Valley 2 has been approved. Construction is expected to commence in mid May 2009 and take about 9 months.
- The contaminated water dam has again silted up due to the heavy rains and needs to be cleaned out.
- It is planned to use the microbial preparation, Archea II, which has been successful in the Eastern Cape, to reduce the organic content of leachate. Application has been made to the DEAT for permission to use this technology

Waste Quantities

- The average monthly amount of waste disposed at the site for the period April 2008 to March 2009 was 22596 tons/month. This is a slight decrease over the previous year.
- Rainfall was particularly high in April 2008 and in the period November 2008 to March 2009.
- The limit of 18 tons/m of sanitary waste was exceeded in March 2009 (19.9 tons) but the average for the last six months was only 15.9 tons/m.

Engineering Studies

Site Stability:

- Jones and Wagener reported that the site stability is good up to the last survey date of the 4th April 2009.

Co-disposal Calculations

- The co-disposal ratio for the site for the period April 2008 to March 2009 was 7.23, which is above Jones and Wagener's recommended target of 7.0.

Air Quality

A copy of the presentation by Andrew Dickson of Margot Saner & Associates at the last monitoring committee meeting was provided to the auditor plus reports on the occupational health and safety studies undertaken on site:

- From an initial reading of the studies, the site does not represent a significant health hazard.
- There has been 1 odour complaint from residents in the period July 2008 to January 2009, 1 in February 2009 and 1 in March 2009.
- Reports on air sampling survey of workers; non-methane organic carbon compounds; and asbestos indicated that all these risks were low.

Water Quality Results

- The next annual Water Quality Monitoring Report is due July 2009 and will be covered in the next audit.
- Water Quality data up to the 16th October 2008 were provided to the auditor by Jones and Wagener.
- An initial assessment of the results indicate that no significant change in the ground and surface water quality since the last annual report in July 2008.
- Biomonitoring of the Mgoshongweni River was done by Umgeni Water in April 2009. The results that were provided to the auditor showed the presence of invertebrate families that have a very low tolerance to pollution in both monitoring positions that show good health; the water had no colour or odour problems.

Provisional Conclusions from Audit

- The site conforms to its permit conditions well:
 - ❑ The permit contains 132 "conditions"
 - ❑ Eighteen (18) of the conditions are not applicable, i.e. they are conditions that will apply, when the Site is finally closed, do not now apply, or they are un-auditable statements;
 - ❑ One (1) partial compliance was noted and this is associated with the load calculations that still need to be done.
 - ❑ One (1) non-compliance was noted and this is associated with not having a leachate treatment plant on-site;
 - ❑ The site was 98.7% compliant.

Future Legislation

- ❑ Revision of the Minimum Requirements
 - The DEAT project to benchmark SA's classification procedures and the Minimum Requirements against international approaches started on the 9th March 2009.
 - Scheduled for completion in September 2010.
 - Develop a revised approach to the classification of hazardous waste.
- ❑ Publication of the Waste Bill
 - The Waste Bill was passed during March 2009 and now becomes known as the Waste Act (28 of 2008)
- ❑ Waste Tyre Regulations
 - The waste tyre regulations were published in February 2009, which has the purpose of regulating the management of waste tyres.
 - Potentially lots of jobs will be created.

***Appendix 4: Copy of the Executive Summary of the Air Pathway Analysis Report by
Margot Saner & Associates: February 2009***

EXECUTIVE SUMMARY

Margot Saner & Associates (MS&A) has been conducting an Air Pathway Analysis System (APAS) at the Shongweni Waste Disposal Site since 1998. The project cycle rotates on an annual basis during which time the following air sampling is conducted:

- * source sampling (subsurface gas probe sampling)
- * worker exposure sampling
- * ambient air sampling

This sampling is conducted in order to assess the health risks to both workers and the surrounding community associated with exposures to airborne contaminant compounds. Both winter and summer sampling is conducted in order to account for any seasonal variations which may impact on results.

Worker Exposure Sampling includes not only sampling of exposure to airborne contaminants but also exposure to other stress factors including: noise, thermal stress, illumination and ergonomic stress. Reports detailing the outcomes of these surveys are issued separately in accordance with the guidelines issued by the Department of Labour for Approved Inspection Authorities. The sampling and survey procedures as well as the relevant reports are structured in accordance with the requirements of the Occupational Health and Safety Act (Act 85 of 1993).

This Interim APAS report serves to summarise the results obtained during the latest source sampling (sub-surface gas probe sampling) and ambient air sampling period: July 2008 – February 2009. The associated health risks posed to the surrounding communities and amenities are also assessed.

TEST RESULTS

These are summarized in the Annexures listed below:

- * **Annexure 5:** Tables 1-4: Ambient Air Sampling Results
- * **Annexure 5:** Table 5: Health Risk Assessment: Non-cancer Risk
- * **Annexure 5:** Table 6 – Health Risk Assessment: Cancer Risk (Class A1 Carcinogen)
- * **Annexure 5:** Table 7 - Health Risk Assessment: Cancer Risk (Class A2 Carcinogen)
- * **Annexure 6:** Subsurface Gas Probe Measurements Results
- * **Annexure 7:** PM₁₀ Sampling Results
- * **Annexure 8:** Odour complaints register

EXECUTIVE SUMMARY

EVALUATION OF RESULTS

Subsurface Gas Probe Sampling

SSGP measurements were obtained on the following dates during the latest sampling cycle:

- 14 October 2008
- 6 January 2009

METHANE:

DWAF guideline Limit (1% v/v)

Concentrations in excess of the Department of Water Affairs & Forestry (DWAF) Guideline Limit (1%) were detected in the following probes:

- October 2008: Probe No's 5, 13, 14, 15 and 17
- January 2009: Probe No's 5, 13, 14, 15 and 17

Explosive Range (5-15% v/v)

Concentrations within the explosive range (5-15%) were recorded in the following probes:

- October 2008: Probe No 17
- January 2009: Probe No 17

From these results it is evident that methane concentrations remain elevated along the Southern and Eastern site boundaries – in probes *inserted into the waste body itself*. Because of the very low gas flow rates and existing site topography it remains unlikely that there would be any significant off-site migration of landfill gas – i.e. continues to pose a minimal risk to off-site receptors.

CARBON DIOXIDE:

DWAF guideline Limit (0.5% v/v)

Concentrations in excess of the Department of Water Affairs & Forestry (DWAF) Guideline Limit (0.5%) were detected in the following probes:

- October 2008: Probe No's 5, 13, 14, 15 and 17
- January 2009: Probe No's 5, 13, 14, 15 and 17

The presence of elevated CO₂ concentrations (i.e. >3 % in soil) may be indicative of the migration of landfill gas in which the methane has been oxidized to water and CO₂. Natural degradation of vegetation in soil may also generate CO₂ concentrations of up to 6-8% - i.e. within the range detected in the majority of the above listed probes. From these results it is evident that carbon dioxide concentrations remain elevated along the Southern and Eastern site boundaries – i.e. primarily in probes *inserted into the waste body itself*. Because of the very low gas flow rates and existing site topography it remains unlikely that there would be any significant off-site migration of landfill gas – i.e. continues to pose a minimal risk to off-site receptors.

EXECUTIVE SUMMARY

EVALUATION OF RESULTS

HYDROGEN SULPHIDE:

Measureable concentrations of H₂S were detected in the following probes:

- October 2008: Probe No 13
- January 2009: Probe No's 5, 13, 14 and 17

During the January 2009 sampling period Probe No 13 yielded a result for H₂S marginally in excess of the odour threshold. The very low flow rate makes it unlikely that ambient concentrations of H₂S within close proximity to this probe would exceed the odour threshold. Off-site transfer of H₂S from this probe is therefore unlikely to occur.

The remainder of the probes yielded trace results (<1ppm) or results below the detection limit of the recording instrument (<0.1ppm)

Flow rates:

The flow rates of gaseous emissions from all the probes remained very low during both of the sampling periods. Significant off-site migration of gaseous emissions is unlikely to occur based on the recorded flow rates.

Ambient Air Sampling

Sampling for ambient concentrations of Non Methane Organic Compounds, Aldehydes (including formaldehyde), Ammonia and Hydrogen sulphide was conducted during four consecutive sampling periods:

- * 12 August – 30 September 2008
- * 30 September – 13 November 2008
- * 13 November 2008 – 7 January 2009
- * 7 January – 11 February 2009

On-site sampling was conducted at a single (priority) location:

- * Location B: Leachate dam (Eastern side of the site)

Off-site sampling was conducted as follows:

- * Location E: Mushroom farm
- * Location F: Onramp to N3 Highway (Assegay Rd)
- * Location G: 26 Hilldene Rd, Hillcrest

EXECUTIVE SUMMARY

EVALUATION OF RESULTS

On-site sampling location:

* **NMOC:** Ambient concentrations of NMOC at Location B (Leachate dam) were well below the relevant UK Environmental Assessment Levels (EALs) during all of the sampling periods.

* **Hydrogen sulphide:** Ambient concentrations of H₂S at Location B were well below the odour threshold during three of the sampling periods. No detectable trace of H₂S was recorded during the August-September period – i.e. ambient concentrations were below the detection limit of the analytical method (<0.01µg per sample). During the January-February 2009 period, ambient concentration of H₂S were marginally in excess of the odour threshold at the on-site sampling location.

* **Ammonia:** Ambient concentrations of ammonia at Location B were far below the relevant UK Environmental Assessment Level (EAL) during all of the sampling periods.

* **Aldehyde compounds:** Ambient concentrations of aldehyde compounds at Location B were below the relevant UK Environmental Assessment Levels (EALs) during three of the four sampling periods. During the November 2008 – January 2009 period, ambient concentrations of formaldehyde and acetaldehyde were in excess of the UK EAL.

Off-site sampling locations:

* **NMOC:** Ambient concentrations of NMOC at all of the off-site locations were far below the relevant UK Environmental Assessment Levels (EALs) during all of the sampling periods. Trace concentrations of BTEX were noted at Location F (N3 Highway) – as expected given the volume of vehicular traffic (exhaust gases sources of VOC emissions). Ambient concentrations of BTEX at the Hillcrest sampling location were minimal during all four of the sampling periods – i.e. either below the detection limits of the analytical method or trace concentrations well below the UK EALs.

* **Hydrogen sulphide:** The results for H₂S at all of the off-site locations were far below both the UK EAL and the Odour Threshold during all of the sampling periods.

* **Ammonia:** The results for NH₃ at all of the off-site locations were, similarly, far below both the UK EAL and the Odour Threshold during both of the sampling periods. As expected, average ambient NH₃ concentrations were highest at the Mushroom farm, although still far below the reference standards.

* **Aldehyde compounds:** The results yielded for average aldehyde concentrations at all of the off-site locations were far below both the UK EALs and the Odour Thresholds during both sampling periods.

EXECUTIVE SUMMARY

EVALUATION OF RESULTS

The latest results mirror those obtained during the previous August-November 2007 and November – January 2008 sampling periods and lend further support to the view that ambient aldehyde concentrations are seasonal in nature – depending on the incidence of off-site combustion sources (veld and cane fires). During the November 2008 – January 2009 sampling period average ambient concentrations of both formaldehyde and acetaldehyde were in fact marginally higher at the Hillcrest sampling location than on-site at the Shongweni landfill – i.e. suggesting that off-site combustion sources were responsible.

* Non-cancer health risks

On-site sampling location:

The non-cancer health risk at the leachate dam sampling location (Location B) was in excess of the Nominal Exposure Limit during three of the four sampling periods. The primary reasons for this were the elevated results obtained for several aldehyde compounds, particularly during the November 2008 – January 2009 period. Despite the elevated aldehyde results, the qualitative descriptors for the on-site non-cancer health risks during the August-September 2008 and January-February 2009 periods were LOW. During the November 2008 – January 2009 period the on-site non-cancer health risk was MODERATE.

Off-site sampling locations:

The non-cancer health risks at all of the off-site locations were MINIMAL during both the August-September 2008 and September- October 2008 sampling periods. Despite the elevated aldehyde concentrations recorded during the subsequent November 2008 – January 2009 period, the off-site non-cancer health risks remained LOW at both the Mushroom Farm and N3 sampling locations. The non-cancer health risk at the Hillcrest sampling location was MODERATE during this period due to elevated formaldehyde and acetaldehyde concentrations. During the January-February 2009 period, non cancer health risks at the on-site location and the Mushroom farm were LOW, whilst at the N3 and Hillcrest locations these non-cancer health risks were MINIMAL.

* Cancer health

On-site sampling location:

The cancer health risk associated with ambient **Benzene** concentrations (a Class A1: confirmed human carcinogen) at Location B (leachate dam) was **LOW** during all of the sampling periods.

Similarly, the cancer health risk associated with ambient **Formaldehyde** concentrations (a Class A2 or suspected human carcinogen) at Location B was **LOW** during all of the sampling periods.

EXECUTIVE SUMMARY

EVALUATION OF RESULTS

Off-site sampling locations:

The cancer health risk for **Benzene** (a Class A1: confirmed human carcinogen) was found to be **LOW** at all of the off-site sampling locations during all of the sampling periods.

Similarly, the cancer health risks associated with **Formaldehyde** concentrations at all of the off-site sampling locations were found to be **LOW** during all of the sampling periods.

PM₁₀ particulate matter

Ambient concentrations of PM₁₀ particulate matter were continuously monitored at an on-site location during a 2 ½ month period between 2007-10-19 and 2008-01-28. Without exception, all of the results obtained were well below both the DEAT Annual Limit for PM₁₀ (60 µg/m³) and the proposed ambient air quality standard of 50 µg/m³ (SANS 1929:2005).

The average ambient PM₁₀ concentration ranged from 0.009 - 0.017 mg/m³ or 9-17 µg/m³.

There were however several problems with the data collection during the sampling period, most of which were again related to an interrupted power supply to the sampler unit. This was caused by cloud cover over the site preventing sufficient sunlight from reaching the solar electrical panels.

Follow-up sampling of PM₁₀ concentrations is scheduled to commence during Summer 2009.

Odour complaints register

Only 1 odour complaint was logged during the period: July 2008 – January 2009. This complaint was logged by Mrs Barrett in August 2008. During February 2009 a single complaint was logged by Mrs Davis. The wind direction at the time of this complaint was blowing from the Shongweni site towards the complainants location – i.e. possible that any odour generated on site could have been transferred in the direction of the complainant.

Results obtained by at on-site sampling location (Leachate dam) continue to indicate that ambient concentrations of H₂S at this source remain largely below the odour threshold. Between August 2008 – February 2009 there was only one period (January – February 2009) when average ambient H₂S concentrations exceeded the odour threshold at the on-site location. There may well have been some excursions above the odour threshold but owing to the time weighted nature of the passive sampling methodology these could not be recorded.

EXECUTIVE SUMMARY

RECOMMENDATIONS

- Real-time continuous dust sampling should again be performed on site during the course of 2009 (PM10 sampling is scheduled to recommence on site during late 2009).
- It is recommended that the locations of the ambient air sampling stations again be reviewed for the 2009 sampling cycle. Sampling at Location A (on-site) should be reinitiated whilst the continued sampling at three off-site locations needs careful consideration.
- The ambient air quality data from the Shongweni site has been input into a formal air dispersion model for the site – generated by Airshed Planning Professionals. This air dispersion model is to be presented at a monitoring committee meeting scheduled for early 2009. Comment on the dispersion model is reserved pending its presentation.
- Monitoring of ambient H₂S concentrations on the Shongweni site should continue during the course of 2009.