



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

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File Reference. 12/9/11/L50/5/R1

EDMS Reference: WL 147014

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LICENCE NUMBER : 12/9/11/L50/5/R1
SECTOR : TREATMENT AND DISPOSAL OF TYPE 3
HAZARDOUS WASTE ON A CLASS C LINED
FACILITY
WASTE MANAGEMENT FACILITY : MEDUPI POWER STATION ASH DUMP
LOCATION : FARM EENZAAMHEID 687 LQ LIMPOPO
PROVINCE.
LICENCE HOLDER : ESKOM HOLDINGS LIMITED
ADDRESS : P.O. BOX 1091, JOHANESBURG, 2000.
CONTACT PERSON : MR JOHAN PRINSLOO
CONTACT DETAILS : TEL: (014) 762 6919 FAX: (013) 693 4331 Email:
prinslcj@eskom.co.za

WASTE MANAGEMENT LICENCE IN TERMS OF SECTION 49(1)(a) OF THE NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT, 2008 (ACT NO. 59 OF 2008)

In terms of the National Environmental Management: Waste Act, 2008 (Act No.59 of 2008), the Deputy Director General: Chemicals and Waste Management, acting under delegation, hereby grants **Eskom Holdings Limited** a Waste Management Licence for the following waste management activities as listed in Category B of Government Notice No 921 dated 29 November 2013:

Category B

- (4) The treatment of hazardous waste in excess of 1 ton per day calculated as a monthly average; using any form of treatment excluding the treatment of effluent , wastewater or sewage.



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- (7) The disposal of any quantity of hazardous waste to land.
- (10) The construction of facilities for activities listed in Category B of this Schedule (not in isolation to associated activity)

In this Licence, "Director" means the Director: Licensing of the National Department of Environmental Affairs who may be contacted at the address below:

Director: Licensing

Department of Environmental Affairs

Private Bag X 447

PRETORIA

0001

In this Licence, "RPW" means the Director: Resource Protection and Waste of the Department of Water and Sanitation (DWS) who may be contacted at the address below:

Director: Resource Protection and Waste

Department of Water and Sanitation

Private Bag X 313

PRETORIA

0001

1. SITE DETAILS

1.1 LOCATION

- 1.1.1 This Licence authorises the construction of the above ground temporary ashing facility and its associated infrastructure (installation of the aboveground ashing facility and construction of the overland ash conveyor belt to dispose ash from the power station to the ashing facility) and to treat, and dispose ash at the Medupi coal fired power station ashing facility located on 1000ha of the Farm Eenzaamheid 687 LQ within the jurisdiction of Lephalale Local Municipality, Limpopo Province (herein after referred to as the "site").



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1.1.2 The location of the Site must be according to the co-ordinates indicated on the licence application form, which is defined as follows:

Ash Conditioning Facility

Number of corners	Latitude	Longitude
A	23. 70896	27.56286
B	23.70925;	27.56236
C	23.70980;	27.56254
D	23.70942;	27.56303

Ash disposal facility

Number of corners	Latitude	Longitude
A	23 42 19.16138	27 32 22.71182
B	23 42 52.94489	27 32 32.01706
C	23 43 03.11708	27 32 02.60958
D	23 43 28.29121	27 30 20.11412
E	23 42 43.12134	27 30 10.34308
F	23 42 21.46992	27 31 51.57257
G	23 42 49.28378	27 31 27.63894

Emergency storage facility

Number of corners	Latitude	Longitude
A	23.70792	27.55791
B	23.70818;	27.55761
C	23.70841;	27.55774
D	23.70827;	27.55866



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1.2 DOCUMENTS CONSIDERED

- 1.2.1 Final Environmental Impact Assessment Report for the proposed construction and operation for treatment of ash and ash disposal facility compiled by Golder Associates, dated May 2006;
- 1.2.2 Addendum to the Final Environmental Impact Assessment Report dated June 2006;
- 1.2.3 Report by Golder Associates on ashing back into the mine pit dated August 2007;
- 1.2.4 Summary report on assessment of options for ash disposal compiled by Savannah Environmental, dated November 2008; and hereinafter referred to as "Report"; and
- 1.2.5 Waste Management Licence Variation dated 11 April 2011.

LICENCE CONDITIONS

1.3 SITE SECURITY AND ACCESS CONTROL

- 1.3.1 The Licence Holder must ensure effective access control of the Waste Management Site to prevent unauthorised entry.
- 1.3.2 Weatherproof, durable and legible signs in at least three official languages applicable in the area must be displayed at each entrance to the site.
- 1.3.3 The signs must indicate the risks involved in entering the Site, include the name, address and telephone number of the Licence Holder and the person responsible for the operation of the Site.



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2. MANAGEMENT

2.1 GENERAL MANAGEMENT

2.1.1 The activities shall be managed and operated:

- a) In accordance with an approved Operational Environmental Management Plan (OEMP), that, *inter alia*, identifies and minimises the risk of pollution, including those arising from operations, maintenance, accidents, incidents and non-conformance as well as those drawn to the attention of the Licence Holder as a result of complaints;
- b) In accordance with conditions of this Licence and any other written instruction by the Director;
and
- c) By an adequate, competent staff complement.

2.1.2 Any persons having duties that are or may be affected by this Licence must have convenient access to a copy thereof, which copy must be kept at or near the place where those duties are carried out.

2.1.3 A copy of this Licence may be published by the Department, in its discretion, on any website or other media.

2.1.4 The Licence Holder must submit a revised environmental management plan "EMP" for the construction of the future cells to the Director for approval before commencement of any future cells of the ash disposal facility stipulated in this licence. The EMP must be submitted at least six (6) months prior to the commencement of construction. The EMP must include but not be limited to the following aspects:-

2.1.4.1 Rehabilitation of all areas disturbed during the construction of future cells excluding those areas where permanent structures are erected;



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- 2.1.4.2 Heritage sites that are likely to be impacted by the development must be protected should they be found during construction of future cells;
- 2.1.4.3 A plan for search and rescue of protected and endangered species must be developed and implemented in order to relocate or re-use such species during the rehabilitation of disturbed areas;
- 2.1.4.4 Implementation of site specific erosion, sediments and dust control measures during the construction of future cells;
- 2.1.4.5 Amendments or any changes to the Construction and Operational EMPs must be submitted to the Director for approval before such changes could be effected. Such submission for consideration by Director must be accompanied by recommendations and or written comments of the monitoring committee as stipulated in condition 11 below and WMCO contemplated in 2.2 below; and
- 2.1.4.6 The Licence Holder must compile a waste inventory and management plan focusing on implementation of the waste hierarchy for each waste stream within 30 days from the date of issue of this licence and submit to the Director for approval.
- 2.2 DESIGNATION OF WASTE MANAGEMENT CONTROL OFFICER
- 2.2.1 A Waste Management Control Officer (WMCO) must be designated in writing to monitor and ensure compliance and correct implementation of all mitigation measures and provisions as stipulated in the licence and standard operation procedures. Proof of designation of the WMCO must be kept by the Licence Holder. The WMCO must:
- (a) Report any non-compliance with any Licence conditions or requirements or provisions of NEM:WA to the licensing authority.



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- 2.2.2 The duties and responsibility of the WMCO should not be seen as exempting the Licence Holder from any other legal obligations in terms of NEM:WA.
- 2.2.3 Duties and responsibilities of the WMCO can be included to the mandate of the ECO appointed in terms of the Medupi Power station ROD condition 3.2.4.1 unless Eskom prefers to designate an additional person as WMCO in line with Section 58 of NEM:WA.
- 2.3 **EMERGENCY PREPAREDNESS PLAN**
- 2.3.1 The Licence Holder must maintain and implement an emergency preparedness plan and review it annually when conducting audit, after each emergency incident and major accident. The plan must, amongst others, include measures to address:
- a) Power failure;
 - b) Equipment malfunction;
 - c) Site fires;
 - d) Industrial action
 - e) Spillage (on Site);
 - f) Natural disasters such as floods; and
 - g) The plan must include contact details of the nearest police station, ambulance services and the emergency centre.

3. PERMISSIBLE WASTE

- 3.1 Any portion of the Site, which has been constructed or developed according to condition 4 below, may be used for the treatment, emergency storage and disposal of hazardous waste (ash only).
- 3.2 The Licence Holder must prevent the treatment and disposal of waste that is not authorised at the Site.



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4. CONSTRUCTION OF THE FACILITY

- 4.1 Construction and further development within the site must be carried out under the supervision of a professional Civil Engineer, registered under the Engineering Profession of South Africa Act, 2000 (Act No.46 of 2000) appointed by the Licence Holder and he/she must submit a written report to the Director that the site is constructed in accordance with engineering requirements and according design plans approved by the Director and Responsible Authority:
- 4.2 The site plan must only be changed under the supervision of a registered professional engineer and upon approval by the Director.
- 4.3 Construction of future cells within the permitted foot may only be undertaken once the specified engineering drawings have been submitted and approved by the Director in writing.
- 4.4 Works shall be constructed and maintained on a continuous basis by the Licence Holder to divert and drain from the Site in a legal manner, all runoff water arising on land adjacent to the Site, which could be expected as a result of the estimated maximum precipitation during a period of 24 hours with an average frequency of once in fifty years (50). Such works shall, under the said rainfall event, maintain a freeboard of 800 mm.
- 4.5 Works shall be must be maintained on a continuous basis by the Licence Holder to divert and drain from the working face of the Site, all runoff water arising on the Site, which could be expected as a result of the estimated maximum precipitation and to prevent such runoff water from coming into contact with leachate from the Site. Such works shall, under the said rainfall event, maintain a freeboard of 800 mm.
- 4.6 Runoff water referred to in conditions which do not comply with the DWAF national water quality guidelines for the natural environment must be allocated for treatment prior to disposal or channelled to sewer provided permission is granted by the relevant local authority.



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- 4.7 The maximum height of the site must not exceed elevation as per the visual impact assessment recommendations which must be submitted to the Director for approval.
- 4.8 The Site must be constructed by a registered professional Engineer with special recognition to civil engineering practice to ensure stability in terms of Engineering Profession of South Africa Act, 2000 (Act No.46 of 2000).
- 4.9 The Licence Holder must construct future cells in line with the Waste Classification and Management Regulations, GN.R.634 of 23 August 2013.
- 4.10 The Licence Holder must ensure that the emergency storage area is constructed in compliance with the engineering designs ensuring that contamination of groundwater is prevented. The emergency storage area must have a storm water management system to collect all the contaminated water that might arise from the area.
- 5. GENERAL IMPACT MANAGEMENT AND OPERATION**
- 5.1 IMPACT MANAGEMENT**
- 5.1.1 Waste, which is not permissible on Site, must be dealt with according to relevant legislation or the Department's policies and practices.
- 5.1.2 The Licence Holder must prevent spillages. Where they happen nonetheless, condition 2.3.1 above shall apply and the Licence Holder must ensure the effective and safe cleaning of such spillages.
- 5.1.3 The disposal of hazardous waste must not impact on a water resource or on any other person's water use, property or land and must not be detrimental to the health and safety of the public in the vicinity of the activity.



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- 5.1.4 The Licence Holder must prevent the occurrence of nuisance conditions or health hazards.
- 5.1.6 The Licence Holder must ensure that all personnel who work with hazardous waste are trained to deal with these potential hazardous situations so as to minimise the risks involved. Records of training and verification of competence must be kept by the Licence Holder.
- 5.1.7 The Licence Holder must implement measures to minimise visual impact of the site.
- 5.1.8 The Licence Holder must ensure that clearing of vegetation does not result in encroachment of exotic species.
- 5.1.9 Indigenous vegetation must be established and maintained around the ash disposal facility paying attention to blending with the natural environment.
- 5.1.10 Noise levels must be within the industrial limits within the boundary of the site.
- 5.2 **OPERATION**
- 5.2.1 The Licence Holder must ensure that the integrity of the waterproof base and infrastructure for the containment of the contaminated storm water is routinely monitored and corrective action must be taken before containment integrity is breached.
- 6 **MONITORING**
- 6.1 **MONITORING METHODS AND PARAMETERS**
- 6.1.1 The Licence Holder must carry out all tests required in terms of this Licence in accordance with published laboratory analysis methods or those prescribed by and obtainable from the South African Bureau of Standards (SABS), referred to in the Standards Act, 2008 (Act 8 of 2008).



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- 6.1.2 The Licence Holder may only use another method of analysis if approved by the Department.
- 6.1.3 The Licence Holder must put in place a monitoring and measurement plan that must amongst others include:
- (a) Compaction ratio;
 - (b) Air space monitoring;
 - (c) Ash disposal facility stability;
 - (d) Noise assessment;
 - (e) Ground water and surface water quality monitoring including contaminated storm water.

6.2 WATER QUALITY MONITORING

- 6.2.1 The Medupi aboveground future cells ashing facility must be lined according to the Norms and Standards for Waste disposal, GN.R.636, of 23 August 2013, to minimise the seepage of pollutants into the ground water.
- 6.2.2 The licence holder must install a technologically advanced drainage and monitoring system as part of the Medupi ashing facility to prevent pollution through seepage. Early leak detection measures must be implemented for when it happens nonetheless.
- 6.2.3 The licence holder must monitor surface and groundwater quality on a monthly basis and implement corrective measures if pollution is detected.
- 6.2.4 The licence holder must establish and maintain a monitoring borehole network for the site whereby there is at least one upstream and another downstream for each aquifer hydro-geologically linked to the ash dump. There must be no obstruction to sampling, as required in terms of this Licence.



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6.2.5 Monitoring boreholes must be accessible and equipped with lockable caps. The Department and DWS reserve the right to take water samples at any time and to analyse these samples or have them analysed.

6.2.3 BACKGROUND MONITORING

6.2.3.1 Samples from the boreholes as required in condition 6.2.4 above, where the groundwater in the boreholes is at an expected higher hydraulic pressure level as the hydraulic pressure level of the groundwater under the site, must be considered as background monitoring.

6.2.3.2 Background groundwater monitoring must be conducted during each monitoring occasion at condition 6.3 and 6.4 for water quality variables listed under Annexure II.

6.3 DETECTION MONITORING

6.3.1 Monitoring must be conducted during wet and dry season of each year for the water quality variables listed in paragraph (a) for wet season and (b) of Annexure III for dry season samples must be tested.

6.4 INVESTIGATIVE MONITORING

6.4.1 If, in the opinion of the Director or Director: DWS, a water quality variable listed under the detection monitoring programme, as referred to in condition 6.3 shows an increasing trend, the Licence Holder must initiate a monthly monitoring programme for the water quality variables listed in Annexure II.



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7. INVESTIGATIONS

- 7.1 If, in the opinion of the Director, environmental pollution, nuisances or health risks may be or is occurring on the Site, the Licence Holder must initiate an investigation into the cause of the problem or suspected problem.
- 7.2 If, in the opinion of the Director and/or Director: DWS, water pollution may be occurring or is occurring, the Licence Holder must initiate an investigation into the cause of the problem or suspected problem. Such investigation must include the monitoring of the water quality variables at those monitoring points and at such frequency as may be specified by Director: DWS.
- 7.3 Should the investigation carried out as per conditions 7.1 and 7.2 above reveal any unacceptable levels of pollution, the Licence Holder must submit mitigation measures to the satisfaction of the Director.

8. RECORDING

- 8.1 The Licence Holder must keep records and update all the information referred to in Annexure I and submit this information to the Director on an annual basis.
- 8.2 All records required or resulting from activities required by this Licence must:
- a) Be legible;
 - b) Be made as soon as reasonably practicable and should form part of the external audit report;
 - c) If amended, be amended in such a way that the original and any subsequent amendments remain legible and are easily retrievable; and
 - d) Be retained in accordance with documented procedures.



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8.3 Records demonstrating compliance with condition 2.1.1 must be maintained for five years.

9. REPORTING

9.1 The Licence Holder must, within 24 hours, notify the Director of the occurrence or detection of any incident on the Site, or incidental to the operation of the site, which has the potential to cause, or has caused pollution of the environment, health risks, nuisance conditions or water pollution.

9.2 The Licence Holder must, within 14 days, or a shorter period of time, if specified by the Director, from the occurrence or detection of any incident referred to in condition 9.1, submit an action plan, which must include a detailed time schedule, and resource allocation, signed off by top management, to the satisfaction of the Director and/or the Director: RPW of measures taken to –

- a) Correct the impact resulting from the incident;
- b) Prevent the incident from causing any further impact; and
- c) Prevent a recurrence of a similar incident.

9.3 In the event that measures have not been implemented within 21 days of the incident to address impacts caused by the incident referred to in condition 9.1, or measures which have been implemented are inadequate, the Director may implement the necessary measures at the cost and risk of the Licence Holder.

9.4 The information required in terms the water quality management plan must be reported to the Director: RPW bi-annually. The information must include a trend report which must contain a graphical representation of all results obtained at any specific point as well as interpretation and discussion of each monitoring occasion.

9.5 The Licence Holder must keep an incident and complaints register, which must be attached to the external audit report, as well as the Department and DWS for audit purposes.



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- 9.6 The Department must be notified without delay in the case of the following:
- a) Any malfunction, breakdown or failure of equipment or techniques, accident or fugitive emission which has caused, is causing or may cause significant pollution;
 - b) The breach of this Licence; and
 - c) Any significant adverse environmental and health effects.
- 9.7 The Department must be notified within 14 days of the following changes:
- a) Licence Holder's trading name, registered name or registered office address;
 - b) Particulars of the licence Holder's ultimate holding company (including details of an ultimate holding where a licence holder has become a subsidiary; and
 - c) Steps taken with a view to the Licence Holder, or any one of them, going into bankruptcy, entering into arrangement with creditors, or, in the case of them being in a partnership, dissolving the partnership.
- 9.8 The information required in terms of condition 6 must be reported to the Director in a yearly report. The information must also be included into a trend report, which must contain a graphical representation of all results obtained previously at any specific point, as well as an interpretation and discussion of the results of each monitoring occasion

10. AUDITING

10.1 INTERNAL AUDITS

- 10.1.1 Internal audits must be conducted monthly by the Licence Holder and on each audit occasion an official report must be compiled by the relevant auditor to report the findings of the audits, which must be made available to the external auditor specified in condition 10.2.1.



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10.2 EXTERNAL AUDITS

10.2.1 The Licence Holder must appoint an independent external auditor to audit the site annually and the auditor must compile an audit report documenting the findings of the audit, which must be submitted by the licence holder.

10.2.2 The audit report must:

- a) Specifically state whether conditions of this licence are adhered to;
- b) Include an interpretation of all available data and test results regarding the operation of the site and all its impacts on the environment;
- c) Specify target dates for the implementation of the recommendations by the Licence Holder to achieve compliance;
- d) Contain recommendations regarding non-compliance or potential non-compliance and must specify target dates for the implementation of the recommendations by the Licence Holder and whether corrective action taken for the previous audit non conformities was adequate; and
- e) Show monitoring results graphically and conduct trend analysis.

10.2.3 Each external audit report referred to in condition 10.2 above must be submitted to the Director within 30 days from the date on which the external auditor finalised the audit report.

10.3 DEPARTMENTAL AUDITS AND INSPECTIONS

10.3.1 The Department reserves the right to audit and/or inspect the Site without prior notification at any time and at such frequency as may be determined by the Director.

10.3.2 The Licence Holder must make any records or documentation available to the Director upon request, as well as any other information he/she may require.



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11 MONITORING COMMITTEE

11.1 The Licence Holder must take all reasonable steps to maintain and ensure the continued functioning of the monitoring committee for the normal operative lifetime of the Facility and for the closure of the Facility, as determined by the Director.

11.2 The Monitoring Committee must formulate a terms of reference and code of conduct, according to the Minimum Requirements and to the satisfaction of the Director, under which the Committee can operate.

11.3 The Monitoring Committee shall be representative of relevant interested and affected persons and may consist of at least the following persons:-

11.3.1 representative(s) of this Department;

11.3.2 representative(s) of the Provincial Department responsible for waste management and environmental functions; and

11.3.3 at least 3 (three) persons/parties, or their representatives elected by the local residents.

11.4 The Monitoring Committee shall meet at least twice a year and not later than 30 days after the external audit report specified in condition 11.2.

11.5 The Licence Holder must keep minutes of all meetings of the Monitoring Committee and distribute these minutes to all members of the Monitoring Committee within 30 days after the meeting.

12. LEASING AND ALIENATION OF THE SITE

12.1 Should the Licence Holder want to alienate or lease the Site, he/she must notify the Director in writing of such an intention at least 120 days prior to the said transaction for approval.



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12.2 Should the approval be granted, the subsequent Licence Holder shall remain liable for compliance with all licence conditions.

13. TRANSFER OF WASTE MANAGEMENT LICENCE

13.1 Should the Licence Holder want to transfer the Licence, he/she must apply in terms of Section 52 of the National Environmental Management: Waste Act, 2008 (Act No 59 of 2008).

13.2 Any subsequent Licence Holder shall be bound by conditions of the Licence.

14. GENERAL

14.6 This Licence shall not be transferable unless such transfer is subject to condition 13.1.

14.7 This Licence shall not be construed as exempting the Licence Holder from compliance with the provisions of National and Provincial Legislation and any relevant Ordinance, Regulation, By-law or relevant National Norms and Standards. Transgression of any condition of this Licence could result in the Licence being withdrawn by the Department.

14.8 Non-compliance with a condition of this Licence may result in criminal prosecution or other actions provided for in Section 67 (1) of the National Environmental Management: Waste Act, 2008.

14.9 In terms of section 28 and 30 of the NEMA and section 19 and 20 of the National Water Act No.36 of 1998, any costs incurred to remedy environmental damage must be borne by the person responsible for the damage. It is therefore imperative that the Licence Holder reads through and understands the legislative requirements pertaining to the project. It is the Applicant's responsibility to take reasonable measures which include informing and educating contractors and employees about the environmental risks of their work and training them to operate in an environmentally acceptable manner.



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14.10 This Licence is valid for a period of ten (10) years and shall be reviewed every five (05) years from the date of issue or at any time before or after that date. The Licence Holder must notify the Director within six (06) months prior the due date of the intended review. Based on the results of the review, especially compliance to Licence conditions or recommendations from the audit reports and or changing legislation, the Licence could be amended or withdrawn or the validity thereof extended.

Mr Mark Gordon

DEPUTY DIRECTOR-GENERAL: CHEMICALS AND WASTE MANAGEMENT

DATE: 18 SEPTEMBER 2015



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ANNEXURE I
INFORMATION WHICH SHALL BE SUBMITTED ON AN ANNUAL BASIS CONDITION

** = Indicate with an X. Please print legibly.*

NAME OF SITE: _____ DATE OF REPORT: _____ (y/m/d)

1. Registered owner(s) of property on which waste management facility is situated:

Name	Telephone	
Postal Address	Fax	
	Postal Code	

2. Operator in control of waste management facility:

Name	Telephone	
Identity number	Tel. After hours	
Educational Qualifications		
Other Relevant competencies:		

3. Indicate the type of waste and approximate quantities of waste generated, treated and disposed during the year:

Type of waste (Specify)	Quantity (m ³ annum ⁻¹)	Source
TOTAL		

4. Indicate the type of waste and approximate quantities of waste produced, treated or disposed during the year:

Type of waste	Quantity (m ³ annum ⁻¹)	Stored, treated or disposed
TOTAL		

I, the undersigned, declare that the information stated above below is to my knowledge a true reflection of the status at the _____ Waste Management Facility

Signature: _____

Name: _____

Capacity: _____ Date: _____



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ANNEXURE II

WATER QUALITY VARIABLES REQUIRED FOR INVESTIGATION AND BACKGROUND MONITORING

Ammonia (NH₃-N)
Alkalinity (P Alk)
Lead (Pb)
Cadmium (Cd)
Boron (B)
Biological Oxygen Demand (BOD)
Calcium (Ca)
Chemical Oxygen Demand (COD)
Chloride (Cl)
Chromium (Hexavalent-Cr⁶⁺)
Chromium (Total-Cr)
Cyanide (CN)
Electric Conductivity (EC)
Free Saline Ammonia as N (NH₄-N)
Magnesium (Mg)
Mercury (Hg)
Nitrate as N (NO₃-N)
pH
Phenolic Compounds (K)
Potassium (K)
Sodium (Na)
Sulphate (SO₄)
Total Dissolved Solids (TDS)
Total Organic carbon (TOX)
Total Organic halogen
Volatile Organic compounds
Fluoride (F)



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ANNEXURE III

WATER QUALITY VARIABLES REQUIRED FOR BACKGROUND AND DETECTION MONITORING

(a) Wet season for

Alkalinity (P Alk)
Chemical Oxygen Demand (COD)
Chloride (Cl)
Nitrate (NO₃-N)
Potassium (K)

(b) Wet and Dry season for

Electric Conductivity (EC)
Calcium (Ca)
Fluoride (F)
Magnesium (Mg)
Sodium (Na)
Sulphate (SO₄)