



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

**RISK ASSESSMENT IN TERMS OF REGULATION 8 OF THE WASTE
EXCLUSION REGULATIONS**

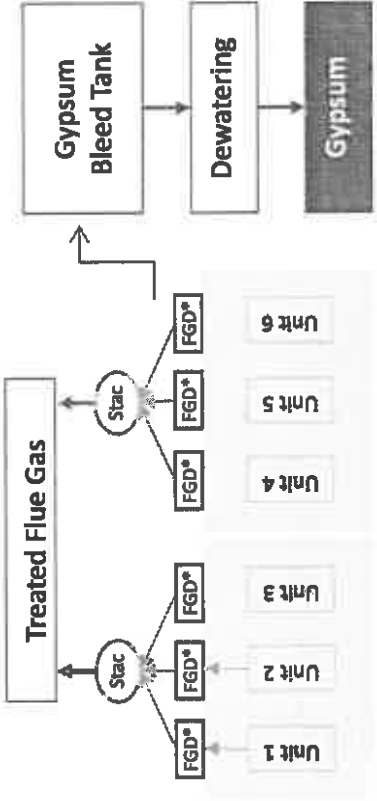
| | | | |
|--|--|-------------------|--------------------------------|
| APPLICANT | ESKOM HOLDINGS SOC Ltd | | |
| WASTE STREAM OR PORTION OF A WASTE STREAM | Flue Gas Desulphurisation Gypsum from Eskom coal fired Power Stations | | |
| BENEFICIAL USE/S | Manufacture of wallboard, cement, plaster of Paris, soil conditioning and a hardening retarder in Portland cement. | | |
| WASTE GENERATING FACILITY | | | |
| PHYSICAL ADDRESS OF FACILITY | POWER STATION NAME | COALFIELDS | Location |
| | Arnot PS | Witbank | Rietkuil, 50km E of Middleburg |

| | | |
|-----------------------------------|------------|-------------------------------------|
| Camden PS | Witbank | 15km E of Ermelo |
| Duvha PS | Witbank | 15km E of Witbank |
| Grootvlei PS | Witbank | Near Balfour in Mpumalanga |
| Hendrina PS | Witbank | Pullenshope, 40km S Middleburg |
| Kendal PS | Witbank | Near Ogies, 40km SW of Witbank |
| Komati PS | Witbank | Komati, 37 km from Middleburg |
| Kriel PS | Witbank | Between Kriel and Ogies |
| Lethabo PS | Free State | Between Vereeniging and Sasolburg |
| Majuba PS | Witbank | Between Volksrust and Amersfort |
| Matimba PS | Waterburg | LepHalale |
| Matia PS | Witbank | Between Kriel and Secunda |
| Tutuka PS | Witbank | 25km from Standerton road to Bethal |
| Medupi PS (Partially operational) | Waterburg | LepHalale |
| Kusile PS (Partially operational) | Witbank | Nkangala district, Mpumalanga |
| | | |
| | | |

GPS CO-ORDINATES OF WASTE GENERATING FACILITY

The co-ordinates of all Eskom Power Stations are included in an Appendix attached to this application. THE CO-ORDINATES REPRESENT "ALL CORNERS" OF THE WASTE GENERATION FACILITY AS REQUIRED BY THE APPLICATION. SEVERAL CO-ORDINATES ARE REQUIRED TO IDENTIFY THE IRREGULAR SHAPE OF ESKOM ASH GENERATING FACILITIES. THE CO-ORDINATES REPRESENT THE BOUNDARIES OF THE POWER STATION PROPERTY WHICH WOULD INCLUDE ALL POSSIBLE ASH TAKE OFF SITES

| CONTACT PERSON | | | | | | | | | | | | | | | | |
|---|---|--|--|--|-----------|-----|------------|-----|--|--|--------|--|--------------|----------------------|--|--|
| NAME | WARREN FUNSTON | | | | | | | | | | | | | | | |
| ADDRESS | MEGAWATT PARK, MAXWELL DRIVE, SANDTON | | | | | | | | | | | | | | | |
| EMAIL ADDRESS | Warren.funston@eskom.co.za | | | | | | | | | | | | | | | |
| TELEPHONE | 011 800 4309 | | | | | | | | | | | | | | | |
| * DETAILED DESCRIPTION OF WASTE GENERATING PROCESS | <p>Synthetic Gypsum is a by-product of the flue gas desulfurization (FGD) process commonly known as "scrubbing. It is referred to as "FGD gypsum" or "synthetic gypsum," and is produced by forced oxidation of calcium sulfite hydrate. Fluidized bed combustion (FBC) boilers burn coal in a fluidized bed of limestone, which captures most of the sulfur in the flue gas as calcium sulfate.</p> | | | | | | | | | | | | | | | |
| | <table border="1"> <thead> <tr> <th colspan="3">FGD Gypsum</th> </tr> <tr> <th>Hazardous</th> <th>Why</th> <th>Waste Type</th> </tr> </thead> <tbody> <tr> <td>Yes</td> <td>Dust with respirable silica Calcium concentration Sulphate concentration</td> <td>Human Health (respiration) Environment</td> </tr> <tr> <td>Kusile</td> <td></td> <td>3 SANS 10234</td> </tr> <tr> <td>Medupi (theoretical)</td> <td></td> <td></td> </tr> </tbody> </table> | FGD Gypsum | | | Hazardous | Why | Waste Type | Yes | Dust with respirable silica Calcium concentration Sulphate concentration | Human Health (respiration) Environment | Kusile | | 3 SANS 10234 | Medupi (theoretical) | | |
| FGD Gypsum | | | | | | | | | | | | | | | | |
| Hazardous | Why | Waste Type | | | | | | | | | | | | | | |
| Yes | Dust with respirable silica Calcium concentration Sulphate concentration | Human Health (respiration) Environment | | | | | | | | | | | | | | |
| Kusile | | 3 SANS 10234 | | | | | | | | | | | | | | |
| Medupi (theoretical) | | | | | | | | | | | | | | | | |

| | | |
|---|---|-----------------------------|
| <p>PRODUCTION PROCESS FLOW CHART ATTACHED</p> | <p>YES X</p>  <pre> graph TD subgraph Units U1[Unit 1] --> FGD1[FGD*] U2[Unit 2] --> FGD2[FGD*] U3[Unit 3] --> FGD3[FGD*] U4[Unit 4] --> FGD4[FGD*] U5[Unit 5] --> FGD5[FGD*] U6[Unit 6] --> FGD6[FGD*] end FGD1 --> S1((Stack)) FGD2 --> S1 FGD3 --> S1 FGD4 --> S1 FGD5 --> S2((Stack)) FGD6 --> S2 S1 --> TFG[Treated Flue Gas] S2 --> TFG TFG --> GBT[Gypsum Bleed Tank] GBT --> DW[Dewatering] DW --> G[Gypsum] </pre> | <p>NO</p> |
| <p>WASTE CLASSIFICATION SANS 10234:</p> | <p>HAZARDOUS WASTE X</p> | <p>GENERAL WASTE</p> |
| <p>*A process flow chart must be attached to the process description</p> | <p>REPORT ON RESULTS OF ENVIRONMENTAL HAZARD ASSESSMENT ATTACHED</p> | <p>YES X</p> |
| <p>NO</p> | | |

| Activity | Risk Description | Environmental Receptor | Assessment of Criteria | Significance |
|----------|------------------|------------------------|------------------------|--------------|
|----------|------------------|------------------------|------------------------|--------------|

RISK ASSESSEMENT

| | | Impact | Probability | Magnitude | Duration | Scale | |
|---|--|---|-------------|-----------|----------|-------|----|
| <p>Transport of gypsum- up loading and off loading</p> <p>Accidental spillages during loading and unloading of vehicles. Dust will be less of a factor in the handling of gypsum. Spillages during the on and / or offloading might contaminate nearby natural botanical species and agricultural crops by settling on the plant leaves, stems or flowers.</p> <p>Although gypsum has been shown to increase the pH of the soil, certain soils might be contaminated with large and continuous deposition of gypsum spillage</p> | <p>Nearby botanical species including agricultural crops.</p> <p>Nearby natural or (groundwater or surface water) or man-made water sources or water bodies</p> <p>Vertebrate or invertebrate aquatic life</p> <p>Soil Pollution</p> | L | 4 | 4 | 1 | 1 | 24 |
| | <p>Transport of all Gypsum</p> <p>Spillage of gypsum from the transport vehicles on route to the gypsum users.</p> <p>Although gypsum has been shown to increase the pH of the soil,</p> | <p>Nearby botanical species including agricultural crops.</p> <p>Nearby natural or (groundwater or surface water) or man-</p> | L | 1 | 8 | 2 | 2 |

| | | | | | | | | | |
|---|--|---|---|---|---|---|---|----|--|
| | <p>certain soils might be contaminated with large and continuous deposition of gypsum.</p> | <p>made water sources or water bodies Vertebrate or invertebrate aquatic life Air pollution Soil Pollution</p> | | | | | | | |
| <p>Transport of all Gypsum : Compliance of vehicle to Road traffic Act</p> | <p>Vehicles in poor condition or inadequate to transport gypsum will facilitate uncontrolled spillages of gypsum. . Although gypsum has been shown to increase the pH of the soil, certain soils might be contaminated with large and continuous deposition of gypsum.</p> | <p>Nearby botanical species including agricultural crops. Nearby natural or surface water) or man-made water sources or water bodies Vertebrate or invertebrate aquatic life Air pollution Soil Pollution</p> | L | 1 | 8 | 2 | 3 | 13 | |

| | | | | | | | | |
|---------------------------------|---|--|---|---|---|---|---|---|
| <p>Storage of Gypsum</p> | <p>Soil contamination by gypsum stored at the user facility. Gypsum will be stored in tankers or closed bins / containers and it remains improbable that any contamination will occur.</p> <p>Gypsum spillages could contaminate water bodies and be detrimental to vertebrate and invertebrate aquatic life. In extreme cases, natural vectors could convey contaminated water to groundwater aquifers. Although gypsum has been shown to increase the pH of the soil, certain soils might be contaminated gypsum spillages.</p> | <p>Natural and man-made surface water bodies and Groundwater. Soil contamination</p> | L | 1 | 6 | 2 | 1 | 9 |
| <p>Storage of Gypsum</p> | <p>Groundwater contamination by gypsum stored at the user facility. Gypsum will be stored in tankers or closed bins / containers and it remains improbable that any contamination will occur</p> <p>Gypsum spillages could contaminate water bodies and be detrimental to vertebrate and invertebrate aquatic life. In extreme cases, natural vectors could convey contaminated water to groundwater aquifers</p> | <p>Natural and man-made surface water bodies and Groundwater.</p> | L | 1 | 4 | 2 | 1 | 7 |

| | | | | | | | | |
|--|---|--|----------|----------|----------|----------|----------|-----------|
| | | | | | | | | |
| <p>Storage of Gypsum</p> | <p>Surface water contamination by gypsum storage at the user facility. Gypsum will be stored in tankers or closed bins / containers and it remains improbable that any contamination will occur</p> <p>Gypsum spillages could contaminate water bodies and be detrimental to vertebrate and invertebrate aquatic life. In extreme cases, natural vectors could convey contaminated water to groundwater aquifers.</p> | <p>Natural and man-made surface water bodies and</p> | <p>L</p> | <p>2</p> | <p>2</p> | <p>2</p> | <p>1</p> | <p>10</p> |
| <p>Potential for stockpiled gypsum to generate leachate during rainfall</p> | <p>Leachate contaminants may be transported by stormwater runoff into nearby drainage lines, streams and rivers resulting in secondary impacts. They may also percolate into the groundwater resulting in secondary impacts on the aquifer.</p> | <p>Soil, Land and water pollution</p> | <p>L</p> | <p>1</p> | <p>2</p> | <p>2</p> | <p>1</p> | <p>5</p> |

| | | | | | | | | |
|--|---|---|---|---|---|---|---|----|
| <p>Construction and design of an gypsum handling or storage facility</p> | <p>Gypsum facilities which are poorly ventilated will cause possible health impacts. Poorly ventilated gypsum workplaces will likely result in health symptoms and skin and dermal irritations associated with gypsum particle ingestion.</p> | <p>Health impacts to staff, handlers and workers of gypsum</p> | L | 1 | 6 | 3 | 1 | 10 |
| <p>Construction and design of an gypsum handling or storage facility</p> | <p>Gypsum facilities close to natural water bodies will cause possible soil or water contamination. Spillages might contaminate natural and man-made surface water bodies.</p> | <p>Soil pollution Water Pollution</p> | L | 1 | 4 | 2 | 1 | 7 |
| <p>Access to Control Gypsum facilities</p> | <p>Uncontrolled access to gypsum facilities will lead to non-compliance to the controls of the Risk Management Plan.</p> | <p>Soil pollution Water Pollution</p> | L | 1 | 6 | 2 | 2 | 9 |
| <p>Handling of Gypsum on / site Extraction of Gypsum / On and off loading of Gypsum</p> | <p>Spillage of gypsum material or slurry. Gypsum spillages in large quantities during the on and / or offloading might contaminate nearby natural botanical species and agricultural crops by settling on the plant leaves, stems or flowers.</p> <p>Although gypsum has been shown</p> | <p>Nearby botanical species including agricultural crops. Nearby natural (groundwater or surface water) or man-made water sources or water bodies Vertebrate or</p> | L | 1 | 2 | 1 | 1 | 4 |

| | | | | | | | |
|--|--|---|----------------|----------|----------|----------|-----------|
| | <p>to increase the pH of the soil, certain soils might be contaminated with large and continuous deposition of gypsum.</p> | <p>invertebrate life</p> | <p>aquatic</p> | | | | |
| <p>Emergency or unplanned event</p> | <p>Loss of containment with potential impacts to air, soil, ground and surface water. In an emergency or unplanned event, spillages in large quantities might contaminate nearby natural botanical species and agricultural crops by settling on the plant leaves, stems or flowers.</p> <p>Although gypsum has been shown to increase the pH of the soil, certain soils might be contaminated with large and continuous deposition of gypsum.</p> | <p>Nearby species including agricultural crops.</p> <p>Nearby natural (groundwater or surface water) or man-made water sources or water bodies</p> <p>Vertebrate or invertebrate aquatic life</p> | <p>L</p> | <p>1</p> | <p>8</p> | <p>2</p> | <p>2</p> |
| <p>Storm water management</p> | <p>The inadequate management of stormwater on site will allow discharge of contaminated water to the environment. Gypsum contaminated effluent or stormwater if diverted into water bodies, may be harmful if ingested by aquatic vertebrates and invertebrates.</p> | <p>Natural surface and ground water aquifers</p> <p>Man-made water bodies</p> | <p>L</p> | <p>1</p> | <p>6</p> | <p>2</p> | <p>10</p> |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|----|
| <p>Leaching of gypsum elements</p> | <p>The chemical reaction of gypsum particles with natural elements in the surrounding soil and water could lead to the leaching of harmful metals into the environment. The leaching of harmful metals from gypsum will be toxic to all vertebrate and invertebrate life in the soil substrate and water bodies. The negative effect will likely be extended to the health of the soils and the botanical biodiversity of the area.</p> | <p>Soil structures, geology, surface and ground water pathways and aquifers</p> | L | 1 | 2 | 2 | 1 | 5 |
| <p>Contamination of soil due to overdose applications.</p> | <p>The application of gypsum to different soils as an ameliorant, will be controlled via a product specification sheet. The over application of gypsum may negatively affect the structure of the soil.</p> | <p>Soil structure</p> | L | 2 | 4 | 3 | 1 | 16 |
| <p>SOCIO-ECONOMIC RISKS: Positive spin offs at risk should gypsum beneficiation not be possible:</p> | | | | | | | | |
| <p>Job creation</p> | <p>Increase in job creation for unskilled to semiskilled workforce in vulnerable communities.</p> | <p>Local economy</p> | + | | | | | |

| | | | | | | | | |
|----------------------------|---|---------------|---|--|--|--|--|--|
| Small business development | The low cost of gypsum and the relaxation of some of the Norms and Standards will promote small business development | Local economy | + | | | | | |
| Community based projects | The low cost of gypsum and the relaxation of some of the Norms and Standards may empower vulnerable communities to participate in projects. Eskom assistance may also promote community based projects. | Local economy | + | | | | | |

**ACCOUNTING FOR GYPSUM BENEFICIATED
"CRADLE TO GRAVE PRINCIPLE"**

Eskom anticipate that gypsum material for soil ameliorant will be supplied via an interim offtaker. The generator retains the ultimate responsibility for ensuring that the waste is handled, stored, transported and disposed of according to the legislation and in an environmentally sound and responsible manner. The law requires that all producers of waste account for the volumes produced and recycled until the waste is properly disposed of or beneficiated into a product fit for use. The following systems will be used to account for the gypsum recycled from Eskom's Power Station:

- Gypsum –
 - Eskom uses weighbridge solution at each loading point to capture the gypsum volumes taken.
 - Off takers have installed their own weighbridges solution which will also be integrated into Eskom bottom gypsum weighbridge solution in order to centralise the volume database and provide consolidated reporting.

- o Eskom uses weighbridge solution at each loading point to capture the gypsum volumes taken.

Notwithstanding the current weighbridge solutions Eskom will continue to review the use of other means of accounting for gypsum volumes including:

- front end-loaders with load cells,
- Standard Cubic Meter Unit Weigh Method

SUPPORT FOR PREVIOUSLY DISADVANTAGED COMPANIES

As a state-owned entity we are conscious of the socio-economic challenges that the country is facing and we are building partnerships with relevant stakeholders to address the poverty challenge. We have active communication channels with DPE, DEA, DTI, MPG, MEGA, etc. to explore various economic opportunities in the form of jobs and businesses through the gypsum and gypsum programme.

The following template will be used for reporting purposes of socio economic and tonnages moved:

| Off-taker | Power Station | Type of Gypsum | Uses | Monthly Tonnages | BEE Level | Black Ownership | Sub-contracting | Direct Jobs |
|-----------|---------------|----------------|------|------------------|-----------|-----------------|-----------------|-------------|
| | | | | | | | | |

The following factors and criteria must be used to assess the impacts of the activities:

| Criteria | |
|----------------------|--|
| MAGNITUDE (Severity) | DURATION |
| 10 - Very high | 5 - Permanent (longer than 10 years) |
| 8 - High | 4 - Long-term (5 to 10 years) |
| 6 - Moderate | 3 - Medium-term (12 months to 5 years) |
| 4 - Low | 2 - Short-term (0 to 12 months) |

| | | |
|-------------------|------------------------|---------------------------------|
| 2 – Minor | 1 – Immediate | PROBABILITY (Likelihood) |
| 5 – International | 5 – Definite | |
| 4 – National | 4 – Highly probable | |
| 3 – Regional | 3 – Medium probability | |
| 2 – Local | 2 – Low probability | |
| 1 – Site only | 1 – Improbable | |
| 0 – None | 0 – None | |

Magnitude
Magnitude measures the size of the impact

Duration
Duration refers to the lifetime of the impact i.e. how long it will last

Scale
The scale refers to the extent of the impact, i.e. will the impact be felt at the local, regional, global scale and so.

Probability
The probability refers to the chance of impact to occur. The potential impact could be most likely to occur, unlikely, etc.

Assessment of Significance of impact

Significance rating of the potential impacts illustrates the importance of the impact itself. The size of area affected by pollution may be extremely high but the significance of this effect is dependent on the concentration or level of pollution in that area. In order to determine the significance of impact, the following method was used:

Significance Points (SP) = (Magnitude + Duration + Scale) x Probability

The values of SP are then ranged as follows:

| Rating | Description |
|---|--|
| SP >60 Indicates high environmental significance | An impact which could influence the decision about whether or not to proceed with the activities regardless of any possible mitigation. |
| SP 30 – 60 Indicates moderate environmental significance | An impact or benefit which is sufficiently important to require management and which could have an influence on the decision unless it is mitigated. |
| SP <30 Indicates low environmental significance | Impacts with little real effect and which will not have an influence on or require modification of the activities. |

+

Positive impact

An impact that is likely to result in positive consequences/effects

I, **WGS FUNSTON** hereby declare that I have read the completed the Risk Assessment form and hereby confirm that the information is to the best of my knowledge true and correct.

Furthermore, I declare that I am fully aware of my responsibilities in terms of the Waste Exclusion Regulations, and that failure to comply with these Regulations may constitute an offence in terms of the National Environmental Management: Waste Act, 2008 (Act 59 of 2008).

Applicant (Full names) **ESKOM HOLDINGS SOC Ltd**

Designation Manager: **Biodiversity and Waste**

Signature



Date **20 September 2018**

Place **JHB**

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| | | | |
|------------------|------------|----------------------------------|--|
| Date Received | | | |
| Decision Taken | Authorised | Not Authorised(provide reasons) | |
| Reference Number | | | |

