

ATT: Tanja Bekker

Environmental Assessment Practitioner
Envirogistics (Pty) Ltd
PO Box 22014,
Helderkruijn, 1733

Cell: +27 (0) 82 412 1799

Email: tanja@envirogistics.co.za

Date: 10 July 2023

RE: AIR QUALITY IMPACT ASSESSMENT - PROPOSED MANGANESE SULPHATE PRODUCTION PLANT AT ARM MACHADODORP WORKS

Dear Tanja Bekker,

It is our understanding that African Rainbow Minerals limited (ARM) proposes to establish a manganese sulphate ($MnSO_4$) production plant within the ARM Machadodorp ferrochrome operations site. The plant will consist in the main of the following major processes.

- Milling
- Pugging (i.e. sulphate conversion)
- Dead burn and leaching
- Jarosite precipitation
- Sulphide precipitation
- Fluoride precipitation
- Crystallisation, crystal drying and decomposition

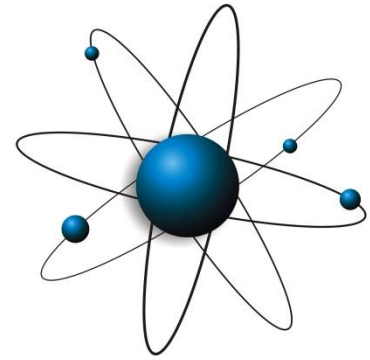
The primary product streams will be $MnSO_4$, $CaSO_4$. The primary reagent inputs to the process, besides the slag, are sulphuric acid, calcium carbonate, and sodium hydrosulphide.

We note that the proposed plant will include processes that fall within the following activities listed into Section 21 of the National Environmental Management: Air Quality Act (Act 39 of 2004):

1. Subcategory 7.2: Production of Acids
2. Subcategory 7.1: Production and or Use in Manufacturing of Ammonia, Fluorine, Fluorine Compounds, Chlorine, and Hydrogen Cyanide
3. Subcategory 4.1: Drying and Calcining
4. Subcategory 4.20: Slag Processes.

Based on a review of the process description supplied by the applicant and our discussions therewith, it is understood that all gases and vapours generated by the plant will be recycled through the process via various closed loop scrubbing systems. It is further noted that all thermal energy will be supplied by electricity and the inherent exothermic nature of some of the reactions i.e. there will be no combustion.

Based on the information availed, it is deduced that there will be no potentially significant emissions to atmosphere from the proposed plant. Accordingly, it is our specialist opinion that the operation of the proposed plant will not appreciably alter the atmospheric emissions profile of the site nor the impact on ambient air quality. The construction and/or decommissioning of such a plant are also not anticipated to have a substantive impact that would warrant a detailed air quality impact assessment.



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R No 2009/014472/07

We therefore submit that an air quality impact assessment is not required to substantively inform an environmental impact assessment process.

It is anticipated that emissions from the construction phase would consist in the main of fugitive emissions from excavations and related material handling. Given the geographical extent of the site, the low level non-buoyant nature of these emissions, and the distance to potential receptors (Refer to Appendix 1), it can reasonably be deduced that the impact of such emissions would be contained within the site. The same would apply to decommissioning.

The current dustfall monitoring network (refer to Appendix 2) for the site is anticipated to be sufficient for the purposes of identifying potentially significant dust fall.

For the construction phase, we recommend:

1. Exposed soil surfaces from which dust can be entrained be wetted to minimise dust entrainment.
2. A complaints register, and a complaints management procedure, be developed to ensure that any relevant air quality complaints received are assessed and addressed.
3. Should Interested and affected parties complain of dust fallout, or should the measured dustfall exceed the allowable standards, as a result of the proposed activities or their construction, then a dust management plan must be developed in accordance with the requirements of the National Dust Control Regulations GN.R 827 2013.

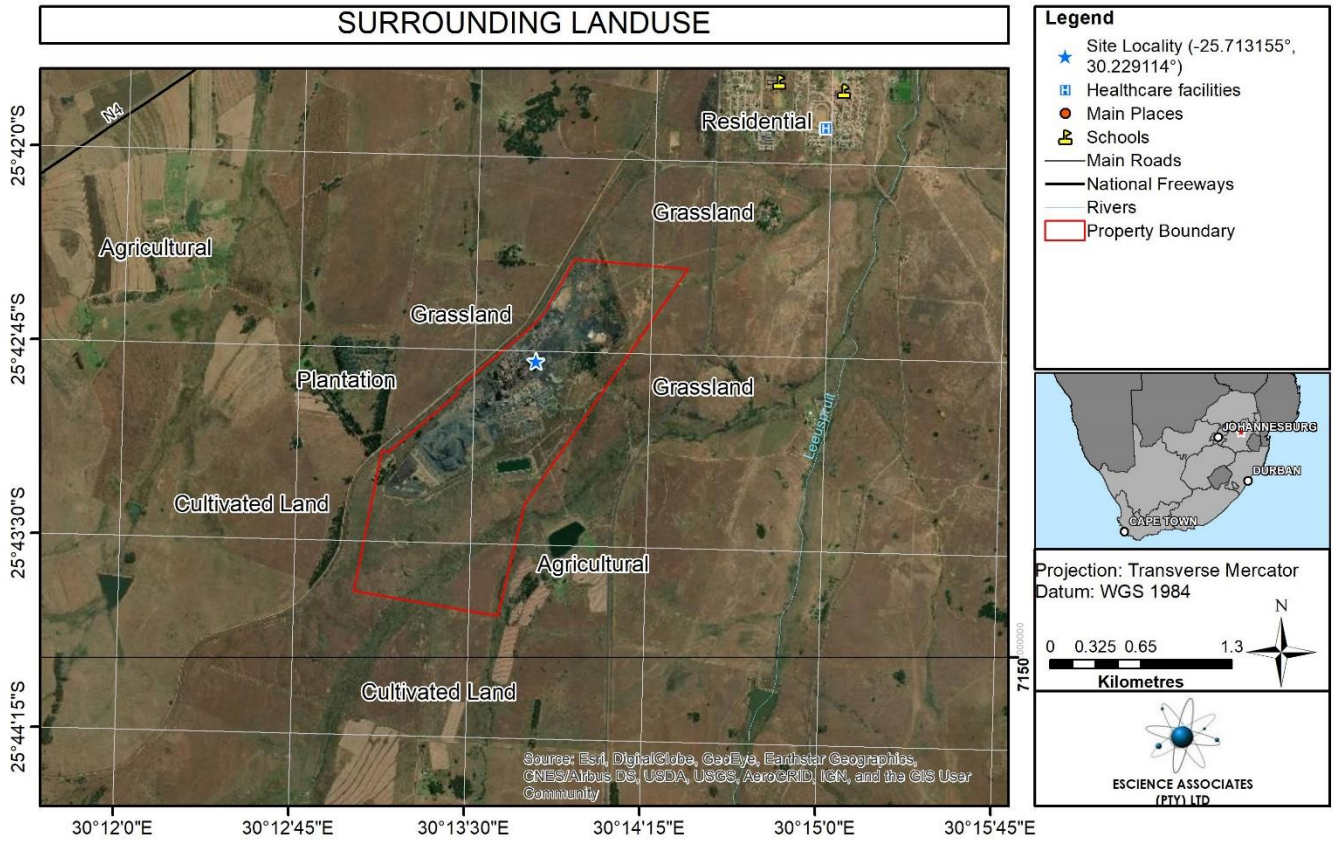
Please contact the undersigned should you have any further queries or should further detail be required.

Yours faithfully,
Abdul Ebrahim



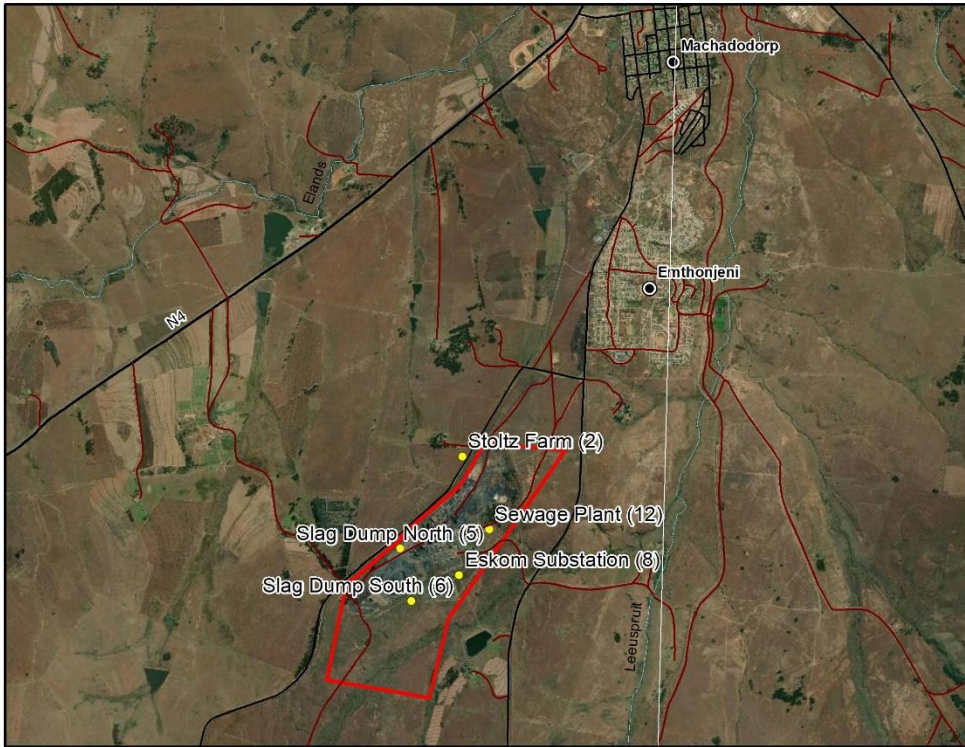
DIRECTOR: ESCIENCE ASSOCIATES (PTY) LTD
(HENG MECHANICAL, HENG ENVIRONMENTAL, Reg. EAPASA)

APPENDIX1: SURROUNDING LAND-USE AND RECEPTORS



APPENDIX 2: EXISTING DUSTFALL MONITORING NETWORK

DUST MONITORING LOCATIONS



Legend

- Dust Monitoring Locations
- Cities and Towns
- Rivers
- National Freeways
- Main Roads
- Other Access
- Asmang Boundary

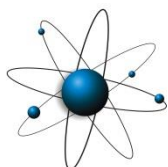
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ESCIENCE ASSOCIATES
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APPENDIX 3: CURRICULUM VITAE



EScience Associates
9 Victoria Road, Oaklands
Johannesburg, 2192
Tel: +27 (0)11 718 6380

Curriculum Vitae:

Abdul
Ebrahim

Surname: Ebrahim
Name: Abdul
Date of birth: 07 December 1977
Residency: RSA
Position: Director
Key Qualifications: BEng (Hons) Environmental, BEng (Hons) Mechanical

Contact details

☎: 011 7186380/ 072 268 1119
✉: abdul@escience.co.za

Abstract

Abdul Ebrahim is a director of EScience Associates, an environmental consultancy specialising in waste and waste recovery, effluent, atmospheric emissions and air quality, as well as cleaner and renewable energy. EScience Associates caters for a diversity of industries and economic sectors and has forged strong relationships with other specialists, and specialist agencies, allowing the company to deal with complex and contentious environmental problems.

Abdul Ebrahim holds a BEng (Hons) in both Mechanical and Environmental Engineering disciplines. He specialises in air quality management, hazardous waste management and cleaner production, as well as their related environmental authorisation and licensing processes. His work experience includes numerous environmental impact assessments, cleaner production, waste recover-recuse-recycling, hazardous waste management assessments, and air quality impact management projects in power generation, manufacturing, minerals processing, and mining industries. His interests range from atmospheric modelling and wind energy, to the beneficial use of industrial wastes and effluents.

He is a member of amongst other professional organisations: Engineering Council of South Africa (ECSA), and the National Association of Clean Air (NACA).

Abdul has provided Honours level lecturing at the University of Pretoria, UNISA, Cape Town University of Technology and various private training institutions in the fields of Environmental Compliance Enforcement, Environmental Impact Assessment, Cleaner Production and Air Quality Management since 2005.

His work experience includes:

- Waste management (classification, handling, storage, and disposal requirements, development of waste minimisation treatment & recycling strategies);
- Air quality management and Air Quality Management Plan development (industrial, household fuel burning, biomass burning and waste burning emissions modelling and inventorisation, development of emissions abatement and management strategies; meteorological and air quality modelling and impact assessment);
- Environmental Authorisation, Waste Management Licensing, Atmospheric Emissions Licensing, Mine Environmental Management Programme development, and their relating environmental impact assessment and stakeholder engagement processes.
- Development of specialist training courses (including EIA Administration and Review, Environmental Enforcement, Environmental Compliance Achievement for Industry).
- Environmental Due Diligence – due diligence assessment to inform purchase or ownership transfer of existing going concerns or proposed new establishments.

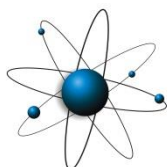
Abdul has over 20 years post graduate experience of which four years are in industry, and the remainder in consulting.

Education

BEng (Hons) Mechanical Engineering
BEng (Hons) Environmental Engineering

Languages

English (excellent speaking and writing)



Experience

Personal work experience includes:

- Cleaner and renewable energy strategy development, plan and project development;
- Technical and environmental due diligence – industrial and energy projects
- Waste management (classification, handling, storage, and disposal requirements;
- Development of waste minimisation treatment & recycling strategies);
- Air quality management and emissions inventorying, development of abatement and management strategies;
- Environmental Impact Assessment and Permitting
- Development and dissemination of specialist training for government and the private sector at NQF level 7 (honours degree).

Abdul's work experience in a wide diversity of economic sectors and industries and provides him with a good understanding of both small scale and large scale impacts of waste and pollution, as well as keeping up to date with various management alternatives available and their individual advantages and disadvantages, both locally and internationally implemented and pilot scale. Various waste streams have been dealt with to determine the most applicable disposal methods and impacts on the environment, from various industries:

- Metallurgical processes
- Power generation
- Food processing
- Waste recovery, reuse, and recycling and waste to energy
- Mining
- Cement manufacturing
- General Commercial – General waste management from various industries

Professional Registration

Environmental Assessment Practitioner (EAP)
Engineering Council of South Africa (ECSA)

Hourly Rate

Nature of expertise offered

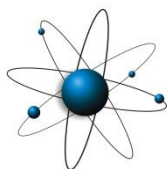
- Ability to interpret and analyse technical material on wide range of subjects
- Engineering expertise in energy, waste, air quality and multi-disciplinary subjects
- Ability to undertake technology feasibility studies, technical and financial due diligence
- Understanding of the green economy and technologies, ICT and agricultural and agro-processing sectors
- Ability to undertake a market research and investigation into the industry
- Proposal evaluation expertise

Experience and relevant projects

1. AIR QUALITY MANAGEMENT:

1.1 Government & Regulatory

- Vaal Triangle Air-shed Priority Area - Air Quality Management Plan review, development of emissions inventory and Ambient Air Quality Impact Assessment.
- Highveld Priority Area Air Quality Management Plan – development of emissions inventory, and mitigation strategies.
 - Reference: Dr Thulile Mdluli



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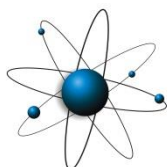
Curriculum Vitae:

Abdul
Ebrahim

- Tel: 012 310 3436
- Email : tmdluli@environment.gov.za
- Ekurhuleni Metropolitan Municipality - Development of an Air Quality Management Plan (AQMP)
 - Reference: Mr Edmund van Wyk
 - Tel: 011 999 2470
 - Email: Edmund.vWyk@ekurhuleni.gov.za
- Nkangala District Municipality - Development of an Air Quality Management Plan (AQMP)
 - Reference: Mr Vusi Mahlangu
 - Tel: 013 249 2164
 - Email: Mahlangumv@nkangaladm.gov.za
- North West Province - development of provincial emissions inventory (PM, NO_x, SO₂ etc)
- Development of National Air Quality Officers Companion Guide for the Republic of South Africa
- Development of the atmospheric emissions licensing department for Nkangala District Municipality
- EThekweni Municipality (Durban) - Greenhouse gas emissions quantification
- Newcastle Local Municipality - Development of an Air Quality Management Plan (AQMP)
 - Reference: Mr Phelelani Ntshingila
 - Tel: 034 328 3300
 - Phelelani.Ntshingila@newcastle.gov.za

1.2 Industrial and Mining

- A large variety of major industrial and mining operation across the Highveld and Vaal Triangle as part of Highveld Priority Area and Vaal Triangle Air-shed Priority Area AQMP projects.
- Lanxess CISA Chrome Chemicals Plant Expansion, CO₂ generation, Power Generation and hazardous waste treatment and recovery
- Samancor Chrome Proposed Chrome Chemicals plant
- Karbochem (Synthetic Rubber Manufacture) proposed Power Generation Plant
- PPC Cement Slurry Cement Plant Expansion
- PPC Cement Jupiter Cement Plant Expansion
- PPC Cement PE Cement Plant Expansion
- PPC Cement Dwaalboom waste heat recovery
- PPC Cement De Hoek, PE, Slurry, and Dwaalboom postponement applications
- Afrisam Cement - Dudfield Environmental Management Programme update.
- ClinX Medical Waste Incineration plant expansion
- Goedemoed organic waste incineration
- AWPP pyrolysis of organic waste
- Interwaste Waste Recovery, Waste to Energy and Waste Incineration plant
- Eskom power generation emissions off-setting
- Hayes Lemmerz SA Aluminium Wheel Manufacturing
- Evraz Highveld Steel and Vanadium proposed Powered Generation - Furnace Off-Gases
- Assmang Ferrochrome and Ferromanganese plants Powered Generation - Furnace Off-Gases
- Resource Generation Proposed Boikarabelo Power Station – coal fired
- Weir Minerals Africa (Isando, Alrode and Heavy Bay Foundries)
- Goedemoed Prison proposed Waste incineration and Landfill
- Consolidated Wire Industries Expansion
- Sylvania Proposed Open Cast PGE Mine and Processing Plant
- Assmang Black Rock proposed manganese mine expansion and sinter plant
- Assmang machadodorp proposed smelter plant expansion and cross-over to manganese



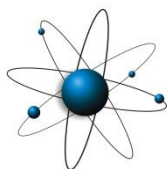
- Dwarsrivier Chrome Mine
- Nkwe proposed Platinum Mine
- Agricultural Research Commission hazardous and infectious waste incineration
- Sephaku Aganang proposed use of AFR's in cement manufacture
- Idwala Phalaborwa atmospheric emission licence for magnetite drying
- Mandini Wealth (Pty) Ltd Air quality health risk assessment
- Johnson Tiles a Division of Norcross Sa (Pty) Ltd Air quality health risk assessment
- Lanxess CISA (Pty) Ltd Air quality health risk assessment

2. WASTE CLASSIFICATION, HAZARD RISK ASSESSMENT AND MANAGEMENT

- Idwala Lime Operations
- Black Rock Mine Operations
- Weir Minerals Africa
- Heavy Bay foundry Port Elizabeth
- Lafarge Gypsum
- Consolidated Wire Industries
- BPB Gypsum
- PG Bison melamine plant
- ABBW Electrical manufacturing plant
- CBI copper and fibre optical cable manufacture
- Holcim Cement
- Lanxess Chrome Chemicals
- Assmang Chrome
- Assmang Manganese
- Hayes Lemmerz SA Aluminium Wheel Manufacturing
- Auto industrial group (Pty) Ltd
- CBI Electrical
- Various metal ore mines

3. ENVIRONMENTAL IMPACT ASSESSMENT:

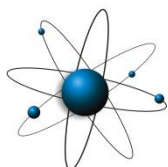
- Highveld Steel furnace off-gas power generation
- Lanxess CISA chrome chemicals plant development
- Samancor chrome chemicals plant development
- Heric Ferrochrome power generation from furnace off-gases
- Kanhym Biogas project
- Turfontein Race Course night racing
- Alumicor secondary aluminium recovery rotary salt furnaces
- Hays Lemmerz Aluminium smelters, furnace and alloy die casting
- Plettenburg Polo Estates
- PG Bison Decorative Panels
- British Aerospace Land Based OMC Systems
- BPB Gypsum phosphogypsum plant
- Extrupet HPDE and PET recycling plants
- Assmang BRMO
- Assmang Machadodorp
- Interwaste waste recovery and waste to energy plants
- PPC Cement
- ClinX Healthcare Risk Waste Management



4. ENVIRONMENTAL LEGAL COMPLIANCE ASSESSMENT & RECTIFICATION PLANNING:

- SASOL Synfuels
- NATCOS Petrochem
- Dwarsrivier Chrome Mine
- Angloplatinum Base Metals Recovery
- Samancor Hotazel Manganese Mines
- PG Bison (Pty) Ltd MDF manufacturing
- Samancor Manganese Division Samancor Metalloys Meyerton
- Holcim SA (Pty) Ltd Cement Plants:
 - DUDFIELD
 - ULCO
 - ROODEPOORT
- Natal Portland Cement Plants:
 - NEWCASTLE
- Consolidated Wire Industries
- South African Airways (Pty) Ltd Technical Division
- TWK forestry strategic environmental legal compliance assessment
- Inergy Automotive Systems(Pty) Ltd
- Consolidated Wire Industries
- Mittal Steel Vereeninging and Dunswart plants – specialist assistance to DEAT environmental management inspectors
- Assmang Black Rock Mining Operations
- ClinX Medical Waste Management
- Extrupet PET and HDEP recycling plants
- Scaw Metals High Chromium Ball Plant
- Unilever waste recovery, recycling, and zero waste-to-landfill
- Numerous waste recycling facilities
- Oilflow
- The Smart Company
- Darkling Industrial Metals CC
- Unilever waste recovery, recycling, and zero waste-to-landfill
- Central Waste
- AT Packaging
- EWaste Africa
- Mpact Recycling
- Wasteplan
- Fine Metals
- Living Earth
- Industrial Plastic Recyclers
- SA Paper Mills
- Interwaste
- Matchem
- TGS
- Verigreen
- SB Boxes
- Drumpal
- Oscars Meat
- FOSECO South Africa (Pty) Ltd
-

5. GREENHOUSE GAS Quantifications and Assessments



- PPC Riebeeck
- Lafarge Lichtenburg
- Ilangabi Investments 12 (Pty) Ltd
- Lanxess CISA (Pty) Ltd
- Green Leaf Energy
- Lagarge Cement
- ClinX Waste Management

6. CLEANER PRODUCTION AUDITS, WASTE TO ENERGY, ENERGY RECOVERY, WASTE RECOVERY AND RELATED PROJECTS:

- Tuffy Plastics
- Proplas plastics
- WHS Distribution
- Premier Foods Pretoria Wheat Mill
- Alfred Nzou municipality
- Lanxess chrome chemicals residue recovery
- Karbochem power generation ash to bricks project
- Cement kilns alternative fuels and raw materials assessment for South Africa
- Kanhym Estates Biogas Generation from piggery effluent
- British American Tobacco:
- Tobacco Processors Zimbabwe
- Souza Cruz Brazil

7. ENVIRONMENTAL MANAGEMENT SYSTEM DEVELOPMENT & IMPLEMENTATION:

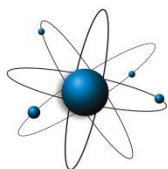
- British American Tobacco (full system development from scratch – ISO 14001 and ISO 9001)
 - Weir Minerals Aspects Identification, Rating, Assessment and Development of EMPs
 - Lafarge Gypsum Aspects Identification, Rating, Assessment and Development of EMPs
 - Environmental Aspects Identification, rating and formulation of EMPs for Samancor Metalloys Meyerton
 - Environmental Aspects Identification, rating and formulation of EMPs for DMS Powders.
 - Holcim Slagment development & implementation of EMS components including waste and air quality management
 - Holcim Roodepoort development & implementation of EMS components including waste and air quality management
 - Consolidated Wire Industries Environmental Aspects Identification, rating and formulation of EMPs and operational control procedures.
 - Samancor Metalloys Ferro Silicon Manganese and FerroSilicon production
 - DMS FeSi dense media production

8. ISO14001 AUDITING:

- Debswana Orapa and Letlhakane Mines
- Ingwe Colliery
- Arnot Colliery
- FOSECO South Africa (Pty) Ltd
- Lafarge Gypsum
- CWI

9. SPECIALIST TRAINING COURSE DEVELOPMENT & PRESENTATION

- 2011 Training of Atmospheric Emissions Licensing Authorities – air quality management, emissions quantification, regulation and enforcement.



- 2007-2015 Training of Authorities for EIA review and permitting

Responsible for development of NEMA EIA Review Course and Administrators EIA Review Manual, theoretical and practical training material, and training of Government Officials responsible for EIA Review - responsible for the whole manual other than Law applicable to EIA Review. As at May 2013 approximately 1000 officials from National, Provincial and Local Government.

- 2005&6 Bridging Training for Environmental Management Inspectors and Enforcement

ESA was part of a consortium selected to develop and conduct the EMI Training. More than 2000 officials and university students have completed the training.

- University Of Pretoria Specialist Lecturer

- Environmental Legal Compliance inspections and investigations (RSA)
- Environmental Legal Compliance achievement (RSA)
- Environmental Legal Compliance inspections and investigations (Africa)

- University Of South Africa Specialist Lecturer

- Environmental Legal Compliance inspections and investigations (RSA)

- Training for industry and mining

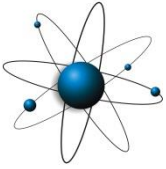
Development and presentation of training material for environmental impact identification and management in terms of South African environmental law for the SABS and other training institutions.

10. SOIL AND GROUNDWATER CONTAMINATION ASSESSMENT:

- Weir Heavy Bay Foundry
- Lafarge Gypsum
- Kanhym Estates
- SABAT (Pty) Ltd Johannesburg – investigation of heavy metal contamination of soils and groundwater
- Chemiphos SA (Pty) Ltd – investigation of phosphate and heavy metal contamination of soils and groundwater
- Castrol Lubricants Zimbabwe

11. ENVIRONMENTAL DUE DILIGENCE AUDITS, INCLUDING ASSESSMENT OF ENVIRONMENTAL AND CLOSURE LIABILITY:

- Determination and quantification of financial provision for the environmental rehabilitation and closure requirements of smelting operations for Highveld Steel & Vanadium operations:
 - HIGHVELD IRON AND STEEL WORKS
 - VANCHEM
 - TRANSALLOYS
 - RAND CARBIDE
 - MAPOCHS MINE
- Determination and quantification of financial provision for the environmental rehabilitation and closure requirements of smelting operations for TransAlloys
- Determination and quantification of financial provision for the environmental rehabilitation and closure requirements of mining operations for Samancor Chrome:



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Curriculum Vitae:

Abdul
Ebrahim

- MIDDELBURG FERROCHROME
- FERROMETALS
- TUBATSE FERROCHROME
- WESTERN CHROME MINES
- EASTERN CHROME MINES
- Determination of critical environmental liability associated with the purchase of Xmeco Foundry by Weir Minerals Africa, and subsequent legal compliance achievement programme

12.

Possible timelines to commit to the assignment

- Available for assignments over the next two years
- Not available during the December holiday period - from 15 December until 3 January – due to company's closure for the festive season