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ArcelorMittal Coke Oven Clean Gas and Water Project: External Environmental Performance Assessment

Audit Report

Version – FINAL

26 September 2018

ArcelorMittal South Africa Limited

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EXECUTIVE SUMMARY

ArcelorMittal South Africa (ArcelorMittal) Vanderbijlpark Works was established in 1942 and commenced production in 1952. ArcelorMittal South Africa Vanderbijlpark Works (Vanderbijlpark Works) is one of the largest steel producers in South Africa. The Vanderbijlpark Works manufacture steel products by charging raw materials such as iron ore, coke and dolomite into blast furnaces to produce liquid iron. The liquid iron is refined in basic oxygen furnaces to produce liquid steel. The liquid steel is further processed into various rolled and coated steel products.

ArcelorMittal operates five coke batteries to produce metallurgical coke for the Blast Furnaces on site. Coke is an important input material into the iron making process. During the coke making process, gas and other by-products are formed. The Coke Batteries were built between 1945 and 1985 and the gas and water cleaning technologies were considered out dated and could not deliver clean gas, which resulted in various maintenance issues and other implications. ArcelorMittal commenced with the Coke Oven Clean Gas and Water (COCGW) Project in the early 2000s in order to install new technology that would enable them to clean the coke oven gas for re-use in the works as fuel gas and also to comply with Environmental Best Practice Standards internationally.

The construction of the plant commenced in 2005 and was commissioned in 2010 at the cost of more than R 330 million. The project faced numerous delays and challenges. In 2010 the plant ran successfully and proved significant sulphur reduction in terms of emissions. Unfortunately, the plant was shut down at the end of 2010 due to technical and mechanical difficulties. From 2011, ArcelorMittal repaired the identified faults in the process and then attempted to re-commission the facility on a few occasions. The plant has not run for more than a few days at end without interruption. Currently the gas is only partially cleaned but no sulphur removal is taking place. The major concern is that the plant is not fully operational and ArcelorMittal is not removing sulphur from the coke oven gas which leads to the release of emissions (particularly Sulphur Dioxide (SO_2)) from the facility to the environment.

A Record of Decision (RoD) was issued to ArcelorMittal for the COCGW Project (RoD number: GAUT 002/02-03/138) in terms of Regulations 1182 and 1183 and promulgated under Sections 21, 22, 26 and 28 of the Environmental Conservation Act, 1989 (Act No. 73 of 1989) (ECA). The RoD was issued by the Gauteng Department of Agriculture, Conservation and Environmental (GDACE), now Gauteng Department of Agriculture and Rural Development (GDARD) in 2004. In order to remain compliant with the conditions of the RoD, ArcelorMittal is required to appoint an external auditor to conduct bi-annual external Environmental Performance Assessment (EPA) Audits for the Vanderbijlpark Works.

GCS Water and Environment (Pty) Ltd. (GCS) was contracted by ArcelorMittal to conduct the second 2018 annual external EPA audit carried out against all conditions included in the RoD.

Accordingly, the following activities were undertaken as part of the EPA Audit:

- Assessment and comparison of the current site activities with those described in the approved RoD;
- Comparison of environmental mitigation measures implemented on site to those required and committed to in terms of the approved RoD in order to assess whether these comply with the management objectives committed to in the RoD;
- Assessment of monitoring requirements to current monitoring practices;
- Assessment of relevant documentation pertaining to various compliance aspects; and
- Identification of current activities and facilities at the Vanderbijlpark Works, which are not specifically included in the approved RoD.

The audit findings, detailed in the report, include practical recommendations whereby the various non-compliance issues can be corrected. All findings were ranked according to the following criteria:

- Compliant;
- Minor non-compliance;
- Moderate non-compliance; and
- Major non-compliance.

Currently the overall compliance with the Record of Decision (RoD) (GAUT 002/02-03/138) is noteworthy. Overall there was one (1) incident of minor non-compliance, three (3) incidents of moderate non-compliance, and zero (0) incidents of major non-compliance observed for the audit period. The instances of non-compliance weren't considered to be directly associated with significant environmental degradation, and as such the auditor believes that current environmental practices implemented on site are adequately mitigating environmental impacts.

H_2S Content in Gas

Condition 3.2(g)(i) states that "The concentrations of the various constituents of the cleaned Coke Oven Gas must be monitored before and after combustion in the coke ovens. The results are to be graphically represented and included in the bi-annual audit report. The H_2S content of the gas must be between 0.8 and 1.5 g/Nm^3."

Observation:

The latest monitoring results indicate the H_2S content of the gas exceeded the maximum limit of 1.5 mg/Nm^3. The current reading is 5.5 mg/Nm^3. The non-compliance is linked to the Sulphur plant not being operational resulting in partially cleaned gas being flared when there is no use for it in the rest of the works as an energy source. The Claus reactor has been non-operational for an extended period of time due to equipment failure and significant repairs and replacements are required. ArcelorMittal has prioritised this problem and the tender for the construction and installation component for the refurbishment of the Sulphur Plant was released at the beginning of August 2018.

Recommendation:

ArcelorMittal should continue with the prioritisation of the refurbishment of the gas plant in order to recommission the sulphur plant.

Plan for Achieving Reduced Fugitive Emissions

Condition 3.2(g)(iii) states that "A plan for door maintenance/replacement of all the coke batteries (No.) and progress in achieving reduced fugitive emissions has to be developed. The plan must be supported by the results of personal monitors, and actual measurements at representative areas of the coke ovens."

Observation:

Battery doors are inspected on a daily basis and a maintenance schedule has been created. Repairs are done continuously. The fugitive emissions are monitored according to the internationally accepted standards and recorded. It was observed during the site visit that the occasional door is still burning and smoking. The commitment from the facility was however also observed to repair and maintain the equipment as far as possible. Exposure monitoring at the batteries indicates that additional fugitive emission mitigation measures are required, above that already implemented. This can however not be attributed only towards doors but rather the fugitive battery emissions as a cumulative source. ArcelorMittal has however implemented management and mitigation measures such as specialised face masks and other measures to protect employees and reduce exposure. Other measures include battery tightening, end-flue repairs and charge emission reduction projects. The effectiveness of these measures should be assessed to determine whether it is sufficient to mitigate fugitive emissions.

Recommendation:

It is recommended that the effectiveness of these measures should continuously be assessed to determine whether it is sufficient to mitigate fugitive emissions.

Plan for Achieving Reduced Fugitive Emissions

Condition 3.2(h) states that "The flaring of uncleaned gas at the relevant flares is only permissible during upset conditions when the Claus Reactor is shut down for inspection/maintenance for 3 weeks every three years, and must be undertaken at temperatures and atmospheric mixing conditions conducive to maximum dispersion of pollutants."

Observation:

The sulphur plant is not operational and therefore partially cleaned gas is flared when there is no use for it in the rest of the works as an energy source. The Claus reactor has been non-operational for an extended period of time due to equipment failure and significant repairs and replacements are required. Flaring of uncleaned gas is taking place on a more regular basis than 3 weeks every 3 years. However, this issue has been reported on and ArcelorMittal is continuously aware that urgent intervention is needed.

Recommendation:

ArcelorMittal must continue monitoring air quality within the Works to maintain a baseline of emission results. The design, construction and operation of the sulphur plant should be prioritised as it is only through this plants operation that the flaring of uncleaned gas can be controlled.

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1 INTRODUCTION

ArcelorMittal South Africa (ArcelorMittal) Vanderbijlpark Works was established in 1942 and commenced production in 1952. ArcelorMittal South Africa Vanderbijlpark Works (Vanderbijlpark Works) is one of the largest steel producers in South Africa. The Vanderbijlpark Works manufacture steel products by charging raw materials such as iron ore, coke and dolomite into blast furnaces to produce liquid iron. The liquid iron is refined in basic oxygen furnaces to produce liquid steel. The liquid steel is further processed into various rolled and coated steel products.

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The project scope is technical and complex and included various improvements and changes to the existing plant as well as the installation of new infrastructure. The project aimed to improve the current controls at the batteries, improve the gas collecting mains, upgrade of the primary cooling to improve naphthalene removal, installation of a new chiller plant, installation of a distillation plant and a sulphur removal plant. The water portion included the installation of new tar decanters, a gravel filter plant and scrubbers.

The construction of the plant commenced in 2005 and was commissioned in 2010 at the cost of more than R 330 million. The project faced numerous delays and challenges. In 2010 the plant ran successfully and proved significant sulphur reduction in terms of emissions. Unfortunately, the plant was shut down at the end of 2010 due to technical and mechanical difficulties. From 2011, ArcelorMittal repaired the identified faults in the process and then attempted to re-commission the facility on a few occasions. The plant has not run for more than a few days at end without interruption. Currently the gas is only partially cleaned but no sulphur removal is taking place. The major concern is that the plant is not fully operational and ArcelorMittal is not removing sulphur from the coke oven gas which leads to the release of emissions (particularly Sulphur Dioxide (SO_2)) from the facility to the environment.

A Record of Decision (RoD) was issued to ArcelorMittal for the COCGW Project (RoD number: GAUT 002/02-03/138) in terms of Regulations 1182 and 1183 and promulgated under Sections 21, 22, 26 and 28 of the Environmental Conservation Act, 1989 (Act No. 73 of 1989) (ECA). The RoD was issued by the Gauteng Department of Agriculture, Conservation and Environmental (GDACE), now Gauteng Department of Agriculture and Rural Development (GDARD) in 2004.

The following conditions are requirements of the RoD in terms of the ECA as issued by the GDACE:

- Condition 3.4 (b): A bi-annual Environmental Performance Audit conducted by an independent, accredited auditor must be submitted to the Department for review, the first audit being due 6 (six) months after commissioning of the COG and water cleaning project, and every 6 (six) months thereafter.

GCS Water and Environment (Pty) Ltd. (GCS) was contracted by ArcelorMittal to conduct an independent Environmental Performance Assessment (EPA) Audit for the Vanderbijlpark Works. The EPA audit was carried out against all conditions included in the EA and the audit assessment was undertaken by Ms. Fatima Matlou and Mrs. Riana Panaino from GCS. Both auditors have experience in mining and industrial projects.

A one (1) day site visit was undertaken at the Vanderbijlpark Works site on 22 August 2018. The site visit was initiated with a project kick-off meeting during which GCS met with Mr. Terrence Wilson, ArcelorMittal's' Environmental Control Officer (ECO) for this project. Following the kick-off meeting, a comprehensive review of the RoD documentation and associated checklists was undertaken. This assessment monitored compliance in terms of document control, systems and procedures. Following the checklist audit and documentation review, the remaining time was spent on site observing and inspecting the activities being conducted.

Accordingly, the following activities were undertaken as part of the EPA Audit:

- Assessment and comparison of the current site activities with those described in the approved RoD;
- Comparison of environmental mitigation measures implemented on site to those required and committed to in terms of the approved RoD in order to assess whether these comply with the management objectives committed to in the RoD;
- Assessment of monitoring requirements to current monitoring practices;
- Assessment of relevant documentation pertaining to various compliance aspects; and

- Identification of current activities and facilities at the Vanderbijlpark Works, which are not specifically included in the approved RoD.

2 AUDIT PROCESS

The following steps formed the basis of the EPA Audit.

2.1 Step 1: What is the objective of the audit?

The objectives of any audit should be clearly defined and settled before either an internal or external audit begins. The setting of objectives is important, as it is against these objectives that ArcelorMittal will be reviewed and expected to improve.

The following objectives formed the basis for the EPA Audit:

- Ensuring legal compliance in terms of the approved RoD;
- Checking that the environmental management tools to achieve compliance are used correctly and efficiently;
- To check whether the environmental management tools are effectively fulfilling their intended purpose of environmental compliance;
- Ensuring environmental performance on a continuous basis, i.e. throughout the life cycle of the Vanderbijlpark Works site;
- Reducing environmental liability;
- To facilitate the transference of information or best practice between operating units;
- To increase environmental awareness among the employees; and
- To track the environmental accountability of managers.

2.2 Step 2: Scope of the audit

The conditions of the RoD stipulate that bi-annual performance assessments need to be undertaken to ensure compliance with the prescribed conditions as contained in the said documents.

This EPA Audit is taken to mean a regular, systematic, documented verification of whether ArcelorMittal is in compliance with the conditions of the approved RoD; the provisions of the ECA and the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), which superseded the ECA; and whether environmental performance objectives and targets are being met.

2.3 Steps 3: Information required to conduct the audit

Table 2.1 sets out the procedures that were used to obtain the audit information.

Table 2.1: Process to obtain audit information

ACTION	DESCRIPTION
Inspection	Inspection consists of examining records and documents. Inspection of records and documents provides audit evidence of varying degrees of reliability depending on their nature and source and the effectiveness of internal controls over their processing.
Observation	Observation consists of on-site observation of the activities being conducted on site.
Enquiry	Enquiry consists of seeking information of knowledgeable persons inside the organisation.
Confirmation	Confirmation consists of making enquiries to corroborate information contained in the RoD.
Computation	Computation consists of checking the accuracy of source documents and the site's records or performing independent checks of information relating to environmental aspects and impacts.

2.4 Steps 4: Conducting the audit

The audit consisted of comparing the information gathered during on-site interviews, from reports as well as assessing on-site activities with the conditions of the RoD. A checklist was developed based on the RoD conditions and used as an auditing tool to establish the audit results.

2.5 Steps 5: Evaluating the audit results

The results of the audit are presented and the auditor assesses the final compliance in relation to the realistic representation of on-site activities; taking into account South African Environmental Legislation. Through such an assessment, the auditor should determine whether the final compliance is a true representation of on-site activities and a final recommendation should be made regarding actual compliance.

2.6 Step 6: Presenting the audit results

The findings of the Audit are included in **Table 5.1** of this Report. The audit findings also include practical recommendations whereby the various non-compliance issues can be corrected.

All findings were ranked according to the criteria indicated in **Table 2.2**. The colour coding assigned to the rankings is used to visually indicate areas of compliance, minor non-compliance, moderate non-compliance, and major non-compliance. Furthermore, to indicate which conditions are not applicable to the on-site activities and which are repeat conditions that have already been scored. Each colour coding has a value (score) attached to it.

Table 2.2: Ranking criteria and colour coding scores.

RANKING	SCORE
Compliant	2
Minor non-compliance	1
Noted/Not Applicable	0
Repeat Condition	-
Moderate non-compliance	-1
Major non-compliance	-2

All findings were ranked according to the following criteria:

Noted/Not-Applicable:

- The specific condition is not relevant to the current on-site activities.

Repeat Condition:

- The specific condition is a repeat of a previous condition.

Compliant:

- ArcelorMittal complies with the conditions as stated in the RoD.

Non-compliance:

- **Minor Non-compliance:**
  - Isolated observations demonstrating that full compliance to the environmental requirements on site have not been, or will not be, fully achieved.
- **Moderate Non-compliance:**
  - There is a substantial failure to meet the environmental requirements for the project, there is a possibility of substantial environmental degradation and/or pollution, and/or objective evidence was observed raising doubt as to the integrity of data or records inspected.
- **Major Non-compliance:**
  - There is a critical failure against legal requirements or management response that presents an immediate or significant risk that could result in prosecution and/or adverse legal findings due to failure to meet regulatory requirements; result in immediate injury or serious injury; result in prolonged business outage; and/or could result in serious damage to the project's reputation.

It must be noted that duplicate conditions are not scored due to the fact that this will negatively influence the scoring results. Duplicate conditions are marked as a Repeat Condition.

2.7 Step 7: Decision-making based on audit results

Decision-making, based on the audit results, must have the following objectives; to improve the present situation and to institute fair and reasonable corrective action. ArcelorMittal should make decisions based on the significance of the problem or non-compliance and the resources required to improve the situation.

2.8 Step 8: Instituting corrective action

It is recommended that an environmental action plan be implemented to address the Audit recommendations. The plan may include:

- Goals;
- Strategies;
- Performance indicators;
- Responsibilities; and
- A timetable for achievement.

An EPA audit is an effective management tool on condition that the recommendations, as identified in this Audit, are considered and implemented. The audit provides a basis for recommending actions to correct any deficiencies and to address any areas of environmental non-compliance recorded as part of the audit findings.

3 DETAILS OF THE AUDITOR

GCS, appointed by ArcelorMittal to conduct an external EPA audit, has more than 30 years of experience and expertise in undertaking and compiling compliance audits.

3.1 Project Team

The EPA Audit was undertaken by the GCS team presented in **Table 3.1**.

Table 3.1: **GCS Team**

NAME	DESIGNATION	RESPONSIBILITY
Riana Panaino • BSc. Honours Biodiversity and Conservation • Pr. Sci. Nat. Reg No. 117170/17) • IAIA	Senior Environmental Consultant	• Overall Legal Compliance • Site visits • Liaison with Client and Project Management • Environmental Legal Assessment • Compilation of Audit Report
Fatima Matlou • National Diploma Environmental Management • ELA (Reg. No. 2017/235/GP)	Senior Environmental Consultant	• Overall Legal Compliance • Site visits • Liaison with Client and Project Management • Environmental Legal Assessment • Compilation of Audit Report
Renee Janse van Rensburg • MSc Environmental Management • Pr. Sci. Nat. Reg No: 400099/06 • ELA (Reg. No. 216/141/GP) • IAIA • SSAG • IOCSA (Reg No. 166)	Manager: Environmental Authorisation and Assessment Unit	• Overall assistance • Report review • Technical and quality control

3.2 Assumptions and Limitations

The findings, results, observations, conclusions and recommendations given in this audit are based on the Auditor's best legal and professional knowledge as well as available information.

Although GCS exercises due care and diligence in rendering services and preparing documents, GCS accepts no liability, and the client by receiving this document, indemnifies GCS and its directors, managers, agents and employees against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, directly or indirectly by GCS and by the use of the information contained in this document.

This audit report must not be altered or added to without the prior written consent of the auditor. This also refers to electronic copies of this Audit which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this audit must make reference to this EPA Audit. If these form part of a main audit relating to this investigation or report, this audit must be included in its entirety as an annexure or separate section to the main audit.

Refer to **Appendix A** for the Declaration of Independence of the Auditor.

4 AUDIT SCORING RESULTS: 2018 ROD EPA AUDIT

Figure 4-1 presents the percentage compliance of ArcelorMittal for the second 2018 external EPA audit for the COCGW Project in tabular and graphic format.

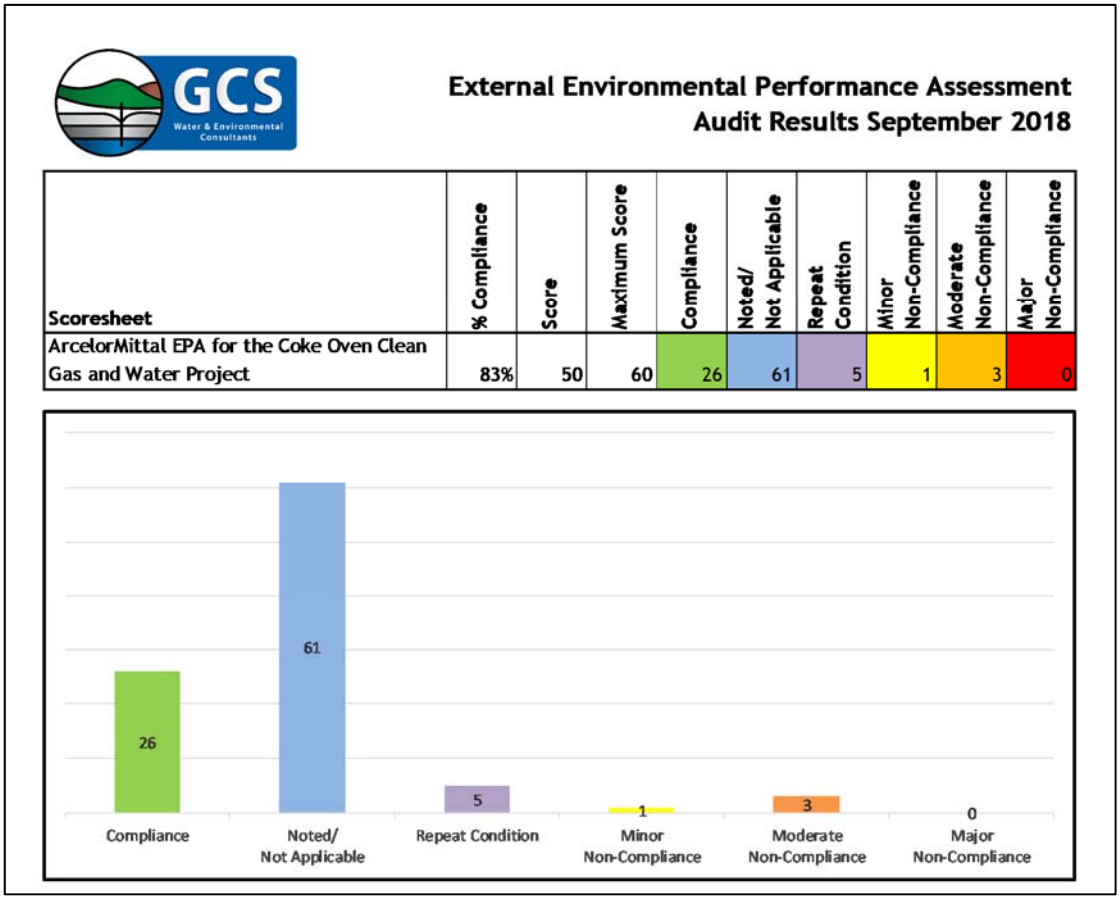


Figure 4-1: 2018 External EPA Audit Results for the COCGW Project.

The graph within the table shows the number of non-compliances observed as well as the number of conditions repeated, noted or not applicable. It can be seen from the graph that ArcelorMittal is compliant with the majority of the RoD conditions. Most of the conditions were observed to be not applicable or noted due to the fact that various changes were made regarding the facility construction and operation, which have been approved by GDARD. During the previous audit it was reported that the last outstanding items to be constructed is towards improving the works water balance and does not influence the plant's operability. This finding is still valid.

5 AUDIT FINDINGS – 2018 ROD EPA AUDIT

Table 5.1 overleaf represents the conditions, observations and recommendations, found at the ArcelorMittal COCGW Project, second 2018 audit.

Table 5.1: Scoring Results of the EPA Audit in respect of conditions of the COCGW RoD (audit undertaken in August 2018).

No	Conditions	Status	Score	Observations	Recommendations
3.1	**Description and extent of the activity**				
1.1	The authorisation applies in respect of the upgrading and operation of the coke oven gas (COG) and water cleaning systems at the existing coke ovens, as detailed In Sections 10-12 (p. 77-94) of the Process Review specialist study conducted by EBS cc., and In Section 4.12 9 p.39-44) of the Scoping Report by SEF (Pty) Ltd. The activity falls within the ambit of sub regulations 1 c(ii), 8 and 9 of Government Notice R.1182 (as amended), promulgated under section 21 of the Act. The extent of the project is summarised as follows:	Noted/Not Applicable	0	This condition is noted. The authorisation pertains to the Coke Oven and Clean Gas and Water (COCGW) Project.	No applicable recommendations.
3.1.1	**PROJECT SCOPE**				
(a)	**Proposed changes to coke ovens by-products plant** Upgrade and re-use of existing Gas Cleaning Plants, combining gas lines, and the upgrading of the coke oven gas (COG) collecting mains.	Compliant	2	Upgrades have been made to the Gas Cleaning Plant, as authorised by GDARD. The plant was upgraded in 2005 and is currently operational.	No applicable recommendations.
(b)	**Proposed changes to gas cleaning line** The 3 basic mechanisms of cleaning COG - condensation by cooling, separation by gravity, and absorption of components onto absorption media will remain the same.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.
	Improving naphthalene removal and scrubbing conditions by reducing gas temperature.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.
	Conversion and installation of equipment to function as final coolers and provide chilled water.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.
	Improving NH_3 removal/absorption by upgrading existing scrubbers converting benzole scrubbers to NH3 scrubbers, and converting circulation to closed loop systems.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.
	Installing two new distillation columns treatment of ammonia scrubbing water and one as de-acidifier to generate the required scrubbing media for H_2S removal, and treatment of NH_3, H_2S, HCN and CO_2 vapour in the ammonia and H2S plant.	Noted/Not Applicable	0	This condition is noted. Infrastructure construction and installation has not yet been completed. Once the final infrastructure has been completed the water will tie in with the overall water balance for the Works resulting in cleaner water being used for quenching. Funds have been approved for the construction and installation required for the remaining upgrade of the project. The design has been finalised and will include the refurbishment of the sulphur plant and the installation of other infrastructure such as the ammonia stripper.	No applicable recommendations.
	Discontinuing ammonium sulphate manufacture and installation of a new plant to convert H_2S to elementary sulphur.	Noted/Not Applicable	0	This condition is noted. Refer to the observations made in condition 3.1.1(b), point 5.	No applicable recommendations.

No	Conditions	Status	Score	Observations	Recommendations
	Cleaning of excess process water The basic mechanisms of cleaning coke oven process water are separation by gravity, mechanical sludge removal, filtration and distillation. Ammonia, H_2S and HCN removed from water will be cracked to H_2, N_2 and CO_2 and elementary sulphur formed.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.
	Improving the handling of various condensate streams by the handling of high and low tar containing streams.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.
	Improving the operation of tar decanting systems, mainly through continuous discharge of crude tar together with constant water content.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.
	Improving the efficiency of operation of the gravel filters, and replacing filters with a single unit of equal capacity.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.
	Improving H_2S and NH_3 scrubbing efficiency, mainly through supporting desulphurisation with a quantity of de-acidified water, reducing ammonia content by means of stripped water, maintaining optimum scrubbing temperature, and integrating the two scrubbing systems.	Noted/Not Applicable	0	This condition is noted. Refer to the observations made in condition 3.1.1(b), point 5.	No applicable recommendations.
	Improving in H_2S and NH_3 stripping efficiency by modifying existing equipment to handle flows from all gas cleaning plants by the coal water stripper for free and fixed ammonia, free ammonia stripper (NH_3 scrubbing liquor), and de-acidifier (de-acidified water for. H_2S removal. Equipment will be designed to treat all excess coal water and scrubbing liquor streams.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a) and condition 3.1.1(b), point 5.	No applicable recommendations.
3.1.2	**CONSTRUCTION/ UPGRADE/ DECOMMISSIONING ACTIVITIES**				
(a)	**Modification of Gas Line 1** Connection of excess coal water to primary cooler.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.
	Modification of the tar discharge and re-collection system.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.
	Separating scrubbing liquor from coal water stream.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.
(b)	**Primary Coolers - Gas Lines 3&4, and Gas Lines 6-9**Gas Lines 3&4: Installation of a new primary cooler, and new chilled water station including cooling tower upgrade, improvements to the tar separation area (removal of the existing gas tar tank from line 4), and modifications to two existing primary coolers, and decommissioning of the primary coolers for gas line 3.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.
	Gas Lines 6-9: installation of 2 new primary coolers, followed by the modification of 3 existing coolers, and Improvements to the condensation plant.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.

No	Conditions	Status	Score	Observations	Recommendations
(c)	**Chilled Water Station/Cooling Water Supply Facilities** Installation of a new chilled water station and chilled water plant. Removal of old wash-oil tanks.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.
(d)	**Installation of a New Pre-Decanter/Modification of Tar Decanters** Upgrading tar separation facilities (lines 8&9), and removal of existing tar collecting tank.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.
	Installation of a new pre-decanter, followed by the modification of tar decanters.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.
(e)	**Installation of a Gravel Filter Unit** Re-use of two tanks as coal water tanks, and Installation of a new gravel filter.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.
(f)	**Upgrading of the Existing Ammonia Stills** Integrating 3 of the 4 distillation columns, and modifying the existing acid storage tank into a caustic soda tank, including unloading and feeder pumps.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.
(g)	**Installation of the New Stripper/ De-acidifier System** Installation of new distillation columns with corrosion resistant materials, and pipes and heat exchangers to tie-in the new stripping columns.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.
	Integration of existing tanks, and installation of one new tank for de-acidified water.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.
(h)	**Scrubbing Facilities - Gas Lines 3&4** Modification of 2 existing ammonia scrubbers, and installation of a new H_2S scrubber, including a final cooling stage.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.
	Conversion of existing naphthalene scrubber to a final cooler together with installation of new heat exchangers.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.
(i)	**Scrubbing Facilities - Gas Lines 6-9** Demolition of the existing and Installation of a new H_2S scrubber, and upgrading one existing ammonia scrubber.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.
	Installation of heat exchangers and a new gas line.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.
(j)	**Elementary Sulphur Plant combined with NH3 Cracking** Installation of a combined plant for the production of elementary sulphur and cracking of nitrogen components,	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.
(k)	**Control System** The installation of a new system to control scrubbing and conversion units.	Noted/Not Applicable	0	Refer to the observations made in condition 3.1.1(a).	No applicable recommendations.
3.2	**Specific Conditions**				

No	Conditions	Status	Score	Observations	Recommendations
a)	An updated project schedule with time-frames must be submitted to the Department 30 (thirty) calendar days prior to the commencement of construction activities. The schedule must clearly indicate the different phases of construction and commissioning and decommissioning (i.e. expected dates of commissioning of specific completed parts of the COG and water treatment systems).	Noted/Not Applicable	0	This condition was adhered to in 2004 and is not applicable until additional construction activities are initiated.	ArcelorMittal must ensure that the GDARD is informed of the proposed commencement of construction activities thirty (30) days prior to such commencement.
b)	The Department must be informed of both the start of construction and the start of commissioning at least 30 (thirty) calendar days prior to the commencement thereof.	Noted/Not Applicable	0	This condition was adhered to in 2004 (construction) and 2010 (commissioning) and is not applicable until additional construction/commissioning activities are initiated.	ArcelorMittal must ensure that the GDARD is informed of the proposed commencement of construction activities thirty (30) days prior to such commencement.
c)	A detailed Environmental Management Plan (EMP) for the implementation of the project must be submitted to the Department for approval 30 (thirty) calendar days prior to the commencement of construction activities. The EMP must specifically include, inter alia:	Noted/Not Applicable	0	This condition was adhered to in 2008 (construction EMP) and in 2012 (operational EMP). The construction EMP was approved by the GDARD. ArcelorMittal have not received approval of the operational EMP from the GDARD, although the GDARD has acknowledged receipt of the operational EMP.	No applicable recommendations.
i.	An auditable plan for monitoring all facets of the COG and water cleaning project implementation and operation, including decommissioning of all underground sumps, piping (underground and overhead), obsolete machinery, plants e.g. the benzol plant ammonium sulphate plant, tar separators etc., as well as taking of soil samples to indicate the levels of remediation required, and any remedial measures to be implemented.	Compliant	2	The operational EMP contains auditable elements relating to the COCGW Project.	No applicable recommendations.
ii.	A proposed surface and groundwater monitoring regime, which will be in line with the DWAF Water License. The graphically represented results of this monitoring are to be included in a bi-annual audit, which must be submitted to this Department for review to determine if the remedial measures have been successful or if further remediation is required.	Compliant	2	Surface water monitoring is being undertaken in line with the requirements of the Water Use License (WUL) issued to ArcelorMittal Vanderbijlpark Works.	No applicable recommendations.
iii.	Proposed methods of reducing spillages at the quench tower.	Compliant	2	The operational EMP addresses the spillages at the quench towers. ArcelorMittal reportedly installed an alarm system at all the quench towers to warn operators of high sump levels.	No applicable recommendations.
iv.	The EMP must include an air quality monitoring program based on the requirements of Condition 3.2(g).	Compliant	2	An air quality monitoring programme, which meets the requirements set out by the condition 3.2 (g), was submitted together with the operational EMP.	No applicable recommendations.
v.	A diagram indicating all unpaved surface areas, including bunds and storm-water channels, and any areas identified for storm-water and surface water management. Plans must be developed to ensure that all surface areas are protected from spillage and erosion, and that dust In the area of the coke ovens is reduced.	Noted/Not Applicable	0	This condition was adhered to in 2010 as the diagram was submitted together with the first bi-annual Environmental Performance Audit (June 2010) to the GDARD.	No applicable recommendations.

No	Conditions	Status	Score	Observations	Recommendations
vi.	A proposal to address significant pollution from cooling tower sumps.	Compliant	2	General operating procedures are covered in the operational EMP. Further, the whole area is bunded and sumps are placed strategically within these bunded areas. A bio-dosing program is also in place to reduce potential microbial health risks.	No applicable recommendations.
vii.	Handling procedures of sulphur and other by-products produced.	Compliant	2	Kindly note that currently no sulphur is generated. Further, the EMP was updated to include the handling of all by-products, including coke breeze.	No applicable recommendations.
viii.	A waste management plan pertaining to any waste from the treatment process not reused or sold as by-products, including expected volumes and classification, the disposal thereof, and waste manifest system.	Compliant	2	The operational EMP addresses waste management. In addition, ArcelorMittal also has a site wide Waste Management Procedure.	No applicable recommendations.
d)	A copy of the detailed HAZOP study to be conducted during the detail design phase of the project must be submitted to the Department 30 (thirty) calendar days before commissioning commences. The HAZOP must specifically include risks related to commissioning or decommissioning of any equipment, failure of treatment systems due to inefficient operation etc., emergencies and shutdowns, incidents such as spills, and potential discharges to the environment (air, water and rand), and must propose operational and emergency procedures accordingly.	Noted/Not Applicable	0	This condition was adhered to in 2003 and again in 2004.	No applicable recommendations.
e)	An auditable Preventative Maintenance Plan must be developed to ensure that all water systems and environmentally critical equipment such as exhausters, ESP's, scrubbers and strippers are maintained as required. This plan must be auditable and must be externally verified on commissioning of the new plant. The management of IVS are to commit to the budget to undertake the required preventative maintenance. A discussion on the implementation of and compliance with the maintenance plan must be included in the bi-annual audit reports.	Compliant	2	An amendment application for the external verification of the Preventative Maintenance Plan (PMP), dated 29 July 2009, was submitted on 7 August 2009. Amendment to this condition was granted in November 2009.	No applicable recommendations.
f)	Final design plans for new and upgraded containment areas (sumps, tar decanters etc.), buffer tanks and chemical storage tanks, as well as proof of the Department of Water Affairs and Forestry's (DWAF) approval thereof as applicable, must be provided 30 (thirty) calendar days prior to the commencement of construction thereof. The above design plans must include information on specific pollution prevention measures (e.g. bunding & liners), compliance with relevant SABS standards (specifically tanks), the sourcing of particular materials as	Noted/Not Applicable	0	This condition was adhered to in 2014. ArcelorMittal has, on many occasions, resubmitted the plans to the Department of Water and Sanitation (DWS) for approval which is, to date, outstanding. Updated designs will be submitted to DWS again in order to obtain the Departments written approval thereof.	ArcelorMittal must ensure that updated designs are submitted to the DWS as and when required.

No	Conditions	Status	Score	Observations	Recommendations
	required (e.g. clay for liners), time-frames for construction, and exact location on site.				
g)	The following air quality management, monitoring and reporting regime must be implemented and reported on in the bi-annual environmental performance audits as applicable. Note that emission sampling (as applicable) is not required for each of the seven coke oven stacks, but may be conducted on a single stack representative of the whole plant (a short motivation for using a particular stack in terms of physical and gas flow characteristics, similarity to other stacks, differences between stacks etc. must however be provided). Note that conditions relevant to the coke ovens themselves are applicable to all the coke oven batteries on site (i.e. no. 1, 3, 41 6, 7, 8, 9):	Compliant	2	The facility has chosen representative stacks for some sampling based on the age and performance of the battery. Battery 4, 8 and 9 was chosen as the current Coke Strategy for the Works indicates that these 3 batteries will most likely be in operation for longer opposed to the other batteries with a shorter remaining life span. The facility argued that they wish to collect data on the remaining batteries which will remain in operation in order to have a long term trend for these batteries, both approaches are reasonable.	No applicable recommendations.
i.	The concentrations of the various constituents of the cleaned Coke Oven Gas must be monitored before and after combustion in the coke ovens. The results are to be graphically represented and included in the bi-annual audit report. The H_2S content of the gas must be between 0.8 and 1.5 g/Nm3	Moderate non-compliance	-1	The latest monitoring results indicate the H_2S content of the gas exceeded the maximum limit of 1.5 mg/Nm3. The current reading is 5.5 mg/Nm3 (refer to **Appendix B**). The non-compliance is linked to the Sulphur plant not being operational resulting in only partially cleaned gas being flared when there is no use for it in the rest of the works as an energy source. The Claus reactor has been non-operational for an extended period of time due to equipment failure and significant repairs and replacements are required. ArcelorMittal has prioritised this problem and the tender for the construction and installation for the refurbishment of the Sulphur Plant was released at the beginning of August 2018.	ArcelorMittal should continue with the prioritisation of the refurbishment in order to recommission the sulphur plant.
ii.	The emissions from the stacks of the coke ovens must be analysed for dioxin and furan emissions within 6 months of decommissioning of the benzole plant. The results of this monitoring must be reported in the bi-annual audit.	Noted/Not Applicable	0	This condition was adhered to in 2006 and is no longer applicable.	No applicable recommendations.
iii.	A plan for door maintenance/replacement of all the coke batteries (No.) and progress in achieving reduced fugitive emissions has to be developed. The plan must be supported by the results of personal monitors, and actual measurements at representative areas of the coke ovens.	Moderate non-compliance	-1	Battery doors are inspected on a daily basis and a maintenance schedule has been created. Repairs are done continuously. The fugitive emissions are monitored according to the internationally accepted standards and recorded. It was observed during the site visit that the occasional door is still burning and smoking. The commitment from the facility was however also observed to repair and maintain the equipment as far as possible. Exposure monitoring at the batteries indicates that additional fugitive emission mitigation measures are required, above that already implemented. This can however not be attributed only towards doors but rather the	It is recommended that the effectiveness of these measures should continuously be assessed to determine whether it is sufficient to mitigate fugitive emissions.

No	Conditions	Status	Score	Observations	Recommendations
				fugitive battery emissions as a cumulative source. ArcelorMittal has however implemented management and mitigation measures such as specialised face masks and other measures to protect employees and reduce exposure. Other measures include battery tightening, end-flue repairs and charge emission reduction projects. The effectiveness of these measures should be assessed to determine whether it is sufficient to mitigate fugitive emissions. Refer to **Appendix C** for the Door Inspection and Maintenance Plan.	
iv.	The assumptions regarding improved air quality made with respect to this project must be confirmed by actual ambient air quality monitoring. The improvements achieved must be discussed in the bi-annual environmental performance audit reports. Attention must be paid to the recommendation contained in the air quality report to install additional PM_{10} and gaseous samplers within the zone of impact directly south of the IVS site.	Noted/Not Applicable	0	Ambient air quality monitoring is conducted however, since the plant is not fully operational as yet, actual ambient air quality information for the completed project are still unattainable. ArcelorMittal is aware of the requirement for actual ambient air quality information.	No applicable recommendations.
v.	The following monitoring must be undertaken within 6 months of the commissioning of the various treatment plants. Results must be included In the first bi-annual environmental audit report, together with a plan for remediation should these emissions be significant. - Monitoring for ammonia and hydrogen sulphide fumes from the tar decanters and liquid sumps and storage tanks. - Monitoring for benzene must be undertaken at the flushing liquor storage tanks. - Sampling frequency and parameters for sampling of the cooling tower water is to be determined. Based on the understanding obtained from this sampling, emissions in the steam must be anticipated and sampling of steam must be undertaken to determine the impact on the environment of the present cooling process, determine if mitigation measures are required, and to develop reduction plans accordingly.	Noted/Not Applicable	0	This condition was adhered to previously and is not applicable to this audit period.	No applicable recommendations.
vi.	The composition of the approximately 15% of treated COG that would be flared, as well as the gas flare temperature, must be determined and reported on in the first bi-annual environmental audit. A discussion on the effective treatment of gas through flaring, and a plan to reduce the need for flaring the remaining 15% of COG must also be provided in the first audit.	Noted/Not Applicable	0	This condition was adhered to previously with the gas quality being reported on in the first bi-annual audit report. As such this condition is not applicable at this stage.	No applicable recommendations.
vii.	Based on the assumptions made in the air quality report, and the results of actual isokinetic sampling and personal monitoring, a	Noted/Not Applicable	0	Airshed Planning Professionals was commissioned in 2011 to conduct the required assessment and develop the air quality	No applicable recommendations.

No	Conditions	Status	Score	Observations	Recommendations
	plan must be developed with proposals on future emission sampling, including the frequency thereof and the constituents to be sampled for. This work must be undertaken by an external expert and a report with recommendations must be submitted with the first bi-annual audit. In order to ensure early detection of issues to be addressed and ensure the efficiency of treatment equipment, relevant air quality monitoring of COG must be undertaken after each step of commissioning a specific treatment technology.			monitoring plan for the Coke Ovens. The report was submitted as required, as such this condition is noted as not applicable at this stage.	
viii.	Based on emission results further emission reduction programs may have to be developed. These plans must consider international standards and best practice, such as the US EPA's *Final rule to reduce toxic emissions from coke ovens* (February, 2003), and *NESHAP for Coke Ovens: Pushing, Quenching and Battery Stacks - Background information for proposed standards* (February 2001).	Compliant	2	ArcelorMittal has developed a Coke Strategy for the short, medium and long term. The facility also implements additional Emission Reduction Plans in line with the various site-specific Atmospheric Emissions Licenses (AEL). Further strategies for emission reductions are continuously investigated. The implementation of the plans, including the establishment of the Ammonia stripping plant, reportedly depends on resource availability. Funds have now been approved for the refurbishment and installation of the Sulphur plant and ammonia stripper, and a tender for new designs has been sent out at the beginning of August 2018. Refer to **Appendix D** for the Cumulative Particulate Matter Report.	No applicable recommendations.
h)	The flaring of uncleaned gas at the relevant flares is only permissible during upset conditions when the Claus Reactor is shut down for inspection/maintenance for 3 weeks every three years, and must be undertaken at temperatures and atmospheric mixing conditions conducive to maximum dispersion of pollutants.	Moderate non-compliance	-1	The Sulphur plant is not operational and therefore only partially cleaned gas is flared when there is no use for it in the rest of the works as an energy source. The Claus reactor has been non-operational for an extended period of time due to equipment failure and significant repairs and replacements are required. Flaring is taking place on a more regular basis than just 3 weeks every 3 years. However, this issue has been reported on and ArcelorMittal is continuously aware that urgent intervention is needed.	ArcelorMittal must continue monitoring air quality within the Works to maintain a baseline of emission results. The design, construction and operation of the sulphur plant should be prioritised as it is only through this plant's operation that the flaring of uncleaned gas can be controlled.
i)	Detailed and up to date records must be kept of all incidents and complaints pertaining to the COG and water cleaning project, how these were managed, and the recurrence thereof prevented. These records must be made available to the Department within 14 (fourteen) calendar days upon written request by the Department.	Compliant	2	Incident and complaints registers are available at the main gate. Incidents are also recorded and saved on the internal reporting system and/or noted in ECO reports/incident register. The facility has an electronic incident management system (PIVOT) which manages the incidents. The system facilitates the investigation and mitigation measures between different responsible parties. No incidents related to the project were recorded during the audit period.	No applicable recommendations.
j)	This Department and the Department of Water Affairs and Forestry must be informed of any major environmental and pollution	Noted/Not Applicable	0	No major or emergency incidents were reported in the reporting period and as such this condition is not applicable.	No applicable recommendations.

No	Conditions	Status	Score	Observations	Recommendations
	incidents relating to the COG and water cleaning project within 24 (twenty four) hours of such incidents occurring.				
k)	The use of the existing Maturation Dams for the storage or disposal of any effluent/sludge/waste is prohibited as from 6 months after commissioning of the completed coke oven by-products plant. An application for authorisation and draft plan for decommissioning and rehabilitation of the existing Maturation Dams must be submitted to the Department within 120 (one hundred and twenty) calendar days of commissioning of the COG and water cleaning project.	Noted/Not Applicable	0	The Department of Environmental Affairs (DEA) issued a Waste Management License (WML) for the decommissioning of the maturation ponds in February 2012. As such the facility implemented various process changes in order to cease the use of the dams. The dams were taken out of operation in 2008, two years before the COCGW project was commissioned. The remediation of the maturation ponds are progressing very well. The dam consisted out of 3 dams of which the remediation of Dams 2 and 3 is 100% complete and Dam 1 about 60% complete. Soil is being remediated in-situ. This condition is therefore noted as not applicable to the audit period.	No applicable recommendations.
l)	Planning with respect to addressing existing groundwater contamination identified in the Coke Plant area must continue. Confirmation of, or plans for the abstraction and/or treatment of contaminated groundwater or specific pollutants, including the feasibility of abstracting contaminated groundwater from the aquifer underlying the site as a source of water supply to the process, needs to be considered. Progress with respect to this matter must be reported on in the quarterly progress reports and bi-annual environmental performance audits thereafter.	Compliant	2	A contaminated land assessment in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA) (Part 8), which encompassed the entire Works, was recently finalised. The contaminated land assessment report, including groundwater assessment, and associated remediation plan was submitted to the Department of Environmental Affairs (DEA) on 7 June 2018. The auditor was informed that the content of these documents would be presented to the Department on 27 August 2018, after the audit site visit. The auditor has been informed that such a meeting took place and that ArcelorMittal Vanderbijlpark Works is awaiting a response from the DEA on the suggested way forward.	No applicable recommendations.
m)	The recommendations contained in the specialist studies submitted in support of the application for authorisation of the COG and water cleaning project are regarded as an extension of the conditions of this authorisation. Implementation of or compliance with these recommendations must be discussed as part of the quarterly progress reports and bi-annual environmental performance audits thereafter.	Compliant	2	These recommendations have been included in the EMP and are also assessed as part of the internal audits. Refer to **Appendix E** for the most recent quarterly report.	No applicable recommendations.
n)	An Independent Environmental Control Officer (ECO) with an understanding of the coke oven operational and treatment processes must be appointment for the duration of construction and commissioning, to monitor and report on compliance with the conditions of this authorisation.	Compliant	2	Mr Terrence Wilson was appointed as the ECO for the ArcelorMittal site on 27 January 2010.	No applicable recommendations.
3.3	**General Conditions**				

No	Conditions	Status	Score	Observations	Recommendations
a)	Any changes to, or deviations from, the project description set out in this letter must be approved, in writing, by the Department before such changes or deviations may be effected. In assessing whether to grant such approval or not, the Department may request such information as It deems necessary to evaluate the significance and impacts or such changes or deviations.	Noted/Not Applicable	0	This condition is noted. No changes to, or deviations from, the project description were made during the audit period.	No applicable recommendations.
b)	This Department may review the conditions contained in this letter from time to time and may, by notice in writing to the applicant, amend, add or remove a condition.	Noted/Not Applicable	0	This condition is noted.	No applicable recommendations.
c)	The applicant must notify the Department, in writing, at least 30 (thirty) days prior to the change of ownership, project developer or the alienation of any similar rights for the activity described in this letter. The applicant must furnish a copy of this document to the new owner, developer or person to whom the rights accrue and inform the new owner, developer or person to whom the rights accrue that the conditions contained herein are binding on them.	Noted/Not Applicable	0	This condition is noted.	No applicable recommendations.
d)	Where any of the applicant's contact details change, including the name of the responsible person, the physical or postal address and/ or telephonic details, the applicant must notify the Department as soon as the new details become known to the applicant.	Noted/Not Applicable	0	This condition is noted.	No applicable recommendations.
e)	Authorisation for the activity is granted in terms of the Environment Conservation Act, 1989 (Act 73 of 1989) only and does not exempt the holder from compliance with other relevant legislation.	Noted/Not Applicable	0	This condition is noted. ArcelorMittal has a legal register in place with sufficient legal advisors to ensure they are aware of their legal requirements. The register is updated as required.	No applicable recommendations.
f)	The applicant shall be responsible for ensuring compliance with the conditions contained in this letter by any person acting on his behalf, including but not limited to, an agent, servant, or employee or any person rendering a service to the applicant in respect the activity, including but not limited to, contractors and consultants.	Compliant	2	An ECO has been appointed to ensure compliance with conditions of the authorisation and ensure contractors are informed of requirements. A copy of the EMP has also been provided to contractors and an agreement signed that they must adhere to the conditions in the EMP.	No applicable recommendations.
g)	Departmental officials shall be given access to the property referred to in 1 above for the purpose of assessing and/ or monitoring compliance with the conditions contained in this document at all reasonable times.	Noted/Not Applicable	0	This condition is noted.	No applicable recommendations.
h)	The applicant must notify the Department within 24 (twenty four) hours if any condition of this authorisation cannot, or is not, adhered to. The notification must be supplemented with reasons for non-compliance.	Noted/Not Applicable	0	This condition is noted.	No applicable recommendations.

No	Conditions	Status	Score	Observations	Recommendations
3.4	**Reporting requirements**				
a)	A summarised quarterly progress report on the implementation of the COG and water cleaning project must be submitted to the Department, the first report being due 90 (ninety) calendar days after construction commences, and every 90 (ninety) calendar days thereafter. These progress reports must address, inter alia, the following:	Compliant	2	ArcelorMittal compiles quarterly progress reports and is only required to submit these reports to GDARD upon request. Refer to **Appendix E** for the most recent quarterly report.	No applicable recommendations.
i.	Up to date scheduling of implementation and associated time-frames.	Noted/Not Applicable	0	This condition is noted as a reporting requirement.	No applicable recommendations.
ii.	Records of any major incidents (see 3.2(i) above).	Noted/Not Applicable	0	This condition is noted as a reporting requirement.	No applicable recommendations.
iii.	Decommissioning of infrastructure.	Noted/Not Applicable	0	This condition is noted as a reporting requirement.	No applicable recommendations.
iv.	Rehabilitation and disposal of contaminated waste material (soil, decommissioned equipment etc.), including the quantity and classification (general/hazardous) thereof.	Noted/Not Applicable	0	This condition is noted as a reporting requirement.	No applicable recommendations.
v.	Commissioning of any treatment infrastructure.	Noted/Not Applicable	0	This condition is noted as a reporting requirement.	No applicable recommendations.
vi.	Results on the monitoring of the efficiency of commissioned treatment infrastructure.	Noted/Not Applicable	0	This condition is noted as a reporting requirement.	No applicable recommendations.
vii.	Monitoring of activities in terms of the environmental management plan (see 3.2 (c) above).	Noted/Not Applicable	0	This condition is noted as a reporting requirement.	No applicable recommendations.
viii.	Any steps taken to rectify areas of non-compliance with environmental requirements.	Noted/Not Applicable	0	This condition is noted as a reporting requirement.	No applicable recommendations.
b)	A bi-annual Environmental Performance Audit conducted by an independent, accredited auditor must be submitted to the Department for review, the first audit being due 6 (six) months after commissioning of the COG and water cleaning project, and every 6 (six) months thereafter. The bi-annual audit must include, inter alia, the following (results in graph format as applicable):	Compliant	2	The previous external EPA was conducted by GCS in March 2018.	No applicable recommendations.
i.	Volume of water treated, volume re-used, volume discharged, and reduction in volume of fresh water intake achieved, i.e. updated water balance for the site.	Compliant	2	ArcelorMittal Vanderbijlpark Works is a zero effluent discharge facility as required in terms of the WUL. The updated water balance for the Works is attached as **Appendix F**, whilst the water balance for the Coke Plant is attached as **Appendix G**. Prior to becoming a zero discharge facility treated effluent was discharged from the Works through the Rietspruit canal into the Rietspruit River which flows into the Vaal River. Effluent discharge qualities and volumes are presented in **Appendix H** and freshwater abstraction volumes are presented in **Appendix I**. An average 65% reduction in water abstraction has been achieved since 2005.	No applicable recommendations.

No	Conditions	Status	Score	Observations	Recommendations
ii.	Results of improvements in air and water quality achieved.	Compliant	2	ArcelorMittal is committed to improving air and water quality results for the Works. Refer to **Appendix B**, **Appendix D**, **Appendix H** and **Appendix I**.	No applicable recommendations.
iii.	Air quality monitoring and reporting as required by Condition 3.2(g).	Compliant	2	Ambient air quality and fugitive emissions monitoring, management and reporting for the Works is undertaken in accordance with the Atmospheric Emissions License (AEL) and the Air Quality Monitoring Plan produced by Airshed Planning Professionals in 2011 (refer to **Appendix J**). The ambient air quality around the Works is monitored by ArcelorMittal at four pre-determined locations. Fugitive emissions by nature are a difficult element to monitor. The monitoring system that has been put in place by ArcelorMittal is noteworthy and the different sources of fugitive emissions are assessed in the fugitive emissions monitoring plan which includes the doors, pipes and charging times, and smoke observed. The Coke Battery Stack dust emissions are attached as **Appendix K**. Occupational health monitoring, undertaken in terms of the Occupational Health and Safety Act, can also be used as a monitoring program in order to determine the effectiveness of the mitigation measures implemented at the Works. Furthermore, as noted in the quarterly progress reports (**Appendix E**), ambient air quality monitoring results from stations operated by the DEA, indicate that SO_2 limits were not exceeded in the Vaal Triangle Airshed Priority Area during the first quarter of the year.	No applicable recommendations.
iv.	Discussion on groundwater treatment (volumes, pollution stabilisation etc.).	Compliant	2	ArcelorMittal have established remedial actions to avoid continued groundwater contamination. A contaminated land assessment was undertaken in 2017/2018 and the report and associated remediation plan was submitted to the DEA on 7 June 2018. This assessment and remediation plan, together with remodelled groundwater information for the Works, will be used to assess the success rate of the remedial actions implemented to date. Arcelor Mittal awaits a response from the DEA on the recommended way forward.	No applicable recommendations.
v.	Discussions on the implementation (or not) of recommendations as contained in the Scoping Report and Specialist Studies.	Compliant	2	The recommendations as contained in the scoping report and specialist reports have been included into the operational EMP and monitoring plans for the project.	No applicable recommendations.
vi.	Results of ground and surface water monitoring as provided for in the EMP.	Minor non-compliance	1	The Works are operated as a zero discharge facility, however in the event of process upset conditions, contaminated surface water can be diverted to the Coke Plant sump which is a buffer	No applicable recommendations.

No	Conditions	Status	Score	Observations	Recommendations
				dam where water from the dam can be reclaimed for re-use as and when there is sufficient capacity in the system. The levels of the coke plant sump is managed and measured to ensure the sump does not overflow. Clean storm water is measured at the coke plant storm water drain but is combined with other areas inflows. The flow is measured continuously and the Electrical Conductivity is also monitored. Discharge into the Rietspruit has taken place a few times during the first 6 months of 2018, with no discharge during the second half as per the data at the time of conducting the audit (refer to **Appendix H**). Groundwater monitoring and management is conducted according to the ArcelorMittal WUL. A contaminated land assessment in terms of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) (NEM:WA) (Part 8), which encompassed the entire Works, was recently finalised. The contaminated land assessment report, including groundwater assessment, and associated remediation plan was submitted to the Department of Environmental Affairs (DEA) on 7 June 2018. The auditor was informed that the content of these documents would be presented to the Department on 27 August 2018, after the audit site visit. The auditor has been informed that such a meeting took place and that ArcelorMittal Vanderbijlpark Works is awaiting a response from the DEA on the suggested way forward. The groundwater monitoring graphs and results are attached as **Appendix L**.	
vii.	Quantities and handling of all by-products produced (sulphur, tar etc.).	Compliant	2	The Coke Ovens generates coke breeze, liquid raw tar and tar sludge as by-products and waste streams. The various waste stream quantities are presented in **Appendix M**. Liquid tar generated by the coke ovens are pumped to the tar plant for further processing. Tar sludge is generated and mixed with coal dross at a temporary storage area from where it is collected and disposed by Enviroserv (Holfontein H:H Waste Disposal site). Safe disposal certificates are kept for the loads as removed. ArcelorMittal reported that the facility has constructed a plant to recycle and re-use the tar sludge back into the coke battery plant. The tar sludge is captured by the existing carousels system and is transported with the forklift to the new tar sludge recycling plant. The tar sludge is mixed in with the coal and used in the coke making process again. The recycling facility has been commissioned with the	No applicable recommendations.

No	Conditions	Status	Score	Observations	Recommendations
				anticipated outcome of a reduction/elimination of the disposal of hazardous waste. No liquid sulphur has been generated during the audit period as the plant is off line. Coke breeze is generated during the quenching process. Water is sprayed onto the hot coals when it is pushed out of the ovens. The coke breeze collects at the base of the quench tower. The majority of the coke breeze is transported by railway to the sinter plant for recycling.	
viii.	Report on the success of the carousal system being implemented for the collection of tar from tar decanters (first audit only), as well as the method used to return the tar to the coke ovens. A mechanism to collect spillages from the carousal must be discussed, as well as the implementation of an alarm to indicate when the collection vessels are full.	Noted/Not Applicable	0	This condition is not applicable for the audit period.	No applicable recommendations.
ix.	Discussion on the implementation of and compliance with the Preventative Maintenance Plan (see 3.2(e) above).	Repeat Condition	-	Critical maintenance requirements are continuously identified and are captured on the SAP system for tracking and action. A job cards is created and managed on this internal system. Refer to **Appendix N** for an example of a job card. This condition is scored according to condition 3.2 (e).	No applicable recommendations.
x.	Records of any major incidents (see 3.2(i) above),	Repeat Condition	-	Refer to the observations made in condition 3.2(i).	No applicable recommendations.
xi.	Quantity of waste generated, and the classification and management thereof.	Repeat Condition	-	Refer to the observations made in condition 3.2(vii).	No applicable recommendations.
xii.	Reporting on compliance with the provisions of this authorisation and the environmental management plan, and steps taken to rectify non-compliance.	Compliant	2	This report serves as the second bi-annual external EPA report for 2018.	No applicable recommendations.
xiii.	Monitoring of relevant boreholes with respect to detecting any leaks/pollution from all facets of the COG and water cleaning.	Compliant	2	A borehole improvement plan has been undertaken. Upgrade of the monitoring borehole network completed in 2010 and supplementary monitoring boreholes have been equipped with caps. New boreholes were drilled to replace the damaged boreholes. A new borehole was installed to replace the previously damaged CO-3D. Refer to the groundwater monitoring results in **Appendix L**.	It is recommended that the WUL be amended to include the new boreholes.
xiv.	Details of any failures in the treatment system an how these were managed.	Repeat Condition	-	Refer to the observations made in condition 3.2(i).	No applicable recommendations.
xv.	Details on the quality and quantity of any discharge (air, water and land), and reasons for discharge, how these were managed, and the recurrence thereof prevented.	Repeat Condition	-	Refer to the observations made in condition 3.4(b)(ii).	No applicable recommendations.
3.5	**Duration of authorisation**				

No	Conditions	Status	Score	Observations	Recommendations
	If the activity authorised by this letter does not commence within 6 (six) months from the date of signature of this letter, the authorisation will lapse and the applicant will need to re-apply for authorisation in terms of the above legislation or any amendments thereto.	Noted/Not Applicable	0	This condition is not applicable for the audit period.	No applicable recommendations.
		Total Findings	**96**		

6 CONCLUSION AND RECOMMENDATIONS

By conducting an EPA, ArcelorMittal recognises the importance of the importance of the authorisation in regulating processes related to the project.

Currently the overall compliance with the Record of Decision (ROD) (GAUT 002/02-03/138) is noteworthy. Overall there was one (1) incident of minor non-compliance, three (3) incidents of moderate non-compliance, and zero (0) incidents of major non-compliance observed for the audit period. ArcelorMittal is compliant with the relevant conditions of the ROD that apply to the current status of the project.

H_2S Content in Gas

Condition 3.2(g)(i) states that "The concentrations of the various constituents of the cleaned Coke Oven Gas must be monitored before and after combustion in the coke ovens. The results are to be graphically represented and included in the bi-annual audit report. The H_2S content of the gas must be between 0.8 and 1.5 g/Nm^3."

Observation:

The latest monitoring results indicate the H_2S content of the gas exceeded the maximum limit of 1.5 mg/Nm^3. The current reading is 5.5 mg/Nm^3. The non-compliance is linked to the Sulphur plant not being operational resulting in partially cleaned gas being flared when there is no use for it in the rest of the works as an energy source. The Claus reactor has been non-operational for an extended period of time due to equipment failure and significant repairs and replacements are required. ArcelorMittal has prioritised this problem and the tender for the construction and installation component for the refurbishment of the Sulphur Plant was released at the beginning of August 2018.

Recommendation:

ArcelorMittal should continue with the prioritisation of the refurbishment of the gas plant in order to recommission the sulphur plant.

Plan for Achieving Reduced Fugitive Emissions

Condition 3.2(g)(iii) states that "A plan for door maintenance/replacement of all the coke batteries (No.) and progress in achieving reduced fugitive emissions has to be developed. The plan must be supported by the results of personal monitors, and actual measurements at representative areas of the coke ovens."

Observation:

Battery doors are inspected on a daily basis and a maintenance schedule has been created. Repairs are done continuously. The fugitive emissions are monitored according to the internationally accepted standards and recorded. It was observed during the site visit that the occasional door is still burning and smoking. The commitment from the facility was however also observed to repair and maintain the equipment as far as possible. Exposure monitoring at the batteries indicates that additional fugitive emission mitigation measures are required, above that already implemented. This can however not be attributed only towards doors but rather the fugitive battery emissions as a cumulative source. ArcelorMittal has however implemented management and mitigation measures such as specialised face masks and other measures to protect employees and reduce exposure. Other measures include battery tightening, end-flue repairs and charge emission reduction projects. The effectiveness of these measures should be assessed to determine whether it is sufficient to mitigate fugitive emissions.

Recommendation:

It is recommended that the effectiveness of these measures should continuously be assessed to determine whether it is sufficient to mitigate fugitive emissions.

Plan for Achieving Reduced Fugitive Emissions

Condition 3.2(h) states that "The flaring of uncleaned gas at the relevant flares is only permissible during upset conditions when the Claus Reactor is shut down for inspection/maintenance for 3 weeks every three years, and must be undertaken at temperatures and atmospheric mixing conditions conducive to maximum dispersion of pollutants."

Observation:

The sulphur plant is not operational and therefore partially cleaned gas is flared when there is no use for it in the rest of the works as an energy source. The Claus reactor has been non-operational for an extended period of time due to equipment failure and significant repairs and replacements are required. Flaring of uncleaned gas is taking place on a more regular basis than 3 weeks every 3 years. However, this issue has been reported on and ArcelorMittal is continuously aware that urgent intervention is needed.

Recommendation:

ArcelorMittal must continue monitoring air quality within the Works to maintain a baseline of emission results. The design, construction and operation of the sulphur plant should be

prioritised as it is only through this plants operation that the flaring of uncleaned gas can be controlled.

The instances of non-compliance weren't considered to be directly associated with significant environmental degradation, and as such the auditor believes that current environmental practices implemented on site are adequately mitigating environmental impacts.

APPENDIX A: DECLARATION OF AUDITOR INDEPENDENCE

I, **Riana Panaino**, declare that:

- I act as the independent environmental auditor in this assessment;
- I will perform the work relating to the assessment in an objective manner, even if this results in views and findings that are not favourable to the authorisation holder;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting environmental auditing, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activities;
- I will comply with the Act, Regulations and all other applicable legislation;
- I will take into account, to the extent possible, the matters listed in Regulation 34 of the Regulations when preparing this assessment and any report relating it;
- I have no, and will not engage in, conflicting interests in the undertaking of this assessment;
- I undertake to disclose to the holder and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I will ensure that information containing all relevant facts in respect of the assessment is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the assessment;
- I will ensure that the comments of all interested and affected parties are considered and recorded in reports that are submitted to the competent authority in respect of the application, provided that comments that are made by interested and affected parties in respect of a final report that will be submitted to the competent authority may be attached to the report without further amendment to the report;
- I will provide the competent authority with access to all information at my disposal regarding the assessment, whether such information is favourable to the holder or not;
- All the particulars furnished by me in this form are true and correct;
- I will perform all other obligations as expected from an environmental auditor in terms of the Regulations; and
- I realise that a false declaration is an offence in terms of Regulation 48 of the Regulations and is punishable in terms of section 24F of the Act.

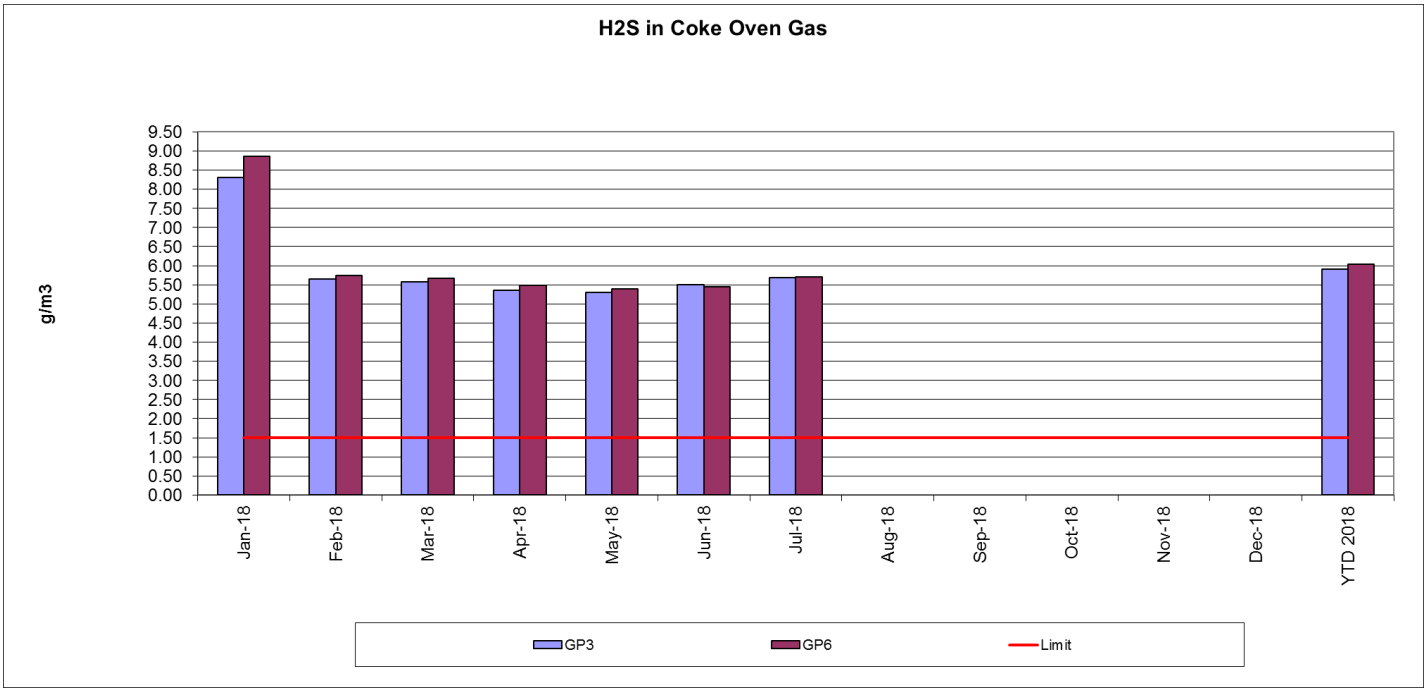
Disclosure of Vested Interest

- I do not have and will not have any vested interest (either business, financial, personal or other) in the proposed activity proceeding other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014.

Signature of the environmental auditor

26 September 2018

APPENDIX B: H2S IN COKE OVEN GAS DATA


H2S in Coke Oven Gas
g/m3
9.50
9.00
8.50
8.00
7.50
7.00
6.50
6.00
5.50
5.00
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
Jan-18
Feb-18
Mar-18
Apr-18
May-18
Jun-18
Jul-18
Aug-18
Sep-18
Oct-18
Nov-18
Dec-18
YTD 2018
GP3
GP6
Limit

APPENDIX C: DOOR INSPECTION AND MAINTENANCE PLAN

DOOR SPARES STOCK LIST'	DATE:	22/08/2018

DEVIATIONS ON INSPECTIONS OF BATTERY DOORS

	P/S	DOORS	HEADS	CHECK/D	KLIETS	SADDLES	DOOR HOOKS	GUN LINTELS	APRONS	C/S	DOORS	KLIETS	SADDLES	DOOR HOOKS	GUN LINTELS	APRONS
4 BATT INSPECTION'	P/S	0	0	7	4	0	0	0	0	C/S	0	5	0	1	0	0
6 BATT INSPECTION'	P/S	0	0	3	5	4	2	1	0	C/S	1	5	0	0	43	0
7 BATT INSPECTION'	P/S	0	0	7	4	1	2	1	1	C/S	0	4	0	0	14	2
8 BATT INSPECTION '	P/S	0	2	4	3	2	0	32	0	C/S	1	1	0	1	4	0
9 BATT INSPECTIONS'	P/S	0	2	6	3	0	0	1	0	C/S	0	1	0	0	0	5
TOTAL DEVIATIONS	P/S	0	4	27	19	7	4	35	1	C/S	2	16	0	2	61	7

Deliveries outstanding from foundry

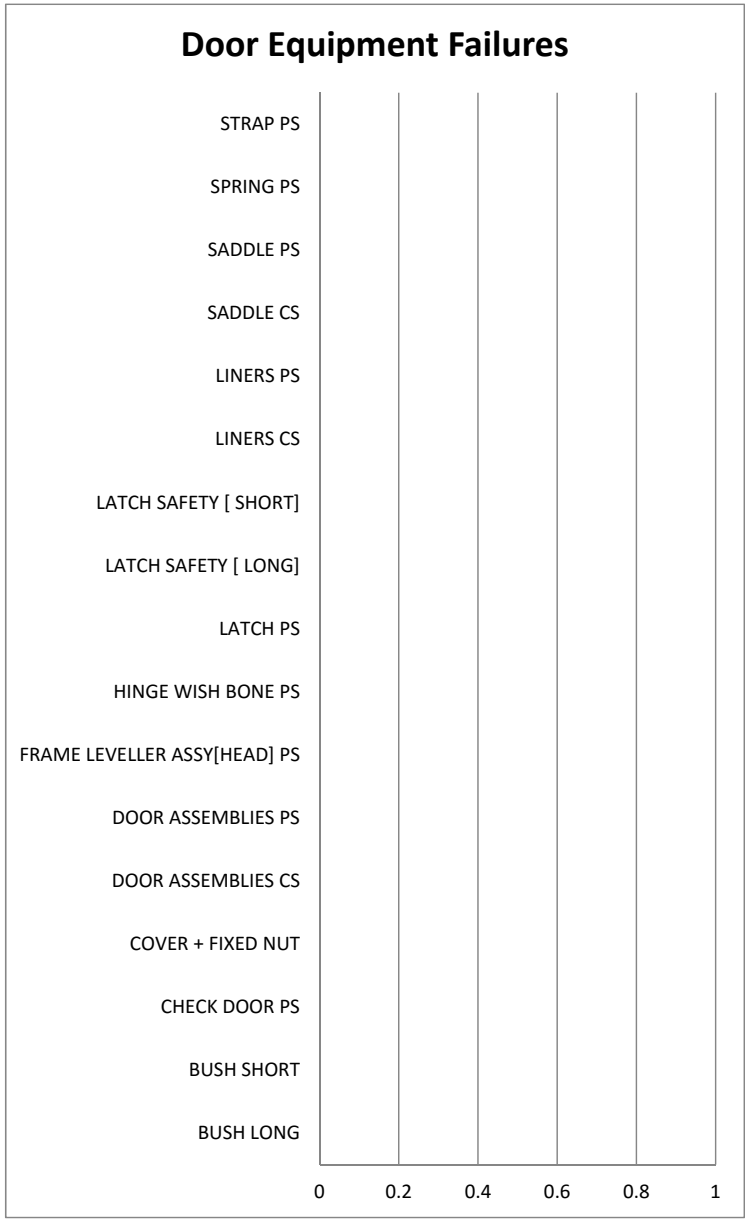
ITEM	QTY	ORDER Nr	SAP DELIVERY	PARTIAL DEL	OUTSTANDING	UNIT PRICE	Total order
P/S DOOR	20	4519850483	2015.06.30	20	0	R 52 981.00	R 1 059 620.00
P/S DOOR	20	4519921772	2015.10.20	20	0	R 52 981.00	R 1 059 620.00
C/S DOOR	15	4519850489	2015.06.30	15	0	R 47 842.00	R 717 630.00
C/S DOOR	15	4519921719	2015.08.31	15	0	R 47 842.00	R 717 630.00
L/FRAME	10	4519850474	2015.06.08	10	0	R 24 290.00	R 242 900.00
L/FRAME	15	4519921698	2015.08.11	15	0	R 24 290.00	R 364 350.00
P/S DOOR	15	4520082748	2015.08.31	15	0	R 57 198.42	R 857 976.30
C/S DOOR	10	4520082766	2015.06.30	10	0	R 49 545.66	R 495 456.60
L/FRAME	10	4520082741	2015.07.21	10	0	R 24 912.00	R 249 120.00
P/S DOOR	7	4520405623	2018.02.18	7	0	R 66 196.00	R 463 372.00
P/S DOOR	4	4520432570	2018.04.19	4	0	R 66 196.00	R 264 784.00
C/S DOOR	2	4520407506	2018.01.02	2	0	R54 951.00	R 109 902.00
C/S DOOR	5	4520405621	2018.02.28	5	0	R54 951.00	R 274 755.00
C/S DOOR	4	4520441349	2018.03.16	4	0	R54 951.00	R 219 804.00
C/S DOOR	4	4520432573	2018.04.20	4	0	R54 951.00	R 219 804.00
L/FRAME	7	4520294929	2017.06.30	NCR(BEDFORD)	7	R23 240.00	R162 680.00
L/FRAME	20	4520394996	2017.12.31	20	0	R23 090.00	R461 800.00
L/FRAME	4	4520492984	2018.08.03	0	4	R23 090.00	R 92 360.00
C/S DOOR	15	4520535388	2018.10.03	0	15	R54 951.00	R 824 265.00

P/S DOOR	14	4520526342	2018.09.26		0	15	R66 196.00	R 926 744.00

R 9 784 572.90

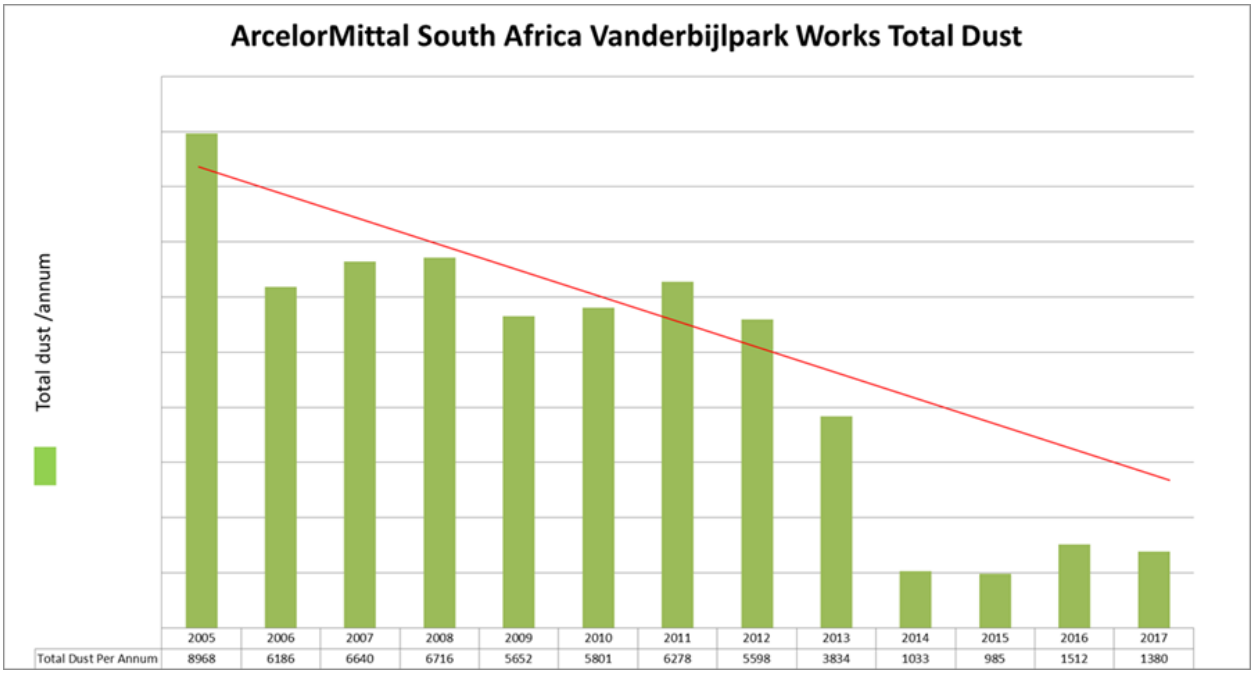
	Start Date	01/01/2018	**End date**	01/10/2018	Months	9	
Doors From Batteries PS	#VALUE!	PS		**Doors From Batteries CS**	#VALUE!	CS	
Doors To Batteries PS	#VALUE!			**Doors To Batteries CS**	#VALUE!		

Door Equipment Failures				Deviations	
Epuipment dameged	**QTY**	**Price/ Unit**	**Total Cost**	**Type of Diviations**	**QTY**
BUSH LONG	#VALUE!	R 145.00	#VALUE!	Crack at bottom door body	#VALUE!
BUSH SHORT	#VALUE!	R 69.95	#VALUE!	Crack at middle door body	#VALUE!
CHECK DOOR PS	#VALUE!	R 2 071.00	#VALUE!	Crack at top door body	#VALUE!
COVER + FIXED NUT	#VALUE!	R 150.00	#VALUE!	Safety Latch broken or bend	#VALUE!
DOOR ASSEMBLIES CS	#VALUE!	R 47 842.00	#VALUE!	Door hooks broken	#VALUE!
DOOR ASSEMBLIES PS	#VALUE!	R 52 981.00	#VALUE!	Check Door broken	#VALUE!
FRAME LEVELLER ASSY[HEAD] PS	#VALUE!	R 24 656.00	#VALUE!	Refractories Broke	#VALUE!
HINGE WISH BONE PS	#VALUE!	R 2 325.00	#VALUE!	Crack leveller Head or Broken	#VALUE!
LATCH PS	#VALUE!	R 264.96	#VALUE!	Leveller Head bend/Seal on check door bad	#VALUE!
LATCH SAFETY [LONG]	#VALUE!	R 3 975.00	#VALUE!	Liners scraped	#VALUE!
LATCH SAFETY [SHORT]	#VALUE!	R 1 217.00	#VALUE!	Saddle CS Scraped	#VALUE!
LINERS CS	#VALUE!	R 1 454.00	#VALUE!	Saddle PS Scraped	#VALUE!
LINERS PS	#VALUE!	R 1 600.00	#VALUE!	Spring of Check door Scraped	#VALUE!
SADDLE CS	#VALUE!	R 1 177.10	#VALUE!	Hinge for wish bone broken	#VALUE!
SADDLE PS	#VALUE!	R 4 045.00	#VALUE!		
SPRING PS	#VALUE!	R 45.00	#VALUE!		
STRAP PS	#VALUE!	R 372.00	#VALUE!		
			#VALUE!		


Door Equipment Failures
STRAP PS
SPRING PS
SADDLE PS
SADDLE CS
LINERS PS
LINERS CS
LATCH SAFETY [SHORT]
LATCH SAFETY [LONG]
LATCH PS
HINGE WISH BONE PS
FRAME LEVELLER ASSY[HEAD] PS
DOOR ASSEMBLIES PS
DOOR ASSEMBLIES CS
COVER + FIXED NUT
CHECK DOOR PS
BUSH SHORT
BUSH LONG
0
0.2
0.4
0.6
0.8
1


Deviations
Hinge for wish bone broken
Spring of Check door Scraped
Saddle PS Scraped
Saddle CS Scraped
Liners scraped
Leveller Head bend/Seal on check door bad
Crack leveller Head or Broken
Refractories Broke
Check Door broken
Door hooks broken
Safety Latch broken or bend
Crack at top door body
Crack at middle door body
Crack at bottom door body
0
0.2
0.4
0.6
0.8
1

APPENDIX D: CUMULATIVE PARTICULATE MATTER EMISSION REDUCTION



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total Dust Per Annum	8968	6186	6640	6716	5652	5801	6278	5598	3834	1033	985	1512	1380

APPENDIX E: QUARTERLY PROGRESS REPORT.

ArcelorMittal South Africa

Vanderbijlpark Works

Cleaning of Coke Oven Gas and Water

Quarterly Progress Report (March 2018)

Contents

ArcelorMittal South Africa
Vanderbijlpark Works
Cleaning of Coke Ovens Gas and Water Project

A. Scheduling of implementation and time frames

1. Cleaning of Coke Ovens gas and water

The major Milestone Dates on the project are reflected below in Table 1: Milestone Summary.

Table 1: Milestone Summary

Item	Milestone Description	Planned Date	Forecast Date	Actual Date
1.	All contract Award Dates	04/10/29	04/10/29	Oct 04
2.	Primary cooling unit & scrubbing facilities GP3	06/06/28	06/07/28	July 06
3.	Primary cooling unit & scrubbing facilities GP6	06/07/12	06/08/30	Sept 06
4.	Chilled water station with cooling tower	06/06/28	06/08/30	Dec 06
5.	Ammonia stills & de-acidifier	06/07/19	06/08/30	Aug 08
6.	Elementary sulphur plant	06/07/19	07/02/28	Jan 10
7.	Process control system	06/06/07	07/02/28	Jan 10
8.	Project completion	06/10/31	07/03/05	Jan 10
9.	Installation of the Gravel Filter	08/12/31	08/12/31	Aug 12 (Note 1)
10.	Installation of ammonia strippers and caustic dosing facilities	15/12/31	Note 2	

Note 1: Commissioning of Gravel Filter unit commenced on 3 September 2013.
Note 2: CAPEX originally budgeted for 2nd phase of coal water treatment in 2016. However, due to integrated operations, the decision was made to incorporate the ammonia strippers into the broader by-products plant upgrade, provisionally scheduled for implementation in 2018.

1.1 Status

One of the specialist recommendations transpiring from the EIA process for the project was that plans for addressing the existing groundwater contamination in the Coke Plant area must continue. All known active sources from the area have been eliminated and since inception of remedial actions, around 2007, which formed part of the original groundwater management plan, significant progress has been made in this regard. As such, it was decided to remodel the groundwater dynamics for the entire site to assess the success of remedial actions undertaken in the past decade. This modelling will tie in with the greater contaminated land assessment for the Works, which will dictate possible contaminated land and groundwater initiatives going forward. The first phase of the contaminated land assessment was completed in September 2017.

On the 15th March 2012, the Department was informed of the progress of the unanticipated temporary shut-down of the Elementary Sulphur Plant, which is an integral component of the coke oven gas cleaning facilities at the Works. The Department has requested feedback on the progress of start-up of the Plant, in a letter dated 3 May 2012, which will be provided once ArcelorMittal has performed all the necessary repairs and is in a position to safely operate the Plant. Feedback on the status of the Plant has been communicated to the Department via external audit reports submitted on a bi-annual basis. The compliance and enforcement section of the provincial authority requested a meeting and site visit to discuss the status of the Plant. In the meeting held on the 23rd November 2016, the history of Plant failures and challenges were presented to the Department officials, together with the extensive actions implemented over the years in an attempt to reinstate operation of the Plant.

The Projects Department has evaluated tenders from specialists to conduct integrity checks of the gas plant equipment, including vessels, heat exchangers, pipes, trestles, exhausters etc. An enquiry for the technical design required for implementation of the actions identified as part of the specialist assessment to determine the deficiencies of the Plant has also been issued, with initial quotes received. The detailed engineering design component of the project is expected to take in the region of a year, thus manufacturing, installation and commissioning of the upgrades is planned to commence in H2 2018 subsequent to the funds approval process. Preliminary cost estimates received from specialists indicate that the required upgrades could cost over R600 million.

As previously reported, the Gravel Filter Plant was commissioned on 3 September 2013. Consequently, significant improvements in water quality (in terms of suspended solids and tar particles) have been achieved. Due to integrated operations of the gas plant infrastructure, the decision was made to incorporate the ammonia strippers into the broader by-products plant upgrade, installation of which is anticipated to commence in 2018.

The tar sludge recycling project has been commissioned and has been rolled out to all batteries on site.

The last bi-annual, external, environmental performance audit was conducted in February 2018.

B. Records of major incidents

Although extended downtime of the Elementary Sulphur Plant remains a concern, no major environmental incidents have occurred during the last quarter.

C. Decommissioning of infrastructure

No further demolition work performed.

D. Rehabilitation and disposal of contaminated material

All equipment, tanks, vessels, and pipes that contained process liquids were flushed into the existing By-products process. The steel scrap was recycled back into the steel making process.

As per condition 3.2 k) the use of the maturation ponds was to cease 6 months after the commissioning date. Although the use of the maturation ponds is directly related to the commissioning of the Coke Oven Clean Gas and Water project, with changes to the water balance of the Works, the maturation ponds' usage ceased in March 2008.

The Maturation Ponds Rehabilitation Plan has been submitted to, and approved by, the Department of Water Affairs and Forestry (DWAF). Application for environmental authorisation to decommission the Maturation Ponds, in terms of the 2010 EIA Regulations, was submitted to the authorities. The application was transferred from the provincial authority to the national authority as mandated by the Waste Act, which delayed the issuing of the authorisation. ArcelorMittal subsequently received the Waste Management License from DEA for the decommissioning and remediation of the Maturation Ponds on 13 February 2012

E. Commissioning

Commissioning of the Project was completed in January 2010. Concerted effort is being placed on actions to receive funding for restitution and start-up of the Elemental Sulphur Plant after extended down-time. Oversees experts were sourced to identify the root cause of equipment failure experienced to date and provide feasible recommendations to resume operation of the Plant. Technical evaluations of the proposals were conducted to assess the feasibility of the various alternatives suggested in the specialist reports. The CAPEX approval process for this capital-intensive total by-products plant upgrade is currently in process.

F. Results on the monitoring of efficiency of commissioned plants

Results submitted to authorities.

G. Monitoring of construction activities in terms of the Environmental Management Plan (EMP)

The Environmental Management Plan (EMP) was submitted and formed part of all the contractors' Site Safety Management Plans. ECO audits were conducted during the construction phase. An ECO audit, and follow-up inspections, was conducted during commissioning of the Project. The Gravel Filter Plant has been installed and has been commissioned. Regular inspections were undertaken to ensure that no breach of environmental regulations (legislation and authorisation) occur.

H. Steps taken to rectify areas of non-compliance with environmental requirements

Regular RoD audits are scheduled to ensure outstanding issues are resolved and potential future non-compliances are avoided.

Shut-down of the sulphur plant is receiving all the necessary attention. Getting the Elementary Sulphur Plant operational remains a level 1 priority. To date, in excess of R20 million, over and above the initial investment of around R300 million, has been spent in an attempt to get the Sulphur Plant operational again.

Due to the complexity of the gas cleaning process, oversees experts in process engineering were sourced to identify shortcomings and recommend corrective actions for re-operation of the Sulphur Plant. Significant CAPEX is currently being sourced to refurbish the by-products plant.

I. Feedback on implementation of specialist recommendations

RECOMMENDATION FROM SPECIALIST STUDIES	FEEDBACK
Process	
Balancing tanks to be installed prior to battery process water treatment facilities	Upgraded 4 x 1000 m^3 settling tanks prior to battery process water treatment. This will give sufficient buffer capacity to balance any process upsets in front of the treatment process – Completed
Monitor concentrations of cleaned COG and report.	Results reported in the first bi-annual report.
Monitor ambient levels of NH_3, H_2S and benzene, and take appropriate actions (as described in EIR) if found to be significant.	Results reported in the first bi-annual report.
The effluent stream sent to the Blast Furnaces should not be heated to the point where the NH_3 is stripped and released to atmosphere.	Investigation completed.
All tar sludge should be returned to the coke ovens with the coal charge, using mechanical means and not by hand.	The tar sludge recycling project has been commissioned to address this point.
All solid waste should be classified according to the Minimum Requirements and disposed of accordingly. Records should be maintained of all waste sent offsite.	Implementation completed.
Scheduled preventative maintenance plan on all water systems to ensure segregation of process water, rainwater and indirect cooling water streams.	PMP implemented for all environmentally critical equipment.
Groundwater	
The feasibility of abstracting contaminated groundwater from the aquifer underlying the site, as a source of water supply to the process should	Investigation underway. All known active sources from the area have been eliminated and since inception of remedial

RECOMMENDATION FROM SPECIALIST STUDIES	FEEDBACK
be investigated.	actions, around 2007, which formed part of the original groundwater management plan, significant progress has been made in this regard. As such, it was decided to remodel the groundwater dynamics for the entire site to assess the success of remedial actions undertaken in the past decade. This modelling will tie in with the greater contaminated land assessment for the Works, which will dictate possible contaminated land and groundwater initiatives going forward.
The option of development of drains in the form of trenches to abstract the contaminated groundwater from the shallow perched aquifer system as part of the foundation design and groundwater containment/remediation options should be investigated.	Same as above.
The water in the cooling tower sumps should be sampled and analysed to determine the quality.	Done – results available
The existing monitoring boreholes should be properly capped to prevent contamination from surface soils and dust with samples that are taken in the boreholes.	Upgrade of monitoring borehole network completed in 2010. Supplementary monitoring boreholes have been equipped with caps. Damaged boreholes throughout the site have been repaired to reinstate monitoring from these particular boreholes.
The construction of the monitoring boreholes should be reviewed to confirm whether the borehole construction material influences the values for iron and manganese in the groundwater in the Coke Ovens area.	Completed. Golder Associates Africa (Pty) Ltd conducted a study to assess the monitoring network.
The resident groundwater pollution should be managed.	Investigation underway. All known active sources from the area have been eliminated and since inception of remedial actions, around 2007, which formed part of the original groundwater management plan, significant progress has been made in this regard. As such, it was decided to remodel the groundwater dynamics for the entire site to assess the success of remedial actions undertaken in the past decade. This modelling will tie in with the greater contaminated land assessment for the Works, which will dictate possible contaminated land and groundwater initiatives going forward.
A numerical groundwater flow and contaminant transport model should be developed.	Remodelling for entire site planned for 2018 – order placed.
Surface water	
The mitigating measures for the construction and operational phase, as proposed in the document, should be made binding on ArcelorMittal South Africa Vanderbijlpark Works, its employees and external contractors.	Noted.
A detailed Environmental Management Plan covering *inter alia* surface water management should be drafted and made binding on ArcelorMittal South Africa Vanderbijlpark Works.	EMP submitted to GDACE. EMP updated as per Air Quality Monitoring Plan recommendations and submitted to authorities for approval. EMP has been submitted on numerous occasions in the past for approval. However, to date, no correspondence has been received from authorities. The EMP was re-submitted once again in March 2012, as per recommendation in January 2012 external audit report, for approval. No feedback has been received, thus assuming the EMP has been approved (as stated in March letter). GDARD did however acknowledge

RECOMMENDATION FROM SPECIALIST STUDIES	FEEDBACK
	receipt of the EMP on 23 April 2012. As per recommendation from the July 2015 external audit report, the EMP was aligned with the requirements stipulated in the new EIA regulations (4 Dec 2014).
The existing Coke and Gas Cleaning Plant surface water-monitoring programme should continue.	Monitoring programme will continue as per the Water Use Licence.
The process and products associated with the recycling of surplus water from the Coking Plant to the Blast Furnace need to be further investigated, in order to determine any potential negative impacts.	Surplus water is to be re-used in the coke making process. Should the need arise to direct surplus water to the Blast Furnaces, these items will be investigated.
Air Quality	
Install an additional PM10 and gaseous sampler (SO_2, NO_x and H_2S) within the zone of impact directly south of the MSVS site to monitor the impact on the surrounding communities.	Completed. Two ambient air monitoring stations were installed south and south-east of ArcelorMittal Vanderbijlpark Works during 2004. The third monitoring station at the northern boundary of the site was installed in 2007.
The monitoring of H_2S should act as a performance indicator to monitor the reductions in ambient H_2S concentrations.	Results reported in the first bi-annual report. It must be noted that it is expected to have a reduction of SO_2 rather than H_2S. This is because the H_2S contained in the gas used as a fuel at the Works will be transformed to SO_2 emissions when burned.
The emission rates of the most significant pollutants need to be measured.	Results reported in the first bi-annual report.
Recommendations from Air Quality Monitoring Plan	
Monitoring of fugitive emissions from Batteries i.t.o. EPA Method 303. Accreditation of in-house training to be investigated subsequent to the Department of Environmental Affair's (DEA's) finalization of an emission monitoring accreditation scheme.	Investigate training accreditation subsequent to finalization of DEA's emission monitoring accreditation scheme.
Measurement of volatiles in accordance with OHS Act to continue.	Occupational Hygiene Department to ensure that these measurements are conducted.
Measurement of H2S before and after gas cleaning to be conducted on a quarterly basis to verify conformance to RoD Condition 3.2(g).	Currently conducted on an ad-hoc basis due to the sulphur plant being on shut-down. Regular monitoring has been arranged when Plant is operational.
Weekly analysis of quench water quality for comparison with future Minimum Emission Standards	Samples analysed on a weekly basis.

J. RoD compliance table summary

RoD Cond. #	Requirement	Status	Comply	Partial	Non-compliance	Comments	Action Plan
3.2 (a)	Updated project schedule with time-frames 30 calendar days prior to construction begins	Completed	X				
(b)	Inform about start of construction and commissioning	Completed	X				
(c)	Environmental Management Plan	Completed	X			Operational EMP submitted to authorities once again in March 2012 for approval. No feedback received, hence assuming approval as stated in cover letter. GDARD did however acknowledge receipt of the EMP on 23 April 2012.	
(d)	Hazop study	Completed	X				
(e)	Preventative Maintenance Plan	Completed	X			Amendment Application concerning external verification of PMP, dated 29 July 2009, was submitted on 7 Aug 2009	Condition amended. Compliance now possible
(f)	Final design plans for new and upgraded containment areas	Completed	X			Design plans re-submitted to DWA for approval	
(g)	Air quality management, monitoring and reporting	Completed	X			Air Quality Management Plan developed by air quality specialist. Results to be reported in Bi-annual Environmental Performance Audits	
(h)	Flaring of un-cleaned gas at Flare 5	Completed			X	Sulphur Plant shutdown extended due to issues mentioned above	Expedite funds approval for refurbishment and start-up of Sulphur Plant
(i)	Records of incidents	Ongoing	X			Incidents are registered in the Work's internal reporting system and/or noted in ECO reports/incident register	

RoD Cond. #	Requirement	Status	Comply	Partial	Non-compliance	Comments	Action Plan
(j)	Inform about major incidents	Ongoing	X			No major or emergency incidents to date	
(k)	Use of maturation dams to cease 6 months after commissioning	Completed ahead of schedule.	X			Application for Environmental Authorisation for decommissioning and remediation of dams submitted. Waste Management License for decommissioning and remediation of dams received on 13 Feb 2012.	
(l)	Groundwater contamination plans	Continuing	X			All known active sources from the area have been eliminated and since inception of remedial actions, around 2007, which formed part of the original groundwater management plan, significant progress has been made in this regard. As such, it was decided to remodel the groundwater dynamics for the entire site to assess the success of remedial actions undertaken in the past decade. This modelling will tie in with the greater contaminated land assessment for the Works, which will dictate possible contaminated land and groundwater initiatives going forward.	Remodelling of groundwater dynamics planned for 2018.
(m)	Recommendations from specialist studies		X			See table above	
(n)	Independent Environmental Control Officer during		X			ECO appointed	

RoD Cond. #	Requirement	Status	Comply	Partial	Non-compliance	Comments	Action Plan
	construction and commissioning						
Reporting requirements							
3.4 (a)	Quarterly Progress Report		X				
(b)	Bi-annual Environmental Performance Audit		X				

K. CONCLUSIONS

Quarterly progress reporting will continue in terms of Condition 3.4(a). However, as per letter from the authority, dated 8 February 2010, these progress reports are only required to be submitted upon request by GDARD. The first bi-annual report was submitted in July 2010.

---END---

ArcelorMittal South Africa

Vanderbijlpark Works

Cleaning of Coke Oven Gas and Water

Quarterly Progress Report (June 2018)

Contents

ArcelorMittal South Africa
Vanderbijlpark Works
Cleaning of Coke Ovens Gas and Water Project

A. Scheduling of implementation and time frames

1. Cleaning of Coke Ovens gas and water

The major Milestone Dates on the project are reflected below in Table 1: Milestone Summary.

Table 1: Milestone Summary

Item	Milestone Description	Planned Date	Forecast Date	Actual Date
1.	All contract Award Dates	04/10/29	04/10/29	Oct 04
2.	Primary cooling unit & scrubbing facilities GP3	06/06/28	06/07/28	July 06
3.	Primary cooling unit & scrubbing facilities GP6	06/07/12	06/08/30	Sept 06
4.	Chilled water station with cooling tower	06/06/28	06/08/30	Dec 06
5.	Ammonia stills & de-acidifier	06/07/19	06/08/30	Aug 08
6.	Elementary sulphur plant	06/07/19	07/02/28	Jan 10
7.	Process control system	06/06/07	07/02/28	Jan 10
8.	Project completion	06/10/31	07/03/05	Jan 10
9.	Installation of the Gravel Filter	08/12/31	08/12/31	Aug 12 (Note 1)
10.	Installation of ammonia strippers and caustic dosing facilities	15/12/31	Note 2	

Note 1: Commissioning of Gravel Filter unit commenced on 3 September 2013.
Note 2: CAPEX originally budgeted for 2nd phase of coal water treatment in 2016. However, due to integrated operations, the decision was made to incorporate the ammonia strippers into the broader by-products plant upgrade, provisionally scheduled for implementation in 2018.

1.1 Status

One of the specialist recommendations transpiring from the EIA process for the project was that plans for addressing the existing groundwater contamination in the Coke Plant area must continue. All known active sources from the area have been eliminated and since inception of remedial actions, around 2007, which formed part of the original groundwater management plan, significant progress has been made in this regard. As such, it was decided to remodel the groundwater dynamics for the entire site to assess the success of remedial actions undertaken in the past decade. This modelling will tie in with the greater contaminated land assessment for the Works, which will dictate possible contaminated land and groundwater initiatives going forward. The first phase of the contaminated land assessment was completed in September 2017. The contaminated land assessment report and associated remediation plan was submitted to the Department of Environmental Affairs on the 7th June 2018. ArcelorMittal Vanderbijlpark Works is awaiting a response from the Department on the way forward.

On the 15th March 2012, the Department was informed of the progress of the unanticipated temporary shut-down of the Elementary Sulphur Plant, which is an integral component of the coke oven gas cleaning facilities at the Works. The Department has requested feedback on the progress of start-up of the Plant, in a letter dated 3 May 2012, which will be provided once ArcelorMittal has performed all the necessary repairs and is in a position to safely operate the Plant. Feedback on the status of the Plant has been communicated to the Department via external audit reports submitted on a bi-annual basis. The compliance and enforcement section of the provincial authority requested a meeting and site visit to discuss the status of the Plant. In the meeting held on the 23rd November 2016, the history of Plant failures and challenges were presented to the Department officials, together with the extensive actions

implemented over the years in an attempt to reinstate operation of the Plant. A pre-compliance notice was also issued by the GDARD on the 10th May 2018 concerning this issue. ArcelorMittal's response was subsequently submitted.

The Projects Department has evaluated tenders from specialists to conduct integrity checks of the gas plant equipment, including vessels, heat exchangers, pipes, trestles, exhausters etc. An enquiry for the technical design required for implementation of the actions identified as part of the specialist assessment to determine the deficiencies of the Plant has also been issued, with quotes received. The detailed engineering design component of the project is expected to take in the region of a year, thus manufacturing, installation and commissioning of the upgrades is planned to commence in H2 2018 subsequent to the funds approval process. Preliminary cost estimates received from specialists indicate that the required upgrades could cost over R600 million.

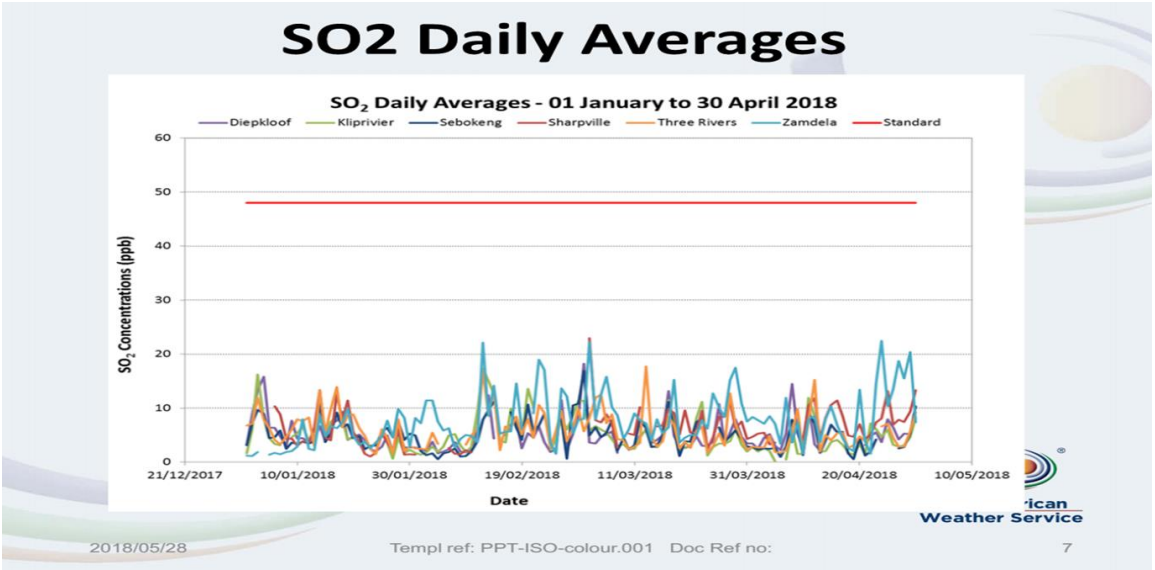
As previously reported, the Gravel Filter Plant was commissioned on 3 September 2013. Consequently, significant improvements in water quality (in terms of suspended solids and tar particles) have been achieved. Due to integrated operations of the gas plant infrastructure, the decision was made to incorporate the ammonia strippers into the broader by-products plant upgrade, installation of which is anticipated to commence in 2018.

The tar sludge recycling project has been commissioned and has been rolled out to all batteries on site.

The last bi-annual, external, environmental performance audit was conducted in February 2018.

B. Records of major incidents

Although extended downtime of the Elementary Sulphur Plant remains a concern, no major environmental incidents have occurred during the last quarter. Despite the Elementary Sulphur Plant not being operational, a significant sulphur emission reduction has still been achieved at the Works. Over the past 6 years, there has been a 22% reduction in total SO_2 emissions from the Works with a 74% reduction in flaring of un-cleaned gas with 2004 as baseline. Although problems have been experienced with operation of the Plant, Vanderbijlpark Works remains within compliance to SO_2 standards prescribed in the AEL for sources which utilise coke oven gas as a fuel for combustion processes. National Ambient Air Quality Standards for SO_2 are also not exceeded in the Priority Area in which Vanderbijlpark Works is located, based on the monitoring results obtained from the various stations in the area. The graph below illustrates the most recent monitoring results for SO_2 at the various locations in the Priority Area.



C. Decommissioning of infrastructure

No further demolition work performed.

D. Rehabilitation and disposal of contaminated material

All equipment, tanks, vessels, and pipes that contained process liquids were flushed into the existing By-products process. The steel scrap was recycled back into the steel making process.

As per condition 3.2 k) the use of the maturation ponds was to cease 6 months after the commissioning date. Although the use of the maturation ponds is directly related to the commissioning of the Coke Oven Clean Gas and Water project, with changes to the water balance of the Works, the maturation ponds' usage ceased in March 2008.

The Maturation Ponds Rehabilitation Plan has been submitted to, and approved by, the Department of Water Affairs and Forestry (DWAF). Application for environmental authorisation to decommission the Maturation Ponds, in terms of the 2010 EIA Regulations, was submitted to the authorities. The application was transferred from the provincial authority to the national authority as mandated by the Waste Act, which delayed the issuing of the authorisation. ArcelorMittal subsequently received the Waste Management License from DEA for the decommissioning and remediation of the Maturation Ponds on 13 February 2012

E. Commissioning

Commissioning of the Project was completed in January 2010. Concerted effort is being placed on actions to receive funding for restitution and start-up of the Elemental Sulphur Plant after extended down-time. Oversees experts were sourced to identify the root cause of equipment failure experienced to date and provide feasible recommendations to resume operation of the Plant. Technical evaluations of the proposals were conducted to assess the feasibility of the various alternatives suggested in the specialist reports. The CAPEX approval process for this capital-intensive total by-products plant upgrade is currently in process.

F. Results on the monitoring of efficiency of commissioned plants

Results submitted to authorities.

G. Monitoring of construction activities in terms of the Environmental Management Plan (EMP)

The Environmental Management Plan (EMP) was submitted and formed part of all the contractors' Site Safety Management Plans. ECO audits were conducted during the construction phase. An ECO audit, and follow-up inspections, was conducted during commissioning of the Project. The Gravel Filter Plant has been installed and has been commissioned. Regular inspections were undertaken to ensure that no breach of environmental regulations (legislation and authorisation) occur.

H. Steps taken to rectify areas of non-compliance with environmental requirements

Regular RoD audits are scheduled to ensure outstanding issues are resolved and potential future non-compliances are avoided.

Shut-down of the sulphur plant is receiving all the necessary attention. Getting the Elementary Sulphur Plant operational remains a level 1 priority. To date, in excess of R20 million, over and above the initial investment of around R300 million, has been spent in an attempt to get the Sulphur Plant operational again.

Due to the complexity of the gas cleaning process, oversees experts in process engineering were sourced to identify shortcomings and recommend corrective actions for re-operation of

the Sulphur Plant. Significant CAPEX is currently being sourced to refurbish the by-products plant.

I. Feedback on implementation of specialist recommendations

RECOMMENDATION FROM SPECIALIST STUDIES	FEEDBACK
Process	
Balancing tanks to be installed prior to battery process water treatment facilities	Upgraded 4 x 1000 m^3 settling tanks prior to battery process water treatment. This will give sufficient buffer capacity to balance any process upsets in front of the treatment process – Completed
Monitor concentrations of cleaned COG and report.	Results reported in the first bi-annual report.
Monitor ambient levels of NH_3, H_2S and benzene, and take appropriate actions (as described in EIR) if found to be significant.	Results reported in the first bi-annual report.
The effluent stream sent to the Blast Furnaces should not be heated to the point where the NH_3 is stripped and released to atmosphere.	Investigation completed.
All tar sludge should be returned to the coke ovens with the coal charge, using mechanical means and not by hand.	The tar sludge recycling project has been commissioned to address this point.
All solid waste should be classified according to the Minimum Requirements and disposed of accordingly. Records should be maintained of all waste sent offsite.	Implementation completed.
Scheduled preventative maintenance plan on all water systems to ensure segregation of process water, rainwater and indirect cooling water streams.	PMP implemented for all environmentally critical equipment.
Groundwater	
The feasibility of abstracting contaminated groundwater from the aquifer underlying the site, as a source of water supply to the process should be investigated.	Investigation underway. All known active sources from the area have been eliminated and since inception of remedial actions, around 2007, which formed part of the original groundwater management plan, significant progress has been made in this regard. As such, it was decided to remodel the groundwater dynamics for the entire site to assess the success of remedial actions undertaken in the past decade. This modelling will tie in with the greater contaminated land assessment for the Works, which will dictate possible contaminated land and groundwater initiatives going forward. The contaminated land assessment report and associated remediation plan was submitted to the Department of Environmental Affairs on the 7th June 2018. ArcelorMittal Vanderbijlpark Works is awaiting a response from the Department on the recommended actions.
The option of development of drains in the form of trenches to abstract the contaminated groundwater from the shallow perched aquifer system as part of the foundation design and groundwater containment/remediation options should be investigated.	Same as above.
The water in the cooling tower sumps should be sampled and analysed to determine the quality.	Done – results available
The existing monitoring boreholes should be properly capped to prevent contamination from surface soils and dust with samples that are taken in the boreholes.	Upgrade of monitoring borehole network completed in 2010. Supplementary monitoring boreholes have been equipped with caps. Damaged boreholes throughout the site have been repaired to reinstate monitoring from these

RECOMMENDATION FROM SPECIALIST STUDIES	FEEDBACK
	particular boreholes.
The construction of the monitoring boreholes should be reviewed to confirm whether the borehole construction material influences the values for iron and manganese in the groundwater in the Coke Ovens area.	Completed. Golder Associates Africa (Pty) Ltd conducted a study to assess the monitoring network.
The resident groundwater pollution should be managed.	Investigation underway. All known active sources from the area have been eliminated and since inception of remedial actions, around 2007, which formed part of the original groundwater management plan, significant progress has been made in this regard. As such, it was decided to remodel the groundwater dynamics for the entire site to assess the success of remedial actions undertaken in the past decade. This modelling will tie in with the greater contaminated land assessment for the Works, which will dictate possible contaminated land and groundwater initiatives going forward. The contaminated land assessment report and associated remediation plan was submitted to the Department of Environmental Affairs on the 7th June 2018. ArcelorMittal Vanderbijlpark Works is awaiting a response from the Department on the recommended actions.
A numerical groundwater flow and contaminant transport model should be developed.	Remodelling for entire site planned for 2018 – order placed.
Surface water	
The mitigating measures for the construction and operational phase, as proposed in the document, should be made binding on ArcelorMittal South Africa Vanderbijlpark Works, its employees and external contractors.	Noted.
A detailed Environmental Management Plan covering *inter alia* surface water management should be drafted and made binding on ArcelorMittal South Africa Vanderbijlpark Works.	EMP submitted to GDACE. EMP updated as per Air Quality Monitoring Plan recommendations and submitted to authorities for approval. EMP has been submitted on numerous occasions in the past for approval. However, to date, no correspondence has been received from authorities. The EMP was re-submitted once again in March 2012, as per recommendation in January 2012 external audit report, for approval. No feedback has been received, thus assuming the EMP has been approved (as stated in March letter). GDARD did however acknowledge receipt of the EMP on 23 April 2012. As per recommendation from the July 2015 external audit report, the EMP was aligned with the requirements stipulated in the new EIA regulations (4 Dec 2014).
The existing Coke and Gas Cleaning Plant surface water-monitoring programme should continue.	Monitoring programme will continue as per the Water Use Licence.
The process and products associated with the recycling of surplus water from the Coking Plant to the Blast Furnace need to be further investigated, in order to determine any potential negative impacts.	Surplus water is to be re-used in the coke making process. Should the need arise to direct surplus water to the Blast Furnaces, these items will be investigated.
Air Quality	
Install an additional PM10 and gaseous sampler (SO_2, NO_x and H_2S) within the zone of impact directly south of the MSVS site to monitor the	Completed. Two ambient air monitoring stations were installed south and south-east of ArcelorMittal Vanderbijlpark Works during 2004.

RECOMMENDATION FROM SPECIALIST STUDIES	FEEDBACK
impact on the surrounding communities.	The third monitoring station at the northern boundary of the site was installed in 2007.
The monitoring of H_2S should act as a performance indicator to monitor the reductions in ambient H_2S concentrations.	Results reported in the first bi-annual report. It must be noted that it is expected to have a reduction of SO_2 rather than H_2S. This is because the H_2S contained in the gas used as a fuel at the Works will be transformed to SO_2 emissions when burned.
The emission rates of the most significant pollutants need to be measured.	Results reported in the first bi-annual report.
Recommendations from Air Quality Monitoring Plan	
Monitoring of fugitive emissions from Batteries i.t.o. EPA Method 303. Accreditation of in-house training to be investigated subsequent to the Department of Environmental Affair's (DEA's) finalization of an emission monitoring accreditation scheme.	Investigate training accreditation subsequent to finalization of DEA's emission monitoring accreditation scheme.
Measurement of volatiles in accordance with OHS Act to continue.	Occupational Hygiene Department to ensure that these measurements are conducted.
Measurement of H2S before and after gas cleaning to be conducted on a quarterly basis to verify conformance to RoD Condition 3.2(g).	Currently conducted on an ad-hoc basis due to the sulphur plant being on shut-down. Regular monitoring has been arranged when Plant is operational.
Weekly analysis of quench water quality for comparison with future Minimum Emission Standards	Samples analysed on a weekly basis.

J. RoD compliance table summary

RoD Cond. #	Requirement	Status	Comply	Partial	Non-compliance	Comments	Action Plan
3.2 (a)	Updated project schedule with time-frames 30 calendar days prior to construction begins	Completed	X				
(b)	Inform about start of construction and commissioning	Completed	X				
(c)	Environmental Management Plan	Completed	X			Operational EMP submitted to authorities once again in March 2012 for approval. No feedback received, hence assuming approval as stated in cover letter. GDARD did however acknowledge receipt of the EMP on 23 April 2012.	
(d)	Hazop study	Completed	X				
(e)	Preventative Maintenance Plan	Completed	X			Amendment Application concerning external verification of PMP, dated 29 July 2009, was submitted on 7 Aug 2009	Condition amended. Compliance now possible
(f)	Final design plans for new and upgraded containment areas	Completed	X			Design plans re-submitted to DWA for approval	
(g)	Air quality management, monitoring and reporting	Completed	X			Air Quality Management Plan developed by air quality specialist. Results to be reported in Bi-annual Environmental Performance Audits	
(h)	Flaring of un-cleaned gas at Flare 5	Completed			X	Sulphur Plant shutdown extended due to issues mentioned above	Expedite funds approval and order placement for refurbishment and start-up of Sulphur Plant

RoD Cond. #	Requirement	Status	Comply	Partial	Non-compliance	Comments	Action Plan
(i)	Records of incidents	Ongoing	X			Incidents are registered in the Work's internal reporting system and/or noted in ECO reports/incident register	
(j)	Inform about major incidents	Ongoing	X			No major or emergency incidents to date	
(k)	Use of maturation dams to cease 6 months after commissioning	Completed ahead of schedule.	X			Application for Environmental Authorisation for decommissioning and remediation of dams submitted. Waste Management License for decommissioning and remediation of dams received on 13 Feb 2012.	
(l)	Groundwater contamination plans	Continuing	X			All known active sources from the area have been eliminated and since inception of remedial actions, around 2007, which formed part of the original groundwater management plan, significant progress has been made in this regard. As such, it was decided to remodel the groundwater dynamics for the entire site to assess the success of remedial actions undertaken in the past decade. This modelling will tie in with the greater contaminated land assessment for the Works, which will dictate possible contaminated land and groundwater initiatives going forward. The contaminated	

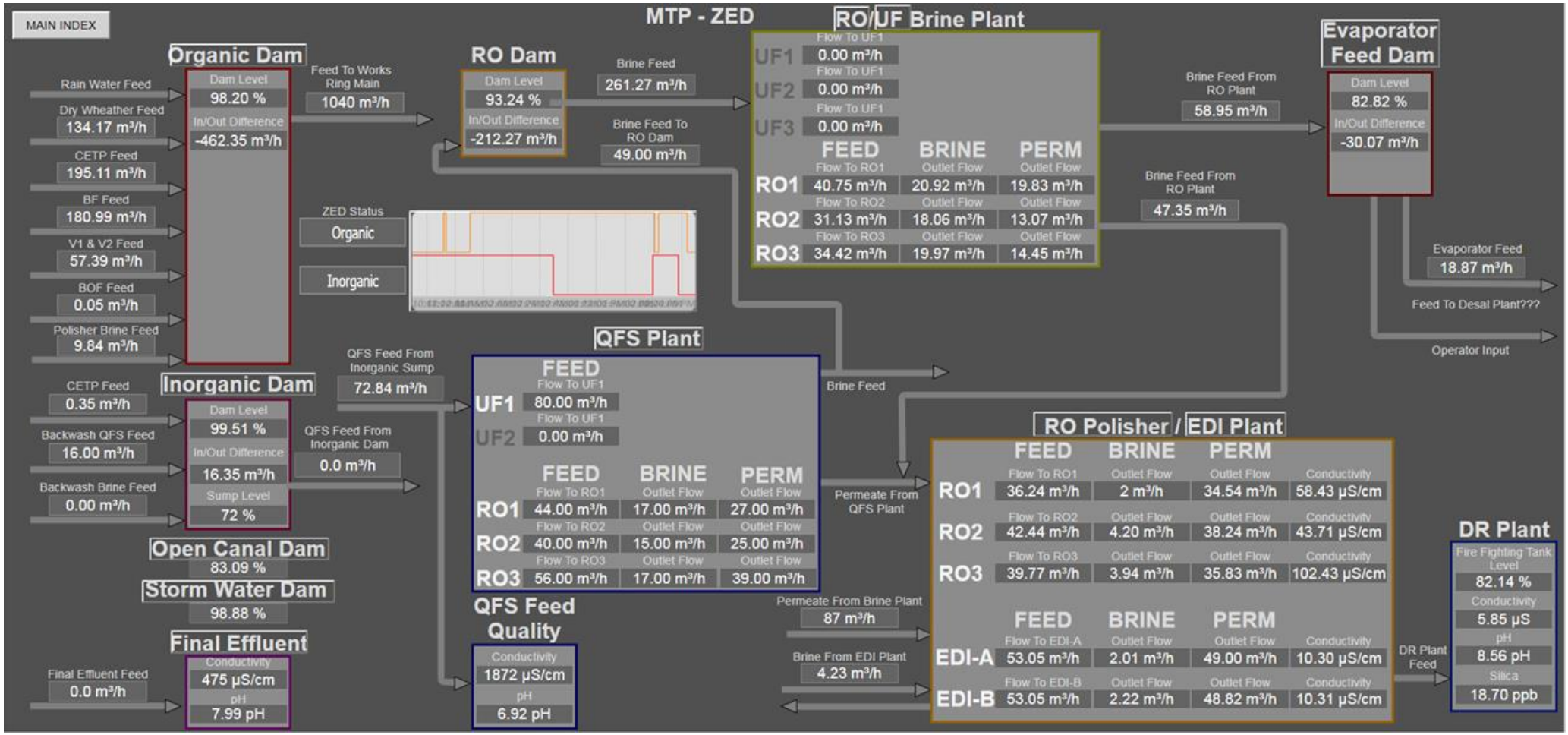
RoD Cond. #	Requirement	Status	Comply	Partial	Non-compliance	Comments	Action Plan
						land assessment report and associated remediation plan was submitted to the Department of Environmental Affairs on the 7th June 2018. ArcelorMittal Vanderbijlpark Works is awaiting a response from the Department on the recommended actions.	
(m)	Recommendations from specialist studies		X			See table above	
(n)	Independent Environmental Control Officer during construction and commissioning		X			ECO appointed	
Reporting requirements							
3.4 (a)	Quarterly Progress Report		X				
(b)	Bi-annual Environmental Performance Audit		X				

K. CONCLUSIONS

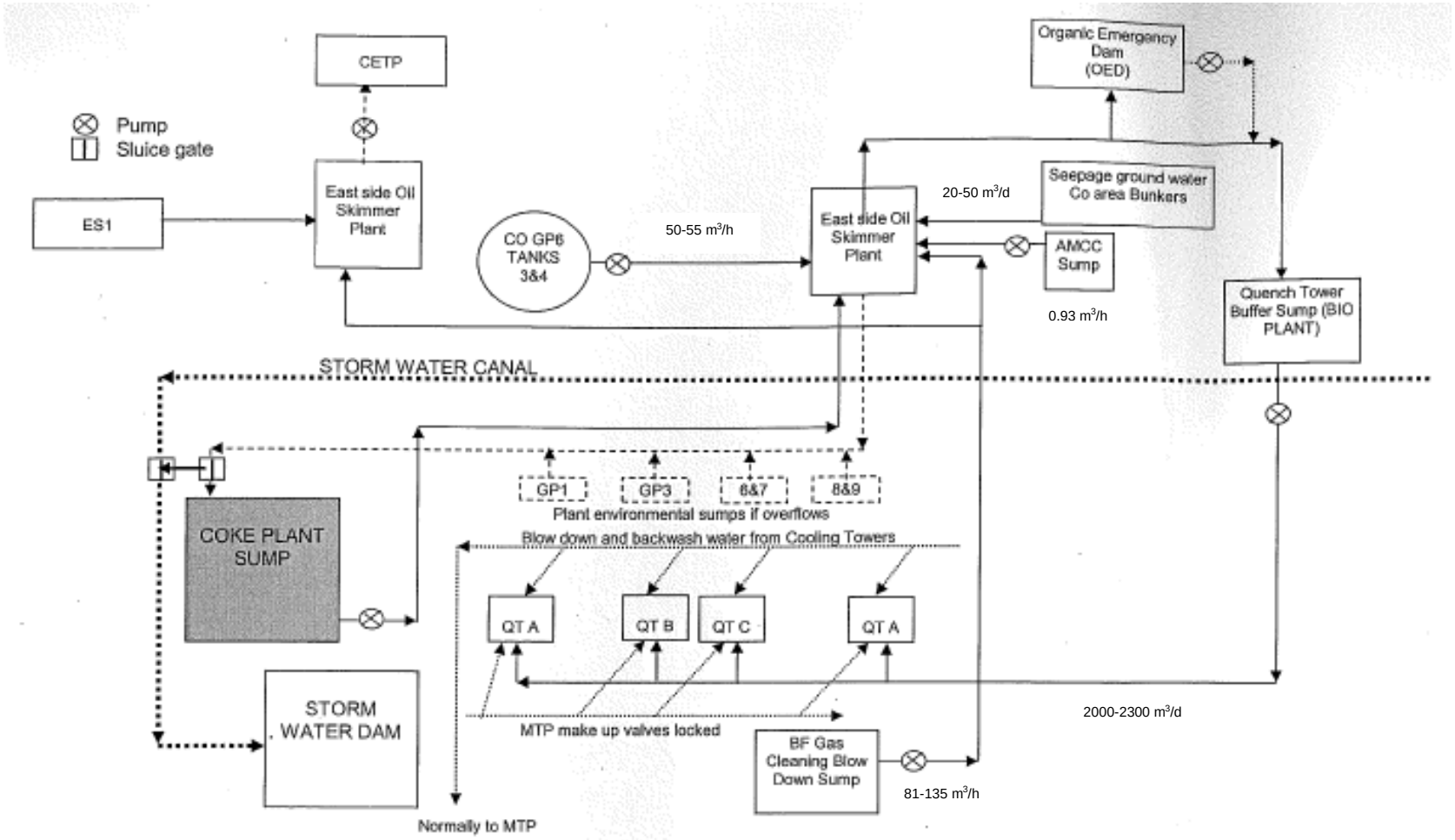
Quarterly progress reporting will continue in terms of Condition 3.4(a). However, as per letter from the authority, dated 8 February 2010, these progress reports are only required to be submitted upon request by GDARD. The first bi-annual report was submitted in July 2010.

---END---

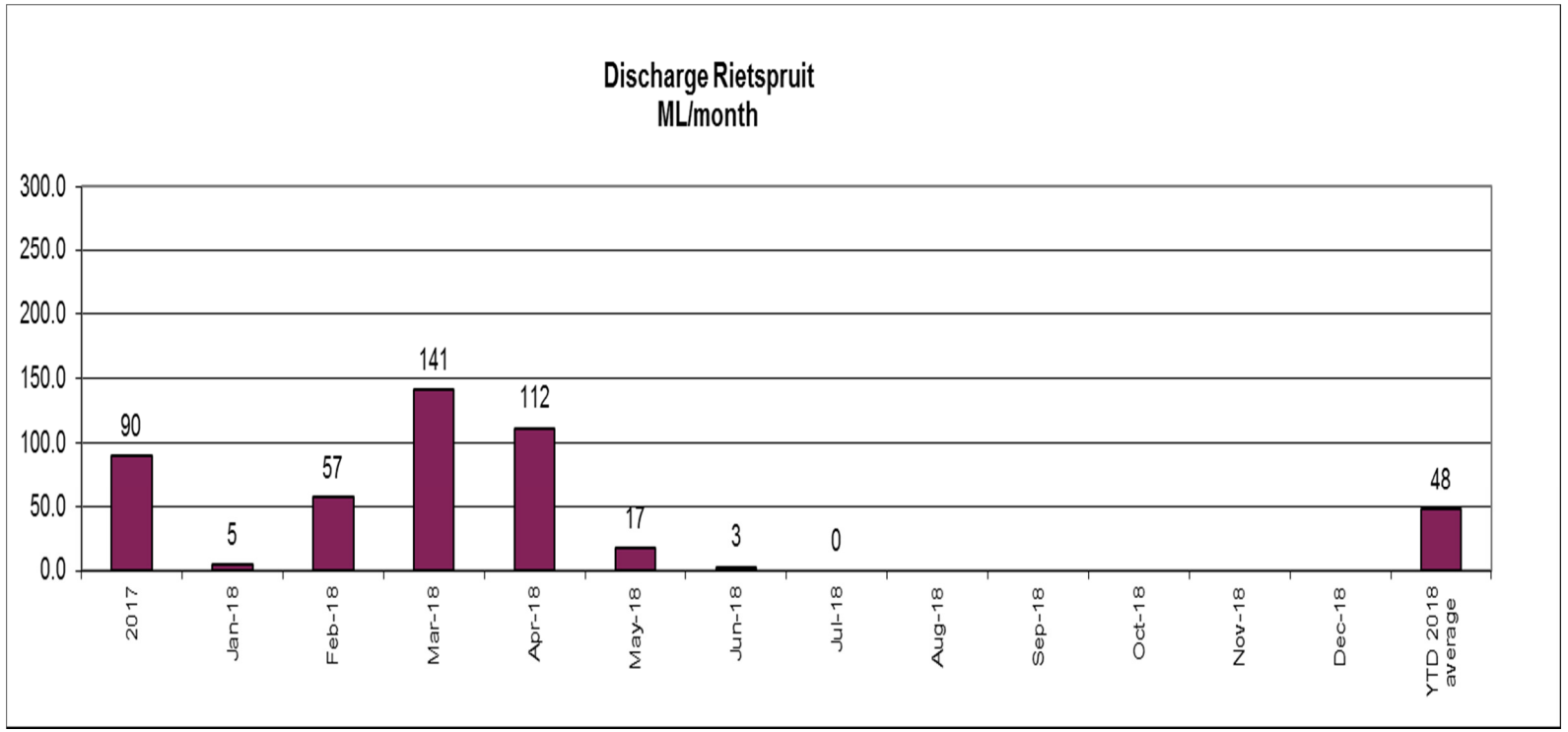
APPENDIX F: UPDATED WORKS WATER BALANCE

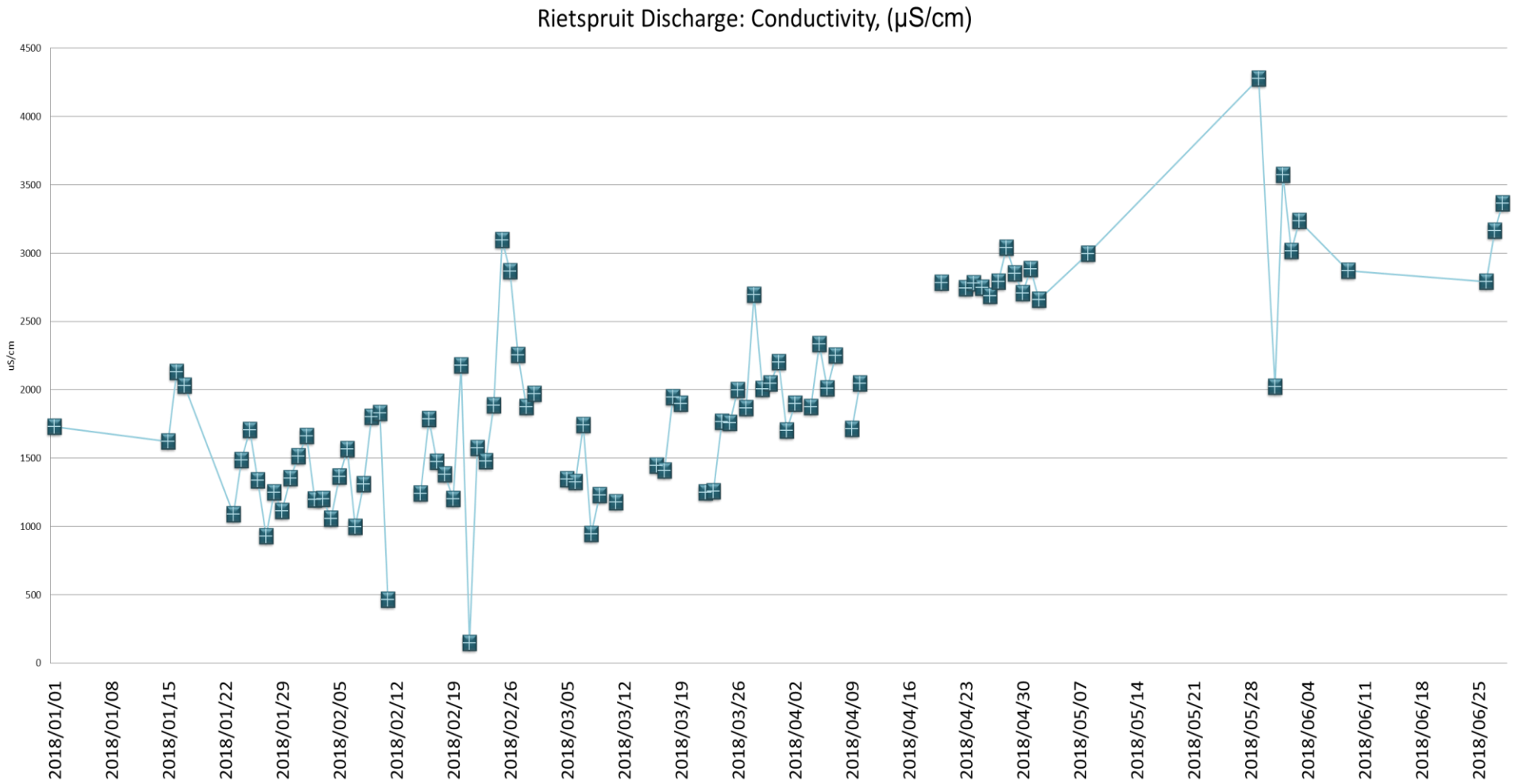

MAIN INDEX
MTP - ZED
Organic Dam
Dam Level
98.20 %
In/Out Difference
-462.35 m³/h
Rain Water Feed
Dry Wheather Feed
134.17 m³/h
CETP Feed
195.11 m³/h
BF Feed
180.99 m³/h
V1 & V2 Feed
57.39 m³/h
BOF Feed
0.05 m³/h
Polisher Brine Feed
9.84 m³/h
Feed To Works Ring Main
1040 m³/h
RO Dam
Dam Level
93.24 %
In/Out Difference
-212.27 m³/h
Brine Feed
261.27 m³/h
Brine Feed To RO Dam
49.00 m³/h
RO/UF Brine Plant
Flow To UF1
UF1 0.00 m³/h
Flow To UF1
UF2 0.00 m³/h
Flow To UF1
UF3 0.00 m³/h
FEED
BRINE
PERM
Flow To RO1
Outlet Flow
Outlet Flow
RO1 40.75 m³/h
20.92 m³/h
19.83 m³/h
Flow To RO2
Outlet Flow
Outlet Flow
RO2 31.13 m³/h
18.06 m³/h
13.07 m³/h
Flow To RO3
Outlet Flow
Outlet Flow
RO3 34.42 m³/h
19.97 m³/h
14.45 m³/h
Brine Feed From RO Plant
58.95 m³/h
Brine Feed From RO Plant
47.35 m³/h
Evaporator Feed Dam
Dam Level
82.82 %
In/Out Difference
-30.07 m³/h
Evaporator Feed
18.87 m³/h
Feed To Desal Plant???
Operator Input
ZED Status
Organic
Inorganic
Inorganic Dam
Dam Level
99.51 %
In/Out Difference
16.35 m³/h
Sump Level
72 %
CETP Feed
0.35 m³/h
Backwash QFS Feed
16.00 m³/h
Backwash Brine Feed
0.00 m³/h
QFS Feed From Inorganic Sump
72.84 m³/h
QFS Feed From Inorganic Dam
0.0 m³/h
QFS Plant
FEED
Flow To UF1
UF1 80.00 m³/h
Flow To UF1
UF2 0.00 m³/h
FEED
BRINE
PERM
Flow To RO1
Outlet Flow
Outlet Flow
RO1 44.00 m³/h
17.00 m³/h
27.00 m³/h
Flow To RO2
Outlet Flow
Outlet Flow
RO2 40.00 m³/h
15.00 m³/h
25.00 m³/h
Flow To RO3
Outlet Flow
Outlet Flow
RO3 56.00 m³/h
17.00 m³/h
39.00 m³/h
Brine Feed
Permeate From QFS Plant
RO Polisher / EDI Plant
FEED
BRINE
PERM
Flow To RO1
Outlet Flow
Outlet Flow
Conductivity
RO1 36.24 m³/h
2 m³/h
34.54 m³/h
58.43 µS/cm
Flow To RO2
Outlet Flow
Outlet Flow
Conductivity
RO2 42.44 m³/h
4.20 m³/h
38.24 m³/h
43.71 µS/cm
Flow To RO3
Outlet Flow
Outlet Flow
Conductivity
RO3 39.77 m³/h
3.94 m³/h
35.83 m³/h
102.43 µS/cm
FEED
BRINE
PERM
Flow To EDI-A
Outlet Flow
Outlet Flow
Conductivity
EDI-A 53.05 m³/h
2.01 m³/h
49.00 m³/h
10.30 µS/cm
Flow To EDI-B
Outlet Flow
Outlet Flow
Conductivity
EDI-B 53.05 m³/h
2.22 m³/h
48.82 m³/h
10.31 µS/cm
DR Plant Feed
DR Plant
Fire Fighting Tank Level
82.14 %
Conductivity
5.85 µS
pH
8.56 pH
Silica
18.70 ppb
Open Canal Dam
83.09 %
Storm Water Dam
98.88 %
Final Effluent
Final Effluent Feed
0.0 m³/h
Conductivity
475 µS/cm
pH
7.99 pH
QFS Feed Quality
Conductivity
1872 µS/cm
pH
6.92 pH
Permeate From Brine Plant
87 m³/h
Brine From EDI Plant
4.23 m³/h

APPENDIX G: COKE PLANT WATER BALANCE


CETP
Pump
Sluice gate
ES1
East side Oil Skimmer Plant
CO GP6 TANKS 3&4
50-55 m3/h
East side Oil Skimmer Plant
20-50 m3/d
Organic Emergency Dam (OED)
Seepage ground water Co area Bunkers
AMCC Sump
0.93 m3/h
Quench Tower Buffer Sump (BIO PLANT)
STORM WATER CANAL
GP1
GP3
6&7
8&9
Plant environmental sumps if overflows
Blow down and backwash water from Cooling Towers
COKE PLANT SUMP
QT A
QT B
QT C
QT A
STORM WATER DAM
MTP make up valves locked
2000-2300 m3/d
BF Gas Cleaning Blow Down Sump
81-135 m3/h
Normally to MTP

APPENDIX H: DISCHARGE VOLUMES


Discharge Rietspruit
ML/month
300.0
250.0
200.0
150.0
100.0
50.0
0.0
90
5
57
141
112
17
3
0
48
2017
Jan-18
Feb-18
Mar-18
Apr-18
May-18
Jun-18
Jul-18
Aug-18
Sep-18
Oct-18
Nov-18
Dec-18
YTD 2018 average


Rietspruit Discharge: Conductivity, (µS/cm)
uS/cm
4500
4000
3500
3000
2500
2000
1500
1000
500
0
2018/01/01
2018/01/08
2018/01/15
2018/01/22
2018/01/29
2018/02/05
2018/02/12
2018/02/19
2018/02/26
2018/03/05
2018/03/12
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2018/03/26
2018/04/02
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2018/05/07
2018/05/14
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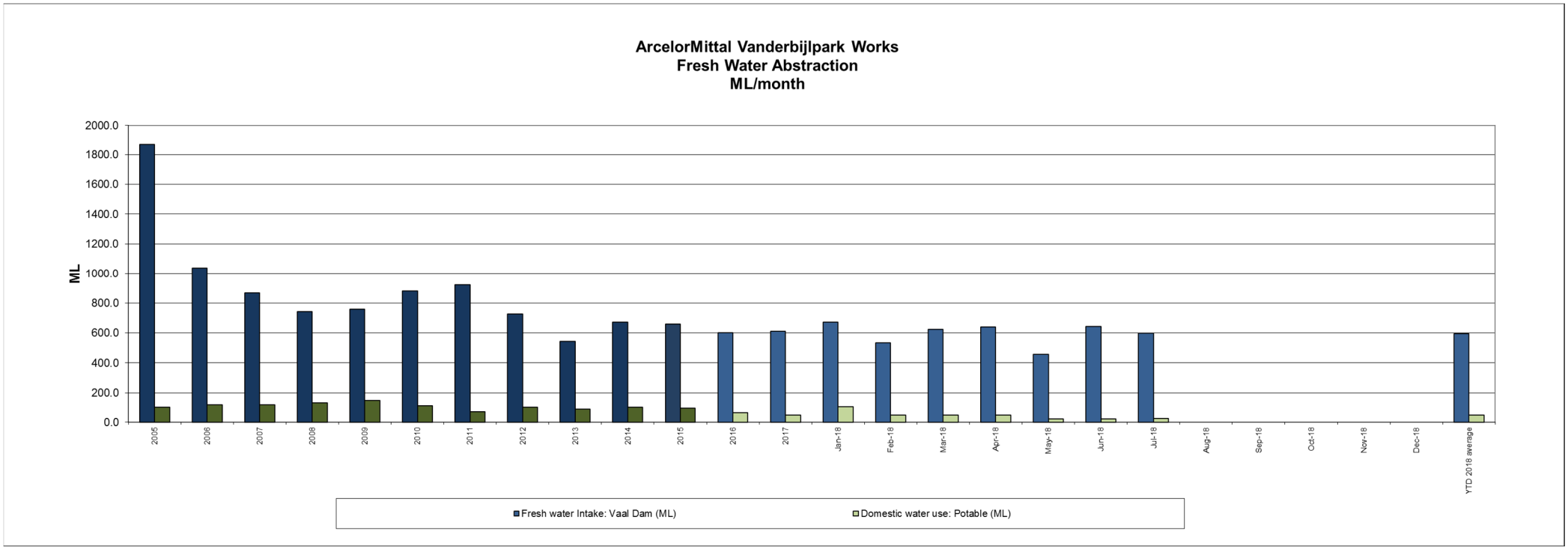
2018/06/25

APPENDIX I: ABSTRACTION VOLUMES


ArcelorMittal Vanderbijlpark Works
Fresh Water Abstraction
ML/month
ML
2000.0
1800.0
1600.0
1400.0
1200.0
1000.0
800.0
600.0
400.0
200.0
0.0
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
Jan-18
Feb-18
Mar-18
Apr-18
May-18
Jun-18
Jul-18
Aug-18
Sep-18
Oct-18
Nov-18
Dec-18
YTD 2018 average
Fresh water Intake: Vaal Dam (ML)
Domestic water use: Potable (ML)

APPENDIX J: COKE PLANT AIR QUALITY MONITORING PLAN

Project done on behalf of

ArcelorMittal South Africa

Vanderbijlpark Works

AIR QUALITY MONITORING PLAN FOR THE ARCELOR MITTAL VANDERBIJLPARK COKE OVENS

Report No.: APP/10/AMSA-01 Rev1.1

JANUARY 2011

G Kornelius

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REPORT DETAILS

Reference	APP/10/AMSA-01
Status	Revision 1.1
Report Title	Air Quality Monitoring Plan for the ArcelorMittal Vanderbijlpark Coke Ovens
Date Submitted	January 2011
Client	ArcelorMittal South Africa(Pty) Ltd
Prepared by	Gerrit Kornelius Pr Eng BEng (Hons) MBA PhD (Chemical Engineering) (University of Pretoria)
Notice	Airshed Planning Professionals (Pty) Ltd is a consulting company located in Midrand, South Africa, specialising in all aspects of air quality, ranging from nearby neighborhood concerns to regional air pollution impacts. The company originated in 1990 as Environmental Management Services, which amalgamated with its sister company, Matrix Environmental Consultants, in 2003.
Declaration	Airshed is an independent consulting firm with no interest in the project other than to fulfil the contract between the client and the consultant for delivery of specialised services as stipulated in the terms of reference.
Copyright Warning	
Acknowledgements	Mr Terence Wilson rendered valuable assistance in gathering and providing data.

REVISION HISTORY

Revision no	**Date**	**Detail**
Rev 0	**25 October 2010**	**Original**
Rev 1	**15 December 2010**	**Client comments processed**
Rev 1.1	**3 January 2011**	**Editorial corrections**

Table of contents

1. BACKGROUND

ArcelorMittal South Africa Vanderbijlpark Works has undertaken a project for the cleaning of coke oven gas and water at their Vanderbijlpark works. From an air quality point of view, the project entailed:

- Improvement of naphthalene recovery by improved gas cooling.
- The improvement of ammonia recovery by upgrading of scrubbers, the conversion of benzene scrubbers to ammonia scrubbers and the provision of a closed loop circulation system.
- The installation of two new distillation columns for the treatment of ammonia scrubbing water and one stripping/de-acidification column for the generation of scrubbing medium for hydrogen sulphide removal.
- Modification of existing ammonia scrubbers and the installation of a new hydrogen sulphide stripper.
- The conversion of hydrogen sulphide to elemental sulphur and the decommissioning of the ammonium sulphate plant.

A record of decision (RoD) was received from the Gauteng Department of Agriculture, Conservation and Environment (GDACE, now the Gauteng Department of Agriculture and Rural Development GDARD) on 21 March 2004.

Airshed Planning Professionals (Pty) Ltd ("APP") was commissioned by ArcelorMittal South Africa Vanderbijlpark Works to develop an air quality monitoring plan to meet the requirements set by GDACE/GDARD in the RoD.

1.1 Study Approach and Methods

A summary of the values obtained by ArceloMittal South Africa Vanderbijlpark Works as a result of the measurement programme to meet RoD requirements is presented. These are compared to legal requirements for ambient air quality and stack emissions.

Based on the comparison, recommendations are made regarding a future monitoring programme/protocol for the coke ovens and associated gas cleaning plant.

2. LEGAL REQUIREMENTS, STANDARDS AND GUIDELINES

Prior to assessing the requirements for monitoring of the gas plant upgrade at the Vanderbijlpark site, reference needs be made to the environmental regulations and guidelines governing the emissions and impact of such operations.

Air quality guidelines and standards are fundamental to effective air quality management, providing the link between the source of atmospheric emissions and the user of that air at the downstream receptor site. The ambient air quality guideline values indicate safe daily exposure levels for the majority of the population, including the very young and the elderly, throughout an individual's lifetime. Air quality guidelines and standards are normally given for specific averaging periods. These averaging periods refer to the time-span over which the air concentration of the pollutant was monitored at a location. Generally, five averaging periods are applicable, namely an instantaneous peak, 1-hour average, 24-hour average, 1-month average, and annual average. The application of these standards varies, with some countries allowing a certain number of exceedances of each of the standards per year.

2.1 Legal requirements according to the Air Quality Act No.39 of 2004

Under the (now defunct) Atmospheric Pollution Prevention Act (Act No 45 of 1965) (APPA) the focus was mainly on sourced based control with Registration Certificates issued for Scheduled Processes. Scheduled processes, referred to in the Act, are processes which emit more than a defined quantity of pollutants per year, including combustion sources and smelting. Best Practicable Means (BPM), on which the Registration Certificate requirements are based, represents an attempt to restrict emissions while having regard to local conditions, the prevailing extent of technical knowledge, the available control options, and the cost of abatement. The Department of Environmental Affairs and Tourism (DEAT) was responsible for the administration of this Act with the implementation thereof charged to the Chief Air Pollution Control Officer (CAPCO).

Although emission limits and ambient concentration guidelines were published by DEAT, no provision was made under the APPA to publish formal ambient air quality standards or emission standards. The decision as to what constitutes the best practicable means for each individual case was reached following discussions with the industry. A registration certificate, containing maximum emission limits specific to the industry, was then issued.

The APPA was outdated and not in line with international best practice. It also proved inadequate to facilitate the implementation of the principles underpinning the National Environmental Management Act (NEMA) and the Integrated Pollution and Waste Management (IP&WM) white paper. In this light, the National Environmental Management: Air Quality Act (Act no. 39 of 2004) was drafted, shifting the approach from source based control to decentralised air quality management through an effects-based approach.

The new National Environmental Management: Air Quality Act has shifted the approach of air quality management from source-based control only to the reduction of impact on the receiving environment. The Act has also placed the responsibility of air quality management on the local authorities (district and metropolitan municipalities) who will be tasked with baseline characterisation, management and operation of ambient monitoring networks, licensing of listed activities, and emissions reduction strategies. The main objective of the act is to ensure the protection of the environment and human

health through reasonable measures of air pollution control within the sustainable (economic, social and ecological) development framework.

2.1.1 Ambient air quality standards

The Air Quality Act (AQA) makes provision for the setting of ambient air quality standards and emission limits at national level, which provides the objective for air quality management. More stringent ambient standards may be implemented by provincial and metropolitan authorities. National ambient standards were published on 24 Dec 2009 (GG 32816) as per table 2-1 below.

Table 2-1: National Ambient Air Quality Standards

Averaging Period	Concentration	Allowed Frequency of	Compliance Date
Sulphur Dioxide (SO_2)			
10 minutes	500ug/m³ (191ppb)	526	Immediate
1 hour	350ug/m³ (134ppb)	88	Immediate
24 hours	125ug/m³(48ppb)	4	Immediate
1 year	50ug/m³ (19ppb)	0	Immediate
Nitrogen Dioxide (NO_2)			
1 hour	200ug/m³ (106ppb)	88	Immediate
1 year	40ug/m³ (21ppb)	0	Immediate
Particulate Matter (PM_{10})			
24 hours	120ug/m³	4	Immediate- End 2014
24 hours	75ug/m³	4	1 January 2015
1 year	50ug/m³	0	Immediate-End 2014
1 year	40ug/m³	0	1 January 2015
Ozone (O_3)			
8 hours (running)	120ug/m³ (61ppb)	11	Immediate
Benzene (C_6H_6)			
1 year	10ug/m³ (3.2ppb)	0	Immediate-end 2014
1 year	5ug/m³ (1.6ppb)	0	1 January 2015
Lead (Pb)			
1 year	0.5ug/m³	0	Immediate
Carbon Monoxide (CO)			
1 hour	30mg/m³ (26ppm)	88	Immediate
8 hour (calculated from 1	10 mg/m³ (8.7ppm)	11	Immediate

2.1.2 Workplace standards

Some workplace measurements were carried out by ArcelorMittal South Africa (Pty) Ltd during June 2010. For the organic compounds measured, the relevant SA workplace standards (Government notice R 1179 of 25 August 1995) are as follows:

Table 2-2: Occupational exposure concentrations (mg/m^3)

Benzene	16
Naphthalene	50
Phenols	19
Cresols	22
Coal tar pitch volatiles (not measured)	0.14
Hydrogen sulphide	14

2.1.3 Emission standards

Listed activities were identified by the Minister and include all activities regarded to have a significant detrimental effect on the environment, including health. Emission limits are established at national level for each of these activities (GG 33064 of 31 March 2010) and an atmospheric emission licence will be required in order to operate. With the decentralisation of power to provincial and local authority level, district and metropolitan municipalities will be responsible for the issuing of licences for listed activities. An air quality officer appointed by local authorities and responsible for the issuing of atmospheric emission licences may require a company or person to submit atmospheric impact reports in order to determine the impact of the proposed emissions on ambient air quality.

Emissions from the coke ovens and by-products recovery units are covered by subcategories 3.1 (Combustion installations not used primarily for steam raising or electricity generation) and subcategory 3.2 (Coke production and coal gasification) of the abovementioned regulations as per tables 2.3 and 2.4 below. For plants operating at the date of the notice, these requirements become applicable on 1 April 2015.

Table 2.3: Subcategory 3.1: Combustion installations

Description:	Combustion installations not used primarily for steam raising or electricity generation.		
Application:	All combustion installations (except test or experimental).		
Substance or mixture of substances		**Plant status**	**mg/Nm^3 under standard conditions of 10% O_2, 273 Kelvin and 101.3 kPa.**
Common Name	**Chemical Symbol**		
Particulate matter	Not applicable	New	50
		Existing	100
Oxides of nitrogen	NOx expressed as NO_2	New	700
		Existing	2000
Total volatile organic	Not applicable	New	40

compounds (from non-coke oven operations)		Existing	90

(a) The following special arrangements shall apply

(i) Sulphur-containing compounds to be recovered from gases to be used for combustion with a recovery efficiency of not less than 90% or remaining content of sulphur-containing compounds to be less than 100 mg/Nm^3 measured as hydrogen sulphide, whichever is strictest.

Table 2.4: Subcategory 3.2: Coke production and coal gasification

Description:	Coke production, coal gasification and by-product recovery from these operations.		
Application:	All installations.		
Substance or mixture of substances		**Plant status**	**mg/Nm^3 under standard conditions of 10% O_2, 273 Kelvin and 101.3 kPa.**
Common Name	**Chemical Symbol**		
Hydrogen sulphide	H_2S	New	$7^{(i)}$
		Existing	$10^{(i)}$

(a) The following special arrangements shall apply

(i) Charging must be carried out "on the main" with additional draught in the ascension or riser pipes produced by high-pressure water jets in the goosenecks. Even coal feeding must be ensured using screw feeders or rotary valve feeders. Telescopic seals are to be used around the charging holes. Visible emissions are limited to 12 sec per charge

(ii) For pushing, evacuation from the coke guide and the quench car using stationary ducting and gas cleaning or any other technology yielding the equivalent or better results is required.

(iii) For quenching, the quench tower must have suitable baffles; quench water must have less than 50 mg/liter suspended solids and no floating oil.

(iv) A battery and door frame maintenance system approved by the licensing authority must be operated. No more than 4% of doors may show visible leaks; no more than 2.5% of gas off-take pipes may show visible leaks.

(v) Measurement/ inspection procedures for visible leaks from doors, standpipes and from charging shall be carried out weekly for each battery using method EPA 303 from table 1 and records submitted to the licensing authority on a quarterly basis.

(b) The licensing authority may set alternative standards and/or control measures for the reduction of hydrogen sulphide emissions.

2.1.4 Specific monitoring requirements

In addition, the RoD sets certain air quality-related monitoring and reporting requirements that are specific to this project (section 3.2 (g) of the RoD). The introductory paragraph implies that, where stack sampling from the battery combustion stacks is required, representative measurement on a single stack will be accepted provided a motivation is included indicating why that stack should be regarded as representative. The specific requirements are:

- Bi-annual measurements of the composition of cleaned coke oven gas before and after combustion in batteries. This is taken to mean the composition of the coke oven gas after cleaning and the composition of the combustion off-gas.

- Dioxin and furan content of the coke oven stack gas; this is required once only within six months of the decommissioning of the benzole plant.

- Proof must be provided, in the form of personal monitor results and other representative measurements that the door maintenance plan and fugitive emission reduction plan is yielding results.

- Assumptions on the impact of the emissions on ambient air quality made in the specialist air quality report produced during the EIA (Liebenberg-Enslin *et al* 2003) must be confirmed by ambient measurements. The specialist report recommended the installation of additional monitors for particulate matter less than 10 µm diameter (PM_{10}), hydrogen sulphide (H_2S), sulphur dioxide (SO_2) and the combined oxides of nitrogen (NO_x) to the south of the ArcelorMittal site. Results of the measurement must be included in the bi-annual audit report.

- Once-off measurements for the concentration of the following must be included in the first bi-annual report, with remediation proposals should the values prove to be excessive:

    - Ammonia and hydrogen sulphide from the tar decanters, liquid sumps and storage tanks.

    - Benzene at the flushing liquor storage tanks

    - Sampling of cooling tower air/vapour and a prediction of the impact of emissions to atmosphere due to its composition to be included in the first bi-annual audit report together with mitigation measures if the impact is found/estimated to be excessive.

    - Composition of flared coke oven gas and the temperature of the flare to be reported

    - Based on the correspondence between the results predicted in the specialist report and those actually measured (emission and ambient monitoring), consultants are to be appointed to propose a future emission monitoring protocol. The present report is the result of this requirement.

- An independent Environmental Control Officer is to be appointed during construction and commissioning to monitor and report on compliance with the conditions set in the RoD.

3 CONFORMANCE WITH ROD CONDITIONS.

3.1 Composition of cleaned coke oven gas and flue gas (after combustion)

Sampling was done on no 3 and 6 gas plants during June 2010. Results are given in table 3-1 below.

Table 3-1: Results of gas plant performance measurement. (3 samples, average ± standard deviation)

	No 3 plant	No 6 plant
H_2S inlet concentration	6173 ± 1996 mg/Nm³	2474 ± 384 mg/Nm³
H_2S outlet concentration	960 ± 1211 mg/Nm³	226 ± 158 mg/Nm³
Efficiency based on averages	84.4%	90.8%

Tests for the pollutant content of the flue gas were carried out on 23 June 2010 on two batteries. Results are given in table 3-2 below.

Table 3-2: Results of flue gas concentration measurements. (3 samples, average ± standard deviation)

	H_2S (mg/Nm³)		NH_3 (mg/Nm³)		
No 4 stack	26.1 ± 12.4		Less than detection limit of 1.2		
No 9 stack	14.1 ± 9.2		Less than detection limit of 1.2		
Overall average	20.1 ± 11.8		Less than detection limit of 1.2		
	CO (ppm)	NO as NO_2 (ppm)	NO_2 (ppm)	NOx as NO_2 (ppm)	SO_2 (ppm)
No 4 stack	5404 ± 541	50 ± 4	20 ± 4	76 ± 8	0
No 9 stack	1072 ± 168	112 ± 6	15 ± 5	127 ± 7	0

3.2 Ambient measurements

3.2.1 "Fenceline" background measurements

ArcelorMittal South Africa Vanderbilpark Works operates a number of real-time ambient monitoring stations located close to the fence line of the factory. The location of these monitoring stations is

given in figure 3-2 overleaf. In view of the prevailing wind directions in the area (see figure 3-1 below), the “south” and “east” stations are most likely to be affected by coke oven emissions. These will also be the stations at which impacts on the adjoining residential areas (Vanderbijlpark to the South and Boipatong to the East) are best reflected.

The results obtained at these stations for SO_2, NOx and PM_{10} are given in Table 3-3 overleaf. The “07/08” values are for the period 1 Jan 2007 to 31 Dec 2008, whereas the “09/10” values are for 1 Jan 09 to 30 Apr 2010. It should be noted that the Northern station was only installed during 2009.

Figure 3-1: Wind direction frequency Vereeniging 1997-2001

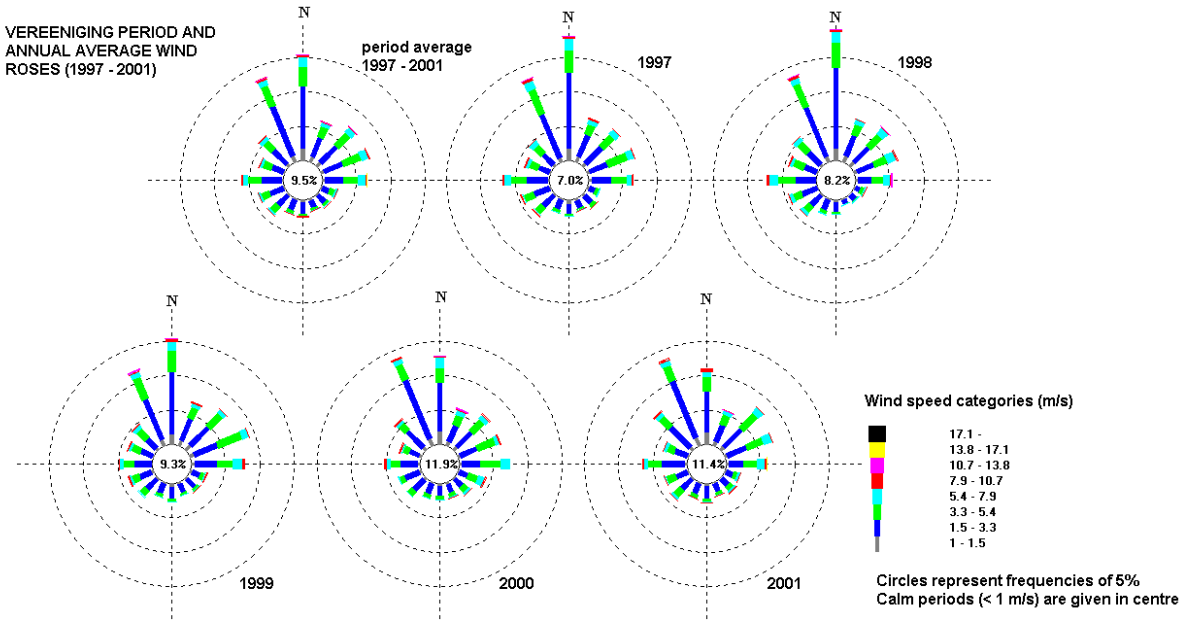


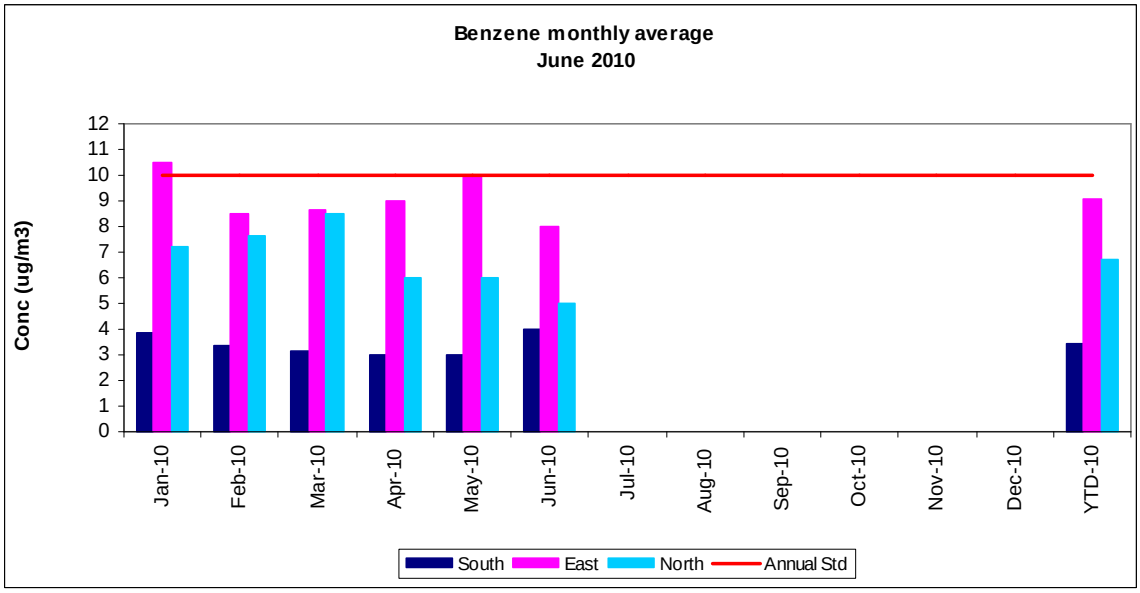
Figure 3-2: Ambient monitoring locations. (Image ArcelorMittal South Africa Vanderbijlpark Works)

Table 3-3: "Fence line" ambient monitoring results

Component	Location and period	Concentration µg/m³	Data availability %
NOx	E 09/10	20.7	84.8
	S 09/10	29.9	80.5
	W 09/10	8.0	29.4
	N 09/10	18.8	63.3
SO_2	E 07/08	34.3	93.7
	E 09/10	22.5	88.1
	S 07/08	24.8	89.1
	S 09/10	45.2	87.2
	W 07/08	9.1	71.1
	W 09/10	8.8	46.2
	N 07/08	ND	
	N 09/10	21.4	61.9
PM_{10}	E 07/08	82.3	86.9
	E 09/10	90.3	82.1
	S 07/08	75.4	85.9
	S 09/10	71.4	47.4
	W 07/08	45.1	61.4
	W 09/10	24.7	29.3
	N 07/08	ND	
	N 09/10	55.4	59

In addition, monthly average benzene values were measured at the above stations. The results for 2010 are given in figure 3-3 below.

Figure 3-3: Monthly fence line benzene values.



3.2.2 In-plant measurements

In addition to the fence line measurements for which the results are given above, ArcelorMittal South Africa Vanderbijlpark Works carried out a number of measurements in the plant area during June 2010.The results are provided in table 3-4 below.

Table 3-4. Measurements carried out in the coke plant area. (µg/m³, value ± standard deviation)

(ND = not determined, BDL = below detection limit)

Gas plant 3, 2 samples each	Ammonia (NH_3)	Benzene (C_6H_6)	Hydrogen sulphide (H_2S)
Background	322 ± 52	918 ± 353	392 ± 144
Tar decanter	809 ± 394	5976 ± 7341	755 ± 460
Environmental sump	487 ± 561	2373 ± 2929	181 ± 78
Sump	695 ± 118	382 ± 252	513 ± 250
Gas plant 6, single samples			
Control	202	292	553

	Ammonia (NH_3)	Benzene (C_6H_6)	Hydrogen sulphide (H_2S)
Tar decanter	87	47	102
Environmental sump	807	950	689
Tar separator	1359	ND	199

Gas plant 3, single samples except as noted	Naphthalene	Acenaphtylene	Phenols	Cresols
Background	209.9 ave of 3	BDL	20.5 ave of 3	BDL
Cooling tower	BDL	BDL	9.6 ave of 3	BDL
Environmental tank	482.2	7.8	48.7	22.2
Submerged tank	255.1	1.1	90.1	24.0
Sump	94.0	BDL	7.7	1.0
Environmental sump	79.9	BDL	1.8	BDL
Tar decanter	1718.8	50.6	79.6	58.1
Gas plant 6, single samples				
Control	94.2	BDL	34.3	6.2
Cooling tower	BDL	BDL	BDL	BDL
Tar decanter	37.6	BDL	5.9	BDL
Gas plant 6, single samples				
Environmental sump	671.1	BDL	30.9	2.3
Tar separator	433.4	BDL	21.0	8.9

3.3 Conclusions from monitoring programme

3.3.1 Gas plant performance.

The gas plants meet the RoD requirements in the sense that the clean gas concentration values are below 1.5 g/Nm^3. Based on the averages of the inlet and outlet compositions, only plant 6 meets the requirements set in the regulation on Minimum Emission Standards (90% removal efficiency or less than 1000 mg/Nm^3 H_2S in the outlet, whichever is strictest), but these requirements only become mandatory 5 years after publication of the regulation, i.e 1 April 2015.

3.3.2 Flue gas composition.

Measurements meet the requirement for NOx concentrations comfortably. Hydrogen sulphide concentrations exceed the future Minimum Emission Standards, but again these need to be met only from 1 April 2015. Attention is drawn to the large standard deviations from the small number of measurements.

3.3.3 "Fence line" ambient monitoring results

- NOx

None of the values measured in 2009/10 exceed the annual average SA ambient standard.

The annual average measured values for 2009/10 correspond remarkably well with the corresponding values for "Coke ovens and other Iscor sources" in the 2003 report. The exception is the "North" station, where the predicted value is slightly less than 10 µg/m³ against the measured value of 18.8 µg/m³. This may be due to the impact of domestic fuel use in the residential areas to the north of the plant area, which due to the low level of emission sources and the prevailing wind direction may impact directly on the "North" station.

- SO_2

None of the values measured in 2007/8 or 2009/10 exceed the annual average SA ambient standard. There is no clear trend over time, as the "East" values have declined from 2007/8 to 2009/10 while the "North" values increased considerably over the same period. Values are generally slightly higher than those predicted due to "Coke plant and other Iscor sources" in 2003, with considerably higher values than the predicted ones for the "North" station (21.4 µg/m³ measured against less than 10 µg/m³ predicted). This is probably not due to under-prediction of the impact of the Iscor sources, but to the impact of low-level sources to the north of the plant as described above.

- PM_{10}

Values for the “East” and “South” stations exceed or approach the SA annual average standard valid until the end of 2014, and considerably exceed the standard valid from 2015 onwards. There is no clear temporal trend, except for the “West” values declining by 55% between the two periods – data availability in the second period is however only 29%.

Values for the “North”, “East” and “West” stations are considerably higher than those predicted in 2003, with the “South” values being only slightly higher. This again indicates the impact of sources to the north and west of the plant, which for PM_{10} may include, in addition to the domestic fuel sources mentioned earlier, vehicle movement on unpaved roads both on the site and in the residential areas to the north, burning of waste in the residential areas and farming activities.

- Benzene

Fence line values are marginally within the present South African annual average standard, but values to the east and north exceed the future SA annual average standard. An anomaly seems to exist in that “North” value is higher than the “South” values in spite of the prevailing winds being from the north to the south.

Values also exceed the predicted values by a considerable margin.

The above leads to the conclusion that a hitherto unidentified source of benzene, or a prevalent high background concentration, is present in the area. Alternatively or additionally, fugitive sources of benzene may be present which were not identified in the 2003 study, where only the batteries themselves were taken into account as benzene sources.

3.3.4 “In-plant” measurements

None of the measured values exceed the legal requirements under the OSH Act. It should however be taken into account that considerably more stringent standards have been adopted internationally, especially for benzene as a known human carcinogen.

4 RECOMMENDATIONS

4.1"Fence line" ambient monitoring.

- ArcelorMittal South Africa Vanderbijlpark Works is to be commended for the useful data obtained from the fence line monitors in terms of community impact and it is recommended that the programme (including determination of benzene levels) be continued.

- It is however clear from even a rudimentary analysis of the data that this programme alone cannot provide confirmation of the success or otherwise of door maintenance and/or other fugitive dust management programmes in the coke oven area.

4.2 In-plant atmospheric monitoring

- It is therefore recommended that visible leaks from doors, standpipes and charging operations be monitored. Method EPA 303, which is the prescribed method in terms of the Minimum Emission Standards regulation, provides guidance on the protocol (including observation frequency), and in-house training has been carried out by ArcelorMittal South Africa Vanderbijlpark Works. Method 303 prescribes EPA-conducted training, which is obviously not applicable to the local situation. The Department of Environmental Affairs has informally indicated that an accreditation scheme for emission monitoring is being investigated. It sis proposed that ArcelorMittal South Africa Vanderbijlpark Works communicate with DEA in this regard, and considers accreditation of the in-house training when these accreditation requirements have been finalised. The results of the method 303 observations will be supported by a trend analysis of the personal monitoring in the coke battery and gas plant area in terms of the OHS Act.

- The required once-off measurements for the concentrations of benzene, ammonia and hydrogen sulphide have shown conformance to legal (in-plant or occupational exposure) limits and it is submitted that repeating these measurements is not necessary.

- Continued regular measurements of these compounds (and coal tar pitch volatiles (CTPV)) for purposes of employee exposure need to be continued as part of the industrial hygiene monitoring programme required by the OSH Act and incidentally, by the analysis of temporal trends, to monitor the management of the fugitive emissions programme.

4.3 Process monitoring

- In view of the wide margin by which the present measurements meet the requirements of the Minimum Emission Standards regulation for these pollutants, annual measurement of the

PM_{10}, NOx and SO_2 emissions from a representative stack per battery stacks under representative operating conditions should be sufficient.

- It will however be noted from the standard deviation that large variations occurred during the measurements of hydrogen sulphide at the gas plant inlet and outlet and with the small number of analyses no final conclusion can be made. It is clear from the high standard deviations of the measurements that either the composition or the measurement method has a high variability. In view of the fact that the plant does potentially not meet the legal requirements applicable from April 2015, these measurements initially need to be repeated at a higher frequency than that specified in the RoD (bi-annually) until the issues of both the measurement variability and the plant performance have been satisfactorily settled and a valid statistical analysis is possible. It is proposed that this be done on a project basis as soon as resources can be made available. Either EPA method 11 (sampling/iodometric).or method 15 (sampling/gas chromatography) could be used.

- Once-off measurement of dioxin and furan in a representative battery stack were done in 2005. Results are low compared to emission standards for other incineration plants and no further action seems to be indicated. .

- Monitoring of quench water quality (and comparison to the requirements of the Minimum Emission Standards regulation) as most probably intended by the RoD requirements should be carried out on a regular basis. As the analytical requirements are not stringent and can probably be met with present in-house facilities, weekly analysis is recommended.

- With regards to the requirement to measure the composition of flared treated gas and the temperature of the flare, it is recommended that an argument be submitted to the authorities that this is a superfluous requirement based on the following:

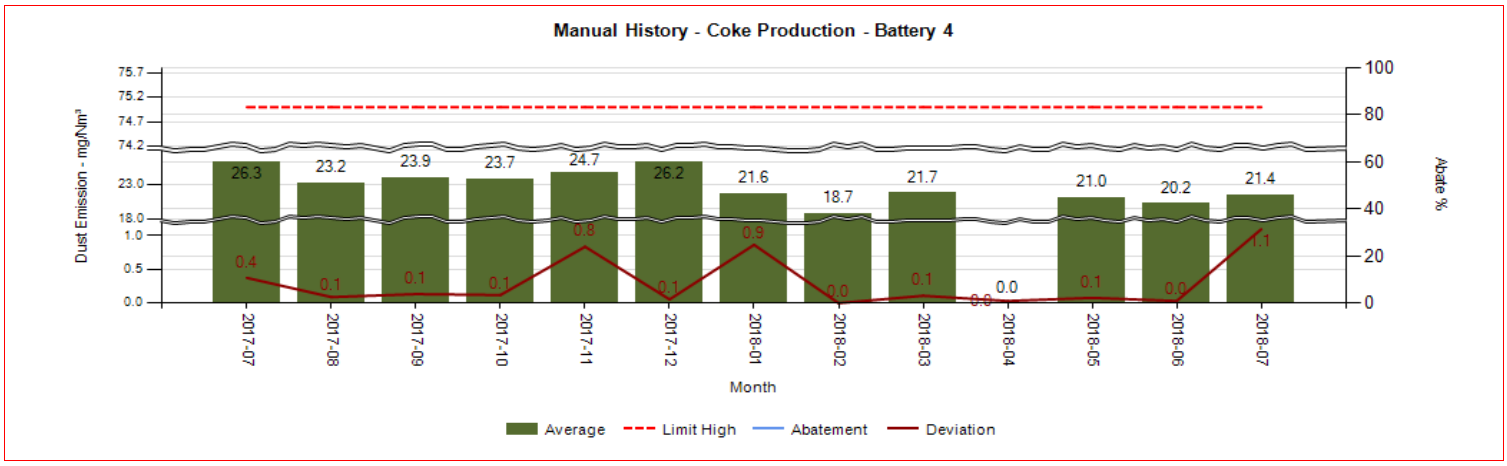
    - The composition of the flared treated gas is the same as measured under the first bullet in this sub-section, and resolution of the measurement requirements as proposed there will also resolve the question of the composition of the flared gas.

    - Although the fare temperature could be measured thermographically, the information would not add value as oxidation of hydrogen sulphide to sulphur dioxide occurs at quite low temperatures. For purpose of dispersion modelling, a sufficiently accurate estimate of flare temperature to determine its buoyancy can be made without measurement.

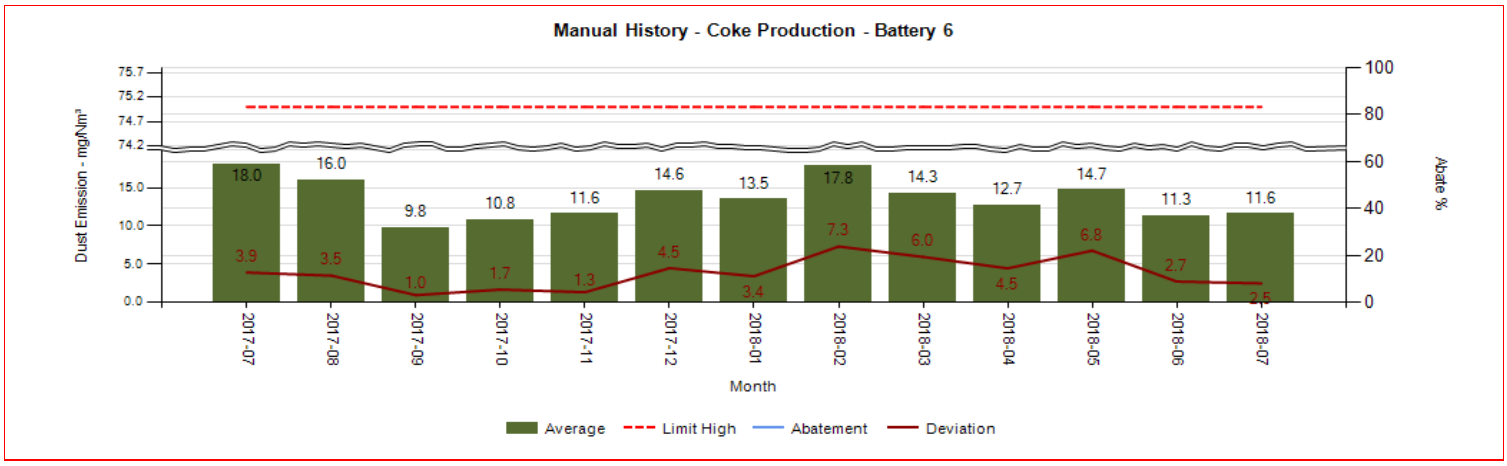
5.REFERENCES.

Liebenberg-Enslin, H *et al.* (2003): *Air quality assessment of the Iscor coke oven gas and water cleaning plant upgrade in Vanderbijlpark, with addendum dd 2 July 2003.* Airshed Planning Professionals (Pty) Ltd report number APP/03/SEF-01 Rev 3. Halfway House

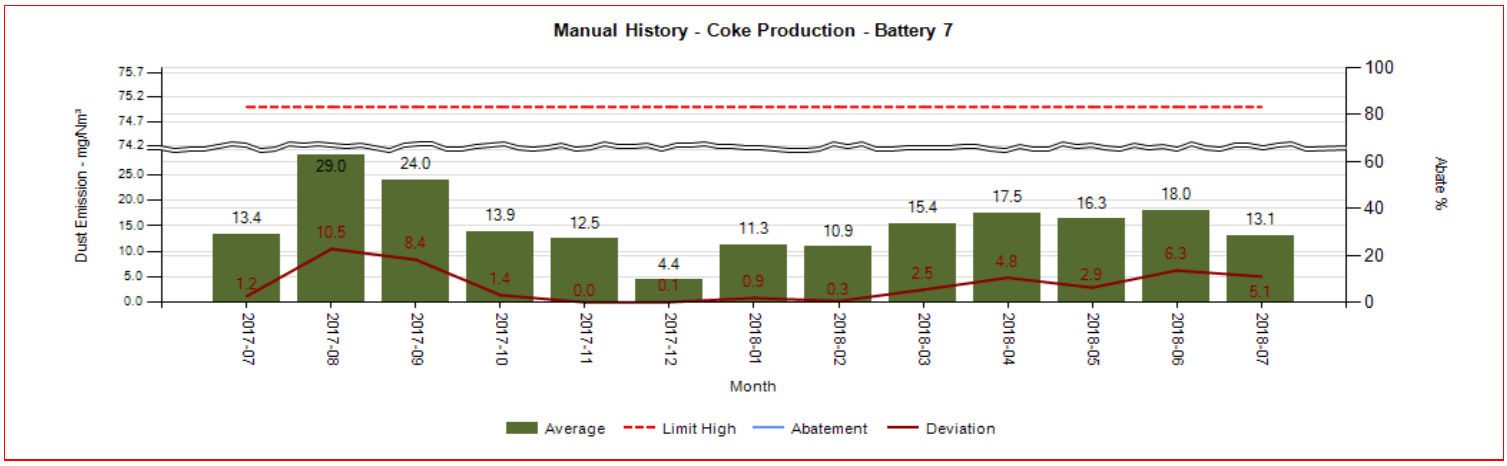
APPENDIX K: COKE BATTERY STACK DUST EMISSIONS



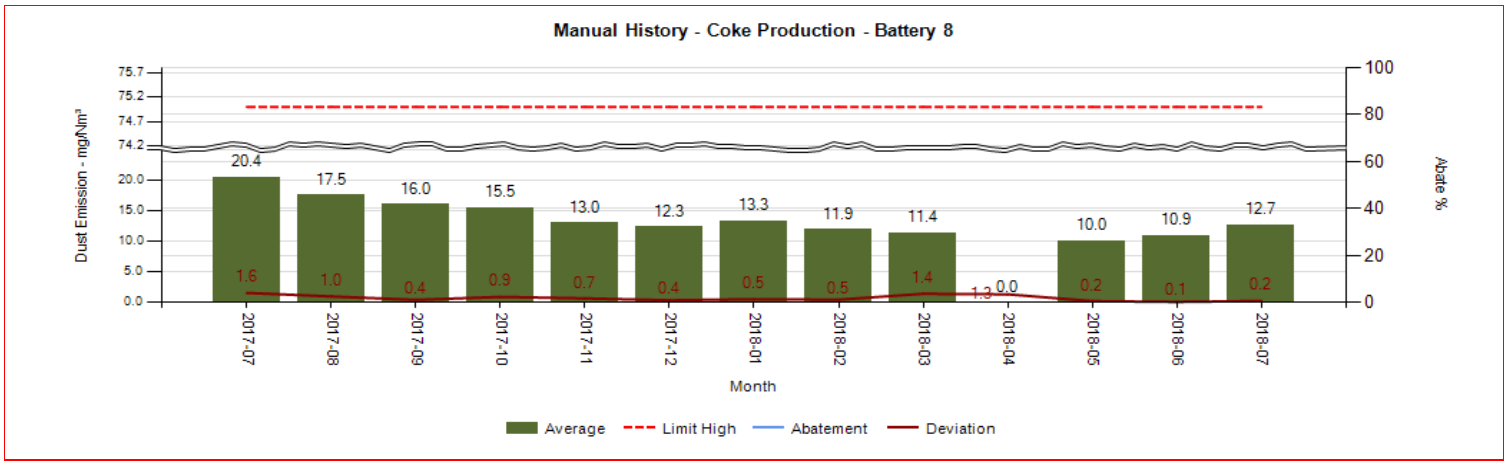
Coke Making	Coke Production	Battery 6	Dust	mg/Nm³



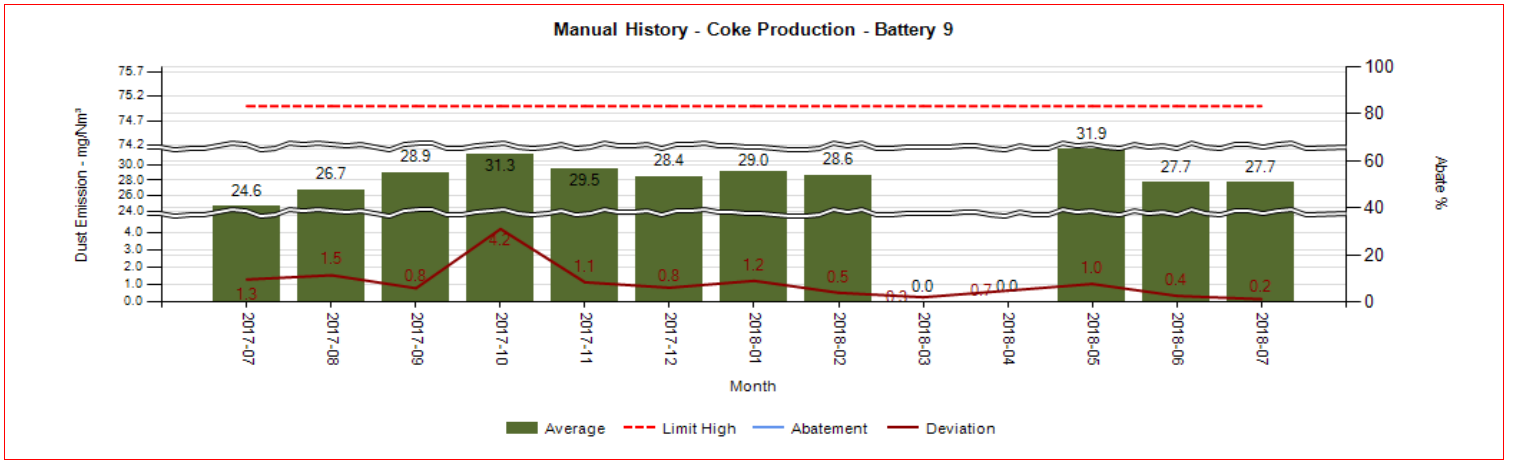
Coke Making	Coke Production	Battery 7	Dust	mg/Nm³



Coke Making	Coke Production	Battery 8	Dust	mg/Nm³



Coke Making	Coke Production	Battery 9	Dust	mg/Nm³


Manual History - Coke Production - Battery 9
Dust Emission - mg/Nm³
Abate %
Month
Average
Limit High
Abatement
Deviation
24.6
26.7
28.9
31.3
29.5
28.4
29.0
28.6
31.9
27.7
27.7
1.3
1.5
0.8
4.2
1.1
0.8
1.2
0.5
0.0
0.0
1.0
0.4
0.2
2017-07
2017-08
2017-09
2017-10
2017-11
2017-12
2018-01
2018-02
2018-03
2018-04
2018-05
2018-06
2018-07

APPENDIX L: GROUNDWATER QUALITY RESULTS

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www.bureaveritas.com

Registration Number 1974/001476/07 VAT Number 4780103505
Consulting Industrial Chemists, Analysts_Samplers
CONFIDENTIAL

Certificate/Report

Laboratory Number		H000904	H000905	H000906
Sampled Date		[redacted]		[redacted]
Sample Marks			CO-3D (org)	
Determinand	Method References	Result	Result	Result
VOC BY GC/MS FOLLOWING PURGE & TRAP TECHNIQUE BASED ON EPA 8260				
trans-1,2-Dichloroethene(ug/l)	EPA 8260B	[redacted]	BDL	[redacted]
1,1,1-Trichloroethane(ug/l)	EPA 8260B		BDL	
Trichloroethene(ug/l)	EPA 8260B		BDL	
trans-1,3-dichloropropene(ug/l)	EPA 8260B		BDL	
Toluene(ug/l)	EPA 8260B		3	
1,1,2-Trichloroethane(ug/l)	EPA 8260B		BDL	
Tetrachloroethylene(ug/l)	EPA 8260B		BDL	
1,1,1,2-Tetrachloroethane(ug/l)	EPA 8260B		BDL	
m, p-Xylene(ug/l)	EPA 8260B		BDL	
Styrene(ug/l)	EPA 8260B		BDL	
o-Xylene(ug/l)	EPA 8260B		BDL	
1,1,2,2-Tetrachloroethane(ug/l)	EPA 8260B		BDL	
1,2,3-Trichloropropane(ug/l)	EPA 8260B		BDL	
Isopropylbenzene(ug/l)	EPA 8260B		BDL	
n-Propylbenzene(ug/l)	EPA 8260B		BDL	
tert-Butylbenzene(ug/l)	EPA 8260B		BDL	
sec-Butylbenzene(ug/l)	EPA 8260B		BDL	
n-Butylbenzene(ug/l)	EPA 8260B		BDL	
1,2,3-Trichlorobenzene(ug/l)	EPA 8260B		BDL	
Naphthalene(ug/l)	EPA 8260B		BDL	
1,2,4-Trichlorobenzene(ug/l)	EPA 8260B		BDL	

Detection limit 1µg/l
BDL - Below Detection Limit
*** Denotes test method not accredited to ISO 17025**
 # Denotes test method is outsourced

sanas T0040

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Certificate/Report

Laboratory Number		H000904	H000905	H000906
Sampled Date		[redacted]		
Sample Marks			CO-3D (org)	[redacted]
Determinand	Method References	Result	Result	Result
VOC BY GC/MS FOLLOWING PURGE & TRAP TECHNIQUE BASED ON EPA 8260				
1,1-Dichloroethene(ug/l)	EPA 8260B	[redacted]	BDL	[redacted]
Chloroform(ug/l)	EPA 8260B		BDL	
1,1-Dichloroethane(ug/l)	EPA 8260B		BDL	
Cis-1,2-Dichloroethene(ug/l)	EPA 8260B		BDL	
2,2-Dichloropropane(ug/l)	EPA 8260B		BDL	
Bromochloromethane(ug/l)	EPA 8260B		BDL	
1,2-Dichloroethane(ug/l)	EPA 8260B		BDL	
1,1-Dichloropropene(ug/l)	EPA 8260B		BDL	
Benzene(ug/l)	EPA 8260B		38	
Carbon Tetrachloride(ug/l)	EPA 8260B		BDL	
Dibromomethane	EPA 8260B		BDL	
Bromodichloromethane(ug/l)	EPA 8260B		BDL	
cis-1,3-dichloropropene(ug/l)	EPA 8260B		BDL	
1,3-Dichloropropane(ug/l)	EPA 8260B		BDL	
Dibromochloromethane(ug/l)	EPA 8260B		BDL	
1,2-Dibromoethane(ug/l)	EPA 8260B		BDL	
Chlorobenzene(ug/l)	EPA 8260B		BDL	
1,2-Dichloropropane(ug/l)	EPA 8260B		BDL	
Ethylbenzene(ug/l)	EPA 8260B		BDL	
Bromoform(ug/l)	EPA 8260B		BDL	
Bromobenzene(ug/l)	EPA 8260B		BDL	
2-Chlorotoluene(ug/l)	EPA 8260B		BDL	
4-Chlorotoluene(ug/l)	EPA 8260B		BDL	
1,3,5-Trimethylbenzene(ug/l)	EPA 8260B		BDL	
1,2,4-Trimethylbenzene(ug/l)	EPA 8260B		BDL	
1,3-Dichlorobenzene(ug/l)	EPA 8260B		BDL	
1,4-Dichlorobenzene(ug/l)	EPA 8260B		BDL	
4-Isopropyltoluene(ug/l)	EPA 8260B		BDL	
1,2-Dichlorobenzene(ug/l)	EPA 8260B		BDL	
1,2-Dibromo-3-chloropropane(ug/l)	EPA 8260B		BDL	
Hexachlorobutadiene(ug/l)	EPA 8260B		BDL	

Detection limit 1µg/l
BDL - Below Detection Limit
*** Denotes test method not accredited to ISO 17025**
 # Denotes test method is outsourced

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CONFIDENTIAL

Certificate/Report

Laboratory Number		H000904	H000905	H000906
Sampled Date		[redacted]		[redacted]
Sample Marks			CO-3D (org)	
Determinand	Method References	Result	Result	Result
SVOC BY GC/MS FOLLOWING BASED ON EPA 8270				
Benzene 1,2 dichloro-(µg/l)	EPA 8270	[redacted]	BDL	[redacted]
Bis (2-ethylhexyl) phthalate(µg/l)	EPA 8270		BDL	
Bis (2-chloroisopropyl) ether(µg/l)	EPA 8270		BDL	
Bis-(2-chloroethoxy) methane(µg/l)	EPA 8270		BDL	
Dibenzofuran(µg/l)	EPA 8270		BDL	
Diethyl Phthalate(ug/l)	EPA 8270		BDL	
Dimethylphthalate(µg/l)	EPA 8270		BDL	
Hexachlorocyclopentadiene(µg/l)	EPA 8270		BDL	
Isophorone(ug/l)	EPA 8270		BDL	
Bis-(2-chloroethyl) ether(µg/l)	EPA 8270		BDL	
2-Chlorophenol(µg/l)	EPA 8270		BDL	
2-Methylphenol(µg/l)	EPA 8270		BDL	
4-Methylphenol(µg/l)	EPA 8270		BDL	
Hexachloroethane(µg/l)	EPA 8270		BDL	
2,4 Dimethylphenol(µg/l)	EPA 8270		BDL	
2-Nitrophenol(µg/l)	EPA 8270		BDL	
2,4-Dichlorophenol(ug/l)	EPA 8270		BDL	
4-chloro-3-methylphenol(µg/L)	EPA 8270		BDL	
2-Methylnaphthalene(µg/l)	EPA 8270		BDL	
2,4,5-Trichlorophenol(µg/l)	EPA 8270		BDL	
2-Chloronaphthalene(µg/l)	EPA 8270		BDL	
2,4-Dinitrotoluene(µg/l)	EPA 8270		BDL	
2,6 Dinitrotoluene(ug/l)	EPA 8270		BDL	
4-Chlorophenyl-phenyl ether(µg/L)	EPA 8270		BDL	
Azobenzene(µg/l)	EPA 8270		BDL	
4-Bromophenyl-phenyl ether(µg/l)	EPA 8270		BDL	
Hexachlorobenzene(µg/l)	EPA 8270		BDL	
Benzyl Butyl Phthalate(µg/l)	EPA 8270		BDL	
Benzo(b+k)fluoranthene(µg/l)	EPA 8270		BDL	
Di-n-octyl phthalate(µg/l)	EPA 8270		BDL	
Di-n-butyl phthalate(µg/l)	EPA 8270		BDL	

Detection limit 500µg/l
BDL - Below Detection Limit
*** Denotes test method not accredited to ISO 17025**
 # Denotes test method is outsourced

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M&L LABS

Ref. No. : ML-2017-06998
Issued at. : Johannesburg
Date : 19/02/2018
Contract No. : 10448317

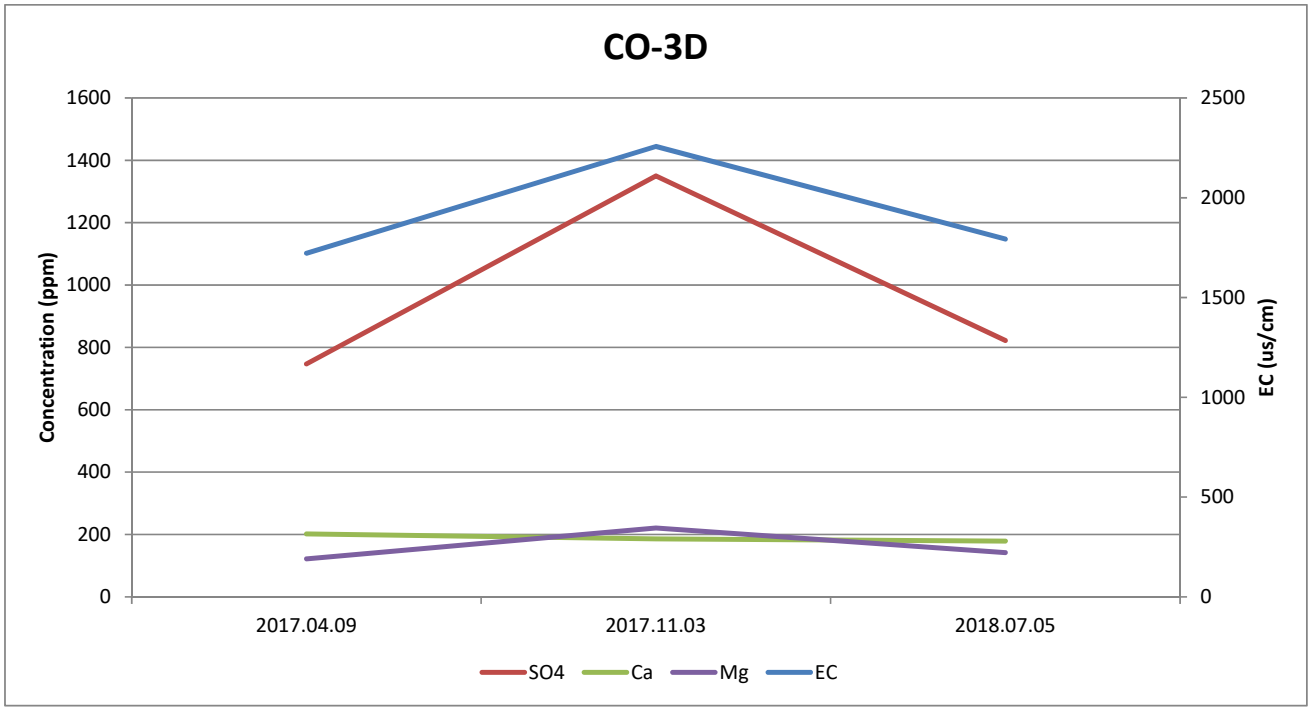
Registration Number 1974/001476/07 VAT Number 4780103505
Consulting Industrial Chemists, Analysts_Samplers
CONFIDENTIAL

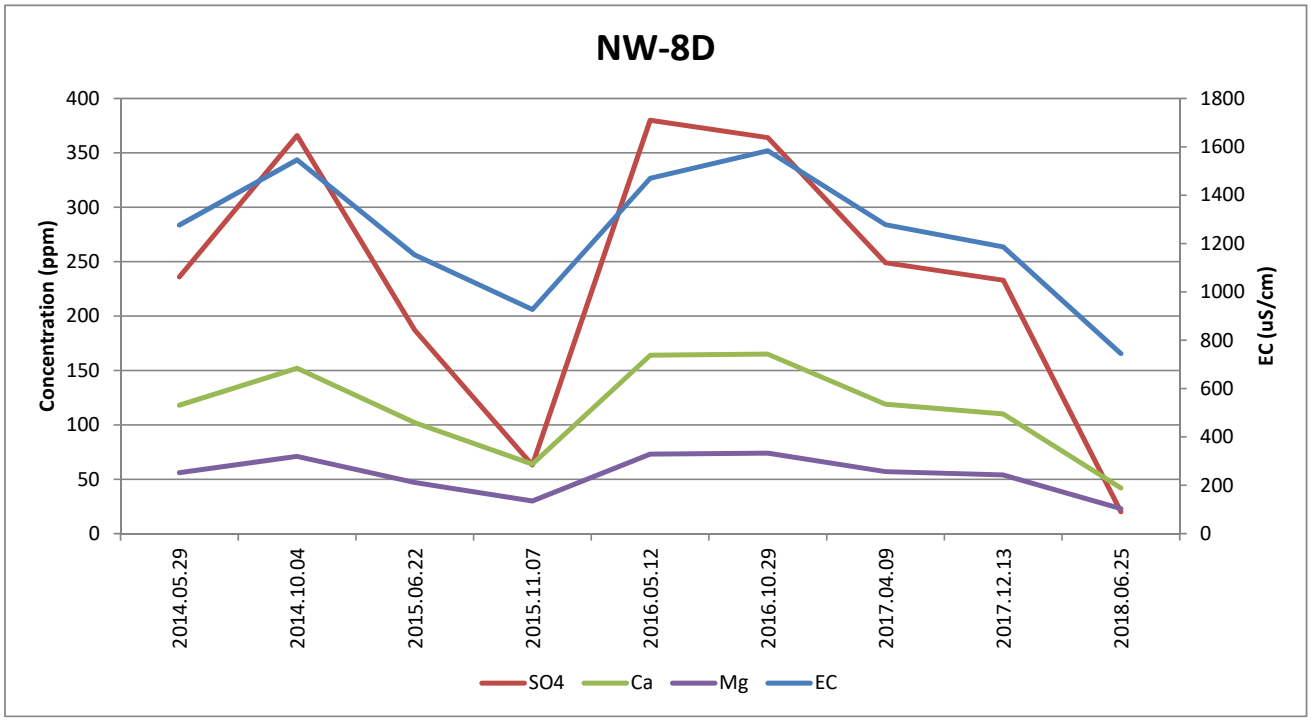
Certificate/Report

Laboratory Number		H000904	H000905	H000906
Sampled Date				
Sample Marks		[redacted]	CO-3D (org)	[redacted]
Determinand	Method References	Result	Result	Result
SVOC BY GC/MS BASED ON EPA 8270				
m-nitroaniline(µg/l)	EPA 8270	[redacted]	BDL	[redacted]
Phenol(µg/l)	EPA 8270	[redacted]	BDL	[redacted]
N-Nitrosodi-n-propylamine(µg/l)	EPA 8270	[redacted]	BDL	[redacted]
Naphthalene(ug/l)	EPA 8270	[redacted]	BDL	[redacted]
2,4,6-Trichlorophenol(µg/l)	EPA 8270	[redacted]	BDL	[redacted]
p-Nitroaniline(µg/l)	EPA 8270	[redacted]	BDL	[redacted]
o-Nitroaniline(µg/l)	EPA 8270	[redacted]	BDL	[redacted]
p-Chloroaniline(µg/l)	EPA 8270	[redacted]	BDL	[redacted]
Nitrobenzene(ug/l)	EPA 8270	[redacted]	BDL	[redacted]

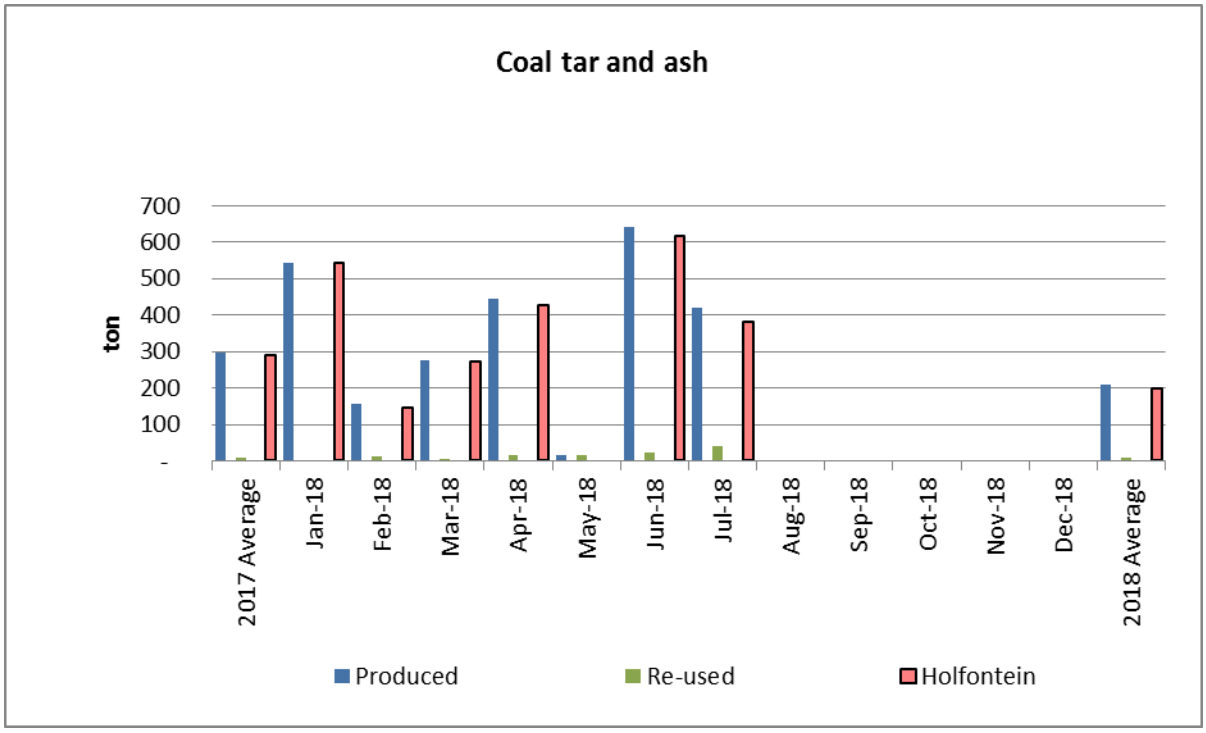
Detection limit 500µg/l
BDL - Below Detection Limit
*** Denotes test method not accredited to ISO 17025**
 # Denotes test method is outsourced

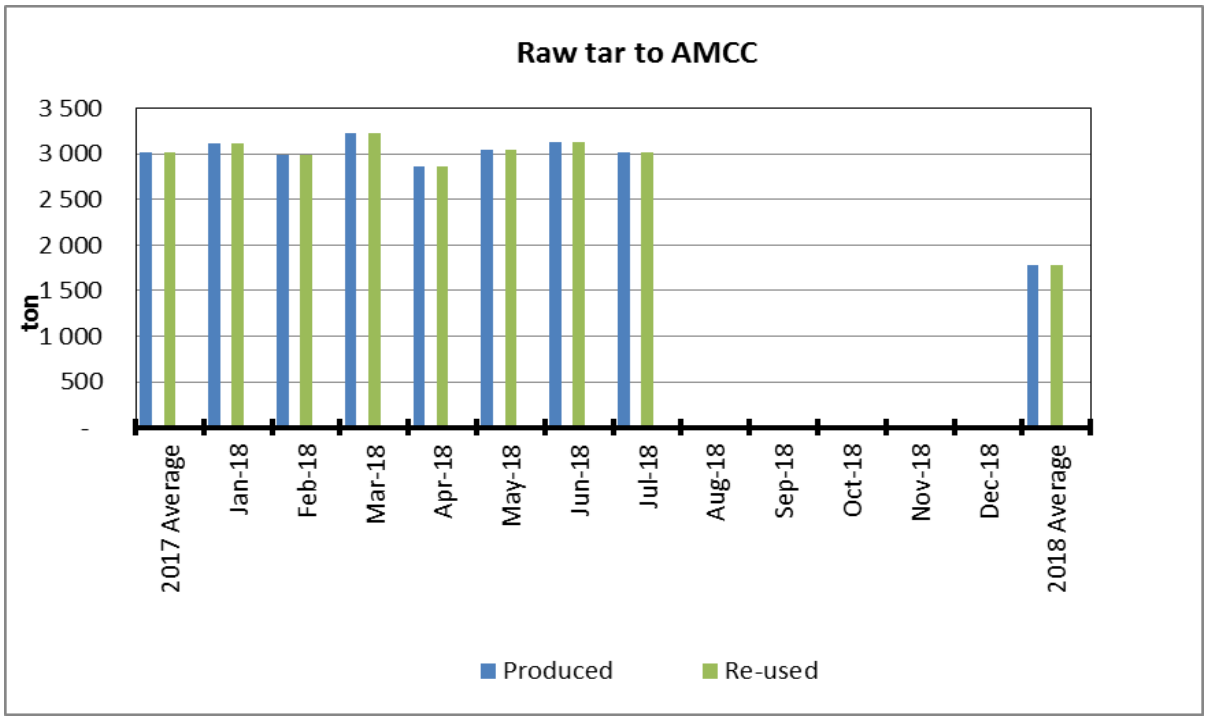
sanas
T0040

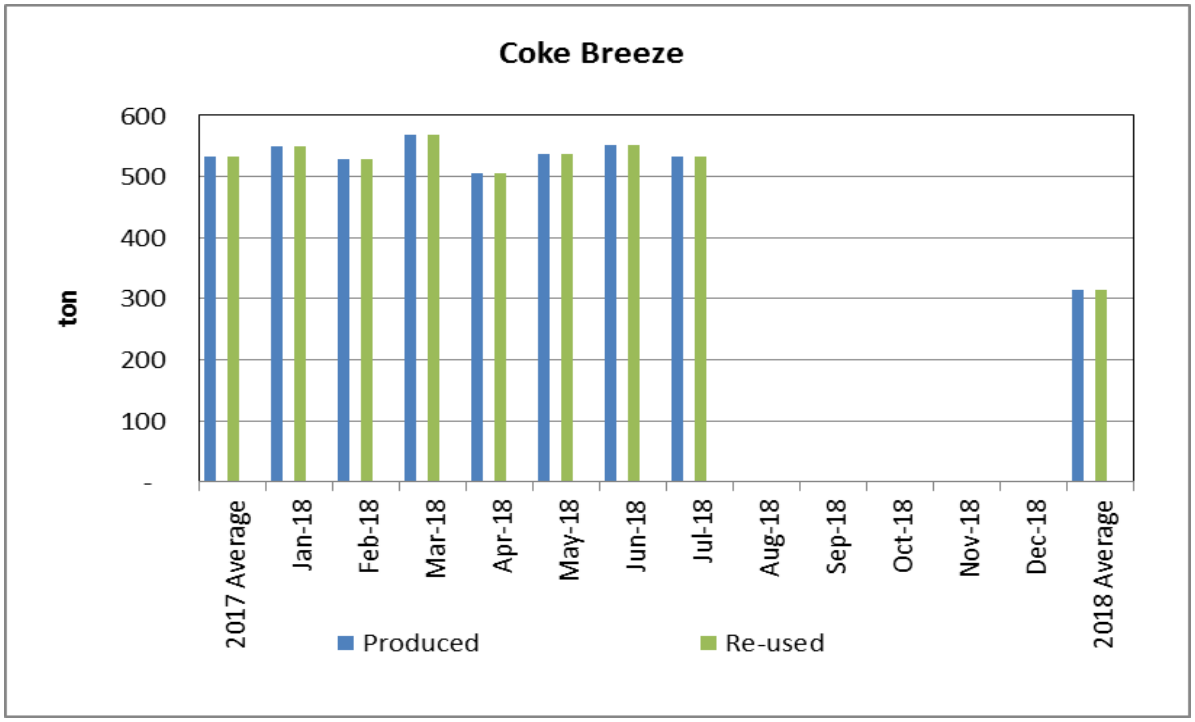

CO-3D
Concentration (ppm)
EC (us/cm)
1600
1400
1200
1000
800
600
400
200
0
2500
2000
1500
1000
500
0
2017.04.09
2017.11.03
2018.07.05
SO4
Ca
Mg
EC


NW-8D
Concentration (ppm)
EC (uS/cm)
400
350
300
250
200
150
100
50
0
1800
1600
1400
1200
1000
800
600
400
200
0
2014.05.29
2014.10.04
2015.06.22
2015.11.07
2016.05.12
2016.10.29
2017.04.09
2017.12.13
2018.06.25
SO4
Ca
Mg
EC

APPENDIX M: WASTE STREAM QUANTITIES


Coal tar and ash
ton
700
600
500
400
300
200
100
-
2017 Average
Jan-18
Feb-18
Mar-18
Apr-18
May-18
Jun-18
Jul-18
Aug-18
Sep-18
Oct-18
Nov-18
Dec-18
2018 Average
Produced
Re-used
Holfontein


Raw tar to AMCC
ton
3 500
3 000
2 500
2 000
1 500
1 000
500
-
2017 Average
Jan-18
Feb-18
Mar-18
Apr-18
May-18
Jun-18
Jul-18
Aug-18
Sep-18
Oct-18
Nov-18
Dec-18
2018 Average
Produced
Re-used


Coke Breeze
ton
600
500
400
300
200
100
-
2017 Average
Jan-18
Feb-18
Mar-18
Apr-18
May-18
Jun-18
Jul-18
Aug-18
Sep-18
Oct-18
Nov-18
Dec-18
2018 Average
Produced
Re-used

APPENDIX N: EXAMPLE OF A RECENT JOB CARD

927402210 0010

Planning Plant: *SF01*
AMSA - Vanderbijlpark Works

ArcelorMittal

BEFORE STARTING THE JOB, ASK YOURSELF THE FOLLOWING QUESTIONS

I Is the equipment **isolated** ? (Mechanical, Electrical, Area)
W Am I **wearing** the correct P.P.E. , What else should I use ?
O What **other** party must know we are working here ?
R Are the **right** tools available and safe for use ?
K Have I discussed the **known** hazards with the team ?
S What in the area could endanger our **safety** ?
A Are specific procedures or instructions **applicable** ?
F What can go wrong or **fail** during the job ?
E Have I communicated **effectively** with the team ?

Does this job have an **Environmental impact**? (Y/N)
If "Y" describe impact .....
What precautions will be put in place to prevent/limit the impact?
.....

Maint Plant: *SFKN Coke Oven By-products* Date Printed: *2018.08.14*

Plant Maintenance Work Order Header

Printed By: 10011375
Copy: 2

M/Plan Nr: 59391
Order Nr: 927402210 Notification Nr:

W/O Type: PM02

Funct Loc:

	03-S	*IFS South Works*
ABC IND:	*C*	*LOW IMPACT*
	03-S-FKN	*Coke Oven By-products*
ABC IND:	*C*	*LOW IMPACT*
	03-S-FKN-853	*GAS PLANT 3*
ABC IND:	*C*	*LOW IMPACT*
	03-S-FKN-853-03	*GP3 ELECTRO DETARRER SYSTEM*
ABC IND:	*A*	*HIGH IMPACT*

Equip:

Object List:
Funct Loc:
Equipment:

Description: (Short) *T MOKOENA - Inspect all Detarrer insulat*

T MOKOENA - Inspect all Detarrer insulat
T MOKOENA - Inspect all Detarrer insulators

Lerato - Inspect all Detarrer insulators

Planning Related Information

PM Planner grp: *MCA*	*Byproducts A-block*	
Main work centre: *ICNS1ELE SF01*	*Electrician*	
System Condition: *5*	***Standing***	
Priority: 2	***Sched - Future Med***	
Status:	*REL PRT CSER NMAT PRC SETC*	C. Labuschagne
Activity Type: *INS*	Inspection	Planner
Basic Start Date: *2018.08.22*	**Basic End Date:** *2018.08.22*	Coke Ovens
Basic Start Time: *07:00:00*	Basic End Time: *07:00:00*	By Products

Equipment Installed/Dismantled:

Equipment Number Dismantled:
Equipment Number Installed:

Operations Detail

Operation number: *0010* — *Inspect all Detarrer insulators*
Status: *PRT REL*
Work Centre: *ICNS2* — *SF01 Superintendent By-Products B-BLOCK*
Personnel Nr:

Number Capacities: *1* — Planned Duration: *0.0 HR*
Earliest Start: *2018.08.22* — Latest Finish: *2018.08.22*

Control Key: *PMIN* — *PMINPlant Maintenance Internal*
System Condition: *5* — *Standing*

Frequency (Package): *01* — *1 Weekly*

Material # / Description	Reservation #	Purchase Order #	Quantity

PRT Number:	Description:	Quantity Required:
COKE OVENS MINI HIRA	Hazard Identification and Risk	1.000

Confirmation number: *0053809185*

Operations Long Text

R=Right
W=Wrong
C=Corrected

Inspect all Detarrer insulators

Detarrer: 3A I 3B I 4A

Insulator temp. 115,6°C I 113,4°C I 111,6°C Deg.C

Doors closed. R I R I R

Is temp. visable R I R I R

4A Insulator teperatures: 1: 111,60°C 2: 87,90°C 3: 106,50°C

ARTISAN TO COMPLETE

Confirmation Sheet:

StDate/Time	End Date/Time	Act.Dur	Emp.Nr	Sign	Descrip	Rem.Work
18/08/21 13H30	18/08/21 14H30	1HR	10011779	[redacted]		

927402210 0010

ditional work identified?	Trade responsible:	Estimated duration:

Reason for operation delay/ not completed

Delay	Delay Duration	Not Done
☐ Travel & no transport		☐ Travel & no transpor
☐ Breakdown		☐ Breakdown
☐ Personnel Late		☐ No Personnel
☐ Support Equipment Late		☐ No Support Equipment
☐ PTO / Training		☐ PTO / Training
☐ Planning not practical		☐ Planning not practic
☐ Unplanned Leave		☐ Unplanned Leave
☐ Addnl/Unforeseen work		☐ Material Unavailable
☐ Material Late		☐ Material Quality
☐ Material Incorrect		☐ Material Incorrect
☐ Equipment Late		☐ Equipment Unavailabl
☐ Prep Incomplete		☐ Prep Incomplete
☐ Unsafe Condition		☐ Unsafe Condition
☐ Assistance Late		☐ Assistance Unavailab
		☐

ArcelorMittal

Superintendent

27 [illegible] Sign-off

Supt Sign: Emp.Nr: Date:

A Khotle - 10005937
016 889 9554

Artisan Additional Feedback

*Inspection Done
*Equipment Shell in Good Condition