

Impact Assessment Methodology

In order to ensure uniformity, a standard impact assessment methodology has been utilised so that a wide range of impacts can be compared. The impact assessment methodology makes provision for the assessment of impacts against the following criteria:

- Significance;
- Spatial scale;
- Temporal scale;
- Probability; and
- Degree of certainty.

A combined quantitative and qualitative methodology was used to describe impacts for each of the aforementioned assessment criteria.

A summary of each of the qualitative descriptors along with the equivalent quantitative rating scale for each of the aforementioned criteria is given in Table 2.

Table 2: Quantitative rating and equivalent descriptors for the impact assessment criteria.

RATING	SIGNIFICANCE	EXTENT SCALE	TEMPORAL SCALE
1	VERY LOW	<i>Isolated corridor / proposed corridor</i>	<u>Incidental</u>
2	LOW	<i>Study area</i>	<u>Short-term</u>
3	MODERATE	<i>Local</i>	<u>Medium-term</u>
4	HIGH	<i>Regional / Provincial</i>	<u>Long-term</u>
5	VERY HIGH	<i>Global / National</i>	<u>Permanent</u>

A more detailed description of each of the assessment criteria is given below.

Significance Assessment

Significance rating (importance) of the associated impacts embraces the notion of extent and magnitude, but does not always clearly define these since their importance in the rating scale is very relative. For example, the magnitude (i.e. the size) of area affected by atmospheric pollution may be extremely large (1000 km²) but the significance of this effect is dependent on the concentration or level of pollution. If the concentration is great, the significance of the impact would be HIGH or VERY HIGH, but if it is diluted it would be VERY LOW or LOW. Similarly, if 60 ha of a grassland type are destroyed the impact would be VERY HIGH if only 100 ha of that grassland type were known. The impact would be VERY LOW if the grassland type was common. A more detailed description of the impact significance rating scale is given in Table 3 below.

Table 3: Description of the significance rating scale.

RATING	DESCRIPTION
5	VERY HIGH
4	HIGH

Of the highest order possible within the bounds of impacts which could occur. In the case of adverse impacts: there is no possible mitigation and/or remedial activity which could offset the impact. In the case of beneficial impacts, there is no real alternative to achieving this benefit.

Impact is of substantial order within the bounds of impacts, which could occur. In the case of adverse impacts: mitigation and/or remedial activity is feasible but difficult, expensive, time-consuming or some combination of these. In the case of beneficial impacts, other means of achieving this benefit are feasible

RATING		DESCRIPTION
		but they are more difficult, expensive, time-consuming or some combination of these.
3	MODERATE	Impact is real but not substantial in relation to other impacts, which might take effect within the bounds of those which could occur. In the case of adverse impacts: mitigation and/or remedial activity are both feasible and fairly easily possible. In the case of beneficial impacts: other means of achieving this benefit are about equal in time, cost, effort, etc.
2	LOW	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts: mitigation and/or remedial activity is either easily achieved or little will be required, or both. In the case of beneficial impacts, alternative means for achieving this benefit are likely to be easier, cheaper, more effective, less time consuming, or some combination of these.
1	VERY LOW	Impact is negligible within the bounds of impacts which could occur. In the case of adverse impacts, almost no mitigation and/or remedial activity is needed, and any minor steps which might be needed are easy, cheap, and simple. In the case of beneficial impacts, alternative means are almost all likely to be better, in one or a number of ways, than this means of achieving the benefit. Three additional categories must also be used where relevant. They are in addition to the category represented on the scale, and if used, will replace the scale.
0	NO IMPACT	There is no impact at all - not even a very low impact on a party or system.

Spatial Scale

The spatial scale refers to the extent of the impact i.e. will the impact be felt at the local, regional, or global scale. The spatial assessment scale is described in more detail in Table 4.

Table 4: Description of the significance rating scale.

RATING		DESCRIPTION
5	Global/National	The maximum extent of any impact.
4	Regional/Provincial	The spatial scale is moderate within the bounds of impacts possible, and will be felt at a regional scale (District Municipality to Provincial Level). The impact will affect an area up to 50 km from the proposed site / corridor.
3	Local	The impact will affect an area up to 5 km from the proposed route corridor / site.
2	Study Area	The impact will affect a route corridor not exceeding the boundary of the corridor / site.
1	Isolated Sites / proposed site	The impact will affect an area no bigger than the corridor / site.

Duration Scale

In order to accurately describe the impact it is necessary to understand the duration and persistence of an impact in the environment. The temporal scale is rated according to criteria set out in Table 5.

Table5: Description of the temporal rating scale.

RATING		DESCRIPTION
1	Incidental	The impact will be limited to isolated incidences that are expected to occur very sporadically.
2	Short-term	The environmental impact identified will operate for the duration of the construction phase or a period of less than 5 years, whichever is the greater.
3	Medium term	The environmental impact identified will operate for the duration of life of the project.
4	Long term	The environmental impact identified will operate beyond the life of operation.
5	Permanent	The environmental impact will be permanent.

Degree of Probability

The probability or likelihood of an impact occurring will be described as shown in Table 6 below.

Table 6: Description of the degree of probability of an impact accruing.

RATING	DESCRIPTION
1	Practically impossible
2	Unlikely
3	Could happen
4	Very Likely
5	It's going to happen / has occurred

Degree of Certainty

As with all studies it is not possible to be 100% certain of all facts, and for this reason a standard "degree of certainty" scale is used as discussed in Table 7. The level of detail for specialist studies is determined according to the degree of certainty required for decision-making. The impacts are discussed in terms of affected parties or environmental components.

Table 7: Description of the degree of certainty rating scale.

RATING	DESCRIPTION
Definite	More than 90% sure of a particular fact.
Probable	Between 70 and 90% sure of a particular fact, or of the likelihood of that impact occurring.
Possible	Between 40 and 70% sure of a particular fact, or of the likelihood of an impact occurring.
Unsure	Less than 40% sure of a particular fact or the likelihood of an impact occurring.
Can't know	The consultant believes an assessment is not possible even with additional research.

Quantitative Description of Impacts

To allow for impacts to be described in a quantitative manner in addition to the qualitative description given above, a rating scale of between 1 and 5 was used for each of the assessment criteria. Thus the total value of the impact is described as the function of significance, spatial and temporal scale as described below:

$$\text{Impact Risk} = \frac{(\text{SIGNIFICANCE} + \text{Spatial} + \text{Temporal})}{3} \times \frac{\text{Probability}}{5}$$

An example of how this rating scale is applied is shown below:

Table 8: Example of Rating Scale.

IMPACT	SIGNIFICANCE	SPATIAL SCALE	TEMPORAL SCALE	PROBABILITY	RATING
	LOW	<i>Local</i>	<u>Medium Term</u>	<u>Could Happen</u>	
Impact to air	2	3	3	3	1.6

Note: The significance, spatial and temporal scales are added to give a total of 8, that is divided by 3 to give a criteria rating of 2,67. The probability (3) is divided by 5 to give a probability rating of 0,6. The criteria rating of 2,67 is then multiplied by the probability rating (0,6) to give the final rating of 1,6.

The impact risk is classified according to 5 classes as described in the table below.

Table 9: Impact Risk Classes.

RATING	IMPACT CLASS	DESCRIPTION
0.1 – 1.0	1	Very Low
1.1 – 2.0	2	Low
2.1 – 3.0	3	Moderate
3.1 – 4.0	4	High
4.1 – 5.0	5	Very High

Therefore, with reference to the example used for air quality above, an impact rating of 1.6 will fall in the Impact Class 2, which will be considered to be a low impact. Positive impacts are illustrated in blue colours.

Table 10: Impact Rating

Activity	Aspect	Impact	Mitigation	Criteria	Rating prior to project	Rating prior to mitigation	Rating prior to mitigation	Cumulative rating	Rating post mitigation						
Decommissioning Phase of the Existing Incinerator															
Demolition activities	Socio-Economic (Indirect impact)	Negative Demolition activities could potentially cause bodily harm to the workers	<ul style="list-style-type: none"> All workers entering the premises to adhere to the Lonmin HSEQ procedures and requirements; PPE to be worn at all times when on site including; <ul style="list-style-type: none"> Safety boots; Safety goggles; Hard hats; Gloves; and Hearing protection Demolition area to be cordoned off and access restricted; No blasting of material allowed; 	Significance	1	Very Low	4	Moderate	4	4	Low				
				Spatial	1							1	1		
				Temporal	1							4	4	3	
				Probability	1							4	4	2	
		Negative Noise and dust from the operations could disturb neighboring settlements and potentially harm workers.	<ul style="list-style-type: none"> As per the EMM requirements, work shall only be allowed between 8h and 17h on weekdays and 8h – 13h on Saturdays with no work allowed on a Sunday or public holiday; PPE to be worn at all times as listed above; No blasting of material allowed. 	Significance	2	Low	2	Low	2	Low	2	Low			
				Spatial	2								1	2	2
				Temporal	3								2	3	3
				Probability	3								4	4	3
		Negative Security of the facility and surrounding communities could be compromised if people flock to the area looking for employment or loitering.	<ul style="list-style-type: none"> Access to be controlled by Lonmin security and only employees of the appointed contractor to be allowed on site; Any day workers required will be interviewed/appointed/collected from the appointed contractors premises and not adjacent to the PMR; 	Significance	1	Low	2	Low	2	Low	2	Low			
				Spatial	2								3	3	3
				Temporal	1								2	2	2
				Probability	4								4	4	3

	Traffic (Direct impact)	Negative During the decommissioning and construction phase construction materials as well as rubble will be delivered to and from site. For short periods traffic around the site will be disrupted due to heavy vehicle traffic	<ul style="list-style-type: none"> As per the EMM requirements, work shall only be allowed between 8h and 17h on weekdays and 8h – 13h on Saturdays with no work allowed on a Sunday or public holiday; Access to and from the site to be controlled by Lonmin Security; 	Significance	1	Very Low	2	Low	2	Low	2	Very Low
				Spatial	2		2		2		2	
				Temporal	1		2		2		2	
				Probability	2		3		3		2	
	Surface Water, Ground Water and Soils (Ground water will be indirectly impacted)	Negative Generation, collection and disposal of building rubble waste	<ul style="list-style-type: none"> All potential recyclable wastes to be separated and stored for recycling; Demarcated areas where waste can be safely contained and stored on a temporary basis during the construction phase should be provided at the hard park; When adequate volumes (not more than 1 month) have accumulated all waste is to be removed from site and disposed of at a licensed facility; Waste is not to be buried on site; Hydro-carbons should be stored in a bunded storage area; All hazardous materials inter alia paints, turpentine and thinners must be stored appropriately to prevent these contaminants from entering the environment; Spill-sorb or similar type product must be used to absorb hydrocarbon spills in the event that such spills should occur; The demarcated construction area to be included into the site storm water management plan as a dirty area. 	Significance	2	Low	2	Moderate	2	Moderate	2	Low
				Spatial	3		3		3		3	
				Temporal	2		2		2		2	
				Probability	3		5		5		3	

Construction Phase of the New Incinerator

The potential impacts of the construction phase are identical to those anticipated for the decommissioning phase of the existing incinerator. Therefore, the impacts for this phase is as the impacts rated above. In addition, the mitigation measures proposed above should also be adhered to during the construction of the new incinerator.

Activity	Aspect	Impact	Mitigation	Criteria	Rating prior to project	Rating prior to mitigation	Cumulative rating	Rating post mitigation
Operational Phase of the New Incinerator								
Storage of Waste	Surface Water, Ground Water and Soils (Ground water will be indirectly impacted)	Negative The storage of the hazardous waste could contaminate the soil that it is in contact with. In addition if rainwater should fall on the waste the water could be contaminated and enter the natural system. This water could also leach into the ground and contaminate ground water.	<ul style="list-style-type: none"> All hazardous wastes to be collected and stored in the designated hazardous waste storage area; Waste storage area to be roofed and concrete floored to prevent ingress of water and contamination of soils; Storage area to also include a bund to contain any spillages that could occur; Ash from incineration to be collected and transported back to the plant for processing; Effluent emanating from the pollution abatement to be collected and disposed of in the current effluent management system on the PMR site; Ensure that the incinerator waste store links up with the current dirty water management system on site; Design and operation of the waste storage area should adhere to the guidelines of the Norms and Standards for the storage of Waste. 	Significance	3	4	4	4
				Spatial	3	3	3	3
				Temporal	3	3	3	3
				Probability	3	5	5	3
					Low	High	High	Low

Storage of Waste	Traffic (Direct impact)	Positive During the operation of the proposed new incinerator waste will be handled and treated on site, reducing the need for waste to be transported from site, hence reducing the number of trucks on the road and risk of spills	<ul style="list-style-type: none"> Ensure that as much waste as possible is treated on site; Ensure that the transport and collection of waste adheres to the Lonmin ISO14001 Waste Management Procedure. 	Significance	1	Very Low	1	Very Low	1	Very Low	1	Very Low
				Spatial	3		2		2			
				Temporal	1		1		1			
				Probability	3		3		3			
Activity	Aspect	Impact	Mitigation	Criteria	Rating prior to project	Rating prior to mitigation	Cumulative rating	Rating post mitigation				
Operation of the Incinerator and reduction of waste streams leaving the site	Safety (Direct impact)	Positive: With the implementation of the incinerator the transport of waste with PGM's will be eliminated. This reduces the risk of employees being held up by syndicates. It also reduces the opportunities for theft from the plant	<ul style="list-style-type: none"> Ensure that all PGM containing waste is incinerated on site; Minimise the transport of waste from the site; Ensure that Lonmin security measures are adhered to all over the incinerator and abatement plant; Lock the temporary storage area with restricted access. 	Significance	4	High	3	Moderate	3	Moderate	3	Moderate Positive
				Spatial	3		3		3			
				Temporal	3		3		3			
				Probability	5		4		4			
		Negative: The baseline ambient air quality in the region is impacted and has consequently been declared a	<ul style="list-style-type: none"> Ensure that the incinerator is constructed with a two stage burner as well as a two stage afterburner Install and maintain the following abatement equipment: <ul style="list-style-type: none"> Venture scrubber; 	Significance	4		4		4		3	
				Spatial	4		4		4		3	

- Incineration of waste	Air Quality and Health (Health will be indirectly impacted)	priority area. The incinerator without abatement technology installed has the potential to produce a range of pollutants that could impact on air quality and human health.	<ul style="list-style-type: none"> ○ Carbon bed; ○ Wet Electrostatic Precipitator; and ○ Cold Filter ● Monitor emissions from the incinerator on a quarterly basis to ensure that the modelled results can be calibrated; ● Ensure that the fuel source as well as the material to be incinerated is monitored 	Temporal	4	High	4	High	4	High	4	Mode-rate
				Probability	5		4		5		4	
Operation of the Incinerator	Employment (Direct impact)	<p>Positive: The operation of the plant will be added to the existing job profiles of existing jobs will be created by the operation of the incinerator.</p>	<ul style="list-style-type: none"> ● Ensure that the community is involved if any employment opportunities arise at the plant. 	Significance	1	Very Low						
				Spatial	1		1		1		1	
				Temporal	1		1		1		1	
				Probability	1		1		1		1	
Decommissioning and Closure Phase												
The potential impacts of the decommissioning of the new waste incinerator are identical to those anticipated for the decommissioning phase of the existing incinerator. Therefore, the impacts for this phase is as the impacts rated in the decommissioning section above.												

