The third and last area (shown in Figure 8-23) is found to the north and north-east of the existing ash facility. This facility has built-in drainage channels around the facility to channel storm water from the site into De Jager's Pan. High water levels in De Jager's Pan have resulted in these channels being filled with water on a semi-permanent basis as shown in the photo below. Furthermore there are several places where this water has seeped from the site to the east down the slope. These areas are mostly covered by sedges and reeds as described above

Figure 8-23 Drainage around the existing ash facility

Eastern Highveld Grassland

The Eastern Highveld Grassland occurs in the Mpumalanga and the Gauteng provinces on the plains between Belfast in the east and the eastern side of Johannesburg in the west extending southwards to Bethal, Ermelo and west of Piet Retief. The landscape is made up of slightly to moderately undulating plains, including some low hills and pan depressions. The vegetation is short dense grassland dominated by the usual Highveld grass composition (*Aristida, Digitaria, Eragrostis, Themeda, Tristachya, etc*.) with small scattered rocky outcrops with wiry, sour grasses and some woody species (*Arcacia caffra, Celtis Africana, Diospyros luciodes subspecies lycioides, Parinari capensis, Protea caffra, P. Welwitschii and Rhus magalismontanum*).

This vegetation unit is considered endangered with a conservation target of 24%. Only a very small fraction is conserved in statutory reserves (Nooitgedacht dam and Jericho dam Nature Reserves) and in private reserves (Holkranse, Kransbank, Morgenstond). Approximately 44% is transformed primarily by cultivation, plantations, mines, urbanisation and by the building of dams. Cultivation may have had a more extensive impact, indicated by land-cover data. No serious alien invasions are reported, but *Acacia mearnsii* can become dominant in disturbed areas.

In terms of the grassland found on site there are several areas used for grazing where the grassland is in a decent condition, however some signs of overgrazing as well as invasion by alien *Acacia mearnsii* and *Eucalyptus spp* are evident. Large sections of the grassland have been converted to agriculture in the southern and eastern parts of the study area, while the development of the power station and its supporting infrastructures has also impacted on a large section of the grassland. Below are photographs of this vegetation unit found in the study area.(Figure 8-24)

Figure 8-24: Eastern Highveld Grassland found to the north (left) and south (right) of Camden Power Station

Disturbance

A major factor found all over the study area is the disturbance of the natural vegetation. Large tracks of land have been changed by cultivation (maize and legumes), mining (coal and borrow pits), industry (power station) and urbanisation (Camden village). Figure 8-25 below provides examples of the source of disturbance across the study area.

Figure 8-25: Disturbances to natural vegetation found along the route

Red data Flora Species

No red data species were found. However species of importance noted on site include the *Boophone disticha.*

8.7.3 Terrestrial Animal Species

Invertebrates

A total of 568 arthropods are recorded for the study area. The large number is mainly due to the wide range of habitat available and the large area covered by the various alternatives.

Reptilia

A total of 3 reptilian species were recorded for the study site.

Amphibia

One amphibian was recorded as occurring within the study area - *Rana angolense*. These species are not restricted in terms of habitat or distribution and none of the species recorded are classified as Red Data species.

Avifauna

A specialist avifauna assessment was undertaken; a summary description of the avifauna which occurs in the study area is given in Section 8.8. For a detailed description of the Avifauna please refer to Appendix G.

Mammalia

Mammal species diversity was low across the bulk of the study area, as very little natural habitat remains. Most of the mammals occur in small pockets of remaining natural vegetation, with a total of 6 species being recorded. Of these only the Aardvark is listed as vulnerable.

8.8 AVIFAUNA

8.8.1 Data Collection

Data collection for the Avifaunal specialist study occurred as a two part study. First the specialist did a desktop study whereby he studied and referred to a series of recognised literature that is considered to be well representative of the study area and Mpumalanga Provinces as a whole. The literature used includes the following:

- Bird distribution data of the Southern African Bird Atlas Project 2 (SABAP2) was obtained from the Animal Demography Unit website (http://sabap2.adu.org.za,), for the Quarter-Degree Grid Cell (QDGC) where the proposed development is located (2630CA).
- The conservation status of all species considered likely to occur in the area was determined as per the most recent iteration of the southern African Red Data list for birds (Barnes 2000), and the most recent and comprehensive summary of southern African bird biology (Hockey et al. 2005). QDGCs are grid cells that cover 15 minutes of latitude by 15 minutes of longitude (15. × 15.), which correspond to the area shown on a 1:50 000 map.
- Additional bird distribution data and a classification of the vegetation types in the QDGCs were obtained from Southern African Bird Atlas Project 1 (SABAP1) (Harrison et al. 1997).
- The Mpumalanga Biobase Report (Emery et al. 2002) was consulted to establish which bird habitats are regarded as conservation priorities in the province.
- Data from the Co-ordinated Avifaunal Road count project (CAR) for the Mpumalanga precincts were obtained (Young, Harrison, Navarro, Anderson and Colahan, 2003). This data was of particular importance in order to establish what densities of large terrestrial birds could be expected to occur in the study area, and especially what the habitat preferences of those species are.
- Interviews were conducted with Ms Ursula Franke, Senior Field Officer: Highveld Crane Conservation Project of the Endangered Wildlife Trust, with regard to the occurrence of cranes and other Red Data species in the Ermelo district.

The second part of the study consisted of a field study. The specialist went out into the field during January 2012. During the field study the birds were counted at all three alternative sites by driving slowly along a pre-determined transect and stopping regularly to scan the surroundings for birds. The number of birds and habitat type for all species seen or heard were recorded. The diversity and abundance of avifauna per habitat type (grassland vs. agriculture) were compared for all three sites combined in order to establish which habitat type supported the greatest variety and abundance of avifauna. The quantity of each habitat type was then measured for each alternative, and the site that contained the lowest quantity of sensitive habitat was deemed to be the preferred alternative for the proposed development.

8.8.2 Regional Description

It is generally accepted that vegetation structure, rather than the actual plant species, influences bird species distribution and abundance (in Harrison *et al.* 1997). Therefore, the vegetation description below does not focus on lists of plant species, but rather on factors which are relevant to bird distribution.

The proposed alignments fall within the grassland biome. The dominant plants in the grassland biome are grass species, with geophytes and herbs also well represented. Grasslands are maintained mainly by a combination of the following factors: relatively high summer rainfall; frequent fires; frost and grazing. These factors preclude the growth of trees

and shrubs. This biome has been largely transformed in South Africa through various land uses such as afforestation, and in Mpumalanga and Gauteng, by crop cultivation and mining. **Sweet grassland** is generally found in the lower rainfall areas - vegetation is taller and sparser, and nutrients are retained in the leaves during winter. **Sour grassland** generally occurs in the higher rainfall areas on leached soils. Many grassland bird species show a preference for sour grassland over sweet or mixed grassland. **Mixed grassland** is a combination or a transition between the two grassland types above.

In the study area itself, short, dense sour grassland is most prevalent, with the dominant grassland type in the study area being Eastern Highveld Grassland (Mucina & Rutherford 2006)

8.8.3 Study area Description

Whilst much of the distribution and abundance of the bird species in the study area can be explained by the description of the broad vegetation type above, it is as important to examine the micro habitats available to birds. These are generally evident at a much smaller spatial scale than the vegetation types, and are determined by a host of factors, such as vegetation type, topography, land use and manmade infrastructure. The land use in the study area is a variety of mixed farming practices. Grazing is developed in parallel with crop farming.

The most important bird micro-habitats other than natural grassland that were identified during the field visit are the following (see Figure 8-26 and Figure 8-27 below for a photographic record of recorded habitat):

Figure 8-26: Cultivated field and Grassland

Figure 8-27: Existing Ash dam and ash disposal facility

- Dry land cultivation: The habitat in the study area has been transformed through dryland cultivation, mostly maize but also other crops. The region has summer rainfall and therefore intensive crop farming is practiced on a wide scale.
- Wetlands and dams: None of the three site alternatives for the proposed ash dump contains any significant wetlands or dams. This habitat is however present in the study area in the form of the existing ash dam (known as De Jagers Pan). This dam characterised by a relatively steep edges with little exposed shallow shoreline. In places, the edges are fringed by bulrush (Typha capensis) and reeds (Phragmites australis). The following bird species represented in Table 8-3 are all potential bird species that could be found at the existing ash dam, and proposed ash dam based on the type of vegetation found around it and the structure of the water edge.

Table 8-3: Potential Waterbird species at the existing and proposed new ash dam

Colloquial Name	***Scientific name***
African Darter	*Anhinga rufa*
African Purple Swamphen	*Porphyrio madagascariensis*
African Rail	*Rallus caerulescens*
African Sacred Ibis	*Threskiornis aethiopicus*
African Spoonbill	*Platalea alba*
Cape Shoveler	*Anas smithii*
Cattle Egret	*Bubulcus ibis*
Common Moorhen	*Gallinula chloropus*
Egyptian Goose	*Alopochen aegyptiaca*
Grey Heron	*Ardea cinerea*
Hamerkop	*Scopus umbretta*
Little Egret	*Egretta garzetta*
Little Grebe	*Tachybaptus ruficollis*
Malachite Kingfisher	*Alcedo cristata*
Pied Kingfisher	*Ceryle rudis*
Purple Heron	*Ardea purpurea*
Red-billed Teal	*Anas erythrorhyncha*

Red-knobbed Coot	*Fulica cristata*
Reed Cormorant	*Phalacrocorax africanus*
Southern Pochard	*Netta erythrophthalma*
Spur-winged Goose	*Plectropterus gambensis*
Three-banded Plover	*Charadrius tricollaris*
Whiskered Tern	*Chlidonias hybrida*
White-breasted Cormorant	*Phalacrocorax lucidus*

It is however important to note that none of the priority avifauna species listed in the Mpumalanga Biobase Report (Emery *et al*. 2002) was recorded by the on-site surveys, but their occurrence cannot be ruled out.

8.9 VISUAL STUDY

The proposed alternatives are all found in a mostly rural landscape that has been infiltrated by mining and industrial development around the power station. The bulk of the study area is utilised for agriculture and coal mining with a varying topography.

8.9.1 Methodology

The methodology adopted for the visual assessment includes the following tasks:

- Examine the baseline information (contours, building dimensions, vegetation, inter alia);
- Determine the area from which the proposed power line may be visible (viewshed);
- Identify the locations from which views of the proposed development may be visible (observation sites), which include buildings and roads;
- Analyse the observation sites to determine the potential level of visual impact that may result from the proposed development; and
- Identify measures available to mitigate the potential impacts.

Each component of the assessment process is explained in detail in the following sections of the Report.

8.9.2 The Viewshed

The viewshed represents the area from which the proposed development would potentially be visible. The extent of the viewshed is influenced primarily by the combination of topography and vegetation, which determine the extent to which the development area would be visible from surrounding areas. The viewshed was determined by Zitholele through the following steps and presumptions:

- The likely viewshed was determined by desktop study (ArcGIS) using contour plans (20 m interval); and
- An offset of 2 m (maximum) for the observer and an offset of 45 m (maximum) for the proposed ash facility were utilized during the spatial analysis.

8.9.3 Visibility Assessment

Site visibility is an assessment of the extent to which the proposed development will potentially be visible from surrounding areas. It takes account of the context of the view, the relative number of viewers, duration of view and view distance.

The underlying rationale for this assessment is that if the proposed facility is not visible from surrounding areas then the development will not produce a visual impact. On the other hand if one or more parts of the facility are highly visible to a large number of people in surrounding areas then the potential visual impact is likely to be high.

Based on a combination of all these factors an overall rating of visibility was applied to each observation point. For the purpose of this report, categories of visibility have been defined as high (H), moderate (M) or low (L).

Assessment Criteria

For the purpose of this report, the quantitative criteria listed in Table 8-4have been determined and used in the Visibility Assessment. The criteria are defined in more detail in the sub-section following.

Table 8-4: Visual Impact Assessment Criteria

CRITERIA	DEFINITIONS
Category of Viewer	
Static	Farms, homesteads or industries
Dynamic	Travelling along road
View Elevation	
Above	Higher elevation then proposed power lines.
Level	Level view with power lines
Below	Lower elevation then power lines viewed
View Distance	
Long	> 5 km
Medium	1 – 5 km
Short	200 m – 1 000 m
Very Short	< 200 m
Period of View	
Long Term	> 120 minutes
Medium Time	1 – 120 minutes
Short Term	< 1 minute

Category Viewer

The visibility of the proposed development will vary between static and dynamic view types. In the case of static views, such as views from a farmhouse or homestead, the visual relationship between the proposed facility and the landscape will not change. The cone of vision is relatively wide and the viewer tends to scan back and forth across the landscape.

In contrast views from a moving vehicle are dynamic as the visual relationship between the proposed facility is constantly changing as well as the visual relationship between the proposed development and the landscape in which they it is seen. The view cone for motorists, particularly drivers, is generally narrower than for static views.

View Elevation

The elevation of the viewer relative to the object observed significantly influences the visibility of the object by changing the background and therefore the visual contrast. In situations where the viewer is at a higher elevation than the building/structure it will be seen against a background of landscape. The level of visual contrast between the proposed facility and the background will determine the level of visibility. A white/bright coloured structure seen against a background of dark/pale coloured tree-covered slopes will be highly visible compared to a background of light coloured slopes covered by yellow/brown dry vegetation.

In situations where the viewer is located at a lower elevation than the proposed facility it will mostly be viewed against the sky. The degree of visual contrast between white coloured structures will depend on the colour of the sky. Dark grey clouds will create a significantly greater level of contrast than for a background of white clouds. Figure 8-28 below illustrates this effect, where the view from above is far less visible.

Figure 8-28: Difference in view from below (left) and above (right)

View Distance

The influence of distance on visibility results from two factors:

- With increasing distance the proportion of the view cone occupied by a visible structure will decline; and
- Atmospheric effects due to dust and moisture in the air reduce the visual contrast between the structure and the background against which they are viewed.

Period of View

The visibility of structures will increase with the period over which they are seen. The longer the period of view the higher the level of visibility. However, it is presumed that over an extended period the level of visibility declines as people become accustomed to the new element in the landscape.

Long term views of the proposed facility will generally be associated with farm houses, informal settlements and a couple of towns located within the viewshed. Short term and moderate term views will generally relate to commuters moving through the viewshed mostly by vehicle.

Site Visibility

The procedure followed by Zitholele to assess Site Visibility involved:

- Generate a viewshed analysis of the area utilizing ArcGIS 10.
- Determine the various categories of observation points (e.g. Static, Dynamic)

9 COMPARATIVE ASSESSMENT OF ALTERNATIVES

A detailed comparative assessment was undertaken of the feasible alternatives (Site 1 and Site 3), as well as the "No-Go" alternative. The assessment was undertaken for all four phases of the development (Construction – Post Closure). The assessment was conducted taking cognisance of the Impact Assessment Methodology outlined in Section 3.8.2, and considered:

- Direction of the Impact (Positive / Negative Impact);
- Magnitude / Significance of the Impact;
- Duration / Temporal Scale of the Impact;
- Spatial Scale of the Impact; and
- Probability of occurrence of the impact.

The project impacts were identified and assessed, with and without mitigation measures; and where relevant, cumulative impacts (total project impact + initial baseline impacts to the environment) we also assessed. The residual cumulative impact post mitigation measures were also rated. The detailed comparative assessment is presented in Chapter 9. A summary of the comparative assessment results is presented in Table 9-1 to Table 9-4. A discussion of the results is presented in this chapter below.

9.1 CONSTRUCTION PHASE

The following key findings from the assessment are pertinent to the construction phase:

General:

- The potential impact risk to the environment from the construction of the proposed Camden Ash Disposal Expansion Facility is relatively low;
- The most significant impact risk to the environment from the Camden Ash Disposal Facility Expansion project, during the construction phase, will be to the Topography, Surface Water and Wetlands Resources, and existing infrastructure. This can be explained as follows:
  - **Topography:** permanent alternation of surface water drainage patterns;
  - **Surface Water and Wetlands:** increased suspended solids and sedimentation of surface water resources from construction activities, decreased recharge of surface water resources from alterations of topography, and installation of a barrier system to prevent water from leaving the contaminated area of the development site; and
  - **Existing infrastructure:** at least three 400kV transmission lines will need to be relocated;

Table 9-1: Summary Results: Comparative Assessment – Construction Phase

		ALTERNATIVE:																			
		Site 1							Site 3A + 3B								"No-Go"						
ENVIRONMENTAL ELEMENT		Risdual Direction of Impact	Residual Degree of Certainty	**Project Impact** - Unmitigated	**Project Impact** - Mitigated	**Status Quo** - Baseline Impact	**Cumulative Impact**	**Residual Impact**	Risdual Direction of Impact	Residual Degree of Certainty	**Project Impact** - Unmitigated	**Project Impact** - Mitigated	**Status Quo** - Baseline Impact	**Cumulative Impact**	**Residual Impact**	Risdual Direction of Impact	Residual Degree of Certainty	**Project Impact** - Unmitigated	**Project Impact** - Unmitigated	**Status Quo** - Baseline Impact	**Cumulative Impact**	**Residual Impact**
CODE:																						
	CONSTRUCTION PHASE																					
G-1	Geology	Negative	Probable	1	1	3.7	3.7	3.7	Negative	Probable	1.1	1.1	3.7	3.7	3.7			0	0	3.7	3.7	3.7
				VLOW	VLOW	HIGH	HIGH	HIGH			LOW	LOW	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH
T-1	Topography	Negative	Definite	3.3	2.7	3.7	3.7	3.7	Negative	Definite	3.7	3.7	3.7	4	4			0	0	3.7	3.7	3.7
				HIGH	MOD	HIGH	HIGH	HIGH			HIGH	HIGH	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH
SLC-1	Soil and Land Capability	Negative	Probable	1.2	0.7	3	3.7	3.3	Negative	Probable	1.3	0.8	3	3.7	3.7			0	0	3	3	3
				LOW	VLOW	MOD	HIGH	HIGH			LOW	VLOW	MOD	HIGH	HIGH			NO	NO	MOD	MOD	MOD
SWW-1	Surface Water and Wetlands	Negative	Probable	2.1	0.9	3.7	3.7	3	Negative	Probable	2.7	1.5	3.7	3.7	3.7			0	0	3.7	3.7	3.7
				MOD	VLOW	HIGH	HIGH	MOD			MOD	LOW	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH
GW-1	Groundwater	Negative	Probable	0.8	0.5	3	3	3	Negative	Probable	0.8	0.5	3	3	3			0	0	3	3	3
				VLOW	VLOW	MOD	MOD	MOD			VLOW	VLOW	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD
TE-1	Terrestrial Ecology	Negative	Definite	1	0.7	3	3	2.7	Negative	Definite	1.1	0.8	3	3.3	3			0	0	3	3	3
				VLOW	VLOW	MOD	MOD	MOD			LOW	VLOW	MOD	HIGH	MOD			NO	NO	MOD	MOD	MOD
AF-1	Avifauna	Negative	Definite	2.4	2.4	3	3	2.7	Negative	Definite	2.1	2.1	3	3	3			0	0	3	3	3
				MOD	MOD	MOD	MOD	MOD			MOD	MOD	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD
AQ-1	Air Quality	Negative	Possible	1.3	0.6	3.3	3.3	3.3	Negative	Possible	1.1	0.5	3.3	3.3	3.3			0	0	3.3	3.3	3.3
				LOW	VLOW	HIGH	HIGH	HIGH			LOW	VLOW	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH
N-1	Noise	Negative	Probable	0.8	0.3	2.7	3	2.7	Negative	Probable	0.5	0.3	2.7	2.7	2.7			0	0	2.7	2.7	2.7
				VLOW	VLOW	MOD	MOD	MOD			VLOW	VLOW	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD
SOC-1	Social Environment	Positive	Probable	0.5	0.5	2.7	2.7	3	Positive	Probable	0.4	0.4	2.7	3	3	Negative	Definite	4.7	0	2.7	4.7	4.7
				VLOW	VLOW	MOD	MOD	MOD			VLOW	VLOW	MOD	MOD	MOD			VHIGH	NO	MOD	VHIGH	VHIGH
EC-1	Economic	Positive	Possible	1	1.3	2.7	3	3	Positive	Possible	0.8	1	2.7	2.1	2.1	Negative	Definite	4.7	0	2.7	4.7	4.7
				VLOW	LOW	MOD	MOD	MOD			VLOW	VLOW	MOD	MOD	MOD			VHIGH	NO	MOD	VHIGH	VHIGH
INF-1	Infrastructure and Traffic	Negative	Probable	4	1	2.7	4.3	1.9	Negative	Probable	4	1	2.7	4.3	1.9			0	0	2.7	2.7	2.7
				HIGH	VLOW	MOD	VHIGH	LOW			HIGH	VLOW	MOD	VHIGH	LOW			NO	NO	MOD	MOD	MOD
V-1	Visual	Negative	Probable	1.2	1	3.7	3.7	3.7	Negative	Probable	1.2	1	3.7	3.7	3.7			0	0	3.7	3.7	3.7
				LOW	VLOW	HIGH	HIGH	HIGH			LOW	VLOW	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH
ArCH-1	Archaeology, Palaeongology, Cultural Heritage	No Impact	Definite	0	0	0	0	0	No Impact	Definite	0	0	0	0	0			0	0	0	0	0
				NO	NO	NO	NO	NO			NO	NO	NO	NO	NO			NO	NO	NO	NO	NO

- All of the aforementioned project impacts can be mitigated to within acceptable levels, and close to baseline conditions;
- With mitigation measures none of the individual construction related impact risks will extend beyond the *local extent*;
- The summary tables indicate that the only positive residual impacts from the construction phase will be to the social and economic environment. With mitigation measures these positive impacts could be a **Moderate Positive Impact** that acts in the long-term;
- The baseline environment is already highly impacted by industrial (Camden Power Station and associated activities), mining (opencast and underground mining), and wide spread agricultural (cultivated lands) activities. The geology, topography, surface water, groundwater, terrestrial and visual environments are most affected; and
- None of the alternatives considered appear to run the risk of impacting the Archaeological, Paleontological and Cultural Heritage environment.

Site1 Alternative:

- The impact risk for Site 1 is less than the impact risk of Site 3;
- All of Site 1's impact risks, with the exception of geology, can be reduced through mitigation measures that are relatively inexpensive and easy to implement with proper prior planning;
- The existing impacts to surface water resources (primarily the De Jager's Pan) can be reduced through mitigation measures (RO Treatment);
- Site 1 is located in close proximity (~500m) to the Camden Village, which although it has been decommissioned still has some residents residing in the area. Camden Village is a sensitive receptor with regards to air quality, noise, and visual impacts; and
- The only residual impacts that are HIGH after the construction phase is complete are the Geological, Topographic, Groundwater, and Visual impacts. This is as a result of the already highly impacted receiving environment. The project will not increase the significance of these existing impacts, but mitigation measures cannot reduce these impacts either.

Site 3 Alternative:

- All impacts with the exception of geology, topography and soil / land capability impacts, can be reduced through mitigation measures that are relatively inexpensive and easy to implement with proper prior planning;
- Site 3 is substantially larger than Site 1 and will affect much larger areas of economically productive cultivated lands, splitting these into smaller uneconomic farming units. Mitigation measures will not reduce the residual significance of this impact;

- The topography on Site 3 is such that two sites will be required to accommodate the total waste stream. Both site components (Site 3A and site 3B) combined are in excess of 19,7 % larger than Site 1, increasing the impact footprint;
- Site 3 will be more costly to construct because of the larger area requiring lining, the longer distances for pipelines, the more complicated and expensive crossing of the Richards Bay Coal Line;
- Site 3A and Site 3B are located on either side of a watershed, thus resulting in a dispersive effect for ground and surface water pollution, as opposed to Site 1 which is smaller and flows only in one direction;
- This site is more remote and thus is less visible, and affects less of the local population (only remote workers and landowner dwellings). The site is not far enough removed from Camden Village or Ermelo that the impact risk to air quality can be reduced; and
- The site is located on the opposite side of the Richards Bay Coal Line which will need to be crossed by all supporting services (i.e. roads, return water pipelines, and slurry pipelines). This is considered a very high risk to the project constructions and operations activities.

No-Go Alternative

- None of the construction related impacts described for Site 1 or Site 3 will be experienced if the Camden Ash Disposal Facility Expansion project is not implemented.
- If the Camden Ash Expansion Project is not constructed then none of the positive social and economic impacts from the project will be realised;
- Furthermore, without the expanded ash facilities the Camden Power Station will need to be shut down, removing 1 510 MW of power from the national grid (3,4 % of Eskom's installed generation capacity) which will cause nationwide blackouts. The impact risk to the receiving environment is thus:
  - Significance / Magnitude: VERY HIGH;
  - Spatial Scale of Impact: NATIONAL;
  - Duration: LONG TERM;
  - Probability of Impact: GOING TO HAPPEN; and
- The secondary impacts to the economy are just as far reaching, and will also be of a VERY HIGH nationwide, long term impact, that is certain to occur.

9.2 OPERATIONAL PHASE

The following key findings from the assessment are pertinent to the Operational Phase:

General:

- The potential impact risk to the environment from the operation of the proposed Camden Ash Disposal Expansion Facility is also relatively low;
- The most significant risk to the environment from the Camden Ash Disposal Facility Expansion project, during the operational phase, will be to the Soil and Land Capability, and groundwater environment. This can be explained as follows:
  - **Soil and Land Capability:** leachate may form below the facility and will pollute soil resources;
  - **Groundwater:** leachate draining from the facility could percolate through soil and into groundwater resources.
- All of the aforementioned impacts can be mitigated to within acceptable levels;
- With mitigation measures the operational phase related impact risks do not extend beyond the *local extent*; and
- Similarly to the construction phase the positive impacts that will occur will be to the social and economic environment. With mitigation measures these impacts can be elevated to a **Moderate Positive Impact** that acts in the Long-Term.

Site1 Alternative:

- The comparative assessment indicates that Site 1 has a lower risk to the environment than Site 3 for the same reasons as documented in Section 5.2.

Site 3 Alternative:

- Site 3 having higher environmental risks will also be more costly to operate as it will consist of two sites, which sum into a larger footprint.

No-Go Alternative

- If the Camden Ash Expansion Project is not constructed it will reduce the operational life of the power station by 19 years. The employment opportunities lost will be exceptionally high;
- If the Camden Ash Expansion Project is not constructed then none of the positive social and economic impacts from the project will be realised; and
- The impact of closing Camden Power Station will be felt at the national level both socially and economically in excess of the 19 year life expansion.

Table 9-2: Summary Results: Comparative Assessment – Operational Phase

		ALTERNATIVE:																				
		Site 1							Site 3A + 3B								"No-Go"						
ENVIRONMENTAL ELEMENT		Risdual Direction of Impact	Residual Degree of Certainty	**Project Impact** - Unmitigated	**Project Impact** - Mitigated	**Status Quo** Baseline Impact	**Cumulative Impact**	**Residual Impact**	Risdual Direction of Impact	Residual Degree of Certainty	**Project Impact** - Unmitigated	**Project Impact** - Mitigated	**Status Quo** Baseline Impact	**Cumulative Impact**	**Residual Impact**	Risdual Direction of Impact	Residual Degree of Certainty	**Project Impact** - Unmitigated	**Project Impact** - Unmitigated	**Status Quo** Baseline Impact	**Cumulative Impact**	**Residual Impact**
CODE:																						
	OPERATIONAL PHASE																					
G-2	Geology	Negative	Probable	0	0	3.7	3.7	3.7	Negative	Probable	0	0	3.7	3.7	3.7			0	0	3.7	3.7	3.7
				NO	NO	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH
T-2	Topography	Negative	Definite	0	0	3.7	3.7	3.7	Negative	Definite	0	0	3.7	4	4			0	0	3.7	3.7	3.7
				NO	NO	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH
SLC-2	Soil and Land Capability	Negative	Probable	1.8	1	3	3.7	3.3	Negative	Probable	2	1.2	3	3.7	3.7			0	0	3	3	3
				LOW	VLOW	MOD	HIGH	HIGH			LOW	LOW	MOD	HIGH	HIGH			NO	NO	MOD	MOD	MOD
SWW-2	Surface Water and Wetlands	Negative	Probable	1.9	0.8	3.7	3.7	2.7	Negative	Probable	2.4	1	3.7	3.7	3.7			0	0	3.7	3.7	3.7
				LOW	VLOW	HIGH	HIGH	MOD			MOD	VLOW	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH
GW-2	Groundwater	Negative	Probable	2.7	0.8	3	3.3	3	Negative	Probable	2.7	0.8	3	3.3	3			0	0	3	3	3
				MOD	VLOW	MOD	HIGH	MOD			MOD	VLOW	MOD	HIGH	MOD			NO	NO	MOD	MOD	MOD
TE-2	Terrestrial Ecology *(The direction of the project impact is positive, although the residual impact remains negative)*	Negative	Definite	1.4	2.7	3	3	2.7	Negative	Definite	1.4	2.7	3	3.3	3			0	0	3	3	3
				LOW	MOD	MOD	MOD	MOD			LOW	MOD	MOD	HIGH	MOD			NO	NO	MOD	MOD	MOD
AF-2	Avifauna	Negative	Definite	0	0	3	3	3	Negative	Definite	0	0	3	3	3			0	0	3	3	3
				NO	NO	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD
AQ-2	Air Quality	Negative	Possible	1.3	0.8	3.3	3.3	3.3	Negative	Possible	1.2	0.7	3.3	3.3	3.3			0	0	3.3	3.3	3.3
				LOW	VLOW	HIGH	HIGH	HIGH			LOW	VLOW	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH
N-2	Noise	Negative	Probable	0	0	2.7	2.3	2.3	Negative	Probable	0	0	2.7	2.3	2.3			0	0	2.7	2.7	2.7
				NO	NO	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD
SOC-2	Social Environment	Positive	Probable	0.3	0.6	2.7	2.7	2.7	Positive	Probable	0.6	0.9	2.7	2.7	2.7	Negative	Definite	0	0	2.7	4.7	4.7
				VLOW	VLOW	MOD	MOD	MOD			VLOW	VLOW	MOD	MOD	MOD			NO	NO	MOD	VHIGH	VHIGH
EC-2	Economic	Positive	Definite	0	0	2.7	3	3	Positive	Definite	0	0	2.7	2.4	2.4	Negative	Definite	0	0	2.7	4.7	4.7
				NO	NO	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD			NO	NO	MOD	VHIGH	VHIGH
INF-2	Infrastructure and Traffic	Negative	Definite	0	0	2.7	4.3	2.7	Negative	Definite	0	0	2.7	4.3	2.7			0	0	2.7	2.7	2.7
				NO	NO	MOD	VHIGH	MOD			NO	NO	MOD	VHIGH	MOD			NO	NO	MOD	MOD	MOD
V-2	Visual	Negative	Definite	2.3	2	3.7	3.7	3.7	Negative	Definite	2.3	2	3.7	3.7	3.7			0	0	3.7	3.7	3.7
				MOD	LOW	HIGH	HIGH	HIGH			MOD	LOW	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH
ArCH-2	Archaeology, Palaeongology, Cultural Heritage	No Impact	Definite	0	0	0	0	0	No Impact	Definite	0	0	0	0	0			0	0	0	0	0
				NO	NO	NO	NO	NO			NO	NO	NO	NO	NO			NO	NO	NO	NO	NO

9.3 CLOSURE PHASE – PROPOSED ASH DISPOSAL FACILITY

The following key findings from the assessment are pertinent to the Closure Phase:

General:

- Closure activities for both site alternatives will have a positive effect on the impacts incurred by this project, helping to remediate such impacts. In some instances closure activities when seen in conjunction with mitigation measures undertaken throughout the project will reduce the already highly impacted baseline environment (i.e. surface water and wetlands, and terrestrial ecology).
- The most significant risk to the environment from the Camden Ash Disposal Facility Expansion project, during the closure phase, will be to the Groundwater and Visual elements of the receiving environment. This can be explained as follows:
  - **Visual Environment:** capping and vegetation of the dam will have a positive impact and must be implemented failure to implement will have substantial negative impacts post closure;
  - **Groundwater:** the leachate draining from the facility will percolate through soil and into groundwater resources if a barrier system is not installed.
- All of the aforementioned impacts can be improved substantially through mitigation measures;
- With mitigation measures the closure related impact risks do not extend beyond the local extent; and
- Similarly to the construction phase the positive impacts that will occur will be to the social and economic environment. With mitigation measures these impacts can be elevated to a **Moderate Positive Impact** that acts in the Long-Term.

Site1 Alternative:

- The comparative assessment indicates during the closure phase there is very little difference between Site 1 and Site 3 alternatives.

Site 3 Alternative:

- Site 3 will be more costly to close as it will consist of two sites and a 19,7 % larger area compared to Site 1.

No-Go Alternative

- The impact of stopping power generation (and ash producing) activities at Camden Power Station will be felt at the national level both socially and economically beyond the closure phase of the project.

Table 9-3: Summary Results: Comparative Assessment – Closure Phase

		ALTERNATIVE:																				
		Site 1							Site 3A + 3B							"No-Go"						
ENVIRONMENTAL ELEMENT		Risdual Direction of Impact	Residual Degree of Certainty	Project Impact - Unmitigated	Project Impact - Mitigated	Status Quo Baseline Impact	Cumulative Impact	Residual Impact	Risdual Direction of Impact	Residual Degree of Certainty	Project Impact - Unmitigated	Project Impact - Mitigated	Status Quo Baseline Impact	Cumulative Impact	Residual Impact	Risdual Direction of Impact	Residual Degree of Certainty	Project Impact - Unmitigated	Project Impact - Unmitigated	Status Quo Baseline Impact	Cumulative Impact	Residual Impact
CODE:																						
	CLOSURE PHASE																					
G-3	Geology	Negative	Probable	0	0	3.7	3.7	3.7	Negative	Probable	0	0	3.7	3.7	3.7			0	0	3.7	3.7	3.7
				NO	NO	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH
T-3	Topography	Negative	Probable	1.6	3	3.7	3.3	2.7	Negative	Probable	1.6	3	3.7	3.7	2.9			0	0	3.7	3.3	2.7
				LOW	MOD	HIGH	HIGH	MOD			LOW	MOD	HIGH	HIGH	MOD			NO	NO	HIGH	HIGH	MOD
SLC-3	Soil and Land Capability	Negative	Probable	1.9	0.6	3	3.7	3.3	Negative	Probable	2.1	0.6	3	3.7	3.7			0	0	3	3	3
				LOW	VLOW	MOD	HIGH	HIGH			MOD	VLOW	MOD	HIGH	HIGH			NO	NO	MOD	MOD	MOD
SWW-3	Surface Water and Wetlands	Negative	Probable	1.2	0.5	3.7	3.7	2.7	Negative	Probable	1.5	0.6	3.7	3.7	2.7			0	0	3.7	3.7	3.7
				LOW	VLOW	HIGH	HIGH	MOD			LOW	VLOW	HIGH	HIGH	MOD			NO	NO	HIGH	HIGH	HIGH
GW-3	Groundwater	Negative	Probable	1.1	0.5	3	3.3	3	Negative	Probable	1.1	0.5	3	3.3	3			0	0	3	3	3
				LOW	VLOW	MOD	HIGH	MOD			LOW	VLOW	MOD	HIGH	MOD			NO	NO	MOD	MOD	MOD
TE-3	Terrestrial Ecology *(The direction of the project impact is positive, although the residual impact remains negative)*	Negative	Probable	1	1.5	3	3	2.7	Negative	Probable	1	1.5	3	3.3	3			0	0	3	3	3
				VLOW	LOW	MOD	MOD	MOD			VLOW	LOW	MOD	HIGH	MOD			NO	NO	MOD	MOD	MOD
AF-3	Avifauna	Negative	Definite	0	0	3	3	3	Negative	Definite	0	0	3	3	3			0	0	3	3	3
				NO	NO	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD
AQ-3	Air Quality	Negative	Possible	1.3	0.8	3.3	3.3	2.7	Negative	Possible	1.3	0.8	3.3	3.3	2.7			0	0	3.3	3.3	2.7
				LOW	VLOW	HIGH	HIGH	MOD			LOW	VLOW	HIGH	HIGH	MOD			NO	NO	HIGH	HIGH	MOD
N-3	Noise	Negative	Probable	0	0	2.7	2.3	2.3	Negative	Probable	0	0	2.7	2.3	2.3			0	0	2.7	2.7	2.7
				NO	NO	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD
SOC-3	Social Environment	Positive	Probable	0	0	2.7	2.7	1.8	Positive	Probable	0	0	2.7	2.7	1.8	Negative	Definite	0	0	2.7	4.7	4.7
				NO	NO	MOD	MOD	LOW			NO	NO	MOD	MOD	LOW			NO	NO	MOD	VHIGH	VHIGH
EC-3	Economic	Positive	Definite	0	0	2.7	3	3	Positive	Definite	0	0	2.7	2.4	2.4	Negative	Definite	0	0	2.7	4.7	4.7
				NO	NO	MOD	MOD	MOD			NO	NO	MOD	MOD	MOD			NO	NO	MOD	VHIGH	VHIGH
INF-3	Infrastructure	Negative	Definite	0	0	2.7	4.3	2.7	Negative	Definite	0	0	2.7	4.3	2.7			0	0	2.7	2.7	2.7
				NO	NO	MOD	VHIGH	MOD			NO	NO	MOD	VHIGH	MOD			NO	NO	MOD	MOD	MOD
V-3	Visual	Negative	Probable	0.7	3.3	3.7	3.7	2.7	Negative	Probable	0.3	3.3	3.7	3.7	3.3			0	0	3.7	3.7	3.3
				VLOW	HIGH	HIGH	HIGH	MOD			VLOW	HIGH	HIGH	HIGH	HIGH			NO	NO	HIGH	HIGH	HIGH
ArCH-3	Archaeology, Palaeongology, Cultural Heritage	No Impact	Definite	0	0	0	0	0	No Impact	Definite	0	0	0	0	0			0	0	0	0	0
				NO	NO	NO	NO	NO			NO	NO	NO	NO	NO			NO	NO	NO	NO	NO

9.4 POST CLOSURE PHASE – ASH DISPOSAL FACILITY

The activities during the Post Closure Phase are the same for both alternatives and consist primarily of monitoring and maintenance of rehabilitated areas until a stable and sustainable condition is reached.

The residual impacts between the two alternatives is very similar, the impacts with regards to topography, soil and land capability, and terrestrial ecology are slightly higher (not enough to change the rating category); whilst the visual impacts are more substantial such that the rating category for Site 3 is HIGH by comparison to Site 1 which is considered MODERATE.

The comparative impact assessment indicates that the residual impacts post closure for the No-Go alternative is substantially higher than either of the other two alternatives and as such should not be pursued.

Table 9-4: Summary Results: Comparative Assessment – Post Closure Phase

		ALTERNATIVE:								
		Site 1			Site 3A + 3B			"No-Go"		
ENVIRONMENTAL ELEMENT		Risdual Direction of Impact	Residual Degree of Certainty	Residual Impact	Risdual Direction of Impact	Residual Degree of Certainty	Residual Impact	Risdual Direction of Impact	Residual Degree of Certainty	Residual Impact
CODE:										
	CLOSURE PHASE									
G-3	Geology	Negative	Probable	3.7 HIGH	Negative	Probable	3.7 HIGH			3.7 HIGH
T-3	Topography	Negative	Probable	2.7 MOD	Negative	Probable	2.9 MOD			2.7 MOD
SLC-3	Soil and Land Capability	Negative	Probable	3.3 HIGH	Negative	Probable	3.7 HIGH			3 MOD
SWW-3	Surface Water and Wetlands	Negative	Probable	2.7 MOD	Negative	Probable	2.7 MOD			3.7 HIGH
GW-3	Groundwater	Negative	Probable	3 MOD	Negative	Probable	3 MOD			3 MOD
TE-3	Terrestrial Ecology *(The direction of the project impact is positive, although the residual impact remains negative)*	Negative	Probable	2.7 MOD	Negative	Probable	3 MOD			3 MOD
AF-3	Avifauna	Negative	Definite	3 MOD	Negative	Definite	3 MOD			3 MOD
AQ-3	Air Quality	Negative	Possible	2.7 MOD	Negative	Possible	2.7 MOD			2.7 MOD
N-3	Noise	Negative	Probable	2.3 MOD	Negative	Probable	2.3 MOD			2.7 MOD
SOC-3	Social Environment	Positive	Probable	1.8 LOW	Positive	Probable	1.8 LOW	Negative	Definite	4.7 VHIGH
EC-3	Economic	Positive	Definite	1.8 LOW	Positive	Definite	2.4 MOD	Negative	Definite	4.7 VHIGH
INF-3	Infrastructure	Negative	Definite	2.7 MOD	Negative	Definite	2.7 MOD			2.7 MOD
V-3	Visual	Negative	Probable	2.7 MOD	Negative	Probable	3.3 HIGH			3.3 HIGH
ArCH-3	Archaeology, Palaeongology, Cultural Heritage	No Impact	Definite	0 NO	No Impact	Definite	0 NO			0 NO

9.5 CONCLUSIONS FROM THE COMPARATIVE ASSESSMENT

The following conclusions and recommendations can made when reviewing the summary results of the comparative assessment presented above:

- The No-Go alternative is fatally flawed and the project should proceed;
- Site 1 is the preferred alternative through all phases of the project and should be implemented;
- Although Site 3 is a feasible alternative it more difficult to manage and will have wider impacts to the biophysical, social and economic environment;
- The following key aspects of Site 1 are considered advantages:
  - a single facility solution that is easier to construct and manage;
  - the site is more than 19,7 % smaller than Site 3 when all infrastructure is combined;
  - there is less impact to land use and agricultural activities;
  - drainage of the site is in one direction, allowing for impacts to be contained and managed easier;
  - this solution allows for easier and more cost effective integration with existing infrastructure;
  - the site does not cross the Richards Bay Coal Line;
  - no complicated mitigation measures are required in order to reduce the impact on the receiving environment;
  - with the exception of installing a barrier system (which is very costly, and also applicable to Site 3) all mitigation measures are relatively inexpensive to implement;
  - this site is the lease costly to construct and operate;
  - the impact risk post closure does not result in an increase of the current baseline impacts to the receiving environment; and
  - there are no substantial water resources in close proximity to the site;
- The following key aspects of Site 1 are considered disadvantages:
  - The site is close to the Camden Village; and
  - The site is visible from the N2

10 ENVIRONMENTAL IMPACT STATEMENT

10.1 IMPACT ASSESSMENT METHODOLOGY

The impact assessment methodology used in the compilation of the Environmental Impact Statement (EIS) and related impact assessment matrix is described in more detail below.

Approach to Assessing Impacts:

- Impacts are assessed separately for the construction, operational, closure, and post-closure phases of the project;
- Impacts to each environmental element documented in the baseline description above are considered in the impact assessment;
- Impacts are described according to the project impact, cumulative impact, mitigation measures and residual impact as follows:
  - The project impact assesses the potential impact of the development on an environmental element;
  - The cumulative impact on an environmental element is the description of the project impact combined with any initial baseline impacts that occur;
  - Mitigation measures that could reduce the impact risk are then prescribed; and
  - The residual impact describes the cumulative impact after the implementation of mitigation measures.
- Impacts are rated against a predetermined set of criteria including (magnitude, duration, spatial scale, probability, and direction of impact);
- Identified impacts are combined by weighting to produce a combined impact rating for each environmental element;
- Each impact is rated with and without mitigation measures; and
- A rating matrix is provided for each environmental element per project phase summarising all the aforementioned in a single table and giving a full breakdown of how the impact risk rating was calculated to produce the EIS.

More detailed description of each of the assessment criteria and any abbreviations used in the rating matrix is given in the following sections.

Magnitude / 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 km^2) 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 10-1 below.

Table 10-1: Description of the significance rating scale.

Rating Matrix			Description
Score	Abbrev.	Category	Explanation
0	NO	NO IMPACT	There is no impact at all - not even a very low impact on a party or system.
1	VLOW	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.
2	LOW	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.
3	MOD	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.
4	HIGH	HIGH	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 but they are more difficult, expensive, time-consuming or some combination of these.
5	VHIGH	VERY 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.

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 10-2.

Table 10-2: Description of the spatial rating scale.

Rating Matrix			Description
Score	Abbrev.	Category	Explanation
####	N/A	*NO IMPACT*	Not Applicable / No Impact
1	ISO	*Development Site / Isolated Site*	The impact will affect an area no bigger than the servitude.
2	STUDY	*Study Area*	The impact will affect a route corridor not exceeding the boundary of the corridor.
3	LOCAL	*Local*	The impact will affect an area up to 5 km from the proposed route corridor.
4	REG	*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).
5	NAT	*Global / National*	The maximum extent of any impact.

Duration / Temporal 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 10-3.

Table 10-3: Description of the temporal rating scale.

Rating Matrix		Description	
Score	Abbrev.	Category	Explanation
####	N/A	NO IMPACT	Not Applicable / No Impact
1	INC	Incidental	The impact will be limited to isolated incidences that are expected to occur very sporadically.
2	SHORT	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	MED	Medium term	The environmental impact identified will operate for the duration of life of the line.
4	LONG	Long term	The environmental impact identified will operate beyond the life of operation.
5	PERM	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 10-4 below.

Table 10-4: Description of the degree of probability of an impact accruing

Rating Matrix		Category Explanation
Score	Abbrev.	Explanation
1	IMPOS	Practically impossible
2	UNLIKE	Unlikely
3	COULD	Could happen
4	VLIKE	Very Likely
5	OCCUR	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 10-5 below. 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 10-5: 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.

Impact Risk Calculation

To allow for impacts to be described in a quantitative manner in addition to the qualitative description, 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 in Table 10-6:

Table 10-6: Example of rating scale

Impact	Magnitude	Spatial scale	Temporal scale	Probability	Rating
Greenhouse gas emissions	**2**	***3***	**3**	**3**	**1.6**
	LOW	***Local***	**Medium Term**	**Could Happen**	

***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 Table 10-7 below.

Table 10-7: 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 greenhouse gas emissions above, an impact rating of 1.6 will fall in the Impact Class 2, which will be considered to be a Low impact.

Weighting and Combining Impacts

In most cases there are numerous impacts to each environmental element. Each environmental impact is not necessarily equally important, thus it becomes necessary to give a weight to each impact when combining the impact rating into a single score that can be used in the EIS. Impact weightings are also made on a scale of 1 to 5. Where 1 is of least importance and 5 is the most importance. It is important to note that impact weightings are not like impact rankings i.e. two impacts may have the same score, which simply means the impacts are equally important.

Notation of Impacts

In order to make the report easier to read the following notation format is used to highlight the various components of the assessment:

- Significance or magnitude- IN CAPITALS
- Duration – in underline
- Probability – *in italics and underlined.*
- Degree of certainty - **in bold**
- Spatial Scale – *in italics*

10.2 CONSTRUCTION PHASE

10.2.1 Geology

Project Impact (Unmitigated)

From the available literature as well as the observations during the site investigation, it is apparent that the site is underlain by the siltstone, mudstone and sandstone that belong to the Vryheid Formation of the Ecca Group, Karoo Supergroup.

During construction of the ash disposal facility and associated infrastructure the terrain will be profiled using conventional construction methods and equipment. This will require cut and fill operations using conventional plant equipment. In some rare instances, blasting may be required (although this is considered highly unlikely given the current underlying geology). Such cut and fill operations will likely affect only shallow geological strata (typically less than ~10m deep, using the existing topographic fall to create the depth required at facilities). The impact footprint on geology during the construction phase will not be greater than combined footprint of the ash facility and the return water dam 162.1 ha, or 9.4% of the study area.

The combined weighted project impact to geology (prior to mitigation) will **definitely** be of a LOW negative significance, affecting the *development site*. The impact will be permanent and *could possibly occur*. The impact risk class is thus **Moderate**.

Cumulative Impact

The existing impacts to the geology within the study area have occurred as a result of the construction of the power station and its ancillary infrastructure such as the existing ash disposal facility and water storage facilities. Although unverified it is highly likely that these impacts are shallow (less than 10m), having occurred during any cut and fill operations that may have been undertaken during the construction of the aforementioned facilities.

Although not occurring within the study area, there are open cast coal mining activities occurring on the boundary of the study area to the east of Site 2; and within 1km to the north of the boundary of Site 1. Open cast mining activities are highly intrusive, destructive to geology, and usually are much deeper than this proposed project (typically ranging from 15m – 80m deep). Although not located within the study area, it is the EAP's opinion that this impact should be taken into account as it will certainly contribute to the cumulative impact rating on geology given below.

The baseline impacts are considered to be substantial, and thus although the project impact will not increase the significance of the existing baseline impacts, the cumulative unmitigated impact will **probable** be of a MODERATE negative significance, affecting the *local* extent. The impact *is going to happen* and will be permanent. The impact risk class is thus **High**.

Mitigation Measures

There are no mitigation measures that can be implemented to reduce the significance of geological impacts.

Residual Impact

As no mitigation measures are possible the residual impact will be the same as the cumulative impact above i.e. the impact will **probably** be of a MODERATE negative significance, affecting the local extent. The impact is going to happen and will be permanent. The impact risk class is thus **High**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in Section 10.1 above. These ratings are provided in the matrix presented in Table 10-8 below.

Table 10-8: Construction Phase Impact Assessment Matrix: Geology

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
				ALTERNATIVES:	Site 1				
G-1	*Geology*								
	CONSTRUCTION PHASE			5					
Impact 1	Destruction of geology shallow than 10m	Negative	Definite	3	2	1	5	5	**2.7**
					LOW	ISO	PERM	OCCUR	**MOD**
Mitigation Measures:	*None Possible.*				2	1	5	5	**2.7**
					LOW	ISO	PERM	OCCUR	**MOD**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		1.2	0.6	3	3	**1**
					LOW	ISO	MED	COULD	**VLOW**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	Negative	Definite		1.2	0.6	3	3	**1**
					LOW	ISO	MED	COULD	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Probable		3	3	5	5	**3.7**
					MOD	LOCAL	PERM	OCCUR	**HIGH**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		3	3	5	5	**3.7**
					MOD	LOCAL	PERM	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		3	3	5	5	**3.7**
					MOD	LOCAL	PERM	OCCUR	**HIGH**

10.2.2 Topography

Project Impact (Unmitigated)

During construction of the proposed Camden Ash Disposal Expansion facility and its associated infrastructure (incl. AWRD, pipelines and roads) the terrain will be profiled using conventional construction methods and equipment. Profiling of the terrain will be permanent, and will affect surface water drainage patterns beyond the life of the facility. The additional impact will affect an area of ~191.1 ha (11 % of the study area).

Without mitigation measures dirty water can flow freely from the facility into the surrounding environment, from where it can have secondary impacts on the surface water and wetlands located downslope of the facilities; this could be exacerbated by incorrect placement in the topographic landscape, leading to contaminated water flowing into more than one water catchment.

The combined weighted project impact to topography (prior to mitigation) will **probably** be of a MODERATE negative significance, affecting the *study area*. The impact will be permanent and *is going to occur*. The impact risk class is thus **High.**

Cumulative Impact

The topography within the study area has been altered by the Camden Power Station and ancillary infrastructure, most especially the existing ash disposal facility. Approximately 251.45 ha (14.5 %) of the natural topography has been permanently altered within the study area.

Open cast mining activities to the north-east and south-east of the study area are also having further impacts to the topography in the region; and this should be considered when assessing cumulative impacts.

There will definitely be a cumulative impact on topography, the combined impact footprint will be ~421.85 ha (24,36 %) of the study area. The unmitigated cumulative impact will thus **definitely** be of a MODERATE negative significance, affecting the *local* extent. The impact *is going to happen* and will be permanent. The impact class is thus **High.**

Mitigation Measures

- Utilise Site 1 for the development;
- Undertake a detailed water balance analysis to confirm the appropriate sizing and design of clean and dirty water management infrastructure;
- Install a clean water cut-off system that at a minimum ensures that:
  - clean water cut-off canals are installed such that they tie into the adjacent terrain;
  - a free draining profile is established on all clean areas, and that storm water is allowed to move unhindered off the site;
  - the clean water cut-off system is designed as close to the facilities as possible to maximise the clean water leaving the site;
  - the clean water cut off system is installed prior to other construction activities are undertaken on the ash dam or AWRD;
- Ensure a profile is established that contains all dirty water within the facility footprint;
- Dirty water must be transferred to the AWRD as soon as practically possible; and
- Ensure that any areas impacted during the construction phase are rehabilitated as soon as practically possible.

Residual Impact

With mitigation measures the residual impact will **definitely** be of a MODERATE negative significance, affecting the *local* extent. The impact *is going to happen* and will be permanent. The impact class is thus **High**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in section 10.1 above. These ratings are provided in the matrix presented in Table 10-9 below.

Table 10-9: Construction Phase Impact Assessment Matrix: Topography

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
T-1	*Topography*								
	CONSTRUCTION PHASE			5					
Impact 1	Alteration of surface water drainage patterns	Negative	Probable	5	3	2	5	5	**3.3**
					MOD	STUDY	PERM	OCCUR	**HIGH**
Mitigation Measures:	*Stormwater management measures, have only one facility, site to drain only in one direction*				2	1	5	5	**2.7**
					LOW	ISO	PERM	OCCUR	**MOD**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		3	2	5	5	**3.3**
					MOD	STUDY	PERM	OCCUR	**HIGH**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	Negative	Definite		2	1	5	5	**2.7**
					LOW	ISO	PERM	OCCUR	**MOD**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Definite		3	3	5	5	**3.7**
					MOD	LOCAL	PERM	OCCUR	**HIGH**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Definite		3	3	5	5	**3.7**
					MOD	LOCAL	PERM	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Definite		3	3	5	5	**3.7**
					MOD	LOCAL	PERM	OCCUR	**HIGH**

10.2.3 Soils and Land Capability

Project Impact (Unmitigated)

During the construction of the ash facility dam wall, access roads, pipelines, trenches / channels, Transmission lines re-routing, and installation of the barrier system impacts will occur to soils and consequently land capability. These impacts will occur as a result of vegetation clearing, excavation and stockpiling of soils, compaction of soils through vehicles traversing the site, and erosion of exposed and agitated soils. Unmanaged and littered waste on site as well as hydrocarbon spillage from construction vehicles / storage areas will further contribute to the pollution of soils.

Either of the barrier systems considered will require clay material in its construction. This material will be purchased from a supplier or a borrow pit will be established to extract this material from a suitable source. The potential impact of a clay borrow pit is not included in this assessment, and will have to be addressed through its own authorisation process if required. In the event that neither option is feasible a geo-synthetic clay liner (or GCL) will be utilised.

The total impact footprint of soils during the construction phase of the project is given in Table 10-10 below.

Table 10-10: Area of Impact per land Capability class

Soils and Land Capability	Study Area Composition (Before Impact)		Impact Footprint		Study Area Composition (After Impact)	
	Area (Ha)	As (%) of Total Study Area	Area (Ha)	As (%) of Study Area Composition	Area (Ha)	As (%) of Total Study Area
Grazing Land Capability	702.2	40.6	75.0	10.8	626.1	36.2
Wetland Soils / Moderate Grazing	43.3	2.5	1.1		43.3	2.5
Water	128.2	7.4			128.2	7.4
Arable Soils / Cultivation	568.4	32.8	138.2	24.3	430.1	24.8
Transformed / Developed	289.3	16.7	2.4	0.8	501.2	30.0
TOTAL	**1731.4**	**100.0**	**216.7**	**12.5**	**1729.0**	**100.0**

The combined weighted project impact to soil and land capability (prior to mitigation) will **definitely** be of a LOW negative significance, affecting the *development site*. The impact will act in the medium term and *very likely to occur*. The impact risk class is thus **Low.**

Cumulative Impact

The bulk of the existing negative impacts to soils within the study area occur as a result of the: Camden Power Station Infrastructure; current ash disposal facility; two borrow pits; Richards Bay Coal Line; Roads; and Transmission Lines. Existing cultivation undertaken in the area is well managed.

Arable and wetland soils occurring in the study area are considered to be of higher sensitivity and/or conservation value than the other soils occurring. Wetland areas were avoided during the site layout phase, and are thus not a differentiating characteristic. The total impact on arable soil will thus be increased to 138,2 ha, a total of 24,3 % of the agricultural soils occurring in the study area.

The baseline impacts are considered to be substantial, and additional project impact (if no mitigation measures are implement) will increase the significance of the existing baseline impacts, the cumulative unmitigated impact will **probably** be of a HIGH negative significance, affecting the *study area* in extent. The impact *is going to happen* and will be permanent. The impact risk class is thus **High**.

Mitigation Measures

- Utilise Alternative 1 because Alternative 3 has a substantially percentage of arable soils that will be impacted;
- Construction waste (such as general waste from offices, paint cans, chemical containers, hydrocarbon contaminated soils etc.) is not to be buried on site, but must be managed in

line with the station's waste management procedures. Any newly established waste management facilities must not exceed the thresholds triggering EIA processes, and must comply with environmental Duty of Care principles. Records of safe disposal of all construction waste generated on site are to be obtained for auditing purposes;

- Hydrocarbons should be stored in a bunded storage area, with a capacity of 110%;
- Spill-sorb or similar type product must be used to absorb hydrocarbon spills in the event that such spills should occur;
- Spread absorbent sand on areas where oil spills are likely to occur, such as the refuelling area in the hard park;
- Hydrocarbon contaminated soils are to be removed to a contained storage area and bio-remediated or disposed of at a licensed facility;
- Avoid unnecessary removal of vegetation cover by demarcating the construction area in advance of construction activities;
- Care must be taken to ensure that in removing vegetation adequate erosion control measures are implemented;
- A storm-water management plan, including sufficient erosion and sediment control measures must be compiled in consultation with a suitably qualified environmental practitioner / control officer during the detailed design phase prior to the commencement of construction;
- Use existing access roads as far as possible;
- All new roads are to include sufficiently designed storm-water protection and erosion and sediment control measures such as cut-off and mitre drains;
- Use berms to minimise erosion where vegetation is disturbed, including hard parks, plant sites, borrow pit and office areas;
- Ensure that the waste body has a storm water drainage system that prevents dirty water from contaminating the adjacent soil ;
- Ensure that the waste disposal facility have appropriate lining/barrier system and a leachate collection system installed to prevent leachate from entering the underlying soil;
- A detailed survey of all topsoil and subsoil is to be undertaken in advance of construction. All useable topsoil and subsoil is to be stripped in advance of the construction phase and stored in a suitably demarcated area for use in rehabilitation of the ash body at a later date;
- Soil stripping needs to be undertaken as follows:
- Soil stripped along road / pipeline construction alignments will be stockpiled upslope of the stripping works or excavation;

- Topsoil of 300mm (including the vegetation and seed bank) will be stripped and stockpiled separately for future use in rehabilitation;
- All useable sub-soils will be stripped and stockpiled separately for later use in capping and rehabilitation of the facility. A soil scientist will be consulted during the construction phase to ensure that all useable subsoil is properly identified;
- Separate stripping and stockpiling of soil layers will be undertaken, especially during construction activities undertaken in wetland areas (such as the construction of the return water pipeline).
- Soil layers will be replaced in the same order as what they were removed i.e. sub-soils, and then top soils. Special care must be taken where different subsoil layers occur in wetland areas (black soils, grey mottled soils, and topsoils);
- All topsoil / subsoil stock piles are to be located upslope and outside of any water-body or wetland area where a risk of erosion may exist. The stockpile will be protected with proper storm water management, erosion and sediment control measures; and
- Wherever possible soil stripping, stockpiling and handling activities should be undertaken during the dry season, especially in wetland areas; and
- All soils should be ameliorated with lime and a suitable N:P:K fertiliser ahead of seeding.

Residual Impact

The impact to soils and land capability will be permanent as pre-development land capability will not be restored, the best that can be hoped to achieve is a post closure land capability tha will be wilderness. In this regard the loss of grazing and arable soils is considered to be substantive (i.e. combined impact of ~200ha). With mitigation measures:

- the impacts will be contained to within the development footprint;
- the smallest impact footprint can be achieved of all alternatives considered; and
- valuable topsoil and sub-soil will be conserved, and reused in the rehabilitation of the area once ashing is complete;

The residual impact to soil and land capability beyond the closure phase of the project will be reduced through mitigation measures but not to within baseline conditions. After mitigation the impacts to soil and land capability will **probably** be of a MODERATE negative significance, affecting the *study area* in extent. The impact *is going to happen* and will be permanent. The impact risk class is thus **High**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in section 10.1 above. These ratings are provided in the matrix presented in Table 10-11 below.

Table 10-11: Construction Phase Impact Assessment Matrix: Soil and Land Capability

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
					ALTERNATIVES: Site 1				
SLC-1	*Soil and Land Capability*								
	CONSTRUCTION PHASE			5					
Impact 1	Sterilisation of agricultural land	Negative	Definite	5	3	1	5	5	**3**
					MOD	ISO	PERM	OCCUR	**MOD**
Mitigation Measures:	*Use Site (smaller area), Stockpile all useable topsoil & Subsoil*				3	1	5	5	**3**
					MOD	ISO	PERM	OCCUR	**MOD**
Impact 2	Loss of soil resources - erosion	Negative	Definite	3	3	1	5	5	**3**
					MOD	ISO	PERM	OCCUR	**MOD**
Mitigation Measures:	*Place soil stockpiles out of water courses, Revegetate Stockpiles, Stormwater Management*				2	1	5	3	**1.6**
					LOW	ISO	PERM	COULD	**LOW**
Impact 3	Pollution of soils	Negative	Definite	3	3	1	4	4	**2.1**
					MOD	ISO	LONG	VLIKE	**MOD**
Mitigation Measures:	*Hydro-carbon management, waste management, Access Control*				1	1	1	1	**0.2**
					VLOW	ISO	INCID	IMPOS	**VLOW**
Impact 4	Net loss of soil volumes and utilistion potential (chemical properties, nutrients, structure etc)	Negative	Definite	3	1	1	4	5	**2**
					VLOW	ISO	LONG	OCCUR	**LOW**
Mitigation Measures:	*Strip and stockpile maximum top soil and subsoil for rehabilitation use. Rehabilitate all areas outside of Dam's storage area.*				1	1	4	5	**2**
					VLOW	ISO	LONG	OCCUR	**LOW**
Impact 5	Compaction of soils	Negative	Definite	3	3	1	4	5	**2.7**
					MOD	ISO	LONG	OCCUR	**MOD**
Mitigation Measures:	*Appropriate ripping and amelioration of construction impacted areas, outside of the Dam's storage area.*				1	1	2	2	**0.5**
					VLOW	ISO	SHORT	UNLIKE	**VLOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		1.8	0.7	3	3.3	**1.2**
					LOW	ISO	MED	VLIKE	**LOW**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	Negative	Definite		1.2	0.7	2.4	2.3	**0.7**
					LOW	ISO	MED	COULD	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Probable		2	2	5	5	**3**
					LOW	STUDY	PERM	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		4	2	5	5	**3.7**
					HIGH	STUDY	PERM	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		3	2	5	5	**3.3**
					MOD	STUDY	PERM	OCCUR	**HIGH**

10.2.4 Surface Water and Wetlands

Project Impact (Unmitigated)

During the construction phase the removal of vegetation and preparation of the construction area will result in a large area of exposed soils. In addition construction vehicles traversing the sites may result in hydrocarbon spillage that may enter the water courses. Without mitigation measures exposed soils will be mobilised during rainfall events which will result in increased sedimentation and turbidity in surface water. Hydrocarbons, even small amounts, entering the surface water resources can have significant detrimental effects on the wetlands

and aquatic environment. Any decrease in water quality will result in a direct impact to surface water and wetland features and the ecological state of these features.

The receiving surface water bodies that could be impacted during the construction phase include:

- The non-perennial water course to the north-west of Site 1, which flows in a north-easterly direction;
- The off stream storage dam located at the co-ordinates: 26°35'38.21"S and 30° 3'59.34"E, is located at the toe of the ARWD and will be impacted; and
- The return water pipeline line will cross a wetland area.

The combined weighted project impact to surface water (prior to mitigation) will **definitely** be of a MODERATE negative significance, affecting the *study area*. The impact will act in the medium term and *is going to occur*. The impact risk class is thus **Moderate**.

Cumulative Impact

The De Jager's Pan has been used as the AWRD for the existing ash disposal facility. As a result the water level of the pan has increased over time to the point where the Camden power station has implemented a RO Plant as a management measure to reduce water levels in the pan. Also, seepage from the existing ash facility has resulted in artificial wetlands establishing in these areas because of continued wetness. These artificial wetland areas are also contaminated with ash and silt from the current disposal facility. In addition the on-going discharge of ash water to the De Jager's Pan has also caused the water quality in the pan to decrease substantially.

The baseline impacts are considered to be substantial, and additional project impact (if no mitigation measures are implement) will increase the significance of the existing baseline impacts, the cumulative unmitigated impact will **definitely** be of a HIGH negative significance, affecting the *local area* in extent. The impact *is going to happen* and will be long term. The impact risk class is thus **High**.

Mitigation Measures

- Construction should be avoided within 100 m from the edge of a surface water body and/or wetland. This is not possible for the Site 3 alternative as the AWRD north of Site 3A is located in the wetland area as indicated on Figure 8-19 and thus the Site 1 alternative is highly recommended for use;
- A wetland / surface water rehabilitation and maintenance plan for the segment of the stream located along the north western boundary of the study area, and indicated on Figure 8-19, must be compiled and implemented as a component of the construction

phase, as a means of improving the quality of wetlands and surface water resources in the area;

- The existing off-stream storage dam located at the co-ordinates: 26°35'38.21"S and 30° 3'59.34"E, needs to be removed and the area rehabilitated as part of the wetland / surface water rehabilitation and maintenance plan mentioned in the bullet above;
- The existing surface / ground- water monitoring plan needs to be updated to account for the proposed project and must include bio-monitoring (quarterly during construction), as well as a hydrocarbon (quarterly during construction), trace metals, ICP-MS, and Cation / Anion constituent monitoring (monthly);
- Demarcated areas where waste generated by construction activities, can be safely contained and stored on a temporary basis for the construction phase, should be provided at the hard park;
- All hazardous materials *inter alia* paints, turpentine and thinners must be stored appropriately to prevent these contaminants from entering the environment;
- Install a dirty-water collection system to prevent contaminated water entering the natural system. This water should be recycled or re-used in the existing power station processes;
- Demarcate the “no-go” areas with tape and ensure that the demarcation remains in place for the duration of the construction works;
- Install an authority approved barrier system at the new ash disposal facility to prevent contamination of the soils and water bodies;
- Once operations at the existing facility cease, ensure that the site is capped, top soiled and re-vegetated prior to leaving the site;
- Ensure that a WULA is obtained from the DWA prior to commencement of any work within 500 m of any wetland / surface water resource;
- In order to mitigate existing impacts that have occurred to the baseline environment the following is recommended:
  - The existing ash disposal facility must during the closure phase be profiled and capped such that clean surface water run-off does not recharge the De Jagers Pan;
  - The polluted water in the De Jagers Pan is treated in an appropriate manner in line with Eskom’s Zero Effluent Discharge policy;
- A suitably qualified professional must be appointed to undertake a search and rescue operation of plant / animal species ahead of the construction phase;
- An alien invasive control programme needs to be established and maintained through all phases of the development; and
- The propagation of low-growing dense vegetation suitable for the habitat such as grasses, sedges or reeds is the best natural method to reduce erosion potential in sensitive areas.

Residual Impact

Mitigation measures will substantially reduce the cumulative impact. The residual impact will **probably** be of a MODERATE negative significance, affecting the *study area* in extent. The impact *is going to happen* and will be long term. The impact risk class is thus **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in section 10.1 above. These ratings are provided in the matrix presented in Table 10-12 below.

Table 10-12: Construction Phase Impact Assessment Matrix: Surface Water and Wetlands

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
SWW-1	*Surface Water and Wetlands*								
	CONSTRUCTION PHASE			5					
Impact 1	Decreased water quality (suspended solids, turbidity, hydro-carbon, chemical, and microbiological)	Negative	Definite	5	3	2	2	5	**2.3**
					MOD	STUDY	SHORT	OCCUR	**MOD**
Mitigation Measures:	*Suitably sized stormwater infrastructure. Water treatment of De Jager's Pan. Build >100m from SW Resources.*				1	1	1	3	**0.6**
					VLOW	ISO	INCID	COULD	**VLOW**
Impact 2	Decreased water quantity - runoff contained in "dirty" area.	Negative	Definite	5	3	2	4	5	**3**
					MOD	STUDY	LONG	OCCUR	**MOD**
Mitigation Measures:	*Clean water cut-off close to facility. Locate facility high on water shed. Use Site 1 (smaller area). Line contaminated areas.*				2	2	4	5	**2.7**
					LOW	STUDY	LONG	OCCUR	**MOD**
Impact 3	Sedimentation of wetlands and surface water resources	Negative	Definite	5	3	2	2	5	**2.3**
					MOD	STUDY	SHORT	OCCUR	**MOD**
Mitigation Measures:	*Suitably sized stormwater infrastructure. Water treatment of De Jager's Pan. Build >100m from SW Resources.*				1	1	1	2	**0.4**
					VLOW	ISO	INCID	UNLIKE	**VLOW**
Impact 4	Reduction in habitat integrity of downstream wetland areas	Negative	Probable	5	1	2	2	3	**1**
					VLOW	STUDY	SHORT	COULD	**VLOW**
Mitigation Measures:	*Suitably sized stormwater infrastructure. Water treatment of De Jager's Pan. Build >100m from SW Resources.*				1	1	1	2	**0.4**
					VLOW	ISO	INCID	UNLIKE	**VLOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		2.5	2	2.5	4.5	**2.1**
					MOD	STUDY	MED	OCCUR	**MOD**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	Negative	Definite		1.3	1.3	1.8	3	**0.9**
					LOW	STUDY	SHORT	COULD	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Probable		4	3	4	5	**3.7**
					HIGH	LOCAL	LONG	OCCUR	**HIGH**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		4	3	4	5	**3.7**
					HIGH	LOCAL	LONG	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		3	2	4	5	**3**
					MOD	STUDY	LONG	OCCUR	**MOD**

10.2.5 Groundwater

Project Impact (Unmitigated)

Cut and fill activities undertaken during the construction of the ash disposal facility, AWRD, and other supporting infrastructure may intersect the shallow perched aquifers occurring within the development footprint. The impact will result in the dewatering of these aquifers during construction. It is unlikely that the deeper production aquifers will be affected by any of the construction activities that will be limited to the shallow soils and geologies present in the area.

The installation of the barrier system, designed to prevent ingress of water / leachate from ash disposal facility and other dirty water management infrastructure such as the solution trenches and AWRD will also prevent recharge from occurring. The total development footprint is only 12.5 % of the study area, and it is unlikely that containing the water recharge over the development footprint will substantially impact the groundwater levels in the area.

In addition, the use of dangerous chemicals during the construction phase such as paints, thinners, solvents and hydrocarbons introduces an environmental risk. Spills occur during the storage, handling, and use of such dangerous chemicals, and in most cases even a small amount entering the environment can cause damage to ecological systems and even pose human health risks.

The combined weighted project impact to groundwater (prior to mitigation) will **definitely** be of a LOW negative significance, affecting the *development site*. The impact will act in the short term and *couldoccur*. The impact risk class is thus **Low**.

Cumulative Impact

The baseline impacts to groundwater in the study area (explained more below) occur as a result of agricultural activities, mining, and the existing ash disposal facility from the Camden Power Station:

- Agricultural activities such as cultivation and livestock farming may contribute contaminants (such as ortho-phosphates and other fertilizers) into the soil and surface water that eventually percolate through to the groundwater;
- Mining activities will likely affect the groundwater quality and quantity[9] as open cast mining results in the dewatering of water carrying aquifers. Water entering open cast mining operations tends to become exposed to contaminated soils, ores, and heavy metals

[9] The extent of the impact from mining activities has not been verified using measurements and analysis and has been rated based on professional experience that such an activity will have on the regional groundwater regime

thereby decreasing their water quality. This impacts occur on the periphery of the study area, and in close proximity to Site 1 (~500m); and

- The leachate from the existing ash disposal facility will affect primarily the water quality. Water percolating through the ash body will pick up contaminants and exit the bottom of the currently unlined ash body as leachate. The leachate, a concentrated form of dissolved pollutants from the ash body, will then recharge to groundwater resources affecting the quality of groundwater resources. Fortunately the existing ash disposal facility (and potential future sites) is located within a climatic zone of significant moisture deficit (a deficit of mean annual precipitation relative to mean annual evaporation), rendering the formation of leachate as an insignificant impact. In addition the Karoo sediments (Vryheid Formation) underlying the study area are relatively impermeable; limiting the spread of possible pollution. The shallow perched aquifer serves as recharge zone along preferential pathways for the deep exploitable aquifer (aquifer that can be utilised for production purposes). However the hydro chemical data gathered during the last two decades from the deep aquifer in the vicinity of the ash stack shows little or no signs of pollution.

The initial impacts to groundwater within the *study area* are not considered to be that substantial, although further afield (the local extent) this impact starts becoming more significant. Additional project impacts are not of such a nature that they will result in a cumulative impact developing during the construction phase of the project.

Therefore in this instance the cumulative baseline impact is determined by the baseline conditions prevalent in the area or initial impact present, which is **probably** of a LOW negative significance, affecting the *local area* in extent. The impact *is going to happen* and will act in the long term. The impact risk class is thus **Moderate**.

Mitigation Measures

- Utilise Site 1 for the construction of the ash disposal facility;
- Site the ash dam north of the sub-catchment watershed, and more than 100m away from the non-perennial stream occurring on the north-west boundary of the area.
- Install clean and dirty water cut off trenches to ensure that clean water is kept clean, and dirty water is contained;
- Ensure a suitable barrier system (i.e. composite barrier system of suitable protection layers / liners, and leak detection system) is installed below all contaminated areas (such as the ash disposal facility, dirty water solution trenches, and the AWRD) to ensure that leachate from the facility does not enter the environment;
- Borehole FBB23 must be sealed properly with a cement bentonite mixture (or similar) to prevent pollutants from entering the groundwater regime directly, as it is in the area recommended for siting the ash disposal facility;

- Install a groundwater monitoring system that ensures that early detection of groundwater pollution can be detected; and
- Trenches should be constructed around the ashing facility to minimise the spreading of pollutants through the shallow perched aquifer.

Residual Impact (Mitigated cumulative impact)

The mitigation measures will ensure that any additional impacts incurred from the construction of the proposed ash disposal facility are reduced in significance, spatial scale, and likelihood of occurrence. However, impacts already incurred from existing activities will not be reduced or mitigated through the implementation of the aforementioned measures.

Should the mitigation measures be implemented then the residual impact will be the same as the cumulative impact presented above i.e. the impact will **probably** be of a LOW negative significance, affecting the *local area* in extent. The impact *is going to happen* and will act in the long term. The impact risk class is thus **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in section 10.1 above. These ratings are provided in the matrix presented in Table 10-13 below.

Table 10-13: Construction Phase Impact Assessment Matrix: Groundwater

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
GW-1	*Groundwater*								
	CONSTRUCTION PHASE			5					
Impact 1	Decreased water quality (suspended solids, turbidity, hydro-carbon, chemical, and microbiological)	Negative	Definite	5	2	1	1	3	**0.8**
					LOW	ISO	INCID	COULD	**VLOW**
Mitigation Measures:	*Hydrocarbon and chemical management.*				1	1	1	1	**0.2**
					VLOW	ISO	INCID	IMPOS	**VLOW**
Impact 2	Decreased water quantity - less recharge to groundwater	Negative	Definite	3	2	1	4	5	**2.3**
					LOW	ISO	LONG	OCCUR	**MOD**
Mitigation Measures:	*None.*				2	1	4	5	**2.3**
					LOW	ISO	LONG	OCCUR	**MOD**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		1.6	0.8	1.7	3	**0.8**
					LOW	ISO	SHORT	COULD	**VLOW**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	Negative	Definite		1.1	0.8	1.7	2	**0.5**
					LOW	ISO	SHORT	UNLIKE	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Probable		2	3	4	5	**3**
					LOW	LOCAL	LONG	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		2	3	4	5	**3**
					LOW	LOCAL	LONG	OCCUR	**MOD**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		2	3	4	5	**3**
					LOW	LOCAL	LONG	OCCUR	**MOD**

10.2.6 Terrestrial Ecology (Flora and Fauna)

Project Impact (Unmitigated)

The project impacts will occur as vegetation is removed from within the proposed footprint of the facility. In addition disturbance to vegetation leads to alien invasive species spreading in an area. These impacts will result in habitat loss and fragmentation. Impacts may be felt as a loss of habitat structure, function, and species composition. Once the facilities are constructed the vegetation will not be re-established until after the facility is rehabilitated and a sustainable vegetation cover is established on the facility. Any fauna present in this proposed footprint will be driven off onto the surrounding habitat.

During the construction phase the vegetation and animal life over the entire development footprint (~216.7 ha) will be impacted. The distribution of this impact per vegetation type is shown in Table 10-14. The greatest percentage of vegetation type impacted is cultivated lands (24% of the cultivated fields within the study area will be impacted), and only 10.8 % of the open grassland occurring the study area will be impacted.

Table 10-14: Vegetation composition and impact areas

Vegetation Type	Study Area Composition (Before Impact)		Impact Footprint Site 1		Study Area Composition (After Impact)	
	Area (Ha)	As (%) of Total Study Area	Area (Ha)	As (%) of Study Area Composition	Area (Ha)	As (%) of Total Study Area
Open Grassland	702.2	40.6	76.1	10.8	626.1	36.2
Moist Grassland	43.3	2.5			43.3	2.5
Water	128.2	7.4			128.2	7.4
Agriculture	568.4	32.8	138.2	24.3	430.1	24.8
Transformed / Developed	289.3	16.7	2.4	0.8	501.2	30.0
TOTAL	**1731.4**	**100.0**	**216.7**	**12.5**	**1729.0**	**100.0**

The natural habitat within the study area is considered highly transformed, more than 50% directly transformed (industrial infrastructure and cultivated land), and 40% is grazed, totalling more than 90% of transformed area. The habitat function will be entirely lost over the area developed for the duration of the construction and operational phase, and partially regained once the site is capped and re-vegetated. The transformation of this area will result in the transformed area increasing from 16.7% to 30% of the study area. Although the vegetation is in a currently transformed state, cultivated and grazing lands (comprising 72.8%) can be rehabilitated and restored to natural habitat if so desired, which will not be the case for areas impacted by the construction of the ash disposal facility – which will be permanently transformed. The conservation value of this land is however not considered to be very high, and the transformation of an additional 13,3 % of the study area is considered to be a low impact.

No red data plant or animal species were identified during site visits, and because of the highly transformed nature of the development site the impact on species composition is expected to be negligible.

The combined weighted project impact to terrestrial ecology (prior to mitigation) will **definitely** be of a LOW negative significance, affecting the *development site*. The impact will act in the medium term and *could occur*. The impact risk class is thus **Very Low**.

Cumulative Impact

The impact to terrestrial ecology described above continues outside of the study area as mining and agricultural activities are systematically impacting on the vegetation and consequently habitat of the region. The grassland biome prevalent in the area is widespread across the South African Highveld, but is poorly conserved, and is through systematic transformation is becoming more threatened.

The cumulative (unmitigated) impact of the project on the terrestrial ecology within context of its surroundings is thus considered **definitely** be of a MODERATE negative significance, affecting the *study area*. The impact will act in the long term and will *is going to happen*. The impact risk class is thus **Moderate**.

Mitigation Measures

- All construction areas should be demarcated prior to construction to ensure that the footprint of the impacts are limited only to the development footprint (including areas where vehicles may traverse);
- A suitable seed mix of indigenous plants should be used in all rehabilitation programmes on the site;
- All alien invasive species on-site should be removed and follow-up monitoring and removal programmes should be undertaken once construction is complete; and
- Adhere to the ESKOM transmission vegetation management guideline when relocating power lines.

Residual Impact

Mitigation measures will reduce the impact footprint and improve the success of any rehabilitation activities undertaken. The residual impact will **definitely** be of a LOW negative significance, affecting the *study area* in extent. The impact will act in the long term and *is going to happen*. The impact risk class is thus **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in section10.1 above. These ratings are provided in the matrix presented in Table 10-15 below.

Table 10-15: Construction Phase Impact Assessment Matrix: Terrestrial Ecology

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
TE-1	*Terrestrial Ecology*								
	CONSTRUCTION PHASE			5					
Impact 1	Destruction of vegetation	Negative	Definite	5	3	1	5	5	3
					MOD	ISO	PERM	OCCUR	MOD
Mitigation Measures:	*Search and Rescue, Alien invasive control, Separate topsoil stripping / stockpiling (including seedbed), Rehab Temp Impact*				2	1	5	5	2.7
					LOW	ISO	PERM	OCCUR	MOD
Impact 2	Loss of faunal populations	Negative	Definite	3	2	1	1	3	0.8
					LOW	ISO	INCID	COULD	VLOW
Mitigation Measures:	*Search and Rescue, Alien invasive control, Rehab Temp Impact Areas*				1	1	1	2	0.4
					VLOW	ISO	INCID	UNLIKE	VLOW
Impact 3	Loss of biodiversity	Negative	Definite	2	2	1	5	3	1.6
					LOW	ISO	PERM	COULD	LOW
Mitigation Measures:	*Harvest Seeds, Alien invasive control, Indigenous Seedmix-Rehab areas, Separate topsoil stripping / stockpiling (including seedbed)*				1	1	5	1	0.5
					VLOW	ISO	PERM	IMPOS	VLOW
Impact 4	Loss of habitat and habitat fragmentation	Negative	Definite	5	3	1	4	5	2.7
					MOD	ISO	LONG	OCCUR	MOD
Mitigation Measures:	*Consecutive Rehab of Dam*				2	1	4	5	2.3
					LOW	ISO	LONG	OCCUR	MOD
Impact 5	Loss of species diversity	Negative	Definite	2	2	1	4	3	1.4
					LOW	ISO	LONG	COULD	LOW
Mitigation Measures:	*Search and Rescue Operations, Seedbank, Separate topsoil stripping and replacement (including seedbed)*				1	1	4	2	0.8
					VLOW	ISO	LONG	UNLIKE	VLOW
Impact 6	Increase in alien invasive species	Negative	Definite	3	3	2	4	5	3
					MOD	STUDY	LONG	OCCUR	MOD
Mitigation Measures:	*Alien invasive control, Indigenous Seedmix - Rehab area*				1	1	4	5	2
					VLOW	ISO	LONG	OCCUR	LOW
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		1.8	0.8	2.6	2.9	1
					LOW	ISO	MED	COULD	VLOW
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	Negative	Definite		1	0.7	2.6	2.6	0.7
					VLOW	ISO	MED	COULD	VLOW
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Definite		3	2	4	5	3
					MOD	STUDY	LONG	OCCUR	MOD
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Definite		3	2	4	5	3
					MOD	STUDY	LONG	OCCUR	MOD
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Definite		2	2	4	5	2.7
					LOW	STUDY	LONG	OCCUR	MOD

10.2.7 Avifauna

The impacts to avifauna were assessed by a specialist consultant; the study is attached in Appendix G.

. The specialist study was used to assist in the rating of the impacts to avifauna presented below.

Project Impact (Unmitigated)

Project impacts to avifauna will occur as natural vegetation is transformed by the construction of the proposed ash disposal facility and its associated infrastructure. The transformation of natural habitat will effectively displace the majority of avifauna currently utilizing the proposed development site to adjacent areas, and will result in the fragmentation of natural grassland habitat.

The impact to vegetation / habitat is assessed separately above. However it appears that there are sufficient adjacent open areas for avifauna species to relocate utilise during the construction phase of the project. The loss of 76.1 ha of grassland is however considered to be a significant impact on Avifauna.

During the specialist study undertaken no red data plant species were found to be foraging or breeding within the area earmarked for development. However, their presence should not be entirely discounted as the specialist study focused on available literature and limited snap shot site visits to the study area.

The combined weighted project impact to avifauna (prior to mitigation) will **definitely** be of a MODERATE negative significance, affecting the *study area*. The impact will act in the long term and will *very likely occur*. The impact risk class is thus **Moderate.**

Cumulative

The proposed development is situated in the grassland biome. The grassland biome in Mpumalanga is under severe threat from many sources, including crop cultivation, industrialisation, afforestation and urbanisation (see for example Alan 1997). The birds least likely to show the effects of these transformations are the small species which are able to persist in small pockets of undisturbed habitat. Conversely, the species most likely to show disrupted patterns of distribution are large species with large home ranges. This is particularly evident in the significant decline of cranes in the Mpumalanga Highveld where numbers have decreased by more than 80% in the past four decades (Barnes 2000). It is conceivable that the perceived absence of larger species such as cranes, bustards and korhaans in the study area may be linked to existing irreversible impacts (roads, industrial development, fences, power lines and agriculture) which have resulted in fragmentation of the remaining grassland. However, there are relatively large tracts of grassland remaining in the study area, and it is not inconceivable that these species may still sporadically use the areas for foraging or even breeding. In this respect, the results of the instantaneous sampling conducted in January 2012, although very valuable to give an indication of what occurs on the site, cannot be regarded as conclusive.

The cumulative impact of losing another ~76.1 ha hectares of grassland bird habitat in the Mpumalanga Highveld should therefore be regarded as a **Moderate** impact within the overall context of existing pressure on natural grassland habitat in Mpumalanga.

Mitigation Measures

- The potential for off-setting the loss of natural grassland by conserving an equivalent quantity and quality of grassland bird habitat elsewhere on the Mpumalanga Highveld should be considered;
- Alternatively, a financial contribution towards a legitimate conservation initiative for threatened grassland avifauna could also be considered as an off-set e.g. a contribution to Birdlife South Africa or the Highveld Crane Conservation Project of the Endangered Wildlife Trust; and
- Maximum use should be made of existing infrastructure (e.g. pipelines, access roads and fencing) to minimise the further fragmentation of natural grassland areas.

Residual Impact

With the successful implementation of the above mitigation measures the residual impact to avifauna will **definitely** be of a LOW negative significance, affecting the *study area* . The impact will act in the long term and *will occur.* The impact risk class is thus **Moderate.**

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in section 10.1 above. These ratings are provided in the matrix presented in Table 10-16 below.

Table 10-16: Construction Phase Impact Assessment Matrix: Avifauna

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
AF-1	*Avifauna*								
	CONSTRUCTION PHASE			5					
Impact 1	Loss of foraging / breeding habitat	Negative	Definite	5	3	2	4	4	**2.4**
					MOD	STUDY	LONG	VLIKE	**MOD**
Mitigation Measures:	*Use Site 3.*				3	2	4	4	**2.4**
					MOD	STUDY	LONG	VLIKE	**MOD**
Impact 2	Electrocutions of birds (will be the same as existing Tx lines)	NO ADDITIONAL IMPACT	Definite		0				**0**
					NO				**NO**
Mitigation Measures:	*Eskom transmission line bird impact reduction standards to be implemented.*				0				**0**
					NO				**NO**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		3	2	4	4	**2.4**
					MOD	STUDY	LONG	VLIKE	**MOD**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	Negative	Definite		3	2	4	4	**2.4**
					MOD	STUDY	LONG	VLIKE	**MOD**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Definite		3	2	4	5	**3**
					MOD	STUDY	LONG	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Definite		3	2	4	5	**3**
					MOD	STUDY	LONG	OCCUR	**MOD**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Definite		2	2	4	5	**2.7**
					LOW	STUDY	LONG	OCCUR	**MOD**

10.2.8 Air Quality

Project Impact (Unmitigated)

Where construction activities are undertaken in conjunction with exposed soils there is a risk of generating dust. Construction vehicles also utilise hydrocarbon fuels and are known to have greenhouse gas exhaust fumes. These impacts are limited to the construction phase.

With regards to dust, the larger particles typically fallout within 500m of the activity, this dust is known for its nuisance factor. Dust fallout on plants will cause a reduction in the plants ability to photosynthesise and may reduce production potential. Beyond 500m the impact from fall out dust is considered negligible. The construction activities will mostly be located more than 500 m from Camden (the closest human settlement); however vehicles traversing the dirt roads to and from site will certainly have an impact on any residents in Camden that have not yet relocated after the village was closed down.

The finer particulates that also result in health impacts are known to travel much further. Sensitive receptors, such as children under 5 years of age and elderly people older than 65 years of age, may be more severely impacted.

No baseline assessment or monitoring was undertaken for the purpose of this study. The assessment given below is based on professional opinion.

The combined weighted project impact during the construction phase to air quality (prior to mitigation) will **possibly** be of a MODERATE negative significance, affecting the *local area*. The impact will act in the short term and will *very likely occur*. The impact risk class is thus **Low.**

Cumulative Impact

The air quality in the area is impacted on by the opencast coal mining activities, Camden Power Station, and agricultural activities in the area. These activities contribute fine particulate and dust particles to the air from exposed soils and spoil stockpiles, dust from vehicle entrainment (heavy mining / construction equipment), ash from the existing ash disposal facility, and stack emissions from the boilers at the power station.

The cumulative impact during the construction phase to air quality (prior to mitigation) will **possibly** be of a MODERATE negative significance, affecting the *regional area*. The current impacts will act for as long as the power station and mining activities are operational and should thus be viewed as operating in the medium term and will *is going to occur*. The impact risk class is thus **High.**

Mitigation Measures

- Ensure that vegetation clearing is limited to only the areas where construction will take place;
- Ensure that “no-go” areas are staked and marked clearly prior to construction commencing;
- Prevent construction vehicles from riding all over the site, and ensure that they stick to pre-determined routes and low speeds;
- Sequence the construction methodology in such a way so as to reduce the area of exposed soil to its minimum extent practically possible;
- Use chemical dust suppression (such as dust-a-side) on areas to be frequently used; and
- Regularly undertake dust suppression using uncontaminated water to ensure that dust mobilisation is prevented.

Residual Impact

The residual impact to air quality during the construction phase will be determined by the baseline impacts and will **possibly** be of a MODERATE negative significance, affecting the *regional area*. The impact will act in the medium term and *is already occurring*. The impact risk class is thus **High.**

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in section 10.1 above. These ratings are provided in the matrix presented in Table 10-17 below.

Table 10-17: Construction Phase Impact Assessment Matrix: Air Quality

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
AQ-1	*Air Quality*								
	CONSTRUCTION PHASE			5					
Impact 1	Greenhouse gas emissions	Negative	Possible	3	2	2	2	5	**2**
					LOW	STUDY	SHORT	OCCUR	**LOW**
Mitigation Measures:	*Reduce energy consumption, Regular vehicle maintenance, Consecutive Rehab*				1	2	2	3	**1**
					VLOW	STUDY	SHORT	COULD	**VLOW**
Impact 2	Nuisance and fall out dust	Negative	Possible	4	4	3	2	5	**3**
					HIGH	LOCAL	SHORT	OCCUR	**MOD**
Mitigation Measures:	*Watering to reduce dust mobilisation, Use Site 3, Revegetate stockpiles, Dust-aside / Chemical Suppressant on Roads.*				2	2	2	3	**1.2**
					LOW	STUDY	SHORT	COULD	**LOW**
Impact 3	Increased particulate matter (PM2.5 and PM10)	Negative	Possible	5	2	3	2	3	**1.4**
					LOW	LOCAL	SHORT	COULD	**LOW**
Mitigation Measures:	*Watering to reduce dust mobilisation, Use Site 3, Revegetate stockpiles, Dust-aside / Chemical Suppressant on Roads.*				2	1	2	2	**0.7**
					LOW	ISO	SHORT	UNLIKE	**VLOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Possible		2.1	2.2	1.6	3.3	**1.3**
					MOD	LOCAL	SHORT	VLIKE	**LOW**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	Negative	Possible		1.4	1.3	1.6	2.1	**0.6**
					LOW	STUDY	SHORT	COULD	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Possible		3	4	3	5	**3.3**
					MOD	REG	MED	OCCUR	**HIGH**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Possible		3	4	3	5	**3.3**
					MOD	REG	MED	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Possible		3	4	3	5	**3.3**
					MOD	REG	MED	OCCUR	**HIGH**

10.2.9 Noise Impact

Project Impact (Unmitigated)

During the construction phase impacts will occur as a result of construction vehicles traversing the site and earth moving activities on site. During the day construction noise will not be noticeable over other background noise already experienced in the area, however during the night time construction noise can carry over vast distances. The Camden Village is located ~1km from the site and represents the nearest sensitive receptor. Noise impacts at night are **probably** going to be of a LOW negative significance, affecting the *study area* in extent, and acting in the short term. The impact is very likely to occur. The impact risk class is **Low.**

Cumulative Impact

The ambient noise environment in the area is impacted on by the open cast mining activities, Camden Power Station, and agricultural activities in the area. These activities introduce noise from blasting, heavy vehicles traversing gravel and surfaced roads, construction vehicles, and massive earth moving equipment.

No baseline assessment or monitoring was undertaken for the purpose of this study. The assessment given below is based on professional opinion.

The cumulative impact during the construction phase from noise (prior to mitigation) will **probably** be of a MODERATE negative significance, affecting the *local area*. The current impacts will act for as long as the power station and mining activities are operational and should thus be viewed as operating in the medium term and *will occur*. The impact risk class is thus **Moderate.**

Mitigation Measures

- Limit construction activities to daylight working hours;
- Inform residents in the Camden Village of construction activities ahead of construction;
- Provide a complaints procedure for stakeholders to raise concerns, follow up, and feedback to stakeholders; and
- Plan vehicle routes ahead of construction and inform stakeholders within 500m of the route of the proposed activities to be undertaken.

Residual Impact

The mitigation measures will ensure that impacts from the construction activities are reduced. None of the mitigation measures will reduce the background noise quality. The residual impact after mitigation measures are implemented will thus be the same as for the initial impact i.e. the residual impact to the ambient noise environment within the study area is **probably** of a LOW negative significance. The impact will act for as long as the activities are undertaken (medium term). The probability is that the impact will occur. The impact class is thus **Moderate.**

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in section10.1 above. These ratings are provided in the matrix presented in Table 10-18 below.

Table 10-18: Construction Phase Impact Assessment Matrix: Noise

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
N-1	*Noise*								
	CONSTRUCTION PHASE			5					
Impact 1	Increased ambient noise levels	Negative	Probable	3	3	3	2	4	**2.1**
					MOD	LOCAL	SHORT	VLIKE	**MOD**
Mitigation Measures:	*6am - 6pm construction time, No Construction on Sundays*				2	1	1	3	**0.8**
					LOW	ISO	INCID	COULD	**VLOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Probable		1.8	1.8	1.2	2.4	**0.8**
					LOW	STUDY	SHORT	COULD	**VLOW**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	Negative	Probable		1.2	0.6	0.6	1.8	**0.3**
					LOW	ISO	INCID	UNLIKE	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Possible		2	3	3	5	**2.7**
					LOW	LOCAL	MED	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		3	3	3	5	**3**
					MOD	LOCAL	MED	OCCUR	**MOD**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		2	3	3	5	**2.7**
					LOW	LOCAL	MED	OCCUR	**MOD**

10.2.10 Social Environment

The impacts to the socio-economic environment were assessed by a specialist consultant. The Social Impact Assessment (SIA) is attached in Appendix M

The social impacts are summarised in the section below, but more detail can be obtained by reading the full report in the attached report.

Project Impact (Unmitigated)

Table 10-19 represents the social change processes that have been identified and the possible social impacts that may result because of these processes. It also identifies the stakeholder group that is most likely to be affected by the process.

Table 10-19: Summary of Socio-economic impacts

Social Change Process	Possible Social Impact	Affected stakeholder group
In-migration	• Increased pressure on local services & infrastructure • Increased incidence of STD's, HIV & AIDS • Disruption to existing power relationships and decision-making structures • Social nuisance e.g. prostitution, damage to property, discrepancy in income of workers	• Vulnerable communities • Surrounding towns • Tourism • Farmers
Resettlement	• Range of social impacts – specific procedures to be followed, best to be avoided • Uncertainty about future	• Vulnerable communities

Social Change Process	Possible Social Impact	Affected stakeholder group
Change in land use	• Decreased access to sources of livelihood resulting in poverty and/or drop in standard of living • Loss of productive land leading to loss of profit leading to job losses • Long term conflict about management of servitudes • Environmental nuisance e.g. noise, dust • Safety hazards • Communication and arrangements surrounding access to properties & management of servitude – can be positive or negative • Loss of sense of place	• Industry • Farmers • Vulnerable communities • Tourism
Deviant social behaviour	• Increase in crime and disorder • Acts of sabotage • Breakdown of traditional values	• Vulnerable communities • Farmers • Industry • Tourism • Surrounding towns
Employment opportunities	• Loss of workers to construction process because of higher pay • Opportunity for local low skill employment • Indirect employment opportunities • Retention of jobs	• Vulnerable communities • Farmers • Industry • Tourism • Surrounding towns
Legal processes	• Uncertainty resulting from EIA process (selection of route) • Fear and anxiety related to the land acquisition process • Feelings related to past experiences of management of servitude – Eskom's social license to operate.	• Industries • Farmers • Vulnerable communities • Tourism • Surrounding towns

The key social impact risks that were identified include employment opportunities; public uncertainty, and retention of jobs. Each of the impact risks described in Table 10-19 is discussed in detail in Appendix M.

Individual social impact risks are rated in the impact matrix in Table 10-20.

It should be noted that some substantial positive impacts can be generated by this project, and the total significance of these positive impacts is whittled away by numerous smaller negative impacts. The potential for mitigation is thus large, and the potential benefits that could be generated by mitigation will show tremendous improvements in the overall rating of this impact.

However, without mitigation the combined weighted project impact to the social environment (prior to mitigation) will **definitely** be of a LOW positive significance, affecting the *study area*. The impact will act in the short term and will be *unlikely to occur*. The impact risk class is thus **Very Low.**

Cumulative Impact

Potential negative cumulative impacts:

- Local businesses in some parts of the project area have already lost labour to other construction processes and this process may escalate that impact.
- As far as the uncertainty is concerned, the perceived impact will be cumulative to the general impact of economic instability due to the worldwide recession, and is therefore not specifically related to the proposed project. Expectations about job creation are also a current reality in South Africa and will be an issue in any project that may generate jobs;
- Cumulative impacts on the agriculture industry may be negative and in the long term contribute to impacts on food production.
- Environmental nuisances that occur during construction will be temporary. Given the fact that there are existing impacts from Camden Power Station, many of the nuisances will be cumulative; and
- People lose faith in the EIA process if they experience a number of these processes in a negative light. The less faith they have in the process the higher the levels of stress and anxiety will be.

Potential positive cumulative impacts:

- The retention of jobs at Camden Power Station is a cumulative impact; and
- Cumulative impacts on local entrepreneurs will be positive and assist in developing their businesses further.

The cumulative impact to the social environment (prior to mitigation) will **definitely** be of a LOW positive significance, affecting the *local area*. The impact will act in the medium term and *will occur*. The impact risk class is thus **Moderate**.

Mitigation Measures

- Site 1 is the recommended site;
- Any infrastructure such as roads which may be impacted on by the project should be maintained in their present condition or improved upon.
- Contractors must adhere to the rules as set down by the property owner. This aspect should be included in their scope of work to ensure that they provide the financial means to execute the necessary maintenance and repair work required. Should they disobey the local rules regarding speeding a fine system must be implemented.
- During construction any incidences must be reported in a complaints register that should be inspected by the social / environmental monitor on a weekly basis. Eskom must audit this document on a monthly basis.
- The contractor should have a person trained in first aid on site to deal with smaller incidents that require medical input.
- Services should be negotiated with landowners and local municipalities and Eskom should audit the agreements that must be put in place to ensure that essential services are not taken away from communities.
- For the duration of the construction phase there must be a well-published, culturally appropriate grievance mechanism. This must be agreed with local communities at the start of the construction period in the area. The communities must give input in the process to ensure ownership.
- Grievances must be dealt with within a certain period.
- All grievances must be recorded in a register stating the grievance, date that it occurred and action taken.
- For the duration of the construction phase the ECO / WMCO will be responsible for assisting the aggrieved person should to complete a form or submission that explains the grievance, the process followed and what the outcomes were;
- Should the provision of bulk-services to contractors be to the detriment of the affected communities, these services should be brought in from outside the affected area.
- When investigating existing accommodation the contractor should ensure that the necessary sanitation services are available and have the capacity to meet the additional needs. This assurance should be given to the contractor in writing.
- Eskom cannot control squatter settlements surrounding towns. The contractor must ensure that no squatter settlements are erected near or adjacent to construction camps. People should be asked to leave before they have the opportunity to settle. The assistance of the local police in this matter will be crucial.
- The contractor must put up signs that no recruitment will take place on site, and all jobseekers must be shown away from site.

- The contractor should not allow his staff to utilise services from squatters. There must be a formal trading area for informal traders, but they must not be allowed to sleep where they trade or set up camps in close proximity to the construction camp.
- HIV/AIDS and Sexually Transmitted Disease (STD) awareness training must form part of the induction of staff.
- Condoms must be freely available on site.
- STD and HIV / AIDS awareness training should be provided in conjunction with local NGOs or the Department of Health;
- The workforce must be discouraged from engaging in casual sexual relationships with local people and informed of the consequences;
- The code of conduct as agreed with the affected communities and landowners should be adhered to;
- No alcohol should be sold in the camps, and the amount of alcohol allowed in the camp should be limited;
- Prostitutes should not be allowed to enter the camp;
- There should be fines for breaking the rules;
- Frequent inspections of the camps should take place, and if non-conformances are found payment to the contractor must be withheld until it is corrected;
- The contractor must take out insurance for the damage of local property – this should be a condition of the contract. The insurance should take the external environment into consideration;
- Develop and implement community relations programme;
- Involve the community in the process as far as possible – encourage co-operative decision-making and management and partnerships with local entrepreneurs;
- Be accessible and sensitive to community needs;
- Unspoilt natural areas should be avoided as far as possible and infrastructure should rather be erected in areas where similar infrastructure already occur, whilst considering cumulative impacts;
- To ensure local service providers benefit as much as possible from the proposed project, the use of these establishments by Eskom and its contractors is recommended;
- Dust suppression must be used;
- No construction work should take place on Sundays, public holidays and during the night;
- Access to the site and the servitude should be controlled as far as possible;
- Local unemployed people must be given preference in the recruitment process;

- Contractor must refrain from employing people who are currently employed in permanent positions;
- There must be employment desks in the towns or settlement areas;
- No recruitment may take place in the construction camps;
- No false expectations must be created and it must be underlined that the employment opportunities are specifically for the unemployed;
- Women must make up a percentage of the workforce;
- Eskom and the contractor must support local entrepreneurs as far as possible;
- It must be acknowledged that there will be local entrepreneurs trying to sell their goods to the construction force. Unless managed carefully this may lead to squatter camps near the construction camps. The contractor should provide a designated area where such services can be provided – the area should ideally form part of the construction camp and be cleared and fenced; and
- No open fires must be allowed. Food should rather be prepared off-site and transported in. Vendors must travel in and out of the area and should not be allowed in the construction area. The social monitor must assist in managing this process.

Residual Impact

Many of the impacts cannot be mitigated to such an extent that they are no longer significant. Many of the impacts will be short term, and disappear after the construction phase. Residual impacts that are mentioned are those impacts that will be long term or permanent. Many of these impacts cannot be managed or controlled by Eskom, as some occur on an individual level.

- Damage to roads may not be repaired for a long period, and as a result local communities and travellers will be exposed to safety risks. The mitigation of this impact lies outside the scope of Eskom. Although they can enter into negotiations with the relevant parties, the influence that they have to prioritise repairs may be limited.
- Another residual impact is STDs and HIV/AIDS. For all practical purposes this is a permanent impact that will be felt on an individual level.
- Unplanned pregnancies resulting in female-headed households are also a long-term residual impact that Eskom can do little about.
- Changes in power relationships and community cohesion may have long-term implications resulting in permanent changes in the community. It must be acknowledged that social change occurs in any event, and that communities can adapt to this change.
- There may be a breakdown of traditional values as a result of crime and external influences.

- Residual impacts will be a positive impact on skills development and economic growth for small-scale entrepreneurs. There may be a negative impact on workers who were temporarily employed and lost their jobs, in that they might struggle to find new employment opportunities.

Should Eskom implement the mitigation, especially related to a community relations programme the results will be a positive neighbourly relationships. The residual impact to the social environment will **probably** be of a MODERATE positive significance, affecting the *local area*. The impact will act in the medium term and *is going to occur*. The impact risk class is thus **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in section 10.1 above. These ratings are provided in the matrix presented in Table 10-20 below.

Table 10-20: Construction Phase Impact Assessment Matrix: Socio-Economic Environment

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
SOC-1	*Social Environment*								
	CONSTRUCTION PHASE			5					
Impact 1	Camden Close Down - loss of employement, loss of electricity	Negative	Definite		0				**0**
					NO				**NO**
Mitigation Measures:	*Don't close down the power station.*				0				**0**
					NO				**NO**
Impact 2	Retention of Jobs	Positive	Definite	5	3	3	3	5	**3**
					MOD	LOCAL	MED	OCCUR	**MOD**
Mitigation Measures:	*None possible*				3	3	3	5	**3**
					MOD	LOCAL	MED	OCCUR	**MOD**
Impact 3	Employment Oportunities - direct and indirect	Positive	Definite	5	2	3	2	2	**0.9**
					LOW	LOCAL	SHORT	UNLIKE	**VLOW**
Mitigation Measures:	*Employ Unemployed Locals*				3	3	3	4	**2.4**
					MOD	LOCAL	MED	VLIKE	**MOD**
Impact 4	Public Uncertainty	Negative	Definite	1	3	2	2	3	**1.4**
					MOD	STUDY	SHORT	COULD	**LOW**
Mitigation Measures:	*Frequent communication, EO/ELO to be appointed, Complaints Register and Feedback, Community Relations Programme*				2	1	2	2	**0.7**
					LOW	ISO	SHORT	UNLIKE	**VLOW**
Impact 5	Deviant social behaviour, Community / Landowner health & safety (crime, STD's)	Negative	Definite	1	3	3	2	3	**1.6**
					MOD	LOCAL	SHORT	COULD	**LOW**
Mitigation Measures:	*Employ Unemployed Locals, Community Policing Forum, No workers housed in site, Access and Work Monitoring, STD*				1	2	2	1	**0.3**
					VLOW	STUDY	SHORT	IMPOS	**VLOW**
Impact 6	Environmental nuisance	Negative	Definite	2	3	3	2	4	**2.1**
					MOD	LOCAL	SHORT	VLIKE	**MOD**
Mitigation Measures:	*Complaints register and Feedback, Fines for breaking rules*				2	3	1	3	**1.2**
					LOW	LOCAL	INCID	COULD	**LOW**
Impact 7	Change in Land Use	Negative	Definite	1	3	1	5	5	**3**
					MOD	ISO	PERM	OCCUR	**MOD**
Mitigation Measures:	*Demarcate impact footprint*				4	1	5	5	**3.3**
					HIGH	ISO	PERM	OCCUR	**HIGH**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Positive	Definite		1.3	1.4	1.3	1.8	**0.5**
					LOW	STUDY	SHORT	UNLIKE	**VLOW**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	Positive	Definite		1.4	1.3	1.4	2	**0.5**
					LOW	STUDY	SHORT	UNLIKE	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Positive	Probable		2	3	3	5	**2.7**
					LOW	LOCAL	MED	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Positive	Probable		2	3	3	5	**2.7**
					LOW	LOCAL	MED	OCCUR	**MOD**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Positive	Probable		3	3	3	5	**3**
					MOD	LOCAL	MED	OCCUR	**MOD**

10.2.11 Economic Environment

Project Impact (Unmitigated)

Both positive and negative economic impacts will occur as a result of the construction of the Camden Ash Disposal Facility. The negative impacts which will occur will primarily be as a result of the cost to build the facility. This direct cost to Eskom will translate into indirect costs to the consumer. Reckless or excessive spending will therefore be counterproductive as electricity costs will increase.

This expenditure will however translate into direct and indirect investment into the South African economy. Limited opportunities for employment and provision of services and goods will be created through this project.

Furthermore, the failure to construct the facility will result in Camden Power Station having to close down since there will not be an ashing space when the current facilities fill up. This will take out a large percentage (3,4 %) of the national grid's electricity capacity. Resulting in shut downs / black-outs. Electricity will become a more sought after commodity, also resulting in increased cost. Besides the direct impacts of job losses of the people employed at Camden, the indirect slowdown of the economy from less available energy will have national ramifications.

The positive economic ramifications from the project are considered to significantly outweigh the negative impacts associated with the cost to construct the facility. The combined weighted project impact to the economic environment (prior to mitigation) will **probably** be of a LOW positive significance affecting the *study area*. The impact will act in the short term and *could occur*. The impact risk class is thus **Very Low.**

Cumulative Impact

Should the project proceed there will definitely be a significant cumulative impact as the power station will remain in operation, retention of jobs, and the creation of additional jobs being two of the most significant economic benefits. Other benefits include the on-going production of almost 3,4 % of the country's electricity.

The cumulative unmitigated impact on the economy will **possibly** be of a MODERATE positive impact. This impact *is going to occur* within the *local* area for the life of the power station (medium term). The impact risk class is thus **Moderate**.

Mitigation Measures

- Ensure that site 1 is developed.
- Employ locally – source local contractor companies, source labour locally, where possible source construction materials from responsible local suppliers; and
- Ensure that procurement is designed to provide the most appropriate costs without compromising on quality, or environmental protection.

Residual Impact

The residual impact to the economic environment as a result of the construction phase will **possibly** be of a MODERATE positive impact that affects the *local extent*. The impact will act in the medium term and *is going to occur*. The impact risk class is thus **Moderate.**

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in section 10.1 above. These ratings are provided in the matrix presented in Table 10-21 below.

Table 10-21: Construction Phase Impact Assessment Matrix: Economic Environment

Rated By: *Warren Kok*
Reviewed By:

				ALTERNATIVES: Site 1					
	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	**Impact Risk**
EC-1	*Economic*								
	CONSTRUCTION PHASE			5					
Impact 1	Camden Close Down - Loss of Economic Development	Negative	Definite		0				**0**
					NO				**NO**
Mitigation Measures:	*Don't close down the power station.*				0				**0**
					NO				**NO**
Impact 2	Employment Oportunities - direct and indirect	Positive	Definite	5	2	3	2	2	**0.9**
					LOW	LOCAL	SHORT	UNLIKE	**VLOW**
Mitigation Measures:	*Employ Unemployed Locals*				3	3	3	4	**2.4**
					MOD	LOCAL	MED	VLIKE	**MOD**
Impact 3	Retention of Jobs	Positive	Definite	5	3	3	3	5	**3**
					MOD	LOCAL	MED	OCCUR	**MOD**
Mitigation Measures:	*None possible*				3	3	3	5	**3**
					MOD	LOCAL	MED	OCCUR	**MOD**
Impact 4	Loss of agricultural production	Negative	Definite	1	3	1	5	5	**3**
					MOD	ISO	PERM	OCCUR	**MOD**
Mitigation Measures:	*None possible*				3	1	5	5	**3**
					MOD	ISO	PERM	OCCUR	**MOD**
Impact 5	Development Cost	Negative	Definite	3	2	1	3	5	**2**
					LOW	ISO	MED	OCCUR	**LOW**
Mitigation Measures:	*Develop Site 1.*				2	1	3	5	**2**
					LOW	ISO	MED	OCCUR	**LOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Positive	Probable		1.7	1.7	2	2.8	**1**
					LOW	STUDY	SHORT	COULD	**VLOW**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	Positive	Probable		2	1.7	2.2	3.3	**1.3**
					LOW	STUDY	MED	VLIKE	**LOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Positive	Possible		2	3	3	5	**2.7**
					LOW	LOCAL	MED	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Positive	Possible		3	3	3	5	**3**
					MOD	LOCAL	MED	OCCUR	**MOD**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Positive	Possible		3	3	3	5	**3**
					MOD	LOCAL	MED	OCCUR	**MOD**

10.2.12 Infrastructure

The construction of the ash disposal facility will require the relocation of three 400kV power lines. The relocation of these power lines will be undertaken as a component of this project. The impact of the power line construction, operation, and decommissioning is thus rated as an integral part of the impact assessment in each of the corresponding sections and is not rated separately. This section is merely included for the sake of completeness.

There will be no interruption in the supply of power and thus the impact to existing infrastructure is rated as NO IMPACT.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in section 10.1 above. These ratings are provided in the matrix presented in Table 10-22 below.

Table 10-22: Construction Phase Impact Assessment Matrix: Traffic and Infrastructure

Rated By: *Warren Kok*
Reviewed By:

				ALTERNATIVES:					
				Site 1					
	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	**Impact Risk**
INF-1	*Infrastructure*								
	CONSTRUCTION PHASE			5					
Impact 1	Inturruption of Electrical Services	Negative	Definite	5	5	5	2	5	**4**
					VHIGH	NAT	SHORT	OCCUR	**HIGH**
Mitigation Measures:	*Construct Tx lines before switching*				0				**0**
					NO				**NO**
Impact 2	Traffic inturruptions	Negative	Possible	5	3	2	2	3	**1.4**
					MOD	STUDY	SHORT	COULD	**LOW**
Mitigation Measures:	*None required*				1	2	2	3	**1**
					VLOW	STUDY	SHORT	COULD	**VLOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		5	5	2	5	**4**
					VHIGH	NAT	SHORT	OCCUR	**HIGH**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	No Impact	Definite		1	2	2	3	**1**
					VLOW	STUDY	SHORT	COULD	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Probable		3	2	3	5	**2.7**
					MOD	STUDY	MED	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		5	5	3	5	**4.3**
					VHIGH	NAT	MED	OCCUR	**VHIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		3	2	2	4	**1.9**
					MOD	STUDY	SHORT	VLIKE	**LOW**

10.2.13 Traffic Impact

Project Impact (Unmitigated)

During the construction phase impacts will occur as a result of construction vehicles which will use existing roads for access.

The combined weighted project impact to the existing traffic environment (prior to mitigation) will **possibly** be of a MODERATE negative significance, affecting the *study area*. The impact will act in the short term and *could occur*. The impact risk class is thus **Low.**

Cumulative Impact

The road network in the study area is already highly impacted by the existing activities being undertaken at a regional extent. During site visits to the area a preponderance of heavy vehicles were observed using the roads for the hauling of coal, and other earth moving

activities. Upgrading of the road network also exacerbates the already negative situation as stop-and-go's in the area reduce the flow of traffic along key route segments.

The additional impact will **likely** produce a small but noticeable cumulative impact to the existing traffic congestion in the area for the duration of the construction phase for those people living in the study area.

The unmitigated cumulative impact to the existing traffic environment (prior to mitigation) will **probably** be of a MODERATE negative significance, affecting the *local area*. The impact will act in the short term and will *very likely occur*. The impact risk class is thus **Moderate.**

Mitigation Measures

- Use existing access roads, and links, on Eskom property wherever possible;
- Undertake access route planning for construction / heavy vehicles and./or abnormal loads ahead of the construction phase;
- Take local farmers and road users into account when sighting the contractors camp / hard park to ensure that impact to existing road users are minimised;
- Build required access roads early in the construction phase;
- Wherever possible ensure that Eskom owned property is used for site access;
- Upgrade roads in the affected area to ensure the damage incurred from vehicle traffic is remediated ; and
- Do not access privately owned land without pre-arranged permission.

Residual Impact

The mitigation measures will ensure that impacts from the construction activities are reduced. None of the mitigation measures will reduce the background traffic congestion. The residual impact after mitigation measures are implemented will thus be the same as for the initial impact i.e. the residual impact to the existing traffic environment will **probably** be of a MODERATE negative significance, affecting the *study area*. The impact will act in the short term and *could occur*. The impact risk class is thus **Low.**

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology as outlined in Section 10.1. These are provided in the impact matrix represented in Table 10-23 below.

Table 10-23: Construction Phase Impact Assessment Matrix: Traffic and Infrastructure

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
					ALTERNATIVES: Site 1				
INF-1	*Infrastructure*								
	CONSTRUCTION PHASE			5					
Impact 1	Inturruption of Electrical Services	Negative	Definite	5	5	5	2	5	**4**
					VHIGH	NAT	SHORT	OCCUR	**HIGH**
Mitigation Measures:	*Construct Tx lines before switching*				0				**0**
					NO				**NO**
Impact 2	Traffic inturruptions	Negative	Possible	5	3	2	2	3	**1.4**
					MOD	STUDY	SHORT	COULD	**LOW**
Mitigation Measures:	*None required*				1	2	2	3	**1**
					VLOW	STUDY	SHORT	COULD	**VLOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		5	5	2	5	**4**
					VHIGH	NAT	SHORT	OCCUR	**HIGH**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	No Impact	Definite		1	2	2	3	**1**
					VLOW	STUDY	SHORT	COULD	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Probable		3	2	3	5	**2.7**
					MOD	STUDY	MED	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		5	5	3	5	**4.3**
					VHIGH	NAT	MED	OCCUR	**VHIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		3	2	2	4	**1.9**
					MOD	STUDY	SHORT	VLIKE	**LOW**

10.2.14 Visual

Project Impact (Unmitigated)

The project impact of the proposed development during construction will be from the earthworks that have to be undertaken. The area will be visible from the roads traversing the area and residence at the Camden Village. Dust, heavy vehicles and construction camps will be characteristic views visible to those in the area. The exposed soils will appear no different to exposed cultivated areas during ploughing and planting.

The combined weighted project impact to the existing visual environment (prior to mitigation) will **definitly** be of a MODERATE negative significance affecting the *study area*. The impact will act in the short term and will *very likely occur*. The impact risk class is thus **Low.**

Cumulative Impact

The present visual landscape is one dominated by agriculture with intermittent rural residences, urban areas and industrial or mining activities. The study site includes the Camden Power Station, Camden Village, the existing ash disposal facility and several existing high voltage power lines that impact on the visual character of the landscape. The additional impact will not significantly alter the extent of the current impacts to the visual environment.

The cumulative impact to the visual environment (prior to mitigation) during the construction phase will **definitly** be of a HIGH negative significance affecting the *local area*. The impact will act in the long term and will *is going to occur*. The impact risk class is thus **High.**

Mitigation Measures

- Only the footprint of the proposed site should be exposed. In all other areas, the natural vegetation should be retained;
- Dust suppression techniques should be in place at all times during the construction phase;
- Access roads should be minimised to prevent unnecessary dust;
- Ensure that dust is monitored as part of the air quality management plan;
- Utilise non-shiny structures for the hard park and toilets, i.e. avoid unpainted roofs; and
- Ensure that all impacted areas during construction are top soiled and revegetated at prior to commencement with the operational phase to resemble the natural landscape.

Residual Impact

The impacts identified and discussed above have been rated according to the impact assessment methodology described in section 10.1 above. These ratings are provided in the matrix presented in Table 10-24 below.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described above. These ratings are provided in the matrix presented in Table 10-24 below.

Table 10-24: Construction Phase Impact Assessment Matrix: Visual Environment

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
				ALTERNATIVES:	Site 1				
V-1	*Visual*								
	CONSTRUCTION PHASE			5					
Impact 1	Visual impact of barrier system installation (all infrastructure)	Negative	Definite	5	3	2	2	5	**2.3**
					MOD	STUDY	SHORT	OCCUR	**MOD**
Mitigation Measures:	*Revegtate topsoil stockpiles, construction site screening*				2	2	2	5	**2**
					LOW	STUDY	SHORT	OCCUR	**LOW**
Impact 2	Visual impact of starter wall - Ash Dam	Negative	Definite	5	3	2	2	5	**2.3**
					MOD	STUDY	SHORT	OCCUR	**MOD**
Mitigation Measures:	*None possible*				2	2	2	5	**2**
					LOW	STUDY	SHORT	OCCUR	**LOW**
Impact 3	Visual impact of Ash Return Water Dam	Negative	Definite	5	3	2	2	5	**2.3**
					MOD	STUDY	SHORT	OCCUR	**MOD**
Mitigation Measures:	*Revegetate exposed areas, construction site screening*				2	2	2	5	**2**
					LOW	STUDY	SHORT	OCCUR	**LOW**
Impact 4	Visual impact of relocated Tx Lines	Negative	Definite	3	0				**0**
					NO				**NO**
Mitigation Measures:	*None required.*				0				**0**
					NO				**NO**
Impact 5	Visual impact of construction of associated infrastructure	Negative	Definite	3	3	2	2	4	**1.9**
					MOD	STUDY	SHORT	VLIKE	**LOW**
Mitigation Measures:	*Revegetate exposed areas, construction site screening*				2	2	2	3	**1.2**
					LOW	STUDY	SHORT	COULD	**LOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		2.2	1.4	1.4	3.5	**1.2**
					MOD	STUDY	SHORT	VLIKE	**LOW**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	Negative	Definite		1.4	1.4	1.4	3.4	**1**
					LOW	STUDY	SHORT	VLIKE	**VLOW**
STATUS QUO	INITIAL IMPACTS TO ENVIRONMENT	Negative	Probable		4	3	4	5	**3.7**
					HIGH	LOCAL	LONG	OCCUR	**HIGH**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		4	3	4	5	**3.7**
					HIGH	LOCAL	LONG	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		4	3	4	5	**3.7**
					HIGH	LOCAL	LONG	OCCUR	**HIGH**

10.2.15 Cultural Heritage Environment

Project Impact (Unmitigated)

Impacts that could occur to historically significant structures are limited to the physical removal of graves and historical buildings, vandalism or renovations to these structures resulting in permanent damage. There is presently no indication that any existing impacts to any historical structures have taken place.

No paleontological, archaeological, cultural, or heritage sites of any significant value were identified on Sites 1 there will probably be NO IMPACT to the archaeological or cultural heritage environment on this site.

Cumulative Impact

There is not expected to by any cumulative impact on the heritage environment.

Mitigation Measures

- Little data have been published on these potentially fossiliferous deposits. Around the coalmines there is most likely to be good material and yet in other areas the exposures may be too poor to be of interest. When they do occur, fossil plants are usually abundant and it would not be feasible to preserve and maintain all the sites, however, in the interests of heritage and science such sites should be well recorded, sampled and the fossils kept in a suitable institution.
- One or two sites must be preserved for posterity, the selection of them being determined by quality of the fossils, and practical issues such as being far away from development and interference by people and livestock, and also have some means of monitoring the safekeeping in place.
- Once construction has begun and if good exposures are found then the contractors and/or Eskom should contact a palaeontologist urgently to do a rescue operation.
- It is recommended that a palaeontologist do spot-checks on excavations base during the construction phase; and
- To minimize the effects on the landscape, it is recommended that the existing corridors be used, as far as possible for the relocation of any infrastructure.

Residual Impact

If the above mitigation measures are implemented, and adhered to then the residual impact on the cultural and heritage environment will **probably** be NO IMPACT.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in section 10.1 above. These ratings are provided in the matrix presented in Table 10-25 below.

Table 10-25: Construction Phase Impact Assessment Matrix: Archaeology, Palaeontology, and Cultural Heritage

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
ArCH-1	*Archaeology, Palaeontology, Cultural Heritage*								
	CONSTRUCTION PHASE			5					
Impact 1	NO ADDITIONAL IMPACT	No Impact	Definite	1	0				**0**
					NO				**NO**
Mitigation Measures:	*None required.*				0				**0**
					NO				**NO**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	No Impact	Definite		0	0	0	0	**0**
					NO	#N/A	#N/A	#N/A	**NO**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease*)	No Impact	Definite		0	0	0	0	**0**
					NO	#N/A	#N/A	#N/A	**NO**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	No Impact	Definite		0				**0**
					NO				**NO**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	No Impact	Definite		0				**0**
					NO				**NO**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	No Impact	Definite		0				**0**
					NO				**NO**

10.3 OPERATIONAL PHASE

10.3.1 Geology

Once the facility is constructed it will not necessary to undertake any activities that may impact on the geology of the area. There is **definitely** expected to be NO ADDITIONAL IMPACT to the geology as a result of operational activities.

10.3.2 Topography

Once the facility is constructed there will be no additional changes in surface water drainage patterns as these will be strictly controlled by the clean and dirty water cut-off canals that will have been constructed. There is **definitely no expected impact** to the topography as a result of operational activities.

10.3.3 Soils and Land Capability

Project Impact (Unmitigated)

During the operational phase the activities that will impact on soils will primarily be the consecutive rehabilitation of the ash body and side slopes (capping of the ash facility will involve the handling and placement of soils), vehicles traversing the site, and leachate generated from the ash body.

The primary additional impact to soil and land capability will be the pollution of soil resources from leachate draining from the facility; followed by the erosion that will likely occur along roads, at soil stockpile areas, and exposed soils placed along the face of the ash body during capping and consecutive rehabilitation activities. Without mitigation measures the leachate will pollute soils within the entire development footprint of 216,7 ha. All exposed soils within the same footprint area will be at risk of erosion.

The combined weighted project impact to the soil and land capability (prior to mitigation) will **definitely** be of a MODERATE negative significance affecting the *development site*. The impact will act in the long term and will *very likely occur*. The impact risk class is thus **Low.**

Cumulative Impact

The cumulative impact during the operational phase to soil and land capability (prior to mitigation) will remain the same as assessed for the construction phase i.e. the cumulative unmitigated impact will **probably** be of a HIGH negative significance, affecting the *study area* in extent. The impact *is going to happen* and will be permanent. The impact risk class is thus **High**.

Mitigation Measures

- Ensure that a suitably designed barrier system is installed with a leachate collection and leak detection layer included.
- Ensure that suitably designed storm water management infrastructure is installed and maintained for the duration of the operational phase, especially around soil stockpiles.
- Ensure that soils which are stockpiled for more than 1 year are suitably fertilised and vegetated to reduce the risk of erosion;
- Ensure that soils to be placed on the ash body during capping and consecutive rehabilitation of the ash body and side slopes are suitably ameliorated with a lime and fertiliser mixture. Soil fertility tests should be undertaken prior to placement to determine what additives need to be made to the soil to enhance its fertility;
- The facility is to be capped with a soil covering of at least 300 mm to ensure that a sustainable capping and vegetation layer can be established post closure. This must be monitored and reported on by an independent soil scientist on an annual basis until the rehabilitation of the facility is completed;
- Replaced soils need to be re-vegetated with an indigenous seed mix and regularly watered to ensure that vegetation successfully establishes within a single growing season; and
- No grazing is to be permitted on the facility. Fences will be established and regularly maintained.

Residual Impact

The residual impact to soil and land capability as a result of operational activities after the implementation of mitigation measures will be negligible in addition to the construction phase impacts already incurred. The residual rating thus remain as assessed for the construction phase i.e. **probably** of a MODERATE negative significance, affecting the *study area* in extent. The impact *is going to happen* and will be permanent. The impact risk class is thus **High**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described above. These ratings are provided in the matrix presented in Table 10-26 below.

Table 10-26: Operational Phase Impact Assessment Matrix: Soil and Land Capability

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
SLC-2	*Soil and Land Capability*								
	OPERATIONAL PHASE			5					
Impact 1	Pollution of soils - leachate	Negative	Definite	5	4	1	5	4	**2.7**
					HIGH	ISO	PERM	VLIKE	**MOD**
Mitigation Measures:	*Install leachate collection system*				2	1	5	3	**1.6**
					LOW	ISO	PERM	COULD	**LOW**
Impact 2	Erosion of soils	Negative	Definite	3	3	1	5	5	**3**
					MOD	ISO	PERM	OCCUR	**MOD**
Mitigation Measures:	*Place soil stockpiles out of water courses, Revegetate Stockpiles, Stormwater Management*				2	1	5	3	**1.6**
					LOW	ISO	PERM	COULD	**LOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		2.9	0.8	4	3.5	**1.8**
					MOD	ISO	LONG	VLIKE	**LOW**
	AFTER MITIGATION *(If mitigation is effective / possible this rating wil decrease)*	Negative	Definite		1.6	0.8	4	2.4	**1**
					LOW	ISO	LONG	COULD	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Probable		2	2	5	5	**3**
					LOW	STUDY	PERM	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		4	2	5	5	**3.7**
					HIGH	STUDY	PERM	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		3	2	5	5	**3.3**
					MOD	STUDY	PERM	OCCUR	**HIGH**

10.3.4 Surface Water and Wetlands

Project Impact (Unmitigated)

During the operational phase the consecutive rehabilitation (capping and replacement of soils on the ash body side slopes), maintenance vehicles traversing the sites, and potential leaks / spills along pipelines could all result in impacts to the surface water environment.

The receiving water / wetland resources include:

- The non-perennial water course to the north-west of Site 1, which flows in a north-easterly direction; and
- The wetland crossing located at the following coordinates 26°36'37,384"S and 30°5'4.606"E.

These activities could result in the following impacts to surface water / wetland resources:

- Decrease in water quality:
  - hydrocarbon spillage that may enter the water courses;
  - increased sedimentation / suspended solids in water resulting in increased turbidity;
  - increased possibility of creating an environment for micro-organisms such as *E.coli* to proliferate; and
  - Decreased habitat conditions;
- Decrease in water quantity:
  - Surface water flow that is intercepted by the dirty water containment infrastructure will decrease the volume of runoff entering surface water resources. This impact is already assessed under construction phase impacts, and has not been assessed again in this section.

The combined weighted project impact to surface water and wetlands (prior to mitigation) will **definitely** be of a MODERATE negative significance, affecting the *study area*. The impact will act in the medium term and will *very likely occur*. The impact risk class is thus **Low**.

Cumulative Impact

The cumulative impact during the operational phase to surface water and wetlands (prior to mitigation) will remain the same as assessed for the construction phase i.e. the cumulative unmitigated impact will probab**ly** be of a HIGH negative significance, affecting the *local area* in extent. The impact *is going to happen* and will be long term. The impact risk class is thus **High**.

Mitigation Measures

- A wetland / surface water rehabilitation and maintenance plan for the segment of the stream located along the north western boundary of the study area, and indicated on Figure 8-19, must be compiled and implemented as a component of the construction phase, as a means of improving the quality of wetlands and surface water resources in the area;

- The existing surface water and groundwater monitoring plan needs to be updated to address the proposed facilities and must include bio-monitoring (quarterly during construction), as well as a hydrocarbon (quarterly during construction), trace metals, ICP-MS, and Cation / Anion constituent monitoring (monthly);
- All waste generated through maintenance activities are to be managed in line with the existing waste management procedure at Camden Power Station;
- Fence off "no-go" areas to ensure these areas are not impacted on by maintenance activities;
- Install an authority approved barrier system at the new ash disposal facility to prevent contamination of the water bodies;
- Ensure that soils placed during consecutive rehabilitation of the ash body and side slopes of the facility are ameliorated with a suitable mix of additives (fertilizers, lime etc) and that an indigenous seed mix is used for seeding of the slopes;
- In order to mitigate existing impacts that have occurred to the baseline environment the following is recommended:
  - The existing ash disposal facility must during the closure phase be profiled and capped such that clean surface water run-off does not recharge the De Jagers Pan;
  - The polluted water in the De Jagers Pan is treated in an appropriate manner in line with Eskom's Zero Effluent Discharge policy;
- Continue the alien invasive programme established in the construction phase. At a minimum the entire development footprint needs to managed through this programme; and
- The propagation of low-growing dense vegetation suitable for the habitat such as grasses, sedges or reeds is the best natural method to reduce erosion potential in sensitive areas.

Residual Impact

Mitigation measures will substantially reduce the cumulative impact and if all measures are implemented will slightly improve the baseline impacts to surface water resources that already exist. The residual impact to surface water and wetlands will **probably** be of a LOW negative significance, affecting the *study area* in extent. The impact *is going to happen* and will be long term. The impact risk class is thus **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in section 10.1 above. These ratings are provided in the matrix presented in Table 10-27 below.

Table 10-27: Operational Phase Impact Assessment Matrix: Surface Water and Wetlands

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERN / Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
SWW-2	*Surface Water and Wetlands*								
	OPERATIONAL PHASE			5					
Impact 1	Decreased water quality - leachate, suspended solids, turbidity, hydrocarbons, E.coli and trace elements	Negative	Definite	5	4	3	3	5	**3.3**
					HIGH	LOCAL	MED	OCCUR	**HIGH**
Mitigation Measures:	*Suitably sized stormwater infrastructure. Water treatment of De Jager's Pan. Build >100m from SW Resources.*				1	1	3	3	**1**
					VLOW	ISO	MED	COULD	**VLOW**
Impact 2	Sedimentation of wetlands and surface water resources	Negative	Definite	5	2	2	3	4	**1.9**
					LOW	STUDY	MED	VLIKE	**LOW**
Mitigation Measures:	*Suitably sized stormwater infrastructure. Water treatment of De Jager's Pan. Build >100m from SW Resources.*				1	1	3	2	**0.7**
					VLOW	ISO	MED	UNLIKE	**VLOW**
Impact 3	Reduction in habitat integrity of downstream wetland areas	Negative	Probable	5	1	1	3	3	**1**
					VLOW	ISO	MED	COULD	**VLOW**
Mitigation Measures:	*Suitably sized stormwater infrastructure. Water treatment of De Jager's Pan. Build >100m from SW Resources.*				1	1	3	2	**0.7**
					VLOW	ISO	MED	UNLIKE	**VLOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		2.3	2	3	4	**1.9**
					MOD	STUDY	MED	VLIKE	**LOW**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease)*	Negative	Definite		1	1	3	2.3	**0.8**
					VLOW	ISO	MED	COULD	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Probable		4	3	4	5	**3.7**
					HIGH	LOCAL	LONG	OCCUR	**HIGH**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		4	3	4	5	**3.7**
					HIGH	LOCAL	LONG	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		2	2	4	5	**2.7**
					LOW	STUDY	LONG	OCCUR	**MOD**

10.3.5 Groundwater

Project Impact (Unmitigated)

During the operational phase of the facility, ash in slurry form will be deposited on the facility, systematically increasing the facility's footprint until it is fully developed. In an unmitigated scenario leachate will develop over time and will percolate into the groundwater below the facility from where it will disperse into the surrounding environment.

Site 1 is underlain by an unweathered dolerite soil with some sandstone layers that are slightly weathered to course, which might result in preferred pathways for potential contaminant transport.

The combined weighted project impact during the operational phase to groundwater (prior to mitigation) will thus **definitely** be of a MODERATE negative significance, affecting the *local* extent, and acting in the long term. The impact will very likely occur. The impact risk class is thus **Moderate**.

Cumulative Impact

There will **definitely** be a risk of cumulative impact to groundwater occurring because of the close proximity of the existing ash disposal facility (located within 100m of the proposed project), and adjacent coal mining activities that are being undertaken within a 1km radius of the proposed site. The coal mining activities are outside the control / influence of this project and are thus taken into account as existing base line impacts, which are considered substantial.

With respect to the existing Camden Power Station ash disposal facility the following is considered relevant in making the assessment of cumulative impacts to the groundwater environment:

- The proposed site is located within 150 m of the existing facility at its nearest point;
- The proposed project is 70 % of the size of Camden Power Station's existing ash disposal facility footprint, and represents 9 % of the study area; The breakdown of the existing, future and combined footprint is shown in Table 10-28.
- Based on the groundwater specialist study there is however no impact being detected from the existing ash disposal facility in any of the existing monitoring boreholes. This is ascribed to the moisture deficit that occurs climactically in the region, combined with the fairly impermeable geology. This is expected to continue into the future;
- Groundwater flow tends to emulate the surface topography, and the existing facility is located in a different sub-catchment to the proposed facility, and ground water is expected to flow in a different direction.

Thus the probability of the existing and proposed facility having a cumulative impact on groundwater resources is considered to be practically impossible.

Table 10-28: Breakdown of the existing and combined ash disposal footprint for Camden Power Station

Vegetation Type	Existing Dam		Impact Footprint Site 1		Combined Footoprint	
	Area (Ha)	As (%) of Total Study Area	Area (Ha)	As (%) of Total Study Area	Area (Ha)	As (%) of Total Study Area
Ash Disposal Dam	83,9 ha	4.8 %	154 ha	8.9 %	137.9	7.9 %
AWRD	155,9 ha	9.0%	8.1 ha	0.5%	164.0	9.5 %
TOTAL	**239,6 ha**	**13.8%**	**164.1 ha**	**9.4%**	**301.9**	**17.4 %**

The cumulative impact during the operational phase to groundwater (prior to mitigation) will thus be determined by the existing baseline conditions prevalent within the area, which in this instance is the same as the construction phase impact discussed in Section 10.2.5 above i.e. **probably** of a MODERATE negative significance, affecting the *local area* in extent. The impact *is going to happen* and will act in the long term. The impact risk class is thus **High**.

Mitigation Measures

- Ensure that the mitigation measures documented in the construction phase are implemented, especially the installation of a suitably designed barrier system below the facility;

Residual Impact

Mitigation measures will ensure that the impact to groundwater resources incurred during the operational phase of the propose project will be reduced to the baseline conditions prevalent on site. The impact will however result in the remediation of existing impacts, and thus the impact rating remains the same as the cumulative rating provided above i.e. **probably** of a LOW negative significance, affecting the *local area* in extent. The impact *is going to happen* and will act in the long term. The impact risk class is thus **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in section 10.1 above. These ratings are provided in the matrix presented in Table 10-29 below.

Table 10-29: Operational Phase Impact Assessment Matrix: Groundwater

Rated By: *Warren Kok*
Reviewed By:

				ALTERNATIVES:					
				Site 1					
	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
GW-2	*Groundwater*								
	OPERATIONAL PHASE			5					
Impact 1	Decreased water quality - Leachate (heavy metals)	Negative	Definite	5	3	3	4	4	**2.7**
					MOD	LOCAL	LONG	VLIKE	**MOD**
Mitigation Measures:	*Install leachate collection, Install Barrier System*				2	1	1	3	**0.8**
					LOW	ISO	INCID	COULD	**VLOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		3	3	4	4	**2.7**
					MOD	LOCAL	LONG	VLIKE	**MOD**
	AFTER MITIGATION *(If mitigation is effective / possible this rating wil decrease)*	Negative	Definite		2	1	1	3	**0.8**
					LOW	ISO	INCID	COULD	**VLOW**
STATUS QUO	INITIAL IMPACTS TO ENVIRONMENT	Negative	Probable		2	3	4	5	**3**
					LOW	LOCAL	LONG	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		3	3	4	5	**3.3**
					MOD	LOCAL	LONG	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		2	3	4	5	**3**
					LOW	LOCAL	LONG	OCCUR	**MOD**

10.3.6 Terrestrial Ecology (Flora and Fauna)

Project Impact (Unmitigated)

During the operational phase of the project the primary impact to the terrestrial ecology will occur as a result of consecutive rehabilitation. Consecutive rehabilitation will involve the placement of soils on the developed slopes of the ash disposal facility, and then re-vegetation with a suitable seed mix of indigenous pioneer species. The effect of these activities will be the systematic recovery of the vegetation within the development footprint.

The combined weighted project impact during the operational phase to terrestrial ecology (prior to mitigation) is **definitely** of LOW positive significance. The impact is expected to act over the long term and will affect the *development site*. Without mitigation measures this impact could happen. The additional impact will be located at the proposed site. The impact risk class is thus **Low**.

Cumulative Impact

During the operational phase the footprint of rehabilitation will increase systematically, the accrual of positive impacts (without mitigation measures) through consecutive rehabilitation will however not be of significant enough proportions to reverse the impacts of the construction phase on the terrestrial ecology. Any real or lasting impact in this regard will only be fully realised in the closure phase when the facilities are finally capped and revegetated fully. Simultaneously, whilst the development of this proposed project is on-going the existing facility will be fully capped and rehabilitated. This represents a substantive positive impact to the terrestrial ecology in the study area. The effectiveness of the rehabilitation measures will be decreased by alien invasive species inhabiting the area, grazing on rehabilitated areas, and burrowing animals that forage on the facility. The positive impacts from the aforementioned activities will result in an improvement of the baseline environmental conditions prevalent within the study area, but will not result in a complete reversal of all negative impacts that exist at present.

The current baseline conditions will however still be affected by mining operations and agricultural activities that will be on-going. It stands to reason then that mining activities will also rehabilitate consecutively as per best practice standards prevalent in South Africa for opencast strip mining activities. An investigation of aerial photography for the mining operations north of Camden Village in fact proves this hypothesis to be true. An investigation of the success and standards of rehabilitation of these mining operations was however not made, and as a precautionary measure we have excluded this area in the assessment of cumulative impacts, this rating is thus considered conservative.

The cumulative unmitigated impact on the receiving environment will **definitely** be reduced to a Moderate negative significance, affecting the *study area*. The impact will act in the long term and *is going to happen*. The impact risk class is thus **Moderate**.

Mitigation Measures

- Undertake consecutive rehabilitation to ensure that a sustainable vegetation cover is achieved on the slopes and areas rehabilitated during the construction phase;
- Ensure that newly placed soils and seeded areas are watered for the first 2 years on a regular basis to improve the success of re-vegetation activities;
- All “no-go” areas need to be fenced off to ensure that during maintenance of the facility no additional impact is incurred on the surrounding areas;
- A suitable seed mix of indigenous plants should be used in all rehabilitation programmes on the site;
- All alien invasive species on-site should be removed and follow-up monitoring and removal programmes should be undertaken throughout the operational phase of the project;
- Ensure that the mitigation measures for the stripping, stockpiling, and replacement of soils documented in the construction and operational phase (Section 10.2.3 and Section) are implemented;
- Adhere to the ESKOM transmission vegetation management guidelines / standards when maintaining power line servitudes

Residual Impact

Mitigation measures will ensure that positive impacts from this proposed project on the terrestrial ecology are maximised and possible negative impacts are controlled. The residual impact, like the cumulative impact, will be dictated by the current baseline conditions. The residual impact will however remain negative and will **definitely** be of a LOW negative significance, affecting the *study area*. The impact will act in the long term and *is going to happen*. The impact risk class is thus **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in section 10.1 above. These ratings are provided in the matrix presented in Table 10-30 below.

Table 10-30: Operational Phase Impact Assessment Matrix: Terrestrial Ecology

Rated By: *Warren Kok*
Reviewed By:

IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
					ALTERNATIVES: Site 1				
TE-2	*Terrestrial Ecology*								
	OPERATIONAL PHASE			5					
Impact 1	Consecutive rehabiliation	Positive	Definite	5	2	1	4	3	**1.4**
					LOW	ISO	LONG	COULD	**LOW**
Mitigation Measures:	*Alien invasive control, Ameliorate soils replaced, Indigenous seedmix, Watering of seeded areas*				3	1	4	5	**2.7**
					MOD	ISO	LONG	OCCUR	**MOD**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Positive	Definite		2	1	4	3	**1.4**
					LOW	ISO	LONG	COULD	**LOW**
	AFTER MITIGATION *(If mitigation is effective / possible this rating wil decrease)*	Positive	Definite		3	1	4	5	**2.7**
					MOD	ISO	LONG	OCCUR	**MOD**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Definite		3	2	4	5	**3**
					MOD	STUDY	LONG	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Definite		3	2	4	5	**3**
					MOD	STUDY	LONG	OCCUR	**MOD**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Definite		2	2	4	5	**2.7**
					LOW	STUDY	LONG	OCCUR	**MOD**

10.3.7 Avifauna

Impacts to avifauna are solely as a result of habitat destruction. This impact is assessed fully in the construction phase and as such there is **definitely** expected to be NO ADDITIONAL IMPACT to the avifauna as a result of operational activities.

10.3.8 Air Quality

Project Impact (Unmitigated)

During the operational phase impacts to air quality will occur as a result of maintenance activities and deposition of ash within the ash disposal facility. Where maintenance activities are undertaken in conjunction with exposed soils there is a risk of generating dust. Vehicles also utilise hydrocarbon fuels and are known to have greenhouse gas exhaust fumes. During the operational phase the surface of the ash disposal facility will be increased substantially. This area will be exposed to the elements. Additional impacts may occur from windblown particles from the exposed areas of ash. As the ash disposal facility is wet facility, the probability of this impact occurring is unlikely, mostly limited to the dry winter months, and only during high windfall events. In the event that fine particles are mobilised it is expected that the impact will be felt up to 1,4 km from the ash disposal facility (without mitigation measures).

The combined weighted project impact during the operational phase to air quality (prior to mitigation) will **possibly** be of a LOW negative significance, affecting the *local area*. The impact will act in the medium term and will *very likely occur*. The impact risk class is thus **Low.**

Cumulative Impact

The cumulative air quality impacts during the operational phase will be dictated by the current baseline conditions and will thus be the same as the assessment provided in the construction phase i.e. the cumulative unmitigated impact will **definitely** be of a MODERATE negative significance, affecting the *regional area*. The current impacts will act for as long as the power station and mining activities are operational; and should thus be viewed as operating in the medium term and *is going to occur*. The impact risk class is thus **High.**

Mitigation Measures

- Ensure that vegetation clearing is limited to only the areas where construction will take place;
- Ensure that "no-go" areas are fenced to ensure that on-going maintenance activities do not impact unnecessarily on the wider area;
- Use chemical dust suppression (such as dust-a-side) on areas to be frequently driven;
- Dust suppression on the ash body is to be undertaken in such a manner as to ensure that air quality impacts are within acceptable Air Quality Standards (especially for dust, PM2.5, and PM10 particulates); and
- Regularly undertake dust suppression on all gravel roads using uncontaminated water to ensure that dust mobilisation is prevented.

Residual Impact

Mitigation measures will reduce the likelihood of the project resulting in additional impacts to the receiving air environment. The residual impact thus remains as assessed for the cumulative impact i.e. will **definitely** be of a LOW negative significance, affecting the *regional area*. The current impacts will act for as long as the power station and mining activities are operational and should thus be viewed as operating in the medium term and will *very likely occur*. The impact risk class is thus **High.**

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in section 10.1 above. These ratings are provided in the matrix presented in the table below.

Table 10-31: Operational Phase Impact Assessment Matrix: Air Quality

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
				ALTERNATIVES:	Site 1				
AQ-2	*Air Quality*								
	OPERATIONAL PHASE			5					
Impact 1	Greenhouse gas emissions	Negative	Possible	3	2	1	2	3	**1**
					LOW	ISO	SHORT	COULD	**VLOW**
Mitigation Measures:	*Reduce energy consumption, Regular vehicle maintenance, Consecutive Rehab*				1	1	2	3	**0.8**
					VLOW	ISO	SHORT	COULD	**VLOW**
Impact 2	Nuisance and fall out dust	Negative	Possible	3	3	3	3	5	**3**
					MOD	LOCAL	MED	OCCUR	**MOD**
Mitigation Measures:	*Watering to reduce dust mobilisation, Use Site 3, Revegetate stockpiles, Dust-aside / Chemical Suppressant on Roads.*				3	1	3	5	**2.3**
					MOD	ISO	MED	OCCUR	**MOD**
Impact 3	Increased particulate matter (PM2.5 and PM10)	Negative	Possible	5	3	4	3	5	**3.3**
					MOD	REG	MED	OCCUR	**HIGH**
Mitigation Measures:	*Watering to reduce dust mobilisation, Use Site 3, Revegetate stockpiles, Dust-aside / Chemical Suppressant on Roads.*				2	3	3	3	**1.6**
					LOW	LOCAL	MED	COULD	**LOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Possible		2	2.1	2	3.3	**1.3**
					LOW	LOCAL	SHORT	VLIKE	**LOW**
	AFTER MITIGATION *(If mitigation is effective / possible this rating wil decrease)*	Negative	Possible		1.5	1.4	2	2.6	**0.8**
					LOW	STUDY	SHORT	COULD	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Possible		3	4	3	5	**3.3**
					MOD	REG	MED	OCCUR	**HIGH**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Possible		3	4	3	5	**3.3**
					MOD	REG	MED	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Possible		3	4	3	5	**3.3**
					MOD	REG	MED	OCCUR	**HIGH**

10.3.9 Noise Impact

None of the operational activities are expected to generate serious noise impacts as the majority of the processes are passive. The operational activities of the proposed facility will be the same as the existing facility. The existing facility will no longer be operational. Thus here is **definitely** expected to be NO ADDITIONAL IMPACT to the ambient noise as a result of operational activities.

10.3.10 Social Environment

Project Impact (Unmitigated)

During the Operational Phase of the project the activities that will have an impact on the social environment include the maintenance of pipelines, roads, associated infrastructure and servitudes, direct / indirect employment opportunities, and retention of jobs at Camden Power Station which will extend through the extended life of the power station which will ensure continuous generation of power for the country.

Table 10-32 represents the social change processes that have been identified and the possible social impacts that may result because of these processes. It also identifies the stakeholder group that is most likely to be affected by the process.

Table 10-32: Summary of Socio-economic impacts

Social Change Process	Possible Social Impact	Affected stakeholder group
Change in land use	• Long term conflict about management of servitudes • Safety hazards • Communication and arrangements surrounding access to properties & management of servitude – can be positive or negative	• Industry • Farmers • Vulnerable communities
Deviant social behaviour	• Acts of sabotage	• Vulnerable communities • Farmers • Industry • Tourism • Surrounding towns
Employment opportunities	• Indirect employment opportunities • Retention of jobs	• Vulnerable communities • Farmers • Industry • Tourism • Surrounding towns

The combined weighted project impact to the existing social environment (prior to mitigation) will **probably** be of a LOW negative significance affecting the *local area*. The impact will act in the short term and *could occur*. The impact risk class is thus **Low.**

Cumulative Impact

Potential cumulative impacts include

- The retention of jobs at Camden Power Station; and
- Cumulative impacts on local entrepreneurs will be positive and assist in developing their businesses further.

The cumulative impact to the social environment (prior to mitigation) during the operational phase will **probably** be of a LOW positive significance, affecting the *local area*. The impact will act in the medium term and will *very likely occur*. The impact risk class is thus **Moderate**.

Mitigation Measures

Refer to the mitigation measures described in the construction phase. Implementation of these mitigation measures through the operational phase.

Residual Impact

The residual impact to the social environment will **probably** be of a MODERATE positive significance, affecting the *local area*. The impact will act in the medium term and will *is going to occur*. The impact risk class is thus **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described above. These ratings are provided in the matrix presented in Table 10-33 below.

Table 10-33: Operational Phase Impact Assessment Matrix: Social Environment

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
SOC-2	*Social Environment*								
	OPERATIONAL PHASE			5					
Impact 1	Employment Oportunities - direct and indirect	Positive	Probable	5	1	3	3	2	**0.9**
					VLOW	LOCAL	MED	UNLIKE	**VLOW**
Mitigation Measures:	*Employ Unemployed Locals*				2	3	3	3	**1.6**
					LOW	LOCAL	MED	COULD	**LOW**
Impact 2	Less environmental nuisance	Positive	Probable	1	2	3	3	2	**1.1**
					LOW	LOCAL	MED	UNLIKE	**LOW**
Mitigation Measures:	*Maintain - (Complaints register and Feedback, Fines for breaking rules)*				3	3	3	4	**2.4**
					MOD	LOCAL	MED	VLIKE	**MOD**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Positive	Probable		0.7	1.8	1.8	1.2	**0.3**
					VLOW	STUDY	SHORT	UNLIKE	**VLOW**
	AFTER MITIGATION *(If mitigation is effective / possible this rating wil decrease)*	Positive	Probable		1.3	1.8	1.8	1.9	**0.6**
					LOW	STUDY	SHORT	UNLIKE	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Positive	Probable		2	3	3	5	**2.7**
					LOW	LOCAL	MED	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Positive	Probable		2	3	3	5	**2.7**
					LOW	LOCAL	MED	OCCUR	**MOD**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Positive	Probable		2	3	3	5	**2.7**
					LOW	LOCAL	MED	OCCUR	**MOD**

10.3.11 Economic Environment

All potential economic impacts that may occur have been identified and assessed during the construction phase assessment above. The proposed activity is the continuation of an existing activity and thus there is **definitely** expected to be NO ADDITIONAL IMPACT to the economic environment as a result of operational activities.

10.3.12 Infrastructure

All potential infrastructure impacts that may occur have been identified and assessed during the construction phase assessment above. The proposed activity is the continuation of an

existing activity and thus there is **definitely** expected to be NO ADDITIONAL IMPACT to the infrastructure present in the area as a result of operational activities.

10.3.13 Traffic Impact

All potential traffic impacts that may occur have been identified and assessed during the construction phase assessment above. The proposed activity is the continuation of an existing activity and thus there is **definitely** expected to be NO ADDITIONAL IMPACT to the traffic in the area as a result of operational activities.

10.3.14 Visual

Project Impact (Unmitigated)

During the operational phase the primary impact to the receiving visual environment will occur as a result the deposition of ash, which will result in the height of the facility. The increased height of the facility makes the facility more visible.

The combined weighted project impact to the existing visual environment (prior to mitigation) will **definitely** be of a MODERATE negative significance affecting the *study area*. The impact will act in the short term and *is going to occur*. The impact risk class is thus **Moderate**.

Cumulative Impact

The cumulative visual impact (prior to mitigation) from the existing ash disposal facility, Camden Power Station, and the final visual footprint of the fully developed ash disposal facility will **definitely** have a HIGH negative impact on the *local* environment acting in the long term. The impact is going to happen. The impact risk class is **High**.

Mitigation Measures

- Undertake consecutive rehabilitation of the side slopes of the facility to reduce the visual impact; and
- Ensure that topsoil stockpiles that will be in place for more than 2 years are seeded and vegetated.

Residual Impact

The visual impact of the proposed ash disposal site cannot be mitigated entirely and a long term visual impact will probably persist post operational phase. With mitigation the impact will occur and is expected to be of a MODERATE negative significance affecting the *local extent*. The impact risk class is **High**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described above. These ratings are provided in the matrix presented in Table 10-34 below.

Table 10-34: Operational Phase Impact Assessment Matrix: Visual Impact

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
V-2	*Visual*								
	OPERATIONAL PHASE			5					
Impact 1	Visual impact - Ash Dam	Negative	Definite	5	3	2	2	5	**2.3**
					MOD	STUDY	SHORT	OCCUR	**MOD**
Mitigation Measures:	*Revegetate exposed areas consecutively, clean litter and waste*				2	2	2	5	**2**
					LOW	STUDY	SHORT	OCCUR	**LOW**
Impact 2	Visual Impact - Associated Infrastructure	Negative	Definite	5	3	2	2	5	**2.3**
					MOD	STUDY	SHORT	OCCUR	**MOD**
Mitigation Measures:	*Maintain revegetated areas, clean litter and waste*				2	2	2	5	**2**
					LOW	STUDY	SHORT	OCCUR	**LOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		3	2	2	5	**2.3**
					MOD	STUDY	SHORT	OCCUR	**MOD**
	AFTER MITIGATION (*If mitigation is effective / possible this rating wil decrease)*	Negative	Definite		2	2	2	5	**2**
					LOW	STUDY	SHORT	OCCUR	**LOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Definite		4	3	4	5	**3.7**
					HIGH	LOCAL	LONG	OCCUR	**HIGH**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Definite		4	3	4	5	**3.7**
					HIGH	LOCAL	LONG	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Definite		4	3	4	5	**3.7**
					HIGH	LOCAL	LONG	OCCUR	**HIGH**

10.3.15 Cultural Heritage Environment

Any impacts to the cultural or heritage aspects of the environment will occur during the construction phase (assessed separately in previous sections of this report) and there is **definitely** expected to be NO ADDITIONAL IMPACT to the Archaeology, Palaeontology, and Cultural Heritage of the area as a result of operational activities.

10.4 CLOSURE PHASE

10.4.1 Geology

Once the facility is constructed it will not necessary to undertake any activities that may impact on the geology of the area. There is **definitely** expected to be NO ADDITIONAL IMPACT to the geology as a result of closure activities.

10.4.2 Topography

Project Impact (Unmitigated)

During the closure phase the primary impact to topography will occur as a result of the final profiling and capping of the ash body to tie into the adjacent terrain. Associated infrastructure such as roads, pipelines, and the AWRD that are no longer required will also be decommissioned and the areas will be profiled to be free draining. These areas will be finally revegetated.

The primary additional impact to topography will be the alteration of surface water drainage patterns. Closure Phase activities will result in 199 ha (91.9 %) of the area impacted on by this project being reintegrated into the surface water drainage system of the sub-catchment. Incorrect profiling could lead to surface water pooling in undesired locations and / or increased erosion.

The combined weighted project impact to the topography (prior to mitigation) during the closure phase will **probably** be of a LOW positive significance affecting the *study area*. The impact will act in the long term and *could possibly occur*. The impact risk class is thus **Low**.

Cumulative Impact

Cumulative impacts will occur as both the existing and proposed ash disposal facilities and their supporting infrastructure will have been capped, profiled and tied into the adjacent terrain. The cumulative area affected is about ~16 % of the study area. The cumulative positive impact to the topography will reduce the accumulated baseline impact currently present in the study area, although not enough to change the overall risk class.

The cumulative impact to the topography (prior to mitigation) during the operational phase will **probably** be reduced to a LOW negative significance, affecting the *local area*. The impact will be permanent and *is going to occur*. The impact risk class is thus **High**.

Mitigation Measures

- Ensure that the final profile of the facility and associated infrastructure rehabilitated is free draining;
- Ensure that mitigation measures documented for soils and terrestrial ecology are implemented to ensure that erosion or the profiled area is reduced;
- Ensure that storm water infrastructure to be left in place post closure is suitably sized and designed to manage flow velocities so as to avoid erosion at outfall positions; and
- Ensure that all infrastructure not required post closure for maintenance and inspection of the post closure facility is identified, decommissioned / removed, and the area is made to be free draining.

Residual Impact

Mitigation measures will ensure that a positive result is achieved during closure activities, and that the impact reduction to the current baseline conditions as identified for the cumulative assessment above will be realised.

The residual impact at the end of the closure phase to topography will **probably** be of a LOW negative significance, affecting the *local area*. The impact is *very likely* going to happen and will be permanent. The impact risk class is thus **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described in section 10.1 above. These ratings are provided in the matrix presented in Table 10-35 below.

Table 10-35: Closure Phase Impact Assessment Matrix: Topography

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	ALTERNATIVES: Site 1 Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
T-3	*Topography*								
	CLOSURE PHASE			5					
Impact 1	Alteration of surface water drainage patterns - stormwater runoff from rehabilitated areas	Positive	Probable	5	2	2	4	3	**1.6**
					LOW	STUDY	LONG	COULD	**LOW**
Mitigation Measure:	*Ensure suitable soil cover, vegetation covers, free draining areas, storm water attentuation, Regular surveying during profiling*				3	2	4	5	**3**
					MOD	STUDY	LONG	OCCUR	**MOD**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Positive	Probable		2	2	4	3	**1.6**
					LOW	STUDY	LONG	COULD	**LOW**
	AFTER MITIGATION *(If mitigation is effective / possible this rating wil decrease)*	Positive	Probable		3	2	4	5	**3**
					MOD	STUDY	LONG	OCCUR	**MOD**
STATUS QUO	INITIAL IMPACTS TO ENVIRONMENT	Negative	Definite		3	3	5	5	**3.7**
					MOD	LOCAL	PERM	OCCUR	**HIGH**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		2	3	5	5	**3.3**
					LOW	LOCAL	PERM	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		2	3	5	4	**2.7**
					LOW	LOCAL	PERM	VLIKE	**MOD**

10.4.3 Soils and Land Capability

Project Impact (Unmitigated)

During the closure phase the activities that will impact on soils will primarily be the excavation, transportation, and placement of soils that will be undertaken during the removal of associated infrastructure (such as pipelines and roads), and the capping of the disposal facility.

The primary additional impact to soil and land capability during the closure phase will be: the pollution of soil resources from vehicles using hydrocarbons, the compaction of soils, and the erosion of exposed soils. The area in which these impacts may occur was measured to be in the region of ~120 ha. All exposed soils within the same footprint area will be at risk of erosion.

The combined weighted project impact to the soil and land capability (prior to mitigation) will **definitely** be of a MODERATE negative significance affecting the *development site*. The impact will act in the long term and will *very likely occur*. The impact risk class is thus **Low.**

Cumulative Impact

The cumulative impact to soil and land capability (prior to mitigation) during the closure phase will remain the same as assessed for the construction phase i.e. the cumulative unmitigated impact will **probably** be of a HIGH negative significance, affecting the *study area* in extent. The impact *is going to happen* and will be permanent. The impact risk class is thus **High**.

Mitigation Measures

- Rehabilitation of infrastructure such as roads / pipelines needs to take the following into account:
  - Soil contaminated by chemicals / hydrocarbons should be contained and disposed of at an appropriately licensed facility;
  - Areas where soils have become compacted, such as below soil stockpiles, or roads that are being rehabilitated, need to be ripped to a minimum depth of 300 mm prior to fertilizer being placed;
- Ensure that a suitably designed barrier system is installed with a leachate collection and leak detection layer included;
- Ensure that suitably designed storm water management infrastructure is installed and maintained for the duration of the operational phase, especially around soil stockpiles.
- Ensure that soils which are stockpiled for more than 1 year are suitably fertilised and vegetated to reduce the risk of erosion;
- Ensure that soils to be placed on the ash body during capping and consecutive rehabilitation of the side slopes are suitably ameliorated with a lime and fertiliser mixture. Soil fertility tests should be undertaken prior to placement to determine what additives need to be made to the soil to enhance its fertility;
- The facility is to be capped with a soil covering of at least 300 mm to ensure that a sustainable capping and vegetation layer can be established post closure. This must be monitored and reported on by an independent soil scientist on an annual basis until the rehabilitation of the facility is completed;

- Replaced soils need to be re-vegetated with an indigenous seed mix and regularly watered to ensure that vegetation successfully establishes within a single growing season; and
- No grazing is to be permitted on the facility. Fences will be established and regularly maintained.

Residual Impact

The residual impact to soil and land capability as a result of closure activities is negligible and the rating will be the same as for the construction phase i.e. **probably** of a MODERATE negative significance, affecting the *study area* in extent. The impact *is going to happen* and will be permanent. The impact risk class is thus **High**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described above. These ratings are provided in the matrix presented in Table 10-36 below.

Table 10-36: Closure Phase Impact Assessment Matrix: Soil and Land Capability

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
				ALTERNATIVES:	Site 1				
SLC-3	*Soil and Land Capability*								
	CLOSURE PHASE			5					
Impact 1	Pollution of soils - hydrocarbon / chemical spills, spills from pipelines during rehabilitation	Negative	Definite	5	2	1	5	5	**2.7**
					LOW	ISO	PERM	OCCUR	**MOD**
Mitigation Measure:	*Hydrocarbon and Chemical Management*				1	1	1	3	**0.6**
					VLOW	ISO	INCID	COULD	**VLOW**
Impact 2	Erosion of soils	Negative	Definite	3	3	1	5	5	**3**
					MOD	ISO	PERM	OCCUR	**MOD**
Mitigation Measure:	*Fertilize soils prior to seeding, Water seeded areas, ensure slopes are not steeper than 1:3, Water seeded areas*				2	1	5	3	**1.6**
					LOW	ISO	PERM	COULD	**LOW**
Impact 3	Low soil fertility and usability	Negative	Definite	5	3	1	4	4	**2.1**
					MOD	ISO	LONG	VLIKE	**MOD**
Mitigation Measure:	*Ameliorate soils prior to resuse in capping facility.*				1	1	1	2	**0.4**
					VLOW	ISO	INCID	UNLIKE	**VLOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Definite		2.3	0.9	4	4	**1.9**
					MOD	ISO	LONG	VLIKE	**LOW**
	AFTER MITIGATION *(If mitigation is effective / possible this rating wil decrease)*	Negative	Definite		1.1	0.9	1.7	2.3	**0.6**
					LOW	ISO	SHORT	COULD	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Probable		2	2	5	5	**3**
					LOW	STUDY	PERM	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		4	2	5	5	**3.7**
					HIGH	STUDY	PERM	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		3	2	5	5	**3.3**
					MOD	STUDY	PERM	OCCUR	**HIGH**

10.4.4 Surface Water and Wetlands

Project Impact (Unmitigated)

During the closure phase the profiling, capping and re-vegetation of the ash disposal facility will be the source of the primary impacts to the surface water and wetlands present. These activities will be undertaken through conventional construction methods (trucks, dozers, and other construction vehicles) and will involve the handling and deposition of soils and the amelioration of soils using fertilizers or other chemical additives. These activities present the similar risks to surface water resources as assessed in the construction phase i.e. the decrease in surface water quality as a result of:

- slurry or dirty water entering the environment during the decommissioning of slurry and return water pipelines;
- hydrocarbon spillage that may enter the water courses;
- increased sedimentation / suspended solids in water resulting in increased turbidity;
- increased possibility of creating an environment for micro-organisms such as *E.coli* to proliferate; and
- Decreased habitat conditions.

The receiving water / wetland resources include:

- The non-perennial water course to the north-west of Site 1, which flows in a north-easterly direction; and
- The wetland crossing located at the following coordinates 26°36'37,384"S and 30°5'4.606"E.

The combined weighted project impact of closure activities to surface water and wetlands (prior to mitigation) will **probably** be of a LOW negative significance, affecting only the *study area*. The impact will act in the medium term and is *very likely* going to occur. The impact risk class is thus **Low**.

Cumulative Impact

Closure activities are not expected to increase the cumulative impacts (prior to mitigation) on the surface water and wetland elements of the receiving environment that may have ocurred during the construction and operational phases. The cumulative impacts will thus be the same as what was rated in the operational phase i.e. **probably** of a HIGH negative significance, affecting the *local area* in extent. The impact *is going to happen* and will be long term. The impact risk class is thus **High**.

Mitigation Measures

- Ensure that the mitigation measures documented in Operational Phase are implemented, especially with regards to improving the quality of the surface water and wetlands of De Jagers Pan
- During the decommissioning of the slurry and return water pipelines:
  - care must be taken that the pipelines are properly flushed with clean water prior to decommissioning;
  - spills of ash contaminated effluent from the pipelines must be immediately contained, and contaminated soils must be taken to a suitably licensed disposal facility;
  - all plinths on which the slurry pipeline are located need to be removed up to at least 500 mm below the natural ground profile;
  - the steel slurry pipeline is to be removed, cleaned and recycled or disposed of at an appropriate licensed facility;
  - HDPE pipelines buried below 500 mm can be left in-situ;
- On-going maintenance of the wetland / surface water rehabilitation plan developed during the construction phase and maintained through the operational phase for the segment of the stream located along the north western boundary of the study area must be continued until post-closure monitoring has indicated that a stable improved state has been attained;

- The surface water monitoring plan needs to be continued beyond the closure phase until a stable and acceptable state of surface water quality has been established;
- Demarcated areas where waste generated by closure activities, can be safely contained and stored on a temporary basis for the construction phase, should be provided at the hard park;
- All hazardous materials *inter alia* paints, turpentine and thinners must be stored appropriately to prevent these contaminants from entering the environment;
- Install an authority approved barrier system at the new ash disposal facility to prevent contamination of the soils and water bodies;
- Fence off "no-go" to ensure these areas are not impacted on by maintenance activities;
- Ensure that a WUL is obtained from the DWA prior to commencement of any work within 500 m of any wetland / surface water resource;
- An alien invasive control programme needs to be established and maintained through all phases of the development;
- The propagation of low-growing dense vegetation suitable for the habitat such as grasses, sedges or reeds is the best natural method to reduce erosion potential in sensitive areas; and
- Ensure that soils placed during consecutive rehabilitation of the side slopes of the facility are ameliorated with a suitable mix of additives (fertilizers, lime etc) and that an indigenous seed mix is used for seeding of the slopes.

Residual Impact

The primary purpose of closure activities is to create a sustainable clean and safe final profile that is suitably tied into the natural drainage pattern, and that will not produce pollution on an on-going basis post closure of the project. If this is achieved the surface water resources will ultimately experience a net positive impact to surface water and wetland resource because the surface water intercepted by containment infrastructure will be reintroduced back into the environment as the final profile will be deemed clean. However without mitigation measures this will not be realised as the project related impacts will result in on-going negative impacts post closure.

Mitigation measures will assist to reduce the cumulative impacts that will have accrued as a result of the already high baseline impacts and the additional impacts that may occur as a result of this project. The residual impact to surface water and wetlands will **probably** be of a LOW negative significance, affecting the *local area* in extent. The impact is *very likely* going to happen and will be long term. The impact risk class is thus **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described above. These ratings are provided in the matrix presented in Table 10-37 below.

Table 10-37: Closure Phase Impact Assessment Matrix: Surface Water and Wetlands

Rated By: *Warren Kok*
Reviewed By:

				ALTERNATIVES: Site 1					
	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	**Impact Risk**
SWW-3	*Surface Water and Wetlands*								
	CLOSURE PHASE			5					
Impact 1	Decreased water quality (suspended solids, turbidity, hydro-carbon, chemical, and microbiological)	Negative	Definite	5	2	2	4	4	**2.1**
					LOW	STUDY	LONG	VLIKE	**MOD**
Mitigation Measure:	*Rehab of unnecessary infrastructure, Water treatment of De Jager's Pan, Slope not exceed 1:3*				1	1	1	4	**0.8**
					VLOW	ISO	INCID	VLIKE	**VLOW**
Impact 2	Reduction in habitat integrity of downstream wetland areas	Negative	Probable	3	3	2	4	4	**2.4**
					MOD	STUDY	LONG	VLIKE	**MOD**
Mitigation Measure:	*Fertilise topsoil, Indigenous Seeding, Water rehabed areas*				1	1	4	4	**1.6**
					VLOW	ISO	LONG	VLIKE	**LOW**
Impact 3	Sedimentation of wetlands and surface water resources	Negative	Probable	3	2	2	2	5	**2**
					LOW	STUDY	SHORT	OCCUR	**LOW**
Mitigation Measure:	*Fertilise topsoil, Indigenous Seeding, Water rehabed areas*				1	1	1	2	**0.4**
					VLOW	ISO	INCID	UNLIKE	**VLOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Probable		1.7	1.5	2.5	3.1	**1.2**
					LOW	STUDY	MED	VLIKE	**LOW**
	AFTER MITIGATION *(If mitigation is effective / possible this rating wil decrease)*	Positive	Definite		0.7	0.7	1.3	2.5	**0.5**
					VLOW	ISO	SHORT	COULD	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Probable		4	3	4	5	**3.7**
					HIGH	LOCAL	LONG	OCCUR	**HIGH**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		4	3	4	5	**3.7**
					HIGH	LOCAL	LONG	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		3	3	4	4	**2.7**
					MOD	LOCAL	LONG	VLIKE	**MOD**

10.4.5 Groundwater

Project Impact (Unmitigated)

During the closure phase the use of dangerous chemicals such as paints, thinners, solvents and hydrocarbons introduces an environmental risk. Spills occur during the storage, handling, and use of such dangerous chemicals. If not contained and remediated such spills may enter the groundwater and cause pollution. In most cases even a small amount of these chemicals entering the environment can cause damage to ecological systems and even pose human health risks.

Decommissioning and closure activities (such as pipeline removal, and capping of the ash body) will be undertaken over the majority of the development site, however such spills will be very small and isolated in extent.

The probability of spills occurring is considered very high, however the risk of such spills entering the groundwater environment is considered to be quite remote. So the probability rating has been adjusted accordingly.

The combined weighted project impact to the groundwater environment (prior to mitigation), as a result of closure activities will **probably** be of a LOW negative significance, affecting only the *development site*, and acting in the long term. The impact will *could* occur. The impact risk class is thus **Low**.

Cumulative Impact

Closure activities are not expected to increase the cumulative impacts to groundwater as assessed in the operational phase i.e. **probably** of a MODERATE negative significance, affecting the *local area* in extent. The impact *is going to happen* and will act in the long term. The impact risk class is thus **High**.

Mitigation Measures

- Ensure that the mitigation measures documented in the construction phase are implemented, especially the installation of a suitably designed barrier system below the facility;

Residual Impact

Mitigation measures will ensure that the impact to groundwater resources incurred during the closure phase of the propose project will be negligible. The residual impact after the closure phase is complete and mitigation measures have been implemented will therefore be the same as the residual impacts after the operational phase of the project has been completed i.e. **probably** of a LOW negative significance, affecting the *local area* in extent. The impact *is going to happen* and will act in the long term. The impact risk class is thus **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described above. These ratings are provided in the matrix presented in Table 10-38 below.

Table 10-38: Closure Phase Impact Assessment Matrix: Groundwater

Rated By:	*Warren Kok*			ALTERNATIVES:					
Reviewed By:				Site 1					
IMPACT DESCRIPTION		Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	**Impact Risk**
GW-3	*Groundwater*								
	CLOSURE PHASE			5					
Impact 1	Decreased water quality - hydrocarbon / chemicals used on site during the closure phase	Negative	Definite	5	2	1	4	3	**1.4**
					LOW	ISO	LONG	COULD	**LOW**
Mitigation Measure:	*Hydrocarbon / Chemical Management*				1	1	1	2	**0.4**
					VLOW	ISO	INCID	UNLIKE	**VLOW**
Impact 2	Surface water ingress into the ash body producing polluted ground water	Negative	Probable	3	3	1	4	4	**2.1**
					MOD	ISO	LONG	VLIKE	**MOD**
Mitigation Measure:	*Topsoil layer >300mm, Sustainable Indigenous Vegetation Cover*				2	2	4	3	**1.6**
					LOW	STUDY	LONG	COULD	**LOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Probable		1.9	0.8	3.2	2.7	**1.1**
					LOW	ISO	LONG	COULD	**LOW**
	AFTER MITIGATION *(If mitigation is effective / possible this rating wil decrease)*	Negative	Definite		1.1	1.1	1.7	1.9	**0.5**
					LOW	STUDY	SHORT	UNLIKE	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Probable		2	3	4	5	**3**
					LOW	LOCAL	LONG	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		3	3	4	5	**3.3**
					MOD	LOCAL	LONG	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		2	3	4	5	**3**
					LOW	LOCAL	LONG	OCCUR	**MOD**

10.4.6 Terrestrial Ecology (Flora and Fauna)

Project Impact (Unmitigated)

During the closure phase of the project the ash body will be finally capped and all unnecessary infrastructure will be removed and the affected areas will be rehabilitated. The rehabilitation of these areas will cause a short term impact as vegetated areas may again be impacted by vegetation clearing, excavation, soil handling, and profiling. Alien invasive species infestation will also happen naturally causing a negative impact on vegetation. Faunal species that returned to the area during the operational phase will again be temporarily displaced.

Negative impacts will however be negligible in context of the overall positive impacts to the terrestrial ecology in the area as a result of capping and rehabilitation of the impacted areas. The closure activities include the amelioration of soils and reseeding of the area to create a sustainable land use post closure. It is envisaged that the post closure land use will be Wilderness, as grazing and cultivation land uses will not be compatible with the rehabilitated areas for the following reasons:

- The maximum topsoil depth on the facility will be 300 mm before the ash body is encountered, which is not suitable for planted crops;
- Ploughing of the rehabilitated areas may cause slope instability and will not be permitted; and

- Grazing animals, especially cattle, will damage the vegetation cover and capping of the facility, resulting in erosion and ash dispersion into the environment.

The restoration of wilderness land use will result in defragmentation which would have occurred during the construction and operational phases of the project.

The combined weighted project impact to terrestrial ecology (prior to mitigation) as a result of closure activities will **probably** be of LOW positive significance. The impact is expected to act over the long term and will affect the *development site*. Without mitigation measures this impact could happen. The impact risk class is thus **Very Low**.

Cumulative Impact

There is expected to be a cumulative impact that occurs as both ash disposal facilities will be capped and all unnecessary infrastructures for both facilities will be decommissioned and the affected areas rehabilitated. The cumulative area affected is about ~16 % of the study area. In a similar manner the adjacent land uses such as the mining operations will also rehabilitate their affected areas. An investigation of aerial photography for the mining operations north of Camden Village in fact proves this is occurring. An investigation of the success and standards of rehabilitation of these mining operations was however not made, and as a precautionary measure we have excluded these areas in the assessment of cumulative impacts.

As mentioned above the rehabilitation activities of the proponent will negate any closure impacts occurred, but will also contribute a positive impact on the already negatively impacted baseline environment.

The cumulative unmitigated impact on the receiving environment will **probably** remain of a MODERATE negative significance, affecting the *study area*. The impact will act in the long term and *is going to happen*. The impact risk class is thus **Moderate**.

Mitigation Measures

- Ensure that newly placed soils and seeded areas are watered for the first 2 years on a regular basis to improve the success of re-vegetation activities;
- All “no-go” areas need to be fenced off to ensure that during maintenance of the facility no additional impact is incurred on the surrounding areas;
- A suitable seed mix of indigenous plants should be used in all rehabilitation programmes on the site;
- All alien invasive species on-site should be removed and follow-up monitoring and removal programmes should be undertaken throughout the operational phase of the project;

- Ensure that the mitigation measures for the stripping, stockpiling, and replacement of soils documented in the construction and operational phase (Section 10.2.6 and Section 10.3.6) are implemented;
- Adhere to the ESKOM transmission vegetation management guidelines / standards when maintaining power line servitudes

Residual Impact

In time the rehabilitated landscape will again start becoming a functional natural habitat for small fauna including insects, mammals and birds. If the mitigation measures for surface water and wetlands are implemented it is also likely that an improved conditions for aquatic ecology will also be observed in the De Jagers Pan. The rehabilitated area will however never return to its pre-development condition, and will also likely never carry large grazing animals.

The residual impact will **probably** of a LOW negative significance, affecting the *study area*. The impact will act in the long term and *is going to happen*. The impact risk class is thus **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described above. These ratings are provided in the matrix presented in Table 10-39 below.

Table 10-39: Closure Phase Impact Assessment Matrix: Terrestrial Ecology

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
				ALTERNATIVES:	Site 1				
TE-3	*Terrestrial Ecology*								
	CLOSURE PHASE			5					
Impact 1	Capping of the waste body	Positive	Probable	5	2	1	4	2	**0.9**
					LOW	ISO	LONG	UNLIKE	**VLOW**
Mitigation Measure:	*Alien invasive control, Ameliorate soils replaced, Indigenous seedmix*				3	1	4	5	**2.7**
					MOD	ISO	LONG	OCCUR	**MOD**
Impact 2	Increase in alien invasive species	Negative	Probable	3	3	1	4	5	**2.7**
					MOD	ISO	LONG	OCCUR	**MOD**
Mitigation Measure:	*Alien invasive control, Indigenous Seedmix - Rehab area*				1	1	4	5	**2**
					VLOW	ISO	LONG	OCCUR	**LOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Positive	Probable		1.9	0.8	3.2	2.5	**1**
					LOW	ISO	LONG	COULD	**VLOW**
	AFTER MITIGATION *(If mitigation is effective / possible this rating wil decrease)*	Positive	Probable		1.8	0.8	3.2	4	**1.5**
					LOW	ISO	LONG	VLIKE	**LOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Definite		3	2	4	5	**3**
					MOD	STUDY	LONG	OCCUR	**MOD**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		3	2	4	5	**3**
					MOD	STUDY	LONG	OCCUR	**MOD**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		2	2	4	5	**2.7**
					LOW	STUDY	LONG	OCCUR	**MOD**

10.4.7 Avifauna

Impacts to avifauna are solely as a result of habitat destruction. This impact is assessed fully in the construction phase and as such there is **definitely** expected to be NO ADDITIONAL IMPACT to the avifauna as a result of closure activities.

10.4.8 Air Quality

Project Impact (Unmitigated)

The capping of the ash body will require the transportation, handling, and placement of soils. The working area will be approximately 120 ha during the closure phase. There is not expected to be any additional impact from these closure activities. In contrast it is expected that the capping of the ash body and revegetation of exposed soils is expected to reduce the impacts to air quality that will occur as a result of the operational phase activities. Failure to establish a sustainable vegetation cover will result in positive impacts from closure activities not being realised.

The combined weighted project impact to air quality (prior to mitigation) during the closure phase will **possibly** be of a LOW negative significance, affecting the *local area*. The impact will act in the short term and *could very likely occur*. The impact risk class is thus **Low.**

Cumulative Impact

The current ash disposal facility will be capped and rehabilitated during the operational phase of this project, and there will certainly be a cumulative positive impact on the air quality by capping and rehabilitating both facilities. Without mitigation measures however, there is no surety that a sustainable vegetation cover will be established, and positive impacts may be diluted.

Other impacts to the receiving environment from mining as well as the Camden Power Station may still continue however, and will largely thus dictate the cumulative rating given.

The cumulative air quality impacts during the closure phase will **possibly** be of a MODERATE negative significance, affecting the *regional area*. The current impacts will act for as long as the power station and mining activities are operational; and should thus be viewed as operating in the medium term and *is going to occur*. The impact risk class is thus **High.**

Mitigation Measures

- Ensure that the mitigation measures for soil and land capability as well as terrestrial ecology are implemented;
- Ensure that regular watering is undertaken of exposed soils and re-vegetated areas to assist in the rapid establishment of a sustainable vegetation cover;
- Ensure that vegetation clearing is limited to only the areas where construction will take place;
- Ensure that “no-go” areas are fenced to ensure that closure activities do not impact unnecessarily on the wider area;
- Use chemical dust suppression (such as dust-a-side) on areas to be frequently driven; and
- Ensure that the installed dust suppression is maintain end and operational on all uncapped areas of the facility;
- Dust suppression on the ash body is to be undertaken in such a manner as to ensure that air quality impacts are within acceptable Air Quality Standards (especially for dust, PM2.5, and PM10 particulates); and
- Regularly undertake dust suppression using uncontaminated water to ensure that dust mobilisation is prevented.

Residual Impact

The residual impact will remain for as long as the power station and mining activities are undertaken within the study area. The residual impact will thus remain as assessed for the cumulative assessment above i.e. **possibly** be of a MODERATE negative significance, affecting the *regional area*. The current impacts will act for as long as the power station and

mining activities are operational; and should thus be viewed as operating in the medium term and is *very likely*. The impact risk class is thus **Moderate.**

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described above. These ratings are provided in the matrix presented in Table 10-40 below.

Table 10-40: Closure Phase Impact Assessment Matrix: Air Quality

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
				ALTERNATIVES:					
				Site 1					
AQ-3	*Air Quality*								
	CLOSURE PHASE			5					
Impact 1	Greenhouse gas emissions	Negative	Possible	3	2	1	2	3	**1**
					LOW	ISO	SHORT	COULD	**VLOW**
Mitigation Measure:	*Reduce energy consumption, Regular vehicle maintenance, Consecutive Rehab*				1	1	1	3	**0.6**
					VLOW	ISO	INCID	COULD	**VLOW**
Impact 2	Nuisance and fall out dust	Negative	Possible	3	3	3	3	5	**3**
					MOD	LOCAL	MED	OCCUR	**MOD**
Mitigation Measure:	*Watering to reduce dust mobilisation, Use Site 3, Revegetate stockpiles, Dust-aside / Chemical Suppressant on Roads.*				3	1	3	5	**2.3**
					MOD	ISO	MED	OCCUR	**MOD**
Impact 3	Increased particulate matter (PM2.5 and PM10)	Negative	Possible	5	3	4	3	5	**3.3**
					MOD	REG	MED	OCCUR	**HIGH**
Mitigation Measure:	*Watering to reduce dust mobilisation, Use Site 3, Revegetate stockpiles, Dust-aside / Chemical Suppressant on Roads.*				2	3	3	3	**1.6**
					LOW	LOCAL	MED	COULD	**LOW**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Negative	Possible		2	2.1	2	3.3	**1.3**
					LOW	LOCAL	SHORT	VLIKE	**LOW**
	AFTER MITIGATION *(If mitigation is effective / possible this rating wil decrease)*	Negative	Possible		1.5	1.4	1.8	2.6	**0.8**
					LOW	STUDY	SHORT	COULD	**VLOW**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Possible		3	4	3	5	**3.3**
					MOD	REG	MED	OCCUR	**HIGH**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Possible		3	4	3	5	**3.3**
					MOD	REG	MED	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Possible		3	4	3	4	**2.7**
					MOD	REG	MED	VLIKE	**MOD**

10.4.9 Noise Impact

None of the operational activities are expected to generate serious noise impacts as the majority of the processes are passive. The operational activities of the proposed facility will be the same as the existing facility. The existing facility will no longer be operational. Thus here is **definitely** expected to be NO ADDITIONAL IMPACT to the ambient noise as a result of closure activities.

10.4.10 Social Impact

All potential social impacts that may occur have been identified and assessed during the construction phase assessment above. The proposed activity is the continuation of an existing activity and thus there is **definitely** expected to be NO ADDITIONAL IMPACT to the economic environment as a result of closure activities.

10.4.11 Economic Environment

All potential economic impacts that may occur have been identified and assessed during the construction phase assessment above. The proposed activity is the continuation of an existing activity and thus there is **definitely** expected to be NO ADDITIONAL IMPACT to the economic environment as a result of closure activities.

10.4.12 Infrastructure

All potential infrastructure impacts that may occur have been identified and assessed during the construction phase assessment above. The proposed activity is the continuation of an existing activity and thus there is **definitely** expected to be NO ADDITIONAL IMPACT to the economic environment as a result of closure activities.

10.4.13 Traffic Impact

All potential traffic impacts that may occur have been identified and assessed during the construction phase assessment above. The proposed activity is the continuation of an existing activity and thus there is **definitely** expected to be NO ADDITIONAL IMPACT to the economic environment as a result of closure activities.

10.4.14 Visual

Project Impact (Unmitigated)

During the closure phase the profiling, capping and revegetation of the ash disposal facility will be the primary impact to the receiving visual environment. This will result in the facility being less visible. Capping and rehabilitation activities will likely impact ~120 ha of the proposed development footprint. Without proper management this positive impact might not be realised.

The combined weighted project impact to the existing visual environment (prior to mitigation) as a result of the closure activities listed above will **probably** be of a VERY LOW positive significance affecting the *study area*. The impact will act in the short term and *is unlikely to occur*. The impact risk class is thus **Very Low**.

Cumulative Impact

The cumulative visual impact (prior to mitigation) from the capping and revegetation of: the existing ash disposal facility; as well as the final footprint of the fully developed ash disposal facility will result in a reduction of the already highly impacted baseline environment. Without mitigation measures though this positive impact will be diluted by a high preponderance of alien invasive species that will proliferate in the area, barren or poorly vegetated areas, erosion, and dust that will likely occur.

Without these positive visual impacts, the cumulative impact to the receiving visual environment will be as assessed for the operational phase above: **probably** be of a MODERATE negative impact on the *local* environment acting in the long term. The impact *is going to happen*. The impact risk class is **High**.

Mitigation Measures

- Ensure that all mitigation measures documented for soil and land capability, terrestrial ecology, and air quality impacts are implemented.

Residual Impact

The visual impact of the proposed ash disposal site cannot be mitigated entirely and a long term visual impact will **probably** continue post closure. However, with mitigation measures in place the visual impact that *very likely occur* is expected to be of a MODERATE negative significance affecting the *local extent*. The impact risk class is **Moderate**.

Impact Matrix

The impacts identified and discussed above have been rated according to the impact assessment methodology described above. These ratings are provided in the matrix presented in Table 10-41 below.

Table 10-41: Closure Phase Impact Assessment Matrix: Visual Environment

Rated By: *Warren Kok*
Reviewed By:

	IMPACT DESCRIPTION	Direction of Impact	Degree of Certainty	Weighting	Magnatude	Spatial	Temporal	Probability	Impact Risk
				ALTERNATIVES:	Site 1				
V-3	*Visual*								
	CONSTRUCTION PHASE			5					
Impact 1	Capping of Ash Dam	Positive	Probable	5	1	2	2	2	**0.7**
					VLOW	STUDY	SHORT	UNLIKE	**VLOW**
Mitigation Measure:	*Utilise indigenous seedmix*				3	3	4	5	**3.3**
					MOD	LOCAL	LONG	OCCUR	**HIGH**
COMBINED WEIGHTED RATING	**BEFORE MITIGATION**	Positive	Probable		1	2	2	2	**0.7**
					VLOW	STUDY	SHORT	UNLIKE	**VLOW**
	AFTER MITIGATION *(If mitigation is effective / possible this rating wil decrease)*	Positive	Probable		3	3	4	5	**3.3**
					MOD	LOCAL	LONG	OCCUR	**HIGH**
STATUS QUO	INITIAL BASELINE IMPACTS TO ENVIRONMENT	Negative	Definite		4	3	4	5	**3.7**
					HIGH	LOCAL	LONG	OCCUR	**HIGH**
CUMULATIVE IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **BEFORE MITIGATION**	Negative	Probable		4	3	4	5	**3.7**
					HIGH	LOCAL	LONG	OCCUR	**HIGH**
RESIDUAL IMPACT	INITIAL IMPACTS TO ENVIRONMENT + ADDITIONAL IMPACTS FROM PROJECT, **AFTER MITIGATION**	Negative	Probable		3	3	4	4	**2.7**
					MOD	LOCAL	LONG	VLIKE	**MOD**

10.4.15 Cultural Heritage Environment

Any impacts to the cultural or heritage aspects of the environment will occur during the construction phase (assessed separately in previous sections of this report) and there is **definitely** expected to be NO ADDITIONAL IMPACT to the Archaeology, Palaeontology, and Cultural Heritage of the area as a result of closure activities.

10.5 POST CLOSURE PHASE

The post closure phase activities will consist of primary monitoring and the occasional maintenance activity such as alien invasive control. The impacts are considered to be negligible. Presented below is a summary of the residual impact the will continue beyond the life of this project if the project is undertaken and all mitigation measures are implemented.

- In assessing closure impacts a few key assumptions have been made:
- The existing ash disposal facility will be profiled, capped, and re-vegetated;
- Surface water run-off from the existing ash disposal facility will be clean;
- All mitigation measures documented in this report have been implemented successfully;
- The power station will still be operational; and
- Open cast coal mining will still be on-going in the area.

10.5.1 Geology

As no mitigation measures are possible the residual impact will be the same as the cumulative impact above after construction is complete i.e. the impact will **definitely** be of a MODERATE negative significance. Although the projects impact to geology will only occur on the *development site*, widespread mining and development activities have impacted geology at a *local* extent. The impact *is going to happen* and will be permanent. The impact risk class is thus **High**.

10.5.2 Topography

The changes to topography are permanent, but with mitigation measures implemented the project impact to surface drainage patterns can be reduced to negligible conditions post closure.

The residual impact to topography beyond the closure phase of the project will **probably** be of a LOW negative significance, affecting the *local area*. The impact *is very likely to occur* and will be permanent. The impact risk class is thus **Moderate**.

10.5.3 Soils and Land Capability

The impact to soils and land capability will be permanent as pre-development land capability will not be restored i.e. the post closure land capability will be wilderness. In this regard the loss of grazing and arable soils is considered to be substantive (i.e. combined impact of ~200ha). With mitigation measures:

- the impacts will be contained to within the development footprint;
- the smallest impact footprint can be achieved of all alternatives considered; and
- valuable topsoil and sub-soil will be conserved, and reused in the rehabilitation of the area once ashing is complete;

The residual impact to soil and land capability beyond the closure phase of the project will be managed to be within the existing baseline conditions and after mitigation will **probably** be of a MODERATE negative significance, affecting the *study area* in extent. The impact *is going to happen* and will be permanent. The impact risk class is thus **High**.

10.5.4 Surface Water and Wetlands

Mitigation measures if successfully implemented will assist to reduce the cumulative impacts that will have accrued as a result of the already high baseline impacts and the additional impacts that may occur as a result of this project.

The residual impact to surface water and wetlands will **probably** be of a LOW negative significance, affecting the *study area* in extent. The impact *is going to happen* and will be long term. The impact risk class is thus **Moderate**.

10.5.5 Groundwater

Mitigation measures if successfully implemented will ensure that residual project related impacts will be negligible.

The post closure residual impact will **probably** of a LOW negative significance, affecting the *local area* in extent. The impact *is going to happen* and will act in the long term. The impact risk class is thus **Moderate**.

10.5.6 Terrestrial Ecology (Flora and Fauna)

In time the rehabilitated landscape will again start becoming a functional natural habitat for small fauna including insects, mammals and birds. If the mitigation measures for surface water and wetlands are implemented it is also likely that an improved conditions for aquatic ecology will also be observed in the De Jagers Pan. The rehabilitated area will however never return to its pre-development condition, and will also likely never carry large grazing animals.

The residual impact will **probably** of a LOW negative significance, affecting the *local area*. The impact will act in the long term and *is going to happen*. The impact risk class is thus **Moderate**.

10.5.7 Avifauna

Impacts to avifauna are directly linked to natural habitat, therefore as the condition of the natural habitat improves as documented above, avifaunal populations and species diversity on the impacted areas are expected to improve.

With the successful implementation of mitigation measures the residual impact to avifauna post closure of the project will **definitely** be of a LOW negative significance, affecting the *Local area*. The impact will act in the long term and *is going to happen.* The impact risk class is thus **Moderate**.

10.5.8 Air Quality

The successful implementation of mitigation measures such as a sustainable vegetation cover on the disposal facility will ensure that there will be NO IMPACT to air quality from this project post closure.

The residual impact to air quality post closure will remain for as long as the power station and mining activities currently present in the area are on-going. There is however a reduction in

the rating of probability as a major source of pollution (i.e. the existing ash disposal facility) will have already been rehabilitated. The residual impact will thus **probably** of a MODERATE negative significance, affecting the *regional area*. The current impacts will act for as long as the power station and mining activities are operational; and should thus be viewed as operating in the medium term and *is very likely to occur*. The impact risk class is thus **Moderate.**

10.5.9 Noise Impact

Post closure there is **definitely** expected to be NO RESIDUAL IMPACT to the ambient noise levels. Any existing impacts the receiving environment will remain unchanged and thus the residual impacts will be the same as the rated status quo at the commencement of the project i.e. **probably** be of a LOW negative significance, affecting the *local area*. The current impacts will act for as long as the power station and mining activities are operational and should thus be viewed as operating in the medium term and *are going to occur*. The impact risk class is thus **Moderate.**

10.5.10 Social Impact

This project will ensure that the power station can continue operating for the next 19 years. This on-going operation of the power station will likely have indirect positive impacts to the community that extends beyond the life of the power station. These positive impacts will however decrease over time.

The residual impact to the social environment will **likely** be of a LOW positive significance, affecting the *local area*. The impact will act in the long term and *could occur*. The impact risk class is thus **Low**.

10.5.11 Economic Environment

This project will ensure that the power station can continue operating for the next 19 years. This on-going operation of the power station will likely have indirect positive impacts to the community that extends beyond the life of the power station. These positive impacts will however decrease over time.

The residual impact to the economic environment will **likely** be of a LOW positive significance, affecting the *local area*. The impact will act in the long term and *could occur*. The impact risk class is thus **Low**.

10.5.12 Infrastructure

Post closure there is **definitely** expected to be NO RESIDUAL IMPACT to infrastructure present in the area as a result of this project. The impact to infrastructure will therefore be the same as presented for the status quo at the commencement of the construction phase i.e.

probably be of a MODERATE negative significance, affecting the *local area*. The impact will act in the short term and will *very likely occur*. The impact risk class is thus **Moderate.**

10.5.13 Traffic Impact

Post closure there is **definitely** expected to be NO RESIDUAL IMPACT to traffic present in the area as a result of this project. The impact to traffic will therefore be the same as presented for the status quo at the commencement of the construction phase i.e. **probably** be of a MODERATE negative significance, affecting the *local area*. The impact will act in the short term and will *very likely occur*. The impact risk class is thus **Moderate.**

10.5.14 Visual

The visual impact of the proposed ash disposal site cannot be mitigated entirely and a long term visual impact will **probably** continue post closure. However, with mitigation measures in place the visual impact that will *very likely occur* is expected to be of a MODERATE negative significance affecting the *local extent*. The impact risk class is **Moderate**.

10.5.15 Cultural Heritage Environment

There is **definitely** expected to be NO RESIDUAL IMPACT to the Archaeology, Palaeontology, and Cultural Heritage of the area.

10.5.16 Summary Matrix – Residual Impacts

The residual impacts as discussed above are summarised in Table 10-42.

Table 10-42: Summary Matrix: Residual Impacts Post Closure

ENVIRONMENTAL ELEMENT		ALTERNATIVE: Site 1 Risdual Direction of Impact	Residual Degree of Certainty	Residual Impact
CODE:				
	CLOSURE PHASE			
G-3	Geology	Negative	Probable	3.7 HIGH
T-3	Topography	Negative	Probable	2.7 MOD
SLC-3	Soil and Land Capability	Negative	Probable	3.3 HIGH
SWW-3	Surface Water and Wetlands	Negative	Probable	2.7 MOD
GW-3	Groundwater	Negative	Probable	3 MOD
TE-3	Terrestrial Ecology *(The direction of the project impact is positive, although the residual impact remains negative)*	Negative	Probable	2.7 MOD
AF-3	Avifauna	Negative	Definite	3 MOD
AQ-3	Air Quality	Negative	Possible	2.7 MOD
N-3	Noise	Negative	Probable	2.3 MOD
SOC-3	Social Environment	Positive	Probable	1.8 LOW
EC-3	Economic	Positive	Definite	1.8 LOW
INF-3	Infrastructure	Negative	Definite	2.7 MOD
V-3	Visual	Negative	Probable	2.7 MOD
ArCH-3	Archaeology, Palaeongology, Cultural Heritage	No Impact	Definite	0 NO

11 EAP OPINION

The reasoned opinion of the principal EAP who conducted this assessment is provided below.

Should this project proceed?

The EAP recommends the implementation of the project for the following reasons:

- The Camden Power Station was re-commissioned specifically to circumvent the power crises in South Africa, and its on-going operation is of strategic significance to further the objectives of sustainable energy production in South Africa;
- The proposed infrastructure is required for the on-going operation of the Camden Power Station and there is no other feasible solution that can be implemented within reasonable cost and with less environmental impacts;
- There is no alternative means available for the disposal of the ash waste stream, storage or disposal on land is the only feasible solution for this waste stream;
- The No-Go alternative is considered to be fatally flawed because it will result in the closure of Camden Power Station – having an unacceptable impact to the social and economic environment at a national level. This impact will persist beyond the post closure life of this project if it were implemented;
- Site 1 is the preferred alternative through all phases of the project and should be implemented;
- Although Site 3 is also a feasible alternative but is more difficult to manage and will have wider impacts to the biophysical, social and economic environment; and
- No specific issues or concerns have been raised by I&APs that indicate the project should not proceed.

Given the aforementioned the EAP states that all reasonable measures have been taken and included in the EMP for the avoidance and reduction of environmental impacts, and as such recommends the implementation of the project.

Which site should be developed?

The EAP recommends the implementation of the project on Site 1 for the following reasons:

- A single facility can be constructed on Site 1 as opposed to Site 3, thus making it an easier alternative to construct and manage;
- Site 1 is more than 19,7 % smaller than Site 3 when all infrastructure is combined;
- There will be a smaller impact to land use and agricultural activities if Site 1 is implemented;

- The drainage of dirty water on the site is only in one direction, allowing for impacts to be contained and managed easier;
- This solution allows for easier and more cost effective integration with existing infrastructure;
- This site alternative does not cross the Richards Bay Coal Line;
- No complicated mitigation measures are required in order to reduce the impact on the receiving environment;
- With the exception of installing a barrier system (which is very costly) all mitigation measures are relatively inexpensive to implement;
- This site is the least costly to construct and operate;
- The impact risk post closure does not result in an increase of the current baseline impacts to the receiving environment; and
- There are no substantial water resources in close proximity to Site 1.

What are the primary impact risks that must be managed?

The most significant impact risk to the environment from the Camden Ash Disposal Facility Expansion project (without mitigation measures), during the construction phase, will be to the Topography, Surface Water and Wetlands Resources, and existing infrastructure. This can be explained as follows:

- **Topography:** permanent alternation of surface water drainage patterns;
- **Surface Water and Wetlands:** potential for increased suspended solids and sedimentation of surface water resources from construction activities, decreased recharge of surface water resources from alterations of topography, and installation of a barrier system to prevent water from leaving the ash disposal facility area of the development site; and
- **Existing infrastructure:** at least three 400kV transmission lines will need to be relocated;
- Site 1 is located in close proximity (~500m) to the Camden Village, which although it has been decommissioned still has some residents residing the area. Camden Village is a sensitive receptor with regards to air quality, noise, and visual impacts; and
- The only residual impacts that are still HIGH after the construction phase is complete are the Geological, Topographic, Groundwater, and Visual impacts. This is as a result of the already highly impacted receiving environment. The project will not increase the significance of these existing impacts, but mitigation measures cannot reduce these impacts either.

The most significant risk to the environment from the Camden Ash Disposal Facility Expansion project (without mitigation measures), during the operational phase, will be to the Soil and Land Capability, and groundwater environment. This can be explained as follows:

- **Soil and Land Capability:** leachate will form below the facility and will pollute soil resources; and
- **Groundwater:** any leachate draining from the facility will percolate through soil and into groundwater resources, but the facility will have an appropriate barrier system.

The most significant risk to the environment from the Camden Ash Disposal Facility Expansion project (without mitigation measures), during the closure phase, will be to the Groundwater and Visual elements of the receiving environment. This can be explained as follows:

- **Visual Environment:** capping and vegetation of the dam will have a positive impact;
- **Groundwater:** any leachate draining from the facility will percolate through soil and into groundwater resources; and
- Closure activities will have a positive impact on the environment, although the residual impact in almost all cases remains negative. This is as a result of the already high baseline impacts that mitigation measures specific to this project will not reduce.

The most significant risk to the environment from the Camden Ash Disposal Facility Expansion project (without mitigation measures), during the post closure phase, will be to the Groundwater and Visual elements of the receiving environment. This can be explained as follows:

- **Soil and Land Capability:** any leachate will form below the facility and will pollute soil resources; and
- **Groundwater:** the leachate draining from the facility will percolate through soil and into groundwater resources;

Are the impact risks considered to be unacceptable?

Unmitigated project impact risks to the soil and land capability, surface water and groundwater environment would be unacceptable if not mitigated. Fortunately these impacts can be mitigated. With mitigation measures implemented at Site 1 all impacts can be reduced to within acceptable limits. The primary mitigation measures that will substantially reduce the impacts to the receiving environment are:

- The installation of a suitably designed barrier system needs to be installed below the ash disposal facility. This barrier system must include composite layers and include a leak detection and leachate collection system;

- A storm water management plan that includes clean and dirty water separation must be implemented;
- Capping and rehabilitation of the existing and proposed ash disposal facility; and
- Dust suppression through all phases of the development.

Can the environment carry this additional impact?

The baseline environment is already substantially impacted by industrial (Camden Power Station and associated activities), mining (opencast and underground mining), and wide spread agricultural (cultivated lands) activities. The geology, topography, surface water, groundwater, and terrestrial environments are most affected. Should Site 1 be implemented it is expected that the additional impact will not increase the current impact on the environment. It is the EAP's opinion that the environment can accommodate the proposed development if mitigation measures are successfully implemented.

Can the impact risks be mitigated or managed?

Mitigation measures identified are relatively well understood, and with the exception of the installation of a liner system below the dirty water facilities (such as the Ash Disposal Facility and Ash Water Return Dam), the mitigation measures are relatively inexpensive to implement.

12 CONCLUSION AND WAY FORWARD

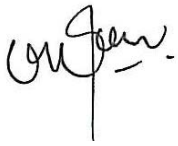
Eskom appointed Zitholele Consulting to undertake the EIA for the proposed expansion of ashing facilities at the Camden Power Station. This EIA study was undertaken with the aim of investigating potential impacts both positive and negative on the biophysical and socio-economic environment and identifying issues, concerns and queries from I&APs.

This Draft EIR documents the process followed and the findings and recommendations of the study. Additionally attached to this document is a Draft EMP that has been developed in order to implement the proposed mitigation measures.

The way forward recommended by this study is as follows:

- The Draft EIR and EMP (this report) is hereby submitted to the stakeholders for review;
- The Final EIR and EMP will thereafter be compiled and submitted to the Department of Environmental Affairs (DEA) for approval;
- The Final EIR and EMP will also be made available simultaneously for stakeholders to review;
- Once the DEA has reached a decision, DEA will issue their decision;
- Upon receipt of the decision, Zitholele will notify all I&APs on the stakeholder database of the DEA's decision by means of letters; and
- The Eskom negotiation process with affected stakeholders will then commence.

ZITHOLELE CONSULTING (PTY) LTD



Warren Kok

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Appendix A : EAP Curricula Vitae

Appendix B: DEA Integrated EA and WML Application Form

Appendix C : Letter of Acceptance from the CA

Appendix D : Public Participation Report

Appendix E : Background Information Document

Appendix F : Comments, Response Report

Appendix G : Specialist Study - Avifaunal Impact Assessment

Appendix H : Specialist Study - Aquatic Impact Assessment

Appendix I : Specialist Study - Biophysical Impact Assessment

Appendix J : Specialist Study - Conceptual Design Report

Appendix K : Specialist Study - Geo-Hydrological Impact Assessment

Appendix L : Specialist Study - Heritage Impact Assessment

Appendix M : Specialist Study - Social Impact Assessment

Appendix N: Specialist Study – Air Quality Assessment

Appendix O: Impact Matrix

Appendix P: Draft EMPr